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Faculty Category Award Winner
AN INVESTIGATION INTO THE OUTCOME OF CONCUSSIONS IN STUDENTS ENROLLED AT A COLLEGIATE INSTITUTION
Prakash Jayabalan, MD, PhD, Natalie Kramer, MED, ATC; Kelly Iwanaga Becker, MS, Brian Vesci, MA, ATC, Rajat Jain, MD, and Kristin Abbott, MD

OBJECTIVES: The Center for Disease Control and Prevention estimate that 3.8 million concussions occur in the United States annually with average length of time for full resolution of symptoms being 7–14 days. This duration is in the pediatric and sports specific populations, however no prior study has evaluated the outcome of concussions in a collegiate student population. This population is unique in that it is heterogeneous in individual sporting activity (varsity vs. club sports vs. recreational activity) and students can have relatively high academic demands placed on them. The pivotal consensus statement on concussion in sport from the 4th International Conference on Concussions advocates for cognitive rest. Yet maintaining a period of cognitive rest in collegiate students is particularly challenging due to the academic rigors of their schooling.

Investigating the outcome of concussions in a collegiate student population allows us to outline issues that remain unresolved in general concussion management. For example, there are no research studies that have compared the outcome between concussions that occur during ‘sports’ and ‘non-sports’ related activity and the relationship between levels of sport participation at baseline (i.e., varsity vs. club vs. recreational vs. no regular participation) and outcome. It is not known whether in a collegiate student population, there are certain patient-specific factors based on their history and/or clusters of presenting symptoms that may contribute to symptom prolongation. Improved ability to predict prognosis would be beneficial in outlining ‘at risk’ subjects for symptom prolongation, help in academic planning and estimating how long an individual may need to be removed from play or class.

The primary objective of this study, which is the first of its kind, was to investigate the days to symptom resolution in students with a concussion, enrolled at a collegiate institution. Our hypothesis was that students who present to our clinic (a student health center within an academic university) with symptoms of a concussion will have prolonged symptoms compared to the average reported duration nationally (7–14 days).

DESIGN: Type/Location: Retrospective chart review for the academic year of 2014–2015 of students who presented to our university student health service.

Subject identification: Medical charts from our clinical database of subjects with diagnoses of “concussion,” “post-concussion syndrome,” or “head injury.”

Inclusion/exclusion criteria: We included subjects aged 18 years at evaluation and enrolled as a full-time student. Subjects were diagnosed with a concussion using the consensus statement on ‘Concussion in Sport’ from the Zurich Guidelines. We excluded subjects not examined within the first 7 days after injury, who did not complain of concussion related symptoms on initial examination, did not complete the Standardized Concussion Assessment Tool (SCAT), and did not provide a specific date of injury or date of symptom resolution.

Symptom clusters: On initial and subsequent evaluations subjects rated their concussion-related symptoms on a scale of 0-6 for 22 symptoms (max. score of 132) using the SCAT. Presenting symptoms from the SCAT were further split into 4 clusters: cognitive, somatic, sleep and emotional components.

Statistical Analyses: Descriptive statistics, independent samples t-tests and a multiple linear regression were utilized.

RESULTS: Of 213 cases identified, 128 subjects fulfilled our inclusion criteria. Average duration of symptoms of a concussion for all subjects was 17.89 days (SD 17.05) the mean age was 20.86 years (SD 3.23) with 46.9% male and 53.1% female. There were 34.4% (n=44) varsity level athletes, 25.8% (n=33) club sports level and 26.6% (n=34) recreational level athletes with 13.3% (n=17) not engaging in regular physical activity or unknown. Subjects who were playing varsity-level sports had significantly less duration of concussion-related symptoms (mean 11.5 days) compared to club (18.61 days, p < 0.001) and recreational level (22.59 days, p < 0.001) athletes. Concussions that were related to sports were shorter in duration (mean 14.96 days) compared to those that were sustained during non-sporting activity (mean 21.75 days). Female students had a longer duration of symptoms compared to male students (20.79 vs. 14.60 days, p < 0.001) and graduate students had more than two weeks longer duration of symptoms compared to undergraduates (16.12 vs. 31.20 days). Statistical analyses showed symptom resolution in subjects with a history of seizure disorder takes approximately 32 days longer than those without and those with a prior concussion were twice as likely to have symptoms for longer than 28 days than those without. The cluster of subject presenting symptoms was not associated with symptom duration.

CONCLUSIONS: This is the first cross-sectional study reporting the outcome of concussions at a collegiate institution. The duration of concussion related symptoms appear to be prolonged in our population at approximately 18 days, compared to that reported nationally of 7–14 days. This suggests the need for further support for the general student population. Varsity athletes had significantly less duration of concussion-related symptoms compared to participants who engage in club or recreational sports. This could be due to the higher amount of medical support these athletes receive at our institution or their goal to return to play sooner. In addition, graduate students had a prolonged duration of symptoms compared to undergraduates, as do females students compared to males. Factors which appear to put athletes at increased risk of prolonged symptoms appear to be history of a prior seizure disorder or prior concussions.

The findings in our study highlight the difficulty in treating subjects with concussions at a collegiate institution, due to both the academic rigors and the differing needs of the student population. It also provides insight into at risk subsets of the student population, which needs to be an important consideration for the physician managing the patient. Our study also suggests the potential need for improved resources for the general population of university students who suffer a concussion, similar to those that varsity athletes receive.

Fellow Category Award Winner
COST-EFFICACY ANALYSIS OF ROUTINE VENOUS DOPPLER ULTRASOUND FOR DIAGNOSIS OF DEEP VENOUS THROMBOSIS AT ADMISSION TO INPATIENT REHABILITATION
Shanti M. Pinto, MD, Mohamed Yassin, MD, PHD, CIC, and Gary F. Galang, MD

OBJECTIVE: Venous thromboembolism (VTE) is a well-known complication that arises in patients with central nervous system or orthopedic trauma, stroke, orthopedic surgical procedures, and multi-visceral trauma, diagnoses that comprise the majority of the reason for which patients are admitted to inpatient rehabilitation (IPR). Pulmonary embolism can develop in roughly half of patients with untreated deep venous thrombosis (DVT) and is associated with increased mortality. Prior work at our institution has found that patients diagnosed with VTE during IPR have longer IPR LOS and rate of acute hospital transfer independent of admission functional independence measure (FIM) score. The timing of VTE diagnosis was found to be an important predictor of IPR LOS and rate of acute hospital transfer. Patients diagnosed with asymptomatic DVT on routine Doppler ultrasound at IPR admission had shorter IPR LOS and lower rater of transfer to acute hospital than patients diagnosed with VTE later in the IPR course. The objective of this study was to perform a cost effectiveness analysis on routine use of venous Doppler ultrasound at IPR admission. We hypothesized that routine venous Doppler ultrasound would be cost-effective.

DESIGN: The study was a retrospective cohort study conducted at a single inpatient rehabilitation facility (IRF) at an academic medical center in an urban setting. Approval was obtained from the quality improvement board at the study institution. The IRF contains 76 beds split among 4 separate inpatient rehabilitation units, which includes specialty brain injury, spinal cord injury, and stroke rehabilitation units in addition to a general rehabilitation unit. All discharges between January 1, 2013 and June 30, 2014 were considered eligible for inclusion in the analysis. Exclusion criteria included IPR LOS less than 24 hours, diagnosis of VTE in the acute hospital prior to IPR admission, use of full dose
Abstracts

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Abstract

Cost-effectiveness analysis of using venous Doppler ultrasound at admission to inpatient rehabilitation. The study included a retrospective chart review of 268 patients who were diagnosed with venous thromboembolism (VTE) during the study time period, both rehabilitation stays were included and were considered separate patient encounters. There were 2312 patient discharges over the 18-month study period, excluding those who were admitted to inpatient rehabilitation for less than 24 hours and patients who were discharged after being readmitted from the acute care hospital. Another 381 patients were excluded based on diagnosis of VTE prior to IPR admission (113 patients) or use of full dose anticoagulation at any time (268 patients), leaving a total sample of 1931 patients. Of this sample, 6.7% of patients who underwent routine venous Doppler ultrasound screening at IPR admission were diagnosed with VTE. If routine Doppler ultrasound was negative, 1.8% of patients with negative Dopplers were diagnosed with VTE later in IPR admission. VTE was diagnosed in 3.6% of patients who did not receive routine Dopplers at IPR admission. IPR LOS was estimated at 15.09 days for those not diagnosed with VTE, 18.96 days for those diagnosed with VTE on routine Dopplers at IPR admission, and 24.00 days for those diagnosed with VTE later in IPR admission. TreeAge Pro Healthcare was used for the two-way sensitivity analysis to calculate cost-effectiveness. Cost of Doppler ultrasound was estimated to be $100, and the cost per day in IPR as $1300 ($166 – $3137) based on actual costs from our IRF. There are multiple limitations to this study. The primary limitation is use of a single IRF within an academic medical center. This center contains specialized rehabilitation units, which may bias our patient population to those with more severe injuries and greater medical complexity. Additionally, the cost analysis is limited to the single center, limiting the generalizability of these findings. The analysis only focused on the timing of VTE diagnosis, with the assumption that the cost of treatment of VTE would be the same regardless of timing of VTE diagnosis. The analysis does not account for the cost of over-treatment through treating asymptomatic DVT that would not have caused clinical symptoms. Furthermore, cost of medical complications that arise from this treatment, such as life-threatening hemorrhaging are not accounted for in this model. Future studies should account for these costs in the cost-effectiveness analysis.

RESULTS: Two-way sensitivity analysis was used to calculate the cost-efficacy of using venous Doppler ultrasound at admission to IPR. Overall IPR cost for patients diagnosed with VTE was $24,648 (1,331.32 – 93,796.30) if diagnosed when the patient was asymptomatic at admission to IPR compared with $74,880 (2,131.44 – 110,296.92) when the patient developed clinical symptoms later in the IPR stay. The cost of IPR stay for those not diagnosed with VTE was $19,617 (1,079 – 74,284.16). As the cost of performing a venous Doppler ultrasound is only $100 at our institution, the potential cost savings of roughly $50,000 per patient is the equivalent of the cost of 500 screening Dopplers. Since the VTE rate at our institution is greater than 1 in 500 admissions, routine admission venous Doppler ultrasound is cost-effective.

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CONCLUSIONS: Routine Doppler ultrasound screening for VTE at IPR admission is cost-effective and may prevent prolonged IPR LOS and acute hospital transfer. Implementation of venous Doppler ultrasound screening should be considered as part of the routine admission orders. RESULTS: Two-way sensitivity analysis was used to calculate the cost-efficacy of using venous Doppler ultrasound at admission to IPR. Overall IPR cost for patients diagnosed with VTE was $24,648 (1,331.32 – 93,796.30) if diagnosed when the patient was asymptomatic at admission to IPR compared with $74,880 (2,131.44 – 110,296.92) when the patient developed clinical symptoms later in the IPR stay. The cost of IPR stay for those not diagnosed with VTE was $19,617 (1,079 – 74,284.16). As the cost of performing a venous Doppler ultrasound is only $100 at our institution, the potential cost savings of roughly $50,000 per patient is the equivalent of the cost of 500 screening Dopplers. Since the VTE rate at our institution is greater than 1 in 500 admissions, routine admission venous Doppler ultrasound is cost-effective.

DISCUSSION: This study provides deeper insights into rehabilitation training needs in sub-Saharan Africa. It is unique in its novel use of a decision matrix framework to identify key low cost high-impact items in patient management, medical knowledge and rehabilitation subspecialty domains, which could be targeted to fill gaps in training needs in a low resource setting. The findings show that the musculoskeletal exam, multi-trauma and burn rehabilitation may form the building blocks of training curricula as trainees should report high familiarity with these aspects of rehabilitation medicine. Familiarity has been reported to be associated with early and easy adoption of new knowledge based skills and concepts. The study also identifies areas of opportunity for further program development such as diagnostic and

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therapeutic joint injections (where trainees reported the least exposure) to cancer reha-
bilitation (where trainees expressed the highest interest). In the context of establishing 
rehabilitation medicine in a low-resource setting, the study underscores that focusing 
on medical knowledge and patient management domains have the potential to yield 
the highest immediate and overall value, efficiently and in a more uniform and 
estimable fashion.

STUDY LIMITATIONS: This study has some limitations. First, the results must 
be considered within the context that only a cross-section of trainees at a single aca-
demic center was surveyed. Therefore, the results may not be generalizable. Second, 
other potential confounders such as trainees’ cultural values, attitudes and beliefs, 
which often have an influence on feasibility and impact of a new training program 
were not explored. Nonetheless, the study sheds light on an important issue with 
regards to prioritizing curricular and knowledge domains that may help fill the void of 
rehabilitation medicine in sub Saharan Africa.

CONCLUSION: Decision matrix framework presents a viable model for perform-

ing needs assessment of rehabilitation education and training in sub Saharan Africa.

Medical Student Category Award Winner
PRELIMINARY EVIDENCE OF CORRELATION OF 
BRAIN-DERIVED NEUROTROPHIC FACTOR WITH FRACTIONAL 
ANISOTROPY IN POST-ACUTE STROKE PATIENTS
Hongmei Wen, MD, PHD, Bryan Le, MD (EXPECTED 2019), 
Mohammad A Alshikho, MD, Xuanwei Liu, MD, MS, Xian Luo, MD, 
and Qing Mei Wang, MD, PHD

OBJECTIVES: Stroke is the leading causes of long-term motor and cognitive 
disability in adults that affects 750,000 Americans each year. Biomarkers that mea-
sure the brain function at the molecular and cellular levels may provide important in-
sight into the neurobiological mechanisms of stroke recovery.

Serum brain-derived neurotrophic factor (BDNF) has the potential for being a 
biomarker of neuroplasticity. Evidence suggests that serum BDNF correlates with 
the level of BDNF in the brain. BDNF and its receptor, tropomyosin-related kinase 
B, have been shown to increase after ischemic conditions. Low levels of BDNF 
have shown a correlation with a poorer prognosis in functional recovery. More recent 
studies show that direct injection of BDNF shortly after stroke improves white matter 
integrity and white matter recovery in animal models. While early studies show evi-
dence of BDNF factoring into functional improvement in stroke recovery, it is unclear 
if BDNF plays a role in white matter tract plasticity.

Diffusion Tensor Imaging (DTI) has been used to measure the structural changes 
of white matter after stroke. Fractional Anisotropy (FA) is a DTI metric that is used to 
evaluate the degree of anisotropy, or directional diffusion, within the white matter fi-
bers. Studies have suggested that FA evaluates the predictive value of Fractional An-
isotropy (FA) regarding stroke recovery outcome. This pilot study investigates the 
relationship between BDNF and FA in post-acute stroke.

DESIGN: Participants and clinical assessments: This was a retrospective study. Med-
cal records for stroke patients admitted to an acute rehabilitation hospital between 
January, 2012 and January, 2016 were screened with the following inclusion 
criteria: age >18 years and MRI including DTI and FA performed with the same 
acquisition parameters in the same institution. The study was approved by the 
IRB committee.

MRI data acquisition: MRI imaging data was collected using the Research Pa-
tient Data Registry (RPDR), a Partners Network clinical database.

There was variation among the acquisition methods and parameters in the MRI 
imaging data. To prevent potential variability in imaging methods, we restricted 
imaging to DTI images obtained using a single Siemens Skyra 3T (Siemens Medical 
Solutions, Erlangen, Germany) scanner and 20-channel head and neck coil.

Diffusion Tensor Imaging: The analysis of DTI data including regions of interest 
(ROI) and data motion evaluation were discussed separately. The Functional MRI 
of the Brain Software Library (V5.0.6, Oxford, UK) was used to create the FA maps. 
In the ROIs located on white matter tracts, the mean FA values were calculated using 
Tract Based Spatial Statistics (TBSS) analysis.

RESULTS: The average age of patients at admission was 73 years old. Thirty-six percent were male. Among risk factors for stroke patients, 45% had 
a history of smoking; 86% had hypertension; 36% had diabetes; 59% had hyper-
lipidemia; 36% had prior CVA; 18% had coronary artery disease (CAD); 32% had atrial fibrillation; and 14% had depression. The average BUN level was 20 
mg/dL (SD 12.85). The average creatinine was 0.99 mg/dL (SD 0.45). The average 
hematocrit was 38.47% (SD 4.02).

K-mean cluster using admission FIM motor sub scores generated high and low 
functional groups. The two groups had significant differences in admission FIM mo-
tor sub score (38.9±9.2 vs 17.0±7.5, respectively, p < 0.01), in the serum level of 
BDNF (19.3 ± 6.8 vs. 14.3 ± 2.0, respectively, p=0.03) and in FA in right CST 
(0.708±0.061 vs. 0.655±0.149, respectively, p<0.034). There was no significant dif-
terence in FA in left CST between two groups (0.71±0.063 vs 0.675±0.12; p=0.137).
Furthermore, patients with high FIM motor sub score displayed a significant correla-
tion between BDNF and FA in the right corticospinal tract (r=0.660, p<0.007), and 
trend correlation in the left (r=0.590, p=0.052). In patients with low FIM motor sub 
score, no correlation was found between BDNF and FA in either the left or right 
corticospinal tract (Left CST: r=0.445, p=0.171; Right CST: r=0.312, p=0.350).

CONCLUSIONS: Data from this pilot study suggests that there is correlation 
between FA and BDNF in patients with higher FIM motor sub scores but not in pa-
ients with lower FIM motor sub scores. These findings support the idea that BDNF 
may play a role in white matter plasticity. The main limitation to this study was the 
small sample size due to our strict parameters to control for imaging variables. The 
location of the stroke could be a factor that was not controlled in our study. Future 
studies are needed to confirm these findings. These biomarkers may provide valuable 
insight into the mechanism for recovery, leading to more effective treatment plans and 
drug development for patients in the future.

A FIVE-YEAR LONGITUDINAL INTERVENTION FOR 
IMPROVING MEDICAL STUDENT EXPOSURE TO PM&R
Kimberly Ross, MD, MBA, Katherine Lin, MD, and Khurana Seema, DO

OBJECTIVES: To increase medical student exposure to and interest in PM&R 
at our medical school which is affiliated with a major urban medical center.

DESIGN: The PM&R department developed an educational exposition (Expo) 
to increase medical student exposure to and interest in the field. 2015 marked the 
fifth anniversary of this annual event. The Expo is an innovative approach that 
uses a rotating station format to increase awareness among the medical students regard-
ning the various aspects of PM&R. Students are divided into 5 groups that rotate be-
tween 15-minute stations in which residents, fellows, and attending physicians give 
presentations on various aspects of PM&R: Traumatic Brain Injury; Spinal Cord In-
jury; Sports Medicine; EMG/Spasticity; and Amputee & Pediatric Rehabilitation.

Pre-testing and post-testing of the students, using an Institutional Review Board 
(IRB)-approved survey, allows for objective measurement of the effect of the Expo 
on student exposure and knowledge. National PM&R residency match data of 
United States (US) seniors was also evaluated and compared to the match data of 
seniors at our school.

RESULTS: The IRB-approved pretest/posttest data confirms that the Expo greatly 
increased student knowledge of and interest in PM&R. In the five years prior 
to the Expo, an average of 4.4 students rotated through PM&R. In the five years after 
the Expo, the number of students nearly tripled. Historical match data demonstrates 
that each year between 2005 and 2011, only 0.005% of seniors at our medical school 
matched into PM&R, while the national average for all US seniors in the match was 
0.01%. From 2012, the year after the first Expo at our medical school, to the present, 
the average match rate into PM&R at our school rose to 1.5%, surpassing the national 
average, which remained at 0.01%.

CONCLUSIONS: This demonstrates that an innovative approach using a ro-
tating station format is an effective way to increase medical student exposure to 
and interest in PM&R. Implementation of the Expo also yielded an increase in 
the number of students rotating through the PM&R elective, as well as going on 
to ultimately match into the specialty.

ADMISSION MINI MENTAL STATUS EXAM AND MOTOR 
FIM IS PREDICTIVE OF DISCHARGE DISPOSITION FOR 
STROKE PATIENTS ADMITTED TO ACUTE INPATIENT 
REHABILITATION FACILITY
Soumabha Das, MD, Hossam Eldin Mohamed, MD, Raman Sharma, MD, 
Raia Minassian, MD, Janet A. Herbold, PT, MPH, and Anne Ambrose, MD, MS

OBJECTIVES: Discharge disposition and length of stay are important quality 
indicators following acute rehabilitation. Many factors influencing discharge
disposition have been studied, including admitting diagnosis, co-morbidities and functional status. However, the role of cognition in predicting discharge disposition has not been fully studied. We examined the role of the Mini Mental Status Exam (MMSE) done on admission in predicting discharge disposition and length of stay in persons with stroke following acute inpatient rehabilitation.

DESIGN: Retrospective chart analysis of patients admitted to Burke Rehabilitation Hospital between 1/1/15 and 12/31/15 was performed examining patients with the admitting diagnosis of stroke. A logistic regression analysis model was used to predict discharge disposition using age, admission MMSE, admission Motor FIM and admission Cognitive FIM.

RESULTS: 34 patients were admitted with the primary diagnosis of stroke out of which 2 patients died during inpatient rehabilitation and 1 patient was discharged to a detoxification facility. In addition, 106 patients were transferred to acute care hospital or another facility before their stipulated length of stay and were excluded from the analysis. A logistic regression was performed to ascertain the predictive powers of age, admission MMSE, admission Motor FIM and admission Cognitive FIM on the likelihood of discharge to a sub-acute facility. The logistic regression model was statistically significant, χ²(4) = 174.229, p < 0.0005. The model explained 49.5% (Nagelkerke R²) of the variance in discharge disposition and correctly classified 78.2% of cases. Low admission MMSE scores and motor FIM scores were associated with an increased likelihood of discharge to a sub-acute facility.

CONCLUSIONS: Initial admission MMSE and admission motor FIM scores were predictive of discharge disposition in patients with stroke admitted to acute rehabilitation facility.

ANALYZING BRAIN-BEHAVIORAL PERFORMANCE OF PEDIATRIC TBI POPULATION THROUGH GO/NO-GO TASKS

Jerald P. Gomes, BS, Stacy Suskauer, MD, PHD, OTR/L, and Benjamin Dirlíkov, MA

OBJECTIVES: The objectives of this study were to evaluate inhibitory control under varying cognitive demands in children with a history of TBI compared to typically developing (TD) children and to evaluate the relationship of cortical thickness, in key brain regions, to inhibitory control.

DESIGN: Data were obtained from 20 children at least one year after mild- to severe TBI and 16 TD children. Behavioral outcome was completion errors on three Go/No-Go tasks: Simple (minimized cognitive demands), Cognitive (working memory demands), and Motivational (monetary reward/punishment). Freesurfer was used to generate cortical thickness in functional subdivisions of the frontal lobe. Independent sample T-tests were used to evaluate group differences in commission errors. Correlations were used to evaluate the relationship between commission errors and cortical thickness in each group.

RESULTS: The group with TBI performed significantly worse than controls on the Simple (p = 0.005) and Motivational (p = 0.048) but not the Cognitive task. There were trend level, negative correlations in the TBI group between Simple commission errors and cortical thickness in left lateral premotor cortex (r = -0.452, p = 0.072) and left supplementary motor cortex (r = -0.457, p = 0.075) cortices. A positive correlation was present in the TD group between Simple commission errors and thickness of the left supplementary motor cortex (r = 0.515, p = 0.050). In the TBI group, there was a strong negative correlation between Cognitive commission errors and thickness of the dorsolateral prefrontal cortex (r = -0.563, p = 0.029). No significant correlations were observed between Motor cortical errors and orbitofrontal cortex thickness.

CONCLUSIONS: Children with TBI experienced more difficulty with inhibitory control compared to their TD peers. The biggest discrepancy was observed on the task with the least cognitive demands. Increasing cognitive demand and incentivizing performance can potentially equalize performance of children with TBI and their TD peers. TBI appears to alter the brain-behavioral relationships with regard to inhibitory control under differing task demands.

BENEFITS OF ACUTE INPATIENT REHABILITATION FOLLOWING LUNG TRANSPLANTATION

Kasandra Hartman, BS, Nicholas Kinback, MD, BS, Katie Hatt, DO, and Eric L. Altschuler, MD, PHD

OBJECTIVES: Lung transplant (LT) patients have significant medical and rehabilitation needs and requirements. We quantified functional outcomes and medical complications of LT patients during acute inpatient rehabilitation (IPR).

DESIGN: Retrospective observational cohort study of LT patients at Temple University Hospital who underwent transplant from December 2014 to November 2015, comparing patients discharged directly home (DtH) from transplant service to patients discharged to IPR (DtIPR) from transplant service. Demographic data (z-test), LOS on transplant service and IPR were reviewed (t-test). A FIM_5 score (sit-to-stand, ambulation, ambulation distance, upper/lower body dressing) was used to assess functional level (t-test). Medical complications were scored 1-3 (1 mild, e.g., medication change, 3 severe, e.g., change in medical status).

RESULTS: 34 patients DtH, 26 DtIPR demographically similar (NS) in terms of age, sex and diagnoses. Conversely, LOS on the transplant service differed significantly (DtIPR) 35.8 ± 24.1 days vs. (DtH) 18.3 ± 14.1 (p < 0.01). The FIM_5 score upon discharge from the transplant service differed significantly (DtIPR) 5.77 ± 0.97 vs. (DtH) 3.54 ± 0.75. After an average of 12 ± 5.5 days in IPR, these patients reached a FIM_5 of 5.38 ± 0.60. Of the 26 patients discharged to IPR, 12 patients (46%) had been readmitted to acute care vs. only 48% of patients DtIPR.

CONCLUSIONS: Nearly half of LT patients are too functionally disabled to be discharged home. Despite twice as long a stay on the transplant service, after an average of 12 days on IPR, DtIPR patients are brought to the same functional level as those DtH. Substantial and significant gains were seen in PT, OT and SLP areas. Time to first readmission was significantly less in patients DtH vs. DtIPR.

BRAIN COMPUTER INTERFACE CONTROL OF A PROSTHETIC KNEE IN A TRANSFEMORAL AMPUTEE

Douglas P. Murphy, MD, William Lovegreen, MS, CPO, John Fox, CPO, Ou Bai, PHD, Brian Burkhardt, MSEE, ATP, and Javier Soares, MD

OBJECTIVES: The purpose of this study was to establish the feasibility of manipulating a prosthetic knee with a brain-computer interface (BCI) system in a transfemoral amputee.

DESIGN: A transfemoral amputee subject was trained to activate a knee-unlocking switch through mental imaging of the movement of his lower extremity. Surface scalp electrodes transmitted brain wave data to a software program that was keyed to activate the switch when the event-related desynchronization (ERD) in the electroencephalography (EEG) recording reached a certain threshold. After achieving more than 90 percent reliability for switch activation, the subject then progressed to activating the knee-unlocking switch on a prosthesis that turned on a motor and unlocked a prosthetic knee. The project took place in the prosthetic department of Veterans Administration Hospital. The study consisted of a single subject with a transfemoral amputation with adequate cognition and physical capacity to engage in the study. The subject walked up and down parallel bars and unlocked the knee for swing phase and for sitting down.

RESULTS: The success of knee unlocking through this system was measured. Additionally the subject filled out a questionnaire on his experiences. The success of unlocking the prosthetic knee mechanism ranged from 50% to 100%.

CONCLUSIONS: The performance of the subject supports a role for BCI control of a lower extremity prosthesis using surface scalp electrodes.

CHRONIC EFFECTS OF HIGH-INTENSITY EXERCISE AND HIGH-PROTEIN DIET ON PARALYZED AND HEALTHY SKELETAL MUSCLE ADAPTATIONS IN INDIVIDUALS WITH LONG-STANDING SPINAL CORD INJURY

Keith F. Polston, MS, Mualla Ersalan, MS, and Ceren Yarar-Fisher, PT, PHD

OBJECTIVES: Spinal cord injury (SCI) is associated with skeletal muscle atrophy and related comorbidity factors such as metabolic diseases. Exercise and diet modification are two treatment options for improving muscle mass and metabolic health. We investigated the effects of 8-week combination exercise and high-protein diet interventions on muscle translation initiation signaling, size, and fiber distribution in 11 individuals with long-standing SCI.

DESIGN: Participants were subjected to an 8-week combination exercise regimen, including neuromuscular electrical stimulation-induced lower extremity resistance exercise and voluntary upper-body exercises (ComEx), or an 8-week high-protein diet. Each protocol was preceded and followed by vastus lateralis and deltoid biopsies. Myofiber type distribution and type-specific size were assessed, and additional tissue was Western blotted for translation initiation signaling proteins.

RESULTS: The 8-week ComEx group demonstrated increases in Type IIa fiber distribution (p < 0.05). There were no significant changes in Type I and Ix fibers in either group. Total Erk (P44/42) was increased in the ComEx group (p < 0.05). Non-significant decreases in total and phosphorylated levels of translation initiation signaling proteins (GSK-3α/γ, p70 S6 Kinase, 4E-BP1, FAK, Akt, and S6R) were observed in leg following ComEx. No significant changes were observed in these proteins in the diet group.
CONCLUSIONS: 8 weeks of CombEx resulted in non-significant increases in total levels of many of the translation initiation signaling proteins – and significant elevation of Erk – in the leg. Erk is involved in mechanically-induced signaling in skeletal muscle, where its activation increases in response to contraction and passive stretching. The muscle is highly sensitive to contractions even years after injury; however, 8 weeks of CombEx may be insufficient to induce significant changes in the abundance of aforementioned proteins. The increase in Type Ila fiber size in the exercise group may result in increased metabolically active muscle, which may lead to improvement in metabolic health.

COMPARISON OF FUNCTIONAL SPECIFICITY BETWEEN CONVENTIONAL AND MULTICHANNEL ELECTRODE MONTAGES FOR tDCS

Allison Wallingford, BA, Pablo Celnik, MD, and Claudia Ammann, MS

OBJECTIVES: Transcranial Direct Current Stimulation (tDCS) is a form of non-invasive brain stimulation capable of modulating brain excitability. To better understand and improve the effects of tDCS, our objective is to compare neuro-modulatory effects and spatial specificity of the traditional bipolar tDCS and a multi-channel tDCS montage applied to the primary motor cortex (M1). We hypothesized that both montages would increase corticomotor excitability, but the multichannel montage would only affect the targeted hand representation (i.e. more focal effect).

DESIGN: Thirteen subjects received tDCS (Neuroelectrics, Spain) targeting the first dorsal interosseous (FDI) representation of M1 with traditional bipolar stimulation (two saline soaked sponges as electrodes), multichannel stimulation and sham stimulation in three separate sessions. Using transcranial magnetic stimulation (TMS), we assessed the excitability of M1 along the motor strip targeting FDI, buccinator, anterior deltoid, and tibialis anterior at two time points before tDCS and three after tDCS. EMG was recorded and peak-to-peak motor-evoked-potential (MEP) amplitude was quantified. The data will be analyzed using a polynomial nested repeated measures ANOVA.

RESULTS: Preliminary analysis was performed for thirteen subjects. For each session, we calculated the average MEP amplitude at each time point for each muscle. For each post-tDCS time point, we compared the average MEP amplitude to the average pre-tDCS MEP amplitude in order to determine tDCS effects. We compared the effects of the different tDCS conditions. Preliminary results suggest that bipolar stimulation resulted in larger increase in the FDI MEP amplitudes compared to the multichannel montage, as well as an increase in deltoid MEP amplitudes. The buccinator and TA muscles showed little change in MEPs pre- and post-tDCS.

CONCLUSIONS: Preliminary results showed that bipolar tDCS induced a larger increase of brain excitability in the area of interest, but presented higher variability and less focal effect than the multichannel montage.

COMPOUND HETEROZYGOUS MUTATION OF SH3TC2 CAUSES A DYSMYELINATING POLYNEUROPATHY

Ryan Castoro, DO, Megan Simmons, MS, and Jun Li, MD, PHD

OBJECTIVES: Charcot-Marie-Tooth (CMT) disease is an inherited neuropathy that affects 1 in 2,500 people worldwide. To date there are no cures or specific treatments for CMT. Genetic studies have identified thousands of mutations in at least 80 genes which are associated with CMT. In this study we have set forth to further the understanding of genetic factors for CMT. Genetic studies have identified thousands of mutations in at least 80 genes which affects 1 in 2,500 people worldwide. To date there are no cures or specific treatments for CMT. Genetic studies have identified thousands of mutations in at least 80 genes which are associated with CMT. Understanding and improving the effects of tDCS, our objective is to compare neuro-modulatory effects and spatial specificity of the traditional bipolar tDCS and a multi-channel tDCS montage applied to the primary motor cortex (M1). We hypothesized that both montages would increase corticomotor excitability, but the multichannel montage would only affect the targeted hand representation (i.e. more focal effect).

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CONCLUSIONS: Preliminary results showed that bipolar tDCS induced a larger increase of brain excitability in the area of interest, but presented higher variability and less focal effect than the multichannel montage.

CORRELATION BETWEEN NEUROLOGIC IMPAIRMENT GRADE AND AMBULATION STATUS IN ADULTS WITH SPINA BIFIDA

Anne C. Tita, MD, John R. Frampton, MD, and Brad Dicianno, MD

OBJECTIVES: While International Standards for Neurological Classification of Spinal Cord Injury (ISNCSCI) are widely accepted as a means of describing neurologic impairments in patients with acquired spinal cord injuries, there is no similar consensus for congenital spinal cord injuries such as spina bifida. We hypothesized that neurologic impairment graded by four commonly used scales would be correlated with ambulation status in adults with spina bifida.

DESIGN: A retrospective chart review was performed on patients seen at the UPMC Adult Spina Bifida Clinic from August 2005 – May 2016. Exam findings were graded using several existing neurologic impairment scales: two versions of the National Spina Bifida Patient Registry (NSBPR) classification (with “reproducible movement” defined as strength 3 or greater versus 1 or greater), ISNCSCI motor level, and Broughton classification (a comprehensive 9-point scale designed by Broughton, et al. for use in spina bifida patients). Ambulation ability was ranked using a 4-point classification system published by Hoffer, et al. Spearman’s rho testing was performed to evaluate correlation between ambulation status and each neurologic impairment scale.

RESULTS: Data were collected from 409 patients. Significant correlations were found between ambulation status and all neurologic impairment scales evaluated. The strongest correlation was noted with Broughton classification (r=0.771 and p < 0.001). High correlations were also noted with both versions of NSBPR: strength 3 or greater (r=0.763 and p < 0.001), and strength 1 or greater (r=0.716 and p < 0.001). For ISNCSCI motor level, a moderate correlation was observed (r=0.56 and p < 0.001).

CONCLUSIONS: Multiple neurologic impairment scales can be used to measure motor function in adult spina bifida patients. While Broughton classification is most highly correlated with ambulation status, the less comprehensive NSBPR scale is also highly correlated and may be easier to administer in a busy clinic setting.

DIFFERENTIAL GENE EXPRESSION IN PERSONS WITH CHRONIC SPINAL CORD INJURY WITH PAIN

Paige Herman, BA, Katie Gibbs, DO, Adam Stein, MD, Rachel Monahan, BA, Andrew Beaufort, MD, and Ona Bloom, PHD

OBJECTIVES: Traumatic spinal cord injury (SCI) affects more than 17,000 Americans. Acutely after traumatic SCI, elevated inflammatory mediators exacerbate the primary injury zone and promote secondary tissue damage. Less is known about inflammatory mediators in the chronic phase of SCI, where they may impact functional recovery and promote secondary complications, including persistent pain. In preclinical models of SCI, inflammatory mediators appear to exert sensitizing effects on pain behavior by acting on primary afferent neurons, especially nociceptors (Walters, ET, Exp Neurol. 2014) Nociceptor cell bodies within dorsal root ganglia cells are also highly correlated and may be easier to administer in a busy clinic setting.

RESULTS: We conducted an IRB-approved prospective, observational study of persons with chronic (≥1 year from initial injury) SCI and uninjured individuals. Information on clinical and symptoms was collected using the NINDS Common Data Elements/ISCOS International SCI Pain Data Set (Widerstrom-Noga et al, Spinal Cord 2014). RNA from participants was isolated from whole blood collected in PAXgene tubes, using standard methods and the manufacturer’s...
Abstracts

Feasibility of Exoskeleton Use During Inpatient Rehabilitation: Clinician Focus Group Feedback
Jyotsna Koduri, BS Psychology, Seema Sikka, MD, Libby Callender, Bachelor Independent Studies, and Simon Driver, PHD

OBJECTIVES: Technological advances have introduced robotic exoskeletons in rehabilitation therapy to allow improved mobility and function for the patient while decreasing physical demands on therapy providers. While studies have demonstrated the safety of exoskeleton use, little research has been directed towards assessing the feasibility of integrating these devices into inpatient rehabilitation. Thus, the purpose was to qualitatively identify the barriers and facilitators faced by clinicians to exoskeleton use during inpatient rehabilitation.

DESIGN: A qualitative approach was adopted through completion of a 60 minute semi-structured focus group. Participants (n=5) included an SCI physiatrist, 2 stroke therapists, and 2 SCI therapists. The therapists had each completed the required exoskeleton training and were using the device in an inpatient rehabilitation setting. The physiatrist oversaw the medical management of patients using the exoskeleton.

RESULTS: A cross-case analysis was completed and four meta-themes arose and were identified as: (a) technical challenges (e.g., screening and inclusion/exclusion criteria), (b) resource limitations (e.g., staffing, set up time), (c) perceived benefits (e.g., patient feedback, clinical judgement), and (d) comparison with traditional therapy (e.g., body weight supported treadmill training (BWSTT)).

Within each meta-theme, several lower level items were discussed at high frequency including measurement challenges (18 quotes), limited treatment time (16), patient response to treatment (11), and combining exoskeleton into traditional therapy (9).

CONCLUSIONS: Findings suggest that clinician’s primary challenges with exoskeleton use are limited staffing time (e.g., for screening, setup, treatment) and a lack of evidence of the benefit in the inpatient setting when compared to traditional modalities. Clinicians reported that utilizing a combination of both exoskeleton therapy and BWSTT sessions may be most advantageous during inpatient rehabilitation. Future research needs to assess the effectiveness of utilizing the exoskeleton on patient outcomes in an inpatient setting.

DOES MY PATIENT WITH SHOULDER PAIN HAVE A ROTATOR CUFF TEAR? A PREDICTIVE MODEL FROM THE ROW COHORT
Nitin B. Jain, MD, MSPH, Run Fan, PHD, MS, and Gregory Ayers, MS

OBJECTIVES: A clinical diagnosis based on patient symptoms and physical examination is the cornerstone of musculoskeletal physiatry. In the United States, shoulder pain accounted for 11.5 million ambulatory care visits to physicians in 2010. Rotator cuff disorders are the underlying issue in 65-70% of patients with shoulder pain and accounted for 272,148 surgeries in the United States in 2006. How-ever, the diagnosis of rotator cuff tear based on patient characteristics, symptoms, and physical examination remains a challenge. In a large cohort of patients with shoulder pain, we modelled patient characteristics, symptomatology, and physical examination findings that predict a rotator cuff tear.

DESIGN: A multi-center cohort of 301 patients with shoulder pain was recruited between 2011 and 2015. Participants underwent a structured shoulder and general health questionnaire and a standardized physical examination as part of our research protocol. Strength testing was performed using a hand-held dynamometer. A rotator cuff tear was diagnosed based on an expert clinical impression and the presence/absence of a tear on blinded review of MRI. A logistic regression model was developed and validated using 632 bootstrap method with 500 repetitions.

RESULTS: In our cohort of 301 patients, 123 patients (40.9%) had rotator cuff tears and 178 did not have cuff tears. Potential variables based on patient symptomatology, demographics and physical examination results were selected. After model calibration to assess the best fit the e-statistics of the final model was 0.821. The predictors of the diagnosis of a rotator cuff tear included: external rotation strength ratio of affected shoulder versus unaffected shoulder (Odds Ratio=1.20; 95% CI=1.08, 1.34), male sex (Odds Ratio=2.05; 95% CI=1.14, 3.67), positive lift off test (Odds Ratio=1.47; 95% CI=0.34, 6.30), and a positive Jobe’s test (Odds Ratio=9.09; 95% CI=4.48, 18.84). A normogram based on these five predictor variables is available to clinicians so they can use it to predict the probability of a rotator cuff tear in a patient with shoulder pain.

CONCLUSIONS: We present a model that can predict the diagnosis of rotator cuff tear based on 4 variables – sex, lift-off test, Jobe’s test, and external rotation strength, without the need for expensive imaging such as MRI. This predictive model can be used by physiatrists and other clinicians in management of patients with shoulder pain when making the diagnosis of rotator cuff tear.
GENETIC AND FAMILIAL PREDISPOSITION TO ROTATOR CUFF DISEASE: A SYSTEMATIC REVIEW

Dominique Dabija, MS, Chan Gao, MD, PhD, Todd L. Edwards, MS, PhD, John Kuhn, MD, MS, and Nitan B. Jain, MD, MPhil

OBJECTIVES: Rotator cuff disease is a common disorder that leads to shoulder pain and loss of function. Its etiology in atrophic cases is uncertain and likely extends beyond repetitive micro-trauma or overuse. Our objective was to determine whether there is a genetic or familial predisposition to rotator cuff disease.

DESIGN: A literature search of PubMed and EMBASE databases through March 2016 identified 251 citations. After reviewing the titles, abstracts, and full articles, 15 studies met our inclusion/exclusion criteria.

RESULTS: Four studies assessed familial predisposition to rotator cuff disease. One of these demonstrated that siblings of an individual with a rotator cuff tear were twice as likely to develop a full-thickness tear and nearly five times more likely to be symptomatic. A five-year follow-up showed that the relative risk for the siblings to have a full-thickness tear was 2.85 (95% CI 1.75-4.64), for a tear to progress in size was 2.08 (95% CI 1.58-2.7), and for being symptom-positive was 1.44 (95% CI 2.04-8.28). Another study demonstrated that a significantly higher number of individuals with tears (32.3%) had family members with a history of tears or surgery than those without tears (18.3%). The other three studies investigated whether there is a genetic predisposition to rotator cuff disease and found significant association of certain haplotypes in DEFB1, FGFR1, FGFR3, ESRRB, and FGF10, and two single nucleotide polymorphisms with FAIM3BP and SASH1.

CONCLUSIONS: Prior studies provide preliminary evidence for genetic and familial predisposition to rotator cuff disease. However, there is a lack of large genome-wide studies that can provide more definitive information. Such studies can guide early detection of individuals at risk, prophylactic rehabilitation, and potential gene therapies and regenerative medicine interventions.

HEART RATE VARIABILITY PARAMETERS REPRESENT BIOMARKERS FOR NEUROPATHIC PAIN IN PATIENTS WITH SPINAL CORD INJURY

Jay Karri, MPH, Shengai Li, MS, Larry Zhang, Yan-Ting Chen, PhD, Argyrios Stampas, MD, Joel Frontiera, MD, Matthew Davis, MD, and Sheng Li, MD, PhD

OBJECTIVES: Heart rate variability (HRV), the physiological variance in the heart's R-R interval length, correlates with autonomic balance and may reflect autonomic abnormalities associated with chronic neuropathic pain (NP) in spinal cord injury (SCI). This study assesses the capacity of HRV parameters to diagnose baseline NP and quantify treatment response in an SCI cohort.

DESIGN: An electrocardiogram (ECG) was collected at rest for healthy controls (HC, n = 15), patients with SCI and chronic NP (SCI + NP, n = 18); and those with SCI only (SCI-NP, n = 12). Breathing controlled electric stimulation (BreEStim), an evoked analgesic for NP and null breathing-only (Breathing-only) treatments were administered to 8 SCI + NP patients. Subjective pain scores and additional ECGs were collected in treated patients at 10 and 30 minutes following intervention. HRV parameters were analyzed using conventional analysis.

RESULTS: At baseline, there were no heart rate differences amongst groups (P > 0.349). However, SCI + NP patients demonstrated a lower resting parasympathetic tone than either HC or SCI-NP groups, as evidenced by lower values for time domain parameters SDNN, RMSSD, NN50, and pNN50 (for all parameters: P < 0.010). No autonomic differences were appreciated in patients with injuries located at T6 and above vs. T7 and below (for all parameters: P > 0.050). Following treatment of SCI + NP patients with BreEStim, compared to Breathing-only intervention, subjective pain scores decreased at 10 and 30 minutes (for both times: P < 0.010). This analgesia with BreEStim treatment was associated with a higher parasympathetic tone across time, as evidenced by higher RMSSD, NN50, and pNN50 (for all parameters: P > 0.050). No differences in frequency domain analysis were observed either at rest or after interventions.

CONCLUSIONS: Patients with SCI and NP exhibit a lower resting parasympathetic tone, which can be determined by HRV time domain parameters SDNN, RMSSD, NN50, and pNN50. In particular, the RMSSD, NN50, and pNN50 parameters can also quantify NP treatment response as analgesic effect was characterized by an increase in parasympathetic tone for these parameters. HRV analysis is an innovative modality with the capacity for objective quantification of chronic NP in patients with SCI.

INCIDENCE AND MEDICAL COSTS ASSOCIATED WITH NON-FATAL CIVILIAN FIREARM INJURY IN THE UNITED STATES: A SUMMARY OF 2001–2014 DATA

Jason S. Frederick, MD

OBJECTIVES: The objective of this observational study is to report the incidence of non-fatal GSW in the U.S. from 2001 – 2014, identify trends within subpopulations, and to report the annual cost data associated with these injuries. Gunshot wound victims likely require substantial rehabilitation and post-acute care, and therefore an analysis of this population may better guide long term management and resource allocation.

DESIGN: Our primary outcome measure was numbers of non-fatal injuries. A simple regression (logistic and linear) model was utilized to analyze trends in the number of non-fatal injuries from 2001–2014. The different co-variates were age, race and gender. The year of injury (2001–2014) was added as a co-variante into the logistic regression model as a control variable to compare the annual incidence rate of non-fatal GSW between the different groups. All regression analysis was conducted using SAS 9.3.

RESULTS: We identified 771,297 non-fatal gunshot wounds which occurred within the US an average of 55,092 per year. The annual incidence of non-fatal gunshot injuries increased from 2001 to 2013. After adjustment for covariates, all three groups (race, gender and age) had an increased likelihood of non-fatal gun injuries with each subsequent year (all with a P <0.001). According to the corresponding F-value, male gender, Black Race, and persons in the 20-24 year age group were more likely to be impacted than any other age group. We computed average costs and total costs for medical and work loss stratified by age group and gender, the sum of these costs were utilized to estimate the total costs for hospitalized patients in 2010.

CONCLUSIONS: The total medical cost for hospitalizations was $898,022,000 U.S. dollars. Males from age group 20-24 had the highest medical costs since the group has highest number hospitalized. The total work cost for non-fatal GSW in the year 2010 was $2,827,859,000.

INTEGRATION OF CHRONIC DISABILITY MANAGEMENT IN A MEDICAL STUDENT CURRICULUM

GlendaLiz Bosques, MD, Kely M. Philip, MBIOE, and Gerard E. Francisco, MD

OBJECTIVES: The 2013 Association of American Medical Colleges Graduation Survey revealed that 33% of graduating students from our institution expressed inadequate exposure to disability management and rehabilitative care. Increasing exposure to the needs of patients with chronic disability is critical to fostering cultural diversity among medical students and residents of all disciplines. This intervention aims to minimize health disparities by training medical students in appropriate disability management.

DESIGN: The intervention consists of a 3-4 week rehabilitation elective course which includes Medical and Disability Pre-test (n = 19), lectures, media-based reflections, a hands-on wheelchair experience, and concludes with a disability attitudes post-test. Responses and reflections from students (n = 12) were then analyzed to assess the impact of the intervention on medical student knowledge base and clinical practice.

RESULTS: 53% of students had a moderate to very strong career interest in PM&R while only 12% of students had previous experience caring for a person with disability. Pre-test data revealed limited knowledge of terminology in disability health which was improved greatly in the post-test assessment. Medical students also gained knowledge on disability laws and available resources with up to 91.7% from previously 43.8% correctly identifying rights delineated in the American with Disabilities Act (ADA) and the Individuals with Disabilities Education Act (IDEA). Pre-test revealed 100% of students were able to correctly identify appropriate accommodations to limit barriers to care along with components of an individualized educational plan. As evidence of a need for an intervention, 40% of students felt no training with respect to disability management was provided.

CONCLUSIONS: A novel, interdisciplinary rehabilitation elective experience increased medical student knowledge and exposure of disability management. Incorporating these changes into the medical school curriculum will be invaluable in training future physicians to close the gap in access to care for persons with disabilities.

LIFE EXPECTANCY OF PERSONS WITH VENTILATOR-DEPENDENT SPINAL CORD INJURY

Michael J. DeVivo, DRPH, and Yuying Chen, MD, PHD

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CONCLUSIONS: A novel, interdisciplinary rehabilitation elective experience increased medical student knowledge and exposure of disability management. Incorporating these changes into the medical school curriculum will be invaluable in training future physicians to close the gap in access to care for persons with disabilities.
DESIGN: The study included 677 persons with ventilator-dependent SCI who were treated at a model system from 1973 through 2015 and who survived at least one year post-injury. Ventilator-dependency was defined as requiring partial or total respiratory support on a daily basis, and included both phrenic nerve stimulators and traditional ventilators. Follow-up was conducted by interview as well as periodic searches of newspaper obituary files and the Social Security Death Index. Causes of death were obtained from hospital records or the National Death Index. Data were analyzed by creation of a person-year data set where each year of follow-up for each person was treated as a separate observation. Logistic regression was used to quantify risk factors and develop a model to calculate age-specific probabilities of dying that were then used to construct life tables.

RESULTS: There were 5,674 years of observation during which 405 persons (59.8%) died. Significant risk factors included age, injury level, AIS grade, and post-injury years 2-4. There was no improvement in life expectancy since the 1980’s. Unlike non-ventilator-dependent SCI, there was no significant effect of gender, race, education, or insurance status. The leading causes of death were pneumonia and other respiratory diseases (40%), heart disease (18%), and septicemia (9%). Life expectancy for a 20 year old white male with C2 AIS A ventilator-dependency was 16.1 years (28% of normal).

CONCLUSIONS: Despite treatment advances, life expectancy remains below normal and is not increasing. Modifiable risk factors need to be identified and effective treatments developed to alter those factors before life expectancy can be improved.

LOWER QUADRICEPS SPEED OF FORCE PRODUCTION IS ASSOCIATED WITH WORSENING PHYSICAL FUNCTION IN ADULTS WITH OR AT RISK FOR KNEE OSTEOARTHROSIS: 36-MONTH FOLLOW-UP DATA FROM THE OSTEOARTHROSIS INITIATIVE

Bo Hu, PhD, Soren T. Skou, PT, PhD, Michael Nevitt, PhD, MPH, Glenn Williams, PT, PhD, ATC, Barton L Wise, MD, and Neil Segal, MD, MS

OBJECTIVES: To examine the relationship between speed of force production (SFP) and physical function in subjects with or at risk for knee osteoarthritis (OA) in order to determine whether quadriceps SFP at baseline was a potential determinant of worsening self-reported physical function and functional performance at 36-month follow-up.

DESIGN: All data were obtained from the Osteoarthritis Initiative, a longitudinal study of ~5,000 adults with or at risk for knee OA. Isometric quadriceps SFP (N/sec) was measured using the Oly-Set Strength Chair. Worsening physical function was defined as the Minimal Clinically Important Difference in WOMAC physical function (WOMAC-PF), 20-meter walk, 400-meter walk, and repeated chair stand performance over 36 months. Logistic regression was used to evaluate the associations between SFP tertiles and worsening physical function, after adjusting for baseline age, sex, BMI, and knee pain.

RESULTS: 3,996, 3,820 and 3,623 participants were included in 12-month, 24-month, and 36-month statistical analyses respectively. Compared to the lowest tertile of SFP, the middle and highest tertiles had lower risk of worsening of WOMAC-PF at 36 month follow-up with adjusted odds ratios of 0.758 (0.583, 0.987) and 0.689 (0.497, 0.956). In women, in comparison with the lowest tertile of SFP, the highest tertile had lower risk for worsening of 20-meter walk, and the middle tertile had lower risk for worsening of WOMAC-PF at 24-month follow-up, after adjustment for other factors, with odds ratios of 0.652 (0.448, 0.948) and 0.620 (0.426, 0.903) respectively. In addition, in comparison with the lowest tertile of SFP, the middle tertile had lower risk of worsening of WOMAC-PF at 36-month follow-up, with an odds ratio of 0.669 (0.476, 0.941).

CONCLUSIONS: These findings indicate that lower quadriceps rate of force production predates worsening of self-reported physical function.

OPIOD REDUCTION IN THE ACUTE REHABILITATION SETTING

Kunj G. Patel, MD, Eeshwar Chandrasekar, BS, MPH, Anna McCrate, MD, Ben Abramoff, MD, Mike Reed, RPH, Bryan Milton, MD, and Dale Strasser, MD

OBJECTIVES: Due to the increased use of opioids in our nation and the risks associated with opioid use, this study aims to decrease the opioid burden among patients admitted to an acute rehabilitation hospital. In particular, we will focus on those orders with a Morphine Equivalent Dose greater than 50, as the CDC has highlighted those orders as associated with increased risk of abuse, addiction, and death.

DESIGN: We reviewed patients admitted to the acute rehabilitation hospital during a two month period in 2016, and calculated the Morphine Equivalent Dose (MED) based on admission med reconciliation and again at discharge.

RESULTS: Seventy-five patients were in the pre-intervention group and 87 were in the post-intervention group. After posting MED charts around the rehabilitation hospital, only 12% were discharged with MED greater than 50, compared with 23% before the intervention. Furthermore, the decrease in MED (expressed as a percent change) from admission to discharge was significantly greater in the post-intervention group.

CONCLUSIONS: Opiate burdens can be significantly decreased in the acute rehabilitation setting by following the MED calculations throughout the length of stay and with periodic reminders from the pharmacist. Given these results, we recommend the use of MED calculation as a patient care tool.

PREVALENCE AND RISK FACTORS FOR SECONDARY ATTENTION DEFICIT/HYPERACTIVITY DISORDER AFTER EARLY-CHILDHOOD TRAUMATIC BRAIN INJURY

Megan Kennelly, Megan Narad, PhD, Shari L. Wade, PhD, Keith Yeates, PhD, Terry Stancin, PhD, ABPP; Hudson Taylor, PhD, and Brad G. Kurowski, MD, MS

OBJECTIVES: Characterize prevalence of ADHD symptomology 18-months after traumatic brain injury and describe injury and environmental factors that are associated with development of secondary ADHD (SADHD).

DESIGN: Cross-sectional cohort design including children with TBI and Orthopedic injury (OD) 18-months after injury. Assessments were administered at 0-3 months to characterize preinjury function and then 18-months post-injury: 213 children, 117 with OI and 86 with TBI (64 moderate, 22 severe), who sustained their injury between the ages of 3-7 years of age at the time of the injury.

RESULTS: At the 18-month assessment, 12 participants met SADHD symptomatology criteria (3 OI, 9 TBI). Logistic regression revealed that injury severity was predictive of development of SADHD 18-months after injury ($P < 0.0027$).
Severe TBI was associated with increased risk of SADHD when compared to OI (OR = 11.429, CL95 = 2.556–51.102). To understand the impact of other factors, logistic regression models including age at injury, sex, socioeconomic status (SES), family functioning, and injury severity were completed. Injury severity was no longer significantly correlated with increased risk of SADHD development (P > 0.0833) when controlling for these other factors; however, children with severe TBI had a 7.389 (CL95 = 1.192-45.810) greater likelihood of developing SADHD when compared to OI. Poor baseline family functioning (P < 0.0144) and male sex (P < 0.0458) were significantly predictive of SADHD and injury group*family functioning interaction was observed, with poor family functioning associated with an increased risk of SADHD for those with severe injuries (P < 0.0045).

**CONCLUSIONS:** Severe TBI was associated with increased risk of SADHD at ~18-months after early childhood TBI. Family functioning and injury severity also interact to influence development of SADHD. Future studies, with larger samples, are needed to characterize how injury factors and environmental factors predict development of SADHD. Understanding how these factors influence SADHD development will also provide insight into potential treatments to optimize outcomes.

**THE RELATIONSHIP BETWEEN EXERCISE AND BURNOUT AMONG PHYSIATRISTS IN NEW ENGLAND**

Kevin C. Pelleter, MD

**OBJECTIVES:** Burnout is a syndrome that can include emotional exhaustion, depersonalization and a reduced sense of personal accomplishment [1]. Some evidence suggests that exercise may be correlated with a lower rate of emotional exhaustion among physicians in various fields [2]. The following research examines the relationship between exercise habits and burnout scores among physiatrists in New England.

**DESIGN:** Participants in this study were members of a particular PM&R organization. Participants were considered eligible if they were physiatrists currently practicing PM&R in New England at the time of the study. From 361 physicians asked to participate, 120 completed surveys were returned.

E-mails were sent containing a link to an online survey. The first part of the survey was made up of 11 questions that asked about demographic information, as well as frequency, duration, type and intensity of workouts. The second part of the survey was the Maslach Burnout Inventory—Human Services Survey, which is a validated 22-question survey that generates scores for the three burnout subscales (emotional exhaustion, depersonalization and personal accomplishment).

**RESULTS:** Statistical analysis revealed that those who exercise at least once a week had lower emotional exhaustion scores. However, there was no significant difference for the depersonalization or personal accomplishment scores. We then investigated if exercising more frequently than once a week correlated with even lower burnout scores. Spearman correlations determined a significant positive correlation between frequency of exercise per week and personal accomplishment score, but no significant correlation for the other two subscale scores.

**CONCLUSIONS:** 1. Exercising at least once a week correlates with lower emotional exhaustion scores than those who exercise less than once per week. 2. Beyond once a week, increased exercise frequency does not correlate with lower emotional exhaustion scores. Physiatrists hoping to reduce burnout may benefit from exercising at least once a week.

**THE RELATIONSHIP OF PROMIS PAIN INTERFERENCE AND PROMIS PHYSICAL FUNCTION SCALES IN PATIENTS WITH SPINE DISORDERS**

William L. Wagner, MD, Richard Kendall, DO, Man Hung, PHD, Darrel Brodke, MD, Jerry Boussanga, BS, Maren Voss, MS, Willam Spiker, MD, and Brandon Lawrence, MD

**OBJECTIVES:** To examine the relationship between the Patient Reported Outcome Measurement Information System (PROMIS) Pain Interference (PI) and PROMIS Physical Function (PF) scales in a population of patients with spinal pain at a University Spinal Center. These instruments were developed by the National Institute of Health (NIH) to better quantify patient-reported outcomes regarding subjective health. While the PROMIS PF measures self-reported function in a single domain, the PROMIS PI had a Pearson Correlation of -0.717 with the PROMIS PF.

**RESULTS:** 1. 3229 patients took the PF Computerized Adaptive Test (CAT) and 2927 patients took the PI CAT. Participants’ mean age was 52.8 years (range = 18 – 94, sd = 6.5). Correlation analysis of the PROMIS PF with the PROMIS PI showed a Pearson Correlation value of -0.717 (P < 0.05). The PROMIS PI had a Pearson Correlation of -0.717 with the PROMIS PF (P < 0.05). This contributes to a strong linear relationship with a high negative correlation on a scatter plot.

**CONCLUSIONS:** For patients with pain from spinal origin there is a strong negative correlation between self-reported physical function and pain interference related to physical, social and mental health. This would support the PROMIS PI being used as a measure of physical function in patients with spinal pain.

**CASE REPORT POSTER PRESENTATIONS**

20-YEAR-OLD FOOTBALL PLAYER FOUND TO HAVE CONGENITAL CERVICAL FUSION ON IMAGING FOLLOWING IN-GAME NECK INJURY

Gregory R. Kelley, MD, and Matthew Maxwell, MS, MD

**Case Diagnosis:** Klippel-Feil Syndrome.

**Case Description:** A 20-year-old college level football player presented to sports medicine clinic after suffering a neck injury following a collision during a scrimmage two days prior. The patient sustained contact forcing his neck to a lateral bending position. He experienced immediate pain in cervical region with radiation the left shoulder. The patient had sustained multiple “stinger” type injuries after collisions in the past.

Physical exam revealed tenderness to palpation at the C4-C5 level with reduced neck flexion and lateral rotation to the left. Spurling’s test was positive on the left. Mild weakness with left biceps flexion was noted.

Cervical x-ray revealed partial fusion of C3-C4 segment with multi-level neuroforaminal encroachment. MRI later revealed congenital osseseous fusion of C3-C4 facet joint consistent with Klippel-Feil Syndrome (KFS) and multi-level neuroforaminal stenosis without spinal stenosis. The patient was subsequently held out of all contact activities and enrolled in physical therapy.

**Discussions:** Suggested guidelines for sports participation and return-to-play guidelines in the management of athletes with congenital spine abnormalities including KFS have been published. Generally, mass fusions involving more than two vertebral levels is an absolute contraindication to participation in collision activities; however, single or double level fusions at C3 or below without any range-of-motion deficits, instability, or degenerative disk disease presents no contraindication to play (Torg, 2009). There are also genitourinary, nervous, cardiac and musculoskeletal anomalies associated with KFS that clinicians should be cognizant of.

**CONCLUSIONS:** The management of athletes participating in collision sports with cervical spine abnormalities such as congenital cervical fusion seen in patients with KFS can be difficult especially in patients without a clear contraindication to play. The decision to clear these athletes with congenital cervical fusion is case-by-case, with an emphasis on specific level of injury, the type of fusion, associated spondylisis, or worrisome clinical findings.

A CASE OF CEREBRAL VASCULITIS IN A PATIENT WITH NEUROSARCOIDOSIS

Gary Panagiotakis, DO, and Mylan Lam, MD

**Case Diagnosis:** Cerebral vasculitis presenting as acute weakness and increased tone in a patient with neurosarcoidosis.

**Case Description:** A 51-year-old female with past medical history of neurosarcoidosis developed right leg weakness and increased tone. She was found to have a new T3-T4 lesion on magnetic resonance imaging. Her neurosarcoidosis was diagnosed in 2006. She was concerned about the deal of this new lesion. The patient was evaluated with a relapse in 2012 presenting as right upper extremity weakness. She previously responded well to corticosteroids and intravenous methylprednisolone was transitioned to oral prednisone on admission to inpatient rehabilitation. She soon developed acute
A CASE OF GALLSTONE PANCREATITIS AFTER TRAUMATIC BRAIN INJURY
Vandana Sood, MD, and Craig DiTommaso, MD

Case Diagnosis: A 41-year-old male with severe traumatic brain injury (TBI) was diagnosed with gallstone pancreatitis while admitted to a rehabilitation hospital.

Case Description: The patient sustained severe TBI after a high-speed motor vehicle collision and was admitted to the Disorders of Consciousness Program in an acute rehabilitation hospital where he remained in a minimally conscious state, non-verbal and unable to functionally communicate. The patient was noted to develop transaminitis (ALT > AST) four months post injury. A right upper quadrant ultrasound revealed mild common bile duct dilation and cholelithiasis.

During physical examination the patient was awake, alert, non-verbal but groaning, with some simple command following. His abdomen remained soft and non-distended, and he tolerated enteral feeds. Vital signs were notable for chronic hypertension and tachycardia with normal blood pressure, he remained afebrile with no jaundice or vomiting observed.

Despite his stable physical exam, we suspected gallstone pancreatitis as a possible cause of his transaminitis. Amylase and lipase were found to be 1,077 and 10,889 respectively and confirmed the diagnosis. The patient was started on intravenous anti-inflammatories provided no relief. On exam, Neer and Hawkins’ maneuvers were positive and range of motion was decreased. MRI of the left shoulder showed hypertrophic changes in the acromioclavicular joint consistent with arthritis. The patient underwent left shoulder arthroscopy with subacromial decompression and acromioclavicular joint resection the following month. He completed therapy, and at the six-month post-operative appointment, range of motion had improved, but he had persistent pain at the left neck, collarbone, arm and periscapular region. He was referred to a physiatrist where a trigger point injection provided no relief. At the next visit, a chest x-ray done for possible rib pathology showed enlargement of the hilum and right paratracheal density. A pulmonologist was consulted. CT scan showed hilar adenopathy, pulmonary nodules in the right lung, ground glass changes in both lungs and left lower lobe pleural thickening. Tissue biopsy found granulomas consistent with sarcoidosis. Steroid treatment was started and his pain improved.

Discussions: Sarcoidosis is a multi-system inflammatory disorder with non-caseating granulomas, diagnosed with chest radiography and presenting with respiratory and eye problems, polyarthralgia and erythema nodosum. Sarcoidosis may impact the musculoskeletal system, which is a challenging clinical picture. Our patient’s vague presentation of diffuse shoulder pain and acromioclavicular joint findings on x-ray made diagnosis of sarcoidosis difficult. A study on patients with asbestos related pleural disease showed similar vague pain in the chest as a manifestation.

Conclusions: Atypical presentation of systemic illness may present as musculoskeletal complaints due to involvement of that system or referral pain patterns, making diagnosis difficult. It is important to keep a broad differential, as early and accurate diagnosis facilitates appropriate interventions that reduce the need for unnecessary surgical intervention.

A CASE OF MUSCLE SPASMS AND FASCICULATION POTENTIALS IN A MALE BODYBUILDER
Juewon Khwarg, MD, Udai Nanda, DO, G. Sunny Sharma, MD, Aasha Basu, MD, and Sharon Gohari, MD

Case Diagnosis: Fasciculation potentials in a bodybuilder.

Case Description: Patient is a 32-year-old male bodybuilder referred for electrodiagnostic evaluation of six-month history of episodic muscle spasms, including the bilateral hands and right lower extremity. Neurologic physical examination was notable for dulness to light touch in the left upper extremity and fasciculations in the tongue and upper limbs. Needle electromyography (EMG) was significant for fasciculation potentials in two limbs, plus the thoracic and lumbar paraspinal muscles. Evidence of chronic reinnervation changes was also noted diffusely. Nerve conduction study showed mild bilateral median motor nerve and right tibial motor nerve slowing. NCS findings were without evidence of isolated motor neuron abnormalities or axonopathic changes. F wave and repetitive nerve stimulation (RNS) testing were unremarkable.

Discussions: Diffuse fasciculations can raise concern for motor neuron disorders such as amyotrophic lateral sclerosis (ALS). Fasciculation potentials, however, have also been identified in otherwise healthy adults, and associated with consumption of caffeine and activities such as heavy exercise. One recent study utilizing ultrasonography detected fasciculations in healthy subjects engaged in vigorous physical activity. We present a case of an avid bodybuilder with an electrodagnostic workup suggestive of fasciculations due to overexertion. Entrapment neuropathies, also seen in our patient, may result from prolonged nerve compression due to muscular hypertrophy.

Conclusions: Although diffuse fasciculation potentials may portend serious neuromuscular disease, findings may also be associated with activities such as bodybuilding. When presented with a patient with fasciculations and a history of heavy exercise, physiatrists should recognize this as a diagnosis of exclusion after complete workup has ruled out more serious disorders.

A CASE OF PERSISTENT PAIN POST ACROMIOLASTY - THE CULPRIT: SARCOIDOSIS
Laurie Dubaghian, MD, and Peter Yonclas, MD

Case Diagnosis: A 35-year-old man consulted an orthopedic surgeon for left shoulder pain.

Case Description: The burning shoulder pain had an insidious onset, exacerbated with activity and relived with rest. Corticosteroid injection and oral anti-inflammatories provided no relief. On exam, Neer’s and Hawkins’ maneuvers were positive and range of motion was decreased. MRI of the left shoulder showed hypertrophic changes in the acromioclavicular joint consistent with arthritis. The patient underwent left shoulder arthroscopy with subacromial decompression and acromioclavicular joint resection the following month. He completed therapy, and at the six-month post-operative appointment, range of motion had improved, but he had persistent pain at the left neck, collarbone, arm and periscapular region. He was referred to a physiatrist where a trigger point injection provided no relief. At the next visit, a chest x-ray done for possible rib pathology showed enlargement of the hilum and right paratracheal density. A pulmonologist was consulted. CT scan showed hilar adenopathy, pulmonary nodules in the right lung, ground glass changes in both lungs and left lower lobe pleural thickening. Tissue biopsy found granulomas consistent with sarcoidosis. Steroid treatment was started and his pain improved.

Discussions: Sarcoidosis is a multi-system inflammatory disorder with non-caseating granulomas, diagnosed with chest radiography and presenting with respiratory and eye problems, polyarthralgia and erythema nodosum. Sarcoidosis may impact the musculoskeletal system, which is a challenging clinical picture. Our patient’s vague presentation of diffuse shoulder pain and acromioclavicular joint findings on x-ray made diagnosis of sarcoidosis difficult. A study on patients with asbestos related pleural disease showed similar vague pain in the chest as a manifestation.

Conclusions: Atypical presentation of systemic illness may present as musculoskeletal complaints due to involvement of that system or referral pain patterns, making diagnosis difficult. It is important to keep a broad differential, as early and accurate diagnosis facilitates appropriate interventions that reduce the need for unnecessary surgical intervention.

A CASE OF STATIN-ASSOCIATED AUTOIMMUNE MYOPATHY
Cassandra J. Kaiser, DO, Anthony Leung, DO, MPH, Andrei Dokukin, MD, and Alexander J. Sweidan, MD

Case Diagnosis: Statin-associated Autoimmune Myopathy.

Case Description: This case describes a 70-year-old previously independent male who developed progressive proximal leg weakness resulting in fall at home and mild traumatic brain injury. His statin, initiated two years prior, was discontinued on admission due to concern for statin myopathy. However, his weakness continued to progress while in acute rehabilitation, where he developed dysphagia requiring placement of a gastrostomy-tube and respiratory failure requiring tracheostomy. Steroids and IVIG were administered without clinical response. Nerve conduction study demonstrated no evidence of neuropathy, while electromyography revealed positive sharp waves, fibrillation potentials and small motor unit action potentials consistent with myopathy. The patient’s muscle biopsy demonstrated myonecrosis and he was found positive for anti-mitochondrial 3-hydroxy-3-methylglutaryl-co-enzyme A reductase [HMGCR], verifying the diagnosis of statin-associated autoimmune myopathy [SAM]. The patient was subsequently treated with Rituxan and methotrexate, had mild clinical improvement, and was weaned off the ventilator. However he developed...
Modafinil and Amantadine.

FOLLOWING AN INVERSION ANKLE INJURY

COMPLICATION OF COMPARTMENT SYNDROME

and IgG-kappa and lambda bands. Patient has edema, acrocyanosis, and plethora in of beta-2 and gamma globulin. Immunofixation test: IgA-lambda monoclonal bands

properitoneal, mesenteric lymph nodes and splenomegaly. Electrophoresis: an M-spike
tient treated with zolendronic acid, Velcade and Dexamethasone. The patient was
CT: a hypodense lesion in the right basal ganglia and innumerable sclerotic lesions

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CONCLUSIONS: Very few cases of Statin-associated autoimmune myopathy have been described in the literature. Through presenting this rare condition and the ultimately fatal course of our patient, we aim to further the understanding of SAM to promote earlier identification and prompt management.

A CASE REPORT OF POEMS SYNDROME

Hongjie Yuan, MD, Pouyan Gohari, MD, Seong Woo Hong, MS,
Todd Lefkowitz, DO, and Marc Ross, MD

Case Diagnosis: POEMS syndrome is an extremely rare multisystem disorder characterized by polyneuropathy, organomegaly, endocrinopathy, monoclonal gammopathy or M proteins, and skin abnormalities. The criteria for diagnosing includes any 2 mandatory major criteria of polyneuropathy and monoclonal plasma cell proliferative disorder, 2 major criteria of an elevated VEGF and sclerotic bone lesions and 4 of minor criteria of organomegaly, extravascular volume overload, endocrinopathy and skin changes.

Case Description: Patient is a 47-year-old male endorsed chronic tingling and pain in fingertips and toes since 2013. The patient has elevated IgG and IgA, monoclonal spikes of IgA lambda. In 2015, the patient developed left extremity weakness. CT: a hypodense lesion in the right basal ganglia and innumerable sclerotic lesions throughout the spine. A biopsy of the T9 confirmed a plasma cell neoplasm. The pa-
tient treated with zolendronic acid, Velcade and Dexamethasone. The patient was found unconscious with seizure on 10/15. Antibiotics were started for sepis and HCAP. CT head: multiple acute infarcts. CT abdomen: small mediastinal, axillary, ret-
ropertitoneal, mesenteric lymph nodes and splenomegaly. Electrolytes: an M-spike of beta-2 and gamma globulin. Immunofixation test: IgA-lambda monoclonal bands and IgG-kappa and lambda bands. Patient has edema, acrocyanosis, and plethora in extremities. Pt had hypogonadism with low testosterone levels. With elevated serum VEGF of 894 pg/ml, POEMS syndrome was confirmed. An EMG showed severe ax-
onal sensorimotor peripheral neuropathy. The patient’s cognition improved with Modafinil and Amantadine.

Discussions: This is a rare case where we follow the course to better understand the nature of the disease and find better management, especially for the poly-
neuropathy and hyperalgesia. It will help us to make a prompt diagnosis and offer effect-
tive treatments for future cases.

CONCLUSIONS: POEMS syndrome is an extremely rare multisystem disorder with symptoms of polyneuropathy, organomegaly, endocrinopathy, monoclonal gammopathy or M proteins, and skin abnormalities.

A CASE REPORT OF SEASON ENDING ANKLE SPRAIN: A RARE COMPLICATION OF COMPARTMENT SYNDROME FOLLOWING AN INVERSION ANKLE INJURY

Justin Raper, MD, MSC, Yuixi Chen, MD, and Shayvan Senthelal, MD

Case Diagnosis: Acute Anterolateral Compartment Syndrome

Case Description: A 15-year-old male presented to the emergency department 4 days after a left ankle inversion injury. He had severe left leg pain, numbness, foot drop with leg swelling, anterior and lateral shin tenderness, decreased superficial and deep peroneal sensation, and loss of ankle dorsiflexion and eversion. X-ray was neg-
itive, CK was 9360, ALT 90, and AST 205 units/L. MRI showed proximal anterior and lateral compartment muscle edema and hemorrhage. Lateral compartment pres-
sure was 8 mmHg. Patient was treated with hydration. On follow-up with physiat-
ry, night-time foot splint was prescribed. Two weeks later, sensory deficit and weakness in left ankle evertors and dorsiflexors persisted. EMG/NCS revealed left superficial and deep peroneal nerve axonal neuropathy. At three months, left foot drop resolved. Weakness of evertors, extensor hallucis longus, and sensory deficit of the dorsal foot remained.

Discussions: Acute compartment syndrome is a rare but serious cause of lower extremity pain that is typically managed by removing external pressure, analgesics, supplemental oxygen, and possible fasciotomy. Potential complications include rhombodomyositis, muscle contractures, neuropathy, and paralysis. Best outcomes are obtained when decompression is performed within 6 hours from onset of symptoms, while 12 hours is associated with a poor chance for return of normal function. This emphasizes the importance of early diagnosis and intervention. In this case, ankle sprain resulted intramuscular hemorrhage that led to compartment syndrome. A nota-
table feature is the patient did not require fasciotomy and had favorable recovery with conservative care.

CONCLUSIONS: Inversion ankle sprain is a common problem encountered on a regular basis. Physicians should be aware that acute compartment syndrome may occur following an inversion ankle injury in the absence of a fracture. Early recogni-
tion and intervention are critical for the best outcomes.

A CASE REPORT OF SILENT CERVICAL SPONDYLOTIC MYELOPATHY WITHOUT NECK PAIN

Kirill Alekseyev, MD MBA, Samuel Thampi, MD, Nnabugo Ozurumba, MD, and Jaison Udani, MD

Case Diagnosis: A 70-year-old African American woman presented to the pain management clinic with complaints of lower back pain and bilateral calf pain with weakness in her legs. The clinical impression was lumbar radiculopathy. MRI of the low back revealed disc bulges which could not explain all the weakness in her legs. Hoffman’s sign was positive which prompted us to image the cervical spine which revealed cervical myelopathy. This case highlights the importance of silent cervical myelopathic presenting without neck pain, in patients with low back pain.

Case Description: We present a 70-year-old female who complaints of lower back pain and bilateral calf pain that started 5 months ago when the patient “got off the bus and the pain started suddenly”. The symptoms are constant throughout the day located at the midline of her lower back, rated 8/10 for pain, aggravated with coughing or movement, and radiates to the midline. These symptoms are relieved by rest. She did not have any bowel or bladder incontinence. The patient has a 4-
year history of NIDDM, hyperlipidemia, and hypertension. On examination, all cranial nerves were intact. Muscle reflexes were biceps, 3+; triceps, 3+

bilateral; brachioradialis, 3+ bilaterally; and 2/4 throughout the lower extremities. Strength examination revealed 3/5 in bilateral upper extremities and 4/5 through-
out the lower extremities. Upper motor neuron signs elicited were: a positive Hoffman’s bilaterally and hyperreflexia bilaterally. Babinski sign was negative bi-
laterally. Sensory examination was intact throughout. The patient demonstrated very poor standing balance, poor standing posture, and ambulated with a noticeable limp while using a quad cane. On inspection of the cervical spine, there was normal curvature of the spine. Spurlings’s sign was negative. Cervical facet tenderness was not noted. Lumbar spine exam did reveal lumbar facet tenderness and the Straight leg test was negative.

MRI imaging of the patient’s C-Spine showed C3-C4 left central disc protrusion (disc herniation) causing cord deformity with associated cord edema and/or glisosis, C4-C5 broad right central disc protrusion (disc herniation) causing cord deformity, C5-C6 broad shallow right central disc protrusion (disc herniation) causing cord de-
formity, C6-C7 shallow central disc protrusion (disc herniation), and Grade 1 to grade 2 degenerative anterior listhesis C7 on T1. The patient was referred to neurosurgery and underwent cervical decompression.

Discussions: Common causes of cervical myelopathy include old age. Among persons younger than 40 years, 25% have degenerative disk disease (DDD), and 4% have foraminal stenosis. In persons older than 40 years, almost 60% have DDD, and 20% have foraminal stenosis, as confirmed with MRI. The role of trauma in spondylosis is controversial although repetitive, subclinical trauma probably influ-
ences the onset and rate of progression of spondylosis. Cervical spondylosis is signific-
antly higher in patients who carry loads on their head than in those who do not. [3]
The most common physical exam findings are: Spurling sign - Radicular pain is ex-
acerbated by extension and lateral bending of the neck toward the side of the lesion, causing additional foraminal compromise; Lhermitte sign - This generalized electrical shock sensation is associated with neck extension; Hoffman sign - Reflex contraction of the thumb and index finger occurs in response to nipping of the middle finger; this sign is suggestive of an upper motor neuron lesion. A Hoffman sign may be insignifi-
cant if present bilaterally; Distal weakness; Decreased ROM in the cervical spine, es-
pecially with neck extension; Hand clumsiness; Loss of sensation.

CONCLUSIONS: This is case study of a patient with cervical spondylotic my-

eloopathy without neck pain in a patient with low back pain. Cervical MRI revealed multiple disc herniation’s causing cord malformations ranging from C3 to T1. Patient can present with low back pain with weakness in the legs. This case highlights the need to look for long tract signs of physical exam to explore possible causes of cervi-
cal myeloopathy to account for weakness in the legs, which cannot be accounted by the low back alone.
A CASE REPORT ON CHRONIC PROCTALGIA & TREATMENT OPTIONS

Garrett Lui, BA, and Donald Hamby, DO

Case Diagnosis: Proctalgia

The Case Description: An 80-year-old male presented to outpatient physiatry clinic with sharp bursts (seconds to minutes) of rectal pain that worsened with defecation, coughing, and prolonged sitting. The pain appeared after hemorrhoidectomy in 2011. The pain improved with suppositories. One month prior to visit, he had received his most recent of two botulinum injections for suspected Levator Ani Syndrome, which provided relief for approximately one week. Prior to clinic visit, he completed pelvic exams by three pelvic physical exam revealed minor scarring consistent with the location of his tenderness, where surgical intervention had been performed. There was concomitant myofascial pain located to the adjacent ischial bursa which was treated with lidocaine with no lasting relief. Proctalgia Fugax versus unspecified functional anorectal pain was diagnosed due to the short duration of the pain.

Discussions: According to the Rome III criteria, Functional Anorectal Pain Disorders are described as Proctalgia Fugax, Levator Ani Syndrome, and Unspecified Functional Anorectal Pain. Each disorder is primarily distinguished by characteristic durations of pain, frequency, and pain quality. Furthermore, one must rule out ischemia, IBD, abscesses or fissures, cryptitis, hemorrhoids or prostatitis. Evidence based treatment for proctalgia includes: warm bath, followed by topical glyceryl trinitrate, topical lidocaine, as well as salbutamol inhalation. Further interventions include warm water enema, clonidine, local anesthetic block with lidocaine, or botulinum toxin injections. The treatments with the highest USPSTF level of evidence are botulinum toxin injection and salbutamol inhalation.

CONCLUSIONS: While rarely seen in the physiatry setting, proctalgia is a common disorder in the general population. Using the Rome III criteria to diagnose functional proctalgia will allow the physiatrist to choose an appropriate treatment for these less commonly encountered pain syndromes.

A CURIOUS CASE OF TRANSVERSE MYELITIS IN A PATIENT WITH PAI-1 4G/5G GENE MUTATION: A CASE REPORT

Mariam Zakhiary, DO, Ajax Yang, MD, MPT, and Miguel Escolan, MD, MPH

Case Diagnosis: Transverse Myelitis in a patient with PAI-1 4G/5G gene mutation.

Case Description: The patient presented sudden, non-traumatic, paralysis of her lower extremities followed by bowel and bladder incontinence. Her physical exam in the ED confirmed flaccid paralysis of the lower extremities and rectal hypotonia. MRI revealed cord edema but no obvious diagnosis. LP was negative. Her paralysis did not improve with IVIG and plasma exchange (PLEX) therapy. She was transferred to rehab with a diagnosis of transverse myelitis wherein further workup was completed to rule out all possible causes. On rehab admission exam, patient was a T9 ASIA A.

Assessment/RESULTS: Extensive workup, including hematology, neurologic, infectious, and rheumatologic was started on neurology service, and completed on our rehabilitation service. Except for MRI findings described and a positive plasminogen activator inhibitor type 1 (PAI-1) mutation, workup was negative. The patient remained without neurological recovery for over 10 weeks post injury.

Discussions: Normal fibrinolytic activity hinges on a balanced interaction between plasminogen activators (e.g., tissue-type plasminogen activators) and inhibitors (e.g., PAI-1). PAI-1 overactivity is known to increase the risk of coronary artery disease. Despite being associated with increased risk of thrombotic events, PAI-1 has yet to be described as a risk factor for spinal infarct. However, given this patient’s genetic mutation, presentation, and other findings, we propose that this mutation of PAI-1 led to a spinal cord infarction in this patient.

CONCLUSIONS: Transverse Myelitis has multiple etiologies. Through thorough workup, the described patient was found to have a mutation in her PAI-1 gene which increased her risk of thrombotic events and led to a spinal infarct. This is the first reported case, to our knowledge of this genetic mutation causing such an event.

A FEMORAL NEW-ROPATHY

Marc A. Raji, DO, Eric Sterne, MD, and Jonathan Greenwald, DO, FAAPMR, FAANEM

Case Diagnosis: Spontaneous iliacus muscle hematoma.

Case Description: Patient is an 81-year-old female with past medical history of DM2 x 50 years and recurrent DVT who was admitted to inpatient rehab for deconditioning secondary to prolonged complicated hospital stay. On initial exam, muscle strength testing was 0/5 in the right quadriceps and hip flexors and otherwise normal throughout. She was arreflexic and symmetric in the lower extremities. There was no evidence of upper motor neuron processes. Patient had subjective complaints of paresthesia’s and pain along the right anterior thigh. Symptoms developed acutely two-weeks prior to inpatient admission during 2 week ICU stay, during which time was found to have an acute blood loss anemia without any identifiable cause. She was transfused and Hemoglobin and Hematocrit remained stable for the remainder of her hospital stay. Prior to discharge, she was restarted on therapeutic Apixaban. She was discharged to inpatient rehab without a definitive diagnosis for acute onset hip flexor and knee extensor weakness.

Impotent EMG/NCS was performed which showed an acute, complete right femoral neuropathy. MRI of the pelvis showed a 2.8x6.4 cm mass of complex signal in the right iliac fossa deep to the right iliacus muscle and diffuse enhancement of the overlying right iliacus consistent with hematoma along with soft tissue swelling down the length of the iliopectos through the inguinal ligament.

Discussions: This case presents an uncommon syndrome of femoral neuropathy secondary to spontaneous iliacus muscle hematoma in a patient on anticoagulation for recurrent DVT. Underlying cause of femoral neuropathy should be promptly identified so that treatment may be undertaken to, at minimum, prevent progression and preserve function. Return of neurologic function is possible if etiology is quickly identified and removed.

CONCLUSIONS: Femoral neuropathy secondary to iliacus muscle hematoma is rare, but should be considered in anticoagulated patients with an acute femoral neuropathy.

A LEFT PARACENTRAL LOBULE GLIONEURONAL TUMOR CAUSING EPILEPSIA PARTIALIS CONTINUA (EPC) AND FOCAL RIGHT LOWER LIMB MYOCLOINIC JERKS AND WEAKNESS

Voyanti T. Jones, MD, Mary Lawler, MD, Cheryl Benjamin, DO, and Steven Kreis, DO

Case Diagnosis: We report on a patient with an undiagnosed left anterior paracentral lobule glioneuronal tumor (ganglioglioma) who presented with focal

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right lower limb myoclonic jerks and weakness secondary to epiphalis partialis continua (EPC).

**Case Description:** A 40-year-old, right-handed previously healthy and independent female presented with right calf cramping and toe curling progressing to a rhythmic jerking motion and weakness. MRI brain showed abnormal FLAIR hyperintensity & cortical distruption in the left anterior paracentral lobe. EEG was consistent with epilepsy partialis continua (EPC). Despite four AEDs she continued to have right leg & abdomen myoclonic jerks & worsening weakness. Subsequent MRI showed expansion of T2/FLAIR/DW hyperintense focus in the frontal lobe. Stereotactic brain biopsy indicated a low-grade glioneuronal tumor. The tumor was resected and she had decreased myoclonic jerks. Her weakness, R foot drop, and imbalance persisted. While in acute inpatient rehab she had one episode of right leg myoclonic jerk. At discharge she was modified independent to independent for ADLs and ambulated with supervision using a rolling walker. An AFO was ordered. She displayed mild cognitive impairments with high order tasks.

**Discussions:** The paracentral lobe is formed by the medial extension of the precentral and post central gyr. When damaged the motor and sensory innervations of the contralateral lower extremity are interrupted and can manifest in lower limb weakness. Cerebral neoplasms often precipitate neuronal dysfunction and in our case resulted in EPC. EPC presents as focal motor clonic seizures typically localized to one extremity, MRI can help to identify the structural lesion of the cortex &/or white matter. AEDs do not cause a significant alteration in the course of this condition alone.

**CONCLUSIONS:** In this patient with a left frontal paracentral glioneuronal tumor who developed EPC resection of the lesion resulted in resolution of her myoclonic jerks and improved leg strength.

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**A NOVEL INFUSION METHOD OF INTRATHecal Baclofen USING PERSONAL THERAPY MANAGER: A CASE SERIES**

Armen Derian, MD; Brianna L. Hoffmann, MD; Jesse Charnoff, MD, and Seema Khurana, DO

**Case Diagnosis:** Personal Therapy Manager (PTM) is a small handheld device that allows patients to self-administer supplemental doses of intrathecal medications. It has been used as a valuable tool for the management of chronic pain, but not spasticity.

The following patients had significant spasticity associated with their conditions and were offered PTM.

- **66-year-old male physician with cystic myelomalacia status post C3-6 decompression and fusion.**
- **54-year-old male with a tethered cervical cord secondary to ependymoma resection.**
- **35-year-old female with secondary progressive multiple sclerosis.**

**Case Description:** Patients reported 30% improvement in their spasticity management. The Spinal Cord Injury Spasticity Evaluation Tool (SC-SSET) and Patient Reported Impact of Spasticity Measure (PRISM) were used to assess spasticity before and after PTM use. SC-SSET showed that all patients improved their ability to transfer, participation in recreational activities and social outings, and their balance and stability. One patient reported that PTM greatly improved his ability to ambulate. The PRISM revealed improvements in scores for social avoidance/anxiety, psychological agitation, daily activities, positioning, need for intervention, and social embarrassment. There were no adverse events reported with PTM use.

**Discussions:** Intrathecal baclofen (ITB) allows for greater management of spasticity for selected patients and it can be accomplished using different dosing patterns. The most common methods include simple continuous and scheduled bolus dosing of ITB programmed by the physician. PTM allows patients the ability to participate and control the administration of their ITB. The selected patients had significant spasticity with their associated conditions and were offered PTM to improve their spasticity management. Rather than incorporating PTM once other modes have proved to be ineffective, employing PTM earlier may be beneficial for the patient's subjective and functional outcomes.

**CONCLUSIONS:** PTM is a useful infusion method of ITB for a select group of patients with spasticity. By giving patients control over their spasticity, we can improve function while reducing the daily dose and potential side effects of ITB.
A RARE CASE OF MILLER FISHER SYNDROME

John Zheng, DO, Jeffrey Mercado, MD, Juewon Khwarg, MD, and Mojgan Saber, MD

Case Diagnosis: Miller Fisher Syndrome.

Case Description: A 52-year-old Latino male veteran with past medical history significant for previous traumatic brain injury mesial temporal sclerosis with intractable seizure disorder status-post left antero-temporal lobectomy, presented with new onset diplopia. Patient denied any recent infections, changes in medications, travel or vaccinations.

Physical exam positive for right cranial nerve VI palsy, mild bilateral dysmetria, ataxia and mild cognitive impairment. Laboratory work-up significant for CSF albuminocytologic dissociation, suggestive of Guillain-Barre syndrome. Patient was diagnosed with Miller Fisher syndrome (MFS). Guillain-Barre syndrome was considered less likely given the lack of any ascending muscular weakness, dysphagia, autonomic dysfunction or respiratory compromise classically associated with GBS. Our poster will go further into detail regarding the work-up, clinical course and management of this patient’s rare disorder.

Discussions: The discussion will focus mainly on the current understanding of the pathophysiology and the differential diagnosis. We correlate our patient’s findings with other documented cases of Miller Fisher syndrome noting key similarities and differences. While investigating our patient’s clinical presentation, it also important to have a wide differential. In our patient with ophthalmoplegia, the differential includes myasthenic syndrome, thyroid eye disease, and myasthenia gravis. Ataxia is another key feature found in our patient which places alcohol consumption and acute ischemic events on the differential as well. In comparing these other pathologies with our patient’s clinical presentation we present why MFS is the more likely diagnosis.

Conclusions: In conclusion, MFS may present with a wide spectrum of clinical features and although more common pathologies such as alcohol consumption and ischemic events should be investigated, MFS should be on the differential in a patient with ataxia and ophthalmoplegia.

A RARE CASE OF RIGHT CEREBRAL PREDOMINANT LATERALIZATION OF LANGUAGE CENTER IN LEFT-HANDED PATIENT WITH POST-STROKE APHASIA

Adam Hintz, MD

Case Diagnosis: Right Cerebral Predominant Lateralization of Language Center in Left-Handed Patient with Post-Stroke Aphasia

Case Description: A 55-year-old left-handed male with past medical history of extensive vascular disease, HTN and CKD presented with new onset of confusion, slurred speech and left sided weakness. CT revealed a moderate-size subacute to chronic infarct in the right cerebral hemisphere of the middle cerebral artery territory involving the temporoparieto-occipital lobe and small chronic lacunar infarcts in the right cerebellar hemisphere. No tPA was administered given unknown time of onset. Patient demonstrated moderate-severe transcortical sensory aphasia characterized by fluent verbal expression containing frequent anoma and semantic paraphasias with relatively intact repetition of single words (per Speech Language Pathologist). Auditory and reading comprehension were significantly impaired above the simple sentence level. Patient was admitted to acute inpatient rehabilitation for therapies focused on aphasia and left sided weakness both of which improved during his hospitalization.

Discussions: Research and clinical evidence has demonstrated a left sided cerebral lateralization of speech representation. One study by Pujol et al. (1999) using fMRI found that 96% of right-handed individuals showed left cerebral lateralization (4% bilateral activation pattern) whereas left-handed subjects had left cerebral lateralization 76% of the time and bilateral activation 14%. The remaining 10% of left-handed individuals had right hemisphere lateralization as is suspected in our patient given his aphasia and that his areas of infarct were exclusively located in the right hemisphere. Frequently the challenges faced by physiatrists and therapists of patients with right hemisphere stroke are those concerning neglect, however given the unique lateralization of speech representation in this patient aphasia was the biggest hurdle.

Conclusions: This case presents a unique presentation of right cerebral lateralization of speech representation manifesting as aphasia post-stroke.

A RARE CASE OF SPINAL DYSRAPHISM WITH PARTIAL AGENESIS OF THE CORPUS CALLOSUM

Thiago Queiroz, DO, Emmanuel Sakla, DO, and Juan Carlos Ortiz, MD

Case Diagnosis: Tethered cord syndrome with partial agenesis of the corpus callosum.

Case Description: A 27-year-old male with no past medical history began experiencing insidious onset of diffuse low back pain in 2009, which progressed to lower extremity pain with paresthesias in a non-dermatomal distribution. He sought medical attention after noticing decreased balance and urinary retention. He had a lumbar spine MRI that showed the conus medullaris ending at L4-L5 with thickening of the filum terminale and fibrolipomatous tissue. He also had an MRI of the brain showing mild to moderate atrophy. During the patient’s inpatient hospitalization, he described increasing difficulty ambulating due to pain with prolonged sitting and standing. A CT myelogram was performed and showed tethered cord syndrome with partial agenesis of the corpus callosum.

Discussions: The discussion will focus on the various surgical options for the management of spinal dysraphism and the importance of early surgical intervention in symptomatic patients to avoid worsening progression of neurological symptoms. This patient also had p-ACC, which is another rare entity with an incidence rate of 2-3% that usually presents with severe neurological symptoms. The association between...
dysgenesis of the corpus callosum (DCC) and malformation is well documented in the pediatric population. However, the correlation between p-ACC and TCS in adulthood is poorly reported.

CONCLUSIONS: Although the association between DCC and open neural tube defects is well documented in the pediatric population, it is rarely seen in adults. This patient’s constellation of neurological symptoms and diagnostic imaging suggests that there may be an association between TCS and p-ACC.

A RARE CASE OF SUBARACHNOID HEMORRHAGE IN BEHÇET’S DISEASE DESPITE NORMAL BRAIN VASCULARITY: A CASE REPORT

Veronica J. Chehata, MD, and Eduardo Chen, MD

Case Diagnosis: Behcet’s Disease (BD) is a multisystem vascular inflammatory disease with a poorly understood etiology. BD presents with several clinical manifestations, usually characterized by chronic recurrent episodes of oral and genital ulcers, iritis and cutaneous lesions. CNS involvement is relatively rare but can lead to severe complications including ischemic events, aneurysms and life threatening bleedings. We present a rare case of a patient with known Behcet’s Disease who developed a subarachnoid hemorrhage despite normal brain vasculature.

Case Description: A 54-year-old Caucasian female with known history of Behcet’s Disease (diagnosed 2 years prior) presents with sudden onset of left sided facial numbness and headache. Physical exam on admission shows a well-developed, well-nourished female in moderate distress. Patient was alert and oriented to person, place, and time, and responded appropriately to questions and verbal commands. Further exam showed impaired CN 5—left facial hypesthesia, DTRs 2+ and symmetric in all extremities, strength 5/5 in the bilateral upper and lower extremities. Initial CT Head without contrast was negative for acute pathology. MRA/MRI Head and Neck were negative for abnormality in the brain parenchyma, stenosis, occlusion, saccular aneurysm dilation or AVM malformation. Symptoms were thought to be secondary to Behcet’s exacerbation and the patient was treated with IV steroids, with some noted improvement in her symptoms. Later during her hospitalization, she developed an acute severe headache. CT Head revealed a left occipital subarachnoid hemorrhage. The patient did not require surgical intervention and was medically managed. Subsequently, she was discharged to acute rehab in stable condition where she clinically improved.

Discussions: Behcet’s Disease is a chronic systemic relapsing inflammatory disorder which commonly affects the oral and or genital mucosa, eyes and skin. Males aged 20 – 40 are most frequently affected (71%). CNS involvement is said to be relatively rare and comprises 5 – 10% of all cases. Neurologic findings are thought to be related to vasculitis of cerebral vessels, but the pathogenesis is poorly understood. Venous involvement is much more common than arterial. Intracranial aneurysms are rare and the association with BD is unclear. Subarachnoid hemorrhage is an extremely rare and serious complication of BD; all previous cases have occurred with documented brain parenchymal or aneurysmal involvement. To our knowledge, only one case of subarachnoid hemorrhage without documented involvement of the brain parenchyma or vasculature has been reported (Badreddine et al., 2003). Our case highlights a rare case of subarachnoid hemorrhage, without abnormal brain or vasculature involvement, in a patient with Behcet’s Disease.

CONCLUSIONS: Behcet’s Disease can present with a myriad of clinical findings. Neurological manifestations of Behcet’s are uncommon, but when present can be serious and life threatening. Subarachnoid hemorrhage is one of the rarest and most critical findings in BD, and needs to be carefully considered in these patients. Our case, to our knowledge, is the second reported case of isolated subarachnoid hemorrhage in a patient with Behcet’s Disease with normal brain vasculature.

A RARE CASE REPORT: SUB-ACUTE POSTTRAUMATIC ASCENDING MYELOPATHY IN AN 18-YEAR-OLD BOY

Katherine Lin, MD, Julie Chow, MD, Kimberly Ross, MD, MBA, and Kevin Dalal, MD

Case Diagnosis: Subacute posttraumatic ascending myelopathy (SPAM)

Case Description: An 18-year-old was involved in a motor vehicle accident in which he sustained an L1 burst fracture with resultant L3 paraplegia. He underwent immediate T11-L3 decompression and fusion surgery and was placed in a post-op TLSO brace. MRI demonstrated abnormal cord signal changes from T6–T12, T1–T2, and posteriorly upwards to C3-C4 in a Wallerian degeneration pattern. He was later found to have an atypical T7 ASIA Level A level at the T7 ASIA level of the chest, abdomen and pelvis demonstrated no vascular cord compromise. MRI 4 months post-injury revealed increased signal changes from T1–T6 which are diminished from prior scans.

Discussions: SPAM is a relatively rare phenomenon occurring days to weeks after traumatic spinal cord injury (SCI) resulting in neurological deterioration at least 4 segments above the site of injury. Review of the literature revealed a combined total of 31 patients with SPAM. The etiology of SPAM is poorly understood. Most patients, including our own, sustained injuries in the thoracolumbar junction, an area supplied by the Great Artery of Adamkiewicz. A post-traumatic thrombus here is a possible etiology. Both Belanger et al and Schmidt, as well as our patient, sustained L1 burst fractures and underwent angiography with no evidence of thrombus in all three patients. Another proposed mechanism is impaired venous drainage and cord stasis. Although 68% of SCI patients demonstrate reversal of the normal hemodynamic gradient, very few develop SPAM. Arterial hypotension and increased venous congestion is a possible mechanism of cord insult. Early mobilization and use of a TLSO brace may cause alterations in blood flow and ultimately ischemic changes in an already-injured cord.

CONCLUSIONS: As the current etiology of SPAM is unclear, each report in the literature is essential to furthering our knowledge. Our case suggests that vascular impairment may play a role in the development of SPAM.

A RARE CAUSE OF AVASCULAR NECROSIS IN A HEALTHY INDIVIDUAL

Vivek Kunnar, DO, and Michael P. Schaefer, MD

Case Diagnosis: Avascular necrosis of bilateral femoral heads secondary to Caisson’s disease

Case Description: A 48-year-old male with past medical history of hypertension presented to an orthopedic clinic for left hip pain. The hip pain started in late 2015 but has increased over the summer of 2016. A salesman with long distance commutes, he had noticed increased pain after long periods of sitting and standing from a seated position. Over the past three months, patient had increased pain and difficulty exercising, walking, and standing for long periods of time. His primary care physician ordered a left hip x-ray for suspected hip osteoarthritis. The x-ray indicated evidence of avascular necrosis without collapse.

Discussions: The patient reported no history of corticosteroid exposure, alcohol abuse, sickle cell anemia, trauma, infection or critical illness. Upon further review of rare cases of avascular necrosis, he recalled a history of deep sea diving and recalled subsequent episodes of the bends (Caisson’s disease). On exam, left hip range of motion was mildly limited without any clunking or associated point tenderness. The patient had no difficulty with weight bearing on exam. An MRI was ordered to characterize the avascular necrosis. Patient was advised to limit weight bearing activities and recommended to lose weight with non-weight bearing exercise.

CONCLUSIONS: After the MRI was obtained, the patient had progressive worsening of symptoms over a period of just one week. MRI results indicated bilateral femoral head avascular necrosis with subarticular collapse, greater on the left. He had antalgic gait with limited range of motion of the left lower extremity. Patient elected to proceed with total hip replacement. Musculoskeletal provider should carefully consider all possible causes for avascular necrosis including Caisson’s disease.

A RARE CAUSE OF NAUSEA AND GLOBUS SENSATION FOLLOWING STROKE

Andrew A. Joyce, MD

Case Diagnosis: Retrograde Migration of Gastrojejunalostomy Tube following Stroke

Case Description: The patient presented to acute inpatient rehabilitation with a gastrojejunostomy (G-J) tube and persistent complaints of nausea, vomiting, and vertigo. Initially, the patient’s complaints were thought to be secondary to his recent stroke, severe constipation, and possible gastrointestinal reflux disease. On day three of his rehabilitation stay, the patient developed worsening of his nausea, and described a new “feeling of a lump” in his throat. Initial examination of the patient’s oropharynx and abdomen were unremarkable. The patient’s symptoms initially improved, before acutely worsening later that day. Repeat examination of the patient’s oropharynx demonstrated migration of the patient’s G-J tube to the oropharynx. This patient had been regularly tolerating a diet, the G-J tube was removed by interventional radiology. Following removal of the patient’s G-J tube, the patient’s globus sensation resolved and his nausea significantly improved.

Discussions: This patient had multiple possible causes for his nausea and globus including severe constipation, and vertigo following his stroke. While antegrade migration of a G-J tube was thought to be a rare and uncommonly encountered phenomenon, this represents a rare cause of nausea and globus sensation in stroke patients. Given the prevalence of feeding tubes and nausea in the rehabilitation setting, physiatrists should be aware of this late complication.
Abstracts

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A SEVERE CASE OF ANTEROGRADE AMNESIA DUE TO A BILATERAL HIPPOCAMPAL STROKE CAUSED BY SEPTIC EMBOLI

Stephen Schauf, MD, and Beth Stepanszuk, MD

Case Diagnosis: A severe case of anterograde amnesia due to a bilateral hippocampal stroke caused by septic emboli.

Case Description: A 68-year-old male presented with a left knee infection followed by arthroplasty requiring revision and insertion of an antibiotic spacer. Postoperatively the patient developed acute onset confusion and aphasia. MRI brain revealed multiple scattered infarcts throughout the posterior cerebral artery territories involving the bilateral hippocampal tails. Stroke mechanism was secondary to septic emboli from endocarditis. The patient underwent emergent mechanical thrombectomy with basilar artery flow restoration. On admission to inpatient rehabilitation the patient was observed to have memory deficits. As a result, his rehab progress was limited due to an inability to recall and carryover therapy information during his sessions. Memory rating scales including the Cognitive Linguistic Quick Test (CLQT) and Ross Information Processing Assessment (RIPA) were administered demonstrating severe anterograde amnesia. Therapies utilized several strategies which included focusing on visual cues and implementing a memory log to help overcome his memory deficits. Also, the patient was started on donepezil 5 mg at bedtime. He was discharged after 36 days at a supervision level with a 33-point increase in his FIM score.

Discussions: This is a unique case demonstrating a post stroke deficit of severe anterograde amnesia. Specific to this case, an infarct involving the bilateral hippocampal areas can lead to impairments in several domains of memory including verbal and visuospatial. In such cases, therapies should utilize tools to aid in recall and carryover of rehabilitation information. In addition, donepezil, a drug commonly used to treat memory deficits in Alzheimer’s dementia, may offer a potential pharmacologic strategy to treat amnesia secondary to stroke.

Conclusions: Post stroke it is important to observe for deficits of amnesia which may limit a patient’s recovery in rehab, but can be overcome by certain therapy strategies and pharmacologic agents such as donepezil.

A RARE GENETIC DISORDER RESULTING IN AN ABOVE KNEE AMPUTATION

Vivek Kumar, DO, and Jayvee Navarro, MD

Case Diagnosis: Arterial tortuosity syndrome, a genetic disorder, resulting in above knee amputation

Case Description: A 65-year-old male with history of chronic right lower extremity ischemia was admitted for a right above knee amputation. Previously, patient underwent right lower extremity angiogram with lysis and percutaneous transluminal angioplasty with viabahn stent graft of right lower extremity. Pain symptoms improved and distal pulses were present. Patient was discharged home on lovenox, warfarin and aspirin. One month later, patient was admitted with severe right lower extremity pain without palpable dorsalis pedis and posterior tibial pulses. Internationally normalized ratio was therapeutic at 2.7. Patient was admitted to inpatient rehabilitation following a fall at home. The patient had a history of peripheral vascular disease, diabetes mellitus and chronic obstructive pulmonary disease. On admission, the patient noted weakness of the right lower extremity, decreased skin elasticity although the patient had neither of these characteristics. The affected gene is SLC2A10, with approximately 100 cases reported in medical literature. It is suspected that many cases go undiagnosed or misdiagnosed.

A RARE PRESENTATION OF BRACHIO-CERVICAL INFLAMMATORY MYOPATHY LATE IN THE DISEASE COURSE IN A REHABILITATION SETTING: A CASE REPORT

Marissa Pfiff, MD, and Jeffrey A. Kandt, MD

Case Diagnosis: Brachio-cervical inflammatory myopathy

Case Description: Patient was a 45-year-old previously active male climber and cyclist with no past medical history, who presented with a 16-month history of progressive functional decline, neck and proximal muscle weakness, marked weight loss, muscle wasting, dysphonia and dysphagia. He underwent extensive work-up and was diagnosed with brachio-cervical inflammatory myopathy + CREST syndrome/early limited systemic sclerosis based on laboratory, imaging and biopsy results. He received treatment with steroids, Cellcept and IVIG and transferred to acute inpatient rehabilitation. The patient received physical, occupational and speech therapies that utilized repeated low-resistance and sub-maximal effort strategies to improve strength and endurance without precipitating further muscle injury in the setting of active myositis process. His strength and endurance improved over the course of rehabilitation, but he was unable to achieve a level of function that would allow for independent living at home and discharged to a skilled nursing facility.

Discussions: Brachio-cervical inflammatory myopathy is an extremely rare diagnosis, with only one case series of 10 patients documented in medical literature to date. Each documented case was accompanied by other autoimmune disorders which further complicated the clinical picture. BCIM is infrequently seen in the rehabilitation setting and poses unique challenges both in medical management and therapeutic aproach. This case demonstrates that patients with BCIM who present with extensive, severe myopathy at time of treatment initiation have limited ability to regain strength within a relatively short period of time. However, like patients with other inflammatory myopathies, they notably benefit from structured rehabilitation with focus on repetitive sub-maximal effort strategies.

Conclusions: Long-term prognosis in patients with BCIM must be determined on a case-by-case basis and is likely influenced by severity of disease at time of presentation. Patients with BCIM can improve their strength and endurance with therapies that focus on repetitive sub-maximal effort strategies.
Physical examination findings include scapulohumeral discongruity, asymmetry, winging, audible snapping, weakness, atrophy, muscle imbalance and tightness. Imaging modalities are not of significant utility, but can aid in surgical planning. Nonoperative management with nonsteroidal anti-inflammatories, activity modifications, physical therapy, and therapeutic injections of steroid and local anesthetic may be helpful. Surgical treatment including bursectomy with or without partial scapulectomy is reserved for patients who have failed three to six months of nonoperative therapy. Even with surgical intervention, many patients continue to experience significant shoulder pain and disability.

CONCLUSIONS: Scapulohumeral bursitis and snapping scapula disorders are rare and underdiagnosed disorders of the scapulohumeral articulation; however when symptomatic, they may produce significant pain and debility. Further effort is needed to improve clinical outcomes and patient satisfaction.

A UNIQUE CASE OF A COMPENSATORY TEAR OF THE BICEPS TENDON: A CASE REPORT
Usker Naqvi, MD, MS, Brianna L. Hoffmann, MD, and Gemayaret Alvarez, MD

Case Diagnosis: Biceps tendon rupture in the setting of contralateral clavicular fracture

Case Description: In this report, we discuss an unusual case of a right-handed patient diagnosed with a proximal right sided bicipital tendonitis managed conservatively for four years prior to suffering a traumatic left clavicle fracture, which led to a compensatory complete tear of the right biceps tendon. The patient initially presented to clinic with right shoulder pain, and exam findings showed significantly decreased active and passive range of motion, a positive Hawkston’s and Neer’s test, as well as a positive Speed’s test. Magnetic Resonance Imaging results showed right sided adhesive capsulitis, full thickness tear of the supraspinatus, subscapularis tendon, anterior superior and posterior superior labral tears, and a tendinosis of the long head of the biceps thought to be degenerative in nature. Over the next two years, the patient received a series of three corticosteroid injections and a course of physical therapy. His initial evaluation in therapy showed patient to have 90 degrees of active shoulder flexion and 65 degrees of shoulder abduction. Therapeutic intervention included active range of motion exercises using a ball on the wall, manual therapy such as stimulation and joint mobility, along with modalities such as ultrasound. In a 2 month time span, patient had gained 10 degrees of motion in all planes of motion, and reported that he was pain free. Over the next year, the patient reported improvement with only one reported minor flare, treated with a home exercise program and anti-inflammatories. As patient was improving, he was involved in a motor vehicle accident, which resulted in a traumatic left clavicle fracture and an inability to use his left arm. His left arm was immobilized in a sling, and he was forced to use his right arm exclusively. Approximately 2 months post left clavicle fracture, patient returned to clinic with severe pain, edema and weakness. Physical exam revealed 90 degrees of active shoulder flexion and 65 degrees of shoulder abduction.

Discussions: The national incidence of biceps tendon rupture is estimated to be 2.55 per 100,000 patient-years. Most cases occur in males with a median age of 46 years. Risk factors include smoking, elevated BMI, corticosteroid injection, and oral corticosteroid use. Evidence does not presently support contralateral clavicular fracture as a risk factor for biceps tendon rupture. In addition, there is no reported data on subsequent biceps tendon rupture in those who have previously treated biceps tendonitis with conservative management.

Conclusions: In conclusion, the patient had a right bicipital tendonitis with underlying rotator cuff pathology that displayed improvement with therapy. However, we believe this to be the first case to comment on a patient with documented improvement to have subsequently suffered a compensatory biceps tendon tear post traumatic fracture of the contralateral clavicle.

A UNIQUE CASE OF CEREBRAL AUTOSOMAL DOMINANT ARTERIOPATHY WITH SUBCORTICAL INFARCTS AND LEUKOENCEPHALOPATHY (CADASIL)
Sarah T. Yang, MD, and Rachel Kernen, MD

Case Diagnosis: Cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy (CADASIL). CADASIL is a nonatherosclerotic angiopathy involving small arteries and capillaries due to mutations in the NOTCH3 gene on chromosome 19, a protein critical for vascular smooth muscle cell differentiation and development. Although CADASIL is a generalized angiopathy, its vascular complications are largely limited to the brain. Its protein product accumulates in cerebral pericytes leading to disruption of the blood–brain-barrier, vessel impairment, and ultimately infarcts.

Case Description: A 59-year-old woman with a PMH hypothyroidism, three-month history of vertigo controlled on meclizine, and Sneddon’s syndrome presented to the Emergency Department with sudden onset left-sided “tingling” and “unsteadiness” upon waking at 2 AM. Emergency Department exam revealed dysarthria, dysmetria and ataxia. Review of systems and exam were otherwise negative. Imaging demonstrated a paramedian pontine lacunar infarct in the setting of diffuse subcortical periventricular white matter disease. She was discharged on aspirin and statin and issued a follow-up with neurology. On neurology follow-up two weeks later, her dysarthria had improved. However, the vertigo and ataxia still persisted, despite meclizine. Family history was notable for Alzheimer’s and migraines. Physical exam revealed left-sided finger-to-nose and heel-to-shin dysmetria, dysdiadochokinesis, hyperreflexia, and leftward-leaning ataxia without sensory loss. She had difficulty positioning and executing movements consistent with corticospinal tract sign. Gait was wide-based with irregular, jerky movements. She had difficulty navigating environmental obstacles and changing speeds. She was impulsive throughout the interview.

Thorough hypercoagulable work-up – lipid panel, A1C, B12, MMA, folic acid, homocysteine, CRF ACE, P-ANCA, C-ANCA, RPR, PT C and S, cryoglobulin, B2 microglobulin, ANA, MTHFR, Echo, CTA neck – was positive for CADASIL and MTHFR heterozygous mutation. Four years later, she was referred to PM&R for evaluation of worsening ataxia, impulsivity, dysarthria and un-triggered dizziness worsened by movement. Recommendations were made for Speech, Physical Therapy, Aquasurgery, use of a weighted vest, and psychology.

Discussions: CADASIL is a rare subcortical ischemic vascular dementia. It is characterized by migraine with aura (20-40% of patients), ischemic infarcts, progressive dementia, and psychiatric disturbances. Acute reversible encephalopathy, sei- zures, and spinal cord infarcts are frequent. Although the clinical course varies, the median age of death is between 65 and 71. Currently, no effective treatments exist; management is focused on symptomatic control and functional optimization. For Mrs. H, we recommended Speech therapy to focus on dysarthria, cognitive decline, dementia, and impulsivity. We endorsed Physical therapy (PT) for gait, balance, selection of safety equipment, and training on appropriate use. We prescribed a weighted vest to improve balance and decrease impulsivity. Some studies have shown weighted vests improve lateral stability, regularity, symmetry, muscle strength, and gait mechanics in patients with Parkinson’s, multiple sclerosis(MS), and ataxia. Other studies demonstrated that the deep-pressure sensory input of weighted vests improved on-task behavior during fine motor activities. We also recommended aqua therapy to improve stability and strength in a low fall-risk environment, especially as it has effectively treated other neurodegenerative disorders (Huntington’s, MS, Parkinson’s, and ALS). Lastly, we encouraged psychological support for the patient and her family to aid in coping and adjustment to impairments.

Conclusions: CADASIL is a rare inherited Notch3 mutation that results in recurrent strokes, migraines, psychiatric disorders, and dementia. As there is no specific treatment, early involvement of PM&R in symptom control and functional optimization can greatly improve quality of life.

A UNIQUE CASE OF MAPLE SYRUP URINE DISEASE: STRATEGIES FOR INPATIENT REHABILITATION
Shweta Singh Duggal, MBBS, and Chirag M. Shah, MD

Case Diagnosis: A morbidly obese 38-year-old woman with past medical history of Maple Syrup Urine Disease (MSUD) initially presented to the emergency department with severe dehydration and ketonuria due to a gastrointestinal viral syndrome. Treatment was initiated with intravenous hydration. Concern was raised for cerebral edema given her MSUD flare and elevated amino acids; she was admitted to the Intensive Care Unit for close monitoring.

Case Description: The patient was diagnosed with MSUD during infancy and had not had metabolic compensation in the last 15 years. Given her prior level of functional independence, physical therapy was consulted for further evaluation due to her recent decline. Examination revealed severe weakness of the bilateral upper and lower extremities with notable right sided ataxia. Reflexes were symmetrically decreased. Mental status exam revealed decline in cognition, delayed processing and memory impairment. After metabolic stability was achieved, she was transferred to the acute inpatient rehabilitation unit for aggressive physical conditioning.

Discussions: MSUD is a rare autosomal recessive disorder affecting 1 in 185,000 infants worldwide. Deficient activity of the rate-limiting enzyme involved in the catabolism of branched chain amino acids, results in accumulation of valine, leucine and isoleucine, which are toxic to the brain and other organs. Metabolic compensation is corrected by treating the precipitating stress while delivering appropriate calories, with goal of reaching an anabolic state. Patient’s rehabilitation had to be closely monitored to prevent a catabolic state given the intensive therapies. As her obesity was contributory to her catabolic state, a combination approach of nutritional and activity therapy was recom- mended. A multidisciplinary approach involving a pediatric geneticist and nutritionist led to a successful outcome with the patient achieving functional independence upon discharge.
CONCLUSIONS: Most inherited metabolic disorders are incurable but, therapeutic synergies between rehabilitation medicine and genetics can help maintain a patient’s quality of life and allow them to integrate into society.

A UNIQUE HISTORY OF LATE ONSET CHARCOT-MARIE-TOOTH DISEASE
Rashi Vora, DO, Howard Gilmer, DO, and Chris Keoverian, BSC
Case Diagnosis: 55-year-old male with late-onset Charcot-Marie-Tooth Disease Case Description: The patient initially complained of severe right foot pain with no relief through conservative treatments. His pain became complicated by progressive weakness of his right foot, but no source was found on imaging studies. NCS/EMG done at that time showed evidence of Charcot-Marie-Tooth disease. While the onset of CMT is unusual in the 6th decade of life, the patient did develop progressive weakness and show hallmark signs of the disease. His medical course continued to include osteomyelitis in the right foot due to non-healing wounds and failed ankle fusion. His medical course did ultimately require transfibial amputation.

Discussions: Diagnosis of CMT with rapid progression of weakness is unusual in the later decades of life. The patient had no significant past medical history, family history, spinal trauma or neurological disorders contributing to his late-onset neuroarthropathy. He did demonstrate the classic CMT hallmarks of high-arched feet, muscle wasting, hammer toes, a bottleneck sign, easy fatigability and ascending neuropathic pain. His activity level, weight training and prior use of human growth hormone (HGH) leave him with well-developed musculature of the legs, torso and upper extremities and no other discernible weakness after amputation. His atypical need for amputation becomes unique in the natural history of CMT as this is not commonly seen.

CONCLUSIONS: Literature is limited on patients with CMT who demonstrate sudden sensory changes, neuropathic arthropathy or require therapeutic amputations. While his symptoms and physical presentation are stereotypical of CMT, his need for amputation and preservation of other muscle strength is unusual. This case demonstrates a unique CMT presentation that draws attention to its possible late manifestation and unusual course. Exogenous usage of HGH prior to the onset of symptoms in his right foot may have slowed disease progression, a possible association to further investigate.

ACELL MICROMATRIX SYNTHETIC TISSUE GRAFT IN WOUND CARE FOR SEVERE DEGLOVING INJURY IN ACUTE REHABILITATION COMPLICATED BY INFECTION TREATED WITH MEROPENAM
Eric Sun, DO, EDM, and Padma Sririgiraju, MD
Case Diagnosis: Twenty-nine-year-old male involved in motorcycle accident resulting extensive avulsion and degloving injury from his left lateral thigh to gluteal region complicated by wound infection.
Case Description: This case report describes a 29-year-old male involved in a motorcycle accident resulting extensive avulsion and degloving injury from his left lateral thigh to gluteal region measuring 50x30cm. The patient required multiple procedures to debride and remove foreign materials. Patient course was also complicated by acute blood loss anemia and difficult pain control. Patient had synthetic skin graft using Acell MicroMatrix with wound vac placement. After transfer to acute rehabilitation, the patient was unable to make significant gains in ADL's and gait (10 ft. max assist to 300 ft. complete independence) and Renu Ohri, MD
Case Diagnosis: Acute acalculous cholecystitis (AAC) in a chronic spinal cord injury patient with incomplete tetraplegia
Case Description: This is a 71-year-old obese Caucasian male veteran with a history of C8 AIS B incomplete tetraplegia after a 6-month hospitalization secondary to septic shock in the setting of immunosuppression for chronic graft versus host disease after bone marrow transplant for treatment-refractory gray zone lymphoma. At admission, she had evidence of AAC in acute SCI complicated by sepsis and meningitis. Her pain control options were limited. During her rehabilitation she had 10 sessions of acupuncture over 2 weeks. After those 2 weeks her pain medication intake (oral morphine equivalents) decreased 65%. Her functional independence measures (FIM) showed a 13-point increase with the largest in ambulation and stair climbing. Prior to acupuncture she ambulated 2–3 feet in parallel bars with maximum assistance from 2 therapists and was unable to stair climb. After acupuncture she ambulated >150 feet with a walker and minimum assistance and could stair climb with maximum assistance. She was discharged 1 week after acupuncture with maintained FIM gains including ambulating with a walker with supervision and climbing stairs with minimum assistance.

Discussions: Acupuncture is becoming an increasingly popular treatment for multiple diseases including cancers. Currently the American Cancer Society has approved its use in mild pain and nausea. Its efficacy has been proven in diabetic peripheral neuropathy, however, there is not significant data in humans demonstrating its efficacy in chemotherapy-induced peripheral neuropathy. In this case, acupuncture appears to be beneficial for both pain and function in this population. Also, it is a relatively safe, low-cost treatment that allowed for a reduction in opioid medications.

CONCLUSIONS: Acupuncture should be considered as an adjunctive treatment for patients with chemotherapy-induced peripheral neuropathy and myopathy for improvements in both pain and function.

ACUPUNCTURE FOR MYOPATHY AND CHEMOTHERAPY INDUCED PERIPHERAL NEUROPATHY
Brittni S. Rohde, MD, Neelay Thakkar, MD, Sheital Bavishi, DO, and Brian D. McMichael, MD
Case Diagnosis: Acupuncture for pain and functional improvement in a patient with Gray Zone Lymphoma, steroid-induced myopathy, and chemotherapy-induced peripheral neuropathy.
Case Description: A 25-year-old woman was admitted to inpatient rehabilitation after a 6-month hospitalization secondary to septic shock in the setting of immunosuppression for chronic graft versus host disease after bone marrow transplant for treatment-refractory gray zone lymphoma. At admission, she had evidence of AAC in acute SCI complicated by peripheral neuropathy and steroid-induced myopathy. Pain was a limiting factor, however, due to her complex medication regimen and low medication tolerance her pain control options were limited. During her rehabilitation she had 10 sessions of acupuncture over 2 weeks. After those 2 weeks her pain medication intake (oral morphine equivalents) decreased 65%. Her functional independence measures (FIM) showed a 13-point increase with the largest in ambulation and stair climbing. Prior to acupuncture she ambulated 2–3 feet in parallel bars with maximum assistance from 2 therapists and was unable to stair climb. After acupuncture she ambulated >150 feet with a walker and minimum assistance and could stair climb with maximum assistance. She was discharged 1 week after acupuncture with maintained FIM gains including ambulating with a walker with supervision and climbing stairs with minimum assistance.

Discussions: Acupuncture is becoming an increasingly popular treatment for multiple diseases including cancers. Currently the American Cancer Society has approved its use in mild pain and nausea. Its efficacy has been proven in diabetic peripheral neuropathy, however, there is not significant data in humans demonstrating its efficacy in chemotherapy-induced peripheral neuropathy. In this case, acupuncture appears to be beneficial for both pain and function in this population. Also, it is a relatively safe, low-cost treatment that allowed for a reduction in opioid medications.

CONCLUSIONS: Acupuncture should be considered as an adjunctive treatment for patients with chemotherapy-induced peripheral neuropathy and myopathy for improvements in both pain and function.
Percutaneous cholecystostomy has been found to be successful as a definitive treatment option in the majority of patients with AAC. It is associated with a low rate of mortality and subsequent cholecystectomy.

CONCLUSIONS: To our knowledge, this is the first case report of AAC that developed in a chronic SCI patient without known predisposing risk factors known in the literature.

Additional prospective epidemiological studies may be helpful to determine the true prevalence of AAC in the chronic phase of SCI.

ACUTE BILATERAL NEURALGIC AMYOTROPHY ATTRIBUTED TO LYME DISEASE

Paul Joseph Stoko, MD, Shangming Zhang, MD, FAAPMR, and David R. Gater, MD, PhD, MS
Case Diagnosis: Acute Bilateral Neuralgic Amyotrophy Attributed to Lyme disease
Case Description: A 74-year-old Caucasian male presented seven separate times the ED over a two-week period due to unbearable pain, paresthesia, tenderness and muscle spasms developing in both arms, for which he was treated with narcotics, NSAIDs and muscle relaxers. After establishing that he was at significant risk for developing Lyme he tested positive for antibodies in both serum and CSF. IV Ceftriaxone was initiated. On physical exam medial scapular winging was noted, weakness, atrophy, numbness and tingling, left > right were present. Other medications included gabapentin titrated up to 1500 mg TID, amitriptyline 50 mg BID, duloxetine 60 mg daily, and oxycodone 10 mg 6qpr. EMG revealed findings consistent with bilateral plexopathy with diffuse active denervation. Patient was able to complete inpatient rehabilitation and be discharged to home.

Discussions: This case illustrates an atypical case of neuralgic amyotrophy (NA). The diagnosis is unfamiliar to many physicians, leading to misdiagnosis or delay in diagnosis. Treatment requires a multidisciplinary approach consisting of pain control, physical therapy, and awareness/acceptance of existing residual sequelae. In this case, neuropathic pain suddenly got worse when IV steroids were stopped and immediate pain relief was achieved as oral prednisone 40 mg PO, BID started. Weaning the gabapentin dose also resulted in worsening pain. These findings suggest that both steroids and gabapentin may play a role in treating neuropathic pain during the acute phase of this rare disorder.

CONCLUSIONS: Only a few case reports of bilateral NA have been published, and even less attributing Lyme disease as the cause. Neuralgic amyotrophy should be considered as one of neurological manifestations of Lyme disease, and thus Lyme serology should be considered when tracking down a cause. Treating the Pain in NA is often difficult, and there is a need for research regarding the right regimen.

ACUTE INFLAMMATORY DEMYELINATING POLYRADICULONEUROPATHY WITH LYME NEUROBORRELIOSIS: A CASE REPORT

Brittany Snider, DO, Erica Bellamkonda, MD, Bradford Landry, DO, Billie Schultz, MD, and Amy Rabatin, MD
Case Diagnosis: Acute inflammatory demyelinating polyradiculoneuropathy (AIDP) in association with Lyme Neuroborreliosis (LNB), presenting as ascending weakness and areflexia, superimposed on aseptic meningitis and multiple cranial neuropathies.

Case Description: A 30-year-old man with no significant past medical history presented to the Emergency Department one month after a canoe trip in Wisconsin with fever, myalgias, “bulls eye” rash, headaches, and progressive weakness, requiring moderate assistance for mobility. Lyme serology was positive, and he was started on doxycycline. Despite antibiotic treatment, his ascending weakness progressed, and he became areflexic. He also developed multiple cranial neuropathies. Brain MRI showed abnormal enhancement of left CN III, right CN V, and bilateral CN VII, suggestive of Lyme cranial neuritis. Lumbar puncture showed lymphocytic pleocytosis, elevated CSF protein, normal CSF-to-serum glucose ratio, and positive IgG and IgM bands. Electrodiagnostic testing was most consistent with AIDP, likely infection-mediated by Borrelia burgdorferi. He was transitioned to ceftriaxone and received five days of intravenous immune globulin. He was admitted to acute inpatient rehabilitation and was discharged home at modified independent level with mobility and self cares.

Discussions: Disseminated Lyme disease may manifest as LNB, with invasion of the central and peripheral nervous systems by B. burgdorferi. Common presentations include lymphocytic meningitis and cranial neuritis, as observed in our patient. Complicating his clinical course was concomitant AIDP, an immune-mediated process targeting peripheral nerve myelin and leading to symmetric, ascending weakness with areflexia. The majority of patients with AIDP report an antecedent illness, but there are few documented cases of B. burgdorferi as the causative agent. This case provides a unique clinical example of LNB preceding the development of AIDP.

CONCLUSIONS: Lyme disease is a rare but important consideration in infection-mediated AIDP. Emphasis should be placed on accurate diagnosis and early treatment.

ACUTE INFLAMMATORY DEMYELINATING POLYRADICULONEUROPATHY WITH LYME NEUROBORRELIOSIS

Sina A. Desai, MD, Emily A. Holick, MD, and Robert Winston, DO
Case Diagnosis: Lower extremity weakness with abnormal F wave response
Case Description: A 64-year-old female exhibited new onset lower extremity weakness and frequent falls. Neurological exam revealed symmetrical weakness and sensory abnormalities of the legs and hyporeflexia. Electromyography was diagnostic for acute inflammatory demyelinating polyradiculoneuropathy (AIDP) with dispersed compound muscle action potential and abnormal F wave response. Severe weakness ensued, despite receiving intravenous immunoglobulin therapy. On arrival to acute inpatient rehabilitation, she was unable to perform transfers, ambulate, incontinent of stool and urine, and dependent for lower body dressings.

Upon discharge, the patient was independent with all activities of daily living; modified independent with transfers and ambulation of 250 feet, using rolling walker. Her neurogenic bladder was managed closely with intermittent straight catheterization for high post void residual volumes which gradually resolved. Neurogenic bowel was managed with fiber supplements, senna, colace, and manual disimpaction; she was fully continent of bowel at discharge. Pain was initially managed with morphine, and discharge pain was controlled with pregabalin alone. Functional independence measure increased from 42 at admission to 110 by discharge. Within one month of receiving outpatient therapy, the patient became completely independent with no device requirements and pain resolution off medications.

Discussions: Our case involves a patient with multiple secondary complications, all addressed during her rehabilitative course, leading to significant functional recovery. Active muscle strengthening can be slowly introduced to achieve good functional outcomes utilizing neuromuscular protocols with simultaneous management of pain and autonomic dysfunction.

CONCLUSIONS: AIDP is an immune mediated-disorder marked by ascending weakness along with several secondary complications. Patients should receive a comprehensive rehabilitation program which manages weakness, autonomic dysfunction, pain, and sensory changes to achieve good functional outcomes. With prolonged recovery likely, as with our patient, patients with continued neurologic deficits benefit from ongoing physical therapy, conditioning programs, and close medical management.

ACUTE INPATIENT REHABILITATION OF TOE-TO-THUMB TRANSPLANT FOLLOWING TRAUMATIC INJURY: A CASE REPORT

Carrie M. Gould, MD, and Padma Srigiriraju, MD
Case Description: A 55-year-old male whose right hand was caught while sharpening his snow blower grinder, resulting in traumatic amputation of his right thumb. Reconstruction was initially attempted at the time of the injury but the thumb could not be salvaged. The patient was re-evaluated as an outpatient and recommended thumb reconstruction from microsurgical toe transfer of his left great toe to his dominant right hand. The thumb could not be salvaged. The patient was re-evaluated as an outpatient and recommended thumb reconstruction from microsurgical toe transfer of his left great toe to his dominant right hand. The thumb was one of the first microsurgical techniques ever adopted and has been used in hand surgery for over 70 years. Operative time was approximately 3 hours and required a special thumb metacarpal. The patient was discharged home on post-operative day 6 and was seen in the outpatient clinic 2 weeks later for suture removal.

CONCLUSIONS: First performed in 1897, the transfer of a toe to replace an amputated thumb was one of the first microsurgical techniques ever adopted and has become an epitome of reconstructive surgery, allowing restoration of function after the loss of a thumb, the “king of digits,” which comprises up to 50 percent of hand function. Rehabilitation is a vital component of the transplant process. Gentle mobilization of the joint can occur as early as 4 days post-operatively, with active exercises shortly thereafter, when tendon repairs have strengthened. At 2 months, strengthening and functional exercises are started. Sensory rehabilitation, wherein the patient begins to interpret altered sensory impulses from exercises facilitating perception of touch with localization, and later focusing on size/shape discrimination as well as object identification, is an important component of recovery.
CONCLUSIONS: Toe-to-thumb transplant surgeries offer improvement in overall function and ADLs to 93% of normal and rehabilitation has much to offer in helping patients regain function and ability.

ACUTE ONSET ATAXIA AND PALATAL TREMOR AFTER LISTERINE INGESTION
Andrew S. Isleib, DO, Ernesto Cruz, MD, and Eric Altschuler, MD, PHD
Case Diagnosis: Acute-Onset Ataxia and Palatal Tremor, an acute variant of Progressive Ataxia and Palatal Tremor, not previously described in medical literature.
Case Description: A 51-year-old male presented with dysphagia and hematemesis after ingesting three large bottles of Listerine. He was tachycardic and tachypneic, but otherwise his vital signs were WN. The patient was alert, awake and oriented x3 without focal weakness, sensation deficits or apparent cognitive impairments. He was noted to be tremulous. A head CT was normal. Lorazepam was started for concerns of alcohol withdrawal and oesotisitis was given for upper GI bleed. The patient became bradycardic and his SpO2 dropped leading to PEA arrest. CPR was commenced and there was return of spontaneous circulation. The patient was intubated for 8 days. Following extubation the patient's speech was garbled and roughly 10% intelligible. The patient exhibited severe oropharyngeal dysphagia, laryngeal bobbing, lingual pumping and palatal tremor. Muscle strength remained 5/5 throughout all extremities. The patient's gait was unsteady and ataxic, initially requiring a moderate assist of 2 for a distance of 2 feet. The patient continued to work with PT and was able to increase his ambulation to 50 feet with a rolling walker and moderate assistance with continued unsteadness and ataxia.
Discussions: The condition that most closely resembles this patient's clinical findings is Progressive Ataxia and Palatal Tremor (PAPT). However, the majority of cases reported in the medical literature include years of progressive ataxia and hypopituitarism of the inferior olive on MRI. This case is atypical as the medulla is free from abnormalities on MRI and the patient's ataxia began suddenly.
CONCLUSIONS: The cause of PAPT is not well understood. The insults to this patient's brain resulting in the acute onset of symptoms may illuminate potential causes of the progressive form of this condition.

ACUTE PARKINSONISM FROM METHAMPHETAMINE ABUSE: A CASE REPORT
Kara Flavin, MD
Case Diagnosis: Patient: 30-year-old otherwise healthy woman with who developed rapid onset of rigidity, tremor, and masked facies in the setting of chronic methamphetamine abuse.
Case Description: The subject presented to the ED with rigidity and tremor in all four extremities which started one month prior to admission, and progressed rapidly. She was bedbound and dependent for her activities of daily living. She demonstrated bradyphrenia, dysautonomia with severe hyperhidrosis and urinary incontinence. The subject had no significant past medical history other than chronic methamphetamine abuse. Family history was negative for neurologic disease.
Clinical Course: The subject underwent lumbar puncture, MRI of brain and cervical spine, EEG, PET CT, infectious and paraneoplastic work-up, all of which were negative. She was empirically started on sinemet, with improvement in her symptoms. Upon discharge to acute rehabilitation, she was able to feed and groom herself independently.
Discussions: Methamphetamine crosses the blood-brain barrier to trigger the release of dopamine from the striatum. Chronic use has been shown to produce loss of markers of dopaminergic neurons. Methamphetamine abusers have been shown to have an increased risk of developing Parkinson's disease later in life. This case is unusual for the early and acute onset of Parkinsonism in a young woman with no risk factors other than methamphetamine abuse.
CONCLUSION: Methamphetamine abuse may lead to development of acute Parkinsonism.

ACUTE QUADRIPLEGIA FOLLOWING POSTERIOR CERVICAL LAMINECTOMY AND FUSION: A RARE CASE REPORT
Andrea Cordova, MD, Gary Inwald, DO, and Yuriy O. Ivanov, DO
Case Diagnosis: Spinal Cord Injury
Case Description: A 51-year-old male underwent emergent surgical decompression via a posterior C3-C5 laminectomy with C2-C6 instrumented arthrodesis for cervical spinal stenosis with cord compression resulting in severe, rapidly progressive cervical myelopathy. He had an uncomplicated post-operative course and was transferred to the acute inpatient rehab unit on postoperative day (POD) #5. Closed-suction drain placed intraoperatively was removed prior to discharge. Presenting physical exam demonstrated mild weakness in the bilateral deltoids and full strength throughout the rest of the upper and lower extremities. During the night of POD #7, patient developed severe sanguinous discharge from his incision. A few minutes later, he complained of sudden numbness and inability to move his arms or legs. Physical exam revealed complete paralysis of the upper and lower extremities with inability to detect light touch or pin prick. Shortly afterwards, he became dystonic, hypotensive and bradycardic, and was subsequently intubated and started on vasopressors for respiratory and hemodynamic instability. The patient was emergently transferred to the operating room and was found to have a large epidural hematoma compressing the dural sac which was promptly evacuated. Postoperatively, the patient regained full strength in the distal upper and lower extremities, however there was no neurological improvement in the proximal upper extremities. At his three-month follow up, the patient had persistent paresis in the bilateral proximal upper extremities.
Discussions: Symptomatic spinal epidural hematoma (SEH) following surgery is a rare (<1%) but serious complication. The usual presentation is acute neurological deficits such as rapidly progressive quadriplegia, or respiratory or bowel/bladder dysfunction. Almost half of patients affected develop these symptoms soon after the intraoperative suction drain has been removed. Potential risk factors include multilevel procedure, coagulopathy, age more than 60 and pre-operative or post-operative use of non-steroidal anti-inflammatories.
CONCLUSIONS: It is important to recognize and diagnose SEH early, as prompt surgical evaluation and decompression can result in marked neurological improvement. A delay in diagnosis and treatment may lead to permanent neurological impairments and poorer recovery.

ACUTE REHABILITATION APPROACH FOR PATIENT WITH ERDHEIN-CHESTER DISEASE OF THE CENTRAL NERVOUS SYSTEM
James Edward Huber, DO, Rosa Cho, MD, and Diane Thompson, MD
Case Diagnosis: A 53-year-old woman with a history of pan hypopituitarism and complex partial seizures who presented to the ED with four days of worsening left-sided headaches after sustaining a traumatic fall at home in which she hit her head. In the ED, patient suffered a seizure-like episode followed by rapidly declining mental status and right-sided hemiplegia. MRI Brain showed cortical enhancement within the left frontal, temporal and parietal lobes. Stereotactic biopsy was consistent with a non-Langerhan’s cell (non-LCH) histiocytosis. Erdheim-Chester Disease (ECD), a type of non-LCH, became the prevailing diagnosis.
Case Description: Patient was admitted to the inpatient rehabilitation unit with right-sided hemiplegia, expressive aphasia, dysphagia p/e PEG tube placement, multifocal pneumonia, aspergillosis, steroid-induced hyperglycemia, hypertensive urgency and overall deconditioning. On admission, she was unable to ambulate. She received aggressive physical, occupational and SLP therapies to address her various deficits with the goal of increasing strength, mobility and eventual reintegration into the community. At baseline, patient was fully functional and independent in her ADLs. She was discharged to a subacute rehabilitation facility after almost three weeks on the IRU.
Discussions: The incidence of Erdheim Chester Disease (ECD) is unknown. There is no known cure nor is there a gold standard treatment established for patients with symptomatic ECD. Fewer than 500 cases have been reported and a PubMed search for rehabilitation of patients with ECD yielded only three articles.
CONCLUSIONS: While we initially utilized modalities of stroke rehab for our patient, our plan was quickly modified to accommodate for unique clinical complications of the disease process. As so little has been published about rehab measures for patients with ECD as well as other histiocytic disorders, understanding our approach may benefit providers who care for patients with this rare and chronic disorder or those who exhibit some of its features.

ACUTE REHABILITATION OF DELAYED POST-HYPOXIC LEUKOENCEPHALOPATHY
Matthew Lin, MD, Brian D. Greenwald, MD, Sindhoori Nalla, BS, and Sara Cucurullo, MD
Case Diagnosis: Delayed Posthypoxic Leukoencephalopathy
Case Description: A 51-year-old man who was admitted to an acute care hospital for pneumonia secondary to influenza. He developed septic shock complicated by hypoxic ischemic encephalopathy. After brief hospitalization he returned to baseline cognitive functioning and discharged home. A few weeks later, he had acute onset of...
ACUTE REHABILITATION OF MILLER-FISHER SYNDROME: A CASE REPORT

Joseph L. Connor, MD, and Mayar Amin, MD

Case Diagnosis: 54-year-old woman with Miller-Fisher Syndrome

Case Description: A 54-year-old woman presented to acute inpatient rehabilitation 18 days after extensive diagnostic work-up for diplopia, photophobia, ataxia, and dysesthesias over her face and distal extremities. Laboratory testing was significant for increased cerebrospinal fluid protein and an elevated GQ1b IgG titer. She was diagnosed with Miller Fisher Syndrome (MFS) and subsequently discharged after a 5 day course of intravenous immunoglobulins. Her hospital course was complicated by severe vertigo improved with meclizine.

Her neurological examination on admission to our facility was significant for absent extraocular movements (except minimal left eye convergence), right ptosis, impaired right lateral visual fields, ataxia, and decreased sensation to light touch and pin prick over her hands, feet, and face. Motor strength was 5 or 5 in all major muscle groups and proprioception was intact.

Neuro-optometry, occupational and physical therapists worked on visual acuity, ocular motor skills and balance training during rehabilitation. Word searches were utilized to encourage repetitive eye movements, reinforcing neuronal pathways. For balancing skills, the patient walked in the parallel bars, focusing on fixed surroundings. She found this helpful due to the ability to recognize her instability, in addition to the tactile feedback from the parallel bars. At discharge, she was ambulating 300 feet with contact guard without any assistive device. Both of her eyes were able to track medially, superiorly, and inferiorly, but lateral tracking was still deficient.

Discussions: MFS is a rare variant of Guillain Barre Syndrome with deficits of extra-ocular muscle weakness and ataxia, as in our patient. Rehabilitation of MFS is not well studied or documented. Solidification of therapeutic regimens to treat these patients would be beneficial.

CONCLUSIONS: Despite motor function preservation in MFS, profound cranial nerve involvement and ataxia significantly hinder daily tasks and mobility. We have found that neuro-optometry involvement, repetitive eye training, and balance skills are paramount in returning to an independent lifestyle.

ACUTE REHABILITATION OF SPONTANEOUS CAROTID ARTERY AND BILATERAL VERTEBRAL ARTERY DISSECTIONS IN AN ADULT WITH WILLIAMS SYNDROME

Dmitry Esterov, DO, Brian D. Greenwald, MD, and Sara Cucurullio, MD

Case Diagnosis: Acute Rehabilitation of Spontaneous Carotid Artery and Bilateral Vertebral Artery Dissections in an Adult with Williams Syndrome

Case Description: Williams Syndrome is a rare multisystem genetic disorder involving a microdeletion of a chromosome subunit of the elastin gene. The literature has described vascular stenosis as the origin of strokes in adults with Williams Syndrome. We present here a 54-year-old female with history of Williams Syndrome with left hemiparesis. Imaging revealed a right MCA infarction with right distal M1 occlusion, in addition to an acute right internal carotid artery dissection and chronic bilateral vertebal artery dissections. The patient had no history of trauma or other risk factors for stroke. She developed cerebral edema and herniation requiring a right decompressive craniectomy. The patient then presented to an inpatient rehabilitation facility and made significant functional gains.

Discussions: Patients with Williams Syndrome present with friendly social personalities with impaired cognition, dysmorphic facial features described as elfin like, and endocrine abnormalities. Although stroke is rare, vascular disease, especially supravalvar aortic stenosis, is a classic complication. It is known that the elastin gene insufficiency leads to increased proliferation of vascular smooth muscle cells and thicker intima media leading to progressive stenosis, a previously reported and known cause of stroke in these patients. The cause of vascular dissection in patients with Williams Syndrome is rare and not well described. This is the first case, to our knowledge, of both carotid and vertebral dissections in a patient with Williams Syndrome reported.

CONCLUSIONS: This case presents a rare cause of CVA with acute and chronic large artery dissections in a patient with Williams Syndrome. The micro deletion of a chromosomal subunit of the elastin gene is linked with vascular stenosis as the cause of stroke in patients with Williams Syndrome. Further studies should be done to see if this chromosomal deletion also predisposes these patients to vascular dissections.

ACUTE TRANSVERSE MYELITIS SECONDARY TO HIV INFECTION: A CASE REPORT

Matthew Davies, MD, Gizelda T. B. Casella, MD, PhD, and Dmitriy Dvoskin, MD

Case Diagnosis: Acute transverse myelitis secondary to HIV myelitis

Case Description: The patient is a 60-year-old male with HIV on HAART, diabetes, hyperlipidemia, and hypertension. He presented with bilateral shoulder pain, new onset of paresthesia, and weakness of his right upper extremity. This weakness progressed over one day to include all extremities. Initially there was no involvement of his bowel or bladder. CT of the head and neck were non-diagnostic. MRI of the brain and cervical spine showed enhancement of the right frontal centrum semiovale that was non-diagnostic. CD4 reported as 291. Lumbar puncture (LP) showed 1 white cell, 4 red cells, glucose of 98, and protein of 36. Cytology and opportunistic infection workup was negative. MRI was then repeated which showed an abnormal T2 hyperdense intermedullary lesion extending from C5-T1, involving the central gray-white matter and greater than half of the cross sectional area of the spinal cord most consistent with acute transverse myelitis (ATM). An infectious workup was repeated and again negative. The patient was diagnosed with ATM likely secondary to HIV myelitis. Viral HIV RNA PCR was sent and resulted positive.

Discussions: The differential diagnosis of neurological deficits in HIV patients is numerous. Workup should differentiate between compressive, infectious, vascular, and inflammatory pathologies. Early workup should include MRI for those cases requiring emergent surgical intervention. This is followed by lumbar puncture where CSF can differentiate between etiologies. In this case MRI and LP were non-diagnostic. Only by repeating the process, including MRI, was ATM found. This patient’s initial differential included vacuolar myelopathy (VM). However, VM is chronic in nature taking years to develop and is usually associated with AIDS dementia in addition to peripheral neuropathy. Ultimately this patient was treated with sulfonmedrol with little improvement followed by IVIG that improved his strength.

CONCLUSIONS: ATM is uncommonly the result of HIV myelitis with few case reports documented in the literature but remains an important differential when working up the HIV+ population.

ADDITIONAL IMMAGING REQUIRED AFTER GOLD STANDARD DIAGNOSIS OF SPINAL EPIDURAL ABSCESSES

Eric Tam, MS4, and Mohammad Islam, MD

Case Diagnosis: Spinal Epidural Abscess with Paravertebral Abscess and Right Iliopsoas Abscess

Case Description: A 54-year-old male with past medical history of HIV (last CD4 count 15%), Hepatitis C and poly-substance abuse is brought in by EMS with complaints of weakness and inability to walk for 2 days. He had associated symptoms of aching diffuse non-radiating back pain rated 7/10. Physical examination significant for fever and open ulcers with drainage in the right forearm, generalized muscle atrophy and deceased reflexes and sensation. MRI was performed showing bilateral epidural abscesses. Patient was taken to OR and had a T2-T5 posterior laminectomy with abscess drainage revealing MSSA. Vancomycin, cefepime and gentamycin were started. Due to worsening clinical picture, a CT scan was performed, showing an abscess in the prevertebral space, a right iliopectus abscess, and septic emboli on lung fields. Iliopsoas and gluteal abscesses were drained and pigtial catheter was placed. PICC line was placed for HAART and antibiotic administration. The patient was stabilized and admitted to PM&R where he received multidisciplinary
therapy for 3 weeks. At discharge, patient demonstrated functional use of bilateral hands for bed level ADLs with minimum-moderate assistance and bed mobility.

**Discussions:** Spinal epidural abscesses are infections causing accumulations of pus in between the dura mater and vertebra. Patients most commonly present with neck or back pain, fever and weakness of the extremities. Physical examination shows spinal tenderness and reflex abnormalities. Rapid diagnosis is critical, with MRI as the gold standard of diagnosis. Treatment requires a combined medical and surgical approach including antibiotics and early decompression.

**CONCLUSIONS:** While the gold standard of diagnosis for spinal epidural abscess is MRI, the presence of worsening clinical picture may require additional imaging. Further research is required to investigate common locations of spread of spinal epidural abscesses.

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**Adhesive Capsulitis of the Shoulder Following a Herpes Zoster Infection in an Immunocompetent Patient**

Allison B. Kessler, MD, and Maria Reese, MD

**Case Diagnosis:** An MRI was obtained of her cervical spine which revealed findings consistent with transverse myelitis centered in the left side of the spinal cord extending from the cervicomedullary junction to the mid C3 level felt to be related to prior herpes zoster infection. It was non-enhancing therefore it was felt to be chronic per the radiologist. A plain X-Ray of her shoulder was normal. She was diagnosed with adhesive capsulitis of the shoulder secondary to disease in the setting of a painful herpes zoster infection with likely infectious myelitis of the cervical spinal cord. She was referred to neurology for evaluation and treatment of the transverse myelitis. She was started in outpatient physical therapy for her adhesive capsulitis to work on shoulder range of motion, shoulder and neck posture as well as periscapular strengthening. She deferred initiation of medications.

**Case Description:** A 69-year-old woman with a history of HTN and osteoarthritis presented to an outpatient musculoskeletal clinic with complaints of left anterior shoulder pain. She reported having a rash on the left posterior neck and left side of her face that was diagnosed as shingles approximately 2 years prior. At the time she developed numbness and tingling in the entire left side of her face and left arm. The rash lasted a month and has not recurred. Since that time the facial and arm numbness resolved, except for residual numbness in the first two digits of her left hand. She also reports that she developed severe left shoulder pain at the time, which never completely resolved. The pain was initially a severe and constant burning, that was worse with any movement of the shoulder. She has since limited the use of her left arm, despite being left handed, due to the pain and has now noted a decrease in range of motion. Currently she reports the pain as a constant ‘soreness’ deep in her shoulder that is worse with any movement of the left arm. She rarely has the burning pain. She has trialed naproxen and gabapentin, yet stopped them due to side effects. Upon further review, she notes occasional neck pain with arm or neck movement and loss of balance when ambulating. She denies bowel, bladder, strength, and sensory abnormalities other than previously noted. Physical exam was notable for limited left shoulder external rotation to 50 degrees and internal rotation to 20 degrees. Strength and sensation of the left arm were intact. Reflexes were 3+ at bilateral biceps and brachioradialis with spread to the fingers, bilateral triceps, patella and medial hamstrings. Hoffman’s testing was positive bilaterally. The rest of her neurological and musculoskeletal exam was normal, except for mild restrictions in range of motion of her cervical spine and difficulty with tandem gait.

**Discussions:** Herpes myelitis is rare, especially in an immunocompetent individual. This is a rare example of herpes zoster infection leading to both shingles as well as herpes zoster myelitis with subsequent post-herpetic neuropalgia contributing to disablement of the left shoulder leading to adhesive capsulitis. The treatment regimen for the adhesive capsulitis consisted of a graded exercise and range of motion program. After two months of therapy she gained an additional 20 degrees of external rotation of her left shoulder, a 50% reduction in pain, and increased functional use of her left arm. She declined any further medications for treatment of the likely neuropathic pain component.

**CONCLUSIONS:** This is a rare case of herpes zoster infection, herpetic myelitis, and shingles with post-herpetic neuropalgia leading with long-term symptoms leading to chronic disable and subsequent adhesive capsulitis of a shoulder with significant improvement with treatment of the adhesive capsulitis alone.

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**ALIEN HAND SYNDROME: AN INTERESTING PRESENTATION OF CORTICAL BASAL GANGLIONIC DEGENERATION: A CASE REPORT**

Hardeep S. Kainth, MD, and Clinton Faulk, MD

**Case Diagnosis:** Cortical basal ganglionic degeneration

**Case Description:** A 59-year-old male with a history of multiple falls secondary to a seven-year history of a progressive undiagnosed neurologic disorder causing cog-wheel movements, dysarthria, right upper extremity flexion contractures and bilateral leg weakness, presented after a fall down 20 steps. On imaging the patient was found to have a C1 Jefferson’s fracture and 2 left sided rib fractures. The patient reported no new sensory or motor deficits post fall. Neurosurgery opted for non-operative management of the cervical fracture. The patient was transferred to inpatient rehabilitation after 5 days on the acute floor. On exam the patient presented with right upper extremity (RUE) dystonia, dyspraxia, cog-wheeling and tremor, dysarthria and ataxia. The pattern of slow symptom progression was most consistent with a neurodegenerative disorder. The patients RUE: dystonia, cogwheel movements and tremor suggested basal ganglia involvement in addition to upper motor neuron involvement. Magnetic resonance imaging (MRI) of the brain showed slight hyper-intense signal in multiple areas suggestive of atrophic lateral sclerosis. Electromyography showed no evidence of anterior horn cell disease. Neurology were consulted and confirmed a diagnosis of cortical basal ganglionic degeneration (CBD).

**Discussions:** CBD is a rare progressive neurodegenerative disease, which typically begins between 50-70 years of age. It is classified as one of the Parkinson Plus Syndromes. Diagnosis is clinical and only definitive on neuropathological examination. Motor symptoms include tremor, rigidity, bradykinesia and limb dystonia. Cognitive symptoms include alien hand syndrome and apraxia. Language symptoms include progressive aphasia.

**CONCLUSIONS:** Interestingly on further history the patient endorsed RUE dyspraxia with Alien Hand Syndrome, a symptom in 60% of CBD patients, where the patient feels a limb is foreign and they cannot control the movements of the limb. In retrospect the patient’s age and progressive motor, cognitive and language symptoms justify a diagnosis of CBD.

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**ALPERS SYNDROME IN A PEDIATRIC PATIENT**

Erica Seidel, MD, and Mark Gornley, MD

**Case Diagnosis:** Alpers Syndrome

**Case Description:** An 8-year-old male presented with new onset seizures that evolved into status epilepticus. He was treated for presumed autoimmune encephalitis with methylprednisolone, IVIG, plasmapheresis, and rituximab. On admission to rehab, he was non-ambulatory but moving all extremities and inconsistently following commands or responding to questions. He progressed during the first two weeks, but during week three he regressed in his functional abilities. He was vocalizing less, eating less, and participating less in ADLs. Psychiatry was consulted and did not feel that patient was depressed. Lab work-up (CBC, CMP, TSH, cortisol, AED levels) and EEG did not show a cause for his regression. MRI demonstrated new lesions in frontal, parietal, and occipital lobes with T2 prolongation of unclear etiology. Patient did not respond to additional rounds of immune modulating therapies and he developed recurrence of seizures. Genetic testing was consistent with Alpers Syndrome. The patient passed away several weeks after his diagnosis.

**Discussions:** Alpers Syndrome is a mitochondrial disorder that typically presents between 2–4 years old. It is due to a mutation on the polymerase gamma gene. The classic triad of symptoms is developmental regression, intractable seizures, and liver dysfunction. Other associated symptoms include movement disorders, peripheral neuropathy, cortical blindness, GI dysmotility, and cardiomyopathy. EEG is variable but often shows an occipital lobe predominance of seizures, and MRI is likewise variable but most often shows lesions in the occipital lobes and thalamus. Diagnosis is confirmed via genetic testing. Treatment is supportive and the disorder is usually fatal within 4 years of diagnosis.

**CONCLUSIONS:** Alpers Syndrome can present outside of the typical age range. It can present with similar symptoms as autoimmune encephalitis. Since autoimmune encephalitis is typically a monophasic illness, physiatrists should be suspicious of another etiology if patients show regression or worsening on MRI after transfer to rehab.

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**AMPUTATION FROM A DOG BITE? A UNIQUE RISK TO CHILDREN WITH INSENSATE LIMBS**

Laura E. Black, MD, Ana-Marie Rojas, MD, and Vineaeta T. Swareop, MD

**Case Diagnosis:** A child with myelomeningocele and sensory deficit with injuries to the lower extremity requiring transtibial amputation after sleeping with the family dog.

**Case Description:** A 7-year-old ambulatory boy with thoracic-level myelomeningocele awoke one morning with right lower limb soft-tissue injuries that exposed the metatarsal bones. He previously walked with a reciprocating gait orthosis (RGO). The family dog, who regularly slept in his bed at night, had chewed on the child’s foot...
throughout the night, and his family found remnants of his distal foot that morning. He had no sensation below the bilateral knees and was unaware of his injuries. On presentation to the emergency department, he had no signs of infection, major bleeding, or pain. Physical examination showed an exposed right distal first metatarsal bone with soft tissue damage extending to the lateral malleolus. Imaging revealed a transverse metatarsal amputation of all five digits in the right foot. He underwent right-sided transstitial amputation and currently ambulates with a below-the-knee prosthesis, RGO, and left-sided ankle-foot orthosis.

**Discussions:** To our knowledge, this is the first case in the medical literature of a child with decreased sensation in the extremities who required surgical amputation due to injuries from a dog bite while asleep. There have been several reports in the lay press of similar incidents in people with insensate limbs. Current dog bite prevention efforts focus on safe interactions when approaching dogs while children are awake and alert. Children without protective sensation should avoid sleeping with animals because they may not notice a pet licking or chewing insensate areas.

**Conclusions:** Educating families of children with sensory deficits about skin care should include the risk of soft tissue injury from animal bites, including from family pets. These children should be awake, able to call for help, and insensate skin should be protected when interacting with pets.

**AN 11-YEAR-OLD PATIENT WITH CEREBRAL PALSY WHOSE PATHOLOGIC GAIT WAS IMPROVED BY CUSTOM BILATERAL RIGID ANKLE-FOOT-ORTHOTICS (AFOS): A CASE REPORT**

John Leuthner, MD, and Larissa Pavone, MD

**Case Diagnosis:** Spastic diplegic gait improved by tuned AFOS.

**Case Description:** This case describes an 11-year-old male with past medical history significant for spastic diplegic cerebral palsy. This patient had bilateral equinovarus malformations of his ankles related to bilateral hamstring, adductor, and posterior tibialis muscle spasticity. At baseline, the patient had a nonfunctional crouched, inverted, and pronated gait. To prevent further footprint breakdown and to assist with a more functional gait, the patient was referred for custom AFOS. After receiving custom AFOS which were tuned during five different sessions over 4 months, the patient saw significant improvements in his Dundee, popliteal, and Thomas test angles along with subjective functional improvements in stride length and heel contact. Over this same time, the patient did not receive Botox treatments and there were no changes to the patient’s medication regimen. The above angles were measured by the same physical therapist using a standard goniometer and the subjective functional improvements were noted on recorded video sessions.

**Discussions:** The patient’s AFOS were initially casted in plasterflexion with subsequent tuning sessions to reduce the plantar flexion angle to improve hamstring, adductor, and posterior tibialis muscle length with each step while the patient was ambulating. The tuned AFOS established a pattern of repetitive stretching which improved the patient’s functional gait without medication changes or injections. Numerous case studies report improvements in speed, cadence, and stride length with tuned AFOS.

**Conclusions:** This case is notable for the significant functional gains this patient made during a period of rapid physiologic growth using only bilateral rigid AFOS and physical therapy. Physiatrists need to be aware of the benefits of tuned AFOS for patients with non-functional diplegic spastic gait. Further research is needed regarding the mechanism to optimize a patient’s AFOS to provide rapid return of functional gait.

**AN INNOVATIVE METHOD TO PROLONG INDEPENDENT BOWEL AND BLADDER MANAGEMENT IN A PATIENT WITH FIBRODYSPLASIA OSSIFFICANS PROGRESSIVA (“STONE MAN SYNDROME”)**

Nicole Strong, DO, Maria A. Vanushkina, MD, Kristen Brusky, DO, and Sara Salim, MD

**Case Diagnosis:** Fibrodysplasia ossificans progressiva (FOP) and right patellar fracture.

**Case Description:** A 58-year-old female with FOP complicated by bilateral hip autofusions, limiting joint flexion/extension and abduction/adduction, presented with right patella fracture after mechanical fall. She underwent uncomplicated operative fixation. Post-operatively she was able to weight bear as tolerated with a knee brace locked in extension. She was admitted to acute rehabilitation with the goal of returning home on a day care setting. During inpatient rehabilitation, bowel and bladder management were significantly limited secondary to her baseline and post-operative lower extremity motion restrictions. A custom funnel device was modified with the input of patient, family, and medical staff. The funnel was connected to a dowel-like rod that enabled it to be balanced within the toilet. After training, the patient could manipulate the device with her left hand and use the bathroom independently in a wide-based standing position.

**Discussions:** FOP is an extremely rare autosomal dominant condition of ectopic ossification leading to gradual ossification of muscle, tendon, and ligament. Patients become dependent for bowel and bladder management secondary to limited mobility and function. In this case, the creative and collaboratively adapted funnel device improved the patient’s quality of life by ultimately prolonging her independence with toileting, which enabled her to return home to an independent living facility. Fortunately, she maintained a few degrees of free elbow flexion/extension, allowing her to maintain personal hygiene with the use of this funnel. The main challenge of the described method is the need for significant coordination and training. It is also limited to those who have the residual upper extremity function needed for appropriate hygiene.

**Conclusions:** An innovative method of toileting using a funnel device may allow for prolonged independence of bowel and bladder management in patients with FOP.

**AN INTERESTING PRESENTATION OF LYME NEUROBORRELIOSIS APPEARING AS AN INCIDENTAL LACUNAR STROKE**

Adnan Solaiman, MD, William Pomilla, MD, and Sarita Said, MD

**Case Diagnosis:** Lyme neuroborreliosis and acute left lacunar ischemic stroke, in the setting of Binswanger’s disease and rotator cuff arthropathy.

**Case Description:** A 79-year-old male with a past medical history of hypertension, right rotator cuff arthropathy, sarcoidosis, and tobacco use presented with progressing confusion, weakness, and falls. He was last normal about four weeks prior. He initially developed neck stiffness and malaise, over time progressing to shoulder weakness. He continued to worsen, and after having multiple falls at home, came to the hospital. He had right shoulder weakness, left facial nerve palsy, ambulatory dysfunction, and behavioral changes. CT scan of head, chest, abdomen and pelvis obtained during trauma evaluation were negative. MRI brain showed acute lacunar infarct in left peririgonal white matter and diffuse chronic microangiopathic changes. MRA head and neck, echocardiogram and Holter monitoring did not show any concerning findings. Further history revealed that he had tick bites one month ago. Lyme testing was performed and IgG and IgM western blot serologies were positive. Lumbar puncture showed 90 nucleated cells, 95% lymphocytes, normal glucose, and 222 protein, favoring Lyme neuroborreliosis. He was started on intravenous ceftriaxone for four weeks, and also on aspirin and simvastatin for secondary stroke prevention, and discharged to acute inpatient rehabilitation hospital. His symptoms improved with antibiotics and multidisciplinary rehabilitation therapy.

**Discussions:** This case provides an example of Lyme neuroborreliosis presenting with an incidental lacunar stroke. It is interesting because of the insidious and multifactorial nature of presentation which was also confounded by Binswanger’s disease and rotator cuff arthropathy. When the stroke did not fully explain his symptoms, further workup uncovered the diagnosis of Lyme neuroborreliosis.

**Conclusions:** Keep a broad differential diagnosis in patients presenting with stroke-like symptoms, especially when history, physical exam and imaging studies are inconsistent. In endemic areas, consider testing for Lyme disease as part of the workup.

**AN UNCOMMON PRESENTATION OF CHEMOTHERAPY INDUCED PERIPHERAL NEUROPATHY: A CASE REPORT**

Katie Gibbs, DO, and Susan Malzer, DO

**Case Diagnosis:** Chemotherapy induced peripheral neuropathy (CIPN) is a common and often debilitating side effect experienced by individuals undergoing treatment for cancer. Chemotherapeutic agents such as taxanes and platinum compounds disrupt the dorsal root ganglion (DRG) of primary sensory neurons, leading to impairments of the peripheral nervous system. Incidence and clinical presentation of CIPN varies with the chemotherapeutic agent of choice and treatment dose. While side effects are often include pain, numbness and weakness, pruritis is a much less common presentation. The severity of symptoms may lead to alterations in treatment regimen and when persistent, negatively impacts the individual’s quality of life. Due to the variable pharmacology of chemotherapeutic agents, there is still much to be learned about the pathophysiology, clinical presentation, treatment and prevention of CIPN.

**Case Description:** A 43-year-old female with history stage IIB invasive ductal breast cancer, ER+, HER2+, treated with doxorubicin, cyclophosphamide, palbociclib, and radiation, status post bilateral mastectomy and reconstruction, presented for evaluation of itching in her bilateral arms, neck and chest. The pruritis had persisted for several months after her reconstruction, was most bothersome at bedtime and...
eventually became debilitating; tingling in the fingertips was also noted. Physical exam revealed mild erythema, but no visible rash in the pruritic area. Motor strength and sensation were fully intact; deep tendon reflexes were symmetric. The source of her pruritus was thought to be secondary to CIPN. Trials of gabapentin, Lyrica and neuropathic compound creams failed to provide relief. She was then started on nortriptyline and noted significant improvement in her symptoms. At present time her neuropathic pruritus is well controlled with 75mg of nortriptyline daily.

Discussions: Previous research has shown that taxanes damage the DRG, nerve terminals and microtubules involved in axonal transport. The typical presentation of CIPN in individuals treated with taxanes is paresthesia, numbness and neuropathic pain in the stocking and glove distribution. Although cases of neuropathic pruritis secondary to chemotherapy have been reported in the past, the diagnosis is rare. The fact that pain and pruritic fibers share common signaling pathways and are found within the same sensory nerve terminals has been established, but the reason why some neuropathies present as pain while others present as pruritis is not well understood. Similar to neuropathic pain, this case demonstrates that neuropathic pruritis may respond well to tricyclic antidepressant agents such as nortriptyline, when properly diagnosed.

CONCLUSIONS: CIPN presenting as neuropathic pruritus without associated pain or weakness is a diagnosis of which all physiatrists should be aware. This atypical presentation may cause the definitive diagnosis to be challenging, but when identified, is easily treatable with common neuropathic agents. This case also reinforces that the research into CIPN must continue as there is still much knowledge to be gained.

AN UNEXPECTED IMPROVEMENT IN VISUAL ACUITY AFTER OCCIPITAL NERVE RFA: A CASE REPORT

Stephanie Van, MD, BS, Eric Scholten, MD, and Akhil Chhatre, MD

Case Diagnosis: Occipital neuralgia is described as irritation, entrapment, or damage to the occipital nerve that may be caused by trauma, stress, infection, or repeated cervical extension and flexion. Symptoms of occipital neuralgia are typically shooting, electricity-like pain at the back of the head and neck, and can be associated with headaches and blurry vision. Management of occipital neuralgia starts conservatively with physical therapy and pharmacotherapy (analgesics, anticonvulsants, and antidepressants). For pain refractory to these approaches, patients can benefit from procedures like nerve blocks (injection of local anesthetic to ablation (destruction of the nerve), and then surgery (nerve decompression, transposition, sectioning). This case report describes strategies for the treatment of occipital neuralgia with occipital nerve RFA and describes a patient for whom this procedure resulted in improved visual acuity to better than baseline. The goal of this report is to describe this unusual and unexpected benefit of this common therapy.

Case Description: This patient is a 65-year-old female with past medical history significant for a motor vehicle collision in 2006, who since has experienced progressively worsening numbness, tingling, and shooting pains in her shoulders and arms. She had undergone three cervical decompression and fusion surgeries, as well as shoulder and hand/wrist surgeries, most recently in 2009, but her radicular symptoms have been persistent for the past two years, despite frequent physical therapy and other conservative methods.

The patient represented in March 2016 for follow up, with complaints of new headaches associated with blurry vision, head and neck pain for one month. These symptoms were less radicular in nature and more consistent with an occipital neuralgia. At this time, she underwent multiple nerve block injections of the bilateral greater and third occipital nerves. After these procedures, she experienced 75% relief of her head and neck pain based on a numerical pain scale; however, her headaches returned shortly after the injections.

In June 2016, she underwent bilateral greater and third occipital nerve radiofrequency ablation (RFA) for her occipital neuralgia. One month later at follow up, she reported that her occipital pain has been greatly relieved. Her headaches had resolved. She was able to tolerate wearing a hat. She also reported improvement in visual acuity, stating that she has not needed to wear her glasses as often.

On her follow up visit in September, 2016, she presented wearing a hat and brought her glasses to the appointment but was not wearing them. When interviewed about her symptoms of occipital neuralgia, she reported that her headaches have not recurred since the procedure. She does not feel the need to take any pain medication for this symptoms, and has not taken any since the immediate postoperative period. When asked about her vision changes, she reports that even before her headache symptoms in March 2016, she was wearing glasses all throughout the day to see clearly. When her headache symptoms started, she recalls that her vision would become increasingly blurry with the headaches. Then, following the occipital nerve RFA procedure in June 2016, she reports that she wears her glasses much less throughout the day.

Discussions: RFA has been practiced for more than 20 years for the treatment of occipital neuralgia with promising outcomes (about 85% postoperative good results after at least 6 months), though a small percentage of significant adverse events have been reported in the literature (ataxia, spatial disorientation - both of which are transient, but also intraventricular hemorrhage resulting in death (one patient), as well as intracranial hypotension which resolved (one patient). In the most recent review of occipital neuralgia, 111 cases were described. Patients underwent initial injection of anesthetic agent to the occipital nerves, then RFA or Botx injections, and if either of these techniques failed to relieve symptoms, they were offered implantation of surgical electrodes linked to an automatic stimulator (an experimental and not commonly used technique). After at least 6 months follow up, roughly 80-85% of patients who received RFA or Botx injections experienced good or excellent outcomes following these procedures, using a combination of the visual analogue scale (VAS) and the Macnab criteria, and this is consistent with other publications on the same topic. None of these cases specifically described improvements in visual acuity better than baseline.

CONCLUSIONS: Treating occipital neuralgia results in decreased in intensity of pain and headaches, and even improvements in vision. For this patient, she wore corrective lenses throughout the day for years before her occipital neuralgia symptoms began. There is the potential for recall bias in the patient’s recollection of her vision and glasses requirement. There is also the possibility that this patient had mild occipital neuralgia which caused neck pain and blurry vision at baseline which was corrected with glasses for many years, but then her symptoms worsened. Following the ORFA procedure, her symptoms have fully resolved and are better than baseline. Patient has a follow up appointment with her optometrist in the next month or so, and will update the pain clinic treatment team with any changes in her description.

AN UNUSUAL CAUSE OF NEW-ONSET BEHAVIORAL ABNORMALITIES: BILATERAL CEREBELLAR INFARCTS CAUSING CEREBELLAR COGNITIVE AFFECTIVE SYNDROME: A CASE REPORT

Araj Sidki, DO, and Jun Zhang, MD

Case Diagnosis: Cerebellar Cognitive Affective Syndrome

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**Case Description:** A 72-year-old female with a history of Hyperlipidemia and Hypertension reported dizziness and confusion. Patient also demonstrated dysarthria, aphasia, and mild confusion. MRI showed multiple bilateral cerebellar infarcts. Psychiatric evaluation was required a few days later, due to new-onset hemicranial ideations towards her family and episodes of agitation and delirium. On admission to acute rehabilitation, the abnormal behavior persisted, despite any previous Psych history. Physical exam revealed lower extremity weakness, disorientation, dysmetria, and unstable gait along with delusions, flat affect and suicidal and homicidal ideations. Cerebellar Cognitive Affective Syndrome (CCAS) was suspected based on clinical findings and interval history. Routine physical and occupational therapy was provided for weakness and gait instability. Neuropsychology therapy and speech treatments were also provided in addition to Psychiatry. Patient’s suicidal ideations resolved and behavior improved. Subsequently, posey restraint was removed permitting her discharge to a subacute facility.

**Discussions:** CCAS is a condition that occurs due to cerebellar lesions. Unlike typical cerebellar infarct symptoms of vertigo, headache, and ataxia, CCAS affects spatial cognition, affect, and causes personality changes resulting in inappropriate behavior. CCAS usually occurs due to cerebellar stroke, tumor, or neurodegenerative diseases and the severity depends on the site and extent of lesion. Cerebellar lesions may also cause certain psychiatric disorders such as schizophrenia, depression and bipolar disorder. Treatment choices are limited and of uncertain efficacy.

**CONCLUSIONS:** This rare case from cerebellar infarctions improved with speech therapy and neuropsychology therapy. Additional research is needed to identify the best treatment for CCAS. Further research is also needed in determining if concentrated neuropsychology treatment and speech therapy is more effective. However, pharmaceutical management, transcranial magnetic stimulation, and cognitive-behavioral therapy are all potential treatment options for CCAS.

**AN UNUSUAL CAUSE OF ORTHOSTATIC HYPOTENSION AFTER MULTI-TRAUMA**

Sara Raiser, MD, Alan Alfano, MD, and Helmy Siragy, MD

**Case Description:** Ocular sellar mass causing secondary adrenal insufficiency

**Case Description:** A 64-year-old male was admitted to acute inpatient rehabilitation (AIR) following multi-trauma with cardiac contusion, loss of consciousness, and multiple orthopedic injuries requiring surgical repairs. Rehabilitation was quickly complicated by symptomatic orthostatic hypotension. Routine workup of hypotension prompted further investigation, which was subsequently consistent with adrenal insufficiency. He had a history of typical Addisonian crisis. MRI of pituitary gland revealed central necrosis or primary adrenal cause for the insufficiency. Replacement hydrocortisone was initiated for secondary adrenal insufficiency along with levotyphroline for hypothyroidism. Appropriate postural and exercise responses returned with treatment. Subsequent investigation with magnetic resonance imaging of the pituitary gland revealed a large cystic intrasellar mass with suprasellar extension abutting the optic chiasm, despite no visual deficits. Patient deferred surgical resection of the tumor for a later time. He successfully completed AIR and will continue to be monitored for development of visual and other neurological deficits, which might indicate need for surgical resection of the sellar tumor.

**Discussions:** Orthostatic hypotension is a common complicating factor in AIR. It is common for a physiatrist to be lured into treating with supportive measures like compression stockings, abdominal binder, salt tabs, and fluids while foregoing a workup for occult causes. Adrenal insufficiency can be primary or secondary and can easily be missed if not part of the differential diagnosis. Important clues in this case were inadequate blood pressure response to exercise, hypotension, and lack of symptomatic response to supportive measures.

**CONCLUSIONS:** Physiatrists must remain vigilant and thorough in evaluation of barriers to progress in the AIR setting. Orthostatic hypotension and hypotension are commonly seen in older individuals receiving AIR. Adrenal insufficiency should be considered and investigated, especially when physiologic compensation is incongruous and the individual’s response to supportive measures is incomplete.

**AN UNUSUAL PRESENTATION OF CERVICAL MYELOPATHY AND LUMBAR RADICULOPATHY IN THE SETTING OF SPINAL ARACHNIOIDITIS DUE TO NEUROCYSTICEROSIS**

Shayan Senthelal, MD, Kevin Sperber, MD, Ankush Jain, DO, Justin Raper, MD, MSC, Neel Chandel, MD, and Jonathan Vecchiarel, MD

**Case Diagnosis:** Cervical myelopathy and lumbar radiculopathy due to sequelae from an infectious process

**Case Description:** A 55-year-old Ecuadorian male diagnosed with neurocysticercosis in 2004. He underwent ventriculo-peritoneal shunt placement for hydrocephalus and was evaluated for burning pain and stiffness of the lower back over the past two months. Pain radiated from the midline (S1) proximally to the occiput, both shoulders and down the lateral aspects of both arms to the elbows. Intermittently, this sacral pain spread along the posterior of the left leg. Review of systems revealed that he suffered from dizziness and loss of balance with a sensation of falling to his right. He admitted to having weakness, numbness and tingling of his left lower extremity from all 5 distal phalanges proximally up the posterior of the left leg to the popliteal region when he had pain. Physical Exam revealed upper motor neuron symptoms, specifically hyperreflexia of the biceps, triceps, brachioradialis, quadriceps, and gastrocnemius tendons. Spasticity (MAS of 1+) of elbow extension, shoulder, knee and plantarflexion bilaterally were also appreciated. Hoffman’s sign was positive bilaterally and tandem gait was performed with difficulty. No sensation deficits were appreciated. MRI of Cervical spine revealed chronic inflammatory changes of arachnoiditis and a stenotic cervical canal, likely preceded by longstanding neurocysticercosis.

**Discussions:** In this case, we present an unusual case of cervical myelopathy and lumbar radiculopathy caused by spinal arachnoiditis due to a previous infection from neurocysticercosis. Though relatively uncommon in the United States, infectious causes of upper motor neuron syndromes should be considered in patients originally or travelling from epidemic regions.

**CONCLUSIONS:** Neurocysticercosis and other parasitic pathogens are a concern in the immigrant communities of the United States. The subsequent neurological and musculoskeletal manifestations in which they present offer unique etiologies for familiar diagnoses.

**AN UNUSUAL PRESENTATION OF COMPARTMENT SYNDROME**

Jamal Khan, DO, and Yu Jen Lai, MD

**Case Diagnosis:** Compartment Syndrome

**Case Description:** A 54-year-old male presented to the emergency department with pain and swelling in his left lower leg. Earlier that day, he attempted to stop a truck from backing up, causing the injury. The truck rolled back after being left in neutral and the patient attempted to stop it with his left leg placed behind him for leverage. The left leg was fully extended with the ankle in dorsiflexion, placing an extreme loading force on his extremity. He came to the ED complaining of leg pain, swelling, and numbness on the dorsum of his foot. The swelling gradually increased until his left leg was approximately twice the width of his right leg. On exam, the leg was tender and the skin was tight. He was then taken for emergent decompressive fasciotomy. He was found intraoperatively to have a gastrocnemius tear which was subsequently repaired.

**Discussions:** Compartment syndrome is a painful condition that occurs when pressure inside a closed muscle compartment increases to dangerous levels due to edema or bleeding. This leads to increased pressure on the muscles, nerves and capillaries. Without a continuous supply of oxygen, these structures can be permanently damaged leading to ischemic necrosis or limb contractures. Historically, acute compartment syndrome occurs after fractures, ischemia-reperfusion or crush injuries. However, acute compartment syndrome from a loading injury such as this had not been previously described in the literature.

**CONCLUSIONS:** The most important aspect of managing compartment syndrome is maintaining a high index of suspicion for people at risk. In patients presenting with symptoms such as pain, swelling and numbness, compartment syndrome should be in the differential even if the presentation is unusual. A delay in diagnosis could be catastrophic. Compartment pressures can be measured for confirmation. With early treatment and rehabilitation, normal function of the extremity could be re-established.

**AN UNUSUAL PRESENTATION OF MULTIPLE SCLEROSIS: A CASE REPORT**

Kimberly Nguyen, DO, and Maria Jovin-Castro, MD

**Case Diagnosis:** Multiple Sclerosis

**Case Description:** A 23-year-old black male with PMH of asthma and HTN was admitted for falls and weakness. Patient reported progressive weakness of bilateral UE and LE, tremors, involuntary movements, and dysphagia with slowing of speech starting 3 years ago. Symptoms are constant and progressively worsening. Patient has episodes of pain, fatigue, change/loss of sensation, bowel/bladder incontinence, use of illicit drugs, or having unsafe sex. Patient ambulates with a straight cane with increasing difficulty. Patient was born as a triplet and has 10 other siblings, all in good health.
MRI brain performed with findings suggestive of periventricular demyelination. Follow up MRI spine showed multiple foci of intrinsic spinal cord abnormality throughout the cervical and thoracic spine. CSF IgGs 6.7 with >5 well defined gamma restriction bands that are not present in the serum control (oligoclonal bands). Patient was given oral prednisol for 3 days, then switched to an oral steroid taper with improvement of symptoms.

**Discussions:** This was an unusual case of multiple sclerosis because it is often seen in females >males, whites–blacks, and usually presents in a remitting/relapsing manner (85%) with symptoms “scattered in time and space”. Occasionally involving siblings (5%), the genetic component was not seen in our patient (healthy triplet siblings). He also lacked the most common initial presenting symptoms of bladder/bowel dysfunction, fatigue, and pain. Our patient had primary progressive MS which has few remissions and can cause death within months. Despite having poor prognostic factors including being male, poly-symptomatic with motor findings at onset, and difficulty with ambulation, the patient is making functional gain in rehab after 3 years of progressive disease.

**CONCLUSIONS:** MS presents with various signs and symptoms but should be included in the differential diagnosis of progressive weakness despite non-classic presentation.

**AN UNUSUAL SOURCE OF ACUTE-ONSET LATERAL HIP PAIN IN A RUNNER**

Lindsay N. Ramey, MD, and Jennifer Baima, MD

**Case Diagnosis:** Full-thickness, proximal iliotibial band (ITB) tear

**Case Description:** A 56-year-old male runner presented with two weeks of acute, sharp left lateral hip pain. He first developed mild pain in the midst of his usual 4–6 mile run without trauma or change in his running regimen. The pain acutely worsened when pulling backwards against a rug stuck to the floor one week later. He felt a pop and developed immediate focal swelling. Examination revealed a large, palpable fluid collection at the lateral hip. He had mild hip abduction weakness of hip. Exam was otherwise normal.

Radiographs were normal. MRI revealed focal, full-thickness tear of the proximal ITB with an underlying hematoma.

He was treated with relative rest followed by physical therapy for core strengthening, pelvic asymmetry correction, therapeutic ultrasound, and a graded return-to-running program. At two months, he had returned to pain-free running.

**Discussions:** Full-thickness ITB tears are uncommon. The limited reports on ITB tears describe distal tears in the setting of steroid injections or radiation. However, ITB friction syndrome and its associated risk factors may predispose patients to ITB tear. This patient may have suffered from underlying ITB irritation from running which predisposed him to traumatic tear under excessive force.

Optimal treatment is currently unclear. There is no research available regarding outcomes of conservative or surgical treatment for tears. However, given its similarities in location and function to the gluteus medius muscle, current treatment strategies for gluteus medius tears may serve as a reference. Gluteus medius tears typically heal well with conservative treatment. A minority of patients with severe, full-thickness tears fail conservative treatment and require surgical repair with good outcomes.

**CONCLUSIONS:** To our knowledge, this is the first case report describing a proximal, full-thickness ITB tear. Further, we describe the case of a recreational runner who was able to return to pain-free running at 8 weeks using a conservative approach.

**ANCONENE SPASTICITY SUCCESSFULLY TREATED WITH BOTOX: A CASE REPORT**

David Robinson, BA, and Lawrence Horn, MD

**Case Diagnosis:** Focal spasticity in anconene.

**Case Description:** A 55-year-old male with lower C4 AIS D tetraplegia from a motor vehicle accident in 2006 presented to PM&R clinic with complaints of increased spasticity in his right upper extremity (UE) upon elbow flexion. For years this spasticity drastically impaired his ability to perform self-care, requiring replacement services. He’d been treated numerous times with Botox for elbow extensor spasticity, ranging from 50-150U injected into his tripes, and had never experienced relief. Our physical examination demonstrated a modified Ashworth of 3 in his elbow extensors and 2 in his UE, no hyperactivity in his proximal tripes. Significant catching was palpated just distal to the lateral epicondyle upon flexion movements. Under EMG guidance 40U of Botox was injected into the right anconene (3cm distal to space between the lateral epicondyle and olecranon) and 60U into the right lateral head of the triceps. At his two week follow up visit he modified Ashworth scale in his elbow extensors was a 0.

**Discussions:** Examination findings pointed to the anconene as causing this patient’s spasticity, evidenced by resolution of his spasticity in light of previous tripes injections. The anconene is a distal elbow extensor originating from the lateral epicondyle. Spasticity is a common cause of functional impairment after upper motor neuron injury or insult with UE flexors most often affected. UE extensor spasticity is rarely encountered and produces a motor imbalance with the elbow extensors overpowering the elbow flexors thus impeding volitional elbow flexion. It compromises performance of activities of daily living and the patient’s quality of life.

**CONCLUSIONS:** To our knowledge this is the first report of successful treatment of anconene spasticity, and we demonstrated Botox to be an effective treatment modality. Proper knowledge of functional anatomy when performing physical examination is critical in treating these atypical presentations of spasticity.

**ANOMALOUS INNERVATION TO THE EXTENSOR DIGITORUM BREVIS MUSCLE**

Neal Washburn, DO, MS, and Bao Tran, MD

**Case Diagnosis:** Tibial-to-peroneal nerve anastomosis in the foot

**Case Description:** A 66-year-old obese male with chronic low back pain presented with pain radiating down his right leg. The patient’s symptoms were not associated with weakness or sensory changes, which were confirmed on physical examination. EMG/NCS was ordered to evaluate for a possible radiculopathy.

EMG of the lower limbs was within normal limits, however NCS of the left peroneal nerve to the extensor digitorum brevis (EDB) revealed about a 50% reduction in compound muscle action potential (CMAP) as compared to the right limb at three stimulation sites (ankle, fibular neck, and popliteal). Despite normal stimulation at the ankle, CMAP was missing in the popliteal fossa resulting in a 236% increase in amplitude at the EDB as compared to the peroneal nerve. Furthermore, submaximal stimulation over the tibial nerve was attempted at the ankle, which revealed a 236% increase in amplitude at the EDB muscle when compared to submaximal stimulation over the peroneal nerve in the popliteal fossa. Similar results were not reproduced in the contralateral limb.

**Discussions:** The EDB muscle is commonly innervated by the deep peroneal nerve, which receives input from the L5 and S1 nerve roots. Additionally, there are studies that have shown that the EDB muscle receives innervation from the accessory deep peroneal nerve as well, which is a branch of the superficial peroneal nerve. There have only been a few case reports that have suggested the possibility of tibial innervation to the EDB muscle in an “all tibial foot.” These reports have found a normal CMAP over the EDB muscle with stimulation of the tibial nerve, at both the ankle and the popliteal fossa, and no response with stimulation over the peroneal nerve locations. In the present case, we found the EDB muscle to receive innervation from both the deep peroneal nerve as well as the tibial nerve. Given the retained, yet diminished CMAP with stimulation over the peroneal nerve, these findings are suggestive of a tibial-to-peroneal nerve anastomosis in the foot.

**CONCLUSIONS:** Innervation anomalies are possible in the upper and lower limbs, some more common than others. From an electrodiagnostic perspective, these anomalies can result in abnormalities during routine NCS testing, which may mistakenly be viewed as pathologic rather than a normal anatomical variant. In the current case, we present such an anomaly that involves tibial innervation to the EDB muscle. Based on our findings, we propose that this is a result of a tibial-to-peroneal anastomosis in the foot.

**ANOTHER ETIOLOGY OF MERALGIA PARESTHETICA-IMPEINGEMENT BY BONE SPUR FROM ANTERIOR SUPERIOR ILIAC SPINE: A CASE REPORT**

Samantha Benjamin, DO/MBA

**Case Diagnosis:** Meralgia Paresthetica

**Case Description:** The patient is an 80-year-old male who presented to an outpatient musculoskeletal and pain management office with a three month history of frequent burning pain to the left thigh with spontaneous onset and no inciting injury. Based on our findings, we propose that this is a result of a tibial-to-peroneal anastomosis in the foot.
into the nerve, with further compression on hip rotation. He had received a local anesthetic injection under ultrasound guidance, followed by a steroid injection under ultrasound guidance on follow up. At one week post steroid injection, the patient reported persistent numbness and pain with no change in quality of pain or function. Surgery was discussed as a treatment option.

**Discussions:** One injection under ultrasound guidance did not give relief, and the patient did not pursue surgery. This is the first reported case, to our knowledge, of meralgia paresthetica secondary to bone spur from the anterior superior iliac spine. Due to the mechanical pressure by the bone on the nerve, the symptoms are unlikely to subside with standard non-surgical treatment of wearing loose clothing and a local injection. Other investigations, i.e. nerve conduction studies (NCS), X-rays, CT scan and MRI may not show a bone spur impinging on a nerve. NCS can be difficult to perform and interpret. Though they may diagnose the condition, they will not show the etiology of a bone spur.

**CONCLUSIONS:** Ultrasound evaluation of the LFCN is recommended at an initial evaluation to rule out impingement of LFCN by bone. More outcomes from meralgia paresthetica patients due to impingement by bone spur need to be documented to make any recommendation for treatment.

**ANTERIOR MEDULLARY SYNDROME ISOLATED TO CORTICOSPINAL TRACT: A CASE REPORT**

Patrick Dolan, MD, Bhavi Patel, DO, and Getahun Kifle, MD

**Case Diagnosis:** Anterior medullary syndrome with isolated corticospinal tract involvement

**Case Description:** A 77-year-old African American female with a past medical history of hypertension and diabetes presented to ED after experiencing six hours of right upper and lower extremity weakness. No other symptoms were present such as chest pain, shortness of breath, facial droop, problems with balance, swallowing, or speech. Initial CT head was within normal limits. However, the patient continued to experience worsening right-sided weakness. Presumed diagnosis was pure motor stroke, likely resultant from a lacunar internal capsule infarction. However, MRI diffusion tensor imaging performed next day revealed small left anterior medial medullary infarction involving only corticospinal tract on diffusion tensor imaging. The patient actually had suffered a medial medullary infarction. Even though infarction involved the medial medulla, this was not a classic “medial medullary (Dejerine’s) syndrome.” A medullary medullary syndrome, representing less than 1% of strokes typically involves contralateral hemiplegia from corticospinal pyramidal tract involvement, contralateral proprioception/vibration loss from medial lemniscus involvement, and ipsilateral tongue motor loss from 12th cranial nerve involvement. She was admitted to an acute rehabilitation unit because of her significant right hemiplegia. With two weeks of therapy she slowly improved motor function of her right-side. She was discharged home with good recovery expected.

**Discussions:** This case signifies the importance of newer imaging techniques along with the possibility of abnormal distributions of ischemia.

**CONCLUSIONS:** In this exceedingly rare case, only a pure motor stroke was manifested from an anterior medial medullary infarction.

**ASPIRATION PNEUMONIA FROM SUPERIOR MESENTERIC ARTERY SYNDROME IN A MINIMALLY CONSCIOUS PATIENT**

Ashley R. Calvi, DO, Carlos A. Jaramillo, MD, and Blessen C. Eapen, MD

**Case Diagnosis:** Aspiration Pneumonia from Superior Mesenteric Artery Syndrome in a Minimally Conscious Patient

**Case Description:** A 21-year-old male active duty Army service member involved in a motor vehicle collision resulting in a severe traumatic brain injury who was admitted to an inpatient rehabilitation unit in a vegetative state. 4 months post injury he had an abrupt onset of vomiting after his morning bolus feeds via peg tube. Clinical diagnostics revealed an E.coli aspiration pneumonia, however CT imaging also unexpectedly demonstrated findings consistent with superior mesenteric artery syndrome (SMAS). General surgery was consulted and agreed with the clinical and radiographic findings of SMAS. Treatment was initiated consisting of IV antibiotics, proton-pump inhibitors, gastric decompression, parenteral nutrition and eventual jejunostomy tube placement followed by a gradual 20-pound weight gain.

**Discussions:** Our patient was a young, active duty male, and had a significant decrease in body fat after his injury, a 28-pound weight loss from admission to symptom onset. Additionally, he had a complicated abdomen with history of an exploratory laparotomy with splenectomy, buried bumper syndrome, a gastric ulcer and PEG tube revision. SMA syndrome is a rare cause of proximal intestinal obstruction caused by compression of the third part of the duodenum between the superior mesenteric artery and aorta, and is often associated with severe, debilitating illness. As our patient was in a minimally conscious state, it was difficult to assess for common complaints like early satiety and abdominal pain, but he had been tolerating his tube feeds with unremarkable abdominal exams leading up to the event. Complications from a delay in diagnosis can include severe electrolyte abnormalities, gastric perforation and pneumonia.

**CONCLUSIONS:** Common complications can occur from atypical causes and prompt identification and treatment is crucial to prevent further debilitation. SMAS is a rare and unusual etiology for aspiration pneumonia, but should always be considered.

**ASSOCIATION BETWEEN TRANSIENT ISCHEMIC ATTACK AND SUBCORTICAL VASCULAR DEMENTIA**

Megan E. Wright, MSPAS, PA-C, Sharon David, MD, David M. Ermak, DO, and Raymond Reichwein, MD

**Case Diagnosis:** Transient ischemic attack associated with cerebral hyperperfusion in subcortical vascular dementia

**Case Description:** An 83-year-old right-handed male presented with acute onset of right upper extremity weakness, expressive aphasia, and dysarthria concerning for acute right middle cerebral artery ischemic stroke. His symptoms improved shortly after arrival. Imaging studies failed to demonstrate any acute intracranial abnormalities, but did show severe chronic microangiopathic changes and central white matter volume loss with chronic lacunar infarcts in the bilateral basal ganglia, left greater than right. Over the next several days, the patient had recurrent stroke-like episodes presenting with focal neurologic deficits
STROKE: A CASE REPORT

OSSIFICATION OF THE ELBOW IN A PATIENT WITH ACUTE ATYPICAL AND ACCELERATED FORMATION OF HETEROTOPIC OSSIFICATION (HO)

by-case basis with careful consideration of the patient's comorbidities and assessment in this patient population. However, this should ultimately be determined on a case-based approach. It may be prudent to liberalize blood pressure goals at the lower end of the spectrum correlating with decreased arousal, functional impairments. Patients with SVD are often sensitive to changes in SBP, with blood pressures lacunar infarction. The disease progresses with age, but the clinical course may wax/wane. Patients with SVD are often sensitive to changes in SBP, with blood pressures due to mature HO formation intracapsularly and on the flexor and extensor surfaces development, our patient presented 10-days post-stroke with restricted elbow motion prior to admission. Further, the patients elbow range of motion was full and without functional impairments. Collectively these findings highlight a unique case of either asymptomatic pre-morbid traumatic HO formation that was accelerated by an acute stroke or a case of rapidly progressive neurogenic HO due to stroke.

CONCLUSIONS: This is the first case to report HO formation of the elbow leading to joint ankylosis within 10 days of a stroke. The etiology for these findings remains unclear, though most likely represents a case of either pre-morbid asymptomatic traumatic HO formation precipitated by an acute stroke or an unusually accelerated formation of neurogenic HO.

ATYPICAL PRESENTATION OF CHARCOT-MARIE-TOOTH DISEASE

Mohammad Islam, MD, Tiwalade Adeji, BA, Joseph A. Heiney, BA, and Tamar Siskind, BA

Case Diagnosis: Diagnosis of Charcot-Marie-Tooth disease (CMT) involves standard family history due to strong genetic component, medical history and neurologic exam. Evidence of muscle weakness, decreased muscle bulk, reduced deep tendon reflexes (DTR), sensory loss and foot deformities, mild scoliosis, or hip dysplasia might support a diagnosis of CMT. Nerve enlargement is specific for CMT1 due to abnormally thickened myelin sheaths detectable on palpation. Additionally, electro-diagnostic studies such as nerve conduction studies and electromyography are useful in diagnosing CMT. Abnormal readings can signify axonal degeneration or demyelination. Diagnosis can also be reached via genetic testing, however this is only available for 27 types of CMT. Nerve biopsy can also be used to detect incurrences of abnormal myelination, such as onion bulb formation which represents alternate zones of demyelinating and remyelinating Schwann cells.

Case Description: A 9-year old male with a past medical history of late walking, frequent falls and balance problems is referred to PMR due to foot drop and bilateral tightness of the Achilles tendon. His family immigrated to the United States from the Dominican Republic recently. On exam, positive pertinent findings include weakness in the distal muscles of the lower extremities with 2/5 plantar flexion and 2/5 dorsiflexion bilaterally, along with mild atrophy of the distal calf and confirmed bilateral hypotonia of the Achilles tendons. Patient also showed pes cavus deformity and signs of hammertoe formation. Duchenne’s muscular dystrophy was considered, but was discounted due to lack of Gower’s sign and lack of calf pseudo-hypertrophy. Of note, patient’s family history includes a wheelchair-bound maternal cousin who began walking with a very gait at age 2. Another maternal relative also experienced difficulty walking in childhood and is currently bed-bound.

Patient underwent electromyography testing which showed slow velocities and low to normal nerve amplitudes on high intensity stimulation. This patient’s presentation is suspicious for a hereditary demyelinating neuropathy, possibly CMT1 or Dejerine-Sottas Disease. Genetic testing demonstrated normal abnormalities of known clinical significance. This finding, however, does not exclude a diagnosis of CMT.

Discussions: CMT is a disease of peripheral nerves, the various forms of which can be classified based on diagnostic studies and genetic identifiers. Several different mutations in the genes for myelin production and maintenance have been identified. CMT1 involves a 1.5 Mb duplication of the PMP-22 gene on the short arm of chromosome 17. This results in slowed conduction velocity on EMG testing. CMT2 affects axons directly, demonstrating reduced CMAP. CMT3, or Dejerine-Sottas disease, presents in infancy and demonstrates a markedly slowed NCV of <10 m/s.

Physical therapy is the mainstay of treatment and use of medical devices, such as ankle-foot orthoses (AFO’s) can correct foot drop and improve gait. Although exercise is encouraged, patients should avoid strenuous activity as this can exacerbate symptoms and result in injury. Foot care is important for patients with severe sensory loss.

Tendon transfer and manipulation of the plantar fascia can also be used to correct a high arched foot. In particular, transfer of the peroneus longus to the peroneus brevis tendon and transfer of the posterior tibialis tendon to the dorsal side can both aid in flattening high arched feet, as well as improving dorsiflexion.

CONCLUSIONS: Though there is currently no cure for CMT, early diagnosis and intervention is important in management. This patient has a clinical presentation and family history suggestive of either CMT1 or CMT3. The lack of significant findings in this patient’s genetic analysis highlights the fact that new mutations for CMT are still being discovered, and not all of them can be detected at this time. This means that a negative genetic finding does not necessarily rule out the diagnosis of CMT.

As CMT is a genetic disease, treatment with gene therapy or stem cell-mediated regeneration of damaged PNS cells are areas worth exploring in the future.

ATYPICAL AND ACCELERATED FORMATION OF HETEROTOPIC OSSIFICATION OF THE ELBOW IN A PATIENT WITH ACUTE STROKE: A CASE REPORT

David B. Essaff, DO, and Nicole Strong, DO

Case Diagnosis: 57-year-old male with acute medial pontine stroke admitted to an acute inpatient rehabilitation unit.

Case Description: A 57-year-old male with a past medical history of hypertension, who was admitted to acute stroke/neurology service of a tertiary care hospital with right hemiplegia following an acute left ventral pontine stroke due to a near-total occlusive basilar artery thrombosis. Following a 10-day uncomplicated hospital course, the patient was transferred to the acute inpatient rehabilitation service.

Rehabilitation admission examination was significant for dense right-sided hemiplegia and mild right-sided spasticity. The patient had a fixed elbow contracture with passive range of motion limited to 45-degrees of extension and 90-degrees of flexion. Right elbow plain film x-ray imaging was obtained to rule out possible neurogenic heterotopic ossification (HO). Findings revealed abundant heterotopic bone formation, anterior and posterior to the elbow, partially intracapsular, with underlying moderate to marked degenerative disease. Patient was subsequently started on etindronate disodium in an effort to slow further disease progression. Additional patient history revealed a traumatic fall onto the right elbow, years prior to admission, with subsequently preserved full range of motion and function leading up to this hospitalization.

Discussions: This is a case of accelerated HO formation with subsequent joint ankylosis following an acute stroke. HO describes a benign bone growth outside of normal skeletal locations. The formation often results from traumatic or neurogenic etiologies. It presents within weeks of injury and often requires months to confirmed maturation on plain film x-rays. In itself, HO is rare in stroke, compared to patients with spinal cord and traumatic brain injuries. In stroke, HO is more commonly found extracapsularly, and on the hemiparetic limb, most commonly near the shoulder or extensor surface of the elbow. Contrary to typical HO development, our patient presented 10-days post-stroke with restricted elbow motion due to mature HO formation intracapsularly and on the flexor and extensor surfaces of the elbow.

While history would suggest prior trauma might have contributed to this atypical presentation of HO, the patient had no signs or symptoms to suggest HO development prior to admission. Further, the patients elbow range of motion was full and without functional impairments. Collectively these findings highlight a unique case of either asymptomatic pre-morbid traumatic HO formation that was accelerated by an acute stroke or a case of rapidly progressive neurogenic HO due to stroke.

CONCLUSIONS: This is the first case to report HO formation of the elbow leading to joint ankylosis within 10 days of a stroke. The etiology for these findings remains unclear, though most likely represents a case of either pre-morbid asymptomatic traumatic HO formation precipitated by an acute stroke or an unusually accelerated formation of neurogenic HO.
ATYPICAL PRESENTATION OF GUILLAIN BARRE SYNDROME

Justin Siegel, BS, Kevin Hoang, BS, Daniella Nussbaum, BS, Junghoon Choi, MD, Yamillette Burgos-Quiniones, MD, and Mohammad Islam, MD

Case Diagnosis: Atypical presentation of Guillain-Barre Syndrome

Case Description: A 30-year-old Hispanic male with past medical history of alcoholism presented with generalized fatigue and malaise as well as vague abdominal pain with no diarrhea for 2 weeks. During his admission, the patient developed altered mental status and respiratory distress and was subsequently intubated.

About one week into his treatment, the patient developed weakness, especially in the proximal extremities graded 2/5 in the shoulders and hips and 4/5 in the hands and ankles. The patient also developed hyporeflexia in the biceps, triceps, knees and ankles. Within the next few days, the strength declined to 1/5 in the shoulders and hips and 3/5 in the hands and ankles. The pupillary reflex was also noted to be sluggish. CT scan of the brain was performed and revealed acute bilateral subdural hygromas, left larger than right. Lumbar puncture was performed and revealed albuminocytological dissociation with protein of 444 mg/dL and no cells. This finding was consistent with diagnosis of Guillain-Barre Syndrome, and the patient was started on a 5-day course of IVIG.

Nerve conduction study showed absent F wave in the motor nerves in both the upper and lower extremities with sparing of the sensory nerves. Several days later, the patient also developed urinary retention. The patient’s continued respiratory distress was also thought to be related to respiratory muscle weakness secondary to Guillain-Barre Syndrome. A tracheostomy and PEG tube placement were completed for long-term support.

Following the completion of IVIG, there began to be improvement in the movements of the limbs. However, the patient began to also develop autonomic dysfunction and hypotension. Autonomic dysfunction was characterized by fluctuations in blood pressure and heart rate. Hyponatremia with Uosm >500 and Ufree Na At the time of submission, patient’s strength has improved considerably. Shoulders rated as 4/5, hands 5/5, hips 3/5, ankles 4/5. The patient is on a trial of tracheostomy with the plan to evaluate for future decannulation. He will continue physical therapy and occupational therapy to improve muscle strength.

Discussions: Typical Guillain-Barre Syndrome presents with ascending paralysis beginning in the toes followed by leg weakness. Patients may also develop respiratory distress and difficulty swallowing. It typically presents after an infection, usually associated with diarrhea or upper respiratory infection. It can also present with a comorbid systemic disease such as systemic lupus erythematosus. Diagnosis of Guillain-Barre Syndrome includes lumbar puncture with examination of cerebrospinal fluid showing normal pressure, little to no cells, and elevated protein concentration greater than 0.55 g/L. This patient displays an atypical presentation of Guillain-Barre Syndrome. The patient had no identifiable preceding infection or past medical history of systemic diseases. In addition, his presenting weakness was greater in the proximal muscles compared to distal. This patient also presented with other features associated with Guillain-Barre Syndrome including SIADH and autonomic dysfunction. This patient’s case underscores the importance of considering Guillain-Barre Syndrome in the differential of patients with respiratory distress and muscle weakness, even if it does not follow the typical ascending pattern.

Conclusions: We present an intriguing case of Guillain-Barre Syndrome in which the patient presented in an atypical fashion. Despite this, standard of care treatment protocol with IVIG followed by physical therapy has led to significant improvements in the patient’s condition.

ATYPICAL PRESENTATION OF TOXIC MEGACOLON IN A SPINAL CORD INJURY PATIENT: A CASE REPORT

Kaveri Sharma, MD, and Keerthi Atturi, MD

Case Diagnosis: Toxic Megacolon in a Spinal Cord Injury Patient

Case Description: A 53-year-old male admitted to inpatient rehabilitation for spinal cord injury (C5 to C7 D, brown-squard syndrome) following a motor vehicle collision. Since admission he had abdominal distension and constipation and was started on a bowel program. He also had severe spasticity in the right upper and lower extremities. Two days after admission, he developed hypotension and confusion with leukocytosis (white blood cell count 20,000). He did not have any symptoms of nausea, vomiting, abdominal pain, diarrhea or fever. Abdominal X-ray revealed dilatation of transverse colon (>7cm). CT Abdomen/Pelvis with contrast revealed wall thickening of the cecum and ascending colon, representing colitis. Stool was tested positive for toxigenic Clostridium difficile.

He was treated for toxic megacolon with PO Vancomycin and IV Metronidazole, bowel rest, bowel decompression (Nasogastric suction) and received parenteral nutrition. He recovered without needing surgery and was able to complete his rehabilitation course.

Discussions: Toxic megacolon is a potentially lethal complication than can be associated with clostridium difficile colitis. Early diagnosis and treatment is essential to prevent complications such as bowel perforation and death. Spinal cord injury patients may not present with typical symptoms with intra-abdominal pathologies and may present with nonspecific signs such as worsening spasticity and autonomic dysreflexia. Laboratory and radiological abnormalities may be the only evidence in these cases. This patient did not present with abdominal pain, diarrhea or fever which are typical for Clostridium difficile colitis. Imaging studies and lab tests helped in establishing the diagnosis and starting the appropriate treatment.

Conclusions: Spinal cord injury patients may not present with typical symptoms when they have an intra-abdominal pathology. Clostridium difficile toxic megacolon should be considered in the differential diagnosis when the spinal cord injury patient has abdominal distension with signs of toxicity even though there is no diarrhea or abdominal pain. This clinical presentation should warrant obtaining timely imaging studies and lab tests to facilitate early diagnosis, treatment and prevention of serious complications.

ATYPICAL TREATMENT OF PHANTOM LIMB PAIN WITH PULSED RADIOFREQUENCY ABLATION

Ankur Patel, Lawrence Kelleher, DO, and Jacob Kochany, DO

Case Diagnosis: Phantom limb pain treated successful with pulsed radiofrequency ablation

Case Description: We present a case of a patient that underwent a left below knee amputation due to an unhealing fracture and osteomyelitis. After she was fitted for a prosthetic leg, she complained of worsening numbness and pain in the distribution of the superficial peroneal region. Physical examination showed a possible neuroma formation at the distal stump site which may be contributed to localized pain but the distribution of dysesthesias in the superficial peroneal region was related to the phantom limb pain. After successful local injections with bupivacaine in the office with short term pain relief, we opted to proceed with radiofrequency ablation with pulsed lesioning at the distal portion of the peroneal nerve at the stump site. This case depicts literature review of thermal versus pulsed radiofrequency ablation and why our approach provides long lasting pain relief for phantom limb pain.

Discussions: Phantom Limb is the sensation of the already amputated limb is still part of the body. Unfortunately, for many this can often lead to a pain syndrome called phantom limb pain in which the distribution of this sensation can be a painful phenomenon. After extensive literature review, we opted to treat phantom limb pain possibly caused by a localized neuroma at the stump site with radiofrequency ablation after a successful diagnostic block with bupivacaine. Sensory stimulation reproduced the dysesthesias allowing us to confirm the precise location of pulsed radiofrequency ablation. We then proceeded with pulsed radiofrequency ablation due to the microscopic neuronal disruption that it causes which can lead to axonal lesioning in the distribution of the nerve that is causing pain.

Conclusions: Our goal was to target the suspected neuroma at the stump site that produced the phantom limb sensation which followed the peroneal nerve distribution with regards to sensation and pain. This treatment modality will allow for optimal pain management for amputees. The patient continues to receive optimal pain relief for over six months and this treatment can serve as a valuable option for other amputees in the early stages of phantom pain prior to the onset of plasticity which may perpetuate chronic pain syndrome.

AUTONOMIC DYSREFLEXIA RELATED TO CERVICAL SPINE INSTABILITY IN A PATIENT WITH CENTRAL CORD SYNDROME: A CASE REPORT

Keri Chung, DO

Case Diagnosis: A 66-year-old male sustained both a spinal cord injury (SCI) and a severe traumatic brain injury (TBI) in a motorcycle crash.

Case Description: His critical care course included management of life-threatening polytraumatic injuries including cervical spine subluxation and fracture. The patient underwent C5-T1 anterior cervical disectomy and fusion four days after the injury. Upon admission to the acute inpatient rehabilitation unit four weeks after the injury, his severe aphasia prevented reliable testing of his motor and sensory function. He was consistently moving his lower limbs significantly more
the upper limbs and was diagnosed with central cord syndrome based on clinical and radiographic features.

Three weeks into his rehabilitation course, the patient had an episode of autonomic dysreflexia (AD) with systolic blood pressures in the 180–210 mm Hg range. His pressures stayed elevated despite treatment with nitroglycerin paste and hydralazine. He was transferred to the critical care unit for hemodynamic monitoring. He did not have any evidence of urinary or bowel abnormalities.

Subsequent exhaustive workup revealed a C6-7 complex fracture with anterior displacement of the surgical hardware. He underwent emergent surgical hardware removal and placement of halo traction. Following this procedure, his blood pressures returned to baseline.

Discussions: AD is a dangerous phenomenon that typically occurs with complete spinal cord injuries at level T6 and above. It is commonly triggered by an underlying physiologic derangement, such as a urinary or gastrointestinal problem. This case was remarkable as it is the first reported case, to our knowledge, that an unstable cervical spine in the setting of a central cord injury triggered a life-threatening AD event.

Conclusions: Nearly 60% of patients with SCI also have a TBI. In this case, the patient’s inability to communicate confounded the search for the AD etiology. An interdisciplinary collaborative approach was crucial to diagnosing and treating the underlying trigger.

AUTONOMIC DYSREFLEXIA AS AN ADVERSE DRUG REACTION TO COMBINATION DULOXETINE AND AMITRIPTYLINE: A CASE REPORT

Sara C. Parke, MD, and Maria R. Reyes, MD

Case Diagnosis: Autonomic dysreflexia following duloxetine and amitriptyline combination therapy

Case Description: A 31-year-old with T3 ASIA Impairment Scale A Spinal Cord Injury (SCI) developed neuropathic pain (NP) poorly controlled by maximal doses of gabapentinoids and conversion to duloxetine monotherapy. The patient had previously experienced autonomic dysreflexia (AD) symptoms from urinary causes, but had no personal history of hypertension (HTN). Within five days of starting combination therapy with duloxetine (60mg) and amitriptyline (20mg), the patient developed recurrent episodes of AD manifested by severe hypertension, headache, sweating, facial flushing and feeling of impending doom, requiring emergent care. Investigation of possible physiologic causes of AD failed to reveal an etiology. Due to concern for medication interaction, duloxetine was discontinued. The recurrent episodes of AD resolved within three days of discontinuation. The patient opted to continue treatment with amitriptyline for treatment of NP without subsequent AD events or HTN.

Discussions: AD and NP are common secondary health conditions after SCI. AD typically affects persons with SCI at T6 or above, and is usually precipitated by noxious stimuli. Pharmacologic triggers have rarely been described. Treatment of NP is critical to improving quality of life, but presents a considerable challenge to most clinicians. Anti-epileptics and antidepressants, such as tricyclic antidepressants and serotonin-norepinephrine reuptake inhibitors, are mainstays of NP treatment. Severe hypertension is a known adverse side effect of amitriptyline and duloxetine, but neither of these drugs, nor the combination, has been previously associated with AD. One potential mechanism by which the combination could provoke AD is inhibition of CYP2D6-mediated metabolism of amitriptyline.

Conclusions: Unexplained AD in patients receiving duloxetine and amitriptyline should prompt consideration of adverse drug effects to combination therapy. Pharmacologically-induced AD warrants further study, but this potential interaction should be considered when selecting combination therapy for NP in persons at risk for AD.

BACLOFEN INDUCED THROMBOCYTOPENIA: A CASE REPORT

Mayur J. Amin, MD, Joseph Connor, MD, and Rachna Malhotra, DO

Case Diagnosis: This is a 20-year-old male who underwent a cavernoma resection who was treated for spasticity and resulted in Baclofen-induced thrombocytopenia.

Case Description: A 20-year-old male who underwent left retrosigmoid craniotomy for left pontine hemorrhagic cavernoma on 08/2014. The patient developed an acute hemorrhage in the left pons with hematoma formation on 9/17/2014. The patient was treated at an acute care hospital with a steroid (dexamethasone) taper. He was admitted to acute inpatient rehabilitation with right upper and right lower extremity weakness on 9/25/2014. Medications at time of admission included dexamethasone taper, pantoprazole, and sliding scale insulin. During his rehabilitation stay he was noted to have increased tone in the right upper extremity with a Modified Ashworth Scale (MAS) of 2 at the elbow. Initially stretching and range of motion (ROM) was performed by physical therapy, however after 1 week, tone remained. The patient was started on Baclofen 5mg TID on 10/01/14. Physical and occupational therapy reported improvement in ROM with medication addition. Dose was increased on 10/07/14 to 5mg BID and 7.5mg qHS. The patient began to report increased fatigue and headaches on 10/09/14. A complete blood count (CBC) showed a significant drop in platelet count from admission labs (260 to 122 × 10^9/L). Medications at this time were TYLENOL #3 for headache and Baclofen. Repeat CBC was performed on 10/11/14, which showed further decreases in platelet count from 122 to 103 × 10^9/L. Decision was made to discontinue Baclofen and CBC was followed routinely. By time of discharge patient’s platelet count had increased to 150 × 10^9/L. Upon follow-up with neurosurgeon and primary care physician, the patient’s platelet count had returned to within the normal range.

Discussions: Thrombocytopenia as an adverse reaction with Baclofen use has been reported in only 0.8% of patients taking the medication. Most of these events have been reported in males aged 40 – 49 years old who are concomitantly taking other medications and have multiple sclerosis.

Conclusions: Baclofen has a number of well-known and common adverse reactions, including drowsiness, dizziness, weakness, hypotension and nausea. When initiating Baclofen therapy for spasticity, one should check the complete blood count, especially when the patient demonstrates signs of fatigue. Additionally, the patient’s medications and past medical history should be considered prior to starting baclofen. Thrombocytopenia, though an extremely rare adverse reaction, can be corrected by discontinuing Baclofen.

BEDSIDE ULTRASOUND USED TO HELP DIAGNOSE PEDIATRIC VASCULAR TUMOR: A CASE REPORT

Jared Ruben Levin, MD, Monika Desai, MD, PGYS, and Dona Rani C. Kathirithambly, MD

Case Diagnosis: Infantile Hemangiomata of the left semimembranosus

Case Description: Seven-month-old boy, born term normal spontaneous delivery referred to clinic for four months of knee pain and contracture. The patient was previously hospitalized at three months for left posterior thigh pain and decreased knee range of motion. He underwent radiographs of the knee and femur, as well as knee MRI, which were read as unremarkable. After discharge patient was treated with serial casting for presumed knee pathology. A knee ultrasound had already been ordered. In our clinic, examination revealed a soft mass of the left posterior thigh with significant tenderness. The left popliteal angle was approximately 45 degrees. All limbs moved to antigravity. Bedside ultrasound identified a non- rimmed, hypo-echoic and compressible mass within the medial hamstrings. Radiology was contacted to review the previous knee MRI, which upon re-analysis did show a poorly visualized fluid filled structure. Workup was re-focused to a left thigh ultrasound, which showed a 2.9x2.5x1.0cm lobulated mass demonstrating arterial and venous vascularity. Subsequent thigh MRI confirmed a mass in the semimembranosus with concern for vascular malformation vs. fibromatosis vs. neurofibroma. The patient subsequently had a biopsy, showing an infantile hemangioma. After a multidisciplinary meeting with the family, nonsurgical management was decided upon.

Discussions: This is a case in which bedside ultrasound, performed by a Physiatrist, played a critical role in ensuring an appropriate workup of this child's tumor. Ultrasound uses sound wave reflection to develop an image of structures below the skin, by identified gradients in tissue density. Commonly cited benefits of ultrasound include: the ability for real-time dynamic evaluation and adjustments; the availability of Doppler; relative portability and access in clinic; and avoidance of radiation exposure. In this case, prior diagnosis had been for hamstring contracture, and thus the mass within the semimembranosus had been poorly visualized and missed on prior knee MRI. In contrast, following clinical suspicion in the office, utilization of ultrasound allowed the Rehab team to confirm that there was a mass in the mid-thigh that appeared to be a fluid filled vascular structure. With visualization of the mass, the Rehab team was able to shift further workup towards diagnosis of this mass, which is believed to be the primary cause of the child’s knee pain and subsequent limitations. Fortunately, biopsy of the tumor diagnosed a benign lesion and the child is able to undergo non-operative treatment.

Conclusions: This is a case of a child with knee contracture, originally believed to be secondary to knee pathology, whose diagnosis of intramuscular infantile hemangiomata was delayed without the assistance of bedside ultrasound. This case demonstrates clinical utilization of sonography as a diagnostic tool in the Rehab clinic when proper knowledge and clinical suspicion guides its use.
BENEFITS OF EXTERNAL FIXATORS IN CHRONIC NON-HEALING HEEL ULCERS: OFFLOADING AND AMBULATION

Neel Choudhri, MD, Shayan Senthelal, MD, and Siha Guha, MD

Case Diagnosis: A 59-year-old Caucasian man with medical history of hypothyroidism, right hydronephrosis, chronic kidney disease stage III, Bell’s palsy without evident sequelae, uncontrolled diabetes mellitus type 2 with severe peripheral neuropathy, chronic bilateral heel ulcers unimproved with previous laser treatment was admitted with bleeding heel ulcers, LE weakness, acute kidney injury secondary to hahdomyolysis, and altered mental status secondary to metabolic acidosis, uremia or hypothyroid. He was started on intravenous antibiotics for osteomyelitis of heels and got bilateral external fixators which were also a walking device with feet suspended to avoid pressure on the heels and feet. Hospital course was complicated with Bacteroides fragilis bacteremia, right femoral DVT. Patient was to continue external fixator and weight bearing as tolerated until the heel ulcers are healed.

Case Description: Review of systems: He admits weakness and numbness in bilateral lower extremities, pain in both legs at fixator sites. Physical Exam: Right heel stage III ulcer 2 x 1cm with red base and 30% yellow slough on the base. Left heel stage III ulcer 2x 1.5cm with red base and very minimum slough tissue. Noted to have good strength proximally. There is no active plantar or dorsiflexion. The intrinsics of the toes are contracted with curling of the toes. Sensory loss up to the knees and in both hands.

Functional: independent with feeding, can take few steps with external fixators using RSW.

 Discussions: Here we present a case of chronic bilateral heel ulcers secondary to severe peripheral neuropathy in uncontrolled diabetes that required external fixators to protect heels from weight bearing, these fixators were also a walking device with weight bearing as tolerated.

CONCLUSIONS: The external fixators that prevents weight bearing of heels, and can be used as a walking device as well can be considered in patients with chronic non healing heel ulcers.

BENT SPINE SYNDROME: AN UNCOMMON SECONDARY CAUSE OF BACK PAIN

Melissa N. Kirk, MD, and Richard Kendall, DO

Case Diagnosis: To describe Bent Spine Syndrome: an uncommon condition which can cause back pain and limited physical function in older individuals.

Case Description: An 83-year-old female presented with worsening chronic back pain with progressive forward leaning and complaint of “fatigue in her tail bone.” Back pain worsened with standing, forward bending, and walking for only short periods. Patient reported inability to hold herself upright, as well as carry, or lift anything that tips her forward. Pain improved with lying down. On examination she had mild forward trunk lean and inability to maintain upright posture with outstretched arms. She had normal upper and lower extremity strength, reflexes and sensation. Labs revealed normal TSH and T4P. MRI revealed no fatty infiltration in the lumbar paraspinal muscles.

Discussions: Bent Spine Syndrome is an abnormal flexion in the trunk in erect position which resolves when supine.1 It is a progressive axial myopathy more common in the elderly population, predominantly females.2 Examination commonly shows extensor spinal muscle weakness and normal neurologic exam (tone, reflexes, and sensation). CT/MRI findings include increased fatty infiltration of the caudal paraspinal muscles, which ascends with age.3,4 EMG findings are consistent with denervation and fatty replacement in the lumbar and thoracic paraspinals.2 Muscle biopsy findings include fibrous tissue in a lobular pattern, with atrophy of muscle fibers and predominance of fatty replacement.2 Treatment is supportive and includes therapy for hip flexor stretching, strengthening of hip extensors, use of assistive devices and activity pacing.

Conclusions: Early recognition of Bent Spine Syndrome can allow prompt integration of physical therapy targeting spinal extensor strengthening, preserving range of motion, and prevention of low back pain.

BILATERAL CORTICAL BLINDNESS SECONDARY TO SUBSTANCE ABUSE: A CASE REPORT

Phillip G. Mendis, DO, Mark A. Guiguis, MS, Ajendra Sohal, MD, and Lyn Weiss, MD

Case Diagnosis: Cortical blindness due to substance-induced occipital lobe infarct.

Case Description: A 25-year-old Caucasian male with polysubstance abuse with heroin, cocaine and benzodiazepines but no other significant past medical history presented with bilateral visual loss. Parents found the patient unconscious and cyanotic, initiated CPR and EMS administered multiple doses of Narcan on route to the emergency department where he regained consciousness. On initial physical exam, the patient had bilateral visual loss but was alert and oriented x3 with no focal, motor or sensory deficits; pupils were equal and reactive to light. Urine toxicology was positive for heroin, benzodiazepines, and cocaine. MRI showed signs of bilateral occipital infarct. Patient regained some perception of light, shadows, and color on hospital day 3 (initially absent). Patient is spatially disoriented and has difficulty discriminating between his left and right extremities.

Discussions: This is the first reported case, to our knowledge, of substance-induced bilateral cortical blindness, which presents with loss of vision in the presence of normal pupillary reflexes and with evidence of occipital lobe infarcts. This can be secondary to hypoxia, cardiac arrest, vasospasm, cardiac embolism, or hypertensive encephalopathy. The likely cause of the injury for this patient was either respiratory arrest or cocaine-induced vasospasm. Vision loss can sometimes be associated with confabulation and denial of vision loss (i.e. Anton’s syndrome), or the unconscious ability to localize motion and shadows (i.e. Blindsight). Better visual recovery has been noted in patients that are young (<40 years old), with no history of hypertension or diabetes and no cognitive impairment. Difficulty discriminating between his left and right extremities.

Conclusions: A suspicion of cortical blindness should be raised when the patient presents with atypical loss of vision and evidence of occipital lobe injury. The symptoms can vary depending on the areas of the occipital region that are affected.

BILATERAL FOREARM AMPUTATIONS FROM ELECTRICAL BURN REQUIRING FUNCTIONAL PLANNING: A CASE REPORT

Ankush Jain, DO, Michelle Stern, MD, and Shayan Senthelal, MD

Case Diagnosis: A 38-year-old male presented with 3rd degree electrical burns to his forearms bilaterally. A nuclear perfusion study demonstrated no blood flow distal to his wrists requiring bilateral forearm guillotine amputations.

Case Description: Severe electrical wires came in contact with the metal ladder the electrician was stabilizing. Bilateral fasciotomies were performed followed by bilateral forearm guillotine amputations. The patient expressed aspirations to continue to work as an electrician, prioritizing his necessity for fine motor skills. His sutures were removed and his physical exam revealed 3 muscle strength testing, decreased edema with shrinkers, and sensation intact to light touch through his residual upper limbs, making him an excellent candidate for prostheses. The patient was adamant in returning to the community independently. His motivation for rehabilitation and our prostheses selection afforded him the best opportunity to lead a dignified life.

Discussions: Electrical burns can require amputations when the limb is the entry or exit point for the current. The current follows subdermal tissues, due to less resistance, where damage is often greatly underestimated. This is the case of our patient who received bilateral fasciotomies prior to his amputations. Furthermore, patients with bilateral forearm amputations require a unique approach to rehab planning. In trying to preserve as much functional ability to the patient, we must account for the fine motor skills required for his profession. Prostheses available include pulley systems, electrical circuitry, exo vs. endoskeletons, and utilitarian terminal devices. Our design and implementation of the appropriate prostheses proved pivotal in helping him feel a sense of self-worth.

Conclusions: Bilateral forearm amputations are unique. The patient’s prior level of function, age, motivation, and future goals are important factors when considering treatment options. Incorporating the patient’s perspective in treatment plans will ultimately forge a path to success for the patient as a productive member of society.

BILATERAL GROIN PAIN IN A PATIENT WITH SPONDYLOLolisthesis: A CASE REPORT

Robert Kinne, MD, BA, and Sharleen Suico, MD

Case Diagnosis: Osteitis Pubis.

Case Description: A 32-year-old female presented to PM&R clinic with two years of bilateral groin and proximal lower extremity pain, worsened with forward flexion at the waist. Initial work-up of lumbar spine x-ray demonstrated a grade 2, L5-S1 spondylolisthesis and conservative management with non-steroidal anti-inflammatory medication was initiated. At follow-up visit, the patient reported that her pain was worst in the anterior pelvic region. MRI lumbar spine...
The initial increase in NDI scores and VAS at week 4 could be due to the pain from the procedure itself. The improvement in her VAS and NDI scores could be attributed to relief via destruction of articular cartilage innervated by sensory fibers. It is also plausible that non-specific lesioning of adjacent structures, synovial lining and joint capsule obliterates proximate and related sources of pain.

The lack of improvement in the psychosocial and emotional aspects of the SF-36 be due to baseline catastrophizing thought patterns and pain-related insomnia. Evidence suggests that poor sleep can decrease the pain threshold. A proactive approach addressing psychosocial aspects of chronic pain and sleep hygiene in conjunction with radial procedural interventions may further improve the success of pain management.

A limitation of this study is that confounders such as depression and insomnia were not assessed. In addition, the findings from a singular case may not be general-ized to other patients.

CONCLUSIONS: Although ablation of the C1–C2 joint is a procedure that may result in a temporary increase in pain after the procedure, it results in functional im-provements at three months. Ablation offers the possibility of long-term relief of cervicogenic headache and chronic neck pain that is refractory to more conservative measures. Incorporation of a multi-disciplinary approach to pain pre-and post-proce-dure could potentially help improve patient outcomes.

BILATERAL INTRA-ARTICULAR RADIOFREQUENCY ABLATION FOR CHRONIC ATLANTO-AXIAL JOINT PAIN: A CASE REPORT
Anne M. Kuwabara, BA, Charles Odonkor, MD, MA, Teresa Tang, MD, David Taftian, DO, and Akhil Chhatre, MD

Case Diagnosis: Cervicogenic headaches and cervicalgia are characterized by unilateral neck or face pain referred from various structures such as the sub-occipital muscles, cervical ligaments and joints, and intervertebral disks. Recently, there has been an increased focus on the lateral atlanto-axial (AA) joint as a pain generator in patients with chronic neck pain. A review of the literature underscores the effectiveness of radiofrequency neurotomy of cervical dorsal rami in relieving pain in patients with chronic C3-4 and C6-7 synovial joint pain. A more recent prospective study of 104 patients with cervical pain showed significant pain relief after cervical medial branch neurotomy. In both studies, patients with C1–2 joint pain were ex-cluded. Given suggestions of a role for targeted C1–2 joint interventions to address neck pain in the literature, we present a case report assessing the effectiveness of C1–2 intra-articular joint ablation for alleviating chronic AA-joint pain.

Case Description: A 27-year-old female presented with worsening chronic neck pain and cervicogenic headache. Her pain was 9/10 by visual analog scale and de-scribed as cramping, burning and aching. Pain was localized sub-occipitally with ra-diation to her jaw and posterior aspect of her neck, worse on the right, and aggravated by postural changes and neck rotation. Associated symptoms included clicking of her temporo-mandibular joint, neck stiffness, teeth clenching, bilateral headaches with peribital pain, numbness and tingling, anxiety and fatigue. Symptom onset began in 2012 after sustaining a whiplash neck injury in a motor vehicle collision. She re-port ed excruciating peribital and neck pain with unilateral right arm weakness at the time. In 2007 after sustaining a whiplash neck injury in a motor vehicle collision. She re-sulted underwent a diagnostic and therapeutic, ultrasound-guided pubic symphysis corticosteroid injection. This injection provided complete resolution of the patient’s groin and anterior pelvic pain as well as her bilateral radiating leg pain. She has since undergone multiple repeat pubic symphysis injections pro-viding relief for greater than 6 months and each time, received complete resolu-tion of pain.

Discussions: Osteitis pubis is a relatively well known source of anterior pelvic and groin pain but also radiating pain to the lower extremities. Additionally, the prevalence of spondylothesis in the general population is estimated to be approxi-mately 10% but it is important to consider that many of these patients are asymptomatic and pain symptoms in a patient with lumbar spondylothesis may be due to other etiologies. As in this patient, corticosteroid injection of the pubic symphysis may provide good relief of symptoms.

BILATERAL SCIATIC MONONEUROPATHIES IN A CRITICALLY ILL PATIENT: A CASE REPORT
Troy Bushman, DO, and Alan Davis, MD, PHD

Case Diagnosis: Bilateral severe axonal sciatic mononeuropathies likely second-ary to sciatic nerve ischemia due to buttoc/proximal thigh pressure effects.

Case Description: 40-year-old Female who presented to the hospital after be-ing found unresponsive (likely due to narcotic and or benzodiazepine overdose and likely down for a number of hours) with PEA with ROSC after CPR, and Narcan. She was intubated and transferred to a local hospital where she was found to be in cardiopulmonary shock from massive PE with multiple problems related to this, including respiratory failure. She was intubated and sedated for a total of 5 days. At the time of extubation, she had severe bilateral lower extremity weak-ness with loss of lower extremity reflexes. Appropriate workup for the weakness was unrewarding. She was presumed to have critical illness neuropathy and be-gan PT/OT. Two weeks following admission she was transferred to an LTAC where an EMG/NCS was performed approximately 1 month after initial admis-sion. Her nerve conduction studies showed absent bilateral peroneal and tibial motor responses with distal and proximal stimulation. It also showed absent bilateral superficial peroneal and sural sensory responses. Her comprehensive EMG study showed dense denervation potentials in all studied muscles supplied by the sciatic nerve and its branches. EMG testing of anterior thigh muscles, muscles supplied by the superior glu-neal nerves, and lumbar paraspinals were normal.

Discussions: Bilateral sciatic nerve compression neuropathy is a rare complica-tion in the critically ill patient. It may be beneficial to consider approaches to prevent this complication, thus preventing significant impairment/disability after recovery from the acute illness.

Conclusions: Bilateral sciatic nerve compression neuropathy is a rare complica-tion in the critically ill patient.

BILATERAL SUPRASCAPULAR MONONEUROPATHIES FOLLOWING EPSTEIN BARR VIRUS INFECTION
Ryan Woods, MD, and Jeffrey Strommen, MD

Case Diagnosis: Bilateral suprascapular mononeuropathies.

Case Description: A 64-year-old right-handed male presents with a 3-month his-tory of bilateral upper limb pain, numbness and weakness. Symptoms began with shoot-ing pains and paresthesia into the neck and bilateral upper extremities that waxed and waned without clear provocation. Weakness developed in the upper limbs particularly in the shoulders. Cervical spine MRI showed evidence of degenerative changes including disk bulging at C5–C6. Traction and ibuprofen was initiated and pain symptoms largely resolved in one month. Weakness however persisted, prompting further investigation.

Upon further questioning he reported a two week course of fevers, night sweats and weight loss prior to his pain onset. This was attributed to an outside diagnosis of mononucleosis based on positive serology. Clinical examination revealed 2/5 weakness in bilateral external rotators with preservation of the deltoid and biceps. An EMG revealed subacute bilateral supra scapular mononeuropathies left greater than right with no evidence for cervical root

Discussions: The patient responded favorably to RFN of the C1–2 joint with the exception of role limitations due to physical health and emotional problems.
compression. The findings in this clinical setting were thought to support an inflammatory etiology, resulting in brachial plexus neuritis (Parsonage-Turner syndrome). Repeat blood testing showed evidence of a recent Epstein Barr virus. The patient was diagnosed with post-infectious brachial plexopathy. Steroid treatment was deferred due to time course. Physical therapy was initiated.

**Discussions:** Parsonage-Turner syndrome is also known as brachial plexus neuritis or neuralgic amyotrophy. The exact etiology is unknown but proposed factors include trauma, infection, viral disease, recent surgery, immunization and autoimmune conditions. The initial presentation consists of sudden onset of shoulder pain, paresthesias and weakness of the upper limb and shoulder girdle. Although electromyography is the optimal method to confirm a suspected diagnosis, the clinical history characterized by sudden onset of severe shoulder pain followed by weakness and atrophy, particularly of the shoulder girdle muscles, is very suggestive. The suprascapular nerve is most commonly involved occurring in 97% of cases. The prognosis is generally favorable with 89% of patients recovering by three years.

Acute Epstein-Barr virus (EBV) infection is associated with neurological complications in 0.5–7.5% of patients. The possibilities is a combination of direct viral invasion and/or indirect immune effects. Post EBV infectious brachial plexopathy is more common in children and immunocompromised adults; however there are reports of lumbar polyradiculitis following EBV infections in immunocompetent adults. Although there is case series data suggesting antivirals may improve outcomes, prospective randomized controlled trials addressing effectiveness of antivirals in patients with primary EBV infection and neurological complications are lacking.

**Conclusions:** EBV associated brachial neuritis is a rare complication following infection. Although more common in children and immunocompromised adults, in the appropriate clinical setting post-infectious EBV brachial neuritis should be considered in the evaluation of radicular pain syndromes, even in immune competent individuals. At this time, there is no evidence based therapy for EBV associated with neurological complications.

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**Botulinum Toxin Injections for the Treatment of Involuntary Toe Movements: A Case Report of a Patient with Painful Leg Moving Toes Syndrome Treated Successfully for More than Three Years**

Stephanie E. Standal, MD, and Dennis Dykstra, MD, PhD

**Case Description:** A patient with Painful Leg Moving Toes (PLMT) Syndrome successfully treated with Botulinum Toxin injections for more than three years.

**Case Diagnosis:** A 65-year-old female with PLMT Syndrome characterized by involuntary flexion-extension movements in her toes and burning sensations in her legs was first treated with numerous pain medications and muscle relaxants. She experienced mild resolution of pain, but her involuntary toe movements persisted. She was ultimately treated with EMG-guided and ultrasound-guided botulinum toxin type A (BoNT-A) injections to the affected muscles in her lower extremities, which provided full resolution of her involuntary toe movements with repeated injections over the course of over three years.

**Discussions:** BoNT-A injections have been shown to prevent involuntary muscle contractions by inhibiting the release of acetylcholine at the neuromuscular junction. This results in localized chemical denervation of the muscle and localized weakness or paralysis. The medical literature includes numerous studies that suggest that BoNT-A injections are helpful in reducing involuntary movements associated with other forms of dystonia, but very little research exists about the use of Botulinum Toxin injections in the treatment of PLMT Syndrome.

**Conclusions:** The results of this case study suggest that BoNT-A (specifically onabotulinumtoxin A) may be beneficial for patients with involuntary toe movements associated with PLMT. Further research on the etiopathogenesis of PLMT as well as the BoNT-A dose, injection sites, and follow-up injections are needed to determine treatment effectiveness for this patient population.

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**Botulinum Toxin Type A for the Treatment of Focal Task-Specific Lower Extremity Dystonia Exacerbated by Total Joint Replacement**

Andrew S. Isleib, DO, and Daniel Moon, MD, MS

**Case Description:** Focal lower limb task-specific dystonia exacerbated by total knee arthroplasty.

**Case Diagnosis:** A 61-year-old male with Parkinson's disease presented for acute inpatient rehabilitation after right total knee arthroplasty. The patient had a several year history of daily focal dystonic episodes with right toe curling and ankle inversion. Prior to the surgery, these episodes would occur once daily for approximately 30 minutes. However, post-operatively, the dystonia occurred every time he attempted to walk. The abnormal foot and ankle posture caused significant pain limiting his ability to bear weight, thus impeding participation in therapies and functional progress. At initial evaluation the patient could walk 45 feet before dystonia was triggered. The patient agreed to intramuscular chemodenervation with onabotulinumtoxinA injections to address the dystonia, but reported that previous botulinum toxin injections were ineffective. Under aseptic conditions, 50 units were injected into the flexor digitorum longus, 50 units into the flexor hallucis longus and 100 units into the tibialis posterior. Electrical stimulation was used for needle guidance. Over the next five days the patient experienced only one mild, short-duration dystonic episode at rest. The patient's ability to ambulate improved considerably and at the time of discharge he walked 290 feet with a rolling walker at a distant supervision level without further dystonic episodes.

**Discussions:** The use of botulinum toxin type A in the treatment of focal upper limb dystonia has been well documented. However this is not the case for focal lower limb dystonias. The failure of this patient's previous botulinum toxin injections done without any needle guidance illustrates the importance of accurate needle localization with electrical stimulation or ultrasound. Additionally, this case provides data regarding effective dosing and muscle selection to address lower limb dystonia.

**Conclusions:** Intramuscular botulinum toxin type A injections can effectively treat focal lower limb dystonia exacerbated by total knee arthroplasty. Furthermore, treatment in the acute inpatient rehabilitation setting may facilitate faster functional recovery resulting in shorter length of stays.

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**Botulinum Toxin Type A Infusion for Primary Headache Syndrome Post-Intracerebral Hemorrhage: A Case Report**

Melissa A. Burgos-Martir, MD, and Keryl Motta-Velazquez, MD

**Case Diagnosis:** Primary Headache Syndrome Post-Intracerebral Hemorrhage.

**Case Description:** Case of a 61-year-old G0P0A0 female patient with medical history of right intra-cerebral/posterior fossa subarachnoid hemorrhage (of undetermined etiology; conservative treatment) with subsequent refractory headache for the past two years prior to our evaluation. Patient continued with moderate-severe pain intensity and was unable to attain satisfactory pain control despite multiple medication trials (Fioricet, Amitriptyline, Topiramate, Sumatriptan, Divalproex, D洛gesic, Gabapentin, Cymbalta and Milgram). Given the failure to multiple drug classes for abortive/prophylactic treatment of headache, we proceeded with Botulinum Toxin Type A trial, with the goal of adjuvant treatment.

**Discussions:** This is the first reported case, to our knowledge, of Botulinum Toxin Type A infusion used to efficiently treat primary headache syndrome post-ICH. Over the treatment course, progressive modulation of headache pain qualities and area of distribution also noted (Table/Figures); making toxin the primary treatment (reduction in intensity, ER visits and simplification of medications), which we suspect is a direct effect of neurotoxin treatment.

**Conclusions:** Although Botulinum Toxin has been established with good response to treat headache syndromes (chronic headache/migraine), no reports are found regarding its use for post-ICH headache management. While post-ICH headache is related to known and proposed pain pathways caused by cortical and meningeal irritation in the presence of blood which literature suggests a natural recovery (which may be viewed as unrelated to Botulinum Toxin mechanism of action); with this case, longstanding post-ICH headache of severe and refractory qualities was successfully managed with neurotoxin. It is proposed that additional underlying pain pathways responsive to neurotoxins are likely contributory to post-ICH headache, which should be further explored for optimization of treatment strategies.

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**Brachial Neuritis**

Timothy Flesher, MD, MS, and Steven Farrell, MD

**Case Diagnosis:** Brachial Neuritis

**Case Description:** A 28-year-old male presented with left arm weakness. Three weeks earlier the patient felt asleep in a chair for two hours, and upon awakening, he complained of sudden, left-sided, sharp neck pain and left arm weakness. On exam, the left supraspinatus, infraspinatus, and deltoid muscles were grade 4 in strength. Lateral flexion of the neck was painful. No other deficits were noted. Due to Copyright © 2017 Wolters Kluwer Health, Inc. All rights reserved.
suspicions for C5 radiculopathy versus brachial plexus injury, cervical spine MRI and left upper extremity electrodiagnostics were ordered. Left upper extremity nerve conduction study and electromyography were consistent with an upper trunk brachial plexus lesion. Cervical spine MRI showed mild degenerative changes, and MRI of the left brachial plexus showed increased T2 signals without enhancement suggestive of inflammation. These findings were consistent with left-sided brachial neuritis. Physical therapy was prescribed for left shoulder girdle strengthening and stabilization. On follow-up four months later, the patient’s neck pain and left arm weakness had resolved.

**Discussions:** Brachial neuritis is a rare disorder of unknown etiology that affects lower motor neurons of the brachial plexus. Acute onset of exacerbating unilateral neck/shoulder pain, followed by flaccid paralysis of shoulder and parascapular muscles several days later characterize the disorder. Movements of the neck usually do not worsen the pain. Treatment includes analgesics and physical therapy, with symptom resolution usually in three to four months.

**CONCLUSIONS:** Patients with acute brachial neuritis may be misdiagnosed with cervical radiculopathy. This patient might have been incorrectly diagnosed with cervical radiculopathy given his unusual presentation of pain with lateral flexion of the neck. The temporal profile of pain preceding weakness is important in establishing a prompt diagnosis and differentiating acute brachial plexus neuritis from cervical radiculopathy. This differentiation is important to avoid unnecessary surgery for cervical spondylotic changes in a patient with a plexitis.

**BROWN-SQUARD SYNDROME AS A CONSEQUENCE OF CERVICAL SPINAL CORD INFARCTION FOLLOWING CERVICAL RHIZOTOMY: A CASE REPORT**

Timothy Kieran Murray Calvert, MD, Andrew S. Isleib, DO, James Wilson, DO, and Todd A. Feathers, DO

**Case Diagnosis:** Interventional spinal procedures have become a common treatment for chronic pain. Our case report highlights the need to ensure prevention of vascular injury during these procedures.

**Case Description:** A 65-year-old male presented with gait and sensory dysfunction following a cervical rhizotomy. The rhizotomy was performed at the C3 through C6 levels using fluoroscopy without complication. Needle aspiration was negative for blood or cerebral spinal fluid. Post-operatively he noted progressively worsening weakness and sensory changes without respiratory or autonomic complaints. On exam, muscle strength was reduced on the left worse than right. Sensory exam revealed right-sided temperature and pin prick deficits, left-sided light touch and proprioceptive deficits and left-sided ataxia. The remainder of the exam was unremarkable. MRI revealed non-specific subtle patchy T2 signal hyperintensity and restricted diffusion of the left posterior lateral cord from the cervico-medullary junction through C3-C4. The patient was diagnosed with incomplete tetraplegia due to cervical spinal cord infarction consistent with Brown Sémèr syndrome (BSS) and admitted to acute inpatient rehabilitation. Initially, he had poor balance and required moderate assistance to ambulate 20–50 feet with a rolling walker. Neurofacilitation techniques, balance and endurance training were implemented. At discharge, he was independent with all ADL’s andambulation of 250’ with a rolling walker.

**Discussions:** BSS is an unusual type of spinal cord injury characterized by loss of ipsilateral motor function, vibration sense, proprioception, and two-point discrimination with contralateral loss of pain and temperature sensation. Classically resulting from penetrating trauma or neoplasm, it can also occur in infection or ischemia. BSS from ischemic injury following cervical rhizotomy has not been reported in the literature, although there are no clinical trials on the management of intramedullary hemorrhage. Neurosurgeons continue to debate the merits of surgical drainage versus the risks of further spinal cord injury with surgery. This case report suggests that conservative management and extensive rehabilitation may lead to better functional outcomes in patients with intramedullary hemorrhage.

**CONCLUSIONS:** There is no consensus management for intramedullary hemorrhage, but this case study suggests that conservative management and extensive rehabilitation may provide a better prognosis even in patients with severe functional impairments. This patient’s early enrollment in inpatient rehabilitation, day rehabilitation and dedication to a home exercise program, led to significant gains in both functional and independence measures. In addition, rehabilitation measures including Botox and orthotics proved to be valuable adjuncts in maximizing function in this case.

**CARDIAC ARREST FOLLOWING PERIPHERAL NERVE BLOCK WITH BUPIVACAINE: A CASE REPORT**

Michael E. Farrell, DC, Mayur J. Amin, MD, Adam Street, DO, and Kris Duggan, MD, MSc

**Case Diagnosis:** Cardiac arrest and anoxic brain injury following suboccipital nerve block.

**Case Description:** A 51-year-old female with a past medical history of migraine headaches was admitted to the acute rehabilitation unit following cardiac arrest and subsequent anoxic brain injury. The patient had a history of migraine headaches with occipital neuralgia failing to respond to conservative therapies. During an elective greater occipital nerve block with bupivacaine, the patient developed cardiac arrest shortly after injection requiring resuscitation. Relevant physical examination findings on admission included dysarthria and spasticity of the bilateral upper extremities more prominent on the right. Magnetic resonance imaging revealed lacunar infarcts in the right and left cerebellum right greater than the left.

**Discussions:** A potential treatment of occipital neuralgia, in the context of migraine headaches, refractory to conservative therapy is greater occipital nerve block using bupivacaine. Relatively few procedural complications exist due to the superficial location of the nerve [1]. However, complications of cardiac arrest have been documented in the literature [2–3]. In addition to its local anesthetic effects, bupivacaine is a potent depressant of electrical conduction [4]. In cases of cardiac arrest caused by bupivacaine, lipid infusions have been used to improve survival. Lipid infusions are believed to extract the lipid soluble bupivacaine molecules from aqueous plasma or diffuse directly into tissue and interact at that level [5].

**CONCLUSIONS:** Cardiac arrest during peripheral nerve injection with bupivacaine is a rare but dangerous complication. In cases of arrest, lipid infusions have been shown to improve survival. Making lipid infusions readily accessible during greater occipital nerve block may help to address this rare but serious complication.

**CARDIAC REHABILITATION CONSIDERATIONS IN A PATIENT WITH MAJOR POLY TRAUMA AND CONFIRMED TAKOTSUBO CARDIOMYOPATHY: A CASE REPORT**

Mohammad H. Zaidi, DO, Kunal Oak, DO, Fahad Ghias, DO, and Yu Jen Lai, MD

**Case Diagnosis:** Takotsubo Cardiomyopathy

**Case Description:** A 75-year-old female who was involved in a motor vehicle collision with a telephone pole with a prolonged extrication time from her vehicle. The patient suffered multiple fractures of her face arms and legs. Prior to rehabilitation admission the patient developed shortness of breath and tachycardia, the patient was deemed to be clinically in heart failure. She was taken for a diagnostic cardiac catheterization which demonstrated no obstructive lesions and a cardiac index of 1.5 with wall motion abnormalities and an ejection fraction of 40%. The patient...
was diagnosed with Takotsubo Cardiomyopathy (TM). The patient was medically sta-
bilized and sent for rehabilitation where she made great gains.

**Discussions:** Following admission to acute inpatient rehabilitation, the patient was
started on a rehabilitation course inclusive of isometric exercise. Through-
out her outpatient hospital stay she would report she could comfortably valsalva
while moving her bowels and elevate her legs without any distress. The patient
had a medically uneventful hospital course and on discharge had made a func-
tional independence measure gain of 29 points. TM affects one to three percent
of the general population and is associated with demonstrable transient heart
failure. A detailed literature review has shown that no current recommendation
exists regarding cardiac precautions in a patient with TM.

**CONCLUSIONS:** Patients with TM may safely engage certain traditional car-
diac rehabilitation precautions.

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**CASE OF A 24-YEAR-OLD MALE WITH WALLENBERG SYNDROME OF UNKNOWN ETIOLOGY**

Aditya Raghunandan, MD  
**Case Diagnosis:** Left lateral medullary infarct  
**Case Description:** Patient is a 24-year-old LHD male with a history of right
sided transient ischemic attack in 2014 (L sided weakness) on Plavix, who pre-
sented to the ED with persistent severe nausea and dizziness since that morning.

Per his mother, patient was out drinking the night before admission, although
was not feeling dizzy or nauseous that night right prior to going to bed. The morning
of admission date, patient woke up with severe persistent dizziness, unable to
open eyes or move, as well as feeling very nauseous. Patient described feeling
very “dizzy”, but the room was not spinning. Stated that the dizziness is worse
with movement, especially if his head moved side to side or if he moved position
suddenly. No reported of change in vision, focal numbness, weakness, visual
deficits, HA. He also endorsed being a pack per day smoker for five years.

His vitals at presentation were: blood pressure 139/74, pulse 95, respiratory rate
14, SpO2 99% on room air, temp was 98.8 F, serum glucose 105 and BMI
of 24. On exam he was noted to have continuous hiccupping, dizziness, hea-
lessness, dysphagia, left eye ptosis, left eye miosis, left sided incoordination, left
gaze preference, bilateral right upward rotatory nystagmus at rest and with
movement in all directions, left facial droop. Initial CTH without contrast
showed persistent R BG infarct w/o evidence of acute parenchymal hemor-
rhage or significant territorial ischemia. CTA's were negative and follow-up
CTH showed similar results. Patient was subsequently admitted to the inpatient
neurology unit.

Two days after admission, MRI brain showed a small acute infarction of the
Left Lateral Medulla. Wallenberg's syndrome was suspected based on MRI and
symptoms. TEE was performed and revealed a normal LVEF and a PFO with
R to L shunt. All hypercoagulability studies were negative, ANA was positive, but
all other autoimmune work-up was negative. He was admitted to the inpatient
general rehabilitation unit 13 days after initial presentation and had good func-
tional improvement and recovery.

**Discussions:** Wallenberg syndrome: Patient presented with classic findings
of horner's syndrome, dysphagia, hoarseness, vertigo, nausea, vomiting, hic-
cups and nystagmus.

Stroke in young patients-arterial ischemic stroke (AIS) is relatively uncommon
in children and young adults, comprising 5-10% of all stroke (Biller Nat Rev Cardiol

**CONCLUSIONS:** Although young adults may have the standard risk factors
for stroke, several other genetic and metabolic disorders need to be included as
likely etiology.

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**CASE OF OSMOTIC DEMYLATION SYNDROME**

Armando Iannicello, MD, Efrain Perez, MD, Kirill Alekseyev, MD, MBA,
Swathy Steekumar, BS, Jitendra Patel, MD, Amarin Suriyakhamhaengwongse, BS,
Moe Khang, MD, and Miksha Patel, MD  
**Case Diagnosis:** This is the case of a 27-year-old Hispanic female with no sign-
ificant past medical history. Patient reported that prior to this episode, she ex-
perienced progressive weakness in her upper and lower extremities for four days.

**Case Description:** Initial patient labs was significant for severe hypokalemia (K = 1.8 mmol/L),
hypernatremia (Na = 146 mmol/L), hyperchloremia (Cl = 123 mmol/L), and
non-ionic gap metabolic acidosis (HCO3 = 10 mmol/L). Patient’s hospital course
was complicated with 6 seconds of Torsade de Pointes, after which she was
intubated due to decreased oxygenation. She also experienced cardiac arrest
due to ventricular fibrillation for 12 minutes, from which she was successfully
resuscitated. Patient was evaluated for Renal Tubular Acidosis Type 1. MRI of
her brain was remarkable for restricted diffusion of central pons, bilateral medial
frontal gyri, right periradiculous cortex, and bilateral external subinsular cortex
with T2 hyperintensity consistent of central pontine myelinolysis, secondary to Re-
nal Tubular Acidosis Type 1.

**Case Description:** Prior to admission to the medical ward, patient was indepen-
dent in ADLs, iADLs, and ambulation. On admission to rehabilitation facility, pa-
tient was noted to have limited flexion of her left shoulder at 45°, with range of
motion within normal limits in all other areas of the upper extremities. In the lower
extremities, patient had limited hip flexion at 20°, knee extension at 10°, and ankle
dorsiflexion at 10°. Patient was noted to have 2/5 strength in the right upper ex-
drew, with 4/5 on the right and 3/5 on the left. Reflexes with 2/4 bilaterally. Tone
was decreased on left upper and lower extremities. Gross motor coordination was
minimally impaired. Patient’s ambulation was 20 ft. with rolling walker. Her gait
was unsteady with decreased cadence and lateral shift. Patient’s care plan included
the following: 90 minutes of physical therapy for a minimum of 5 days/week and
90 minutes of occupational therapy for a minimum for 5 days/week until patient’s
goals are met. PT modalities included: transfer training, supervised Kinsetron, hip
flexion and LAQ with ankle weights, abduction with black Theraband, adduction
with ball-squeeze, balance training with parallel bars, and tandem stance on Airex
pad. The treatment plan was discussed with the patient, her family, and the rehabil-
tiation team.

Patient progressed through PT/OT without difficulty. Upon discharge, pa-
tient was able to meet her rehabilitation goals. She was ambulating 165 ft. with
modified independence. She was able to negotiate 12 steps with handrails. Range
of motion in upper and lower extremities are within normal limits. Gross and
fine motor coordination intact bilaterally. She was modified independent on
ADLs and iADLs.

**Discussions:** Renal tubular acidosis Type 1, or distal renal tubular acidosis,
is a defect of the intercalated cells of the cortical collecting duct which pre-
vents with hypokalemia, non-union gap metabolic acidosis, and the inability to
acidiﬁy urine

**CONCLUSIONS:** Patient presented initially with quadriplegia secondary to
severe hypokalemia. Further evaluation of the patient showed that she had renal
tubular acidosis Type 1 with secondary osmotic demyelination syndrome. Pa-
ient’s quadriplegia can be attributed to both hypokalemia and CPM. Patient’s
electrolyte abnormalities further predisposed her to a complicated hospital
course, with torsade de points and cardiac arrest. Patient developed left arm
DVT after her cardiac arrest and she was started on Xarelto 15 mg. On admission
to rehabilitation, patient had significant left-sided weakness. Upon discharge,
patient was able to ambulate with modiﬁed independence and was able to per-
form ADLs/iADLs independently. Patient was scheduled for follow-up visits with
out-patient primary care, nephrology for RTA Type 1, neurology for CPM, and hematol-
ysis for UE DVT. She is at an increased risk for osteomalacia due to her underlying
RTA type 1; patient will also continue physical therapy to maintain functioning.

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**CASE REPORT: AN ATYPICAL PRESENTATION OF LATE-ONSET MULTIPLE SCLEROSIS**

Chamette Lercara, BS, Yamilythe Burgos-Quinones, MD, and Mohammad Islam, MD

**Case Diagnosis:** Multiple sclerosis (MS) is most commonly seen in women be-
tween 20 to 40 years old. It is an autoimmune disease of the central nervous system
(CNS) characterized by focal episodes of neurological deficit caused by white matter
plaques of demyelination affecting the optic nerves, spinal cord and brain. Patients
with MS present with corresponding clinical symptomatology possibly involving vi-
sion, cognition, speech, swallowing, bowel and bladder function, and motor strength.
These episodes may remit and recur and can ultimately result in progressive disability
over the patient’s lifetime. In up to 12.7% of cases, the first symptoms of MS can oc-
cur in individuals over the age of 50. This is defined as late-onset multiple sclerosis
(LOMS). Diagnosing LOMS can be challenging and is thought to be underestimated
because of a low index of suspicion, a large age-associated differential diagnosis
and atypical presentations.

**Case Description:** A 57-year-old Caucasian male with past medical history of re-
cent upper respiratory illness, diabetes mellitus and hypertension presented to the
emergency department with unsteady gait and bilateral leg numbness that had
progressed in an ascending pattern from his toes to his hips over the last two days.
He also reported averted spasts, pain in both legs, poor gait, altered speech, and
weakness. EMG/NCS was consistent with LEMS. He had no history of traumatic
head injury, central upper respiratory illness, diabetes mellitus and hypertension.
His physical exam showed hyperreflexia in all extremities, patient had limited hip
extension and LAQ with ankle weights, abduction with black Theraband, adduction
with ball-squeeze, balance training with parallel bars, and tandem stance on Airex
pad. The treatment plan was discussed with the patient, her family, and the rehabil-
tiation team.

Patient progressed through PT/OT without difficulty. Upon discharge, pa-
tient was able to meet her rehabilitation goals. She was ambulating 165 ft. with
modified independence. She was able to negotiate 12 steps with handrails. Range
of motion in upper and lower extremities are within normal limits. Gross and
fine motor coordination intact bilaterally. She was modified independent on
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**CONCLUSIONS:** Patient presented initially with quadriplegia secondary to
severe hypokalemia. Further evaluation of the patient showed that she had renal
tubular acidosis Type 1 with secondary osmotic demyelination syndrome. Pa-
ient’s quadriplegia can be attributed to both hypokalemia and CPM. Patient’s
electrolyte abnormalities further predisposed her to a complicated hospital
course, with torsade de points and cardiac arrest. Patient developed left arm
DVT after her cardiac arrest and she was started on Xarelto 15 mg. On admission
to rehabilitation, patient had significant left-sided weakness. Upon discharge,
patient was able to ambulate with modified independence and was able to per-
form ADLs/iADLs independently. Patient was scheduled for follow-up visits with
out-patient primary care, nephrology for RTA Type 1, neurology for CPM, and hematol-
ysis for UE DVT. She is at an increased risk for osteomalacia due to her underlying
RTA type 1; patient will also continue physical therapy to maintain functioning.
stay, he continued to report ascending numbness that progressed from the hips to the T6 level and developed urinary retention consistent with neurogenic bladder. He was previously independent in his activities of daily living and was able to ambulate without any gait aid. Imaging showed multiple foci of hypertensive lesions on MRI in the left corona radiata, bilateral periventricular and subcortical white matter, C1/C2 and thoracic spine suggestive of demyelination. Lumbar puncture with cerebrospinal fluid analysis was negative. This patient received a five day course of IV corticosteroids and saw improvement of motor and sensory function bilaterally, confirmed with subsequent physical examinations and physical therapy. Upon discharge, patient was able to stand and take a few steps with minimal assistance with sensation intact down to the mid tibia. One month after admission, patient had a follow up appointment with neurology where he reported unilateral vision loss which recovered three days after resuming his previous prednisone dose.

**Discussions:** This patient presented with ascending numbness and gait imbalance following an upper respiratory illness. With the episode of vision loss occurring one month after his admitting symptoms had remitted, his case becomes suspicious for LOMS. Unlike MS in a younger population, there is a paucity of epidemiologic data on LOMS with no consensus on its presentation or disease course, making it more difficult to diagnose. This is in line with studies that have reported up to forty percent of LOMS diagnoses being delayed an average of 3 years due to a large differential diagnoses associated with age and comorbidities. Current data show that the clinical features of LOMS differ from MS, with the presence of more motor symptoms and less visual symptoms or dysarthria. LOMS typically presents with a non-specific symptom complex, usually motor or cerebellar impairment and has progressive involvement of other systems, particularly resulting in sensory and sphincteric dysfunction. LOMS is an uncommon condition often orphaned by other diseases on one’s differential diagnosis. As a result, awareness of atypical presentations of LOMS becomes important so that diagnosis and treatment will not be delayed, resulting in improved outcomes for patients.

**Conclusions:** We present an interesting case of possible LOMS in a 57 year old man. Although he presented atypically with bilateral ascending motor numbness following an upper respiratory infection and gait imbalance, the remission of his symptoms followed by a later focal episode of vision loss suggests the most appropriate diagnosis is late-onset multiple sclerosis.

### CASE REPORT: FUNCTIONAL RECOVERY IN A PATIENT WITH RECURRENT FLARES OF NEUROMYELITIS OPTICA WHO DECLARES PLASMAPHERESIS

Matthew W. Oglesby, MD  
**Case Diagnosis:** Neuromyelitis Optica  
**Case Description:** A 55-year-old woman presents with diminished sensation to light touch along both hands, poor coordination of upper extremities, right-sided weakness, abnormal temperature sensation, and difficulty ambulating. Patient presented to the hospital after her symptoms failed to improve since onset.

A C-spine MRI demonstrated enhancing lesions from C1-C4 (while brain MRI did not show enhancing lesions) and prior serum tests were positive for anti-AQP4 antibody. Patient was diagnosed with a flare of Neuromyelitis Optica (NMO) and treated with high-dose steroids for a 5-day course.

A review of patient’s medical records shows she was initially diagnosed with NMO 3 years prior when she was evaluated for a visual disturbance consistent with optic neuritis. She reported her first episode more than 15 years prior, whereupon she required a wheelchair for several months before recovering to prior functional levels. She reports several more flares over the past 3 years that have affected her vision, coordination, and sensation. She reports recovery to baseline after each flare.

**Discussions:** Patient is currently undergoing acute rehabilitation but her functional improvements have been severely limited. Multiple medical providers have discussed the option of plasmapheresis with her but patient continues to decline treatment. While the possibility exists for her to recover to baseline, it is unknown if the repeated flares of her disease will eventually cause permanent damage.

**Conclusions:** It is important to discuss all treatment options with patients and ensure that they are properly informed when they make their own medical decisions.

### CASE REPORT: MANAGEMENT OF ACUTE SCI IN THE SETTING OF A PATIENT RECENTLY DIAGNOSED WITH MYASTHENIA GRAVIS

Tiffany Chang, MD, and Richard W. Keyme, MD  
**Case Diagnosis:** A previously healthy male with a new diagnosis of myasthenia gravis (MG) suffered a spinal cord injury (SCI) resulting in cervical myelopathy, complicated by neuromuscular respiratory weakness and ventilator dependency. His care required a close collaboration between neurology, neuro critical care specialist, respiratory therapists, physical therapy, occupational therapy, speech & language pathology, and psychiatry. In the already complex rehabilitation of SCI patients, the added diagnosis of MG added a unique challenge.

**Case Description:** A 57-year-old man had progressive dysphagia and generalized weakness for 6 months, eventually being diagnosed with MG. Three days after starting pyridostigmine, he suffered a ground level fall resulting in neck trauma and notable weakness compared to baseline. Upon hospitalization, he developed respiratory failure, was placed on mechanical ventilation, and was transferred for a higher level of care. MRIs showed cervical myelopathy with cord signal changes. He underwent C3-6 laminectomy with posterior fusion, tracheostomy, and gastrostomy tube placement. Due to MG, neurology was involved early in the care, who administered five sessions of IVIG, initiated steroids, and continued pyridostigmine.

By time of transfer to inpatient rehabilitation two weeks after the fall, he had weaned off the ventilator completely and began eating by mouth. However, his pulmonary function regressed without a clear etiology and was placed back on the ventilator. Over the course of the next 6 weeks, he successfully weaned off the ventilator again and tolerated regular diet. Given that recovery was going well, patient was continued on the same dose of oral prednisone 40 mg daily and pyridostigmine 60 mg every 6 hours with ongoing outpatients follow up.

**Conclusions:** Concurrent occurrence of MG and SCI is extremely rare. There are only two published reports: new diagnosis of MG in a chronic SCI patient and tetrapiresis after trauma in a patient with MG. To better serve patients with this rare combination, we identify several clinical considerations.

Both MG and SCI can independently affect the respiratory function. Combination increases the risk of ventilator dependency and need for aggressive pulmonary toileting. MG can cause head, neck, and bulbar weakness, which can further put respiratory status at risk with aspiration and limit the use of adaptive SCI equipment. The differential for progressive weakness is wider in this population, including syrinx and MG exacerbation. Decline in neuromuscular status should be managed aggressively, with early involvement of neurology. Appropriate medication selection is important, given many of the commonly used medications in SCI have been shown to trigger MG exacerbation, including aminoglycosides, fluoroquinolones, and even gabapentin. Adverse effects of MG medications like glucocorticoids and immune-modulators can have greater impact in the SCI population, including higher risk of infection, osteoporosis, and weight gain. In addition, life threatening complications are not uncommon in MG and SCI, thus clinicians should have a low threshold for admission to ICU.

**Conclusions:** Although rarely seen, concurrent management of acute spinal cord injury and myasthenia gravis poses challenges due to multiple overlapping signs and symptoms. This case reaffirms the previous findings that acute rehabilitation of SCI in patients with MG can still lead to a good outcome, though the course may be prolonged. Due to the complex and variable presentation of MG, an early interdisciplinary collaboration should be considered. In addition, planning of care should include the possibility of prolonged ventilator dependency and dysphagia.

### CATARACT FORMATION WITHOUT SPECIFIC OCULAR TRAUMA AFTER TRAUMATIC BRAIN INJURY: A CASE REPORT

Carol Li, MD, Blessen C. Eapen, MD, and Sandra Fox, OD  
**Case Diagnosis:** Unilateral traumatic cataract in the setting of traumatic brain injury without a specific associated ocular trauma.

**Case Description:** A 29-year-old African American male with no significant past medical history was a restrained driver involved in a motor vehicle side collision sustaining primarily left sided cranial injuries including left zygomatic and greater wing of sphenoid bone fractures, left frontal and temporal lobe epidural hematomas with 4 mm shift and subsequent left temporal bone fracture requiring emergent evacuation and craniotomy. Patient was diagnosed with severe traumatic brain injury (TBI) and sustained multiple fractures involving pelvis, cervical, thoracic, spine, and face but no reports of specific ocular injuries.

During the patient’s three-month inpatient neurorehabilitation stay at the VA Polytrauma Center, the patient was followed extensively by an interdisciplinary team including neurorehabilitation specialists, physical therapists, occupational therapists, speech and language pathologists, and neurology where he reported unilateral vision loss which recovered three days after resuming his previous prednisone dose.
prior dot hemorrhages were again seen in the inferior retina of right eye in addition to cataract formation (Figs. 1 and 2). Though patient sustained mostly left sided injuries as listed above, patient also sustained a fracture of the clivus with initial MRI brain demonstrating a small area of infarction to the right temporal lobe near upper brainstem. Given the anatomical proximity of clivus to the retina and basilar artery’s connection to posterior cerebral artery, this may suggest a vascular etiology rather than the typical blunt force trauma etiology for patient’s right ocular findings. Based on the severity of patient’s injury and the absence of premorbid or family history of ocular pathology, this cataract formation is likely related to patient’s TBI. Patient did not have any subjective symptoms other than dry eyes and photosensitivity. Patient did not have any complaints of eye pain, disruption in extraocular movements or diplopia. On initial exam, patient had slight nasal deviation of right eye, exhibited difficulty with smooth pursuit and saccadic movements of bilateral eyes leading to omission and addition reading errors, and had poor depth perception. All oculomotor skills improved and abnormal eye movements resolved with weekly vision rehabilitation. Given that patient’s cataract was in the inferior temporal region of retina, functional vision was left intact.

**Discussions:** It is well known that brain injury of all severities can cause visual disturbances and abnormalities. Current literature mainly addresses traumatic cataracts as a result of penetrating injuries as it is the leading cause of monocular blindness in pediatric age groups, and is more often associated with worse prognosis. Cataracts are common after direct trauma, specifically blunt and multidirectional head trauma. This is predominantly implied by both pediatric and adult literature. However, non-perforating trauma such as concussive injuries to the orbit, head or body can also cause cataract formation. There is limited information in regards to timeline of cataract formation after trauma. In adults, increasing age is the primary risk factor for cataract formation; however, certain military members, especially Marine Corps and Army, have higher incidence of traumatic cataracts due to occupational exposure. Demographically, incidence rate is higher in black and non-Hispanic service members. In setting of known brain injury, etiology of patient’s cataract is likely traumatic, though the mechanism may be more indirect as most of his injuries are left sided. Additionally, the location of this patient’s cataract is inferior, which differs from the more common anterior, segmental or subcapsular location.

**Conclusions:** To the authors’ knowledge, this is the first case of unilateral traumatic cataract in the setting of traumatic brain injury without a specific associated ocular trauma. Findings from this case emphasize the importance of conducting visual screening to include a fundoscopic eye exam even if patient is generally asymptomatic, especially in cases of severe traumatic brain injuries of which patients may not have the communication abilities or cognition to convey symptoms. Traumatic cataracts may lead to lens opacification, which can progress to decreased light perception and vision loss. Fortunately in this case, there was no effect on functional vision given location of cataract, and patient will require periodic monitoring; however, removal of the cataract by a retinal surgeon may be necessary in the future to prevent known complications like retinal detachment. Additional research is needed to explore the incidence and overall prognosis of this condition in TBI populations.

### CAUDA EQUINA SYNDROME AFTER LUMBAR DISC HERNIATION, A CASE REPORT

**Case Description:** HR is a 36-year-old male with chronic back pain who was admitted for sudden difficulty in ambulating associated with nonspecific lower extremity numbness, bowel dysfunction and urinary retention progressing to inability to void. He had a history of persistent chronic back pain which was diagnosed as severe sciatica after several visits to the ED. On day of admission, MRI showed massive extrusion of L3–L4 disk material, segmental stenosis and severe narrowing of compression of thecal sac. Patient then underwent emergent lumbar decompression for cauda equina syndrome. Post-op patient’s weakness improved but he was still having weakness on bilateral dorsiflexion, and still had bowel dysfunction requiring suppositories and bladder dysfunction requiring in and out catherization.

**Discussions:** The presentation of cauda equina syndrome varies from its classical presentation, especially in its early stages of compression. In this case for example, the patient’s symptoms were attributed to a severe case of "sciatica". Delayed diagnosis and treatment of this syndrome could lead to poor outcomes.

**Conclusions:** The national annual incidence of low back pain is 5%. One quarter of patients with back pain have sciatica. The most common cause of sciatica is herniation of the lower lumbar intervertebral disks. In contrast to sciatica, cases of CES after disk herniation are relatively rare. In one study, the incidence of CES due to lumbar disk herniation has been reported to range from 1% to 10% of operated disk cases.

**Conclusions:** Acute compression of the cauda equina is a neurologically compromising and debilitating condition. Physicians who evaluate low back pain must be able to recognize the signs and symptoms of this relatively rare but critical spinal syndrome and must expedite emergent evaluation and intervention.

### CENTRAL SALT WASTING DUE TO SPINAL CORD INJURY

**Case Description:** A 52-year-old male with a C2 nerve sheath tumor status post C1–2 laminectomy and resection of left C2 tumor with resultant central salt wasting.

**Case Description:** The patient presented with progressive ataxia and bilateral upper extremity numbness and weakness. He underwent a C1–2 laminectomy and resection of the left C2 nerve sheath tumor. On admission, his sodium was 132, and postoperatively his sodium down-trended to as low as 122. Urine osmolality was 608, serum osmolality was 280, urine sodium was 112, and Cortisol was 21.13. Initially, a 1-liter fluid restriction was trialed, but sodium levels did not improve. Then salt tabs, 1 gram three times a day were started; slowly, his sodium rose up to 129 over the course of one week.

**Discussions:** Hyponatremia is a common electrolyte disorder in the setting of central nervous system (CNS) disease. One mechanism is the disruption of neural input to the kidney. The sympathetic nervous system promotes sodium, uric acid, water reabsorption in the proximal tubule, and renin release. Metabolic and biochemical abnormalities frequently occur after traumatic spinal cord injury (SCI), and may reflect disruption of descending anatomic pathways. Impaired sodium conservation has been found at the higher levels of SCI, and this association could not be explained by sodium intake. The reduced retention of sodium in the presence of hyponatremia at the higher levels of paralysis suggests salt wasting on the basis of a central nervous system lesion, comparable to that noted with brain injury.

**Conclusions:** The distinction between central salt wasting and the syndrome of inappropriate antidiuretic hormone secretion is critically important since the two disorders are managed differently, with possible adverse consequences if the incorrect therapeutic strategy is administered. Thus it is essential for clinicians to be aware that salt wasting can occur in the presence of not just brain injury, but also SCI.

### CEREBRAL NOCARDIOSIS SECONDARY TO CHRONIC PREDNISONE AND METHOTREXATE THERAPY FOR ADVANCED SARCOIDOSIS: A CASE REPORT

**Case Description:** A 51-year-old female with a history of advanced sarcoidosis managed with chronic prednisone and methotrexate presented to the emergency department with worsening expressive aphasia and confusion. Computer tomography (CT) of her head was performed which revealed a lesion in the left cerebral hemisphere with significant edema and mass effect. Differential diagnoses included primary tumor, secondary tumor, or a brain abscess. Subsequent magnetic resonance imaging (MRI) was performed revealing a rim-enhancing lesion of the left temporal and parietal lobes determined to be an abscess with fluid collection. She was initially treated with vancomycin, trimethoprim-sulfamethoxazole, and metronidazole. She was admitted on appropriate antibiotic therapy with imipenem and trimethoprim-sulfamethoxazole over the course of 2 weeks. She demonstrated clinical...
improvement which led to discharge to the rehabilitation hospital with noted continued stabilization of mental status and aphasia.

CONCLUSIONS: Patients on chronic immunosuppressants with altered mental status require a high clinical suspicion for cerebral abscess formation. Considerations for the post-operative care in these patients include seizure prophylaxis, careful monitoring of their mental status, and continued assessment of the immunocompromised state.

CEREBROSPINAL FLUID PSEUDOCYST IN AN ADULT WITH SPINA BIFIDA WITH VENTRICULOPERITONEAL SHUNT

Danielle K. Powell, MD, MSPH, and Joy Deshazo, BA

Case Diagnosis: Cerebrospinal fluid pseudocyst

Case Description: A 37-year-old woman with spina bifida and ventriculo-peritoneal shunt (VPS) for congenital hydrocephalus was referred to our hospital for an ovarian cyst found on transvaginal ultrasound for a mildly elevated CA-125. The patient reported a recent increase in abdominal girth and denied abdominal pain, changes in bladder or bowel function, or neurologic disturbances such as headaches and dizziness. She had a history of myelomeningocele repaired at birth and hydrocephalus with VPS also since birth. She had 6 previous revisions of her shunt for failure at distal and proximal ends, with the last one being 4 months prior to presentation. She had no prior abdominal surgeries other than those involved in placing the VPS. Neurologic exam was normal and no masses were palpable in the abdomen or pelvis. CA-125 was 48 units/mL and white blood cell count was within reference range. Transvaginal ultrasound showed an 11.3 x 4.6 cm complex left adnexal cyst with single thin 1 mm septation and internal debris. CT of the abdomen and pelvis confirmed these findings and also noted a focal fluid collection measuring 7.8 cm near the right ovary. The VPS catheter tip was noted in the right abdomen. The patient underwent exploratory laparotomy and a small 3 cm ovary that was encompassed by an even larger pseudocyst. Massive adhesive appendicitis was also discovered, involving the small and large bowel, bladder, uterus, left and right adnexa, and abdominal wall. The patient’s immediate post-operative course was successful, however she presented to the hospital 2 months later with signs of acute shunt failure and underwent revision for an obstruction of the peritoneal catheter.

Discussions: Though CSF pseudocysts are rare, they are a potentially life-threatening complication of a VPS and may result in distal shunt obstruction or intestinal obstruction. They have resulted in hydrencephaly, inferior vena cava obstruction, cholelithiasis, elevated liver function tests, and pleural effusions in other case reports. This is the first case report of a pseudocyst adhering to the adnexa. The causes of CSF pseudocysts are not fully understood, however they are believed to be the result of an inflammatory process, including infection and hypersensitivity to latex gloves and shunt tubing. Shunt revisions, shunt infections, and peritoneal adhesions predispose to the formation of CSF pseudocysts, all three of which were present in this patient. Early diagnosis of a CSF pseudocyst is important in improving the clinical outcome of these patients. Plain films are generally the first step in recognition, however an ultrasound or CT is needed for definitive diagnosis. Debris is a common finding in the fluid collections. Due to the high incidence of infection in patients with a CSF pseudocyst, treatment includes antibiotics and shunt externalization. If the patient has had multiple VP shunt revisions or recurrence of a CSF pseudocyst, diverting the shunt to a different cavity is recommended.

Conclusions: Physicians in physical medicine and rehabilitation should be aware of the abdominal and pelvic complications of a VPS and consider CSF pseudocysts in the differential diagnosis of any abdominopelvic complaint in order to provide early diagnosis and treatment of these problems and improve mortality and morbidity for this population.

CERVICAL MENINGOCELE AFTER SUBOCCIPITAL CRANIOTOMY: A CASE REPORT

Maryam Sultan, MD, and Fabiola Kopp, MD

Case Diagnosis: Cervical meningoele after suboccipital craniectomy

Case Description: A 70-year-old female, s/p right cerebellar hemorrhagic stroke, for which suboccipital craniectomy was performed on April 6th, 2016. She was admitted to the Rehabilitation hospital on May 5th, 2016. Nausea was present upon admission, but became severe on June 10th, 2016. She also reported severe posterior neck pain. She suffered a marked decline in her mobility and ability to perform tasks independently despite daily therapies. Multiple CTs of the head had been performed to elucidate a cause of her decline, all of which showed stable post-operative changes within the brain. Cervical spine CT without contrast and with coronal and sagittal reconstructions demonstrated a pseudomeningocele extending from the suboccipital craniectomy site down to the level of C4. Large volume lumbar puncture (LP) was performed on June 15th, 2016 to assess for symptom improvement upon removal of the fluid collection. The patient’s symptoms and function markedly improved after the LP, but symptoms and functional deficits recurred 36 hours after the procedure. A ventriculo-peritoneal (VP) shunt was placed for long-term management of the pseudomeningocele, after which nausea and function improved.

Conclusions: The incidence of cervical pseudomeningocele after suboccipital craniectomy in unclear. Nausea and neck pain are potential indicators of this complication during a patient’s acute rehabilitation stay and may limit progression in therapy. Evaluation for a cervical pseudomeningocele with coronal cuts of brain CT and/or C-spine CT is warranted in this setting. Fluid shunting proved an effective treatment in this case and was necessary for progression of rehabilitation.

CERVICAL TRANSVERSE MYELITIS IN A PATIENT PREVIOUSLY DIAGNOSED WITH MULTIPLE SCLEROSIS AND SYSTEMIC LUPUS ERYTHEMATOSUS: A CASE REPORT

Erin M. Kelly, Patrick D. Sims, MD, Jessica Berry, MD, and Lindsey Healy, MD

Case Diagnosis: A 41-year-old African American woman with a past medical history of Multiple Sclerosis (MS), bilateral optic neuritis legally blind NMO antibody negative, Systemic Lupus Erythematosus (SLE), Antiphospholipid Antibody Syndrome (APS) and a prior right pontine ischemic stroke with residual left-sided hemiparesis and ataxia presented to the Emergency Department after a mechanical fall for progressively worsening bilateral hand tingling and numbness, torso and bilateral thigh numbness, and difficulty walking for four days. These symptoms differed from previous MS flares of right-sided weakness and tightness, last one being 10 years ago. She denied bowel/bladder incontinence or saddle anesthesia but endorsed headaches. Brain, cervical and thoracic spine MRI revealed acute transverse myelitis of the superior cervical cord with significant edema and enhancement, multiple white matter lesions within the brain and cord, and additional brain lesions reflecting chronic infarcts. Patient was diagnosed with acute cervical transverse myelitis.

Case Description: Acute Care Course: Patient was admitted and received pulse steroids of 1000mg IV Solu-Medrol. Over the first 24 hours, her weakness progressed to 0-1/5 RUE, 1-2/5 LUE, 3/5 LE bilaterally with increased tone in the lower extremities. She had impaired vibration and decreased proprioception in upper and lower extremities, with a sensory ataxia level at C8. She developed worsening respiratory distress with tachypnea, accessory muscle use, inability to lay flat and negative inspiratory force (NIF) of -24. She was started on plasma exchange (PLEX) and had improvement in NIF to -40 and vital capacity (VC) to 1770 over the next 48 hours. She completed a 5 day steroid course of 1000mg Solu-Medrol/day and 5 cycles of PLEX with improvement in her paresthesias and strength to 1-2/5 RUE, 3-4/5 LUE, and 2/5 LE bilaterally but not back to her baseline. One-time 1000mg rituximab infusion was given based on rheumatology and neurology recommendations after completion of PLEX. CellCept was changed from 1000mg twice a day to 1000mg daily.

Rehabilitation Course: After a 14 day hospital course, patient was transferred to inpatient rehabilitation with incomplete tetraplegia. She required maximum assistance with transfers and ADLs. Prior to this admission, patient was independent with ADLs and ambulation using a single point cane or occasionally a walker. Her rehabilitation course was complicated by urinary urgency with normal post void residual volumes and a negative urinary analysis. Oxybutynin was started. She had worsening urinary retention and required catheterization. Oxybutynin was discontinued and she began taking Flomax with mild improvement of bladder function. Persistent urinary frequency prompted a repeat a UA which was positive at that time, and she completed a course of cefoxipime. Her spasticity was managed with oral baclofen. Her numbness, tingling and neuropathic pain were controlled with Trileptal and gabapentin. She made very small gains in extremity strength and passive movement. She was later trained in power mobility, power wheelchair transfer, and wheelchair use.

Discussions: Transverse myelitis is inflammation of the spinal cord across one or more levels that presents with weakness, sensory deficits, and autonomic bowel, bladder, or sexual dysfunction below the lesion. Transverse myelitis can be idiopathic or...
secondary to: infectious causes such as Lyme disease, demyelinating diseases such as MS or Neuromyelitis Optica (NMO), or generalized inflammatory conditions including SLE or APS. Determining the etiology of transverse myelitis is essential for appropriate treatment and determining prognosis.

Our patient was diagnosed with acute cervical transverse myelitis believed to be secondary to MS/SLE overlap by the primary team. Literature does not have supporting evidence for MS/SLE overlap syndrome but defines each as their own entity with some overlapping signs or symptoms. Our patient meets the diagnostically criteria for Neuromyelitis Optica Spectrum Disorder (NMOSD) antibody negative, if alternate diagnoses can be excluded. This presentation of transverse myelitis with evidence of 3-5 segment spinal cord involvement and respiratory failure was most consistent with NMOSD, which carries a poorer prognosis and recovery than other etiologies. However, the patient’s brain MRI findings in 2004 were consistent with MS, not NMOSD. Therefore, the etiology of our patient’s transverse myelitis may be multifactorial.

Conclusions: We present a 41-year-old African American woman with a past medical history significant for MS, bilateral optic neuritis legally blind NMO antibody negative, SLE, and APS with progressively worsening bilateral hand tingling and numbness, torso and bilateral thigh numbness, and difficulty walking for four days found to have acute cervical transverse myelitis. This is a particularly interesting case in that the patient meets the criteria for diagnosis of NMOSD, but alternative etiologies cannot be excluded. Therefore, it is important for the etiology of acute transverse myelitis to be determined in order to assure proper treatment, establish appropriate rehabilitation goals and prognosis for the patient.

CHEMOTHERAPY-INDUCED PERIPHERAL POLYNEUROPATHY: MONOCHROMATIC INFRARED LIGHT ENERGY THERAPY IMPROVES SYMPTOMS AND MOBILITY-RELATED FUNCTION
Andrew Savoie, DO, and Sara Sales, DO

Case Diagnosis: Bilateral lower extremity peripheral neuropathy secondary to chemotherapy.

Case Description: A 69-year-old male presented with history of stage IIA adenocarcinoma of the rectum status post neoadjuvant capecitabine and radiation therapy followed by surgical resection and then postoperative oxaliplatin and capecitabine. He was seen at Survivorship Clinic and referred to us for evaluation of bilateral lower extremity paresthesias and neuropathic pain. He was treated conservatively with control of neuropathic paresthesias and pain with use of monochromatic infrared light therapy (Anodyne) and general mobility therapies. Patient underwent thirteen physical therapy (PT) sessions in total and received Anodyne therapy to his bilateral feet during twelve. After three sessions he reported subjective improvement in pain and numbness, at which point duration of therapy was increased from 15 minutes to 35 minutes. His functional progress was measured with Single Leg Stance times (right leg 5s to 23s, left leg 6s to 25s) and 3 time sit to stand (22s with upper extremity assist to 12s with no upper extremity assist).

Discussions: Chemotherapy-induced peripheral neuropathy due to oxaliplatin has been described in two distinct patterns: a transient, acute syndrome and a dose-limiting, cumulative neuropathy that typically resolves within 6-12 months of therapy discontinuation. Capecitabine has also been shown to induce peripheral neuropathy in some cases, however symptoms are milder and occur less frequently. Use of Anodyne therapy has been shown to improve some symptoms of peripheral neuropathy and is approved for use in temporarily increasing circulation and reducing pain. In this case, Anodyne therapy used in conjunction with PT improved function and symptoms of chronic pain and paresthesias due to chemotherapy-induced peripheral neuropathy.

Conclusions: Monochromatic infrared light therapy is an available therapy modality that may improve symptoms of chemotherapy-induced peripheral neuropathy and paresthesias.

CHRONIC ATROPHIC SUBLUXATION OF STERNOMCLAVICULAR JOINT TREATED WITH DEXTROSE PROLOTHERAPY: A CASE REPORT
Lea Rispoli, MD, and Alfred Gelblum, MD

Case Diagnosis: Chronic anterior subluxation of the sternoclavicular joint.

Case Description: Patient presented with 12-year history of left sternoclavicular pain and chronic subluxation. She initially dislocated her left SCJ anteriorly, and was managed with physical therapy. This would become painful in repeated situations and limit range of motion. Physical exam revealed mild prominence on left sternoclavicular joint at rest. With active left arm abduction there was palpable and visual anterior subluxation of the clavicular portion of the joint. Range of motion was nearly full, however some lag was noted when compared to right side. A clinical goal of reducing subluxation events was set in order to decrease the likelihood of future development of osteoarthritis. However, there was no role for physical therapy or surgical intervention in this case. The decision was made to pursue a series of dextrose injections directed to the ligamentous structures across the sternoclavicular joint. Using ultrasound imaging for guidance, injection solution containing Lidocaine 1% Iml., Dextrose 50% 1.5-2.0 mL was placed in the periarticular ligaments. Patient received a total of 5 injections over the course of 2 months. Patient presented for 4 month follow-up from the initial injection, with reported significant improvement. She reported minimal pain, improved tightness and stability of joint, and improved function – now able to do yoga and trapeze with only minimal subluxation. There was also resolution of left sternoclavicular joint prominence. Ultrasound imaging revealed relative thickening of the sternoclavicular joint ligaments, no asymmetry in joint space at rest, no widening of joint through active range of motion in all planes.

Discussions: To our knowledge, this case is the first documented successful case of using dextrose prolotherapy alone in treating symptomatic chronic anterior subluxation of the sternoclavicular joint.

Conclusions: Prolotherapy is a safe, well tolerated, and successful treatment approach in chronic anterior subluxation of sternoclavicular joint.

CHRONIC C4 RADICULOPATHY PRESENTING AS SHOULDER PAIN AND LATERAL SCAPULAR WINGING
Matthew Haas, MD, Daniel A. Goodman, MD, and Nida Glevickas-Martens, DO, MS

Case Diagnosis: Chronic C4 Radiculopathy Presenting as Shoulder pain and Lateral Scapular Winging

Case Description: A 65-year-old male with several months of right shoulder pain and lateral scapular winging was referred for electrodiagnostic evaluation. Pain was localized over right scapula with radiation down the posterior arm to elbow when reaching behind his head.

Examination revealed mild atrophy of infraspinatus muscle and lateral translation of right scapula that was most prominent with forward flexion of the right shoulder to 90 degrees. Wall pushup did not exacerbate his pain and provided mild reduction of winging. Right shoulder abduction, external rotation and lift off were notably weak. Remainder of neurologic exam was normal bilaterally.

Electrodiagnostic studies revealed chronic neurogenic changes in right rhomboid major and medial trapezius without evidence of spontaneous activity, most consistent with chronic C4 radiculopathy on the right. MRI of cervical spine showed severe degenerative disk disease at C4–C5 with disk protrusion causing mild effacement along anterior thecal sac, including moderate canal stenosis at C4–C5 and severe left foraminal stenosis at C4–C5.

Conclusions: Lateral winging may result from weakness of the trapezius or rhomboid muscles, both of which demonstrated chronic neurogenic findings in this study. The trapezius muscle is typically taught to be innervated by the spinal accessory nerve, while the dorsal scapular nerve to the rhomboids is innervated by the C4–C5 nerve roots. The presence of a C4 innervated trapezius muscle in this patient is a normal anatomic variant and allows for localization of the pathology to the C4 nerve root.

Conclusions: This case presents a patient with a less common C4 innervation of the trapezius muscle combined with a radiculopathy at an uncommon level. C4 radiculopathy should be considered in cases of lateral scapular winging.

CHRONIC LYMPHOCYTIC INFLAMMATION WITH PONTINE PERIVASCULAR ENHANCEMENT RESPONSIVE TO STEROID: A RARE CASE REPORT
Rebecca Hayworth, MD, Jayesh Vallabh, MD, MBA, Jennifer Mast, MD, and Mark Tomoro, MD

Case Diagnosis: CLIPPERS (Chronic Lymphocytic Inflammation with Pontine Perivascular Enhancement Responsive to Steroids)

Case Description: First described in 2010, CLIPPERS is a rare relapsing-remitting disorder that is highly responsive to steroids. Per a review in 2013, only 56 cases have been reported worldwide. Our patient is a 38-year-old female with no significant past medical history who presented with headaches, dizziness, and vomiting. Persistant symptomatology led to repeat emergency department (ED) visits, where a head CT and CTA brain were non-acute. A brain MRI was later obtained, which revealed numerous cerebral and cerebellar abnormalities concerning for acute lacunar infarcts. She was discharged home with close family supervision but returned to the ED due to
continued gradual decline. Brain imaging revealed additional lesions, a lumbar puncture revealed mild lymphocytosis, and a brain biopsy revealed micro-ischemia with perivascular lymphocytes. She was treated with a short course of IV steroids and then transferred to acute inpatient rehabilitation, where she initially made significant cognitive and physical gains. However, this was again followed by functional decline. She was restarted on IV steroids. CLIPPERS was suspected given her clinical context and diagnostic evaluations. Patient completed acute inpatient rehabilitation. After six months, repeat MRI revealed improvements in the white matter lesions, although she continued to require relatively significant family support. Our case is the first, to our knowledge, that presented after an initial trial of acute inpatient rehab. Future studies should investigate both the medical and rehabilitative management in this patient population and their prognosis for recovery.

**CHRONIC PNEUMOCEPHALUS AFTER GUN SHOT WOUND TO THE HEAD**

Kung G. Patel, MD, Lauren Brandes, BS, Emily Boyd, MD, and Andrew Denison, MD

**Case Diagnosis:** Pneumocephalus

**Case Description:** A 53-year-old man suffered a gunshot wound (GSW) to the head, resulting in a significant complex injury to the head and face, including a left frontotemporal subdural hematoma and pneumocephalus after injury. The patient underwent a bifrontal craniotomy with reconstruction of the skull base for notable cerebrospinal fluid (CSF) leak. After surgery, the patient became more lethargic and was found to have tension pneumocephalus, which was treated with endovascular drain (EVD) placement. Otolaryngology (ENT) performed nasal endoscopy, but no evidence of CSF leak, and the EVD was discontinued. Two weeks later, a follow-up CT scan showed persistent large volume pneumocephalus. Plastics and ENT were again consulted, but did not find evidence for CSF leak. The patient was then started on 100% oxygen for eight days for treatment of his pneumocephalus. A follow-up CT at both 11 days and one month after treatment showed resolution of the pneumocephalus.

**Conclusions:** Pneumocephalus is a known sequela of GSW to the head, and also common after craniotomy. For small pneumocephalus, the air spontaneously resorbs, but in our case, large pneumocephalus was present more than a month after craniotomy. Symptoms of large pneumocephalus, when present, range from headache and lethargy to brain herniation and death. Such persistence of large pneumocephalus often suggests a CSF leak. However, once this is excluded, the effective treatment is 100% oxygen, which lowers the concentration of nitrogen in the blood allowing for a concentration gradient to develop by which the 80% nitrogen in the pneumocephalus can slowly diffuse away.

**Discussions:** Pneumocephalus is a complication of both craniotomy and GSW to the head. For cases of large volume or persistent pneumocephalus, CSF tract should be excluded, followed by treatment with 100% oxygen.

**CLINICAL FEATURES AND MANAGEMENT OF POSTHERNORRHEOPHAGY INGUINAL PAIN (CPIP) SECONDARY TO ILIOINGUALINE NERVE ENEATRAMP**

Luis J. Soliz, MD

**Case Diagnosis:** Chronic Postherniorrhaphy Inguinal Pain (CPIP) secondary to Ilioinguinal Nerve Entrapment

**Case Description:** A 46-year-old female presenting with one-year history of left hip pain with radiation to left groin and medial anterior thigh. Of note patient reported a gradual onset of symptoms shortly after a left inguinal repair with mesh placement. Exacerbating factors included walking as well as prolonged standing. Relieving factors consisted of non-steroidal anti-inflammatory drugs. The pain is constant and decreasing with active range of motion. Physical examination was significant for right shoulder weakness, sub-axial joint tenderness, a positive Hawkins’ test, crepitus, and an audible-palpable snap over his right medial scapula that was exacerbated by shoulder abduction. Shoulder x-ray, cervical MRI, and EMG/NC studies were all within normal limits. A right shoulder MRI revealed a B rubble Complex and subcutaneous soft tissue edema along the posterior-lateral aspect of his deltoid muscle. The patient was prescribed occupational therapy focused on reducing inflammation and strengthening both his serratus anterior and subscapularis muscles. Additionally, he was sub-axial bony union injection consisting of 1% Xylocaine and 1ml of 40mg/ml Depomedrol. Over the next twelve weeks the patient continued to improve. His therapist noted a marked increase in strength throughout all planes of motion. The patient endorsed a significant decrease in pain along with quality of life improvements. Currently, the patient continues to advance towards his prior level of activity.

**Discussions:** Snapping scapula syndrome (SSS) stems from the disruption of the scalapuloharic articulation. Common causes include bursitis and anatomic variations; such as muscle, soft tissue, or bony abnormalities. Although a B rubble complex is considered a normal labral variant in 1.5–6% of our population; it is now being related to various intra-articular pathologies such as SLAP lesions, subscapularis tenon tears, and gleno-humeral instability.

**Conclusions:** To our knowledge, this is the first reported case of SSS in association with a B rubble Complex.

**CLARIFYING THE MOTOR HOMUNCULUS: SHOULDER BRAIN IS FOLLOWED BY ELBOW EXTENSORS THEN BY ELBOW FLEXORS**

Alexandre J. Feng, MD, Ossama Khaaazal, MD, Sean Cleymaet, BA, Andres Andino, MD, Katie Hart, DO, and Eric L. Altshuler, MD, PhD

**Case Diagnosis:** Lesioned Motor Homunculus

**Case Description:** A 72-year-old right-handed woman presented with left arm weakness and slurred speech. MRI showed a lesion in the right pre-frontal cortex. Her speech rapidly improved but the arm weakness persisted. Sensation was intact. She was found to have 5/5 strength in her left leg, and left shoulder abduction, flexion, and extension. Conversely, strength in the left hand muscles, wrist extensors and flexors, and forearm pronation and supination was 0/5. Interestingly, although left elbow extension was 5/5, the patient was unable to flex at her elbow with her forearm passively passed in supination, and in pronation she was only able to flex the elbow in a gravity eliminated position. The patient displayed a Modified Thomas Test for reproduction of left hip pain with provocation at left iliospos, tensor fascia lata, and rectus femoris muscles. There was tenderness over the ilioinguinal nerve distribution as well as the pubic tubercle on the operated side.

Plain films of L hip and pelvis were unremarkable. Patient was treated with a diagnosis as well as therapeutic left inguinal nerve block with local anesthetic in clinic in conjunction with an order for physical therapy to improve core strength as well as pelvic stabilization.

Upon follow-up in musculoskeletal clinic patient reported 80% relief of presenting symptoms.

**Conclusions:** Chronic severe groin pain after inguinal hernia repair potentially can be debilitating to the point that quality of life is severely affected. Although the exact cause is not clear entrapment of the iliouinguinal, iliohypogastric, or geniofemoral nerve is most commonly implicated. CLIPPERS: CIDP can be both a diagnostic and therapeutic challenge to the treating clinician. Most patient can be successfully managed with nerve blocks with surgical exploration being reserved only for patients who fail conservative management.

**CHRONIC SHOULDER PAIN SECONDARY TO SNAPPING SCAPULA SYNDROME IN A PATIENT WITH A BUFORD COMPLEX: A CASE REPORT**

Nicholas Giordano, MD, Borna Kavousi, MD, Getahun Kifle, MD, Sanjeev Agarwal, MD, and Richard G. Chang, MD, MPH

**Case Diagnosis:** A 26-year-old active male with chronic right shoulder pain secondary to Snapping Scapula Syndrome in association with a Buford Complex.

**Case Description:** The above patient presented for evaluation of right shoulder pain that had progressed over eight years. The pain was associated with activity, specific movements, and overhead movements. The patient endorsed weakness and an audible snap with active range of motion. Physical examination was significant for right shoulder weakness, sub-axial joint tenderness, a positive Hawkin’s test, crepitus, and an audible-palpable snap over his right medial scapula that was exacerbated by shoulder abduction. Shoulder x-ray, cervical MRI, and EMG/NC studies were all within normal limits. A right shoulder MRI revealed a Buford Complex and subcutaneous soft tissue edema along the posterior-lateral aspect of his deltoid muscle. The patient was prescribed occupational therapy focused on reducing inflammation and strengthening both his serratus anterior and subscapularis muscles. Additionally, he was sub-axial bony union injection consisting of 1% Xylocaine and 1ml of 40mg/ml Depomedrol. Over the next twelve weeks the patient continued to improve. His therapist noted a marked increase in strength throughout all planes of motion. The patient endorsed a significant decrease in pain along with quality of life improvements. Currently, the patient continues to advance towards his prior level of activity.

**Discussions:** Snapping scapula syndrome (SSS) stems from the disruption of the scalapuloharic articulation. Common causes include bursitis and anatomic variations; such as muscle, soft tissue, or bony abnormalities. Although a Buford complex is considered a normal labral variant in 1.5–6% of our population; it is now being related to various intra-articular pathologies such as SLAP lesions, subscapularis tendon tears, and gleno-humeral instability.

**Conclusions:** To our knowledge, this is the first reported case of SSS in association with a Buford Complex.
motor mapping will contribute to future studies in plastic reorganization of the human cortex and rehabilitation.

CLAUDIE SYNDROME: AN UNUSUAL STROKE SYNDROME
Kadir J. Carruthers, MD, and Mary Ann Mikneveich, MD
Case Diagnosis: Claude's Syndrome
Case Description: Claude's syndrome is characterized by ipsilateral oculomotor nerve palsy and contralateral cerebellar ataxia due to a lesion of the oculomotor and red nuclei of the midbrain and superior cerebellar peduncle. This syndrome is quite rare with no precise incidence or prevalence data available. The infrequency which it is encountered may lead to misdiagnosis. A 58-year-old left-handed male presented with reduced arousability, slurred speech, and inability to open left eye. Physical exam was notable for left third nerve palsy and ptosis, bilateral vertical gaze palsy, right-sided ataxia and intention tremor, right lower facial weakness, and moderate dysarthria. Patient was initially assessed to have Benedikt syndrome.
MRI of the brain showed a faint signal abnormality on the left thalamus with no clear thrombus. Given oculomotor nerve involvement, a thrombus was postulated to have been present at the junction of the basilar artery and posterior cerebral artery prior to dissolution. Transthoracic echocardiogram revealed a patent foramen ovale. Patient was started on anticoagulation due to concern for possible cardiobolic etiology.

Rehabilitation course was notable for improvements in ambulation, coordination, and dysphagia. By the second month, the patient progressed from requiring moderate assistance for ambulation with wheeled walker to contact-guard assist with improved maintenance of posture. At four months dysphagia and performance of activities of daily living showed considerable improvement although left ptosis persisted. Patient's functional goals were for independent management of self-care and mobility prior to returning home.

Discussions: Discernment between midbrain stroke syndromes affecting the oculomotor nerve can be challenging. Most involve a component of both hemiataxia and hemiparesis. Small midbrain nuclei are also not easily identified on neuroimaging. Prominent contralateral hemiataxia present in this patient is most consistent with Claude's syndrome.

Conclusions: Accurate diagnosis of Claude syndrome and other stroke syndromes may lead to refinement of rehabilitation goals and improved outcomes.

CLIPPERS SYNDROME (CHRONIC LYMPHOCYTIC INFLAMMATION WITH PONTINE PERIVASCULAR ENHANCEMENT RESPONSIVE TO STEROIDS SYNDROME): A TREATABLE AND REVERSIBLE INFLAMMATORY DISORDER OF THE CENTRAL NERVOUS SYSTEM (CNS). A CASE REPORT
Robertta Liu, MD, MBS, and Francis Lopez, MD, MPH
Case Diagnosis: Chronic Lymphocytic Inflammation with Pontine Perivascular Enhancement Responsive to Steroids (CLIPPERS) Syndrome
Case Description: A 54-year-old male with medical history of CLIPPERS syndrome initially presented after an acute episode of tonic-clonic seizure at home and progressively worsening gait over the past two months. His symptoms coincided with a downward titration of his prednisone dose from 40mg to 10mg daily a few weeks earlier due to adverse side effects. On admission, an MRI of the brain was performed showing multiple T2 hyper-intense and T1 enhancing lesions throughout the cerebral parenchyma, cerebellum, and brainstem consistent with his known CLIPPERS syndrome, as well as a new area of enhancement in the left mesial temporal area. It was presumed that these new lesions represented an exacerbation of his CLIPPERS syndrome. He was subsequently started high dose glucocorticoids (GCs) and on a higher dose of Mycophenolate with marked improvement. He was transferred to acute inpatient rehabilitation, exhibited excellent progress in all fields of therapy, and was discharged home with a cane for ambulation.

Discussions: CLIPPERS syndrome is a rare inflammatory disorder of the CNS that has recently been described in the literature. Clinical presentation includes ataxia and seizures. Most unique to this syndrome is its response to high-dose steroids and recurrence of lesions without maintenance therapy. Glucocorticoids are the drugs of choice, however, their use is limited due to their side effects and clinicians often use GCs sparing agents such as Mycophenolate and Methotrexate as adjuvants.

Conclusions: CLIPPERS syndrome, a recently described condition, is a treatable and reversible inflammatory condition of the CNS. Initiation of steroids often leads to a full or close to full recovery. Patients with CLIPPERS make excellent candidates for acute inpatient rehabilitation. Knowledge of CLIPPERS syndrome and its clinical presentations is imperative for diagnosis, treatment, and rehabilitation planning for individuals with this syndrome.

CNS TOXOPLASMOSIS RESULTING IN FOCAL NEUROLOGICAL DEFICITS, FROM DIAGNOSIS TO REHABILITATION: A CASE REPORT
Daniel Reid, MD, and Rachna Malhotra, DO
Case Diagnosis: CNS Toxoplasmosis
Case Description: A 62-year-old female with a history of common variable immunodeficiency syndrome and progressive membranoproliferative glomerulonephritis treated with prednisone and mycophenolate. During treatment she was diagnosed with CMV colitis which was treated with a short course of ganciclovir and fluid resuscitation. Two days after discharge she experienced a seizure and sudden right sided weakness. MRI demonstrated a fronto-ring enhancing lesion and her brain biopsy was suggestive of an infectious etiology. She was started on a 6 week course of Sulfasalazine and Pyrimethamine as empiric treatment for toxoplasmosis. Serology later was positive for IgG antibodies against T. gondii.

Discussions: Toxoplasmosis is caused by the intracellular protozoan parasite, Toxoplasma gondii. Toxoplasmosis is acquired through ingestion of infected oocysts from soil or cat litter contaminated with feline feces, or undercooked meat from an infected animal. Toxoplasmosis affects twenty percent of the United States population. Eighty percent of immunocompetent hosts are asymptomatic. In immunocompromised patients, the parasite can reactivate and cause disease. CNS toxoplasmosis typically presents with headache, confusion, and/or other neurologic symptoms. Our patient presented with sudden focal neurological deficits including right sided weakness and seizures. At admission to acute inpatient rehabilitation she had significant functional decline from her baseline. She required moderate assistance with transfers and was unable to ambulate. She showed significant improvement after her six week treatment course. At the time of discharge, she was independent with transfers and ambulating 600 feet at a supervisory level. Repeat MRI six months later revealed resolution of her ring enhancing lesions.

Conclusions: A high level of suspicion for CNS toxoplasmosis should be present in patients with compromised immunity and acute focal neurological symptoms. Prompt diagnosis and treatment coupled with early rehabilitation can lead to rapid functional improvement, even with a severe initial presentation.

CONCOMITANT CRITICAL ILLNESS MYOPATHY MIMICKING LOCKED-IN SYNDROME IN A PATIENT WITH STROKE
Anton Marveev, MBS, Peter Shupper, MD, Radhika Banipdeeu, MD, and Mooyeon Oh-Park, MD
Case Diagnosis: Critical Illness Myopathy after right cerebellar infarction with right pontine extension.
Case Description: A 54-year-old male with a history of夹心 aneurysm presented to the ED with acute right eye pain, emesis and gait instability. MRI revealed a right cerebellar infarct with extension into the pons. The nine-week hospitalization included ventilator-dependent failure, tracheotomy placement, bilateral pulmonary emboli and IVC filter placement. In the ICU, upon arising from sedation with dexmedetomidine, fentanyl, and propofol, the patient developed total quadriplegia sparing extracranial muscles. The patient was thought to have locked-in syndrome (LIS).

He was transferred to an acute rehabilitation facility where he was nonverbal, with no motor activity other than an intact volitional blink and intact volitional extracranial muscle movement past both horizontal and vertical midlines. Given his preserved extracranial movement, an electrodiagnostic evaluation was conducted. Nerve conduction studies revealed preserved sensory potentials in all limbs and markedly low motor potentials with preserved conduction velocity. Electromyography revealed profuse muscle instabilities in proximal and distal limb muscles. Normal sensory potentials, markedly low motor amplitude, abnormal spontaneous activities in muscles with limited volitional activities suggested a diagnosis of critical illness myopathy. With rehabilitation, the patients FIM score improved from 21 on admission to 53 on discharge.

Discussions: The most common form of intensive care unit (ICU)-acquired myopathy is critical illness myopathy (CIM), also known as acute quadriplegic myopathy and thick filament myopathy. In non-communicate ICU patients who have had a stroke, it may be difficult to distinguish CIM from locked-in syndrome (LIS). Here we present a case of severe CIM resulting in quadriplegia, initially suspected to be LIS.

Given the physiatrist’s unique skillset in the electrodiagnosis, treatment, and rehabilitation of various neuropathic and myopathic conditions, physiatrists have an
Abstracts

CRPS TYPE I ASSOCIATED WITH RETROCALCANEAL BURSITIS IN A PEDIATRIC PATIENT

Satyen Hou, MD, PHD

Case Description: CRPS type I associated with retrocalcaneal bursitis in a child.

CRPS type I associated with retrocalcaneal bursitis is very rare, and no mention of weakness in ICU patients, and requires electrodiagnostic testing for diagnosis. This case highlights the importance of a physical therapist knowledgeable in neuromuscular disorders, to be present in the neurorehabilitation unit, as well as timely electrodiagnostic consultation. Likewise, it is essential to consult physiatrists in the acute care setting in order to facilitate accurate diagnosis and treatment of patients with ICU-acquired weakness.

CRPS TYPE I ASSOCIATED WITH RETROCALCANEAL BURSITIS IN A PEDIATRIC PATIENT

Case Description: An 11-year-old female with no past medical history presented with right foot pain for 2 months. Her right foot pain started while she was running. She felt a sudden pain in her right foot but continued playing. Pain is localized in her whole right foot. No trauma was reported. The pain evolved slowly going from an intermittent botor to a constant sharp pain. Several days later the pain ascending to her right leg. Patient describes this pain as constant, sharp, stabbing, with observed color changes and temperature changes (warmth). Upon her physical exam, right foot and leg appeared mottling. She had limited range of motion of right ankle in all planes. Pain was worse with dorsiflexion and palpation of the heel/Achilles attachment point. She had allodynia and hyperalgesia with cold temperature testing and light touch and sharp object. She was unable to tolerate weight bearing through right leg without shoes donned and perform toe touch weight bearing. A MRI revealed retrocalcaneal bursitis. Patient was diagnosed with CRPS type I based on her history and physical examination.

She received physical therapy, two times per week and aquatics therapy, 1 time per week for 3 months. Therapy focused on progressive desensitization techniques, strengthening, and range of motion. Her pain was significantly improved 3 months later. She was able to ambulate with equal stance time and increased right lower extremity weight bearing. The range of motion of right ankle was improved to allow for return to typical gait and age appropriate engagement in sports.

Conclusions: Pediatric CRPS type I occurs most often after injury, surgery, fracture, or motor vehicle accidents. It is characterized by allodynia, hyperalgesia, warm and edema. CRPS type I associated with retrocalcaneal bursitis is very rare, and no report has been documented in the literature. This case presented with CRPS type I associated with retrocalcaneal bursitis which has good response to physical therapy.

Conclusions: This is a rare case of pediatric CRPS type I associated with retrocalcaneal bursitis. It can be effectively treated with physical therapy.

DECOMPRESSION SICKNESS, AN UNCOMMON CAUSE OF SPINAL CORD INJURY AND CEREBROVASCULAR ACCIDENT: A CASE REPORT

Michael Chiou, BA, Ryan Solinsky, MD, and Jeremiah D. Nieves, MD

Case Description: Decompression sickness.

Case Diagnosis: A 24-year-old male encountered difficulty on ascent during scuba diving and experienced left-sided paralysis of his arm and leg immediately afterwards. Within ten minutes, he regained enough strength for mobility. After three rounds of hyperbaric oxygen therapy, his symptoms greatly improved, though there was residual left-sided weakness and numbness. MRI revealed a focal area of cerebellar ischemia and a T4–T6 infarct of the spinal cord. He was admitted to acute inpatient rehabilitation on day five. Gait and activities of daily living (ADL) dysfunction were present due to sensory changes below the T7 dermatome and weakness of the left lower extremity. The patient underwent an intensive regimen of physical and occupational therapy of three hours per day for seven days with a focus on balance and proprioception. His functional independent measurement score improved from 102 to 118, and he was discharged to home.

Conclusions: Neurological decompression sickness is encountered most commonly by divers with rapid ascent and results from hyperbaric exposure leading to the formation of intravascular and extravascular gas bubbles. Recompression therapy with hyperbaric oxygen is a well-established treatment strategy. When residual gait and ADL dysfunction are present, patients are excellent candidates for acute inpatient rehabilitation. A short 7–10 day course of rehabilitation permitted the patient to be discharged to home safely with outpatient therapy. Post-decompression sickness rehabilitation not only incorporates strategies to accommodate weakness, hypoxemia, and coordination deficits, as described in the literature, but also facilitates a safe, controlled return to community.

Conclusions: Decompression sickness may result in either transient or lasting neurologic injury with variable deficits. The goals of inpatient rehabilitation medicine include patient reconditioning to address the persistent deficits not resolved with hyperbaric oxygen therapy.

DEEP BRAIN STIMULATOR (DBS) IMPLANTED FOR REFRACTORY BIPOLAR DISORDER AND MAJOR DEPRESSION AS NOVEL TRIAL THERAPY AND INPATIENT REHABILITATION FOR COMPLICATIONS THAT MAY ARISE

Eric Sun, DO, EDM, and Padma Sirigiraju, MD

Case Description: A 55-year-old female with history of bipolar disorder (BDP), major depressive disorder (MDD) refractory to medical management and electroconvulsive therapy (ECT) suffering complications from implantation of deep brain stimulator (DBS).

Conclusions: DBS for psychiatric disorders such as bipolar disorder and major depressive disorder is in clinical trials. DBS has been used in the past for epilepsy, chronic pain, cluster headache, and movement disorders such as Parkinson’s disease, tremor, and dystonia. DBS is now targeting several areas of the brain to treat psychiatric disorders such as obsessive-compulsive disorder (OCD), Tourette’s, BPD, and MDD. In the case of depression, the first area of the brain targeted is area 25 or the subgenual cingulate cortex, which has been found to be overactive in depression and mood disorders. Later research has targeted several other areas of the brain affected by depression. This patient had leads placed at the bilateral subthalamic nucleus. Patient demonstrated some improvement in ADL’s, transfers, mobility and gait (50 ft. minimal assist to 200ft with straight cane).

Conclusions: DBS implantation is a common practice in movement disorders, but in the future will become more common as there are now experimental trials for psychological disorders such as OCD, Tourette’s, BPD, and MDD. Acute inpatient rehabilitation proves some benefit in ADL’s, transfers, mobility and gait to patients experiencing complications from DBS implantation secondary to refractory BPD and MDD, such as dizziness and fractures as demonstrated in this case.

DEEP PELVIC ENDOMETRIOSIS CAUSING CYCLIC LOW BACK PAIN

Aaron J. Yang, MD, and Ryan Castoro, DO

Case Description: Endometriosis, Pelvic Neuropathy, and Inflammatory Spondylitis.

Case Description: Patient is a 34-year-old female who presented to an academic spine center with primary complaint of right sided low back and buttock pain. She stated for the past couple years she had been having stiffness in her low back region that was worse in the morning but improved as the day progressed. Her symptoms of axial back pain would take about 2 hours to improve and overall her symptoms were relatively mild. About 1 year later, she subsequently developed right buttock pain that she would describe as “burning” without any radiation into the right leg. Her symptoms would fluctuate with her menstrual cycle and while she was menstruating her pain would worsen as the day progressed. In between her menstrual cycle, she denied any symptoms in the buttock region. During her menstrual cycle, her pain would be very severe and focal and would radiate to the gluteal crease. Pain is described as deep and sitting or pressure on the buttock would flare her pain in addition to external and internal rotation of her right hip. She could find some comfort by externally rotating her right hip. She preferred to avoid any pain medications during her most painful episodes she would occasionally take Tylenol.

She eventually had an MRI of her lumbar spine and pelvis. Her lumbar spine MRI was unremarkable but her pelvis MRI demonstrated extensive endometriosis extending from the right posterior vaginal fornix to the pelvis involving the right sided sacrospinous ligament, pudendal neurovascular bundle, internal obturator muscle, and right piriformis muscle.

She was started on an oral contraceptive (drospirenone and ethinyl estradiol) which significantly reduced her symptoms by controlling her menstrual cycle and started working with a pelvic floor therapist. Her obstetrician did not want to pursue
surgical intervention until the endometriosis was reduced and recommended starting Leuprolrelin therapy. The patient was evaluated with the only significant physical examination finding notable for tenderness along the right Piriformis muscle with positive provocative maneuvers. The patient was subsequently referred to rheumatology following our visit and was considered to have non radiographic, Anti-lynklosing Spondyli- tis. She was found to be ANA positive and also reported a history of uveitis. She was started on full dose Naproxen 500 mg twice a day for 6–8 weeks with consideration for further medical intervention depending on her medical course.

Discussions:
1. Consideration for low back pain caused by an inflammatory process include:
   a) Onset of low back pain under 35 years of age and is insidious in onset
   b) Pain that is worse with immobility such as at night or in the morning
   c) Pain that persists longer than 3 months
   d) Back pain that improves with exercise and physical activity
   e) Anti-inflammatories are helpful in relieving pain and stiffness
2. Pudendal neuralgia can be an under recognized cause of low back and buttock pain. Symptoms that may usually present with are pain worse with sitting that is relieved with standing, pain that can radiate to the buttocks, scrotal or perineal region in males and vaginal region in females. Sexual dysfunction as well as bowel and bladder can also be affected.
3. Endometriosis can extend beyond the uterus affecting multiple locations in the pelvis. This patient responded to oral contraceptives which helped control her cyclic pain. There have been presentations of “sciatric endometriosis” which has been rarely reported in the literature.

Conclusions: This was a complicated and rare etiology of low back pain. A triad of endometriosis, inflammatory back pain, and pudendal neuralgia are individually rare causes of back pain itself but this case was interesting in that they all presented together creating complicated yet understandable clinical presentation of right sided buttock pain that was cyclic with her menstrual cycle in addition to axial low back pain that was worse in the morning and improved as the day progressed.

DELEYED BILATERAL FACIAL NERVE PALSY WITH GUILLAIN-BARRE SYNDROME, MILLER FISHER VARIANT: A CASE REPORT

Daniel Reid, MD, Alexandre Mazar, BSC, BA, and Camilo Castillo, MD


Case Description: A 30-year-old male with no known past medical history presented to the Emergency Department with a 4 day history of progressive weakness, myalgias, paresthesias and blurred vision. Physical exam demonstrated global weakness in all four extremities, areflexia, and impaired extraocular movements consistent with Guillain-Barre Syndrome, Miller Fisher variant. Diagnosis was confirmed after Lumbar puncture showed high protein with no white blood cells. He received 5 doses of IVlg that resulted in gradual improvement in strength. He was transferred to acute inpatient rehabilitation (AIR) 2 weeks after initial presentation where his strength and light touch sensation continued to improve. While in AIR he developed rapid onset bilateral facial weakness without any other new neurological signs. After one week his facial weakness began to gradually improve without further treatment.

Discussions: Miller Fisher syndrome is a rare variant of Guillain-Barre Syndrome characterized by ophthalmoplegias, ataxia and areflexia. It is observed in only 1–5 percent of Guillain-Barre patients. Recent literature shows half of Miller Fisher variant patients develop initial facial nerve palsy during the disease process. However, in this case, the facial palsy was bilateral and delayed until the recovery phase. As suggested by Tan et al. 2015 a different composition of gangliosides in the facial nerve may contribute to this delay and that it has a good prognosis.

Conclusions: Miller Fisher variant is a rare subtype of Guillain-Barre Syndrome. It may rarely present with unilateral or bilateral delayed facial nerve palsy, but this has been shown to have a good prognosis. As such, it is important to be aware of this variation and presentation to help rehabilitation clinicians reassure patients and families.

DELEYED COMPLICATIONS FOLLOWING SPINAL SURGERY IN SPINAL CORD INJURED PATIENT: A CASE REPORT

Mairam Zakharay, DO, and Miguel Escalon, MD, MPH


Case Description: Patient is a 63-year-old male with history of renal cell carci- noma diagnosed five years prior and found to have metastases to the spine after progressive weakness for the preceding four months and inability to walk for five days. Imaging revealed T9 pathologic fracture with cord compression. Patient underwent T9 laminectomy, and partial corpectomy, T6–T11 posterior fusion and instrumentation. Upon admission to rehab, patient was found to have a T9 ASIA B spinal cord injury (SCI). He progressed well with therapies and graduated to T9 ASIA D. How- ever, on day 18 of rehab the patient began to experience increased back pain.

Discussions: UPON physical examination of the spine a “Step-off” was appreciated at caudal-most level of the spinal fusion. Thoracic x-ray was completed and showed displaced hardware as well as increased kyphosis in the spine. CT scan of the thoracic spine showed increased fracture of the pedicles, displaced hardware, and kyphosed spine and required immediate surgical intervention. He underwent including T6–T11 fusion revision, extension of instrumentation and fu- sion to T5–L2, partial T10 excision, and cage placement.

Conclusions: It is important to properly evaluate new pain in a person with SCI following spine surgery. Delayed complications can include hardware malfunction requiring re-operation. Failure to realize such a complication could have catastrophic results.

Case Description: Our patient is a 33-year-old female with a history of nodular sclerosing lymphoma treated with chemoradiation to the neck, mediastinum and periaortic lymph nodes at age thirty. Twenty years later, she was then diagnosed on CT venogram with radiation induced stenosis of the right subclavian, axillary and innominate veins with swelling and pain of the right arm and face. Delayed effects of ra- diation also caused decreased mobility of the paravertebral muscles and severe neck pain. She received 74 sessions of hyperbaric oxygen therapy (HBOT) at 2.4 atmospheres. Post-treatment CT venogram showed decreased stenosis of the right subcla- vian, axillary and innominate veins. Post-treatment MRI showed decreased stranding in the paravertebral muscles. Most impressively, symptoms were completely resolved.

Discussions: Previously radiated tissue can be hypovascular and hypocellular. HBOT induced angiogenesis and increased fibroblastic activity which led to increased collagen production in the fibrotic tissue and increased compliance in the afflicted veins which led to resolution of symptoms.

Conclusions: To our knowledge, this is the first case of HBOT successfully treating stenosis of the right subclavian, axillary and innominate veins secondary to delayed effects of radiation.

DEMONSTRATING THE FEASIBILITY OF VIRTUAL REALITY – ANGLE (VRA) IN PEDIATRIC PATIENTS WITH PAIN CONTROL DURING BOTULINUM TOXIN INJECTIONS (BTI) FOR SPASTICITY MANAGEMENT: A CASE SERIES

Yuxi Chen, MD, Stephen Erosa, DO, Yuriy I. Ivanov, DO, Jared Ruben Levin, MD, and Brian W. Lee, DO

Case Diagnosis: Spastic Cerebral Palsy (CP), Procedural Pain.

Case Description: Three patients between the ages of 8 to 11 with the diagnosis spastic cerebral palsy requiring botulinum toxin injections (BTI) were selected. All three subjects used a Virtual Reality Head mounted display (VRHMD) powered by a cell phone. A Generic VR experience was provided throughout the BTI’s. Pain was measured using the Face, Legs, Activity, Cry, Consolability scale (FLACC) for all subjects. The FLACC scale was used to assess pain during the intervention. Sub- ject 1 received a FLACC score of 1. The VR headset remained on throughout the entirety of the procedure. Subject 2 received a FLACC score of 6. The patient initially was wearing the VRHMD but then removed it mid procedure and would not put it back on. Subject 3 received a FLACC score 10. The patient refused the VRHMD.

Assessment: This assessment required a three second restraint during BTI.

Discussions: The purpose of this case series was to evaluate the efficacy of virtual reality analgesia (VRA) for pediatric patients undergoing BTI’s for spasticity management. Hypertonia is a common problem in children with cerebral palsy. Botulinum toxin serotype A injection is best treatment option. The standard of care is to receive the BTI’s without anesthesia, but if the patient is unable to tolerate the procedure due to anxiety, on pain they may receive general sedation prior to the procedure. Virtual reality is a digital simulation of a three dimensional environment in which the user is capable of interacting with the generated world via computerized equipment such as a VRHMD. Previous studies have demonstrated the
DERCUM’S DISEASE: A RARE CHRONIC BACK PAIN GENERATOR IN ADOLESCENT OBESE FEMALE: A CASE REPORT

Kelsey S. O’Connor, DO, and Tom Pang, MD

Case Diagnosis: Dercum’s disease (adiposis dolorosa) is a rare non-curable condition with an unknown prevalence. While its exact etiology is also unknown, hypotheses include nervous system dysfunction, mechanical pressure on nerves, adipose tissue dysfunction and trauma. It has been mainly described in postmenopausal females but recent literature shows that the disease begins manifesting between the ages of 35 to 50 years. The painful subcutaneous lipomas of Dercum’s disease are most commonly found in the extremities, trunk, pelvic area, and buttocks and are often present near exiting roots in the spinal canal causing impingement and radicular symptoms. Several treatments have been described in the literature but none have been uniformly successful in eradicating pain and disability, including use of lidocaine. We report a case in which a novel treatment, diagnostic lidocaine/marcaine block followed by intraneuronal phenol injection has demonstrated significant pain relief.

Case Description: A 16-year-old obese female presented to sports med clinic for continued low back pain since 2010. She reports it to be worse with laying down on her back, worse with running/jumping/lifting. Pain is localized to the b1 SI region, above gluteal folds. She recently completed a LBP PT and reports only mild improvement. Today is noticing lumps in her low back near sacrum, which are very tender. She denies any leg pain or weakness, no gait issues, denies any bladder or bowel issues, and denies saddle paresthesias. Previous MRI indicates a mild L4-5 degenerative disease with a possible annular tear involvement. On exam, she has pain at bilateral SIJ with b1 small moveable tubular shape with moveable and definitive borders. No other lipomas palpated on back/arms. She also has tender MFP to levator/upper traps. A non-tender QL bilaterally but severely guarded mobility, laying and sitting. Her hip flexors are to neutral bilaterally. Strength is 5/5 bilaterally in the UE and LE, with negative provocative testing in the low back/SI region. Muscle stretch reflexes were 2/4 in UE and LE except at quadriceps where ¾ bilaterally was noted. EMG was completed and was within normal for age, no insertional activity or latencies noted.

She was diagnosed with Dercum’s disease as major generator of her pain source. She underwent diagnostic block with lidocaine/Marcaine in office with excellent results. She reported a near resolution of her pain and limiting symptoms for 2–3 hours and then a slow return to her baseline. At 4 week follow up she proceeded with long term solution of phenol injection. She underwent a 5% Phenol injection with perimodal distribution to medial half of lipoma for denervation and associated dry needling. The phenol procedure was repeated 8 weeks later due to slow resolution of her pain. Post second phenol injection she has had complete pain control and continued limited functionality.

Discussions: Dercum’s disease is a rare disorder with little research to support etiology, epidemiology, or management. Some investigations into the disease indicate that pain can continue up to 5 years and patients often have chronic unremitting pain. The deposit of subcutaneous fatty lipomas can be exquisitely tender and painful. Previous case studies have shown a variety of treatment strategies including dermolipectomy, TENs units, analgesics, lidocaine, corticosteroids and methotrexate/infliximab.

A CASE REPORT

Borna Kavousi, MD, Patrick Dolan, MD, and Susan M. Stickevers, MD

Case Description: A 69-year-old male presenting with proximal weakness and inability to ambulate. Left upper and lower extremity EMG revealed short duration, low amplitude, polyphasic motor units and denervation potentials in multiple muscles suggestive of an inflammatory myopathy. Muscle biopsy of vastus lateralis revealed perimysial and perivascular mononuclear cell infiltrates and perifascicular myofiber necrosis and regeneration, consistent with dermatomyositis.

Case Diagnosis: A 69-year-old man with history of hyperlipidemia treated with rosuvastatin was admitted with pneumonia and herpes zoster. He reported myalgias, proximal muscle weakness and inability to ambulate. Treatment was initiated with IV antibiotics and valacyclovir. Admission labs revealed elevated liver enzymes and myoglobinuria with serum CPK of 9000. He received aggressive fluid resuscitation for rhabdomyolysis and rosuvastatin was discontinued. TSH was within normal limits. Antiviral and autoimmune serologies including hepatitis serologies, HIV titres, anti Jo-1, anti Smith, anti SSA, ANA, and anti mitochondrial antibodies were all negative. The patient was treated with oral prednisone and admitted for acute inpatient rehabilitation.

Conclusions: Inflammatory myopathies typically present with muscle weakness and elevated CPK. EMG testing reveals denervation potentials and low amplitude, short duration, polyphasic motor units with early recruitment. Dermatomyositis is an inflammatory myopathy which classically presents with a heliotrope rash and Gottron’s papules. Interestingly, our patient was a biopsy proven case of dermatomyositis without these hallmark cutaneous manifestations.

Case Description: This case warrants review as it the first reported case to our knowledge of dermatomyositis without cutaneous manifestations. Muscle biopsy results are needed to make the definitive diagnosis of dermatomyositis and to determine proper treatment.

DESMODIUM DISEASE TREATED WITH PULSED RADIOFREQUENCY ABLATION: A CASE REPORT

Ankur Patel, Corey Reeves, MD, Ritika Oberoi-Jassal, MD, and Benito Torres, DO

Case Diagnosis: We investigated a possible treatment option for a desmoid tumor causing shoulder pain. The detailed anatomy of the glenohumeral joint and innervation of pain fibers from the supraacapular nerve were the basis for treatment with a peripheral nerve block followed by radiofrequency ablation.

Case Description: We present a case of a 52-year-old female with a large left shoulder desmoid tumor, initially managed with chemotherapy and radiation but resulted in ongoing shoulder pain. The shoulder mass originated from the region of the rhomboid minor and it infiltrated the left trapezius with invasion into the levator scapulae muscle, measuring approximately 9 cm × 8 cm × 5 cm in size. Orthopedics suggested that surgical removal would leave her debilitated and she would likely lose function of her shoulder. She developed adhesions that may have contributed to radiation which was effectively treated the aggressive range of motion but did not effectively address the deep achy pain. Given the anatomy and innervation of the suprascapular nerve to the glenohumeral joint, we achieved a successful diagnostic suprascapular nerve block. A longer lasting treatment option of radiofrequency ablation was utilized to provide longer pain relief.

Conclusions: Radiofrequency ablation and collaboration with interventional pain medicine can assist in not only pain control but functional improvement. This case demonstrates how a routine procedure could improve functional status and prevent debility and side effects from a major orthopedic intervention. Additionally, types of radiofrequency ablation will be discussed to provide the reader more education about this treatment modality.

DEVELOPMENT OF HETEROTOPIC OSSIFICATION IN THE SETTING OF BURN REHABILITATION

Parat Patel, Desi Barraga, MD, Thomas Pfann, BA, and Ziyad Ayyoub, MD

Case Diagnosis: Heterotopic ossification (HO) is a condition that may be seen following a variety of bodily insults including traumatic brain injury, spinal cord injury, muscular skeletal trauma and burns. Our objective with this report is to depict a case of HO seen in the setting of rehabilitation from severe burns. HO is not
uncommonly seen during the burn rehabilitation process, and therefore, we find it im-
portant to bring attention to this condition. HO can alter the morbidity of a patient by 
increasing length of stay, and decrease function and quality of life for the patient. 

Discussions: Resting the acutely involved joint followed by gentle ROM exer-
cises after two weeks are recommended to maintain joint mobility. Therapy such as 
ice therapy, NSAIDs (indomethacin), or etidronate may be used to treat 
HO. Etidronate is thought to reduce further HO formation by reducing osteoblastic 
activity but does not treat HO that is already formed. However, no study has 
shown that etidronate prevents or diminishes the severity of HO in burn patients. 
Radiation therapy can be used to prevent and/or treat HO in post-total hip arthroplasty 
patients. Surgical resection is indicated in patients with significant functional impair-
ment. Three factors make the ideal surgical candidate: no joint pain or swelling, a 
normal alkaline phosphatase level and a three-phase bone scan indicating mature HO. It 
is imperative to ensure that HO is mature before resection, because resection of im-
mature HO leads to recurrence rates of nearly 100%. Physicians should be aware of 
HO, especially when severe burn patients complain of decreased range of motion, 
swelling or pain in joints. Early diagnosis will lead to better prognosis and surgical 
correction of HO combined with physical rehabilitation have proven to be an effective 
means of treatment.

Conclusions: Heterotopic ossification is a condition of lamellae bone growth in 
the soft tissue around large joints. Neurogenic HO is the most common form and is 
associated with brain injuries, spinal cord injuries, burns, etc. Risk factors for the 
development of HO include prolonged coma ~2 weeks, immobility, and limb spasticity 
or increased tone. Risk factors for HO development in burn patients include greater 
than 30% total body surface area burn, grafts, ventilator days and number of surger-
ies. Morbidity of a patient increases with the development of HO due to decreased 
range of motion, pain and weakness thus increasing the length of stay in hospitals. It 
is important for clinicians to keep a keen eye on the possible development of HO in 
the setting of severe burns. Early, appropriate and proper intervention can decrease 
the length of stay, and increase function and quality of life for the patient.

DIAGNOSIS OF A RARE CASE OF SPONTANEOUS PLANTAR 
FASCIA RUPTURE—A CASE REPORT
Siena Ona, MD, John Norbury, MD, RMSK, and Clinton Faulk, MD

Case Description: Patient was initially referred for possible tarsal tunnel syn-
drome which was found to be negative. Patient had 1 year history of persistent pain on the tips of the last 2 toes and plantar side of her left foot, described as burning sometimes pins and needles sensation. She also complained of worsening intermittent numbness. Electromyography (EMG) and TMT joint become fused in 2002. In the morning, Patient denied inciting events.

Electrodiagnostic results only showed peripheral neuropathy from hyperthyroidism. This result however did not account for patient’s symptoms. On examination Achilles tendon and tibial nerve was intact. Tarsal tunnel nerves were normal. On further ultrasound studies, the patient was found to have bilateral plantar fasciitis and plantar fascia rupture on the left. Her right plantar fascia was measured at 7.23 mm. (normal <5.9 mm) and was found to have increased hypoechoicinity. On the left foot, the proximal plantar fascia was ruptured with re-
traction of the distal segment. There was an increased hypoechoic area and increased echogenicity noted in the muscle belly of the left plantar fascia.

Discussion: The plantar fascia is a relatively nonelastic structure that is extend-
able by only 4%. During push-off, the TMT joint becomes more extended creating a 
higher degree of tension on the medial side of calcaneus, thus making this area vul-
nerable to injury. Based on a cadaver study, it ruptured after loading with a 90-kg weight. Cases of spontaneous plantar fascia rupture are rare in literature. In equivocal cases of foot pain, wherein the clinical and electrodiagnostic picture is not clear such as in the case of this patient, ultrasound is a good tool in establishing the diagnosis.

Conclusions: Foot pain and setting may be diagnostically challenging due to the various dif-
fentials associated with it. Ultrasound in this case was used to diagnose a plantar fascia 
rupture in real time leading to earlier diagnosis and management. This case 
emphasizes the importance of ultrasound in accurately diagnosing rare cases of spon-
taneous plantar fascia rupture. Additionally, plantar fasciopathy and rupture must be kept in mind in the differential of tarsal tunnel syndrome. Ultrasound is a good tool to efficiently evaluate both cases.

DICLOFENAC GEL TOXICITY IN AN ELDERLY ACUTE 
REHABILITATION PATIENT: A CASE REPORT
Jeffrey Okada, MD, Rodion Erenburg, MD, Susan M. Stickewers, MD, and Saurajeet Agarwal, MD

Case Diagnosis: Topical Non-Steroidal Anti-Inflammatory Drug (NSAID) Toxicity.

Case Description: An 80-year-old female with history of diabetes, hypertension, 
osteoporosis and renal insufficiency presented for inpatient rehabilitation following 
cerebrovascular accident. On the fourth day after admission, she became lethargic and unresponsive. Lab tests revealed potassium level of seven, elevated liver function 
tests and worsening azotemia of unknown etiology. Treatment with IV hydration and sodium polystyrene sulfonate administration improved her clinical status. The pa-
tient’s daughter subsequently reported that she had applied 1% Diclofenac gel to ap-
proximately 60% of the patient’s body surface area without prescription from the 
physicians twice daily for several days prior to her mother’s change in status. Diclofenac gel had been prescribed prior to this admission by an internist with direc-
tions to “apply topically as directed.” The patient and her daughter denied receiving 
instruction in the measurement and application of the appropriate dose of gel for this 
patient with renal insufficiency. The patient improved with conservative management 
after diclofenac was discontinued.

Discussion: Oral NSAIDs are well known for their detrimental systemic effects. 
Topical NSAIDs are thought to have minimal systemic absorption and primarily 
dermatological side effects, however use of topical diclofenac has been associated with 
gastrointestinal bleeding, renal failure, elevated liver enzymes, hypertension, somno-
lossence, hypoglycemia, myocardial infarction, stroke, and anaphylaxis. It is particularly 
important to adjust the dose in patients with renal insufficiency. Patients must be 
instructed in use of the dosage measurement template included in the package insert 
to measure the appropriate dose of gel. Patients also must be instructed to limit the 
sites of application to prevent toxicity.

Conclusions: This case warrants review as it highlights the potential adverse 
effects associated with topical NSAID application and the importance of instructing 
patients how to measure and apply the appropriate dose of this medication, par-
icularly in patients with renal insufficiency.

DIRECT ULTRASOUND FOR PROSTHETIC RESTORATION IN A 
TRANSTIBIAL AMPUTEE
Cecil T. Hollen, DO, Rachelle Pecoy, DO, Robert Worthing, MD, and Shayne Adkins, CP

Case Diagnosis: Evaluation and management of residual limb pain and prosthetic 
 restoration in a transtibial amputee using an interdisciplinary ultrasound 
guided approach.

Case Description: A middle-aged male presented for prosthetic restoration fol-
lowing lower extremity transfemoral amputation secondary to intractable limb pain status post 
residual limb pain following motor vehicle accident. Residual limb pain prevented functional 
prosthesis use despite multiple socket constructs by three separate certified prosthet-
ists. Comprehensive evaluation including diagnostic ultrasound identified four etiologies 
for functionally limiting pain: suboptimal Tibial and fibular bony contour, adventitious 
tibial bursa formation, symptomatic fibular neuroma, and a retained staple. Compared 
with dynamic ultrasound findings, the diameter of the anaesthesia improved. Following ultrasound guided fibular 
nerve block and ultrasound-guided digital percutaneous 
nerve block, the patient achieved an improved functional outcome.
Iliotibial band syndrome is a dynamic condition with symptoms fluctuating in relation to activity. Thus, the pain experienced by runners is often resolved by the time the individual seeks medical care hours or days after their running event. Studies such as this case report assessing ITB structures immediately after running provide valuable information regarding the pathophysiology and etiology of the pain associated with iliotibial band syndrome. This information can then be extrapolated to help make treatment decisions.

Conclusions: Iliotibial band syndrome, a common cause of lateral knee pain in runners, may be caused by compression of the fat pad between the iliotibial band and lateral femoral condyle that is worsened with repetitive activity. We utilized dynamic ultrasound evaluation of a runner with one symptomatic and one asymptomatic knee. Evaluation of ITB structures immediately after pain was provoked by running allows for real-time evaluation of the dynamic changes occurring. Further studies investigating more subjects and for a longer duration will also provide greater information, which can then direct treatments offered to these athletes.

**Dystonic Movements Improved with Levodopa-Carbidopa in a Patient with Traumatic Brain Injury Undergoing Acute Rehabilitation**

Rohan Kapoor, MD, and Justin Burton, MD

**Case Description:** Our patient is a 17-year-old female with anoxic brain injury undergoing acute inpatient rehabilitation. She presented with deficits in functioning; impaired speech secondary to dystonic facial movements, as well as dystonic movements in all four extremities. The dystonic movements were limiting the improvement of functionality during the acute rehabilitation process. After the discussion and approval of the patient’s mother, our team made a plan to start a trial of low-dose Levodopa-Carbidopa for improvement of her movement disorder. Patient was initially started on 10-100 mg one hour prior to starting therapies. After close monitoring with PT/OT/SLP it was noted that the patient had significant improvement of her dystonic movements in all four extremities. The next day we increased the dose to 10–100 mg, dosing one prior to morning therapies and one prior to afternoon therapies. Our therapy team observed that the patient had a smoother gait pattern, reduction in adventitious movements, and an earlier time initiating speech with the medication. These improvements were sustained during her inpatient stay.

**Discussions:** Conventionally, Levodopa-Carbidopa is FDA approved for the treatment of Parkinson’s disease. Movement disorders can stem from abnormalities in neurotransmitter levels after brain injury. Although formal studies are lacking, we hypothesized that the off-label use of Levodopa-Carbidopa may increase neurotransmitters in the brain to improve dystonic movements that were limiting her during acute rehabilitation. Levodopa-Carbidopa can be monitored after a one-time dose to determine any changes in movement. In our patient it was adventitious to trial a dose during an inpatient stay because we were able to closely monitor for adverse effects.

**Conclusions:** Consider off-label use of Levodopa-Carbidopa in patients with dystonic movements during rehabilitation. Levodopa-Carbidopa may provide noticeable improvements. Future studies of pharmaceuticals are indicated to determine their role for management of dystonia.

**Early vs. Late Cranioplasty After Cranectomy Examining Functional Outcomes**

Elizabeth Aguilà, BS, Peter Shupper, MD, and Radhika Bapineedu, MD

**Case Diagnosis:** Functional improvement after early cranioplasty in patient with TBI.
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Abstracts

EFFECTIVE ACUTE INPATIENT REHABILITATION FOR PROGRESSIVE SUPRANUCLEAR PALSY: A CASE REPORT
Jeffrey Ryan Cara, DO, Pegah Safaeian, DO, and Christopher Reger, MD

Case Diagnosis: Progressive Supranuclear Palsy.

Case Description: A 61-year-old male with a history of type 2 diabetes was admitted to the hospital secondary to a recent history of diplopia, dysarthria, dysphagia, and frequent falls. Computed tomography and magnetic resonance imaging were negative for acute stroke. Electrodiagnostic studies were consistent with diabetic neuropathy but were otherwise unremarkable. Based on his constellation of symptoms, a diagnosis of progressive supranuclear palsy (PSP) was made, and he was admitted to acute inpatient rehabilitation.

The physical examination was notable for dysarthria, impaired vertical and horizontal gaze, brisk reflexes with crossed adductors, and mild dysdiadochokinesia. Optokinetic nystagmus was diminished in all directions.

Therapy evaluations revealed minimal to moderate assist with ambulation and total assist for bathing, shower transfers, and stairs. His initial Berg Balance score was 20/36.

The patient underwent three weeks of focused physical and occupational therapy, resulting in significant functional gains. He was also seen regularly by the technology center therapists, who focused on compensatory measures for his visual impairment, including the use of larger icons, voice commands, and dictation software for his phone and computer.

At discharge, he improved to supervision for shower transfers and stairs, modified independent with ambulation, and a Berg Balance score of 48/56.

Discussions: PSP is a rapidly progressive, rare condition associated with gait disturbance, postural instability, supranuclear ophthalmoplegia, dysphagia, dysarthria, and cognitive impairment with an incidence of approximately 0.3 to 1.1 per 100,000. Unfortunately, medical treatment offers limited efficacy, with most patients becoming dependent within three to four years. Despite the marked reduction in function and quality of life, little has been written about the utility of rehabilitation. This case was notable for significant functional improvement over three weeks of intensive rehabilitation.

Conclusions: Rehabilitation with a progressive neurologic disease such as PSP demonstrates the potential for improvements in function using compensatory strategies and techniques.

EFFECTIVE TREATMENT OF DECOMPRESSION-RELATED SPINAL CORD INJURY WITH A NOVEL HYPERBARIC OXYGEN TREATMENT PARADIGM: A CASE REPORT
Kerri Chung, DO

Case Diagnosis: A 64-year-old male suffered a decompression-related spinal cord injury.

Case Description: An expert scuba diver suffered decompression sickness upon accidentally ascending from a 220-foot dive in under two minutes. Spinal cord perfusion was compromised by inert nitrogen gas bubbles in blood vessels and tissues. MRI demonstrated ischemic abnormalities at C2-7, T3-4, and T7-8.

Medical management included a two-week course of HBO re-compression therapy. A specialized team increased chamber air pressure and oxygen levels to facilitate the safe escape of injurious bubbles. He was taken for an unprecedented 53-hour HBO session with pressures simulating a depth of greater than 165 feet. Additional treatments involved durations of one to two hours and simulated depths of up to 100 feet. Traditional treatment depth is less than 60 feet. Prior to his prolonged and deep HBO treatment, this patient was only able to weakly shrug his shoulders and had patchy sensation in the left upper limb. Afterward, motor and sensory function steadily improved. He worked closely with the spinal cord injury rehabilitation team. His American Spinal Injury Association Impairment Scale classification progressed from C6-B at one week post-injury to T1-C five weeks later. At discharge, he could move his upper and proximal lower limbs, had intact sensation in most dermatomes, self-propelled a manual wheelchair, and was independent with upper body activities.

Discussions: Ischemic spinal cord injury in scuba divers who develop decompression sickness during rapid ascent is often catastrophic. Survival and recovery are not assured even when widely accepted treatment protocols are implemented. In this case, prolonged and deep HBO therapy helped treat this injury in a manner that, to our knowledge, has not been previously described.
Conclusions: Rehabilitation clinicians collaborated with numerous other providers to administer individualized care throughout this patient’s complex course. Consequently, he survived, began healing, and regained some functional independence.

Electrodiagnostic monitoring of traumatic posterior cord brachial plexopathy with reinnervation and recovery
Adeepa Singh, MD, Laurent Delavaux, MD, David Brown, DO, and Sara Cuccurullo, MD
Case Diagnosis: Severe posterior cord brachial plexus injury.
Case Description: A 47-year-old man presented with right shoulder pain and weakness after an anterior shoulder dislocation eight days prior. Symptoms included numbness of the right shoulder, lateral arm, elbow and dorsal wrist and hand. Motor strength was 0/5 for shoulder abduction, elbow extension, and wrist extension; 4/5 for elbow flexion, finger abduction, 0/5 for finger extension, and 5/5 for finger flexion. Nerve conduction studies revealed absent radial sensory responses; absent motor unit action potentials in the deltoid, teres minor, brachioradialis, extensor indicis communis, and triceps. One motor unit was active in the triceps. He was diagnosed with a severe posterior cord injury with involvement of the radial and axillary nerves.
Repeat evaluation six weeks later demonstrated motor strength improvement in shoulder abduction to 4/5, elbow extension 3/5, wrist and finger extension 1/5. There was return of the radial sensory nerve conduction response. Fibrillation potentials were noted in the deltoid, teres minor, triceps, brachioradialis, extensor digitorum communis, and triceps, with decreased recruitment in these muscles. The study revealed significant evidence of reinnervation.
Discussions: This uncommon case describes anterior shoulder dislocation resulting in isolated posterior cord injury, without vascular or other neural structural involvement. Traumatic shoulder dislocation may involve several important structures including the axillary artery, terminal nerve branches, or larger portions of the brachial plexus. The literature suggests brachial plexus injury in traumatic anterior shoulder dislocation relates to arm position during dislocation, most notably with the elbow in flexion placing the posterior and medial cords under greater tension than other positions. Electrodiagnostic evaluation is important in distinguishing brachial plexopathy from nerve root avulsion, accurately localizing, and predicting severity and prognosis of injury. Repeat studies are critical to assessment of recovery. In the case described, initial electrodiagnostic study revealed significant pathology, six weeks later marked re-innervation was noted; suggesting incomplete injury such as neurapraxia or axonotmesis. Electrodiagnostic follow up allowed for accurate diagnosis and monitoring of injury progression.
Conclusions: This unique case of posterior cord brachial plexopathy after anterior shoulder dislocation demonstrates utilization of electrodiagnostics for diagnosis and monitoring recovery. Implementation of electrodiagnosis for such brachial plexus injuries is essential to the physiatrist for accurate diagnosis and prognostication. It is important to note that limb position during trauma, particularly of the elbow, may dictate expected findings of brachial plexopathy in anterior shoulder dislocation.

EMG/Guided Botulinum toxin type A injections for functional problems associated to congenital facial palsy: A case report
David Quincy Atkins, MD, and Isabel M. Rutzen, MD
Case Diagnosis: Case of a 46-year-old male with congenital right facial palsy.
Case Description: A 46-year-old male with congenital right facial palsy who was evaluated by physiatry service since aside from the cosmetic impact of his facial asymmetry, he was experiencing late onset functional problems. He complained of progressive lip inversion causing recurrent biting and discomfort. Physical exam was remarkable for right lip inversion and hypertrophy of the contralateral facial muscles. Decision was made to infiltrate selected left facial muscles with incobotulinum toxin type A to reduce muscle pull on the weaker right side, with functional outcome goals of reducing biting as well as improving facial symmetry. The botulinum toxin was reconstituted with 0.9% normal saline to a concentration of 4U/0.1 cc. A total of 45U were distributed among selected muscles under EMG guidance. At 6 weeks post-injection the patient reported favorable outcomes, referring resolution of lip biting and overall satisfaction with improvement in facial symmetry. The patient denied adverse reactions from procedure. Physical exam was pertinent for significant reduction in right lip inversion and decreased hypertrophy of left facial muscles.

EMG/Imaging of Becker's muscular dystrophy in Hispanic adult
Elham R. Cohen, MD, Faye Chiu-Tan, MD, Joslyn John, MD, and Amy Cao, MD
Case Diagnosis: 37-year-old Hispanic Male with Becker's muscular dystrophy.
Case Description: A 37-year-old Hispanic male with past medical history of cardiomyopathy complains of weakness in proximal lower extremities. He was unable to run since he was 22 years old. The weakness is more prominent when he is climbing the stairs. Also he noticed that trips easily on small objects on the floor. He denies numbness but has tingling sensation in buttock area when he goes up the stairs. Patient's two maternal half-brothers died in young ages (13 and 16 years old). Also his maternal uncle died at age 40 and was wheelchair bound since 10 years old. He has three sons 13, 9, and 7 years old with no symptoms at this time. In physical exam upper and lower extremities muscle strength were within normal except hip flexors 4/5 and knee extensors 3/5 bilaterally and left elbow flexion 4/5. He has strong family history of Becker's muscular dystrophy. In his Labs; CK 1190. Transthoracic echocardiogram showed severe left ventricular ejection fraction of 20%. Nerve conduction study was normal and EMG showed chronic myopathy disease. Patient underwent defibrillator for his cardiomyopathy. Also patient underwent genetic lab and musculoskeletal ultrasound.
Discussions: In the study by Romitti et al. there is 57% of 765 patients in 6 United States sites were Caucasian with Duchenne and Becker dystrophies (DBMD) and then highest minority was Hispanic ethnicity by 20.5%.
Conclusions: Since the DBMD is more common in Hispanic minorities in the United States, the physicians who take care of adult Hispanic population should have heightened awareness of the possibility of its existence for the patients they care for.

End stage heart failure requiring intra-aortic balloon pump (IABP) complicated by a cerebrovascular accident and femoral neuropathy: A rehabilitation challenge
Yonghoon Lee, DO, and Enath Saad, MD
Case Description: A 50-year-old male with history of end stage heart failure with ejection fraction of 10-15% secondary to extension coronary artery disease presented with cardiogenic shock requiring IABP support. His hospital course was complicated by a cerebrovascular accident resulting in right hemiparesis. He was also found to have a retroperitoneal hematoma resulting in lumbar plexopathy involving the femoral and obturator nerves with added quadrieps weakness on the same side.
Discussions: First devised in 1962, IABP has been the most widely used circulatory assist device in critically ill patients with cardiac disease. IABP maximizes...
coronary artery perfusion and increases cardiac output by reducing left ventricular afterload, thus increasing myocardial oxygen supply and decreasing myocardial oxygen demand, respectively. Compare to LVAD, IABP showed reduced device-related infection, stroke, thrombosis, exhaustion times, and cost. The placement of an auxiliary IABP is a simpler procedure. IABP was traditionally inserted via femoral artery, and patients were typically on bedrest until removal of the device. The benefits of early ambulation over bedrest are well known. Prolonged bedrest can cause muscle wasting, weakness, and ICU myopathy. Auxiliary approach to IABP was developed to facilitate early ambulation. It was also found to have increased heart transplant rate as compared to the femoral in the literature. The patient was on auxiliary IABP for 30 days and was able to consistently participate with physical therapy to improve his functional status.

**Conclusions:** While there is mounting evidence in the literature on the benefit of physical therapy in the earlier stages of heart failure, patients with advanced heart failure have been understudied. This case was unique that the patient with IABP with multiple comorbidities in the CCU setting was able to tolerate a course of physical therapy without untoward effects in the presence of the perfusionist and CCU nurse. Rehabilitation should not be delayed in patients with auxiliary IABP in the right setting.

**ENTERAL DANTROLENE FOR THE MANAGEMENT OF AWAKE MALIGNANT HYPERTELMIA: AN UNUSUAL USE FOR A COMMON REHABILITATION MEDICATION**

Elizabeth Martin, MD, MPH, MHS, and Kelly Pham, MD

**Case Diagnosis:** Awake Malignant Hyperthermia in a three-year-old female with RYR1 mutation

**Case Description:** A three-year-old female with a history of RYR1 mutation, developmental delays, and prior malignant hyperthermia episode during surgery presented with a temperature to 103 F, status epilepticus, and with concern for septic shock. She was stabilized and started on keppra and lacosamide for seizure management, and diazepam for hypertonicity. Over the subsequent month she had recurrent episodes of seizure confirmed on EEG, with hypertonicity and fevers to over 40 degrees Celsius despite cooling blankets, twice requiring treatment with IV dantrolene. Rehabilitation was consulted and initially considered a trial of enteral dantrolene, however bloodwork revealed elevated ALT, AST and GGT. Despite propranolol and clonidine she continued to have recurrence requiring ICU management, cooling, and another dose of IV dantrolene. LFT’s improved with time. After extensive discussion and literature review a consensus was reached to try enteral dantrolene under the guidance of Rehabilitation medicine, given our familiarity prescribing dantrolene for spasticity management. An initial dose of 0.5 mg/kg BID was recommended, and titrated to 0.7 mg/kg q8h. Her LFT’s continue to trend to normal, and at the time of this writing, she has had no further hypertpyrexic episodes.

**Discussions:** Malignant hyperthermia (MH) resulting from anesthetic medication is an uncommon disorder typically managed by anesthesiologists. Nonanesthetic or “awake” MH is a condition with no clear treatment recommendations. Few prior case reports describe enteral dantrolene for nonanesthetic MH in adults, and one prior case reported from the Hospital for Sick Children, Toronto uses enteral dantrolene in a pediatric case. 

**Conclusions:** Awake malignant hyperthermia in the pediatric population is rare, but essential to diagnose to allow appropriate management. This is the second case in the literature to our knowledge, suggesting that recurrent episodes may respond to enteral dantrolene dosing within the ranges also used for spasticity management.

**ETHICAL CHALLENGES IN DISCHARGING A PATIENT WITH SEVERE BRAINSTROKE AND HYPOXEMIC BRAIN INJURY HIGHLIGHT THE ROLE FOR FAMILY MEETINGS:**  
**A CASE REPORT**

Katharine Tam, MD, Debjani Mukherjee, PhD, and Richard L. Harvey, MD

**Case Diagnosis:** The patient is a 65-year-old man with severe brainstroke with hypoxemic brain injury admitted to an acute inpatient rehabilitation hospital.

**Case Description:** The patient had tetraplegia, inconsistent communication and lacked decisional capacity. His surrogate decision-makers were his three adult children; two disagreed about the goals of care and the third was absent from the decision-making. The son stayed with his father, participated in providential care, and advocated for a home discharge. This surrogate planned to become the vulnerable patient. Decisions, but ethically, the care team struggled with decisions made on behalf of this vulnerable patient.

**Conclusions:** A patient with severe brainstroke, complex medical needs and complicated family dynamics may result in ethical challenges for health care professionals, particularly around goals of care and discharge planning. This case highlights the role of early family meetings to facilitate alignment of health care professional and family member’s expectations for care.

**FEMORAL MONONEUROPATHY MISTAKEN FOR FUNCTIONAL NEUROLOGICAL DISORDER**

Ingrid Yang, MD, Jeffrey Cara, DO, Christina Marciniak, MD, and Christopher Reger, MD

**Case Diagnosis:** Femoral mononeuropathy.

**Case Description:** A 38-year-old female presented after an un witnessed fall at work secondary to cardiac arrest. She was successfully resuscitated and treated with empiric Tissue plasminogen activator for pulmonary embolism. While on a heparin drip, the patient developed a left groin hematoma involving the distal left iliopsoas and iliacus muscles, and bilateral, symmetric lower extremity weakness. Because CT explained only her left-sided symptoms, the medical team speculated that the patient’s right-side symptoms could be a manifestation of a functional neurological disorder. 

**Conclusions:** The patient was admitted to acute inpatient rehabilitation with subsequent resolution of the left-sided hematoma and left lower extremity weakness. However, the right lower extremity weakness persisted. Unable to explain her symptoms, electromyography testing was performed, demonstrating a right femoral mononeuropathy localized to above the rectus femoris branch. The iliopsoas was not evaluated due to the patient’s elevated INR, prohibiting clarification of the most proximal extent. The lack of involvement in other L2-3-4 innervated muscles, absence of saphenous nerve conduction response, and normal paraspinal muscles all indicated a diagnosis of femoral neuropathy.

**Discussions:** The location of the femoral nerve in the pelvis and upper leg render it susceptible to a variety of iatrogenic and traumatic injuries. Femoral nerve compression secondary to iliacus hematoma has been widely reported. In this case, the patient’s left leg weakness was explained by the left-sided pelvis hematoma. However, imaging and laboratory studies yielded no explanation for her persistent right leg weakness, resulting in a misdiagnosis of functional neurological disorder, a psychiatric illness. Eventually, nerve conduction results explained her weakness as a right femoral mononeuropathy. It was thus postulated that the patient may have suffered trauma secondary to her fall upon cardiac arrest.

**Conclusions:** This case demonstrates the importance of obtaining EMG and NCS studies for unexplained weakness after a patient has suffered trauma or bleeding.

**FLEXERIL-INDUCED DELIRIUM IN THE MIDDLE-AGED: A CASE REPORT**

Roberta Lui, MD, MBS, Maria Jovin-Castro, MD, and Karan Gupta, MD

**Case Diagnosis:** Flexeril-Induced Delirium in the Middle-Aged.

**Case Description:** We report a 67-year-old gentleman with chronic hepatitis C, hepatocellular carcinoma status post partial hepatectomy, diabetes mellitus and hypertension who underwent elective cervical laminectomy and fusion of C3-C6 for management of symptomatic cervical myelopathy. He was admitted to acute rehabilitation post-operatively and was continued on Percocet and Flexeril, but unfortunately his pain was not controlled. When conservative measures failed he was started on mirtazapine, trazodone and gabapentin. 4 days later he appeared confused, lethargic, unsteady, and had worsening pain leading to regression in all disciplines of therapy. Work up for infection, depression, dementia, and adrenal insufficiency all proved unremarkable. Focus then shifted to review of medications and namely Flexeril, a known

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FOOT DROP AND SCAPULAR STABILIZER WEAKNESS IN LATE ONSET FSH MUSCULAR DYSTROPHY

Hugh McDermott, MD, and Joseph L. Graham, MS, BA

Case Diagnosis: Foot drop and scapular stabilizer weakness in late onset FSH Muscular Dystrophy.

Case Description: A 51-year-old male with fascioscapulohumeral muscular dystrophy presented with a complaint of increasing difficulty sleeping due to pain from worsening upper extremity weakness. He was diagnosed ten years prior with the presenting symptoms of bilateral foot drop. His foot drop, secondary to profound tibialis anterior weakness, had continued to worsen. He is finding himself increasingly fatigued throughout the day. Additionally, he had developed paroxysmal atrial flutter secondary to a disorder of mitochondrial respiratory chain complexes. On examination, the patient had atrophy of bilateral scapular stabilizers, and winging of both scapulae. General upper extremity strength was maintained through compensatory mechanisms. On lower extremity examination, the patient had 2/5 dorsiflexion strength with marked atrophy of bilateral tibialis anterior muscles. Without use of flexible ankle foot orthotics, he demonstrated steppage gait, with compensatory excessive lumbar lordosis and forward riding hips. He was provided with a physical therapy program for increasing flexibility to scapular girdle and lower extremity, as well as proper positioning techniques for energy conservation. His goal is to try and maintain current strength and range of motion or at least postpone some of his possible continued disease progression.

Discussions: While multiple variants of presentation for FSH muscular dystrophy are known, this was a novel case due to the original presenting sign being foot drop as well as the age of the patient at 41, since about 90% of patients show symptoms by their twenties. Additionally, his upper extremity and facial strength is largely spared comparatively. Finally, in terms of our therapy prescription, we intended to avoid strengthening or endurance exercises due to concern for exacerbating muscle wasting and disease progression. However, several literature searches seem to indicate that low-intensity aerobic exercise improves maximal oxygen uptake and workload with no signs of muscular damage.

Conclusions: This is a novel case of fascioscapulohumeral muscular dystrophy due to the age and originally presenting symptoms of our patient. In addition, while winging was appreciated, his upper extremities were largely spared in comparison to his lower extremity strength. Finally, one of his main complaints is fatigue and our physical therapy prescription focuses on increasing flexibility and energy conservation techniques to improve his daily function. After our literature search, it would be prudent to include an aerobic exercise component to his therapy to further benefit his endurance training and strengthening.

FOOT PAIN AND WEAKNESS AS INITIAL PRESENTATION OF MEDIAL PLANTAR NERVE NEUROPATHY: A CASE REPORT

Kimberly Nguyen, DO, Eugene Palatulan, MA, Mohammed Enam, MD, and Se Won Lee, MD

Case Diagnosis: Medial plantar nerve neuropathy.

Case Description: A 40-year-old female with PMH of pes planus and plantar fasciitis presents with one-month history of left foot tingling, weakness, and worsening pain. Symptoms began abruptly without preceding injury or trauma. The pain is worse at the medial arch, radiates distally with numbness/tingling involving all digits except 5th toe. Patient denies foot dragging or slapping.

On physical examination, patient was noted to have tight heel cords bilaterally. No gross muscle atrophy of foot noted, sensation was intact and equal to pinprick/ light touch with no splitting of 4th toe bilaterally. Manual muscle testing 5-5 for all lower extremity muscles. DTR were intact and equal bilaterally. Gait pattern was normal, patient toe and heel walked unassisted.

EMG study revealed unobtainable left foot medial plantar compound-nerve action potential and abnormal spontaneous activities in the abductor hallucis and flexor hallucis brevis muscles. This was suggestive of left medial plantar nerve neuropathy involving an axonal component proximal to the abductor hallucis muscle, likely at the distal tarsal tunnel. Office MSK ultrasound revealed a small ganglion cyst (~0.5 cm diameter) contacting the medial plantar nerve, likely explaining the underlying etiology.

Discussions: Foot pain can be divided into MSK or neuropathic pain. Planter fasciitis is a common cause of MSK pain, particularly in pes planus. Local nerve entrapment is a common cause of neuropathic pain. However, inferior calcaneal nerve entrapment and medial plantar nerve entrapment are an under-recognized cause of persistent heel and medial arch pain. The incidence of isolated plantar nerve neuropathy is relatively rare; usually due to trauma or mass lesion such as the ganglion cyst in this case. NCS and needle EMG play an important role in localizing the neuropathy.

Conclusions: Medial plantar neuropathy should be included in the differential diagnosis of medial arch pain despite the rare incidence.

FUNCTIONAL DECLINE IN A CERVICAL MYELITIS PATIENT WITH NEUROASARCOIDOSIS DUE TO MEDICATION CESSATION

Ankur Verma, DO, Vovanti T. Jones, MD, Jay J. Chacko, and Ray Lee, MD

Case Diagnosis: We report on a patient who developed functional decline due to cervical myelitis secondary to sarcoidosis exacerbation from cessation of treatment.

Case Description: A 67-year-old female patient with PMH of pulmonary sarcoidosis presented with seven days of progressive pain, weakness, loss of ambulation, and urinary incontinence. She had stopped taking mycophenolate due to cost of medication. MRI cervical spine showed increased cervical spinal cord edema and cord compression at C3-C4 and C4-C5. Patient was given 5-day course of IV methylprednisolone with no surgical intervention and was restarted on mycophenolate. She was transferred to an acute rehabilitation hospital. During her rehab course, mycophenolate was maintained. Patient developed upper extremity neuropathy, which was treated with gabapentin. Patient was initially stand-by assist at wheelchair level; by the time of discharge, she progressed to supervision with ambulation with a rolling walker and right AFO. She improved from minimal assist to modified independence with transfers.

Discussions: Neurosarcoidosis involvement with the spinal cord occurs in less than 1% of patients with sarcoidosis. Lesions can be intramedullary, extramedullary, or can affect the cauda equina. Spinal neurosarcoidosis has a predilection for the cervical and thoracic region. Since diagnosis can be challenging absent systemic manifestations, if clinical suspicion is high, one should perform a high-resolution chest CT, PET, ophthalmic examination, or a gallium-67 scan to identify extraneural granulomas that can be used to biopsy. Intramedullary disease would appear as a longitudinally extensive, T1-hypointense, T2-hyperintense, heterogeneously enhancing lesion with fusiform cord enlargement or myelomalacia. First line treatment is steroids, but at least one study suggests that cyclophosphamide can be an effective therapeutic choice for spinal cord neurosarcoidosis if minimal response to steroids. A recent study showed that multidisciplinary rehabilitation programs result in improved outcomes among sarcoidosis patients.

Conclusions: This patient with cervical myelitis could have prevented sarcoidosis exacerbation by maintaining steroid treatment.

FUNCTIONAL OUTCOMES IN INFERIOR MEDIAL PONTINE SYNDROME (FOVILLE SYNDROME): A CASE REPORT

Claire Finkel, MD, and Joseph Burris, MD

Case Diagnosis: Basilar artery stroke causing Foville Syndrome.

Case Description: A 71-year-old male presented to the emergency department with stroke symptoms. Imaging demonstrated partial occlusion of the basilar artery resulting in left pontine and left medullary infarction. Deficits included dysphagia,
dysarthria, left facial weakness, right hemiplegia, and left lateral gaze weakness. He discharged to an inpatient rehabilitation facility then discharged home with home health therapies; dysphagia resolved. He underwent a second inpatient rehabilitation stay 6 months later following acute hospitalization for urinary tract infection. He had new spasticity in his right upper and lower extremities limiting his function. He was again able to discharge home with powered wheelchair for his in home mobility needs.

**Discussions:** The patient's cluster of findings is consistent with Foville Syndrome, characterized by compromise to the paramedian branches or short circumferential arteries of the basilar artery. Pathology includes contralateral hemiplegia due to involvement of cranial nerve VII nucleus, ipsilateral facial weakness due to involvement of the paramedian pontine reticular formation and/or abducens nerve nuclei. During initial rehabilitation, overall Functional Independence Measure (FIM) score increased from 35 on admission to 63 on discharge, with greatest improvement in bowel and bladder status, upper extremity dressing, and expression. FIM scores decreased in the interim due to spasticity and infection. During his second rehabilitation stay, overall FIM score increased from 37 on admission to 77 on discharge, with greatest improvement in bowel and bladder status, wheelchair locomotion, and bathroom transfers.

**Conclusions:** Foville Syndrome diffusely affects function by interfering with self-care, mobility, swallowing, and communication. Patients that undergo inpatient rehabilitation can be comprehensively treated for early and late effects of this stroke syndrome. This is the first noted report of Foville Syndrome functional outcome measures.

**FUNCTIONAL OUTCOMES IN THE MANAGEMENT OF FLEXION CONTRACTURES FOLLOWING TOTAL KNEE ARTHROPLASTY USING BOTULINUM TOXIN TYPE A: A CASE SERIES**

Aiwane Iboaya, DO, Julie Larson, MD, and Tiffany Williams, MD

**Case Diagnosis:** Knee flexion contracture in the setting of arthrofibrosis sequelae following Total Knee Arthroplasty.

**Case Description:** Five patients following a total knee arthroplasty who subsequently developed arthrofibrosis and later hypertonicity of the hamstring muscle in the setting of a flexion contracture of the prosthetic knee despite undergoing aggressive formalized physical therapy, underwent chemodenervation with botulinum toxin type-A injection. Treatment with botulinum toxin type-A occurred within a 10–20 week period following a total knee arthroplasty for three out of the five patients and a revision total knee arthroplasty for two of the five patients. All patients were given a total of 200 units of botulinum toxin via the same Physiatrist. 50 units of botulinum toxin were injected into each of the following hamstring muscles: biceps femoris short head, biceps femoris long head, semimembranosus, and semitendinosus. Electromyography guidance was utilized during the procedure to ensure proper placement and distribution of botulinum toxin. Botulinum toxin produces a neuromuscular blocking effect which leads to chemodenervation allowing for a temporary reduction of spasticity. During this time period of temporary paralysis, patients again underwent intensive rehabilitation in the form of formalized physical therapy, home exercises, and bracing trials in the hopes of improving debilitating pain that impaired their function and impeded their quality of life.

**Discussions:** Previous studies document functional gains with aggressive therapies following a total knee arthroplasty. However, despite aggressive therapies a select number of patients subsequently develop arthrofibrosis. This study aims to assess the effects of botulinum toxin-type A for the treatment of arthrofibrosis of the prosthetic knee and establish if the treatment is associated with improvements in pain and function when coupled with aggressive rehabilitation. To our knowledge, this is one of the first studies to investigate the efficacy of botulinum toxin-type A in the treatment of arthrofibrosis following total knee arthroplasty. Research focused on botulinum toxin as a treatment for arthrofibrosis primarily occurs in animal studies. Botulinum toxin studies have focused on focal spasticity secondary to neurological and neuromuscular disorders and chronic pain conditions due to its temporary blockade in the diminish- ment of pain signal transmission. The case series results show that the botulinum toxin type-A injections unfortunately resulted in minimal to no functional improvement nor pain relief on a Visual Analog Scale one and three months following chemodenervation. Two out of the five patients received a second botulinum injection on their three month follow up. Again both noted minimal improvement in function and no functional improvement from the second injection.

**Conclusions:** The results of this case series suggest botulinum toxin type-A and physical rehabilitation may not increase function nor provide pain relief in patients with arthrofibrosis secondary to a total knee arthroplasty. Despite the limitations of this case series, botulinum toxin injections may increase the function and quality of life in patients with subsequent flexion contracture of the prosthetic knee following a total knee arthroplasty when performed in conjunction with aggressive therapies. Further studies are necessary to further establish the potential role of botulinum toxin type-A in the treatment and management of arthrofibrosis contracture following a total knee arthroplasty.

**GAIT TRAINING IN A LEGALLY BLIND PATIENT WITH BILATERAL LOWER EXTREMITY AMPUTATIONS: A CASE REPORT**

Anokhi Mehta, MD, Arlene LazarO, DO, and Jeffrey S. Fine, MD

**Case Diagnosis:** A 28-year-old male with premorbid legal blindness and depression who became a traumatic bilateral lower extremity amputee.

**Case Description:** Patient was intoxicated and fell onto the subway tracks. He was struck by an oncoming train and underwent a left Syme amputation and a right above the knee amputation. Patient had premorbid legal blindness and a history of alcohol abuse. Patient lacked central vision but retained some peripheral vision. Patient was admitted under the surgical service for approximately 6 months prior to coming to the rehab unit. He was wearing a right residual limb shrinker upon admission to rehab but had not been fitted for a prosthesis. He received his bilateral prostheses while in rehab. Despite visual deficits that impeded compensation for his bilateral amputations, patient progressed to ambulating 150 feet x 2 with a rolling walker with supervision and verbal cues on discharge. Patient now able to travel alone on the local train to keep his outpatient appointments in the rehab and amputee clinics. When seen in the amputee clinic for follow-up at 18 weeks post-discharge, patient was a community ambulator with a single arm axillary crutch despite his premorbid blindness. Rehabilitation management enabled this legally blind patient who was a traumatic bilateral lower extremity amputation to become modified independent in ambulation.

**Discussions:** Patient's gait training with new bilateral prostheses was complicated by his premorbid legal blindness. Now, he is a community amputee and is still working to improve his ambulation. In hopes to progress from the single arm axillary crutch to a straight cane, patient practices ambulating with a straight cane in his home. Patient no longer drinks alcohol and is being treated for depression.

**Conclusions:** With conscientious rehabilitation management, patients with premorbid disabilities can become independent in the community.

**GENICULAR NERVE RADIOFREQUENCY ABLATION FOR THE TREATMENT OF KNEE OSTEOARTHRITIS**

G. Sunny Sharma, MD, Ching Yon, DO, and David Fish, MD

**Case Diagnosis:** Knee Osteoarthritis.

**Case Description:** Patient is a 70-year-old female who was referred for recalcitrant right knee pain. Imaging demonstrated severe knee osteoarthritis. She reported significant pain at her right knee, worse with weight bearing, that was refractory to conservative measures including oral medications, physical therapy, bracing, corticosteroid injections, and hyaluronic acid injections. Patient was referred for a possible total knee arthroplasty but she declined, wishing to avoid surgery. She was offered genicular nerve radiofrequency ablation (RFA) under fluoroscopic guidance. Conventional continuous radiofrequency ablation was performed at the lateral superior, medial superior, and medial inferior genicular nerves. No perioperative complications were observed. On seven-day and fourteen-day telephone follow-up, the patient reported significant pain relief without complaint of adverse reactions. She further reported ability to ambulate longer distances due to pain relief.

**Discussions:** Genicular nerve ablation with radiofrequency (RF) has emerged as a treatment option in the management of osteoarthritis related knee pain. Recent data suggests that “genicular nerve RF neurotomy is a safe and efficient treatment modality and provides functional improvement along with analgesia in patients with chronic knee OA.” Our case demonstrates significant pain relief and improved function following genicular nerve RFA. However, future studies will be beneficial to assess long-term responses. It is also important to acknowledge that literature review studies have demonstrated genicular vascular complications, particularly in post-operative surgical patients. Although no cases have been reported, vascular injury is a theoretical risk of genicular nerve RFA. As with any procedure, it is important to weigh the benefits and possible risks, especially as its use grows in popularity.

**Conclusions:** For patients with knee osteoarthritis who have symptoms refractory to conservative measures but may not be surgical candidates or would like other non-surgical treatment options, genicular nerve radiofrequency ablation may be an appropriate treatment option for pain management.
Giant Cell Arteritis Presenting as Stroke

Samuel Murala, MD MPH

Case Diagnosis: Bilateral Carotid Artery Stenosis likely - Giant Cell Arteritis.

Case Description: A 63-year-old male with history of Hypertension, Type 2 Diabetes Mellitus, Coronary Artery disease and Peripheral artery disease presented with sudden-onset Right upper and lower extremity weakness, and unsteady gait. Initial work-up revealed right cerebellar stroke and left parietal stroke with hemorrhagic transformation. He had evidence of bilateral carotid disease and coronary artery disease, and recently underwent left carotid endarterectomy (CEA). Neck Magnetic Resonance imaging and carotid duplex demonstrated bilateral carotid stenosis causing near occlusion to bilateral arteries. Patient underwent Left carotid endarterectomy (CEA). During hospitalization he was also found to have severe blockages of coronary vessels and plan was to perform CAGB (Coronary Artery Bypass Graft) following successful recovery from L CEA. Pt underwent carotid endarterectomy on 8/22 and was transferred in hemodynamically stable condition to Acute Rehab. On 8/25 he had presyncope episode and fell to floor without loss of consciousness (LOC). CT head was negative for intracranial pathology. However patient reported frequent episodes of dizziness, loss of balance to right, with some nausea and presyncope feeling when standing. He estimates that episodes occur approximately 30-50% of times that he stands. Pt reports onset is abrupt and severe. Timing of symptom onset after standing is variable, at times within 2 minutes, other times 5–10 minutes. Symptoms resolve slowly with sitting, more quickly with lying down, but still can take a few minutes. Pt denied chest pain, shortness of breath, palpitations, visual change, tinnitus, weakness or numbness during episodes. Pt also reports some mild Right facial weakness, mild jaw myalgia follows the stroke, but no fluctuation with episodic symptoms. He has been having recurrent R temporal-parietal headache daily and mentions some Right jaw myalgia when chewing food. Neurology was consulted because patient had continued complaints of dizziness and nausea and Facial pain. On 9/18 Pt found to have elevated ESR and CRP, started on high dose prednisone for possible GCA last night, now s/p 2 doses. Pt reported headache has been better past 2 days, not certain but believes it coincides with steroid intake.

Discussions: Cerebrovascular ischemic events associated with giant cell arteritis (GCA) are uncommon and have been reported in 3%-4% of patients. Bilateral internal carotid artery stenosis may be seen in patients presenting with typical symptoms of GCA and may persist after steroid treatment despite resolution of clinical symptoms. Classic temporal arteritis may cause headache (70%), jaw claudication (50%) and, as its most feared complication, blindness.

The literature suggests that clinically manifested aortic disease occurs in 10% to 15% of GCA patients, about one third of whom present with aortic dissection or rupture, which most commonly affect the proximal thoracic aorta. Any type of clinically manifested large artery (aorta and proximal branches) complication has been reported to occur in up to 25% of patients with GCA. GCA is a disease process that is located mainly in medium and large extracranial vessels. Although involvement of internal carotid and vertebral arteries has been reported, the intracranial/innominate portions of the major vessels are spared. In 1972, Wilkinson and Russell reviewed medical records of 4 individuals they had treated and then reviewed 8 additional cases in the literature that had histologic evidence of GCA in the superficial temporal arteries and a full postmortem examination.

Conclusions: In conclusion, obstruction and occlusion of internal carotid and/or vertebral arteries are the most frequent causes of cerebrovascular ischemic events in patients with GCA. Arteritic involvement of intracranial/intradural arteries in patients with GCA is a rare event.

Glioblastoma Multiforme Mimics a Stroke and Results in Intracranial Hemorrhage after Thrombolysis: A Case Report

Lillian F. Nguyen, and Mark A. Hirsch, PHD

Case Diagnosis: Glioblastoma Multiforme Presenting with Stroke-like Symptoms during Inpatient Rehabilitation.

Case Description: We present a case of a 61-year-old gentleman presenting to a community hospital with headache, left facial droop and aphasia. A head CT scan showed a subacute infarct. A code stroke was initiated and he was given t-PA (tissue plasminogen activator). Subsequently, he developed an intracranial hemorrhage and was transferred into a tertiary care medical center for definitive management. Post-stabilization, he was admitted to an acute rehabilitation hospital for an interdisciplinary stroke rehabilitation program. On the second day after admission, he became hyperreflexic. A repeat head CT scan showed a large low-density lesion. A follow-up MRI revealed a large locolated mass. Glioblastoma multiforme was confirmed in a biopsy and, subsequent to surgical removal of the tumor, the patient was discharged home under the care of his wife with the assistance of hospice.

Discussions: In this case report we present that correct diagnosis and treatment with t-PA are important considerations for the physiatrist since many complications may occur (just like in this patient) in the rehabilitation setting after the tertiary care setting. This is the first case report of intracranial hemorrhage after thrombolysis in a patient during inpatient rehabilitation. The uniqueness of our case is the acuteness of the presentation of the Glioblastoma. Typically, these cases have signs and symptoms similar to a stroke. However, unlike strokes, they usually develop slowly over time.

Conclusions: This case highlights the challenges of physiatric management of brain tumors that can present in the same manner to strokes during inpatient rehabilitation. Because there is a high hemorrhage risk associated with brain tumors and the initial delay of the correct diagnosis and treatment, t-PA should be used judiciously.

Guillain-Barre Syndrome in a Patient with Chronic Myeloid Leukemia Treated with Dasatinib: A Case Report

William Warren Ide, MD, and Ragan Roey, MD, MPH

Case Diagnosis: Guillain-Barré Syndrome.

Case Description: An 84-year-old man with a history of chronic myeloid leukemia (CML) initially presented to the Emergency Department with complaints of vertigo, numbness in his hands and feet and gait unsteadiness four days after initiating treatment with Dasatinib. Following a brief acute admission to internal medicine, Dasatinib was discontinued and the patient was discharged to acute rehabilitation with a diagnosis of peripheral neuropathy secondary to use of a tyrosine kinase inhibitor. During inpatient rehabilitation the patient developed worsening weakness in the lower and upper extremities with inability to stand with assistance over the course of 2 days. Urinary retention, although chronic due to a history of benign prostate hyperplasia, was acutely exacerbated and required intermittent catheterization. Additionally, he reported new-onset dysphagia noted with swallowing pills and hoarseness. Repeat neurologic examination was significant for ascending weakness which had progressed from admission, hypophonia, weak eye closure, weak neck flexion and loss of deep tendon reflexes. In light of his progressive symptoms with potential for respiratory involvement, the patient was transferred to the UVA Emergency Department for further evaluation. On arrival to the ED, a chest X-Ray revealed evidence of aspiration and pulmonary function tests demonstrated respiratory compromise without remarkable neuroimaging.

The Neurology service was promptly consulted in the ED and the patient was admitted to the Neurosciences Intensive Care Unit with a presumptive diagnosis of Guillain-Barré syndrome (GBS). An EMG was significant for evidence of a widespread sensorimotor polyneuropathy with features of acquired demyelination consistent with Acute Inflammatory Demyelinating Polyneuropathy (AIDP). The patient was ultimately treated with IVIG at a dose of 2g/Kg over 5 days. He required non-invasive ventilatory support with close monitoring of his respiratory status. Enteral feeding was initially provided with a nasogastric tube and ultimately via PEG. Gradually, the patient displayed incremental increases in strength and function and was able to return to comprehensive inpatient rehabilitation and ambulated utilizing a walker upon discharge to home.

Discussions: This case demonstrates the potential association between Dasatinib and the rare complication of AIDP. Prompt recognition and treatment may minimize serious complications of severe demyelinating disease.

Conclusions: GBS should be considered by prescribing physicians in patients presenting with neurological symptoms in the setting of Dasatinib treatment.

Guillain-Barre and the Rare Froin’s Syndrome: The Importance of Differential Diagnosis

Yurii O. Ivanov, DO, Francis Lopez, MD, MPH, Michelle Stern, MD, and Totka Koutzeva, MD

Case Diagnosis: A 69-year-old male with history of alcohol abuse was admitted with altered mental status, bilateral upper and lower extremity weakness and a left tibia-fibula fracture. Upon admission the patient became hypothermic and hypotensive and was transferred to the intensive care unit for septic shock. Initial bloodwork revealed hyponatremia and an elevated white blood cell count. Physical exam was impressive for stiff neck, bilateral upper and lower extremity weakness, with normal reflexes and sensation.

Case Description: As part of the sepsis workup, lumbar puncture was performed, which showed albuminocytologic dissociation: elevated protein without increase in the number of white blood cells. Differential diagnoses included: GBS, cervical myelopathy, cervical spinal abscesses, polyperipheral neuropathy and Froin’s syndrome. Neurology recommended magnetic resonance imaging and electromyography study to check for cervical spinal pathology versus acute inflammatory demyelinating
Guillain-Barre Syndrome after Surgical Knee Replacement with Global Sensory Symptoms as the Primary Presentation

Amir Ali Rahnavard, MD, and Chirag M. Shah, MD

Case Diagnosis: A 55-year-old female with past medical history of Bell’s Palsy (episode 11 years prior), osteoarthritis, and bilateral hip replacements (2014) presented to acute ED with worsening dysphagia and mild dyspnea, and suspected to have Guillain Barre Syndrome. She initially had the procedure in an outpatient setting and received further care in a subacute rehab facility. A week into her SAR stay, she developed distal paresthesia’s in the left lower limb. On initial evaluation, her numbness and tingling sensation was deemed secondary to the surgical procedure, however her symptoms rapidly progressed to paresthesias in bilateral hands, feet, along with the lips and tongue. Within two weeks, she developed swallowing difficulties and dyspnea, however denied any peripheral muscle strength weakness. She presented to acute ED with worsening dysphagia and mild dyspnea, and suspected to have Guillain Barre Syndrome s/p surgery, without any infectious prodrome in the previous four months.

Case Description: Upon admission, the patient had basic lab work completed along with heavy metal toxicity, vit B12, folate levels as well as drug toxicity - all within normal limits. She had a Lumbar Puncture completed with cerebrospinal fluid having labs consistent with suspected Guillain-Barre Syndrome: elevated protein, normal glucose, no growth of bacteria, normal cell count, oligoclonal bands negative. Patient’s electrophysiological studies suggested denervation and the patient was diagnosed with Guillain Barre Syndrome. Although the patients primary symptoms were absent of motor symptoms, they included 2 weeks of progressive abnormal sensory findings - paresthesias and numbness in the extremities, lips and tongue. The patient received five PLEX sessions for Guillain-Barré syndrome with significant improvements in sensory symptoms and mild decrease in dysphagia. The patient’s initial functional evaluation scores were low secondary to severe paresthesias and pain in all extremities preventing tolerance of activities. After medical treatment with PLEX, the Patient was admitted to acute inpatient rehabilitation for aggressive therapy in functional evaluation. This gives rise to an elevated protein level in the CSF. This is known as Froin blockage of cerebrospinal fluid flow which in turn leads to improper CSF absorption; this resulted in an elevated protein level in the CSF. Froin is the leading diagnosis. Froin’s syndrome is a rare mimicker of GBS, but a thorough diagnostic study of the spine should be performed to prevent missing a treatable spinal pathology.

Conclusions: Presence of albuminocytologic dissociation on LP and weakness on physical exam should raise suspicion of a potential case of GBS in the leading diagnosis. Froin’s syndrome is a rare mimicker of GBS, but a thorough diagnostic study of the spine should be performed to prevent missing a treatable spinal pathology.

Hashimoto Encephalitis: A Rare Presentation of Delirium

Alex B. Behr, MD, ATC/L, Yogen Patel, DO, Daniel Bunzol, MD, and Sean Dwijendra

Case Diagnosis: A 29-year-old female initially presented to an outside hospital with hallucinations and insomnia, as well as suicidal and homicidal ideation; the initial diagnosis was social loss and depression. The patient was placed on intrathecal baclofen (ITB) therapy for spasticity management 3 months post-injury. His ITB dose was titrated up to the desired effect to peak dose of 364 mcg/day simple continuous infusion (over span of approximately 3 months post pump implantation). At nine months post implantation, his dose was decreased to 350 mcg/day simple continuous infusion for “being tired and relaxed”. Over the next year he had multiple gradual dose decreases at different times for sleepiness/lethargy, flaccidity, and “weakness”. At 21 months post implantation he was weaned to a dose of 135 mcg/day simple continuous infusion. At 22 months post implantation, he began having intermittent episodes of paranoia, hallucinations, and agitation, but no other symptoms of baclofen withdrawal. The patient was diagnosed with oral baclofen withdrawal, with subsequent exacerbation of his symptoms. Weaning of his ITB was begun at that time with the intent to discontinue the ITB. At 24 months post implantation, his ITB therapy was discontinued and the pump was filled with normal saline.

Discussions: This is the first reported case, to our knowledge, of hallucinations secondary to intrathecal baclofen therapy outside the context of withdrawal or overdose.

Conclusions: Hallucinations are a possible side effect of intrathecal baclofen therapy even in the absence of withdrawal or overdose.
and a plasma exchange. Hashimoto encephalitis was diagnosed. Her clinical course and functional status improved during the acute inpatient rehabilitation admission on steroids. She was discharged to a subacute rehabilitation facility with cognitive impairments and required significant assistance with lower extremity activities of daily living.

Discussions: Steroid-responsive encephalopathy associated with autoimmune thyroiditis (SEART), also known as Hashimoto encephalitis, is a rare primary autoimmune disorder found in adults. Hallmark symptoms of SEART include seizures, alteration in mental and conscious states, and gait disorders. Furthermore, neuropsychiatric symptoms may occur including hallucinations and psychosis. A diagnosis is made by the presence of psychological and/or neurological symptoms, elevated thyroid antibodies, especially anti-ThyPO, a therapeutic response to corticosteroids, and no other identifiable cause of the encephalitis.

Conclusions: Unfortunately, patients who present with these symptoms are very difficult to diagnose and thereby difficult to treat. The encephalitis work-up usually progresses from psychiatric conditions to viral disease and finally a more extensive work-up until a diagnosis is made.

Hemorrhagic Stroke Precipitated by Acute Management of Priapism
Devin A. Wells, MD, and Keerthi Atluri, MD

Case Diagnosis: Hemorrhagic Pontine Stroke.

Case Description: A 43-year-old male presented to an ED with a prolonged painful erection of 6-hour duration. He had a history of recurrent priapism treated on multiple occasions with therapeutic corpus cavernosum aspiration and intracavernous phenylephrine injection without complication. During this priapism recurrence, he underwent injection of 100 micrograms of phenylephrine into each corpus cavernosum with subsequent detumescence. After injection, SBP was noted to be greater than 230 mm Hg and he developed chest pain, diaphoresis, dizziness, headache, nausea, weakness, ataxia, dysarthria, impaired left eye abduction. CT showed L pontine hemorrhage with extension into the middle cerebellar peduncle. He was stabilized and admitted for observation. He had recurrence of priapism and a proximal caudal spinal spongoisal shunt was placed. He was treated conservatively for hemorrhagic stroke and transferred to acute rehabilitation. At discharge from rehabilitation, he was requiring minimal assistance for walking but continued to have difficulty with spasticity, gait abnormality and diplopia.

Discussions: A review of literature shows a single reported case of stroke due to treatment of priapism. A 23-year-old male with priapism secondary to sickle cell disease was treated with intracavernous phenylephrine injection which resulted in subarachnoid hemorrhage.

Phenylephrine is typically used because it carries less cardiovascular effects compared to other agents which increase inotropic and chronotropic effects on the heart as well as indirect norepinephrine release. Phenylephrine is an alpha-1 agonist. Alpha-1 adrenergic activation results in vasoconstriction. Hypertensive crisis caused by peripheral vasoconstriction may result in hemorrhagic stroke.

Conclusions: One potentially fatal outcome of intracavernous phenylephrine injection is hypertensive crisis, which may result in hypertensive hemorrhagic stroke. When performing therapeutic medical procedures, it is imperative to monitor for symptoms and signs that may indicate complications or adverse reactions, especially in patients at high risk for stroke.

Hepatic Encephalopathy as the Primary Catalyst to Traumatic Brain Injury
Joe Mendez, MD, and Riley Smith, MD

Case Diagnosis: With this case series of seven patients, we aim to recognize the systemic effects of Hepatic Encephalopathy as it relates and possibly leads to Traumatic Brain Injuries due to premorbid cognitive impairment.

Case Description: Several cases of patients ranging from ages 54 to 70 years old were rehabilitated due to traumatic brain injuries from various sources of trauma, however upon premorbid review, it was noted they all had elevated ammonia levels prior to trauma. Head CT’s were ordered on all patients to rule out emergent intracranial lesions or cerebral edema. All of the patients had varying degrees of acute liver failure with chronic cirrhosis. During their rehabilitation stay, Ammonia levels were routinely utilized to measure cognitive progression and ability to participate in rehabilitative therapies. If Ammonia levels were allowed to reach threshold elevation, they became encephalopathic and cognitively impaired without ability to adequately participate in therapy until ammonia was cleared.

Discussions: There is in general, a paucity of cases reported with regard to Hepatic Encephalopathy as a causal relationship leading to Traumatic Brain Injuries. Hepatic Encephalopathy is a syndrome observed in patients with cirrhosis. Hepatic encephalopathy is characterized by personality changes, intellectual impairment, and a depressed level of consciousness.

Ammonia is produced in the gastrointestinal tract by bacterial degradation of amines, amino acids, purines, and urea. Enterocytes also convert glutamine to glutamate and ammonia by the activity of glutaminase.

Normally, ammonia is detoxified in the liver by conversion to urea by the Krebs-Henseleit cycle. Ammonia is also consumed in the conversion of glutamate to glutamine, a reaction that depends upon the activity of glutamine synthetase. Two factors contribute to the hyperammonemia that is seen in cirrhosis. First, there is a decrease in the mass of functioning hepatocytes, resulting in fewer opportunities for ammonia to be detoxified. Second, glycogenolysis by the abnormal liver cells may divert ammonia-containing blood away from the liver to the systemic circulation.

Conclusions: These cases brought to light an interesting perspective of how Hepatic Encephalopathy can lead to Traumatic Brain Injury of varying degrees. The theory of traumatic brain injury leading to cognitive impairment is not necessarily always the catalyst but may be the sequela as such. The patients’ level of recovery from such injury could continue to be impaired by ongoing lack of control to Ammonia levels. If Ammonia levels remain high, this can lead to cognitive impairment that prolong neurorecovery times and may potentially lead to permanent damage.

Herpes Zoster Plexopathy
Elise M. Adcock, MD, Bao Tran, MD, Tony Lo, DO, MS, and Edward L. Barawid, DO

Case Diagnosis: Herpes zoster, or shingles, is caused by the reactivation of a varicella-zoster virus (VZV) infection that has been latent within a sensory ganglion. Primary infection with VZV, or chickenpox, is characterized by vesicular lesions of different stages that erupt on the face, trunk, and extremities. Herpes zoster, however, is manifested by the eruption of vesicular, painful lesions which usually occur in a restricted dermatomal distribution. We present a retrospective review of an interesting case of lower extremity weakness secondary to herpes zoster infection. A comprehensive history and thorough physical exam is crucial in establishing the correct diagnosis. Many diagnoses present with radicular pain and weakness; however, it is important to consider herpetic radiculopathy or plexopathy in the differential, especially in a patient with dermatomal manifestations.

Case Description: A 68-year-old man presented to a walk-in clinic with complaints of three weeks of increasing right hip pain and numbness to the right foot. He described his pain as 10/10 and worse at night and with standing. Radiographs showed moderate osteoarthritis of bilateral hips, bilateral CAM-type femoral acetabular impingements and moderate degenerative changes in the lumbar spine. He was instructed to use a heating pad and take Naproxen as needed.

With no relief of symptoms, he returned to the clinic six days later with complaints of increasing pain, now radiating down his right lower extremity. A swollen, erythematosus right foot and a vesicular rash on an erythematosus base to the right buttocks and right lower extremity in a dermatomal distribution were noted on physical exam. Herpes zoster was suspected and he was given a seven-day treatment of acyclovir. After treatment, he presented to the ED with continued pain, numbness and tingling in new areas extending down to the right lower extremity. Physical exam showed decreased light touch sensation to the right lateral foot and healing vesicles located from the posterior right hip down the lateral leg. MRI scans revealed multi-level loss of intervertebral disk height and disk desiccation and with the right side worse than the left, there was also a multilevel paracentral disc protrusion (3–3.6 mm from L1-L5) impairing on anterior thecal sac with mild lateral spinal and neural foraminal stenosis.

Two weeks later, after receiving a right L5 transforaminal epidural steroid injection, he presented to the rehabilitation clinic using a front-wheel-walker for ambulation. Musculoskeletal physical exam revealed positive right FAIR and straight leg test along with decreased strength in the right leg: 4/5 in right hip flexion and knee extension, 0/5 upon activation of right extensor hallucis longus and ankle dorsiflexion, and 1-2/5 in right ankle plantarflexion. Exam also showed decreased pin prick sensation to the R L4-L5 dermatomes. The patient was suspected of right L4-L5 radiculopathy and was referred to physical therapy for lumbar traction, right lower extremity strengthening and was prescribed a right ankle-foot orthosis with close skin monitoring. Electrodiagnostic evaluation revealed an acute lesion of the right L4-L5 lumbosacral trunk. Follow-up in the rehabilitation clinic showed continued sensation impairment and weakness three and six months after initial presentation.

Discussions: NCS and EMG can be a helpful tool when investigating herpes zoster perineural radiculopathy. Tinel’s sign is commonly positive, and may show some secondary segmental demyelination after a VZV insult. In our patient, the right superficial peroneal sensory neuropathy on NCS supports a lesion distal to the dorsal root ganglion, likely a plexopathy. Although the NCS of the right sural sensory nerve
was within normal limits, this nerve originates primarily from the S1 root level, therefore is spared in a lumbosacral trunk lesion. In addition, the motor studies of the bilateral and peroneal nerves revealed low amplitude or no response, respectively, as would be expected in an axonal demyelinating process.

Active axonal demyelination was found on EMG of affected muscles in our patient. Increased insertional activity, fibrillation potentials and positive sharp waves (PSW) were found in the gluteus medius, anterior tibialis, biceps femoris, semitendinosus, peroneus longus and posterior tibialis, all supplied by the lumbosacral trunk. Due to the increased insertional activity found in the gluteus medius, a pure sciatic neuropathy can be ruled out. Absence of abnormality in the lumbar paraspinal muscles and an abnormal SNAP supports the diagnosis of a lumbosacral plexopathy.

Conclusions: Many diagnoses present with radicular pain and weakness; however, it is important to consider herpetic radiculopathy in the differential, especially in a patient with dermatomal manifestations. A comprehensive history and physical exam is crucial in establishing the correct diagnosis. Herpes zoster neuritis may involve motor paresis in approximately 50% of the cases which can be confirmed using NC and EMG. Typical electrodiagnostic examination shows axonal degeneration with some secondary segmental demyelination.

The recovery process of patients with zoster paresis includes a multidisciplinary team. Physical therapy should focus on the maintenance of range of motion and advancing to strengthening exercises as motor function returns. Occupational therapy can assist in providing the correct assistive devices or orthoses. The prognosis of recovery from motor paresis secondary to herpes zoster neuritis is good, especially if the patient can participate in a comprehensive rehabilitation program to ensure he or she achieves maximal functional recovery.

Heterotrophic Ossification in Patients with Prosthetic Legs
Nathaniel Milburn, MBA, Lori A. Yap, MD, and Gargi Raval, MD

Case Diagnosis: Heterotrophic ossification is a well described phenomenon in patients with spinal cord injury, head injury, burns, hip replacement, and general trauma. However, it has only been described through a relative paucity of case reports that repeated micro-trauma from use of weight bearing leg prostheses is an additional possible cause of heterotrophic ossification. In our case, we examine a patient that developed a progressive case of heterotopic ossification after he began an exercise regimen with assistance from a running limb.

Case Description: Our patient is an army veteran who experienced a total of eight IED blasts during his deployment. While the first seven blasts resulted in no injuries, the eighth blast resulted in shrapnel injuries to his right leg requiring an above the knee amputation in 7/2010. The patient had a complicated recovery course that involved multiple surgeries, including four surgeries for HO (left thigh 1/2011, left hip 10/2011, right thigh 10/2011, and left forearm 4/2012). He was subsequently issued a right transfemoral prosthesis, noted to have a K-level of 3 on initial PM&R evaluation in 7/2014, and did not have any significant updates besides obtaining a running limb on 9/2015. The patient did not return to clinic until 2/2016 complaining of a developing pain attributed to a bone spur that worsened shortly after using the running limb. On physical exam a palpable mass was appreciated in the right femur attributed to a bone spur, and he was sent for a right femur x-ray which demonstrated a 36mm x 13mm bony overgrowth. The combination of physical exam and radiographical findings suggested a diagnosis of HO; he was referred to orthopedic surgery for removal, and subsequently reached a full recovery.

Conclusions: Our patient is another example of a newly described phenomenon of prosthetic induced heterotrophic ossification. Although the patient had previously described episodes of HO, all of these episodes had occurred and resolved more than 4 years prior. In addition, the patient noted that his bone spur worsened shortly after beginning running with prosthetics. It has been previously described in the literature that prostheses may induce HO in patients with a variety of different lower limb amputations, although in some cases the HO was advantageous in the fact that it created a more snug fit of the prosthetic device.

Conclusions: There is a plethora of information available that supports the role of trauma and amputations in the development of heterotrophic ossification. However, this case along with others described in the literature demonstrates the need for physicians to be aware of the possibility that a prosthesis may worsen HO in and of itself. In addition, the clinical finding must be viewed through the lens of patient symptoms as a large proportion have no pain or adverse symptoms, and in some cases the HO may even be partially beneficial.

Human Recombinant Hyaluronidase Injections for Upper Limb Muscle Stiffness in Severe Idiopathic Sensorimotor Axonal Polyneuropathy: A Case Report
Susie Kwon, MD, Preeti Raghavan, MD, and Prin X. Amorapanth, MD, PHD

Case Diagnosis: Severe idiopathic sensorimotor axonal polyneuropathy.

Case Description: We present a unique case of a 12-year-old wheelchair dependent Chinese girl with severe idiopathic sensorimotor axonal polyneuropathy (ISMAP) since early childhood. She presented with a one-year history of worsening upper limb motor function and painless muscle stiffness, resulting in difficulty with activities of daily living, such as holding a spoon to feed herself, dressing herself, and participating in self-care. Following off-label intramuscular injections of the human recombinant enzyme hyaluronidase into the stiff finger flexor, wrist flexor and pronator muscles bilaterally, she demonstrated markedly decreased muscle stiffness, increased active joint movement and function in the upper limbs. The onset of therapeutic response was within one week and persisted over the six-month period of follow-up. There were no adverse effects.

Conclusions: ISMAP is a major health problem with high prevalence, affecting up to one-third of patients diagnosed with neuropathies in late adulthood. Current treatment centers around neuropathic pain control with no specific treatment for muscle stiffness, defined as increased resistance to movement. It is a common symptom reported by patients with varying degrees of either central or peripheral nervous system injuries. Animal studies have shown increased accumulation of hyaluronan, a non-sulfated, high molecular weight glycosaminoglycan, in muscles after a period of joint immobilization. Hyaluronan is present in the extracellular matrix around the endomysium, perimysium, and epimysium of muscles; it typically functions as a lubricant, facilitating the sliding of muscle fibers for proper muscle contraction and relaxation. However, when its concentration is increased it becomes highly viscous, impedes muscle function, and may contribute to muscle stiffness. Commercially available enzyme hyaluronidase may however restore the consistency of hyaluronan and facilitate muscle function.

Conclusions: Motor function can be improved in ISMAP by using intramuscular injections of human recombinant enzyme hyaluronidase to treat muscle stiffness.

Hypokalemic Periodic Paralysis, an Uncommon Cause of Acute Weakness: A Case Report
Aaron Conger, DO

Case Diagnosis: Hypokalemic Periodic Paralysis.

Case Description: We present an unusual case of a 33-year-old Caucasian man with no medical history who presented to the emergency department with acute onset generalized muscle weakness which began the previous night. Examination was essentially normal except for profound weakness in proximal muscle groups of upper and lower extremities. Chemistry, liver enzymes, complete blood count, inflammatory markers, muscle enzymes, and thyroid stimulating hormone were normal except for serum potassium of 1.8 mEq/L. Urine sodium and potassium concentrations were consistent with appropriate potassium retention. MRI of cervical spine and brain were unremarkable. The patient received aggressive intravenous and oral potassium replacement. 12 hours later serum potassium was remeasured at 4.1 mEq/L, and his weakness had resolved.

Discussions: Familial hypokalemic periodic paralysis is a rare genetic disorder presenting with acute flaccid paralysis accompanied by documented hypokalemia (K+ < 3.5 mEq/L) during the episodes and defined by recovery of both potassium levels and strength following treatment. Clinical presentation varies, but patients generally have first episode of weakness or flaccid paralysis before age 20, lasting hours to days, often provoked factors by intense exercise or carbohydrate load. Potassium levels are always low during acute episodes. The diagnosis is made by excluding GI and renal losses of potassium, with further confirmation by exercise EMG or DNA analysis.

Conclusions: Weakness is a common but non-specific complaint in both the inpatient and outpatient settings. Although rare, hypokalemic periodic paralysis can cause life threatening weakness if not diagnosed quickly so proper treatment can be initiated. The relatively advanced age of the presented patient is unusual for familial hypokalemic periodic paralysis and demonstrates that patients may go decades without symptoms or may misattribute their weakness to another source. Physician should consider hypokalemic periodic paralysis when evaluating patients with acute or episodic weakness as it is a potentially disabling but treatable condition.

Identifying Subclavian Stenosis in Brain Tumor Patients Undergoing Acute Rehabilitation
Selorm Takyi, MD, Christine Greiss, DO, and Adeel Malik, BA

Case Diagnosis: Subclavian Stenosis.

Case Description: A 76-year-old male is admitted to acute inpatient rehabilitation following resection of a left parietal tumor and presenting with acute onset with hypokalemic periodic paralysis and demonstrates that patients may go decades without symptoms or may misattribute their weakness to another source. Physician should consider hypokalemic periodic paralysis when evaluating patients with acute or episodic weakness as it is a potentially disabling but treatable condition.

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Systolic blood pressure was markedly decreased on the left when compared to the right. Bilateral carotid ultrasound and upper extremity arterial ultrasound Doppler was performed. Studies revealed antegrade flow in the right vertebral artery, retrograde flow within the left vertebral artery and subclavian stenosis in the left upper extremity. The necessity when monitoring carotid Doppler with subclavian steal physiology. Cardiology was consulted and the patient was diagnosed with Subclavian Steal Syndrome. Additional imaging attributed primary lung tumor to be the cause.

**Discussions:** Hypotension is a common finding, not only following brain tumor resection, but in many other diagnoses admitted to inpatient rehabilitation. Sometimes this may be attributed to stenosis taper or possibly cerebral salt wasting. However, consistent finding when monitoring carotid Doppler with subclavian steal phenomenon. Subclavian Stenosis is an indicator for cardiovascular disease and associated with an increase in morbidity and mortality. Prompt identification is important in addition to providing patients with secondary preventive treatment while undergoing acute rehabilitation and transitioning into communal living.

**Idiopathic Sensory Ganglionopathy: A Case Report**
Qianna Armstrong, MD, and Danielle Saenz, DO

**Case Diagnosis:** Idiopathic Sensory Ganglionopathy

**Case Description:** A 33-year-old female with hypertension and alcohol abuse, who presented with low back pain and lower extremity weakness, progressing to ataxia with recurrent falls. On history, patient reported drinking a pint of vodka daily and chronic anemia for which she received a blood transfusion, however, there was no improvement in her symptoms. On physical evaluation, she was noted to have mild proximal weakness, decreased proprioception as well as decreased muscle stretch reflexes in lower extremities. MRI of brain and cervical spine showed no significant abnormalities. The patient was referred to the neurology service for right hand and forearm pain over the last several years with a complicated medical course. He initially noted paresthesias in this region after an accident. He was seen by orthopedic surgery, he had an EMG/NCSE completed revealing concern for carpal tunnel syndrome. He participated in hand therapy without improvement, then underwent carpal tunnel release surgery. Post-operatively, he noted significantly increased pain and paresthesias, primarily involving his right wrist and digits 1–4, as well as significant aldolysis of the right upper limb. A follow-up EMG/NCSE evaluation was unremarkable. He was sent for an additional course of hand therapy, including mirror therapy, yet found no relief. He then was referred to our rehabilitation program. He described the pain as constant, sharp, and burning with paresthesias. He was diagnosed with Complex Regional Pain Syndrome Type II (CRPS), and trialed on a variety of agents for neuropathic pain as well as narcotics. He was later referred for a trial of immersive virtual reality (VR), after Institutional Review Board approval. Using a head-mounted display with motion tracking capabilities (Vive, HTC), the patient participated in 4 virtual reality interactive environment after completing informed consent. This consisted of an initial introductory environment utilizing myoelectric control of a virtual hand on his symptomatic limb (Phelan, Sheffield Hallam University), followed by interactive VR sports (Selfie Tennis, Ping Pong Waves VR, and Audiosurf). Total VR time was approximately 45 minutes. Pre and immediate post VR pain scale evaluations and subjective feedback were elicited. He reported almost complete immersion in all experiences, as well as total, constant pain relief during the VR session. A decrease in pain using the Visual Analog Scale (VAS) from pre to post was also noted, although the difference was not clinically significant. A Short-form McGill Pain Questionnaire was also attempted, but the patient was unable to complete it. No adverse effects were reported during the session, and the patient reported interest in further participation if available.

**Impaired Motor Control, Emotional Ability and Cognitive Deficits due to an Artery of Percheron Variant: A Rare Cause of Stroke**
Sonal Oza, MD, and Richard L. Harvey, MD

**Case Diagnosis:** Impaired motor control, emotional liability and cognitive deficits due to an Artery of Percheron Variant: A Rare Cause of Stroke

**Case Description:** A 31-year-old highly educated, previously functionally independent male presented to inpatient rehabilitation after diagnosis of bilateral thalamic infarcts from an Artery of Percheron stroke. He had motor weakness, impaired balance and vertical ocular gaze defects. He expressed impulsivity and child-like behavior such as petting a stuffed animal. Cognitive assessment revealed deficits in initiation, attention and problem-solving. After one month, he improved from minimal total assistance to supervision-modified independence for transfers. Vertical gaze markedly improved with exercises. He continued to show impaired thought organization and trouble with ADL sequencing but adapted techniques to improve his attention. He was discharged to home with outpatient therapy.

**Discussions:** The Artery of Percheron is a P1 variant of the posterior cerebral artery where a unilateral segment supplies the thalami and midbrain. Artery of Percheron strokes contribute to 0.1-2% of ischemic strokes and make up 4-18% of thalamic infarcts. Common signs are memory impairment, vertical gaze palsy, and sleep-wake cycle disturbance. Many individuals at outpatient follow-up showed impaired executive function and visuospatial memory. Fewer reported impulsivity or juvenile behavior. Many recover from vision and sleep disturbances but personality and cognitive changes were noted to persist months later. The impact of inpatient rehabilitation has not been as extensively reported.

**Conclusions:** Individuals with paramedian thalamic strokes exhibit a variable presentation and have potential to recover function during inpatient rehabilitation.

**Implantable Telescopes for Treatment of Macular Degeneration**
Wendy Luo, MD, Lyn Weiss, MD, and Carol K. Channoff, BS

**Case Diagnosis:** Age related macular degeneration (AMD) is an insidious disease with gradual loss of central vision. Launched in 2011 the implantable miniature telescope replaces the existing lens in one eye. The other eye provides peripheral vision. www.ajpmr.com

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vision. The telescope works by magnifying an image 2.5 times onto areas of the retina unaffected by AMD. Over a six month period a patient will learn to use the telescope to reverse some of their functional vision loss.

Case Description: A 75-year-old female presents for pre-implantable telescope evaluation by a low vision occupational therapist. At the first visit, patient goals and expectations are discussed. A self-report assessment of functional visual performance profile was completed. The patient hoped the implant would help with: reading, writing, and travel. She rated her current ability to complete these goals as 2, 2, and 5 out of 10 with 0 as unable to perform. Over the next six months the patient worked with a low vision occupational therapist. At the final visit a repeat self-report was completed and the patient rated her ability to perform her top three goals as 5, 7, and 5 out of 10.

Discussions: Not all patients are good candidates. To determine eligibility an occupational therapist will have the patient first try a telescope prototype. Some are unable to tolerate the visual difference between the two eyes. After implantation, the patient must participate in occupational therapy. During training patients learn to switch between the non-implanted eye for peripheral vision and the implanted eye for central vision. The telescope does not repair the macula and patients will need to continue to use corrective lenses.

Conclusions: The implantable telescope is a device that can help restore central vision loss in appropriate candidates who suffer from advanced AMD.

Improved Pain and Function with Cooled Radiofrequency Ablation in Bilateral Hip Osteoarthritis: A Case Report

Solomon Rojhani, MD, and Akhil Chhatre, MD

Case Diagnosis: Chronic osteoarthritis (OA) of the hip is a debilitating and costly condition currently affecting millions of individuals worldwide. The case of an individual with bilateral hip OA and subsequent improved pain and function after water-cooled radiofrequency (CRF) ablation is presented. To the authors’ knowledge, the application of CRF in hip OA has not been described in the literature.

Case Description: A 58-year-old nonsmoking African-American male with a past medical history of chronic asthma and obesity (BMI of 48 kg/m², WHO Class III Obesity) presented to an outpatient physiatric clinic with chronic bilateral hip pain and previously diagnosed chronic moderate to severe OA. Conservative management of OA consisted of trials of acetaminophen, gabapentin, tramadol, oral opioids, rest (non-weight bearing), heat, ice, immobilization, physical therapy and aqua therapy. He continued naproxen and oral opioid treatments, as well as having obtained relief from multiple intra-articular steroid injections, although with diminishing efficacy, gradually worsening pain, and significant functional deficits. One week prior to bilateral hip CRF, Numeric Rating Scale (NRS) and total Hip Disability and Osteoarthritis Outcome (HOOS) scores were on average 10 out of 10 and 18, respectively. At 6 months post-ablation, average NRS was 3/10 and HOOS score 58.8

Discussions: Previously utilized in treating painful lumbosacral spine disorders, the application of CRF has expanded to treat neck and peripheral joint pain. Successful application of CRF provided significant pain relief which resulted in increased function and improved quality of life. CRF allows for greater ablative volumes at lower temperatures and may facilitate easier probe placement techniques while potentially cutting fluoroscopy and achieving greater overall success.

Conclusions: In this case, the application of CRF was successful in providing lasting pain relief, sustained functional improvements and improving quality of life.

Incidental Right Femoral Neck Fracture Found on Imaging during Fluoroscopic Guided Hip Injection

Richard J. Lawley, MD, and Prempreet S. Bajaj, DO

Case Diagnosis: Right femoral neck fracture

Case Description: A 79-year-old female with prior left femoral fracture in 1989 status post ORIF, left THA 11/2014, osteoarthritis of right knee who presented to clinic complaining of right groin and buttock pain for 1 month. She woke up with severe pain to right groin that would radiate down her leg. She had difficulty putting weight on her right leg, requiring a rolling walker to ambulate. After 2 weeks the pain continued to worsen and she went to the ED where imaging showed arthritis without fracture. She was given a steroid pack and muscle relaxers but symptoms did not improve. Approximately 3 days prior to clinic visit she lost her balance and fell to the floor, this was mentioned nonchalantly by her daughter. On exam, there was no evidence of trauma, no change in pain nor gait, no tenderness over right greater trochanter, 4/5 strength bilateral lower extremities, sensation intact, 2+ rectal tone, normal rectal reflex with FABER, no groin pain with FABER, negative straight leg raise test bilaterally. She returned to clinic the next day for a fluoroscopically guided hip injection, where she was noted to have displaced femoral neck fracture in AP view prior to injection.

Discussions: This patient presented with a common complaint which included both history and physical exam consistent with right hip osteoarthritis. After onset of symptoms she had imaging which ruled out serious pathology. Both she and her daughter dismissed her recent mechanical fall as minor and not concerning. She did not require a hospital visit and there was no change in symptoms. The patient wished for symptomatic treatment of her hip pain, which based on the available evidence was diagnosed as osteoarthritis. Once in the fluoroscopy suite, however, imaging clearly showed a displaced femoral neck fracture. She was therefore send to the emergency room and admitted to the orthopedic service, where she was sent to the OR the next day for total hip arthroplasty.

Conclusions: In a patient with risk factors for broken hip and with recent mechanical fall, such as an elderly individual with prior femoral neck fracture, it may be prudent to evaluate with plain films prior to scheduling for injection even if clinical suspicion is low for a new fracture based on symptoms.

Incomplete Spinal Cord Injury due to Progressive Arteriopathy With an Acute Decompensation from Drug Use: A Case Report

Carolyn Campbell, MD, and Jeffrey Rosenbluth, MD

Case Diagnosis: This case report describes a rare cause of incomplete spinal cord injury which involves progressive arteriopathy with an acute decompensation from drug use.

Case Description: A young female with a complicated medical history of poorly controlled diabetes with multi-organ involvement presented to the emergency room with flaccid paraplegia. She described a gradual decline in lower extremity strength followed by an acute worsening on the day of presentation. The initial differential included transverse myelitis versus anterior spinal cord syndrome from spinal cord ischemia. The patient was admitted, and workup done for transverse myelitis was found to be negative. However, pertinent findings included an admission urine toxicology screen which was positive for stimulant amines and opiates. Additionally, an MR of the thoracic spine revealed myelomalacia, but there was no DWI signal change (although there may have been a limited ability to see DWI changes due to preexisting myelomalacia). Given her vascular history in the setting of drug abuse, it was thought that she had progressive ischemia of the spinal cord with myelopathic changes that was acutely worsened by drug abuse with subsequent infarct.

Discussions: Spinal cord ischemia is often seen in the setting of atherosclerosis, aortic surgery, aortic dissection, hypotension, or vascular malformations. However, there are few cases describing an acute on chronic mechanism of injury. Further investigation is warranted to evaluate the mechanisms in which a chronic vascular condition may predispose an individual to a subsequent spinal cord injury. Furthermore, the effect of such premorbid conditions on functional outcomes and recovery remains unknown.

Conclusions: Pre-existing medical conditions including vasculopathic disease may predispose individuals to spinal cord injury, especially in the setting of an acute exacerbating insult such as drug use. Identifying such co-morbid conditions may assist in determining the complex etiology of the spinal cord injury and help to direct optimal treatment and prevention.

Innovative Interdisciplinary Rehabilitation Approach in an Outpatient Clinic: A Program Case Report

Elham R. Cohen, MD, Marissa F. Lyon, DPT, and Monica Verdugo-Gutierrez, MD

Case Diagnosis: A selective rotating position filled by a physical therapist (PT) or occupational therapist (OT) with expertise in neurological rehabilitation serves patients in concert with physiatrists and other providers in an outpatient clinic setting. The therapist consults, evaluates, and assesses patient’s therapeutic needs in an academic multidisciplinary outpatient clinic for patients with disabilities.

Case Description: The outpatient specialty clinic at this medical center is a multidisciplinary medical home for patients with disabilities. It is served by specialized physiatrists as well as other specialists who treat individuals after spinal cord injury, traumatic brain injury, cerebrovascular accident, progressive neuromuscular disease, chemotherapy-induced neurologic disease, lower and upper limb amputation and oncological diagnoses and sequelae. A PT or OT serves as a consultant in this interdisciplinary model while the patient is at their clinic visit. They help address therapy-related rehabilitation needs, spasticity, lymphedema, durable medical equipment, gait impairment assessment and related orthotic/prosthetic decision making. Additionally, the clinic therapist performs baseline and follow-assessment of impairments and functional limitations including spasticity and cognitive function, provides ongoing patient education regarding equipment maintenance and home exercise programs, coordinates with physicians in determining appropriate referrals to other allied health care providers or physicians, and liaise between physiatrists and treating clinic physical,
Inpatient Acute Rehabilitation Elicits a Significant Improvement for a Bilateral Pulmonary Transplant Patient

Alexander R. Sands, BS, Benjamin Seiden, BS, and Seema Khurana, DO

Abstract:

A 41-year-old male underwent bilateral sequential pulmonary transplant on 11/13/15 due to idiopathic pulmonary fibrosis (IPF) and was admitted to Jackson Rehabilitation Hospital on 4/18/16 to focus on improving functional mobility. Upon admission the patient was being fed through a nasogastric tube (NG tube) for a total of six months and had a tracheostomy collar that was on for almost seven years. He was able to walk a distance of 40 feet with minimal assistance. Although there was no change in FIM score, the patient did show improvements in the walking category. This case demonstrates the inherent benefit of postoperative inpatient rehabilitation for bilateral pulmonary transplant patients.

Discussions:

This case report is significant in that it provides evidence for the benefits of inpatient rehabilitation for patients who have received sequential pulmonary transplant. The patient, who had been dependent on a tracheostomy and nasogastric tube for several months, was able to walk 40 feet with minimal assistance after undergoing inpatient rehabilitation. The patient also showed improvements in other areas of the FIM instrument, indicating a comprehensive approach to patient recovery.

Innovative Management of Coexisting Contralateral Severe Knee Osteoarthritis (OA) in a Unilateral Transfermoral Amputation (TMA)

Judith B. Kosasih, MD, and Jennifer N. Yacub Martin, MD

Abstract:

A 61-year-old male with a right TMA at age 40 following complex femur fracture in a motorcycle crash. Early on, he stopped using his prosthetic limb, preferring independent mobility with crutches. Over the next 20 years, he developed contralateral (left) knee pain due to OA. Failing conservative management, he required a total knee arthroplasty (TKA). To optimize the success of post-TKA rehabilitation, interdisciplinary care coordination included re-implementation of the TF prosthesis limb intervention prior to TKA. He successfully completed prosthetic training as a K3 unlimited community amputee utilizing a cane and right microprocessor knee prosthesis. During TKA rehabilitation, the prosthesis limb was the essential supportive leg, promoting timely mobility training to sustain a K3 functional level.

Discussions:

This case highlights the importance of delaying prosthetic rehabilitation to ensure functional outcomes. The patient was able to achieve a functional level with the contralateral limb and then progress to a K3 level with the prosthetic limb. The interdisciplinary approach, including re-implementation of the TF prosthesis, was crucial in achieving this outcome.

Intensive Rehab in a Patient With Myasthenia Gravis and Respiratory Failure Secondary to Phrenic Nerve Transection Post Thyotomy

Sanjay J. Digamber, MD, and Chirag M. Shah, MD

Abstract:

A 28-year-old woman presented with an eight-month history of progressive left lower extremity paresis. She underwent an extensive workup that ruled out any organic causes of her symptoms and was diagnosed with functional movement disorder. She completed a 25-day inpatient rehabilitation program that incorporated patient education, positive reinforcement, retraining movement strategies with robotic devices, psychotherapy, therapeutic recreation, and encouragement to develop self-management plans. On initial evaluation, she was functioning at wheelchair level, requiring total assistance for ambulation and maximum assistance for transfers, bed mobility, and lower body dressing. On discharge, she was modified independent for ambulation (180 feet with a rolling walker), transfers, and bed mobility, and required minimum assistance for lower body dressing. Her left lower extremity regained antigravity strength from an initial presentation of no movement, and she met all of her rehabilitation goals.

Discussions:

This case demonstrates the inherent benefit of postoperative inpatient rehabilitation for patients with functional movement disorders. The patient, who had been non-ambulatory and dependent on a wheelchair, was able to achieve independent ambulation with minimal assistance after undergoing inpatient rehabilitation. This case lends support for the growing trend toward a comprehensive inpatient rehabilitation approach for functional movement disorders.

Inpatient Rehabilitation Management of Functional Movement Disorder

Kristen Jost, MD, and Padma Sririgiraju, MD

Abstract:

A 33-year-old female with progressive left lower extremity paresis. She underwent an extensive workup that ruled out any organic causes of her symptoms and was diagnosed with functional movement disorder. She completed a 25-day inpatient rehabilitation program that incorporated patient education, positive reinforcement, retraining movement strategies with robotic devices, psychotherapy, therapeutic recreation, and encouragement to develop self-management plans. On initial evaluation, she was functioning at wheelchair level, requiring total assistance for ambulation and maximum assistance for transfers, bed mobility, and lower body dressing. On discharge, she was modified independent for ambulation (180 feet with a rolling walker), transfers, and bed mobility, and required minimum assistance for lower body dressing. Her left lower extremity regained antigravity strength from an initial presentation of no movement, and she met all of her rehabilitation goals.

Discussions:

This case highlights the importance of interdisciplinary care coordination and re-implementation of the TF prosthesis limb intervention prior to TKA. The patient was able to achieve a functional level with the contralateral limb and then progress to a K3 level with the prosthetic limb. The interdisciplinary approach, including re-implementation of the TF prosthesis, was crucial in achieving this outcome.

Intensive Rehab in a Patient With Myasthenia Gravis and Respiratory Failure Secondary to Phrenic Nerve Transection Post Thyotomy

Sanjay J. Digamber, MD, and Chirag M. Shah, MD

Abstract:

A 28-year-old woman presented with an eight-month history of progressive left lower extremity paresis. She underwent an extensive workup that ruled out any organic causes of her symptoms and was diagnosed with functional movement disorder. She completed a 25-day inpatient rehabilitation program that incorporated patient education, positive reinforcement, retraining movement strategies with robotic devices, psychotherapy, therapeutic recreation, and encouragement to develop self-management plans. On initial evaluation, she was functioning at wheelchair level, requiring total assistance for ambulation and maximum assistance for transfers, bed mobility, and lower body dressing. On discharge, she was modified independent for ambulation (180 feet with a rolling walker), transfers, and bed mobility, and required minimum assistance for lower body dressing. Her left lower extremity regained antigravity strength from an initial presentation of no movement, and she met all of her rehabilitation goals.

Discussions:

This case demonstrates the inherent benefit of postoperative inpatient rehabilitation for patients with functional movement disorders. The patient, who had been non-ambulatory and dependent on a wheelchair, was able to achieve independent ambulation with minimal assistance after undergoing inpatient rehabilitation. This case lends support for the growing trend toward a comprehensive inpatient rehabilitation approach for functional movement disorders. The patient, who had been non-ambulatory and dependent on a wheelchair, was able to achieve independent ambulation with minimal assistance after undergoing inpatient rehabilitation. This case lends support for the growing trend toward a comprehensive inpatient rehabilitation approach for functional movement disorders.
the disease in most patients. Without thymoma may be treated with steroids, pyridostigmine, IVIG, and plasmapheresis. Myasthenia is diagnosed by administration of edrophonium or by testing for anti-ach antibodies in the patient’s blood which is 100% specific for this condition. 

**Case Description:** A 63-year-old female who initially presented with generalized weakness, night sweats, and 20 lb. weight loss over two years. The patient was diagnosed with myasthenia gravis with thymoma who failed conservative management with steroids and plasmapheresis. Surgical removal of the thymoma was then recommended. The surgery was scheduled and the thymoma was successfully resected but complicated by phrenic nerve transection and symptomatic bradycardia from new onset sick sinus syndrome. The patient then had a left-sided pacemaker placed. The patient was unwearyable from the ventilator post op and a tracheostomy was performed. The patient also had a PEG simultaneously placed at that time. Once medically stable, the patient was transferred to acute rehab for intensive therapy. During rehab the patient remained on high dose steroids to prevent a relapse of their myasthenia. The patient required physical therapy, occupational therapy, and intensive speech therapy. 

**Discussions:** Therapy was focused on strengthening oropharyngeal muscles, vocal cords, and phonation while maintaining oxygen saturations and pulmonary function. The patient initially failed digital trach trials with coughing and thick expectoration and was unable to tolerate Passy Muir Valve for phonation. With continued therapy over a period of a few days the patient was able to tolerate the PMV. The patient’s trach was then downsized and capping trials were performed with no desaturations or dyspnea. Over the course of 1 month the patient was subsequently downgraded with no complications and tolerating room air. Over the one month period of therapy, the patient also performed bolus control exercises, the masako maneuver, and the mendelson maneuvers to strengthen the oropharyngeal muscles and improve her dysphagia. Over this period of time the patient was able to advance from NPO and PEG feedings to a general diet with thin liquids on discharge. 

**Conclusions:** This case demonstrates the importance of speech therapy in strengthening respiratory effort, oropharyngeal muscles and phonation in patients with respiratory failure secondary to phrenic nerve transection. With intensive therapy the patient was able to improve respiratory status from requiring mechanical ventilation by tracheostomy to breathing on her own over a one month period of time. With the help of therapy and formal exercises the patient was able to advance their diet from NPO to a general diet over a 30 day period. It’s also important to note the importance of managing and stabilizing the underlying neuromuscular disease to optimize the patient’s ability to perform in therapy and prevent relapse. 

**Intersection Syndrome of the Second and Third Extensor Compartments: A Case Report**

Erika Moody, MD, and John C. Cianca, MD

**Case Description:** Intersection Syndrome of the Second and Third Extensor Compartments 

**Case Description:** A 41-year-old female with one month history of left radial thumb and wrist pain. Symptoms were intermittent and aggravated with thumb abduction, grip, wrist flexion and extension. The patient denied a history of trauma, unusual activities, other joint aches or fevers. Physical exam demonstrated an edematous, mildly erythematous wrist with pain and limited active range of motion with wrist extension and flexion. Finkelstein’s test and ulnar deviation were non-painful. There was tenderness to palpation over the dorsal second and third extensor compartments. 

Ultrasound examination demonstrated abnormalities consistent with tenosynovitis of the left extensor carpi radialis longus (ECRL) tendon from the intersection position with the third compartment to just distal and the extensor carpi radialis brevis (ECRB) tendon in the intersection region. There was a small hypeerechoic fragment located within the ECRB sheath. Tenosynovitis was also demonstrated in the left extensor pollicis longus (EPL) tendon from just distal to the Lister tubercle to the first metacarpal. A bifid Lister tubercle was seen with the EPL on top. 

**Discussions:** Dynamic ultrasound revealed a second and third extensor compartment tenosynovitis most notable at the intersection of the tendons with the EPL tendon affected. No locations appeared to have friction or compression to explain these findings. A thumb spica splint, topical nonsteroidal anti-inflammatory cream and ice massage were prescribed. 

**Conclusions:** Intersection syndrome is a relatively uncommon overuse disorder, classically described in the literature as friction or entrapment between the musculotendinous junction of the first (abductor pollicis longus (APL) and extensor pollicis brevis (EPB)) and second (ECRB) dorsal extensor compartments. This case reports an unusual, and likely rare, intersection syndrome diagnosed by ultrasound that involves the second and third dorsal extensor compartments, which is of unclear etiology. 

**Intracranial Glioblastoma Multiforme With Metastases to Spine and Vertebral and Resultant Conus Medullaris Syndrome: A Case Report**

Wade Johnson, DO, and Jessel Pedro-Guzman, MD

**Case Diagnosis:** A 58-year-old man with a history of progressive low back pain and gait instability for several months, presented with complaint of acute right sided weakness, bowel and bladder incontinence. Workup included brain and spine magnetic resonance imaging (MRI) notable for left thalamic and temporal mass as well as diffuse leptomeningeal enhancement, T11 intradural extramedullary mass and mass within the S1 vertebral body. CSF studies ruled out granulomatous process, socal biopsy of the lesion revealed WHO grade IV glioma. 

**Case Description:** Patient was admitted to acute rehabilitation with initial exam revealing grade 2/5 strength throughout the right lower extremity, and grade 2-3/5 strength in the left lower extremity. Patient was completely dependent for bowel and bladder management with constipation and urinary retention requiring aggressive bowel program and catheterization. During admission, patient developed worsening back pain with progression of lower extremity weakness prompting discharge to acute unit with 0/5 strength in the right lower extremity and 2/5 strength in the left lower extremity. The goals set on admission patient was able to achieve one upper extremity occupational therapy involving dressing using henti technique. Other PT/OT goals were not met. 

**Discussions:** Repeat MRI imaging performed after weakness progressed, revealed increased tumor burden in the thoracic spine and ongoing enhancement at the conus medullaris. Also present was increased edema throughout the cord consistent with craniopinal radiation changes. In setting of tumor progression, decision was then made to start patient on a combination of chemotherapy and interferon beta. 

**Conclusions:** While incredibly rare, it is important for the rehabilitation medicine doctor to consider spinal cord and vertebral metastases in a patient with primary intracranial GBM especially in patients with progressive symptoms including upper and lower motor neuron signs concerning for conus medullaris syndrome. Early recognition is likely to change rehabilitation goals and alter symptom management options. 

**Intractable Agitation in 33-year-old Traumatic Brain Injury Patient due to Trazadone Administration in Acute Inpatient Rehabilitation:** A Case Report

Rishi Shah, MD, and Jeffrey Oken, MD

**Case Diagnosis:** Intractable agitation secondary to Trazadone administration 

**Case Description:** A 33-year-old male with no significant past medical history suffered a traumatic brain injury after being struck by a train. Patient suffered diffuse axonal injury, subarachnoid hemorrhage, intraparenchymal hemorrhage, subdural and epidural hematomas. Patient also suffered a displaced T1 transverse process and right scapular fracture. Patients stay in the acute care hospital was complicated by shock, respiratory failure, and pulmonary embolism with IV filter placement. Once patient was medical stabilized patient was transferred to acute inpatient rehabilitation. Patients agitation was measured using the agitated behavior scale (ABS). On admission patients ABS was 23 patient was continued on Seroquel 25 mg TID and Klonopin 1 mg TID for agitation. Patient was also noted to have difficulty sleeping with increased agitation at night for which Trazadone was added. After Trazadone therapy was initiated patients agitation worsened. Not until Trazadone was discontinued did we see a significant drop in patients ABS. Patients average ABS with Trazadone was 32, once Trazadone was discontinued patients average ABS was 17.5, a difference of 14.5. 

**Discussions:** Trazadone is a Serotonin agonist and reuptake inhibitor commonly used in treatment for anxiety, insomnia, and depression. Trazadone is metabolized by Cytochrome P450 CYP2D6. Approximately 20% of Trazadone is metabolized into an active metabolite mCPP, mCPP can lead to anxiogenic properties when its levels exceed those of Trazadone. This can lead to increased agitation as seen in this patient. 

**Conclusions:** Agitation and restlessess secondary to Trazadone is rare phenomenon observed when mCPP levels exceed those of Trazadone. If not recognized early, it can lead to lost therapy time, injury to patients and staff, and increased length of stay. Prompt recognition and adjustments of medication by physiatrist is necessary to prevent these occurrences. Once Trazadone was identified as the cause this patients ABS score dropped from 32 to 17.5, which allowed to patient to participate in therapies and be discharged home. 

**Intrathecal Baclofen Pump Overdose in Setting of Increase in Altitude**

Michael R. Ortiz, MD, Venessa Lee, MD, Colby Hansen, MD, Allison Oki, MD, and Michael M. Green, DO

**Case Diagnosis:** This case report describes the management of a patient with baclofen pump overdose thought to be due to increased altitude exposure.
Case Description: A 15-year-old male with history of right-sided dystonic cerebral palsy and intrathecal baclofen pump presented to the emergency department with altered mental status and respiratory distress. The patient was transported from a nearby mountain range where he was found unresponsive after hiking to an altitude of 10,000 feet. He was bradycardic and cyanotic requiring oxygen on route to the hospital. It was discovered that the patient was visiting from an out of state area near sea level, arriving four days prior for hiking trip. In emergency department, he was somnolent, confused, hypothermic, and hypotonic with enlarged pupil diameter and several episodes of emesis. CT head was performed without signs of acute process. Laboratory studies showed no evidence of infection, electrolyte imbalance or glucose abnormalities. His baclofen pump was interrogated showing dose setting of 599.9 mcg/day and no abnormalities. Baclofen pump dose was decreased by 10% followed by resolution of his symptoms.

Discussions: Intrathecal baclofen pump is used to treat children with generalized spasticity or dystonia. Signs and symptoms of baclofen overdose are well documented and include sedation, somnolence, respiratory depression, hypotonia, hyporeflexia, hyperthermia, seizure, and autonomic instability. Medtronic reports indicate a theoretical risk of increased flow rate at higher altitudes. Low atmospheric pressure is thought to cause the pump to deliver up to more than 14.5% of the programmed flow rate. However, there are currently no documented case reports.

Conclusions: Patients traveling to higher altitudes above sea level are exposed to lower atmospheric pressures which can theoretically lead to higher flow rate of the pump within days of exposure. Changes in pump concentration or programming should be considered in patients exposed to lower pressures presenting with signs and symptoms of baclofen overdose.

Ipsilateral Lower Limb Weakness After Sarcoma Treatment: A Case Report
Jennifer Baima, MD, Amanda Doodlesack, BS, and Jennifer LaFemina, MD, FACS
Case Diagnosis: Our patient experienced worsening left foot neuropathy following chemotherapy and radiation treatment for sarcoma.
Case Description: A 24-year-old man underwent local resection of a 12 cm x 8 cm x 14.5 cm rhabdomyosarcoma in the left vastus lateralis. Then, he was treated with vincristine for 40 weeks and radiation to the left lateral thigh with a maximum dose of 50.4 Gy. The sciatic nerve was outside the target area and received a lower dose. While undergoing chemotherapy, the patient experienced bilateral dysesthesias in his fingertips and feet. He had no history of neuropathy prior to treatment. After chemotherapy was completed, these symptoms subsided in all extremities except the left foot which developed ataxic plantar flexion and dorsiflexion weakness, great toe extensor and flexor weakness, decreased sensation in the distal left toe to the metatarsal. Electromyography and needle conduction studies demonstrated left worse than right polyneuropathy mainly affecting the tibial and peroneal motor nerves. There was no clear evidence of a single nerve compressive lesion and repeat scans of the thigh showed no new lesion. Given the presence of milder nerve abnormalities on the right in addition to left sided weakness, the cause is likely multifactorial and temporally related to cancer treatments.

Discussions: Persistent or worsening features may appear in patients who received vincristine despite termination of treatment. The pattern is typically sensorimotor; however, this patient demonstrates mainly motor abnormalities. The left worse than right pattern could suggest radiation-induced neuropathy, but no myokymic potentials were seen. Myokymic potentials are common in radiation neuropathy, although their absence does not rule it out. Treatment included physical therapy, gabapentin, and an ankle foot orthosis.

Conclusions:Fourteen months after completing radiation and seven months after completing chemotherapy (seven months after symptom onset), the patient’s symptoms are markedly improved. This case demonstrates that neuropathy after treatment in sarcoma patients may be multifactorial.

Ischemic Global Pallidus Infarct Presenting as Hemiballismus
Emma Nally, MD, and Rachna Malhotra, DO
Case Diagnosis: Acute ischemic infarct resulting in hemiballismus in the setting of Polycythemia Vera.
Case Description: A previously healthy 74-year-old man presented to the emergency department with acute onset of isolated right hemiballismus. Magnetic resonance imaging showed acute infarct in the left globus pallidus. Laboratory studies revealed Hemoglobin of 16.8, Hematocrit of 51, platelets of 708, and positive JAK2 V617F mutation; meeting diagnostic criteria for Polycythemia Vera (PV). Therapy was initiated with aspirin, statin, and hemodilution with resolution of shurred speech but persistence of hemiballismus. He was admitted to acute inpatient rehabilitation as he required an interdisciplinary approach to address his complex physical needs due to persistent hemiballismus in the absence of sensory or other motor deficits and medical management of PV. He improved over the course of his admission and required close supervision with activities of daily living (ADLs) upon discharge, and at follow-up four months later he was independent with his ADLs with resolution of hemiballismus.

Discussions: Unilateral isolated globus pallidus lesions are rare and those described are classically associated with dystonia, Parkinsonism, dementia, chorea, and/or cognitive disorders. Hemiballismus due to an infarct in the globus pallidus is unusual and emphasizes the intricacy of the pathophysiology of hemiballismus. Furthermore, this case provides insight into the complexity of the basal ganglia and the coordination of movement. This case provides information regarding prognosis for the treating multidisciplinary team as well as methods towards modifying the rehabilitation approach for a patient with ballistic movement compared to that of the majority of stroke patients.

Conclusions: This case highlights a rare presentation of hemiballismus due to globus pallidus infarct. It provides insight into the pathophysiology of hemiballismus, the complexity of the basal ganglia, and provides the rehabilitation team with a guideline for rehabilitation technique in the setting of a rare ballistic movement.

Ischemic Stroke following Spinal Manipulation: A Case Study
Mezgebe Abegaz, MD, and Padma Sririgiraju, MD
Case Diagnosis: Ischemic stroke following Spinal manipulation
Case Description: A 44-year-old male was unable to see his normal chiropractor for recurrent neck pain because of time constraints. He normally gets adjustments from a chiropractor for neck pain every few months. One day, the patient was in so much discomfort he attempted to adjust himself. Immediately afterwards he felt nauseous, light-headed, and vomited twice. Over the next few hours his symptoms intensified, prompting an admission to the ER. Imaging of the head and neck showed tortuous looping of the right PCA and an acute left cerebellar ischemic infarct. ER Physicians concluded that the spinal manipulation was likely involved in the ischemic stroke.

Previous functional level was independent with all mobility and self-care activities. After the event, the patient had decreased mobility and self-care requiring minimal assistance to contact guard assistance for sit-to-stand transfers and 50% physical assistance for his gait training. Additionally, he had increasing difficulty with right upper and lower extremity coordination. After 15 days of rehabilitation, the patient was independent for transfers and upper/lower extremity dressing. Patient was also able to walk a distance of 500 feet with complete independence.

Discussions: It is well known that many physicians from various specialties are concerned about the associated risk between spinal manipulations and stroke. More
Isolated Intramedullary Spinal Neurosarcoïdosis Presenting as Neuropathy: A Case Report

Mayur J. Amin, MD, and Joseph Connor, MD

Case Diagnosis: A 70-year-old female with cervical spine syrinx found to be isolated neurosarcoïdosis.

Case Description: A 70-year-old African American female who presented to her primary care physician in 01/2014 with a complaint of new-onset left upper and lower extremity numbness, tingling, and weakness in addition to a noticeable difficulty with ambulation. When there was no relief in symptoms with neurophatic agents and physical therapy an MRI was performed in 04/2014. The study showed a cervical cord syrinx and high signal intensity in the cervical spine. She was then seen by neurosurgeon for evaluation. A repeat MRI was performed in 06/2014, which demonstrated an inhomogeneous mediastinal and hilar lymph nodes. On 09/08/2014 the patient underwent a C5 through C7 total decompressive cervical laminectomy with approach to the intradural, intramedullary spinal cord mass. The specimen was sent for pathology. The patient had an unremarkable hospital course and was discharged to inpatient rehabilitation on 09/11/2014 due to continued weakness and numbness causing poor mobility. Additional testing was completed during her rehabilitation hospitalization to work up these symptoms. Rapid plasma regain (RPR), Lyme antibody, antinuclear antibodies (ANA), and mycobacterium tuberculosis testing were negative. Additionally, an angiotensin converting enzyme (ACE) level was within normal range. However, the erythrocyte sedimentation rate (ESR) and C-reaction protein (CRP) levels were elevated (ESR: 79 mm/hr [normal < 3 mg/L]). On 09/15/2014 pathologic of the spinal mass returned demonstrating non-caseating granuloma with chronic inflammation and fibrosis consistent with sarcoïdosis. A CT scan of the chest was performed on 09/17/2014 was consistent with sarcoïdosis displaying both calcified and non-calcified small and medium-sized mediastinal and hilar lymph nodes. The patient was started on 40 mg of oral prednisone. She was discharged home on 09/19/2014 able to complete all activities of daily living and walking unassisted.

Discussion: Neurosarcoïdosis occurs in only 5% of patients with sarcoïdosis. Of those, about 50% present with neurologic difficulties at the sarcoïdosis is diagnosed. Clinical features include neuropathy, myelopathy or radiculopathy, meningitis, as well as others. Furthermore, patients may have no systemic features of the disease. Non-neurologic symptoms were present in less than one-fourth of patients and were most commonly anterior uveitis, cough and dyspnea, renal impairment, rash, and polyarthritis.

Conclusions: Though neurosarcoïdosis is an especially rare form of sarcoïdosis, it should not be excluded in the differential diagnosis of patients presenting with new neurologic symptoms presenting at radiculopathy, myelopathy, or neuropathy. Further testing should be conducted whether it imaging or laboratory. Neurosarcoïdosis can be effectively treated with steroids.

Ketamine Infusion followed by Acute Inpatient Rehabilitation for the Treatment of Radiation-Induced Brachial Plexus Neuropathy in a Patient With Breast Cancer

Nicole Kelleher, MD, MPH, Alan Alfano, MD, and Regan Royer, MD, MPH

Case Diagnosis: Radiation-Induced Brachial Plexus Neuropathy

Case Description: A 58-year-old female who had been treated with local radiation therapy for metastatic breast cancer, presented to clinic with severe neuropathy of the lumbar spine which revealed T12 and L1 compression fractures. The patient sustained a fall from a ladder which subsequently resulted worsening low back pain for 4 months. In the outpatient setting, his primary care physician ordered an X-ray of the lumbar spine which revealed T12 and L1 compression fractures. The patient’s fractures were managed non-operatively by neurosurgery and he was referred to pain management. The patient failed conservative treatment in the outpatient setting and subsequently underwent kyphoplasty at the T12 and L1 levels along with a translaminar cervical epidural steroid injection. The patient was not utilizing pharmacologic anticoagulation prior to the procedures. One week after the procedures, the patient presented to the tertiary care hospital with worsening low back
pain, difficulty walking, and urinary retention. This was a significant functional decline as he was living independently and did not require assistance prior to his fall. Magnetic resonance imaging (MRI) of the lumbar spine revealed an intrahepatic hematoma at the L5-S1 level. The patient was evaluated by neurosurgeons who performed an L5/S1 laminectomy, foraminotomy, and decompression for the removal of an intradural hematoma. Post-operatively, the patient noted an improvement in his low back pain, leg weakness, and urinary retention and was subsequently transferred to an inpatient rehabilitation (IPR) facility where he was able to ambulate with minimal assistance. While at IPR, the patient was noted to have copious drainage from his back incision and a constant headache, which prompted transfer back to the tertiary care hospital. The patient was noted to have headache, fever, altered mental status, and continued leakage from the incision site. A lumbar drain was placed and broad-spectrum antibiotics were initiated. There was also concern for seizure activity, and electroencephalogram (EEG) showed non-convulsive status epilepticus. The patient’s CSF culture was found to contain Vancomycin-Resistant Enterococcus (VRE). The patient later developed an epidural abscess in the lumbar spine and was subsequently transitioned to hospice due to a lack of response to treatment and no further neurosurgical intervention. The patient expired shortly after his transition to hospice care.

Discussions: There are inherent risks to any interventional procedure however rare they may be. The typical approach of a kyphoplasty is outside of the spinal canal itself, which would make spiral cord/nerve root compression unlikely. However, there have been reported cases in the literature, and a single case report of a patient where the herniation was noted to be just posterior to the vertebral bodies. This procedure was also in close proximity to where the subdural hematoma was found on imaging, which supports a kyphoplasty complication inciting the subdural hematoma. It is also reasonable to speculate that a complication from the cervical epidural injection could have potentially caused the subdural hematoma. A cervical epidural steroid injection complication resulting in cauda equina syndrome has not previously been discussed in the literature. While an incidental dural puncture is a known potential complication of any epidural procedure, it is highly unusual for a complication to occur at a site distal from the procedure itself. Lumbar back pain with or without radiation to the lower extremities has been documented in the literature from downward migration of intracranial subdural hematomas, which further supports the plausibility for distal migration of a subdural bleed from a cervical epidural complication.

Conclusions: Complications from a kyphoplasty and epidural steroid injections are typically rare events; however, worsening low back pain, leg weakness, and urinary retention in the setting of spinal stenosis should warrant concern after a procedure. This case report illustrates that complications in the form of subdural hematomas can present at sites distal to the procedure. This particular patient had a high functional baseline, which made the functional decline more apparent. As this case illustrates, there can also be a rapid clinical deterioration from a compounding effect of multiple complications. One should proceed with caution, with this patient population and attempt to minimize risk by ensuring an absence of anticoagulation therapy prior to the procedure, utilizing proper interventional technique with fluoroscopic guidance, and early neurologic examinations in the days following the procedure.

L1-L2 Intraspinal Disc Extrusion Presenting as Lumbar Radiculopathy: A Case Report

Mark Bauerfeind, MD, Nicole Strong, DO, Raymond Tan, MD, and Clifford R. Everett, MD, MPH

Case Diagnosis: Lumbar radiculain pain exacerbation secondary to intraspinal disc extrusion.

Case Description: A 61-year-old female with a history of chronic intermittent bilateral lumbosacral radicular pain presented with 6 weeks of progressive right-sided posterolateral radicular thigh and leg pain with associated foot numbness. Symptoms were exacerbated by sitting and activity, and alleviated by lying supine. The physical exam was notable for right-sided pain on resisted hip flexion and a positive straight leg raise test. Worsening unilateral radicular symptoms prompted further workup with a MRI and nightly dosed gabapentin was prescribed. The gabapentin was later transitioned to Lyrica due to concern for potential side effects on memory and dizziness. MRI demonstrated a new tear-drop shaped lesion 0.6 x 1.1 x 1.5 cm in dimension, consistent with a L1-L2 right lateral intraspinal disc extrusion into the psos muscle with surrounding inflammation. Neuroforaminal stenosis was unchanged from prior MRI obtained approximately 1.5 years earlier. Ultimately, it was anticipated that the disc herniation would gradually resolve with time. At 2-month follow-up, the relieved radicular symptoms were improved without notable side effects on Lyrica.

Discussions: Disc herniations are very common. Posterolateral herniations followed by central herniations are the most common while far lateral and anterior herniations are less common. Lateral disc extrusion into the psosas muscle is exceedingly rare, which can be mistaken for a psosas abscess. There are only two known documented cases of such herniations. One presented as gait abnormality, posterior pelvic pain, and hip pain. The other presented as right flank pain with radiation to the right leg. To our knowledge, this case is the first description of an intraspinal disc extrusion at L1-L2 presenting as an exacerbation of lumbar radicular pain, possibly related to altered lumbar biomechanics.

Conclusions: While disc extrusion into the psosas muscle is extremely rare, it may exacerbate prior lumbar radicular patterns of pain on presentation.

Late-Onset Atlantoaxial Instability Results in Brainstem Dysfunction and Intractable Nausea and Vomiting in C5 ASIA A Spinal Cord Injury

Katie M. Fast, MD, and Jane Anne Emerson, MD

Case Diagnosis: Brainstem dysfunction secondary to atlanto-axial instability causing intractable nausea and vomiting.

Case Description: A 16-year-old female who was status post motor vehicle accident suffered a C5 ASIA A spinal cord injury. Acutely, she underwent C2 cervical fusion for spine stabilization; she also required a gastric and tracheostomy tube. She was transferred to inpatient rehabilitation one month following her injury, but suffered intractable nausea/vomiting and feeding intolerance, severely limiting her initial rehabilitation. Multiple etiologies were considered and included medication side effects, gastroparesis, autonomic dysreflexia, anxiety, hypokalemia, gastric reflux, and constipation. Each of these was treated systemically with multiple medication changes and feeding adjustments. Electrolytes including calcium were within normal range throughout her stay. Additional multifactorial treatment considerations included modifications to patient’s positioning, rehabilitation psychology, wheelchair adjustments to improve sitting tolerance and overall comfort, and modified therapy sessions. However, her symptoms persisted despite these treatments and she continued to lose significant weight and her participation in therapy remained suboptimal. Her inpatient physiatrist became increasingly concerned with centralized etiology although she had no other signs or symptoms. Cervical MRI demonstrated subluxation of the dens onto the brainstem, denoting brainstem compression and concern for atlantoaxial instability. She underwent occipital to C2 fusion with resolution of symptoms and successfully completed rehabilitation.

Discussions: Nausea and vomiting have many potential etiologies in spinal cord injury and are rarely refractory. Despite extensive and appropriate treatments this patient’s symptoms remained persistent and intractable, severely limiting re habilitation. Central etiology should be considered in such circumstances.

Conclusions: Brainstem dysfunction may manifest as persistent, intractable nausea and vomiting in cervical spinal cord injury and should be considered if all other treatments prove ineffective.

Late-Onset Superior Mesenteric Artery Syndrome in Spinal Cord Injury Patient

Jacob Feihl, MD, and John Dennis Alfonso, MD

Case Diagnosis: Superior Mesenteric Artery Syndrome.

Case Description: A 35-year-old traumatic C5 AIS A spinal cord injury (SCI) sustained during a motor vehicle presented the emergency center in 2013 with 8/10, non-radiating, dull, cramping, diffuse, constant abdominal pain. Abdominal computed tomography scan was negative and the patient was discharged home. He returned to SCI Clinic in January 2015 following a long hiatus and reported persistent abdominal pain for greater than one year. During that time he had undergone gastrointestinal shunting of an earlier diagnosed syrinx spanning C6 to T1 levels, left orchectomy for suspected recurrent epididymitis, and biopsy of three liver lesions identified on an abdominal computed tomography study performed at an outside hospital, the results of which revealed normal hepatic tissue, however his abdominal pain continued. Additional history revealed that he also suffered from early satiety, decreased appetite, and weight loss over the past year. We obtained an upper GI series with gastrografin. The imaging and clinical history were compatible with superior mesenteric artery (SMA) syndrome. The patient was referred to a nutritionist for closer nutritional surveillance and weight trending. We advised the patient to ingest smaller, more frequent meals and to reposition in the prone or left lateral decubitus postprandially.

Discussions: SMA syndrome is a rare complication of SCI described in only a handful of case reports and reviews between 1975 and 2015. The condition is associated with symptoms which may yield significant morbidity and mortality if not addressed. Our patient developed SMA syndrome seven years after sustaining SCI, and underwent a multitude of examinations and interventions to obtain an accurate diagnosis.
Abstracts

Conclusions: Chronic abdominal pain in SCI patients involves a broad differential workup. Although exceedingly rare, particularly in patients with chronic SCI, SMA syndrome should be considered in patients with abdominal pain, early satiety, and profound weight loss despite the chronicity of SCI.

Left Sided Weakness and Incoordination Following Kyphoplasty in 83-year-old Male Leads to Diagnosis of Multiple Sclerosis

Rene C. Ruggiero, MD, Christopher T. Isham, BS, and Michael Yoshida, MD, PhD

Case Diagnosis: This case report identifies the signs and symptoms of late onset multiple sclerosis (LOMS, onset > 50 yrs) to encourage earlier diagnosis and treatment.

Case Description: An 83-year-old male presented to IPR s/p T12/L3 kyphoplasty after a ground level fall. Initially, patient demonstrated dysarthria, hearing loss and left-sided incoordination with no significant muscle weakness. On day 8 patient had difficulty clearing his left foot during gait. The left lower extremity was 3/5 strength for dorsi and plantar flexion. Further history gathering revealed patient fell in 2014, resulting in a right fibula fracture. Additionally, the family first noticed a “speech impediment” 5 years prior, which they attributed to his hearing difficulties. This case illustrates LOMS in a male patient with symptoms of progressively worsening dysarthria and incoordination that may have been present 5–7 years before diagnosis. Although LOMS is often responsive to treatment, delayed diagnosis of LOMS occurs in over two-thirds of patients. Furthermore, comorbidities are common in this population, often obscuring the presentation of underlying LOMS, which emphasizes the necessity of vigilance to recognize unusual MS symptomatology in the elderly.

Discussion: This case enlightens us to consider LOMS as a differential diagnosis in our elderly patients with weakness, dysarthria or incoordination. In this patient, specifically, his age and existing comorbidities contributed to a clinical presentation that buried MS on the list of differentials, prohibiting an earlier diagnosis.

Leg Paralysis after Epidural Steroid Injection: A Case of Congestive Myelopathy

Ziva Petrin, MD, Christina Olesen, MD, and Ralph J. Marino, MD, MS

Case Diagnosis: Our patient is a fit 87-year-old male, who lives independently with his wife, and is physically very active. His past medical history includes prostate cancer s/p local irradiation, well controlled hyperlipidemia and hypertension.

He has a history of long standing low back pain radiating to the left thigh and prior diagnosis of bilateral radiculopathy. This had worsened over the preceding three months, and he suffered from intermittent back pain radiating to both legs, associated with intermittent leg bucking and falls. He further described episodes of transient loss of feeling and strength in his legs, associated with episodes of intermittent unexplained fecal incontinence.

Case Description: He underwent an outpatient epidural injection of non-particulate single-use steroid at L5-S1 for bilateral leg pain thought to be secondary to spinal stenosis with radiculopathy and had returned home without any complications. However, within hours post-injection, he developed severe pain radiating down his legs. The pain resolved with opioid medication, and he went to sleep. The next morning, however, he was unable to get out of bed due to bilateral lower extremity paresis with associated incontinence of urine.

He was initially evaluated at a local emergency department, where he was noted to have bilateral lower extremity complete sensory and motor loss, as well as 2000 cc urinary retention. MRI showed spinal cord edema from mid-thoracic to lumbar cord terminating at the conus. He received 10 mg dexamethasone intravenously for concern for transverse myelitis and was transferred to a tertiary spine care center.

On transfer admission the next day, his sensation and leg strength had partially improved. He had residual patchy weakness grades 1/5 to 4/5 in the muscles of the lower extremity and normalization of the sensory deficit.

A repeat MRI of the thoracolumbar spine was performed giving atypical clinical presentation, which showed vascular patterns concerning for dural arterio-venous fistula (AVF). (Figures 1&2) MRA with Time Resolved Imaging of Contrast Kinetics (TRICKS) imaging confirmed this suspicion. (Figures 3–5) Coiling of a feeder vessel was attempted, but failed secondary to difficulty accessing the feeding vessel. After the angiogram and attempted coiling, the patient again suffered from transient complete paralysis of the bilateral lower extremities, likely secondary to vascular congestion.

He underwent a T12-L2 laminectomy and clamping of the dural AVF. His neurological status again improved to normal sensation and at least antigravity strength bilaterally following the procedure. He was discharged to an acute rehabilitation facility.

While paresis closely followed the epidual injection of steroid in this patient, it is most likely that the procedure merely exacerbated the underlying vascular congestion, resulting in cord edema. Similar transient edema resulted after attempted coiling, with improvement in motor within hours. The transient and reversible nature of neurological changes and typical findings on imaging do not support any evidence of direct needle injury, spinal cord injury or post-procedure thrombosis or infarction.

Discussion: Myelopathy secondary to AVF has a known presentation which waxes and wanes and can be mistaken for spinal stenosis or lumbar radiculopathy, particularly since both disease processes occur in the older population, with a higher incidence of concurrent degenerative changes of the spine.

The syndrome of congestive myelopathy associated with vascular malformation has also been termed Foix-Alajouanine syndrome, after two cases of myelopathy secondary to thrombosis of a vascular malformation described by the authors Foix and Alajouanine in 1926. The incidence of the syndrome is unclear, but the condition typically occurs in older (>50 years) and predominantly male patients (estimated male to female ratio 5:1). Venous congestion in the vascular malformation can cause reversible edematous myelopathy, which can progress to irreversible necrotizing myelopathy in the case of thrombosis in the malformation.

While significant vascular malformations can be seen on basic MRI weighed images as seen in Figures 1 & 2, improved imaging for surgical planning can be obtained with MRA and TRICKS imaging as seen in Figures 3–5.

Treatment aims to resolve the underlying vascular congestion, either with coiling of feeding and draining vessels, or by surgical clipping and resection.

Conclusions: Lower extremity weakness after epidural steroid injection is a rare event with unclear incidence. Diffuse lower extremity weakness or sensory loss in a distribution outside of the injected nerve root level should prompt an evaluation for spinal cord pathology, including spinal cord infarct, direct damage from needle, hematoma or infarction. Congestive myelopathy can mimic radiculopathy or spinal stenosis with complaints of leg pain with weakness, but has a typical presentation with waxing and waning symptoms in the older patient.

In the case of fluctuating deficits, consider vascular malformation and evaluation with MRA with TRICKS sequences, which are more sensitive than standard MRA sequences.

Lifting the Veil on a Serious Disease Presenting as Common Low Back Pain

Kimberly Ross, MD, MBA, Katherine Lin, MD, and Andrew L. Sherman, MD, MS

Case Diagnosis: A 69-year-old male presented with a three year history of chronic non-radiating low back pain (LBP) exacerbated by heavy lifting. He denied any bowel or bladder incontinence or saddle anesthesia. A lumbar X-ray revealed an ill-defined sclerotic area of the right L1 pedicle. Follow-up bone scan demonstrated confluent areas of radiotracer accumulation in bilateral calvaria indicating bone turnover of unclear etiology. A lumbar MRI revealed multiple metastatic bone lesions throughout the lumbar spine, sacrum, and ilium without pathologic fractures or epidural extension. PET-CT scan demonstrated widespread lesions involving the right frontotemporal region, cervical, thoracic, and lumbar spine, pelvis, axillary lymph nodes, bilateral humeral heads, scapulae, clavicles, ribs, and left femoral neck. Interventional radiology (IR)-guided sacral biopsy demonstrated follicular lymphoma. He was diagnosed with stage IV disease given the extensive skeletal involvement. His follicular lymphoma international prognostic index (FLIPI) score is at least a 3 (elevated LDH, age ≥60, 0–2 nodal sites). He was assessed by Oncology and scheduled to start treatment with bendamustine and rituximab.

Discussion: LBP is a nonspecific symptom that can be overlooked or attributed to more common, less malignant etiologies. Acute LBP has a lifetime prevalence of 75-80% and generally is self-limiting. Initial presentation often does not warrant imaging unless there is neurological involvement or clinical suspicion of a more severe diagnosis. The majority of cases can be attributed to a mechanical axial cause of pain arising from myofascial, facetogenic, discogenic, spondylotic, or stenotic etiologies. Close follow-up is advised and if pain is unremitting, a plain X-ray should be considered to avoid imaging.

Conclusions: Investigating chronic unremitting symptoms can help unveil serious diagnoses masquerading as common, benign conditions. Having a broad differential, including more serious diagnoses, may lead to a more timely diagnosis and treatment.
Lumbar Transforaminal Epidural Steroid Injection for Severe Pain Caused by Diabetic Amyotrophy

Jean Guy-Yoma Souffrant, MD, and Lingli Zhou, MD

Case Diagnosis: To our knowledge, there are no reported cases of diabetic amyotrophy treated with transforaminal epidural steroid injections. A review of the literature revealed cases treated with IVIG, oral steroids, other immunomodulating agents, analgesics, tricyclic antidepressants, and anti-seizure drugs with variable response. This case reports on a case of severe pain and weakness associated with diabetic amyotrophy that responded well to lumbar transforaminal epidural steroid injections.

Case Description: A 66-year-old male with a diagnosis of type II diabetes, developed progressive pain, weakness and atrophy in his left lower extremity. His initial symptom was buckling of the left knee followed by frequent episodes of falls and numbness over the anterior thigh, spreading to the left ankle. Shortly thereafter, he developed low back pain radiating to the anterior thigh and anterior leg despite adequate diabetic and pain control. Over the next few months, his symptoms worsened. His symptoms became so debilitating that by 6 months, he was confined to a wheelchair. His right lower extremity was asymptomatic.

On physical examination, he was overweight (BMI = 30) but looked reasonably healthy. There were multiple skin changes in both lower legs. Examination of both upper extremities, right lower extremity and left great toe extension showed normal motor responses in both upper extremities, trace at the right patella and absent at both Achilles. Light touch and pinprick sensation were intact in the right lower extremity and decreased at the left L-2, L-3, L-4 and L-5 distribution. Babinski, clonus and Hoffman’s signs were negative. Vibration was decreased in both ankles. X-ray of the lumbar spine revealed lumbar degenerative disc disease. The hips appeared normal. His lumbar MRI revealed multiple level mild degenerative disc disease. No foraminal or subarachnoid stenosis. No compression deformity or pathologic marrow edema. Nerve conduction studies showed decreased motor responses in the left femoral, peroneal and posterior tibial motor responses. Needle electromyography (EMG) showed acute denervation of the proximal and distal muscles of the left leg and left lumbar sacral paraspinals. Based on the clinical and electrodiagnostic findings, a diagnosis of diabetic amyotrophy was made.

Glycemic control, analgesics and physical therapy provided no benefit. Three months later, he received a series of 3 epidural steroid injections, 2 weeks apart at L2, L3 and L4. Before treatment, his visual analog pain scale score was 10/10 (0 = no pain, 10 = worst pain ever experienced). His first injection provided significant pain relief. His pain score was 0/10. Following the second injection, he was able to ambulate with a rolling walker. At six months, the pain was completely resolved and his proximal muscle strength continued to improve.

Discussion: DA commonly affects the lumbar sacral plexus, nerve roots and peripheral nerves. Its typical features include subacute progressive weakness and atrophy of proximal limb muscles, decreased motor conduction velocity of the femoral nerve, absence of sensory disturbance and normal CSF study. Its
pathogenesis remains largely unknown. Both metabolic and ischemic theories have been proposed. DA is thought to be due to proximal nerve infarct and its natural course is variable, with variable but often incomplete improvement. The initial pain associated with DA is severe and may persist for years. In the majority of patients, the pain improves several months following initial presentation. It is typically limited to superficial pain. It is important for physicians to be aware of this condition as one of the causes of LBP for proper management.

Maligne's syndrome: an underdiagnosed cause of low back pain

Abir Naguib, MD

Case Diagnosis: A 56-year-old male with right-sided low back pain for 6 months with no inciting event.

Case Description: Patient's pain was sharp, felt in the right lower back and sacral area with no radiation to the legs. It was aggravated by standing and rotational movements. He had been using acetaminophen with minimal pain relief. He denied paresthesia or weakness in his legs and denied any sphincteric dysfunction. There were no neurological deficits. Straight leg raising test, FABER and pelvic compression tests were negative. Radiographic studies were unremarkable showing mild degenerative changes of the lumbar spine. The clinical picture was consistent with Maigne's syndrome. He was referred to PT for spinal manipulation which resulted in good pain relief.

Responses: Maigne's syndrome, also known as thoracolumbar junction syndrome (TLSJ) is a frequent cause of LBP that is often misdiagnosed as lumbo-sacral or sciatic dysfunction. It is often involved in rotatory movements and can be due to minor intervertebral dysfunction at the thoracolumbar junction. It can also occur without any obvious precipitating factors. Pain can be caused by entrapment of the cutaneous dorsal ramius of L1 when it crosses the iliac crest. Examination of thoracolumbar junction area may produce tenderness. Imaging is non-contributory and diagnosis is made clinically. Treatment involves NSAIDS, spinal manipulation and anesthetic blocks.

Conclusions: TLSJ is a common cause of unilateral LBP that is underdiagnosed. Due to the referred nature of the pain, which can also include groin pain, it is often misdiagnosed and improperly treated. It is important for physicians to be aware of this condition as one of the causes of LBP for proper management.

Malleable Penile Prosthesis Extruding through the Phallus in a Paraplegic Male: A Rare Urologic Complication in a Spinal Cord Injury Patient

Vidya Jayawardena, MD

Case Diagnosis: This is a case report of an 86-year-old paraplegic male with SCI for sexual rehabilitation. He was referred to clinic, it was noted that a white foreign object was visible through the urethra. As the patient had no intact sensation in this area, he was not aware of it. He has been using a catheter due to convenience and safety. He denied having dysuria, fever, chill, nausea, or oemesis. He continued to drain clear yellow urine. He has a Malleable penile prosthesis placed about 30 years ago and does not use his prosthesis for sexual intercourse.

Magnetic Resonance Imaging Guided Administration of an Oncolytic Adenovirus for Glioblastoma Multiforme

Neeley Thalakar, MD, Brian D. McMichael, MD, and Brian Walsh, MD

Case Diagnosis: Magnetic Resonance Imaging Guided Injection of an Oncolytic Adenovirus in a patient with Glioblastoma Multiforme

Case Description: A 43-year-old woman was admitted to an inpatient rehabilitation facility following multiple craniosynostoses for resection of recurrent glioblastoma multiforme (GBM) and multiple rounds of chemotherapy with poor response. Her case was reviewed at the neuro-oncology tumor board and she was determined to be eligible for magnetic resonance imaging (MRI)-guided administration of an oncolytic adenovirus. This procedure occurred in July 2016 after which the patient was discharged to inpatient rehabilitation. During her 2-week rehabilitation course the patient worked with therapists to improve her right hemiparesis, cognition, and aphasia with only modest functional gains.

Conclusions: GBM is notorious for being resistant to most chemotherapeutic drugs with resulting local recurrence and poor prognosis. Ongoing clinical research of oncolytic viruses (OVs) suggest that they may be a promising treatment option for gliomas in the near future. Use of OVs began in the 1990's with the list of potential OVs expanding to over 20 different viruses, 7 of which have undergone clinical trials specifically for GBM. These viruses include herpes simplex virus, adenovirus, Newcastle disease virus, reovirus, EBV, parvovirus, measles virus, and poliovirus. While GBM remains the main focus of OVs as it is almost always confined to the brain with metastasis occurring rarely. In addition, most GBM tumor cells are surrounded by post-mitotic cells, which poses an advantage for OVs as they require an active cell cycle to replicate.

Discussions: The current standard of care for GBM involves surgical resection followed by chemoradiation with low survival. Injection of oncolytic adenovirus is an adjuvant treatment option that is currently investigational and undergoing clinical trials. Further research is needed to determine the clinical efficacy of OVs in GBM. In the meantime, physiatrists may encounter GBM patients that have undergone OV injection.

Adenovirus for Glioblastoma Multiforme

Neelay Thakkar, MD, Brian D. McMichael, MD, and Brian Walsh, MD

Case Diagnosis: Possible right subthalamic nucleus of Luys stroke resulting in hemiballismus

Case Description: Possible right subthalamic nucleus of Luys stroke resulting in hemiballismus

Case Description: A 79-year-old female with history of hypertension, hyperlipidemia, and diabetes presented with slurred speech, facial asymmetry, and headache. Her blood pressure was 237/130. Nicardipine was administered with improvement in her blood pressure. CT head was negative. CT angiogram revealed subtle right frontal ischemic defect. MRI revealed no acute intracranial findings, however, extensive periventricular deep white matter disease and old infarcts were present. She was admitted to neurology service for treatment of new onset left sided flinging movements of her extremities characteristic of hemiballismus. Haldol and tetraabenazine, the conventional treatments for hemiballismus were not administered due to her prolonged corrected QT interval (QTc). Clonazepam and gabapentin were ineffective. Hemiballismus was likely secondary to lacunar infarct in the right subthalamic nucleus of Luys which was not detectable on imaging studies. The patient was subsequently admitted for inpatient rehabilitation where her abnormal movements were controlled with lurasidone. The use of immunomodulating agents including IVIG, IV and oral steroid resulted in a reduction in pain and significant improvement in strength. IVIG is thought to inhibit the function of T-cells, macrophages and modulate antibody production but has many potential adverse effects.

Conclusions: The presentation of asymmetric, subacute progressive proximal lower limb weakness and muscle atrophy in diabetics should be highly concerning for DA. The physical examination and electrodiagnostic studies are important diagnostic tools. Nerve and muscle biopsies are not typically done but may show loss of small and large myelinated fibers and axonal changes, or evidence of vasculitis or inflammation affecting primarily the proximal musculature. An MRI of the lumbar spine helps rule out an infection or tumor affecting the lumbosacral nerve roots or plexus. DA has variable natural course and symptoms usually improve with better glycemic control. Analgesics, oral steroids, tricyclic antidepressants, anti-seizure drugs and immunomodulating agents have all been used. Lumber transforaminal epidural steroid injections have less side effects than IVIG and oral steroids. It provided significant pain relief and overall improvement in mobility and may be another valuable treatment option for patients with DA.

Lurasidone for Treatment of Hemiballismus Following Possible Cerebrovascular Accident: A Case Report

Bhavi Patel, DO, Rodion Enrenburg, MD, Paul A. Pipia, BA MS MD, and Susan M. Stickevers, MD

Case Diagnosis: Possible right subthalamic nucleus of Luys stroke resulting in hemiballismus

Case Description: A 79-year-old female with history of hypertension, hyperlipidemia, and diabetes presented with slurred speech, facial asymmetry, and headache. Her blood pressure was 237/130. Nicardipine was administered with improvement in her blood pressure. CT head was negative. CT angiogram revealed subtle right frontal ischemic defect. MRI revealed no acute intracranial findings, however, extensive periventricular deep white matter disease and old infarcts were present. She was admitted to neurology service for treatment of new onset left sided flinging movements of her extremities characteristic of hemiballismus. Haldol and tetraabenazine, the conventional treatments for hemiballismus were not administered due to her prolonged corrected QT interval (QTc). Clonazepam and gabapentin were ineffective. Hemiballismus was likely secondary to lacunar infarct in the right subthalamic nucleus of Luys which was not detectable on imaging studies. The patient was subsequently admitted for inpatient rehabilitation where her abnormal movements impaired her ability to participate in therapy. A trial of lurasidone for control of her hemiballismus was attempted due to its lower propensity for QTc prolongation compared to other drugs of its class. Daily EKGs were monitored without evidence of QTc prolongation and hemiballismus was successfully controlled with lurasidone. Her ability to tolerate therapy improved and she was discharged home with a 20 point gain in her FIM score.

Discussions: This case warrants review as it demonstrates a novel, currently off label use of lurasidone for the treatment of hemiballismus. Lurasidone has a lower propensity for QTc prolongation and a better metabolic side effect profile than agents typically used for treatment of this condition.

Conclusions: Lurasidone warrants further study as a possible agent for the control of hemiballismus, particularly in patients with QTc prolongation and metabolic syndrome.
In the ER, given that this has likely been present for over two weeks and did not appear infected at that time he was discharged to home with a urology clinic appointment in the following week. He was given information to decide whether he wanted surgery or observation. If he was found to have bedside removal of it, whereas with two, he will require surgery under anesthesia. Then he was sent home with the Indwelling Catheter for Neurogenic Bladder.

Following week he presented to Urology clinic. He underwent removal of extruding cylinder at bedside. As there was no resistance during the procedure, it was thought that the prosthesis had broken prior to removal. This may also explain why the prosthesis began migrating out of the meatus. Given that the rear tip extender remained in place and may be exposed to urine, he was kept on a course of Cefepim to prevent infection until follow up in three to four weeks. He was informed to return to ER if he developed any signs of local or systemic infection.

Discussions: Penile implants have high patient satisfaction rates. It is being used for SCI patients to keep condom catheters in place, for sexual function and for ease of intermittent catheterizations. However, they do present complications which can be classified into three broad categories: implantation, infection and mechanical failure of the prosthesis. Implantation complications are: Buckling, Migration, Displacement and prostheses cross over. Infection can be associated with the prosthesis. Mechanical failure is associated with Fracture of the prosthesis and erosion in genitals of Spinal cord injury patients, due to their sensation deficits. They can have these complications without any warning or pain. In this patient population it can also present with autonomic dysreflexia if they are prone to get dysreflexia and are high level Spinal cord injury. Therefore Physicians taking care of Spinal cord injury patients should be cautious and should weigh benefits versus risks when recommending this to their patients.

Conclusions: Although beneficial in a subset of patients, Complications of penile implants can have serious medical consequences, especially in patients without sensation in the genitalia. It has been suggested that Magnetic Resonance imaging can be used to investigate malpositioning of the implant to detect abnormalities. Patients, spouses, partners and caregivers should be well informed of all the complications prior to getting this procedure done if they have sensation deficits.

Management of High Grade Spondylolisthesis from Pregnancy to Delivery

Blossom Samuels, MD, and Farah Hameed, MD

Case Diagnosis: Management of High Grade Spondylolisthesis from Pregnancy to Delivery

Case Description: A 38-year-old woman presented with intermittent low back pain at 17 weeks gestation during her first pregnancy. The patient had a history of intermittent, nonradiating low back pain that started several years earlier after she fell from a horse during a horseback riding session. Sometime after the accident, she sought medical attention for her pain, and was found to have grade 4 L5-S1 spondylolisthesis on an MRI. She had been monitored every few years since then to evaluate for progression. Her last MRI in 2012 revealed persistent high grade spondylolisthesis. Due to minimal symptoms, she avoided any surgical correction over the years. However, now at 17 weeks into her pregnancy, her obstetrician anticipated that her history of spondylolisthesis could complicate the pregnancy and delivery, and therefore referred her to rehabilitation medicine for an evaluation of her condition. Her clinical exam demonstrated no neurologic deficits, and lumbar range of motion was pain free. Rehabilitation medicine closely followed her throughout the pregnancy to coordinate care with her obstetrician. Based on the high grade of spondylolisthesis, along with the potential for progression due to ligamentous laxity associated with pregnancy, she was referred to physical therapy to work on a neutral spine stabilization program. She was advised to minimize heavy lifting and any maneuvers that might cause significant spinal loading. Additionally, the patient was referred to consult with orthopedic spine surgery in order to establish a point of care in the event that her condition progressed and urgent surgical intervention was necessary. Furthermore, an anesthesia consult was also placed in order to ensure that they were aware of her condition and make sure they would feel comfortable performing spinal anesthesia. She was followed by rehabilitation medicine every 2-4 weeks for neurologic checks as her pregnancy progressed. On reviewing the scans, it became apparent that there was a need for delivery modifications in patients with high grade spondylolisthesis, a shared decision was made including discussion with the patient, rehabilitation physician and obstetrician that she would deliver via cesarean section to minimize the risk of any complication. At 39 weeks gestation, without any changes in her neurologic status or significant worsening of her back pain, she underwent successful cesarean section. The delivery was uneventful and she was discharged home the same day.

Discussions: In asymptomatic cases of high grade spondylolisthesis, conservative management is generally preferred. Prior studies have concluded that pregnancy does not constitute a risk for progression of spondylolisthesis, however the literature on this particular issue is very limited. In this case, rehabilitation medicine assisted this patient with establishing point of care with orthopedic spine surgery and anesthesia in order to ensure that if any urgent change in status were to develop, that a plan of care would be in place. She was followed closely in order to monitor her neurologic status, and participated in physical therapy to learn a neutral spine stabilization program. In this case, the delivery through a planned cesarean section was uncomplicated; and is currently the standard of care recommended in the literature for this patient population.

Conclusions: Patients with high grade spondylolisthesis in pregnancy should be closely monitored for pain control and neurological stability due to the theoretical risk for progression from spondylolisthesis from ligamentous laxity associated with pregnancy. Through an interdisciplinary approach to management of high grade spondylolisthesis in pregnancy, rehabilitation medicine can assist to establish a supportive network of multiple specialists. This allows for close monitoring throughout pregnancy in order to prepare for potential complications. In this case, the delivery was uncomplicated via cesarean section; however there is very little literature outlining delivery recommendations for pregnant patients with high grade spondylolisthesis.

Management of Segmental Dystonia Associated to Knee Replacement Surgery: A Case Report

Tricia Prince, DO, MS, Amir Mahajer, DO, and Ramon Cuevas-Trisan, MD

Case Diagnosis: Joint replacement is a common surgical treatment for end-stage osteoarthritis (OA). This case describes a very rare case of limb dystonia following total knee arthroplasty (TKA) with treatment utilizing functionally targeted Onabotulinumtoxin-A (OBTA) injections [1, 2, 3, and 4], bracing and therapy.

Case Description: A 76-year-old male Veteran presented with three years of left lower extremity (LLE) functionally short limb and painless, gait-induced, scissoring, knee flexion dystonic gait requiring a walker to ambulate very short distances with extreme difficulty [5,6]. Onset of segmental dystonia and gait dysfunction was shortly after primary TKA for end-stage OA [6]. Eventual post-surgical course included deep vein thrombosis, hemorrhatis and insertion of a larger joint spacer ten months later. After negative brain imaging and electrodiagnostics [7] treatments included extensive therapy, Carbipedia/Levodopa, Pimozide, Risperpine, tibal nerve phenol injection, and 200 then 300 units of OBTA injections to the illopoas, hip adductors, rectus femoris and hamstring, but the dystonia and severe gait dysfunction persisted. Only the first OBTA afforded one month of minimal improvement.

Discussions: Our evaluation and management included a new trial of OBTA injections targeting the most proximal functionally-affected muscles (hip adductors and hamstringa for a total of 250 units). All injections performed using electromyographic guidance [7]. Gait assistance was provided with a left i-ROM locking knee brace allowing for full knee extension and locking at twenty degrees’ knee flexion during ambulation/upright activities with quick release for sitting. Therapy prescription focused on stretching with heat modalities. Upon follow-up, marked improvement in mobility, weight-bearing and ambulation was noted. A second course of OBTA included injection of more distal muscles (medial gastrocnemius and tibialis posterior) for a total of 350 units. At follow-up, the patient’s gait had nearly normalized without the brace or assistive device for household ambulation and only using a single-point cane for long distance ambulation.

Conclusions: To our knowledge, this is the first case describing treatment of dystonia following TKA with targeted OBTA after several failed treatments.

Managing Rehabilitation and Therapeutic Anticoagulation for Venous Sinus Thrombosis during Pregnancy

Heidi Choe, DO, Andrew K. Abdou, DO, Aditya Raghunandan, MD, and Jeffrey S. Fine, MD

Case Diagnosis: A 35-year-old 5-week pregnant female with venous sinus thrombosis was admitted for a total of 350 units. At follow-up, the patient’s gait had nearly normalized without the brace or assistive device for household ambulation and only using a single-point cane for long distance ambulation.

Discussions: Our evaluation and management included a new trial of OBTA injections targeting the most proximal functionally-affected muscles (hip adductors and hamstring). All injections performed using electromyographic guidance [7]. Gait assistance was provided with a left i-ROM locking knee brace allowing for full knee extension and locking at twenty degrees’ knee flexion during ambulation/upright activities with quick release for sitting. Therapy prescription focused on stretching with heat modalities. Upon follow-up, marked improvement in mobility, weight-bearing and ambulation was noted. A second course of OBTA included injection of more distal muscles (medial gastrocnemius and tibialis posterior) for a total of 350 units. At follow-up, the patient’s gait had nearly normalized without the brace or assistive device for household ambulation and only using a single-point cane for long distance ambulation.

Conclusions: To our knowledge, this is the first case describing treatment of dystonia following TKA with targeted OBTA after several failed treatments.
Discussions: Cerebral venous sinus thrombosis has a variety of clinical presentations ranging from a severe headache to deep coma. The most common presentation includes a headache (97%) followed by seizure attacks (47%) and paresis (43%). Women are more commonly affected than men, with a ratio of 1.29:1. It is commonly presented in women of 25–35 years of age and occurs more frequently than during pregnancy. No cause is identified in 20% to 25% of patients. The most common pathogenesis includes hypercoagulable states such as pregnancy and puerperium and the use of oral contraceptives.

Conclusions: This case demonstrated several challenges overcome by the patient and the rehabilitation team. The patient was unaware she was pregnant at the time of her hospital admission and was faced with a decision as to whether or not to terminate the pregnancy. Furthermore, anticoagulation and seizure prophylaxis posed an additional risk to the fetus. Through education on the safety profile of her medications, efficacy of rehabilitation, and long-term planning of common rehab considerations during her pregnancy, the patient was motivated to recover.

Metastatic Breast Cancer Presenting as Upper Extremity Skin Rash in a Patient with Lymphedema: A Case Report
Thomas Lione, DO, and Susan Maltser, DO

Case Diagnosis: The majority of breast cancer related deaths are due to metastatic disease and not due to primary tumor. Detection of breast cancer metastasis relies on clinical signs, biopsies, radiological imaging, and serum tumor markers. Rarely, cutaneous metastasis occurs and can be of major clinical significance indicating advanced disease. Early recognition is vital, but can be challenging given the variety of dermatological pathologies that may occur in tandem with, or following cancer treatments.

Case Description: A 54-year-old female with history of breast cancer status post mastectomy, lymphedema-undergoing therapy, status post chemotherapy and radiation, presented with chest and right arm pain, rash, and worsening edema one and a half years after initial diagnosis. The patient underwent upper extremity ultrasound to rule out DVT and was subsequently diagnosed with post-radiation skin changes with superimposed infection and treated with broad-spectrum antibiotics for cellulitis. After rash did not resolve, dermatology was consulted and punch biopsy ultimately revealed poorly differentiated carcinoma consistent with cutaneous metastatic breast cancer.

Discussions: Breast cancer is the most common cancer among women and the second commonest cause of cancer deaths among U.S. women. Typical signs of recurrent breast cancer include presence of new breast lumps, pain in bone, chest, or abdomen, fatigue, and dyspnea. Cutaneous metastases do occur, but are rare and only encountered in 0.7-0.9% of cancer patients. Further, cutaneous metastatic breast cancer can simulate cellulitis or a breast-plate (“en cuirasse”) pattern making identification and early action challenging.

Conclusions: Cutaneous metastatic breast cancer is rare, but early identification is of paramount importance due to its prognostic implications. Diagnosis may be challenging in the absence of classic clinical signs of recurrence, but physiatrists specializing in cancer rehabilitation and treating patients with lymphedema should be especially aware of this potential manifestation and include cutaneous metastasis in the differential diagnosis for any cancer patient with dermatologic symptoms.

Mild Traumatic Brain Injury with Concomitant Superficial Temporal Artery Aneurysm
Majid Dadgar-Kiani, DO, Justin S. Hong, MD, and Lori M. Grafton, MD

Case Description: A 19-year-old male struck in the right temporal region with a baseball without loss of consciousness or amnesia who presented to the emergency department with complaints of pain and pressure behind his right eye. Examination was neurologically non-focal. Imaging demonstrated right-sided fronto-temporal intraparenchymal hemorrhage with non-displaced sphenoid fracture. He was started on Leveteinatcem for seizure prophylaxis and admitted for observation. He was discharged the following day. About one year later, he presented to Physical Medicine and Rehabilitation clinic with complaints included throbbing bulge over the right temple, decreased hearing, intermittent blurry vision, and memory problems. Examination was significant for decreased right-sided hearing and a palpable thrill over the right temporal area. Workup including MRI/MRA brain and transcranial Doppler demonstrated multiple dilated channels anterior to the right ear and temporal scalp supplied by branches of the right external carotid artery (ECA) and showed a right superficial temporal artery (STA) aneurysm 9.5mm in maximum diameter. We referred him to neurosurgery. He underwent catheter angiogram and was deemed an appropriate candidate for embolization.

Discussions: Superficial temporal artery aneurysms can occur following head injury. The STA is one of the terminal branches of the ECA that supplies the scalp, coursing superficially to the zygomatic bone and temporalis muscle making it vulnerable to trauma. In a clinical review by DIP et al looking at 186 STA aneurysm cases from 1867-2010, the most common complaints included painless pulsatile mass followed by pain and headaches. Vision or hearing changes have yet to be described in the literature. Interestingly, our patient reported insidious onset of hearing loss and
visual changes which prompted our neurosurgical colleagues to recommend treatment options of either embolization or surgical excision.

Conclusions: This case demonstrates the importance of physical examination in evaluating patients with head injury.

Missed Sciatic Neuroma Affecting Prosthesis Use in a Patient with Hip Disarticulation Amputation

Sarah A. Welch, DO, MA, and Gerasimos Bastas, MD, PHD

Case Diagnosis: Missed Sciatic Neuroma Affecting Prosthesis Use in a Patient with Hip Disarticulation Amputation

Case Description: A 51-year-old lady status post motorcycle collision and right hip disarticulation amputation (September 2012), was referred for recommendations to facilitate prosthetic fitting. She presented with progressively worsening amputation site pain, affecting sitting, and disallowing donning and use of two previously fabricated prostheses. She never achieved prosthetic ambulation and was being maintained on multiple, high-dose, pain medications, without relief. Examination revealed a well-healed, skin-grafted, amputation site, atypically lacking musculocutaneous coverage over the lateral pelvis, and a protrubent (4x3 cm) mass, exquisitely tender to light touch. MRI with contrast confirmed a large sciatic neuroma under the dermis. Care was coordinated for surgical resection of the neuroma and musculocutaneous flap, performed April 2016. By June 2016, pain had decreased (from 8 to 3/10) and she was successfully fitted with a prosthesis. She can now ambulate with her prosthesis without other assistive devices, is actively seeking re-employment, and weaning off pain medications.

Discussions: Traumatic neuromas are non-neoplastic proliferations at the distal ends of injured or resected nerves. Associated symptoms may not always offer localizing insights and can be difficult to distinguish from phantom limb pain. Clinical findings may reveal soft-tissue mass, or pain with percussion of the residuum. MRI is useful for localization of most neuromas. Symptomatic sciatic neuromas are known to occur in transfemoral amputees, months to decades following limb loss. To our knowledge, this is first case reported of a symptomatic sciatic neuroma in a hip disarticulation amputation and its successful management.

Conclusions: A thorough history, physical exam, and medical work up, remain imperative in the evaluation for prosthetic candidacy. For our patient, earlier communication between providers, diligence in examination and medical workup, could have expedited requisite interventions, prosthetic enablement, and helped avoid unnecessary pharmacologic treatment.

Modafinil to Treat Decreased Wakefulness Secondary to Bilateral Thalamic Infarcts

Jeffrey A. Kandt, MD, Jennifer Shen, MD, and Hejah Imteyaz, MPH

Case Diagnosis: Bilateral thalamic infarcts resulting in decreased wakefulness.

Case Description: This case involves two patients who were initially found unresponsive at home. Patients A and B had an NIHSS of 20 and 21 on presentation, respectively. Each patient underwent an MRI, which revealed acute infarcts in the bilateral thalami. On day three of hospitalization both patients were started on modafinil. Patient A received two separate 100 mg doses at 7:00A/11:00A and Patient B received a single 200 mg dose at 7:00A. Both patients were found to be more alert within 24 hours of starting the medication. Patient A became less alert as we decreased her modafinil dose on day 7. Patient B was minimally responsive for most of the day prior to being started on modafinil and had complete resolution of impaired wakefulness once modafinil was started. Patient A was older than Patient B by 43 years and had an additional infarct in the right midbrain on MRI. Both patients were discharged home on a decreased dose of modafinil.

Discussions: Modafinil is FDA approved for the treatment of narcolepsy, but we also see it used as an off-label medication to increase alertness in stroke and TBI patients. The exact mechanism of this medication is still unknown, but we do know about some of its actions in the thalamus. In this region, modafinil occupies NE transporter sites and increases glutamate release while not increasing GABA. We also know the thalamus plays a key role in wakefulness. Our two patients suffered bilateral thalamic infarcts causing them to struggle with alertness, which improved when modafinil was administered.

Conclusions: Patients suffering from decreased wakefulness following bilateral thalamic infarcts may benefit from modafinil. This medication has been shown in our two patients to improve their participation in therapy, which led to them graduating from inpatient rehabilitation earlier.


Nina Bhupathiraju, MD, and Silpa Katta, MD

Case Diagnosis: A 62-year-old female with a history of cervical C5-C7 fusion and neck pain for fifteen years was diagnosed with multiple causes of neck pain including degenerative disc disease, myalgia and Meniere’s disease and treated in an interdisciplinary pain management program.

Case Description: Patient initially underwent cervical C5-C7 fusion for degenerative disc disease fifteen years prior to presentation in an outpatient pain management clinic. Neck pain was affecting quality of life and persistent despite physical therapy, massage, and various pain medication regimens. Examination revealed increased thoracic kyphosis, anterior head posture, mild scoliosis, and left shoulder height was higher than the right. Strength was 4/5 in bilateral upper extremities and neurological examination was normal. Patient was recommended for the comprehensive pain management program for neck pain likely related to history of fusion.

Discussions: Patient started in 21-day comprehensive pain management program and was seen by physiatrist, physical therapist, nurse, and psychologist. Further history and examination in the first week revealed vertigo, ear fullness, and intermittent balance problems and she was diagnosed with Meniere’s disease. Patient used accessory neck movements to focus gaze which would subsequently trigger cervical myalgia. In addition to general endurance training and strengthening, patient practiced scapular resetting, self-muscle release, massage, traction, breathing and pacing exercises and worked on vestibular physical therapy. With additional therapy strategies to target different causes of neck pain, patient noted improvement in pain control and quality of life.

Conclusions: While patients may have an initial clear etiology of pain, those with chronic pain despite multiple separate therapeutic strategies may benefit from a comprehensive pain management program. Frequent visits with a physiatrist, psychologist and trained physical therapist will aid in appropriate diagnoses of various causes of chronic pain. Subsequently, targeted therapy and use of proper modalities may aid in improving pain control, quality of life and mood.

Multiple Approaches to Orthotic Management of Femoral Neuropathy: A Case Series

Jeffrey Michael Derbas, MD, and Noel Rao, MFAPAAMR

Case Diagnosis: Two patients presented to orthotics clinic with left knee instability and gait impairment. The first patient was a 53-year-old female diagnosed with left
femoral neuropathy after a motor vehicle accident with a pelvic fracture. The second patient was a 75-year-old male suffering from left femoral neuropathy after abdominal surgery to remove a liposarcoma.

**Case Description:** Patient 1 with femoral neuropathy from a motor vehicle accident received a decompressive hinged knee brace. Patient 2 with femoral neuropathy after abdominal surgery received a solid AFO and experienced improvement in gait and knee stability.

**Conclusions:** Femoral neuropathy can occur after pelvic trauma or abdominal surgery. It presents with weak quadriceps and knee instability. An AFO set in several degrees of plantar flexion can improve stability. Alternatively, a decompressive hinged knee orthosis may reduce knee instability. Patient compliance is critical, therefore clinicians should incorporate patient feedback in order to improve treatment fidelity.

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**Musculocutaneous Neuropathy due to PICC line insertion: A Case Report**

**Case Diagnosis:** A 55-year-old gentleman with uncontrolled diabetes mellitus developed a diabetic foot ulcer and osteomyelitis requiring intravenous antibiotics. He underwent sonographically guided PICC line placement using a 5 French catheter with radiographic confirmation of the tip at the cavoatrial junction. The patient recalls terrible pain and extensive ecchymoses of his right arm and lateral thorax in the days following the procedure as well as weakness with right elbow flexion and paresthesias over the lateral forearm. He was seen two months later by the physical therapist and found to have right elbow hyperextension with flexion of 4 mm, which was increased from 2 mm from cervical spine x-rays in 2008. Also noted was discogenic degenerative changes at C2-3 and C3-4 and severe right C3-4 foraminal stenosis.

**Case Description:** In 2011, the patient reported that the numbness abated postoperatively. Three years later in November of 2014, cervical spine x-rays revealed a C2 on C3 anterior subluxation. The first patient opted for a solid AFO and experienced improvement in gait and knee stability.

**Conclusions:** Femoral neuropathy can occur after pelvic trauma or abdominal surgery. It presents with weak quadriceps and knee instability. An AFO set in several degrees of plantar flexion can improve stability. Alternatively, a decompressive hinged knee orthosis may reduce knee instability. Patient compliance is critical, therefore clinicians should incorporate patient feedback in order to improve treatment fidelity.

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Myofascial and Scar Tissue Release for Pain, Decreased Sensation and Decreased Function after Degloving Injuries

**Case Diagnosis:** We describe the case of a young adult female who suffered intraarticular and degloving injuries of her bilateral lower extremities requiring a total of 3 reconstructive knee surgeries and 5 skin graft surgeries. These surgeries resulted in allodinia and reduced knee range of motion. This patient presented 14 months following healing of skin grafts for recommendations to manage pain and improve lower extremity function.

**Case Description:** A 25-year-old female, 14 months following a pedestrian versus motor vehicle accident, presented following surgeries including: right thigh, left thigh and left leg skin grafts and reconstructive knee surgeries for the right medial collateral and posterior cruciate ligament and left lateral collateral and anterior cruciate ligament. The patient had undergone extensive physical therapy following the surgeries. Her right elbow flexion was a 2/10 painful, shocking sensation at rest in the skin graft sites on her medial thighs down to her medial knees. In addition to the skin grafts, the examination was significant for a positive Tinel’s to Hunter’s canal bilaterally. Nerve conduction studies were significant for absent saphenous nerve findings and normal electromyography studies of selected muscles. Pregabalin reduced her pain initially but her baseline at rest pain continued. She was referred to a medical massage therapist for desensitization, scar and myofascial release. The focus of the treatment included skin rolling and superficial fascial mobilization to the skin graft scars and fascia. After 6 myofascial release sessions, the patient has no pain at rest and reported improved sensation on the right leg by 10-30%. When looking at the PROMIS data, the patient’s physical function scores improved by one standard deviation.

**Discussions:** After becoming fibrotic, the collagen comprising scar tissue aligns in a single direction as opposed to the normal weaved formation of healthy fascial tissue. This alignment in a single direction is inferior to function when compared to the more organized, multidirectional alignment of normal fascial tissue. Myofascial and scar tissue release techniques such as skin rolling and superficial fascial mobilization can help significantly to decrease pain, improve sensation and improve function.

**Conclusions:** Myofascial and scar tissue release techniques can be impactful in improving pain and function in patients with extensive skin grafts and subsequent sensory neuropathies. Benefits were seen even when treatment was delayed until 14 months following this patient’s injuries. Earlier intervention following skin graft healing should be studied further.
Neural Prolotherapy Treatment for Neuropathic Pain after Spinal Cord Injury: A Case Report

Stanley Poole, DO, Ghebrendrias Youhans, MD, and Amripasha Elsan, MD

Case Diagnosis: Patient was a previously healthy 38-year-old female with no medical or surgical history who was admitted to inpatient acute rehab following surgical resection of a rare invasive intradural thoracic spinal cord lipoma resulting in a T8 ASIA C injury. She initially presented with chief complaint of acute sharp thoracic back pain in a bilateral band-like axial distribution at the neurological level of injury. Pain was described as sharp, sensitive pain localized to this area. Pain improved transiently with stretching/strengthening therapy, initiation of gabapentin, amitriptyline and topical capsaicin cream but worsened with time. Functionally, pain caused patient to have difficulty with trunk movements, performing ADLs and participating in therapy.

Case Description: Exam revealed normal skin and hyperalgesia in the bilateral T8 dermatomal distribution. Therefore, neural prolotherapy using dextrose 5% with water was employed by injecting a total of 10 cc in the subcutaneous tissue, 1 cc per injection in a grid-like pattern over the areas of pain. Patient reported an 80% improvement in pain post-injection, and 100% improvement in pain at 24 hours post-injection which sustained for the remainder of the hospitalization. Also, the patient was able to move her trunk without pain, improved performing ADLs and was more easily able to participate in therapy.

Discussion: The concept of Neural Prolotherapy was developed by New Zealand physician Dr. John Lyforgt based on ‘Hilton’s Law’ that describes nerves that supply a joint also innervate overlying tissue and muscles that move that joint. Dr. Lyforgt hypothesized that irritation or hypersensitivity to that nerve may also cause dysfunction and pain to the tissues surrounding that joint [Reeves]. By restoring the function of that nerve, it would lead to healing and pain reduction. The vanilloid receptor TRPV1 (Transient receptor potential V1) is a non-selective channel that is abundantly expressed in nociceptors, especially C-fibers [Wong]. When antagonized it has been shown in preclinical species to relieve pain behaviors, inflammation, osteoarthritis and cancer [Wong]. It was also found to be relieved with use of capsaicin [Wong]. This receptor was also found to be upregulated during inflammation and in TRPV1 knockout mice, displaying reduced thermal hypersensitivity [Wong]. Dextrose has been shown to inhibit the TRPV1 receptor and restore normal nerve function [Reeves].

Conclusions: In this case report, we describe a case of successful intervention for neuropathic pain at the neurological level of spinal cord injury following surgical resection of spinal cord lipoma using neural prolotherapy injections which may be considered a safe and effective alternative to oral pharmacological intervention. This case report may warrant further studies.

Neuralgic Amyotrophy after Subclavian Vein Compression Syndrome in a Patient with Traumatic Paraplegia and a History of Multiple Episodes of Acute Inflammatory Demyelinating Polyradiculoneuropathy: A Case Report

Johan Latorre, MS, and Natasha L. Warnick, DO

Case Diagnosis: Neuralgic Amyotropy.

Case Description: A 50-year-old gentleman with history of chronic traumatic paraplegia and resolved acute inflammatory demyelinating polyneuropathy (AIDP) presented with right SVC syndrome. He underwent balloon angioplasty and developed a subsequent post-operative infection at the surgical site. Initially, neurological status was at baseline with intact upper extremity function and motor complete paraplegia. A few days later, patient developed contralateral left-sided facial droop, left arm paralysis without dysesthesias and severe pain in his scapular region. Given asymmetry, AIDP recurrence was unlikely. After a negative work up, he was ultimately diagnosed with neuralgic amyotropy with complete paralysis of left upper extremity. He was subsequently transferred to begin aggressive inpatient rehabilitation to maximize functional recovery.

Neurologic symptoms were suggestive of acute axonal sensorimotor polyneuropathy and the patient was subsequently diagnosed with Acute Motor-Sensory Axonal Neuropathy variant of Guillain-Barré Syndrome.

Case Description: The patient completed 5 doses of IVIG and was transferred to acute inpatient rehabilitation. During her stay in rehab, she did not notice any improvement in weakness. Furthermore, she started having autonomic dysregulation with tachycardia, fevers and respiratory depression requiring transfer to MICU. With no improvement in symptoms despite completing 5 sessions of plasmapheresis, suspicion of Neuroparciosis was increased and patient had a biopsy that confirmed the diagnosis. She was started on Mycophenolate Mofetil and transferred to rehab again, however, this time noted great improvement in weakness with objective changes in FIM scores and reported resolution of pain in hands and feet bilaterally.

Discussion: Neuroparciosis complications from sarcoidosis is rare and seen only in 5-10% of patients. Pathophysiology is unclear; one hypothesis is exaggerated cellular immune response to foreign or self-antigens. It can present as a polynuropathy, mononeuritis multiplex, focal mononeuropathies, or polyradiculopathy from involvement of spinal root sheaths. Definitional diagnosis requires nerve or muscle biopsy. Patients typically present with a slowly progressive chronic course with multiple exacerbations; however long term prognosis has not been clearly defined.

Conclusions: While neuroparciosis is rare and can mimic other autoimmune diseases, it should be considered as an etiology of acute peripheral neuropathy in someone with a history of sarcoidosis. Early diagnosis can help guide treatment and more importantly alter the prognosis and functional outcome for these patients.

Neutropenia as a Complication of Tumefactive Demyelinating Disease

Kali Webb, DO, and Marisa Osorio, DO

Case Diagnosis: Neutropenia as a complication of tumefactive demyelinating disease.

Case Description: A 13-year-old healthy female presented with sudden onset rapidly progressive left hemiplegia and hemianopsia. Brain MRI showed tumefactive demyelinating white matter lesion with partial rim of enhancement in the right hemisphere. She received a 5 day course of high dose steroids with some improvement in her hemiplegia. While on inpatient rehabilitation 2 weeks after diagnosis, she developed myalgias, rash, abdominal pain, and mouth pain. Routine labs revealed severe neutropenia (WBC 0.8, ANC 0). Work up was negative for leukemia, hemophagocytic lymphohistiocytosis, lupus or mixed connective tissue disorder. Brain biopsy showed acute inflammatory demyelinating changes of the white matter and meninges consistent with tumefactive demyelinating disease. Steroid therapy was discontinued as a potential contributing factor to the neutropenia without improvement. The patient was transferred to hematologist and ultimately received G-CSF for 9 days with resolution of her neutropenia.

Discussion: Tumefactive multiple sclerosis (MS) is a rare variant of MS and neutropenia is a known complication of this disease process. This patient had classic findings of tumefactive disease, but she did not have disseminated lesions in time and space to satisfy McDonald criteria for MS diagnosis. Alternative etiologies for neutropenia should be explored, including oncologic, hematologic, medication and infectious causes. The neutropenia in this case was determined to be a secondary complication of the tumefactive disease process. Neutropenia is of concern in the rehab setting since patients share the therapy gym and common areas, posing an increased risk of infection in a neutropenic patient.

Conclusions: Neutropenia should be considered a complication of the MS disease process itself, not just a complication of treatment. Physiatrists should consider this in the differential for nonspecific systemic symptoms as this can impact patients’ health and ability to participate in the rehabilitation program.
New Frontiers: Inpatient Comprehensive Rehabilitation after Full-Face Transplantation, a Case Report

Tracy Espiritu McKay, DO, Matina Balou, PHD, CCC-SLP, BCS-S, Daniel Kao, MD, Derek J. Ho, DO, Jeffrey Cohen, MD, and Eduardo Rodriguez, MD, DDS

Case Diagnosis: Status-post face vascularized allotransplant

Case Description: Patient was a 41-year-old male with facial deformity secondary to severe facial trauma in 2001 and status-post face vascularized allotransplant who was admitted to acute rehabilitation seven weeks post-op with deficits including severe oropharyngeal dysphagia, mild impaired balance, poor hand coordination, and impaired visual acuity. His physical exam was notable for facial swelling and decreased tone, reduced peripheral vision, and left tongue deviation. He received rehabilitation comprising of SLP, PT, OT, and psychology with focus on swallow function, facial reanimation, and speech mechanisms. At discharge, he was primarily receiving nutrition and hydration by mouth, exhibited improved cardiovascular endurance and improved balance using learned compensation and self-correction skills despite decreased depth perception on presentation.

Discussions: Rehabilitation post-full face transplantation has not been described in the past. After twelve days of a multidisciplinary team approach utilizing a minimum of therapy three hours a day, all aspects of functionality, speech, and swallow had improved. This is the first reported case of systematic review of the rehabilitation course post-facial transplantation.

Conclusions: Early acute rehabilitation is crucial for safety, recovery, successful reentry into society post-full face transplantation.

New Onset Bilateral Foot Drop Due to Newly Diagnosed Lupus and Vasculitic Neuropathy, Complicated by Acute Stroke: A Case Report

Anna Rozman, DO, MBA, Yurii O. Ivanov, DO, Fleza Saleem, MD, Katherine Power, MD, and Maria Jovin-Castro, MD

Case Diagnosis: New onset bilateral foot drop due to vasculitic neuropathy in newly diagnosed Lupus, complicated by acute stroke.

Case Description: A 47-year-old female with mixed connective tissue disorder and Raynaud syndrome presented with two months of difficulty walking, foot pain, numbness, and weakness in bilateral lower extremities. Diagnosed with deep vein thrombosis (DVT) and placed on heparin. Electrodiagnostic (EDX) studies showed severe axonal sensorimotor polyneuropathy distal to proximal gradient of denervation, likely due to a vasculitic process. Bloodwork suggested Lupus. Renal biopsy showed lupus nephritis and focal segmental glomerulosclerosis. The day after her biopsy she developed right hemiparesis. MRI showed an acute stroke. Patient admitted to rehab with right hemiparesis, diminished sensation, dysarthria, bilateral foot drop, and severe gait dysfunction. Intravenous Prednisone and pulse Cytoxan started for lupus vasculitis. Course complicated by renal failure requiring dialysis and severe lower extremity neuropathic pain which improved with medications. Regained some strength in her bilateral lower extremities, but foot drop remained. Discharged home with ankle foot orthoses and able to ambulate 100 feet with walking roller.

Discussions: Literature review reports between 6-21% incidence rates of peripheral neuropathy in Lupus patients. Lymphocytic infiltrate in peripheral nerve blood vessels leads to damage of sensory and motor nerves, with longest nerves affected first. The most common peripheral nerve syndrome is symmetric sensorimotor neuropathy, but mononeuritis multiplex also seen. Foot drop is a typical feature. Workup includes rheumatologic labs, EDX studies, and nerve biopsy (gold standard) demonstrating vasculitis. Treatment includes corticosteroids (IV for five days then oral taper), Cytoxan, plasma exchange, immunosuppressants, and physical therapy to improve motor function.

Conclusions: The differential for a patient presenting with new foot drop and sensory deficits should include vasculitic neuropathy as early diagnosis and treatment typically have more favorable outcomes. These patients should also be monitored for vasculitic complications including strokes and DVTs.

No Smiling Matter: An Unusual Presentation and Rehabilitative Course of Guillain Barre Syndrome

Kadir J. Carruthers, MD, and Mary Ann Miknevich, MD

Case Diagnosis: Guillain Barre Syndrome (Miller-Fisher variant) with bilateral facial nerve paralysis.

Case Description: The presentation of bilateral facial paralysis is very rare. Guillain-Barre syndrome must always be among the differential diagnoses. A 61-year-old female presented with bilateral facial weakness, dysphagia, bilateral ptosis, blurred vision, which progressed to decreased lower extremity strength, sensation, and coordination. Physical exam showed diminished lower extremity reflexes. MRI of the brain and cervical and thoracic spine were unremarkable. Lumbar puncture revealed cytologic and immunologic dissociation. Plasmapheresis treatment was initiated for presumed Guillain Barre Syndrome (GBS). Patient was transferred to intensive care unit due to concern for respiratory compromise. Pulmonary service performed diagnostic electromyography (EMG) and nerve conduction studies (NCS) on day #3 after onset. Sensory responses in the upper extremities showed prolonged distal latencies. Sural and superficial fibular sensory responses were normal. All distal motor latencies were prolonged in upper and lower extremities. Motor conductions were slow in the upper extremity but normal in the lower extremity. Overall findings revealed an early idiopathic demyelinating polyneuropathy consistent with GBS. Ocular symptoms and ataxia were suggestive of the Miller-Fisher GBS variant. Following clinical improvement with plasmapheresis, patient was transferred to inpatient rehabilitation (IPR). Lower extremity strength modestly improved by time of discharge from IPR. Facial diplegia gradually resolved over a period of six weeks. Blurred vision resolved upon discharge from IPR, however patient was not able to fully close her eyes until after six weeks. Four months were required for the patient to regain the ability to swallow thin liquids without use of a straw.

Discussions: EMG and NCS studies on GBS patients with bilateral facial paralysis have consistently shown evidence of a demyelinating process with no evidence of an axonal-type neuropathy. Optimal outcomes have typically been achieved with intensive pulmonary function assessments and treatment with plasmapheresis or intravenous immunoglobulin.

Conclusions: Clinicians need to be acutely aware of bilateral facial paralysis as a presenting feature of GBS.

Non Traumatic Ischiofemoral Impingement Syndrome

David Chu, MD, Vivek Mehta, MD, Aam HonShy, MD, and Lila Rubin, BS

Case Diagnosis: Non Traumatic Ischiofemoral Impingement Syndrome

Case Description: A 32-year-old female presented with a nine month history of severe left hip pain localized to the anterior groin up to 9/10 on the visual analog scale, exacerbated with walking and light exercise. She also noted pain in the left buttck although denied any radiating symptoms. She has been walking with associated limp secondary to pain in her left hip and buttck. She notes to characterize her hip pain as sore in nature with sensations of hip snapping.

Discussions: She previously underwent a conservative three month course of treatment including rest, ice, and oral non-steroidal anti-inflammatory medications with minimal improvement of her pains. The patient was referred for MRI studies of the left hip and was found to have significant narrowing of the ischiofemoral eminida in the quadratus femoris muscle was found, consistent with the diagnosis of Ischiofemoral Impingement Syndrome. In an effort to avoid surgery, performed a left hip intraarticular injection under fluoroscopic guidance with 90% relief of pain. The patient started another course of physical therapy with active and active assisted range of motion, single-leg steps and heel slide exercises, therapeutic modalities, stretching, and strengthening exercises she noted within two weeks 90% of her pain and complete resolution of audible snapping hip sensation.

Conclusions: Upon literature review Ischiofemoral Impingement Syndrome is an uncommon cause of hip pain. The few reported cases of ischiofemoral syn-drome have been treated surgically and are secondary to a traumatic event. This case differs in the treatment was conservative and provided significantly with relief anti-inflammatories and physical therapy.

Natalgia Paresthetica

Yousaf L. Chowdhry, MD, Adam Isaacson, MD, Dennis Dowling, DO, Archana Chand, DO, Eric Yuan, DO, and Michael Mosier, MD

Case Diagnosis: Natalgia paresthetica (NP) is generally characterized by pruritis in a unilateral dermatomal distribution. Other presentations include burning or cold sensations, paresthesia, or pain. It most commonly presents between the vertebrae and scapula within T2-T6 in women 54-62 years of age. A common cutaneous finding is a tan or brown patch or macule in the affected region, most likely due to post-inflammatory hyperpigmentation or amyloid deposition from chronic rubbing or scratching. The strongest evidence of disease etiology points to spinal nerve root management.

Case Description: A 44-year-old male presented with left scapular pain for one year, described as 10/10 pain, sharp with occasional spasms, and radiation to the anterior chest wall in a dermatomal distribution following the third rib.
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Pain is worse during the day with overhead reaching and repetitive movements. The patient was working in a warehouse lifting heavy boxes when it began and did not seek medical attention at that time. His ability to carry out his daily tasks was limited, and he reported interrupted sleep when on his back or left side. The patient had a 20-year medical history of lower extremity pain during running, which limited his function. Both of these symptoms improved while using Botox injections.

Discussion: Due to the dermatomal distribution of the pain, negative imaging and EMG/NCV along with scratch marks seen over the rhomboid/medial scapular border indicating pruritis, Notalgia Paresthetica was suspected. While pruritis is the classic presenting symptom, pain may also affect up to 30% of patients with nostalgia paresthetica. (1) A negative MRI of the shoulder/rhomboid/scapula area was unexpected for NP. However, one study found 60.7% of patients had spinal pathology on MRI which corresponded with the dermatomal lesion. (1) There is no definitive treatment for NP, but several modalities have been proposed including topical capsicain, which has been shown to decrease itching in several instances. (2, 3) Topical tacrolimus alleviated symptoms in 6 of 7 patients in another study. (4) With both topical treatments, symptoms tend to recur upon discontinuation. A case report showed promising results with Botox® injection (5), but a double-blind study failed to show symptom improvement in the Botox® group vs. placebo. (6) Gabapentin was used to treat restless legs syndrome with promising results with Botox® injection (5), but a double-blind study failed to show symptom improvement in the Botox® group vs. placebo. (6) Gabapentin was used as non-pharmacological treatment options are TENS, physical therapy, and acupuncture. GOMT has been reported to relieve the symptoms, such as in this case but this was based on a single case study. (8, 9).

Conclusions: Notalgia Paresthetica is a commonly missed diagnosis because it is rarely found on the differential for a patient with the above presentation. Given the refractory nature of this process, it should be considered earlier in the treatment process as it can potentially save an extensive workup if the patient responds to the conservative symptomatic treatment.

Novel Techniques to Diagnose and Treat Popliteal Artery Entrapment Syndrome

Marc P. Grunder, DO, MBA, and Mark Kasner, MD

Case Diagnosis: This is a 19-year-old female runner that presented with bilateral lower leg pain and paresthesias during running. Multiple providers evaluated this patient for 6 years, having had tests such as x-ray, RI, bone scan, angiography, diagnostic ultrasound, and compartment pressure testing. At her initial visit, we confirmed the diagnosis of dynamic popliteal artery entrapment syndrome (PAES). We used dynamic ultrasound to demonstrate complete loss of blood flow through the popliteal artery during sustained plantar flexion immediately following symptom onset invoked by treadmill running.

Case Description: Treatment options discussed with this patient included partial gastrocnemius surgical resection, botulinum toxin injection to the gastrocnemius, and activity modification. Discussing with multiple physicians, we decided to perform Botox injections.

Under ultrasound guidance, we injected 60 units of Botox into the right medial and lateral gastrocnemius; we injected 40 units each into the less symptomatic left medial and lateral gastrocnemius. The patient was held out of competition until symptoms-free during running, which was 6 weeks. The symptoms returned 6 months later, and two additional Botox injections were performed with subsequent resolution of symptoms.

Discussion: This case illustrates the use of ultrasound for the diagnosis and treatment of PAES. Diagnostic ultrasound may be equally efficacious and significantly more cost-effective than other imaging used to diagnose PAES. Additionally, ultrasound has dynamic capability, including provocative testing, as well as Doppler, which quantitatively measures blood flow. There are few cases of PAES treated successfully with Botox injections. This patient achieved complete symptom resolution for 3-9 months after each injection.

Further research, not only in diagnosis and treatment, but also a more standardized return to sport protocol are necessary to determine effectiveness of Botox injections as a treatment for PAES.

Conclusions: Dynamic ultrasound may be a safe, more cost-effective option to accurately diagnose PAES. Additionally, Botox could be an alternative to surgery for these patients.
the counter nutritional supplements are used frequently by athletes, many times in combination with other supplements as well as prescription medications. The FDA does not evaluate these supplements and great caution must be taken when consid-
ering using these products. Patients should consult with a physician to fully review all current medications as well as herbal and nutritional supplements they are taking prior to beginning any new supplements.

Conclusions: Nutritional supplements can be a possible cause of rhabdomyolysis.

Occipital Infarct Following Meningioma Resection: A Case Report

Bhavi Patel, DO, Patrick Dolan, MD, Cicone Cicone, DO, and Jack Mensch, MD

Case Diagnosis: Occipital infarct following meningioma resection

Case Description: A 58-year-old male with no significant past medical history presented with a bump on the back of his head for 3 years without any associated neuro-
ological symptoms. CT head revealed an occipital meningioma. Patient subsequently underwent elective craniotomy and meningioma resection. Postoperatively, patient
experienced left hemiparesis. He required minimal assistance for transfers and mod-
erate assistance for ambulation with rolling walker. Prior to the surgery he had been
independent in all activities. During his inpatient rehab stay he developed new onset
unsteadiness, blurry vision, right visual neglect and weakness. Repeat imaging re-
vealed an acute infarct in the left occipital lobe and pulvinar region of left thalamus,
and cut-off of flow related signal in the distal left PCA.

Discussions: Some of the most common risk factors following meningioma re-
section include transient neurological deterioration, postoperative hematomas, and
postoperative infections; infarctions are shown to occur post meningioma resection
however, to a much lower degree. Given the patient’s young age and lack of risk fac-
tors, the cause of the stroke is most likely from the meningioma resection.

Conclusions: It is important to keep in mind, the most common risk factors fol-
lowing meningioma resection and to monitor their physical exam for any signs of
change that can indicate these adverse processes.

Orthostatic Hypertension as a Limitation to Rehabilitation Therapy Tolerance

Frank Jackson, DO, Michael R. Ortiz, MD, and Alexandra Flis, MD

Case Diagnosis: This case describes a 37-year-old gentleman with 7.5% total body
surface area burns and an inhalation injury who developed persistent orthostatic
hypertension limiting his abilities to tolerate rehabilitation therapies.

Case Description: The patient is a 37-year-old gentleman who was involved in a
house fire. He was admitted to the Burn Intensive Care Unit (ICU) and required intu-
bation due to inhalation injury. He had a six week stay in the ICU that was compli-
cated by gastrointestinal bleeding and acute kidney injury. During this ICU course,
he developed significant muscle weakness and muscle mass loss. Due to his complica-
ted medical issues, he was placed on bed rest for approximately one month. After
being cleared for out of bed activities, when transferring from a supine to a seated po-
sition his systolic blood pressure would increase from 150 mmHg to ~200 mmHg; he
remained asymptomatic despite this rapid rise in blood pressure. Over seven days, the
orthostatic hypertention improved gradually with the use of a tilt in space table. On
admission to inpatient rehabilitation, eleven days later, he was no longer having diffi-
culties with orthostatic hypertention.

Discussions: Orthostatic hypertension can significantly interfere with an in-
dividual’s ability to tolerate rehabilitation therapy. It is under recognized but
can lead to severe complications. Early recognition and management is essential
to promote safe therapy participation. While there is a significant amount of lit-
erature addressing orthostatic hypotension, less is documented on orthostatic hyper-
tension. The pathophysiology of orthostatic hypertension is not fully understood. A
proposed mechanisms includes blood pooling in the lower extremities with exces-
sive sympathetic response due to baroreceptor hypersensitivity.

Conclusions: Orthostatic hypertension is a poorly understood pathological con-
dition, which can lead to poor therapy tolerance and even more severe effects as
stroke or death. Clinicians should be aware of this phenomenon and monitor for
blood pressure changesclosely.

Out of Breath: Respiratory Complications in Chronic Spinal Cord Injury

Sharon Bushi, MD, and Mylan Lam, MD

Case Diagnosis: Respiratory complications are one of the most common reasons
for morbidity and mortality in the cervical spinal cord injury population. Specifically,
common causes of respiratory failure are increased respiratory tract infections,
deceased respiratory drive, and increased chance of venous thromboembolism.
These complications most commonly occur in the acute period, usually within one
year after the injury. Yet, we present here a case of unique respiratory complications
in a patient that occur thirty years after his original cervical spine injury.

Case Description: This 55-year-old gentleman has a history of motor vehicle
accident (1987) resulting in a chronic tetraplegia, seizures, tracheostomy, and
neurogenic bowel and bladder who was admitted to our rehab center for ADL
dysfunction secondary to general debility in December 2015 after being hospi-
talized for aspiration pneumonia. The patient was enrolled in a comprehensive
physical and occupational rehabilitation, weaned off ventilator support to two liters
of oxygen, and was progressing in function until mid-January when he was found
to be altered in mental status. An arterial blood gas showed significant hypercapnic
respiratory acidosis. He was returned to ventilator support, as recommended by the
consulting pulmonologist, and subsequently improved.

Discussions: Immediately post injury, respiratory failure results from phrenic or
intercostal nerve injury with possible acute aspiration. Within one year, respiratory
muscle strength recovers with improved peak inspiratory, expiratory pressures, and
vital capacities. There is no clear mechanism to delineate lung function in the chronic
stage of a high level spinal cord injury. We present one possible mechanism demon-
strated by the severely reduced forced expiratory volume and forced vital capacity
of our patient. It is likely that there was significantly decreased compliance from years of
muscle weakness that promoted retention of carbon dioxide.

Conclusions: With a growing generation of patients with chronic spinal cord in-
juries, further study of pulmonary function in this population has promising clinical
applications for therapeutic and diag nostic modalities.

Oxycodone Induced Delirium in a Post-op Patient with End Stage Renal Disease: A Case Report

Alexander M. Morales, DO, Wesam S. Mohamed, DO, Thiago Queiroz, DO,
Lina Hurtado, MD, and Jose Diaz, DO

Case Diagnosis: Oxycodone induced delirium

Case Description: A 53-year-old African American female with past medical
history of end stage renal disease on hemodialysis underwent surgical debridement
for discitis and osteomyelitis followed by revision of lumbar fusion. She was started
on hydromorphone and oxycodone immediately after surgery and was transitioned
to extended release oxycodone post-op day 2. The patient was transferred to acute re-
hab on post-op day 7. On post-op day 11 the patient developed delirium characterized
by lethargy, fluctuating confusion and vertigo. The patient was observed to have vi-
sual and auditory hallucinations consisting of deceased family members. Oxycodone
accumulation was suspected and the medication discontinued. The patient was ad-
ministered naloxone with improvement in her symptoms. She was started on trama-
dol, acetaminophen and a lidoca ine patch for pain control. The patient was able to
participate in therapy after symptom resolution and showed significant improvement
during her stay.

Discussions: Patients with end stage renal disease are commonplace in the acute
rehab setting due to their susceptibility to medical complications and impaired func-
tional capacity. Pharmacologic management of pain in these patients is a challenge
that has not been fully explored. Oxycodone accumulates in these patients due to
its renal excretion. Furthermore, filtration of oxycodone in hemodialysis has been
shown to be insufficient in removing the drug. Opioid toxicity can be difficult to rec-
ognize when respiratory depression is absent. Therefore, it is important to consider
opioid toxicity in the differential of post-op delirium in hemodialysis patients.

Conclusions: This case illustrates the risk of narcotic pain medications in patients
on hemodialysis and the importance for careful selection of a pain management strat-
agy. It also emphasizes the need for further study into the pharmacodynamics of dif-
ferent opioids in hemodialysis and the establishment of best practice guidelines for
pain management in this patient population.

Painful Hand Instability in a Patient with Partial Traumatic Finger Amputations

Kristopher Marin, DO, and Joseph Burris, MD

Case Diagnosis: Painful Left Hand Instability in a patient with Partial Traumatic
Finger Amputations

Case Description: A 60-year-old left-handed patient presented to amputee clinic
with traumatic amputations of his left 3rd-5th fingers after a table saw accident 39 years
ago. Chronically, the patient developed instability of the remaining digits (left index finger and thumb) requiring multiple joint and soft tissue injections to re-
lieve pain. Specifically he developed severe ulnar deviation upon active finger
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Paraneoplastic Myelitis Secondary to Hodgkin's Lymphoma: A Case Report

Armen Derian, MD, Seema Khurana, DO, Christopher E. Alexander, MD, Jesse Chamoff, MD, and Evan Dammitt, MD

Case Diagnosis: A 62-year-old previously healthy male presented with acute paraplegia and incontinence due to transverse myelitis. He was initially treated for a presumed autoimmune process with minimal improvement. Further workup including cervical mass biopsy and imaging revealed lymphocyte predominant Hodgkin's Lymphoma. He received 4 cycles of intravenous and intrathecal chemotherapy, after which his lymphoma went into remission. He continued to be nonambulatory, although the majority of his Functional Independence Measures improved during his inpatient rehabilitation. His therapies consisted of static and dynamic balance training, therapeutic exercises to improve strength, range of motion, and endurance, as well as gait training and neuromuscular reeducation. Upon discharge, he was independent or required minimal assistance for transfers, mobility, intermittent catheterization, bowel and bladder incontinence, and his activities of daily living.

Conclusions: An understanding of the complexity of this issue is essential and each patient's management should be considered individually. Actual risk at this time is unknown, though current existing data suggests a minimal likelihood. While the incidence is rare, there is a definite risk of spinal hematoma and to the individuals it occurs to, it can devastating.

Paraplegia after Epidural Hematoma

Andrew S. Tang, DO, and Kellee R. Schweitzer, MD

Case Diagnosis: Epidural Hematoma

Case Description: An 81-year-old woman with severe spinal stenosis elects to undergo elective spinal cord stimulator trial. Procedure occurred about 1000. While in recovery patient began experiencing severe worsening of pain. At 1400 she was taken back to the procedure room for removal of epidural leads. Subsequently the patient reported loss of sensation and strength in the bilateral lower extremities. An urgent MRI was performed demonstrating a large epidural hematoma from levels T5-T10. The patient was transferred from community hospital to Tertiary Level 1 Trauma center arriving about 1930 for immediate orthopedic surgery consultation. She was taken to the OR at 2230 for emergent T5-T10 laminectomy and decompression. Postoperatively the patient had little functional recovery below level of injury and was referred to inpatient rehab. By time of discharge 5 weeks later she remains a presumed T10 ASIA C with poor prognosis for further motor or sensory recovery.

Conclusions: Due to difficulty in studying complications such as spinal hematoma, there are no current evidence based guidelines of management of anticoagulation in interventional spinal procedures. Consensus statements which represent the collective experience of recognized experts are based on case reports, clinical series, pharmacology, hematology and risk factors for surgical bleeding.

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Paraplegia Due to Arachnoiditis after Interlaminar Epidural Steroid Injection in a Patient with Failed Back Surgery Syndrome: A Case Report

Paolo Jorge, MD, and Scott Strum, MD

Case Diagnosis: Paraplegia due to arachnoiditis after epidural steroid injection.
Paraplegia Due to Spinal Pilocytic Astrocytoma in an Adult

Simi A. Desai, MD, Ogochukwu Azuh, MD, and Manika Hess, MD

Case Description: A 12-year-old male presented with lower extremity weakness. Two years prior he sustained a 30-foot fall. Over the next fourteen months he developed left hemiparesis and paraparesis below mid-thoracic level, pain, left leg weakness, incontinence, and gait abnormalities. The differential diagnosis was post-traumatic myelopathy. Brain MRI demonstrated a diffuse enhancing left T8-T10 lesion. He underwent T8-T10 laminectomy with biopsy of the necrotic T9-10 lesion with somatosensory evoked potentials monitoring. Pathology revealed pilocytic astrocytoma (WHO I) with BRAF KIAA1549 mutation. Post-operatively he complained of inability to move his legs.

On examination, he had no motor movement of his lower extremities. Light touch and pinprick were absent bilaterally below L4, pinprick altered below C8 on the right and throughout his legs.

Paraplegia Following Surgical Treatment of Idiopathic Scoliosis: A Case Report

Michelle Chi, MD, Hannah Aura. Shoval, MD, and Patricia Tan, MD

Case Description: A 15-year-old male with chronic low back pain status-post L4-L5 laminectomy and L4-L5/L5-S1 fusion underwent a fluoroscopically-guided inter-laminar epidural steroid injection (ESI) as failed back surgery syndrome (FBSS). Triamcinolone 40mg with 4mL saline was injected at L1/L2. Two days later, he reported acute worsened bilateral leg weakness, paresthesias, and severe back pain radiating to both feet. MRI showed spinal hematoma and loss of free-flowing appearance of cauda equina nerve roots below L3, compatible with arachnoiditis. He initially refused surgical intervention, was treated with IV dexamethasone, but eventually underwent L3-L4 fusion and L4-S1 fusion revision and was discharged to acute rehabilitation.

These surgically induced anatomic changes cause loss of resistance at tissue planes other than the epidural space, complicating epidural injections.

Arachnoiditis has been reported primarily with the use of depo-steroid polyethylene glycol and detergent in contaminated procaine. The few reports of arachnoiditis with standard steroid preparations cite intrathecal injection and spinal cord penetration as potential causes. In FBSS, anatomic changes predispose to intrathecal injection and spinal cord injury, all issues predisposed to by previous laminectomy and fusion. Pain associated with FBSS is due to epidural fibrosis with tissue adherence to the dura mater and nerve roots causing mechanical tethering. These surgically induced anatomic changes cause loss of resistance at tissue planes other than the epidural space, complicating epidural injections.

Conclusions: This case highlights the risk factors and technical nuances associated with ESIs in patients with previous lumbar laminectomy and fusion. Physicians should consider arachnoiditis in patients presenting with sudden increased pain, paresthesia, and weakness after an ESI, especially in the setting of FBSS.

Paroxysmal Sympathetic Hyperactivity (PSH) Successfully Treated with Tracheostomy Placement: A Case Report

Neha P. James, DO, Diane Mortimer, MD, and Mary Himmler, MD

Case Description: A 31-year-old man with untreated obstructive sleep apnea sustained a severe traumatic brain injury (TBI) in a moped crash. He required emergent treatment for bilateral subdural hematomas. He did not regain consciousness in acute care. He underwent tracheostomy placement on day 14. He was subsequently weaned from the ventilator and discharged on day 28.

Conclusions: This is an uncommon case of a young patient who developed delayed spinal cord injury due to slow epidural fluid collection following surgical treatment for idiopathic scoliosis. Thorough post-operative examination allowed for early recognition, treatment, and full neurological recovery. Adequate MAPs and hemoglobin should be maintained to reduce the risk of spinal cord ischemia. However, in the setting of neurological deterioration, in addition to addressing possible causes of ischemia, imaging is needed to rule out other potential causes.

Paroxysmal sympathetic hyperactivity (PSH) is a rare but devastating complication. This case highlights the importance of thorough neurological examination, and quick diagnosis with removal of hardware when indicated.
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Peripheral and Cortical Changes in Response to Non-invasive Brain and Spinal Stimulation Combined with Repetitive Training in Incomplete Cervical Spinal Cord Injury: A Case Study
Nuray Yozbatiran, PhD, Nikunj A. Bhagat, MTECH, Radha Koropolu, MD, MS, Marcia K. O’Malley, PhD, Jose L. Conteras-Vidal, PHD, and Gerard E. Francisco, MD

Case Diagnosis: Chronic, incomplete cervical spinal cord injury.
Case Description: A 24-year-old female with incomplete spinal cord injury at the C4-C6 level, classified as American Spinal Injury Impairment Scale D (AIS) and 11 months post-injury, participated in a rehabilitation program that combined non-invasive brain stimulation, non-invasive spinal cord stimulation and repetitive arm training aiming to improve arm and hand function in adults with weakness in their arms due to cervical spinal cord injury. Participant was evaluated for baseline motor and sensory functions including muscle tone, grip and pinch strength, Graded Assessment of Strength Sensibility and Prehension (GRASP). Slow cortical potential during a behavioral task (volitional squeeze and release of a hand grip- per) was used with a high-density active EEG system. All tests were repeated after completion of the intervention phase. The intervention consisted of combined anodal transcranial direct current stimulation at 2mA for 15 minutes followed by sham trans-sphenoidal direct current stimulation at 2.5mA for 15 minutes and simultaneous robotic-assisted training with the MAHI robot lateral ventricule. At the rehabilitation hospital he was receiving comprehensive physical, occupational and speech therapy and showing progress in his speech and ambulation ability. He was continued on his hypertension medications and anticoagulation with subcutaneous heparin. About a week after arrival he began complaining of hiccups. He was started on 25mg of Thiorazine nightly and then increased to every 8 hours which appeared to help transiently. His vital signs had been stable but his heart rate was noted to be in the 90s during the same time period. After about 4 days with the hiccups his heart rate increased to over 100 and he developed a mild cough. He was then sent out for evaluation. CT angiography revealed bilateral pulmonary emboli. He was placed on heparin drip and after transitioning to oral anticoagulation sent back to acute rehabilitation where he continued to progress.

Discussions: Persistent hiccups are sometimes underlying causes. A few case reports have been published previously which describe patients diagnosed with pulmonary emboli who were asymptomatic other than new onset of persistent hiccups. For this reason it is not recommended persistent hiccups be dismissed without workup.

Conclusions: While rare, one should evaluate persistent hiccups in rehabilitation patients with caution so as to not miss a severe and life-threatening complication.

Peripheral Polyneuropathy and Gait Disturbance Due to Polyarteritis Nodosa
Brian Nguyen, MD, Courtney L. Gilbert, BS, and Daniel Moon, MD, MS
Case Diagnosis: Polyarteritis nodosa, peripheral polyneuropathy, foot drop.
Case Description: A 31-year-old male initially presented to the emergency department with fevers, chills, weight loss, severe painful paresthesias, progressive weakness and difficulty walking after traveling to Ohio for construction work. Work up revealed acute hepatitis B and histoplasmosis infection. Inpatient electrodiagnostic studies showed no volitional activity in the bilateral tibialis anterior muscles, reduced recruitment in the left gastrocnemius, and evidence of severe axonal injury to bilateral tibial and peroneal nerves. Nerve, muscle and vascular biopsies revealed vasculitic neuropathy and polyarteritis nodosa (PAN). The patient was treated with cyclophosphamide along with antifungal and antiviral medications. He was initially discharged to a skilled nursing facility and subsequently discharged home without orthosis or follow-up therapies. He continued to decline functionally and medically due to limited support and depression. Therefore, he was admitted to a comprehensive inpatient rehabilitation program. His rehabilitation course was complicated by malignant hypertension, severe neuropathic pain limiting ability to bear weight and bilateral foot drop. After two weeks, his ambulatory function improved from ambulating with a rolling walker at a minimum assistance level to ambulating at a modified independent level with only the use of dorsiflexion assistance ankle foot orthoses.

Discussions: Vasculitic polyneuropathy due to PAN can manifest as neuropathic pain and weakness leading to severe disability. Unfortunately, literature review is limited regarding the impact of rehabilitative interventions.

Conclusions: This case highlights the benefits of multidisciplinary approach provided by acute inpatient rehabilitation to treat PAN-associated vasculitic polyneuropathy. Additionally, severe pain and systemic involvement of PAN warrants frequent medical monitoring and management that may not be available in other rehabilitation facilities.

Physiatric Progression of a Patient with Chronic Inflammatory Demyelinating Polyneuropathy with Underlying Phacomelia
Sanjay J. Digamber, MD, and Chirag M. Shah, MD
Case Diagnosis: Chronic Inflammatory Demyelinating Polyneuropathy is a condition that affects peripheral nerves. The disease is thought to be immunologically based through both the humoral and cellular components. Patients usually have symmetric motor weakness in the proximal and distal muscles and may have sensory involvement as well. The motor component is usually more affected than the sensory component in these patients. Sensory is affected in a distal to proximal distribution and proprioception/vibration are affected more than pain sensation. Cranial nerve or bulbar defects may be seen in 10-20% of patients. CIDP is differentiated from GBS by progression or relapse after an 8 week period.
of time and also by respiratory involvement. There are many variants including sensory only, motor only, and CNS variants.

Case Description: This is a 53 year old male with past medical history of phacomelia secondary to intrauterine thalidomide use, diabetes mellitus type II, congenital heart defects and Bell's palsy who presented with progressively worsening falls over the past two months. He reports multiple episodes of falling posteriorly due to leg weakness. He also reports difficulty chewing and closing his eyes. On exam, the patient was noted to have absent lower extremity reflexes with decreased tone bilaterally. Vibriatory sensation was diminished from his bilateral toes to his ankles. Pinprick sensation was diminished from his bilateral legs to his feet. His lower extremity exam was limited due to his phacomelia. The patient also had bilateral facial palsy with weakness of eyelid closure and inabiity to smile or raise eyebrows. A lumbar puncture was performed for suspected inflammatory neuropathy showing protein levels two times the normal values. Patient was diagnosed with chronic inflammatory demyelinating polyneuropathy and was started on IVIG. During treatment the patient developed AKI and IVIG was discontinued on treatment 2/5. The patient was then started on plasmapheresis of which 5/5 treatments were completed. The patient was then transferred to acute rehab for intensive therapy.

Discussion: Over the course of this patient’s rehab stay there was significant improvements in functional mobility. Despite this patient’s inability to compensate for lower extremity weakness, he was stable able to make progress with the aid of rehab staff. He participated in muscular strengthening and balancing exercises with physical therapy in addition to compensatory techniques for ADLs and transfers. The patient progressed from the time of admission to discharge with FIM of 4–6 with rolling, 3–4 for supine to sit and 2–4 from sit to stand, 2–3 with gait. With ADLs the patient had scores of 1–2 with grooming, 1–3 with upper body dressing, and 1–1 for lower body dressing, bathing, and toileting.

Conclusion: This case shows the functional impairments of a patient with inflammatory neuropathy with congenital phacomelia who made functional progress with support from physical therapy, occupational therapy, and medical staff. It’s important to note that despite the inability to compensate for lower extremity weakness by using their upper extremities, patients can show objective progress with intensive rehab therapy. This case demonstrates the importance of acute rehab for patients with underlying comorbidities and the functional progression they can make to improve quality of life and independence at home.

Plexiform Neurofibromas as a Cause of Cervical Spinal Stenosis: A Case Report
Hardeep S. Kainth, MD, and Clinton Faulk, MD

Case Description: Plexiform Neurofibromas

Case Description: A 40-year-old male with a past medical history of Neurofibromatosis Type 1 (NF1) presented to the emergency department with progressive nausea and abdominal pain over the last 2 months. The patient was found to have choledolithiasis and subsequently underwent a cholecystectomy with no surgical complications. During recovery the patient reported bilateral lower extremity and upper extremity weakness, with no focal sensory deficits and no bowel or bladder dysfunction. On further history, the patient reports a history of intermittent transient lower extremity weakness associated with stress. 10 years previously the patient had similar disabling symptoms and he underwent a C4-5 laminectomy with excision of small intradural-extradural neurofibromas. A cervical spine magnetic resonance imaging (MRI) was preformed which showed cervical spine plexiform neurofibromas along multiple cervical roots, prominent in the C2 foramina and in the C4-C5 foramina and mass effect on the cord by C4-C5 neurofibromas. Neurosurgery were consulted who further evaluated the patient and recommended a cervical laminectomy with excision of 4 small intradural-extramedullary neurofibromas. During surgery the patient was noted to have absent lower extremity reflexes with decreased tone bilaterally. Vibriatory sensation was diminished from his bilateral toes to his ankles. Pinprick sensation was diminished from his bilateral legs to his feet. His lower extremity exam was limited due to his phacomelia. The patient also had bilateral facial palsy with weakness of eyelid closure and inability to smile or raise eyebrows. A lumbar puncture was performed for suspected inflammatory neuropathy showing protein levels two times the normal values. Patient was diagnosed with chronic inflammatory demyelinating polyneuropathy and was started on IVIG. During treatment the patient developed AKI and IVIG was discontinued on treatment 2/5. The patient was then started on plasmapheresis of which 5/5 treatments were completed. The patient was then transferred to acute rehab for intensive therapy.

Discussion: Over the course of this patient’s rehab stay there was significant improvements in functional mobility. Despite this patient’s inability to compensate for lower extremity weakness, he was stable able to make progress with the aid of rehab staff. He participated in muscular strengthening and balancing exercises with physical therapy in addition to compensatory techniques for ADLs and transfers. The patient progressed from the time of admission to discharge with FIM of 4–6 with rolling, 3–4 for supine to sit and 2–4 from sit to stand, 2–3 with gait. With ADLs the patient had scores of 1–2 with grooming, 1–3 with upper body dressing, and 1–1 for lower body dressing, bathing, and toileting.

Conclusion: This case shows the functional impairments of a patient with inflammatory neuropathy with congenital phacomelia who made functional progress with support from physical therapy, occupational therapy, and medical staff. It’s important to note that despite the inability to compensate for lower extremity weakness by using their upper extremities, patients can show objective progress with intensive rehab therapy. This case showcases the importance of acute rehab for patients with underlying comorbidities and the functional progression they can make to improve quality of life and independence at home.

Point-of-Care Ultrasonography in Diagnosing and Differentiating Mechanical versus Gout Induced Achilles Tendinitis and Retrocalcaneal Bursitis: A Case Report
Julia Reed, MD, Robert Diaz, MD, and Minna J. Kohler, MD

Case Diagnosis: Achilles Tendinitis and Calcific Retrocalcaneal Bursitis

Case Description: A 43-year-old obese male restaurant owner with three year history of polartacular gout presented to a tertiary Rheumatology musculoskeletal ultrasound clinic for ultrasound evaluation for bilateral posterior ankle and heel pain. Due to his occupation and inconsistent compliance with diet, he experienced intermittent gouty flares affecting his toes, ankles, and knees often provoked by high protein meals. His symptoms quickly improved after receiving indomethacin and colchicine. Despite improved control of his symptoms with allopurinol, the patient continued to experience bilateral posterior ankle and heel pain, right greater than left, with presumed etiology of gouty inflammation. Point-of-care ultrasound examination revealed findings consistent with bilateral mechanical Achilles tendinitis and calcific retrocalcaneal bursitis. His imaging did not demonstrate the ultrasound findings associated with crystalline deposition of gout such as hypererechoic stippled foci, hyperechoic soft tissue areas/hypoechoic streaks, or intratendinous tophi. Due to his severe pain symptoms on the right side, an ultrasound-guided right retrocalcaneal bursal steroid injection was performed with an improvement in his pain symptoms.

Discussion: In patients with a history of polartacular gout, inflammation can occur in tendons and soft tissue as well as joints. The ultrasound appearance of gout crystals differs when compared to the appearance of calcific crystals. This case demonstrates the importance of ultrasound imaging in differentiating inflammatory versus mechanical etiology of Achilles tendinitis and retrocalcaneal bursitis and ultimately affected management of the patient.

Conclusion: There is growing literature demonstrating the superior capabilities of ultrasonography in detecting gouty crystals and tophaceous material within joints, tendons, and cartilaginous surfaces, compared to MRI. Ultrasonography can quickly detect typical characteristics of gout pathology and lead to a swifter diagnosis and targeted therapy. Further studies are needed to evaluate the diagnostic utility and prognostic value of ultrasonography in gout induced Achilles tendinitis.

Polymyalgia Rheumatica: An Imitator of Degenerative Disc Disease
Ingrid Yang, MD, John Temple, MD, and Christopher Reger, MD

Case Diagnosis: Polymyalgia Rheumatica

Case Description: A 73-year-old man presented to the Emergency Department (ED) with progressively worsening back and hip pain with radiation into bilateral thighs. He was diagnosed with sciatica, and discharged with Cyclobenzaprine, Ibuprofen, physical therapy consult, and a prescription for outpatient lumbar spine MRI. MRI revealed L2-L3 foraminal disc bulge and mild multilevel spondyloitic changes. Physical therapy resulted in little improvement.

Within a few weeks, his pain and stiffness worsened and he became entirely bed-bound. He presented again one month after initial presentation with severe neck, shoulder, back and hip pain and stiffness, and was unable to raise his arms to test pronator drift. Cervical spine CT scan revealed moderate to severe multilevel degenerative disc disease and C5-C7 spondylolisthesis. Physical exam revealed 3/5 strength in bilateral shoulder abduction and hip flexion, but otherwise 5/5 throughout. Laboratory studies revealed ESR and CRP elevations of 60 and 6, respectively. Given the physical exam findings of proximal weakness and elevated inflammatory markers, sciatica appeared an unlikely diagnosis, and polymyalgia rheumatic was considered. A trial of Prednisone was initiated. By day three of steroid treatment, the patient’s motor exam revealed 5/5 strength throughout and he was well enough to walk out of the hospital. He continues to be completely independent in all ADLs maintained on a low-dose daily prednisone.

Discussion: Polymyalgia Rheumatica (PMR) often affects older individuals and is characterized by morning stiffness, limited range of motion and pain in the neck, back and pelvis. In an aging population with degenerative disc disease, these symptoms can be incorrectly attributed to radiculopathy or spinal stenosis.

Conclusion: This case emphasizes the importance of maintaining a broad differential diagnosis when assessing back pain and stiffness. While degenerative disc disease is a common finding among people in the seventh decade, other etiologies such as malignant, infectious, and inflammatory causes should be considered.

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POST-STROKE GAIT REHABILITATION COMPLICATED BY MADELUNG DISEASE: A CASE REPORT

Mahmudul Patwary, MS4, Wendy Luo, MD, and Ajendra Sohal, MD

**Case Diagnosis:** Madelung Disease, Left Occipital Stroke

**Case Description:** A 54-year-old female with lipodyrophy was prescribed physical therapy after a left occipital stroke. Despite improvement in her fine motor coordination, she still complained of gait instability and pain/parasthesias in all her extremities 7 months after her stroke. She also reported that 5 years ago she noticed a disproportionate increase in the size of both of her legs. The weight of her legs coupled with neuropathic pain impeded her ability to ambulate. Physical examination demonstrated enlarged lower extremities, decreased sensation, bilateral ulcers, and 3/5 strength. CT/MRI revealed lipomas on the lower extremities. An EMG showed diffuse sensorimotor demyelinating peripheral neuropathy predominantly affecting the extremities.

**Discussions:** Madelung Disease is characterized by symmetrical growth of lipomas commonly found in the shoulder, arms, thorax and thighs. The diagnosis is made by a detailed history and physical, as well as a CT or MRI demonstrating the lipomas. Peripheral neuropathy is an integral part of this condition and is a result of distal axonal demyelination. This can lead to neurological consequences such as gait disturbances, paraesthesias, and peripheral neuropathies. The size and weight of the lipomas can cause problems with active motion, as well as severe pain. Interventions include surgical excision and liposuction, though the recurrence rate is high. Non-surgical approaches include phosphatidylcholine injection, salbutamol, and selenium. However, there have not been any clinical trials to prove the efficacy of these treatments. For this patient, surgical therapy is a poor option due to the recurrence rate. Management of her edema and pain is a better approach to improve active motion. She was prescribed gabapentin 300mg at bedtime.

**Conclusions:** In post-stroke patients with Madelung disease, physical therapy alone is not enough to improve gait functionality. Proper management of Madelung disease during the rehabilitation process is still unclear due to lack of clinical trials.

POST-TRAUMATIC VISUALIZED SUPERNUMERARY PHANTOM LIMBS: A CASE REPORT

S. Courtney-Kay Lamb, MD

**Case Diagnosis:** Post-Traumatic Visualized Supernumerary Phantom Limbs

**Case Description:** The patient is a 38-year-old male with a history of traumatic brain injury (TBI) 10 years prior to presentation with resultant post-traumatic epilepsy. Following a medication change, he was in a severe traffic collision attributed to seizure activity. Extensive polytrauma injuries resulted, most notably C4 complete tetraplegia, a new TBI, and cerebellar infarcts. Post-traumatically, the patient reported constantly feeling and visualizing additional arms sprouting from elbow height bilaterally. These extra arms moved independently of his true arms and were visualized even with his true arms covered. Consultations from Psychiatry, Neurology and Ophthalmology could not find any alternate diagnoses for this experience and he was diagnosed with visualized supernumerary phantom limbs (SPLs). Three months post-traumatically, he spontaneously began experiencing supernumerary phantom legs, sprouting medially from his knees bilaterally, after a suspected seizure. EEG at that time recorded left occipital epileptiform activity.

**Discussions:** Supernumerary Phantoms limbs are a rare phenomenon known to occur following a variety of neurological ailments including stroke, spinal cord injury, epilepsy, TBI, space occupying lesion, cerebral root avulsion and demyelinating disease. Less than thirty cases of SPLs have been reported and of those, only six cases described visualized SPLs, all of which were in the setting of isolated stroke. While it is currently not possible to establish the primary etiology of our patient’s visualized SPLs, given that he experienced acute and chronic TBIs, SCI, stroke and acute and chronic seizures, the later development of his new lower extremity SPLs with corresponding left occipital epileptiform activity seems to heavily suggest seizure activity as the primary contributor to his SPL experience.

**Conclusions:** This case report describes what appears to be the first reported case of visualized supernumerary phantom limbs in a polytrauma patient.

PRESENTATION AND PHYSIATRIC COORDINATED REHABILITATION MANAGEMENT OF A PATIENT WITH GUILAIN-BARRE SYNDROME SECONDARY TO ZIKA VIRUS INFECTION: A CASE REPORT

Neil Mandalaywala, MD, Young Il Seo, MD, Kevin Franzese, DO, Quaisi Dahodwala, DO, Mark Raguaci, DO, and Robert Petrucelli, MD

**Case Diagnosis:** Guillain-Barre syndrome; Zika virus infection

**Case Description:** The patient is a 64-year-old female with history of HTN who presented to the ER with worsening extremity weakness. Of note patient had recently returned from a trip to the Dominican Republic 2 weeks prior. Patient reported significant amount of mosquito bites sustained while abroad. Upon return to the United States, the patient noted low grade fevers, rash, joint pain and flu-like symptoms which prompted her presentation to OSH ER. She reported recently hearing the news that her cousin diagnosed with Zika infection. Labs were drawn for Zika and Chikungunya and the patient was discharged on support. Repeat lipomas gradually resolved until 2 days prior to admission with new complaints of numbness in her feet along with weakness in extremities requiring assistance to walk.

The patient was admitted to the hospital for monitoring due to significant weakness noted on exam. During inpatient admission, EMG/NCS performed showed diffuse demyelination with sparing of the sural nerves and significant involvement of the bilaterally demyelinated ulnar nerves. Management of her edema and pain is a better approach to improve active motion. She was discharged to the step down service where she was monitored until inpatient rehabilitation admission on HD#26.

On initial inpatient rehabilitation assessment, the patient was noted to be too weak to total assist for ambulation, transfers and portions of self-care. A comprehensive rehabilitation plan was designed and implemented targeting functional limitations the patient was experiencing. She made significant gains made during inpatient therapy and upon discharge to home the patient was noted to be modified independent to independent in mobility, transfers, ambulation and self-care activities.

**Discussions:** While a recent editorial was published by the New England Journal of Medicine showcased an association with Guillain-Barre syndrome and Zika virus infection, this is the first case, to our knowledge, of successful rehabilitation management of Zika virus associated GBS.

**Conclusions:** With further study the Zika virus and advocation for rehabilitation management, this may assist with improving functional outcomes for patients presenting with Guillain Barre Syndrome associated with Zika infection.

PRESENTATION AND REHABILITATION IN A PATIENT WITH TOXOPLASMOSISENCEPHALITIS: A CASE STUDY AND REVIEW

Ryan Mattie, MD, Zachary McCormick, MD, and Henry Huie, MD

**Case Diagnosis:** Toxoplasmosis Encephalitis

**Case Description:** A 30-year-old right-handed male with no significant past medical history was in his usual state of health when he began to develop right-sided numbness and blurred peripheral vision in the right eye. Magnetic resonance imaging (MRI) of the brain was obtained and showed two enhancing lesions, one in the left frontal lobe and one in the left thalamus. The radiology report determined the lesions were most consistent with metastatic disease. However, a CT scan of the chest, abdomen, and pelvis with contrast from was unremarkable. The patient’s symptoms progressed so he presented to our institution for a second opinion.

On examination, the patient was thin, alert and oriented and in no acute distress. Vital signs were stable and within normal limits. There was evident psychomotor slowing and periods of inattention. There was right lower quadrant palpation with limitation of supraduption and nystagmus with right end-gaze. The patient had decreased muscle bulk and atrophy in the upper and lower extremities. Right upper extremity strength testing revealed 2+5 shoulder abduction, 4/5 elbow flexion and extension, 2/5 wrist extension and 2/5 finger abduction. Spasticity was graded at a Modified Ashworth Score (MAS) of 1+4 in the right elbow flexors. Right lower extremity strength testing revealed 2+5 hip flexion, knee extension, and ankle dorsiflexion, with 4/5 ankle plantar flexion and extensor hallucis longus dorsiflexion. Sensation to light touch was absent in the right upper and lower extremities. Reflexes were 2+ throughout, toes were upgoing with Babinski reflex testing bilaterally and there was no clonus. There was difficulty with finger-to-nose testing using the right hand. Blood work returned positive for HIV-1 RNA, a CD-4 count of 11, and a viral load of 555,973 copies/mL. An enzyme linked fluorescent assay was positive for Toxoplasma gondii, and a subsequent 6-week serology noted a titer of 1:160. Computed tomography (CT) and magnetic resonance imaging (MRI) of the brain showed multiple enhancing peripheral ringed lesions consistent with Toxoplasmosis Encephalitis.

Rehabilitation included a comprehensive program of physical therapy, occupa tional therapy, speech language pathology, rehabilitation nursing, recreational therapy, psychology, and medical management by a physical therapist. The patient was followed closely by infectious disease specialists for coordinated care. Prior to discharge, a repeat MRI showed stable multifocal rim enhancing lesions with a decrease in in size of new lesions. No new lesions were noted. A repeat CD-4 count increased to 48, and the HIV viral load decreased to 616 copies/mL. Repeat physical examination revealed at least 4/5 muscle strength in the right upper and lower extremity except for hip flexion, which was 3/5.
Discussions: Toxoplasmosis is a rare disease caused by an intracellular protozoan parasite, but it commonly affects patients with advanced HIV immunodeficiency and can be severely debilitating, even fatal, in patients with central nervous system (CNS) involvement. There are a number of case reports focusing on diagnosing toxoplasmosis with MRI, but our experience suggests that this modality can reveal no reports on the potential for functional recovery after a patient has presented with severe cognitive and neurologic deficits in the setting of toxoplasmosis encephalitis. Our case uniquely illustrates how acute inpatient rehabilitation can lead to significant gains in functional measures of physical and cognitive ability. This case demonstrates the array of deficits that can result from multiple lesions throughout the body (including both the brain and lungs), and the dramatic improvement which effective rehabilitation can improve these deficits. Our patient presented with severe limitations due to motor weakness, sensory deficits, cognitive delay, and memory and judgment impairments.

After comprehensive rehabilitation in conjunction with medical management of the disease, vast improvements were made on every level. While our patient’s recovery required extensive medical treatment for both the HIV/AIDS and toxoplasmosis infections, this case describes the neurologic and functional recovery after inpatient rehabilitation.

Conclusions: We report a case of significant functional improvement in a patient with toxoplasmosis encephalitis after undergoing acute inpatient rehabilitation. Despite the improvement in functional ability from admission to discharge, our patient’s MRI did not show the same degree of change, suggesting that neurological and functional recovery is not dependent on resolution of the brain lesions associated with toxoplasmosis. MRI may be valuable for diagnosis, but not for monitoring or predicting the extent of recovery. This case suggests that rehabilitation may play an important role in the recovery of function lost from neurologic insults caused by this disease.

PRESENTATION OF PARSONAGE-TURNER SYNDROME COINCIDING WITH ONSET OF SHOULDER ADHESIVE CAPSULITIS AND ACUTE PARTIAL THICKNESS RIM-RENT SUPRASPINATUS ROTATOR CUFF TEAR: A CASE REPORT

Thanzeela K. Mohideen, MD, and Andrew Hsu, MD, MPH

Case Diagnosis: Parsonage-Turner Syndrome coinciding with onset of Shoulder Adhesive Capsulitis and acute partial thickness Rim-Rent Supraspinatus Rotator Cuff Tear

Case Description: A 58-year-old right-handed female presented with a 6-week history of severe right shoulder pain, right arm pain, and numbness/tingling in all 5 right digits. The patient reported throwing trash into a garbage and feeling a "pop" in her right shoulder. The pain in the right shoulder and arm progressed over the next several days. She also developed right finger paresthesias/dysesthesias (digits 2-5 greater than digit 1) and shoulder and hand weakness. Physical exam revealed weak right external rotation (4/5), shoulder flexion (3+/5), shoulder abduction (3+/5), finger abduction (4-5), and finger extension (4/5). Strength in right elbow flexion, elbow extension, wrist extension, and left upper extremities were normal. Exam also revealed symmetrical and normal upper and lower extremity reflexes. Babinski reflex, Sparling’s test and Hoffman’s sign were negative. Shoulder exam revealed restricted right shoulder active and passive ROM, specifically with shoulder flexion, abduction, internal rotation and external rotation. Right elbow and wrist range of motion were normal. Nuer’s and Hawkins maneuvers provoked pain in the right shoulder.NCIS revealed normal right median and ulnar motor studies. NCS at the right wrist and elbow showed normal median, ulnar, and median sensory evoked potentials. Needle EMG revealed normal EMG of the triceps, pronator teres, and cervical paraspinals.

Right shoulder MRI revealed a tiny partial undersurface tear at the far anterior aspect of the supraspinatus (rim-rent type tear) with tendinosis of the supraspinatus. Additionally, MRI revealed an amorphous intermediate T2 signal within the rotator interval along with mild thickening of the axillary recess suggestive of adhesive capsulitis. Brachial plexus MRI showed normal appearance of the right brachial plexus with no neural thickening or perineural edema.

Pharmacological treatment consisted of neuromodulating medication (gabapentin) and short course of low dose prednisone to address the brachial neuritis symptoms. Patient also underwent gurnehominal joint injection under ultrasound guidance, followed by physical therapy to address the adhesive capsulitis and small rotator cuff tear injury. The patient had slow steady improvement in symptoms over the course of 2 years.

Discussions: This case illustrates a rare presentation of Parsonage-Turner Syndrome coinciding with onset of shoulder adhesive capsulitis and acute partial thickness Rim-Rent Supraspinatus Rotator Cuff Tear. This case highlights the importance of considering both primary and secondary diagnoses in the evaluation of patients with shoulder pain. The presence of shoulder pain, sensory deficits, and cognitive delay in this patient suggests a complex clinical scenario requiring interdisciplinary management. The case also emphasizes the role of comprehensive rehabilitation in the recovery of functional abilities after severe shoulder injuries.

PRIMARY SPINAL EPIDURAL Ewings SARCOMA OF THE CERVICAL SPINE IN AN ADULT WITH HEMOPHILIA TRAIT: A CASE REPORT

Megan Flanigan, MD, and David Chen, MD

Case Diagnosis: Ewing’s Sarcoma of the cervical spine leading to paralysis in an adult with concomitant hemophilia trait

Case Description: This 36-year-old female began having achy pain between her scapulae approximately one month prior to presentation to the emergency room. She had been evaluated by multiple health care workers with diagnosis made of musculoskeletal pain. One week prior to presentation the patient began having radiating tingling down both arms. Upon evaluation in the ED, patient was found to have a mass in her cervical spine (C6-T1) that was compressing the cord. Surgery was postponed initially due to risk of bleeding with hemophilia trait until patient began having progressive weakness in all four extremities two days after imaging showed cord compression. She underwent emergent decompression surgery at this time and pathology was positive for Ewing sarcoma. PET scan and brain MRI showed no other lesions. Patient continued to have residual paralysis as well as neurogenic bowel and bladder, although these gradually improved with inpatient rehabilitation.

Discussions: There have been few reported cases of primary spinal extradural Ewings sarcoma of the cervical spine. These cases are uncommon with severe consequences. Patients should be monitored closely for any spinal cord compression symptoms. Early intervention and surgery may be necessary to prevent permanent neurological damage.

PREVENTION IS THE BEST MEDICINE: A CASE REPORT OF INDIRECT TRAUMATIC OPTIC NEUROPATHY FOLLOWING A PEDIATRIC TRAUMATIC BRAIN INJURY

Logan McCool, DO, and Mark Gormley, MD

Case Diagnosis: Indirect Traumatic Optic Neuropathy

Case Description: A 7-year-old male suffered a traumatic brain injury after coldicing into a tree while driving an ATV. He lost consciousness for five minutes and was airlifted by helicopter from the scene with a GCS of 14 for confusion. He had multiple injuries including subdural hematomas, skull base fracture, inner and outer table frontal sinus fracture, midline skull fracture through frontal suture, comminuted nasal bone and ethmoid sinus fracture, and right orbital wall fracture. The facial fractures were confirmed on CT and MRI. Six days after the injury he complained of eye pain and double vision and vision loss. His visual acuity was 20/100 in the right and right hands in the left. He had a relative afferent pupillary defect on the left. Fundoscopy was normal.

Discussions: Indirect traumatic optic neuropathy (ITON) causes permanent blindness in 50% of injured eyes. ITON occurs between 0.5 and 5% of closed head injuries. Changes in visual acuity, color differentiation, or presence of a relative afferent pupillary defect are common clinical indicators. The pathophysiology of ITON is hypothesized to involve either shearing forces that damage the optic nerve or a striking of the optic nerve on the orbit’s falx/fallopian ligament. Therapeutic options are limited. A surgical technique for ITON has not been validated. Observational studies involving corticosteroids have not demonstrated additional benefits over conservative treatments. One placebo-controlled RCT revealed that corticosteroids increase mortality at 6 months after head injury. In contrast, a double-blind placebo-controlled RCT demonstrated significant improvement when levodopa was administered with corticosteroids compared to corticosteroids alone.

Conclusions: Indirect traumatic optic neuropathy from traumatic brain injury is an uncommon presentation with severe consequences. Physicians should know that acute administration of corticosteroids has led to increased mortality, surgical decompression has shown equivocal results, and carbido/levodopa shows promise but still inconclusive results.

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Abstracts

Conclusions: Although rare, Ewing sarcoma can be found in the spine and lead to paralysis. Symptoms of pain may be present for weeks to months prior to neurolologic symptoms such as paresthesias and paralysis. Ewing sarcoma primarily affects children but is found occasionally in adults and should not be left off the differential.

PROGRESSIVE MULTIFOCAL LEUKOENCEPHALOPATHY IN A PEDIATRIC PATIENT WITH SYSTEMIC LUPUS ERYTHEMATOSUS: A CASE REPORT

Shannon Stallings, MD, Derek J. Ho, DO, and Renat Sukhov, MD

Case Diagnosis: Progressive Multifocal Leukoencephalopathy, Systemic Lupus Erythematosus

Case Description: A 15-year-old female with a history of systemic lupus erythematosus (SLE) presented to the hospital with complaints of worsening balance and increased slurred speech. The patient had been recently discharged from acute inpatient rehabilitation (AIR) after receiving steroids and cytoxan for a right cerebellar lesion thought to be caused by lupus cerebritis. She returned to the ED after two days of worsening balance and slurred speech. MRI revealed interval worsening of the lesion. Diagnostic workup revealed JC virus in the cerebral spinal fluid (CSF). Progressive multifocal leukoencephalopathy (PML) was entertained in the differential diagnosis and confirmed by brain biopsy. The patient continued to exhibit functional deficits, and was subsequently re-admitted to pediatric AIR with symptoms of ataxia, visual deficits, and right hemiparesis. Structured rehabilitation interventions, combined with a comprehensive psychosocial and integrative medicine approach, led to improvements in her symptoms and discharge to home.

Discussions: We present a case of PML in a pediatric patient with a diagnosis of SLE. Although rare, it is important to consider PML in the differential of a patient with SLE receiving immunosuppression. Increased ataxia, neurological, and visual symptoms, along with the presence of JC virus in the CSF, can raise suspicion for PML. In this patient, the diagnosis was confirmed via brain biopsy. Unfortunately, there are few similar reports in the literature, and thus little is known of the outcomes of these patients, including the one presented here. Although our patient was able to be discharged home, each case must be analyzed for the coordination of care options, including palliative care.

Conclusions: Functional deficits observed in patients diagnosed with PML, especially in pediatric settings, should be addressed with a structured, coordinated approach within AIR units. A family-centered, goal-oriented rehabilitation program should be utilized with the diagnosis of this devastating disease.

PROLONGED NEUROLOGIC SYMPTOMS FOLLOWING MEDIAN STERNOTOMY: A CASE REPORT

Mariko Kubinec, MD, Brenton Bohlig, MD, and David Haustein, MD

Case Diagnosis: Post-sternotomy plexopathy

Case Description: A 60-year-old female reported decreased sensation in left digits four and five, and clumsiness/weakness of the left hand following a median sternotomy for open heart surgery. An electrodiagnostic study demonstrated spontaneous activity in the left first dorsal interosseous, left flexor carpi ulnaris, and left extensor digitorum communis that was originally interpreted as a left C8 radiculopathy. She continued to have left hand tingling, numbness, and weakness for seven years and was referred for repeat electrodiagnostic evaluation. Left arm sensory and motor nerve conduction studies were normal, but EMG demonstrated decreased recruitment of long duration, large amplitude potentials in the left extensor digitorum communis. Needle study was abbreviated due to bleeding. Combined with the clinical history of sternotomy and initial EMG findings, this patient appears to have experienced a sternotomy related plexopathy with denervation followed by reinnervation in the left lower trunk distribution affecting C8-involved muscles.

Discussions: The incidence of brachial plexus injury following open heart surgery ranges from 2% to 38%. Patients most commonly present with medial hand sensory complaints. Electrodiagnostics can confirm decreased ulnar SNAP and CMAP amplitudes and axonal loss in muscles innervated by the C8 nerve root. Prognosis is usually excellent with an overwhelming majority of patients making a full recovery within one month of surgery.

Conclusions: This is an unusual case of incomplete recovery of lower trunk brachial plexopathy secondary to open heart surgery in which the lower trunk was re-innervated, but the patient continued to have sensory complaints seven years later.

PROLONGED REHABILITATION OF PATIENT WITH AIDP PROGRESSING TO CIDP: A CASE REPORT

Bhivi Patel, DO, Patrick Dolan, MD, and Jack Mensch, MD

Case Diagnosis: Acute inflammatory demyelinating polyneuropathy progressing into chronic inflammatory demyelinating polyneuropathy

Case Description: A 36-year-old female presented with one week history of generalized weakness and progressive shortness of breath. Patient was intubated in ED and transferred to ICU. CSF studies confirmed diagnosis of Acute Inflammatory Demyelinating Polyneuropathy (AIDP) based on classic finding of increased protein count with minimal increase in WBC count - "albuminocytologic dissociation." Her hospital course became prolonged, requiring tracheostomy and gastrostomy placement in ICU. Patient slowly began to tolerate regular diet and was weaned off oxygen. She was eventually transferred to an acute rehabilitation unit where she made minimal functional improvements before having issues with shortness of breath and stridor. She received dilation and scar ligation of trachea to help with dyspnea. Unfortunately, dyspnea only worsened and patient was reintubated and transferred to ICU. Further scar ligation occurred at outside facility before patient returned to rehabilitation. She remained intubated. She demonstrated weakness of core musculature and intrinsic hand muscles. Because of continued inflammation, patient was diagnosed with Chronic Inflammatory Demyelinating Polyneuropathy (CIDP). Eventually, patient was able to be extubated and participated in further rehabilitation. She required maximum assistance with transfers and ambulation at this time. She ultimately progressed to contact guard assistance with rolling walker. There were no further issues with dyspnea and patient was eventually discharged home.

Discussions: This case demonstrates the spectrum of AIDP to CIDP with various complications experienced by our patient. It also highlights the importance of monitoring a patient’s functional status, as we were able to diagnose our patient with CIDP because of her worsening deficits.

Conclusions: Despite CIDP diagnosis and multiple complications, our patient progressed with rehabilitation, eventually guiding her home.

PSUEO-TENDONITIS OF BILATERAL PERONEUS BREVIS SECONDARY TO SNEAKER IRRITATION AT THE LATERAL MALLEOLAR NOTCH

Youl Yee Kim, MD, Antonio Howard, MD, Jared Levin, MD, and Dennis DJ Kim, MD

Case Diagnosis: This is a case of a 35-year-old man with history of obesity, status post right peroneal brevis tendon debridement by Orthopedics for tendon split tear, who presented with persistent pain of the lateral ankles and feet bilaterally for more than one year. Seven months prior to his surgery, the patient developed pain in the right foot, followed by similar symptom in left foot after a 10 mile-walk in boots. On radiologic studies, bilateral peroneus brevis tendon split tear were found. After failing conservative treatment, surgical debridement was performed for the more symptomatic right side. However, the surgery failed to provide any relief of pain, and subsequently the patient was referred to rehabilitations rot clinic, 7 months later. At the time of presentation, his left sided symptoms had also progressed.

Case Description: On the initial visit to Rehabilitation Clinic, the patient’s numeric rating scale of pain was 7 out of 10. Right foot symptoms were associated with intermittent numbness and tingling in the lateral aspect of the hind foot, with intermittent radiation to the lateral forefoot when walking, especially with foot inversion. Symptoms were similar in the left, without numbness. On exam, the right foot was sensitive to light touch along lateral aspect of the hind foot. Using lipstick marking, the point of maximal tenderness, located between bilateral peroneal tubercle and lateral malleolus, was found to correspond with a point of friction with the boot’s lateral heel counter. Because symptoms were believed to be secondary to friction, the patient was advised to wear two layers of thick socks, provided with 3/4 inch heel lift, and instruction for daily calf stretches. The patient’s pain on 3-month follow up had improved by 50%.

Discussions: Peroneal tendons and sural nerve branches travel through the peroneal tubercle of the lateral calcaneus. Symptoms of pain and irritation can occur at this area with or without traumatic events (such as ankle sprain). Splinting of peroneus brevis tendon is not an uncommon finding. However, irritation of the tendons, ligaments or sural nerve branches by friction from high ankle footwear may result in such symptoms. Most well-constructed athletic footwear facilitates relief at the lateral malleolus by creating “lateral notches”. In some instances, the athlete’s footwear and lateral malleolus does not match properly which can result in painful symptoms.

Conclusions: Thorous history and physical taking, including footwear examination are a critical piece of diagnosis and treatment strategies for foot pain. A 35-year-old man presented with refractory pain of the lateral aspect of bilateral ankles despite bilateral peroneus brevis tendon debridement for tendon split tears. Right ankle pain was superimposed with allodynia after the surgery. Applying of long-soft thick double socks, elevating 3/4 inch heel lifts, and stretching of gastrocnemius muscles was helpful in pain relief and functional improvement.

PULMONARY HYPERTENSION SECONDARY TO CHRONIC RECURRENT PULMONARY EMBOLISM IN A PARAPLEGIC INDIVIDUAL: A CASE REPORT/REVIEW PAPER

Jesson Baumgartner, DO, and Ronald Reeves, MD

Case Diagnosis: A 42-year-old male with chronic paraplegia presented 15 years post injury with chronic cough, shortness of breath and subsequently developed lower limb
edema. Echocardiogram revealed findings consistent with severe pulmonary hypertension. Chest CT angiogram showed multiple bilateral acute and chronic pulmonary emboli.

**Case Description:** This individual originally presented with symptoms of a cough and dyspnea on exertion. He was treated for sinusitis and allergic rhinitis for 6 months. Eventually he developed lower limb edema. Lower extremity Doppler was negative for DVTs. His symptoms prompted an evaluation of his cardiac status with an echocardiogram, which revealed severe right ventricular enlargement and decreased systolic dysfunction. A chest CT angiogram revealed multiple bilateral acute and chronic pulmonary emboli.

**Discussions:** There is only one other case report of chronic pulmonary emboli in a patient with tetraplegia causing heart failure. This lack of reports suggests that this is a rare finding, but the actual incidence and prevalence are unknown. In 2016 the Consortium for Spinal Cord Medicine published new guidelines for the prevention of venous thromboembolism. No specific recommendations are provided for prevention beyond 8 weeks following spinal cord injury. In fact, they state that “the optimal duration of thromboprophylaxis following SCI remains unclear”.

**Conclusions:** Pulmonary hypertension and right heart failure secondary to chronic, recurrent pulmonary emboli after spinal cord injury is a potentially preventable condition. Future studies to determine the prevalence and incidence are warranted. Given that this is likely a rare event, these studies may need to occur using a multi-center approach. Once more information is known, guidelines for monitoring and treating chronic pulmonary emboli in spinal cord injury patients may help prevent these complications.

**RADIAL ARTERY THROMBOSIS IN A STROKE SURVIVOR: URGENT DIAGNOSIS MIMICKING A NEW STROKE**

Chris Cherian, MD, Allison Averill, MD, and Mooyeon Oh-Park, MD

**Case Diagnosis:** Radial Artery Thrombosis in a stroke survivor: Urgent diagnosis mimicking new stroke.

**Case Description:** A 90-year-old, right handed woman, with a past medical history of atrial fibrillation on anticoagulation, and hypertension who originally presented to the emergency department with complaint of left sided weakness. CT scan of the head revealed a 7mm right thalamic hemorrhage. Four days after the onset of her stroke, patient was transferred to the inpatient rehabilitation facility with instructions to remain off of anticoagulation until follow up CT scan of head.

Follow-up CT scan nine days post stroke revealed resolving hemorrhage. Decision was then made to begin Aspirin for eleven days, followed by Clopidogrel subsequently. Twelve days post stroke and eleven days after aspirin was started, patient reported sudden weakness in her right hand. Vital signs and her mental status was normal. Neurological examination revealed a decrease in right hand grip from 5/5 to 3/5 in manual muscle testing. In addition, the patient’s right hand was pale and cool to touch. Radial pulse was not palpable on affected arm, but a brachial pulse was present. Her left upper extremity was unaffected and no other focal deficits were appreciated.

She was transferred to an acute care hospital for thrombectomy of the occlusion, and subsequently went to a subacute rehabilitation facility.

**Discussions:** Radial artery thrombosis (RAT) is relatively uncommon, yet requires urgent intervention due to tissue loss and compromise of hand function. The causes of RAT include iatrogenic cannulation, atherosclerosis, atrial fibrillation, or blunt and penetrating trauma. To the best of our knowledge, this is the first case of occurrence of RAT in a patient with a recent stroke undergoing rehabilitation. Acute weakness in stroke patients in inpatient rehabilitation unit is typically interpreted as another cerebrovascular event. The patient had risk factors for thrombosis formation including atrial fibrillation without anticoagulation, atherosclerosis, and prior stroke. An astute physician with index of suspicion captured the positive findings in vascular examination and negative findings (e.g. normal mental status) in neurological examination other than weakness leading to the accurate diagnosis and timely intervention.

The functional consequence of RAT in stroke survivors may be even more significant considering the already compromised function in the contralateral limb. Therefore, RAT should be included in differential diagnoses when evaluating stroke patients presenting with sudden onset of hand weakness.

**Conclusions:** Radial artery thrombosis (RAT) is a rare, yet time sensitive diagnosis with marked impact on the hand function of the patient. This is a case that RAT presented as hand weakness in stroke survivors. This emphasizes acute weakness in patients with recent stroke should include vascular in addition to neurological examination, particularly for those at risk of thrombus formation, not to overlook this detrimental diagnosis.

**RAPID ONSET COMMUNICATING HYDROCEPHALUS WITH MIDLINE SHIFT IN A POST-CRANECECTOMY TBI PATIENT**

John Schmidt, MD, Ana Michunovich, DO, and Vu Nguyen, MD

**Case Diagnosis:** Post-traumatic communicating hydrocephalus with effacement and midline shift severe traumatic brain injury.

**Case Description:** A 42-year-old white male was admitted to acute inpatient rehabilitation after severe traumatic brain injury (TBI) status post motor vehicle accident with best initial Glasgow Coma Scale score of 7 and uncertain loss of consciousness status (patient intubated in the field). While at acute care, the patient also underwent left sided craniectomy for bilateral subdural hematomas, subarachnoid hemorrhage, and depressed left temporal bone fracture. During the rehabilitation stay, the patient initially had sunken scalp over the craniectomy site until he developed acute, significant new edema at craniectomy site over a 12 hour period. However, he continued to improve functionally without neurologic decline. The new edema was discussed with the neurosurgery service, who was initially hesitant to repeat head imaging due to functional stability. Due to the acuteness of the change, repeat head CT was performed and showed large volume communicating hydrocephalus with effacement and midline shift. The patient required transfer back to neurological intensive care unit, daily CT head scans, and placement of ventriculostomy for intracranial pressure management of this rapidly-enlarging hydrocephalus to prevent herniation.

**Discussions:** Posttraumatic hydrocephalus is a relatively common complication of TBI, occurring in 2-23% of cases (1), with 2-8% of cases requiring CSF shunting (2–3). However, such rapid onset and severity of a communicating hydrocephalus – particularly in light of the patient’s previous craniectomy – is uncommon, and we could find no similar cases reported in the literature. This case highlights the importance of thorough clinical examination daily, as this patient’s only symptom was new craniectomy site edema, which could have been easily missed under a craniectomy helmet. Given the size of the hydrocephalus and the increased intracranial pressure on CT, the patient would have been expected to decline rapidly, and so the timely new neurologic changes occurred on exam, herniation may have already occurred.

**Conclusions:** While posttraumatic hydrocephalus is a common and often straightforward complication of TBI, clinical vigilance is needed, as the clinical manifestation of even severe hydrocephalus can be subtle.

**RARE ANATOMIC VARIANCE AS A POSSIBLE CAUSE FOR UNEXPLAINED SCIENTIC NERVE PALSY**

Jungsoon Choi, MD, and Haresh Sampathkumar, MD

**Case Diagnosis:** Post-operative left sciatic nerve neuropathy from prolonged lithotomy position.

**Case Description:** A 38-year-old woman underwent an elective pelvic floor reconstruction with repair of cystocele and rectocele. The patient was under general anesthesia, held in standard lithotomy position using calf support extensions integrated to the surgical bed. The surgery lasted about 2 hours. After surgery, the patient complained of left foot weakness and left leg and foot numbness. Computerized Tomography (CT) abdomen/pelvis did not reveal any evidence of compressive neuropathy. Electrodagnostic study performed about one month after the injury showed sciatic nerve injury at mid-thigh between branches of gluteus maximus and long head of biceps femoris.

**Discussions:** The most common cause of sciatic nerve injury is extrinsic compression. However, this is unlikely to be the cause of injury in our patient considering no evidence of compression on CT and the way the patient’s lithotomy position was achieved. One of the documented hypothesis for our findings is stretch or compression of the sciatic nerve at the sciatic notch; however, an alternative hypothesis based on unpublished data suggests persistent sciatic artery as a possible cause. This a rare vascular anomaly where there is a continuation of the internal iliac artery into the thigh through the greater sciatic notch. This artery, if present, becomes the main blood supply to the sciatic nerve. When patients with this anatomic variance are placed in lithotomy position, the arterial blood supply may be compromised as the artery gets compressed at the sciatic notch. The incidence of this vascular anomaly is roughly the same as the incidence of lithotomy position induced sciatic nerve palsy (0.4%).

**Conclusions:** Clinicians should be alerted about the possibility of this rare anatomic variance since unexplained sciatic nerve palsy after dorsal lithotomy could be due to this condition. An angiogram may be used for confirmation.

**RARE CASE OF PEDIATRIC CERVICAL RADICULOPATHY SECONDARY TO TRAUMA**

Mohammad Islam, MD, David Lee, BA, Chun Wai Hung, BE, MENG, Giancarlo A. Perez-Albela, MD, and Carlos Arias, MD

**Case Diagnosis:** A 12-year-old Hispanic female presented to the ED with chief complaint of neck and back pain after falling from a trampoline. After being diagnosed with a strain from the ED with spinal X-rays and CT scans, she was referred to neurology 5-6 weeks later for persistent paresthesia of the palms bilaterally, which then gradually spread to the lower back and soles of her feet. At the time of physical examination approximately 8 months after the appearance of symptoms, the patient’s...
Abstracts

CHALLENGING INTRATHecal BACloFEN PUMP REFILL: A CASE REPORT AND PROCEDURE DESCRIPTION
Mithra B. Maneyapanda, MD, Samuel T. Clanton, MD, PHD, and Christopher Reger, MD

Case Diagnosis: Spastic paraplegia secondary to multiple sclerosis

Case Description: The patient is a 55-year-old man with history of multiple sclerosis (MS) and spasticity managed with intrathecal baclofen (ITB) who presented to an outpatient rehabilitation clinic for routine ITB pump refill. His ITB pump was noted to be tilted and mobile within the subcutaneous pocket. Given challenges of an outpatient rehabilitation clinic for routine ITB pump refill. His ITB pump was prescribed Tramadol with oxycodone for breakthrough pain. A local block with 1% lidocaine was also performed under ultrasound guidance; the patient reported excellent sound and physical examination revealed virtually complete healing as well as no neuropathy or radiculopathy.

Conclusions: This case represents cervical radiculopathy in a pediatric patient. The patient’s history and her chief complaint are typical of cervical radiculopathy, but her symptoms only warrant conservative treatment at this time. Although the clinical and diagnostic findings were largely within normal limits, it is important for the clinician to assess for red flag signs during follow-up, such as progressive motor weakness or persistent pain that may denote a more severe spinal nerve issue.

REAL-TIME ULTRASOUND GUIDANCE FOR TECHNICALLY CHALLENGING INTRATHecal BACloFEN PUMP REFILL: A CASE REPORT AND PROCEDURE DESCRIPTION
Mithra B. Maneyapanda, MD, Samuel T. Clanton, MD, PHD, and Christopher Reger, MD

Case Diagnosis: Scoliosis (MS) and spasticity managed with intrathecal baclofen (ITB) who presented to an outpatient rehabilitation clinic for routine ITB pump refill. His ITB pump was noted to be tilted and mobile within the subcutaneous pocket. Given challenges of using the guide template on the skin, real-time ultrasound (US) guidance was used to access that reservoir fill port (RFP). Using a sterile technique, including transducer using the guide template on the skin, real-time ultrasound (US) guidance was used to access that reservoir fill port (RFP). Using a sterile technique, including transducer cover and sterile gel, the patient’s abdomen was scanned with a linear transducer to identify the RFP. The transducer was translated to position the RFP on the edge of the US machine’s screen. The RFP was then accessed using the Huber needle included in the refill kit while visualizing the RFP via US. The remainder of the refill procedure was completed per manufacturer instructions.

Discussions: Historically, ITB pump refill procedures have been performed without image guidance. Recently, US guidance has been introduced as a practical technique during intrathecal drug pump refill. This can facilitate ITB pump refills in technically challenging cases due to excess subcutaneous fat, pump tilt, spasticity, and suboptimal positioning. Real-time US guidance for ITB pump refill has been described in one cadaveric study and a single case report. Here we describe a novel real-time US guidance technique that avoids the multiple needle passes involved with a short-axis approach.

Conclusions: ITB pump refill with US guidance is feasible and efficient. Real-time US guidance allows the advantage of direct visualization of the RFP during the refill procedure compared to indirect methods. This technique may be most useful for select patients where pump and skin movement would hinder indirect methods.

REFRACTORY BACK PAIN DUE TO ADIPOsIS DOLOROSA: A CASE REPORT
WeiBin Shi, MD, PHD, and David R. Gater, MD, PHDMS

Case Diagnosis: Adiposis dolorosa

Case Description: A 39-year-old woman with two years of low back pain was referred to our clinic for back pain management. The pain was described as sharp, aching, 9/10, and traveled down buttocks to anterior aspect of thighs. Previous MRI and X-ray of lumbar spine were unremarkable. She was diagnosed with low back pain and myofascial pain, and tried NSAIDs, acetaminophen, TENS, physical therapy and a few trigger point injections without improvement. On physical exam, a 0.5 cm, well-defined, mobile and tender subcutaneous nodule was palpable at the low back, 5 cm left to the midline at L5 level. Pressure on the nodule reproduced the same severe pain referring to buttocks and thighs. Further exam did not reveal any neurological or musculoskeletal abnormalities except mild paraspinal tenderness on palpation, and a diagnosis of adiposis dolorosa was made. She was unable to tolerate the side effects of amitriptyline, and lidocaine transdermal patch was not covered by her insurance, so she was prescribed Tramadol with oxycodone for breakthrough pain. A local block with 1% lidocaine was also performed under ultrasound guidance; the patient reported excellent instant pain relief. Her pain was under control for 3 months. A similar result was achieved with 6% phenol neurolysis. She subsequently had a surgical removal of the painful nodule with a good outcome. Pathologic diagnosis was consistent with lipoma.

Discussions: Adiposis dolorosa is a rare disorder characterized by painful subcutaneous adipose tissue, which can be easily missed or mistaken for many other diseases. Even rarer that a single adipose nodule acts as an etiology of low back pain. Conservative treatment is still the first line option and worth to try before surgery.

Conclusions: Adiposis dolorosa could be a source of low back pain refractory to conservative treatment.
REFRACTORY DYSTONIC STORMING IN A PATIENT WITH CEREBRAL PALSY AND SPASTIC QUADRIPLEGIA
Grace Maloney, MD, and Larissa Pavone, MD

Case Diagnosis: Refractory Status Dystonicus

A 39-year-old male born in 1982 with grade III intraventricular hemorrhage and dystonic cerebral palsy presented for rehabilitation following placement of a deep brain stimulator (DBS). Over a period of 3 years, he had increasing frequency and duration of dystonic storming. Dystonic storming persisted despite medication adjustments, therefore a decision was made for DBS placement. The patient was placed on dexmedetomidine drip for sedation but continued to have unmanageable dystonia prior to procedure, therefore general anesthesia was used. Post-operatively the patient continued having severe dystonia requiring frequent adjustments to her medication regimen and DBS settings. Severe episodes of dystonia lasted for over 9 hours at a time despite high doses of rescue medications. She had aspiration pneumonitis related to dystonia associated dysphagia. NG tube was placed for supplemental nutrition. Propranolol and clonidine reduced her episodes however she developed significant bradycardia and therefore propranolol was discontinued. Different combinations of gabapentin, clonidine, carbipoda/levodopa, clonazepam, diazepam, benzotropine, and baclofen were used to minimize the episodes along with frequent adjustment of the DBS settings. At optimal status, she had 1 episode in 24 hours lasting approximately 1 hour and resolving after early administration of scheduled medications.

Discussions: Uncontrolled secondary multifocal dystonia presents significant barriers to quality of life, function, and care of a patient. Severe dystonia, in the worst scenarios may lead to loss of function, and failure of the pulmonary system is at risk from chronic aspiration. Rhabdomyolysis compromises kidney function. Pharmacologic and surgical approaches in combination may be needed to adequately treat status dystonicus.

Conclusions: Pharmacologic and surgical approaches in conjunction may be needed for life threatening refractory dystonia which is uncommon and difficult to manage. When dystonia continues to be inadequately controlled, systematic modification of the treatment approach and trials of different medications are necessary.

REHABILITATION BEYOND BARRIERS
Mohammed Emam, MD, and Huma Naqvi, MD

The rapid growth of Physical Medicine and Rehabilitation over the past few decades testifies to the need for rehabilitation medicine is intuitive and paramount. The Montefiore Medical Center’s PM&R department at Albert Einstein College of Medicine recognized this need globally and hence launched the global health project with primary focus on establishing a rehabilitation unit in the recent warfare state. The initiative started by developing a multidisciplinary approach for successful rehabilitation of patients with NMO complication.

Case Diagnosis: Intrapartum Neuromyelitis Optica: A Case Report
Priya B. Patel, DO, Rachel Santiago, BS, and Miguel Escalon, MD, MPH

Case Description: A 31-year-old G2P020 female at 20 weeks gestation presented to an acute rehabilitation unit with incomplete paraplegia of unknown etiology. MRI spine records showed multi-level T2 signal changes, suggestive of a myelitis disease process; however, a diagnosis was not established until lab results from previous facility showed that patient was positive for NMO. She denied current or previous symptoms of vision loss or optic pain. Neurology was consulted and patient had 5 sessions of plasmapheresis off the unit and then transferred back for inpatient rehabilitation. Goals during rehab extended past the acute setting to ensure the patient and family were confident of the plan to manage NMO as the pregnancy advanced.

Discussions: Neuromyelitis optica (NMO) is a CNS autoimmune disease causing vision loss, eye pain, and the clinical manifestations of transverse myelitis including arm and leg paralysis, bladder and bowel incontinence. Other clinical manifestations include severe nausea and vomiting. Current interventions for pregnant patients are limited and documented cases demonstrate pregnancy negatively affected the disease course and worsening disability progression a year after delivery.

Conclusions: There have been less than one hundred cases documenting the complications of NMO during pregnancy. The use of immunosuppressants and muscle relaxants to treat the neurological and musculoskeletal clinical manifestation of NMO is limited in pregnancy. It is therefore prudent to investigate response to physical therapy modalities in this patient population. This case illustrates the necessity for a multidisciplinary approach for successful rehabilitation of patients with NMO complicated by pregnancy.

REHABILITATION OF A PATIENT WITH BILATERAL ALENDRONATE-ASSOCIATED ATYPICAL FEMORAL FRACTURES
Andrea D. Niti-Marquis, MD

Case Diagnosis: Bilateral Alendronate-associated femoral fractures

Case Description: An 80-year-old female with a history of osteoporosis on Alendronate for 10 years presented to the Emergency Department with increasing discomfort in her right thigh. No trauma. A right intramedullary femoral nail was placed 16 years ago for a fracture due to a fall. A CT scan showed a fracture in the lateral aspect of the right upper femur. Orthopedics considered the fracture findings to be Alendronate-associated. Non-surgical management was recommended and patient adhered to bear weight as tolerated. Alendronate was discontinued.

The patient was admitted to inpatient rehabilitation where she developed left thigh pain. Imaging showed a fracture through the lateral cortical of the proximal left femur with findings of an Alendronate-associated fracture. No change in management. At baseline, patient was independent for her ADLs and used a straight cane for mobility. Upon admission, patient required minimal assistance of 2 for ambulation with a rolling walker (RW) and minimal to moderate assistance for her lower extremity activities of daily living (ADLs).

Rehabilitation protocol consisted of balance training, transfer skills, range of motion, strengthening, gait training and self-care activities.

Ultrasound showed dilated ventricles and CT showed numerous calcific densities throughout the brain with mild prominence of the ventricles and lissencephaly. Serum testing for Zika virus revealed presumptive positive IgM antibody. Initial rehabilitative treatment included consultation to speech therapy for poor feeding and occupations therapy for management of motor disabilities. Mother was educated on elevated side-lying position during feeding and to perform gentle stretching exercises for the fingers. Following discharge, cessation of speech and occupational therapy through Early Intervention Program was recommended.

Discussions: Frequent neurological and musculoskeletal abnormalities in infants with congenital Zika infection are now starting to be recognized. Physiatrists should play a key role in management immediately after birth to initiate institution of appropriate treatment. Consultation and referral to speech therapy for feeding difficulties secondary to hypotonia and to occupational/physical therapy or orthopedic surgery for management of joint deformities and other musculoskeletal abnormalities can likely improve long-term functional outcomes for these patients.

Conclusions: With the emergence of Zika virus as a cause of congenital microcephaly associated with neurological and musculoskeletal malformations, it is imperative to develop an approach to provide comprehensive rehabilitative care for affected infants through coordination of a multidisciplinary team. Treatment should be initiated immediately after birth and continue through Early Intervention programs and beyond.
Constance Li, BS, and Surendra Barsikar, MD

**Case Diagnosis:** The patient is a 43-year-old male with a history of spinal muscular atrophy type IV (SMA 4)

**Case Description:** A 43-year-old right handed male presents to acute rehabilitation facility due to progressive proximal muscle weakness from spinal muscular atrophy type IV (SMA 4). He was previously living independently and presented to the hospital secondary to generalized weakness, inability to transfer out of the bed and to ambulate. Secondary to an acute decline in his function after medical stabilization, he was transferred to acute inpatient rehabilitation. On examination, his strength in bilateral deltoids, biceps and triceps was 2/5, while his wrist extensor and hand grip was 4/5. His bilateral hip flexors and knee extensor were normal. His blood work, neuro imaging was normal except a slight elevation in CPK which was 274.

While at inpatient rehab he was started on comprehensive acute inpatient rehabilitation which included 3 hours of PT/OT every day for 5 days a week. His functional status on admission to rehab was as follows: he needed moderate assistance for his bed mobility and transfers from wheelchair to bed. He needed moderate assistance in his ADLs including dressing and grooming secondary to proximal weakness. He was dependent for transfer to the toilet and car. He was started on physical and occupational therapy with a submaximal intensity in order to prevent fatigue. Therapy also focused at adapting to customized assistive devices. Therapy made a home visit and customized his DME as per their assessment. He received a specialized Quikie 2 ultra-weight wheelchair with power assist. It was also fitted a stander which helped in stand and transfer. On discharge patient’s functional status improved to being independent in bed mobility, transfers, Independent in all ADLs except showering. This all became possible due to adaptive equipment, specialized techniques and strategies.

**Discussions:** The collection of diseases known as spinal muscular atrophy are named for the spinal origin of the motor neurons which atrophy and the muscles they affect, but other neurons may also play a role. SMA 4 is a late onset form of SMA which begins when patients are well into adulthood and causes impairment at a slower rate than the other types of SMA.

SMA is an autosomal recessive condition caused by inheriting two defective alleles of the survival of motor neurons 1 (SMN1) gene. The theorized reason for the variable age of onset lies in the number of copies of a similar gene, SMN2, that are present to offset the deficiency of the protein product. SMA 4 patients have the most copies of SMN2 out of all the types. Currently, there is no effective treatment to prevent the progression of SMA. However, biomolecular therapy targeting the SMN1 and SMN2 genes and protein products is under investigation.

**Conclusions:** Spinal Muscular Atrophy Type IV is a progressive disease with a genetic basis and a late onset. There is ongoing research to find a biologic treatment which offers hope to affected patients. Currently, individual tailored therapy at a submaximal level and adaptive equipment offer significant functional benefit to patients. The goal of therapy should be to maintain mobility, prevent fatigue, increase muscle flexibility, joint ROM and prevent contractures.

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The patient was discharged home 2 weeks later independent for her ADLs and using a RW for safety. No surgical intervention at follow-up.

**Discussions:** Recent studies have shown that Alendronate inhibits osteogenesis. The characteristic findings of these fractures on a radiograph include involvement of the proximal femur, limitation to the cortex, and a typically transverse pattern. This case is particularly interesting given that the patient already had a femoral intramedullary nail that did not prevent the fracture.

**Conclusions:** The suspicion for Alendronate-associated fractures should be high in patients taking Alendronate for more than 5 years and who develop thigh pain.

**Early rehabilitation** the patient was able to avoid a surgical intervention and maintain her functional status.

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Katie Hatt, DO, Ning Cao, MD, and Andrew S. Isleib, DO

**Case Diagnosis:** A 22-year-old woman with a history of uncontrolled diabetes and poly-substance abuse initially presented with altered mental status and right ptosis. Work up indicated diabetic ketoacidosis in the setting of rhino-orbital-cerebral mucormycosis with magnetic resonance imaging revealing a parenchymal abscess in the right inferior frontal and anterior temporal lobe with obstructive hydrocephalus. Despite extensive medical and surgical management including multiple debridements, right maxillectomy, and occipital decompressive craniotomy she developed severe functional deficits requiring ongoing inpatient and outpatient rehabilitation services.

**Case Description:** On admission to acute inpatient rehabilitation, the patient required total assistance for all activities of daily living and mobility due to her impaired trunk control, left hemiparesis, poor activity tolerance, aphasia and cognitive slowing. After 4 weeks of intensive inpatient rehabilitation incorporating an individualized robot-assisted program and communication device training she was able to be discharged home using a power wheelchair and directing self-care independently. She eventually received an obturator prosthesis with goals to restore facial contour and her regain ability to talk and masticate. At one year follow up she was independent for mobility with use of a motorized wheelchair, and required maximal assistance for transfers due to impaired trunk control. With functional right hand grasp and positioning strategies for fine motor control she required intermittent verbal, tactile, and modeling cues. She also required minimal prompting for pronunciation and use of a communication board.

**Discussions:** Mucormycosis is a rare, life-threatening fungal infection with a fulminating course most commonly seen in immunocompromised individuals. Although it remains a rare entity, the frequency of this condition has increased in recent years. While the condition carries a mortality rate of fifty to eighty-five percent, earlier recognition and aggressive treatment options increase chance of survival. A multimodal approach including ongoing surgical, medical and rehabilitation interventions play a key role in producing the best functional outcome for these patients.

**Conclusions:** This case demonstrates the role of the multidisciplinary team approach in addressing the functional needs of individuals surviving severe infections with rhino-orbital-cerebral mucormycosis.

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Mary Schmidt, DO, and Jennifer Shen, MD

**Case Diagnosis:** Anti-NMDA Receptor Encephalitis

**Case Description:** A 58-year-old female with medical history including chronic pain and bipolar disorder presented with acute onset agitation and combative behavior, initially thought to be due to medication overdose. Within a few days of admission she developed refractory status epilepticus requiring multiple antiepileptic drugs (AED). An extensive laboratory workup was inconclusive. Transabdominal ultrasound showed small cyst on left ovary. Concern was raised for possible paraneoplastic disorder in setting of ovarian cyst and she was started on IVIG therapy. However after several infusions her status did not improve and decision was made to proceed with bilateral oophorectomy for presumed treatment of anti-NMDA encephalitis. In the days following the operation she tolerated weaning of sedation and AED medications. Her mental status remained altered but she had begun change. Her hospital course was complicated by episodes of fever and tachycardia, which warranted extensive sepsis workups. Ultimately these were thought to be secondary to the autonomic component of her disease process. She also required significant co-management from our pulmonologists in assisting her ventilator weaning. On discharge, she was successfully advanced to diurnal CPAP, but she still required nocturnal ventilation. Nutritional services played an important role in her rehabilitation course to optimize her weight management. Additionally, our therapy teams played a paramount role in improving her conditioning and allowing her to be more functional despite her relative obesity and pulmonary insufficiency.

**Discussions:** This case is unique in that there are estimated to be approximately 78 reported cases in the world. ROHHAD is a pediatric syndrome marked by endocrine, pulmonary, and autonomic pathologies that make the disease process potentially fatal. The unique combination of symptoms make the rehabilitation course a tenuous one, and our case highlights the importance of inpatient rehabilitation in the long term success of these patients. Pediatric rehabilitation practitioners caring for patients with ROHHAD should utilize a comprehensive, interdisciplinary approach with engagement from autonomic, pulmonary, and endocrine specialists.

**Conclusions:** ROHHAD syndrome is an extremely rare pediatric diagnosis that presents significant comorbidities with which all pediatric rehabilitation physicians should be familiar.

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**REHABILITATION OF A YOUNG WOMAN WITH RHINO-ORBITAL-CEREBRAL MUCORMYCOSIS: A CASE REPORT**

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**REHABILITATION OF A PATIENT WITH SPINAL MUSCULAR ATROPHY**

Vu Nguyen, MD, Zachary Bailowitz, MD, Tobias Tsai, MD, and Dukjin Im, MD

**Case Description:** Rehabilitation of a pediatric patient with ROHHAD syndrome

**Case Diagnosis:** A 43-year-old male who was referred for inpatient rehabilitation after receiving the diagnosis of Rapid-onset Obesity with Hypothalamic dysfunction, Hypoventilation, and Autonomic Dysregulation (ROHHAD) at an outside facility. Her rehabilitation necessity was in large part due to her pulmonary compromise with being ventilator dependent on admission. Her course presented similarly to a morbidly obese adult patient with severe debility. Her weight gain had been impressive, going from 40 to 90 pounds in a matter of six months. As such, she experienced pulmonary and physical decompensation due to the rapidity of
following commands and tolerating 3 hours of sitting in a chair. Physical Medicine and Rehabilitation was consulted and the decision was made to transfer her to the inpatient stroke rehabilitation unit. The patient’s initial Functional Independence Measure (FIM) on admission was 21 and after 4 weeks of intensive therapy her discharge FIM was 53. She presented with cognitive deficits, oriented to self only and attending to task only 50% of the time. At time of discharge she had mild to moderate impairments in executive functioning, memory and attention. She was discharged to skilled nursing facility to continue her rehabilitation. At outpatient follow up she was functioning at modified independent level for activities of daily living and had returned home with her husband.

Discussions: Anti-NMDA-receptor encephalitis is a rare cause of altered mental status, primarily affecting young females. Symptoms are progressive in nature and include cognitive impairment, psychosis, seizures and catatonia. It is an underdiagnosed condition that is potentially reversible with treatment.

Conclusions: This patient’s significant functional improvement demonstrates the rehabilitation potential for patients with Anti-NMDA-Receptor Encephalitis.

REHABILITATION OF CENTRAL PONTINE MYELINOLYSIS/OSMOTIC DEMYELINATION SYNDROME

William L. Wagner, MD, Alexandra Flis, MD, and Keith Cummings, DO

Case Diagnosis: Osmotic Demyelination Syndrome (Central Pontine Myelinolysis)

Case Description: A 38-year-old male was admitted to an academic teaching hospital after first presenting to an outside facility with a week history of nausea, vomiting and confusion. He was subsequently admitted for hyponatremia (with a Sodium level of 108 mEq/L) and concern for alcohol withdrawal. He was placed on alcohol withdrawal protocol and sodium correction was initiated. He did not improve with standard care, instead he had persistent and worsening encephalopathy, tremors and weakness. His symptoms were initially attributed to alcohol withdrawal, although he did not improve with Ativan and Librium. His Na level was corrected to 132mEq/L, but it was unclear over what period of time and at what rate. Due to persistent encephalopathy, an MRI was performed and it revealed central pontine myelinolysis, consistent with Osmotic Demyelination Syndrome (ODM). He was transferred to the academic teaching hospital for further treatment and rehabilitation. In the setting of the recent MRI findings, his symptoms of encephalopathy were due to ODM and not the presumed alcohol withdrawal as initially suspected.

Discussions: Central Pontine Myelinolysis (CPM) is a known complication and risk for treating hyponatremia. The literature on prognosis and the post-acute treatment course of CPM/ODM is very limited. There are no published documents on the rehabilitation course of ODM. Our patient was very impaired functionally on admission to rehabilitation with profound weakness, somnolence and emotional lability. His treatment course fluctuated initially, but with the use of neurostimulants and focused therapies he began to progress steadily. Over a four week course he progressed from maximum assist for bed mobility and being pre-gait to being modified independent level for activities of daily living and had returned home with her husband.

Conclusions: ODM can be a very debilitating condition and the severity of presentation can range widely. Information on the prognosis and course of recovery is minimal in the current literature. Our case details the rehabilitation of the condition from both a therapeutic and medical management approach.

REHABILITATION OF MYOCLOMIC EPILEPSY WITH RAGGED RED FIBERS (MERRF) AND SEVERE POLYNEUROPATHY

Paul R. Overdorf, DO, and Natasha L. Warnick, DO

Case Diagnosis: Myoclonic Epilepsy with Ragged Red Fibers (MERRF) and Severe Polyneuropathy

Case Description: A 47-year-old male with history of Myoclonic Epilepsy with Ragged Red Fibers (MERRF) presented to acute inpatient rehabilitation after several falls at home with subsequent injuries including a fifth metatarsal fracture. In the 3–4 weeks prior to admission, the patient admitted to frequent falls secondary to loss of balance and fatigue. He also endorsed symptoms of severe polyneuropathy consistent with prior NCS/EMG diagnosis. Upon admission, he was modified independent with a rolling walker for ambulation with frequent rest for fatigue. After undergoing two weeks of acute inpatient rehabilitation, he had improved to ambulating 185 feet with a rolling walker. However, for safety issues, it was determined that he would be most safe with a wheelchair for long distance ambulation with future plans for power wheelchair as his disease progressed. The goal of this case report is to summarize how this patient progressed with therapies and make future suggestions to tailor rehabilitation plans for patients with mitochondrial myopathies.

Discussions: Acute inpatient rehabilitation allowed the patient to be thoroughly assessed regarding functionality and safety. He was able to progress for most of his activities to modified independent with wheelchair and RW. At follow up, the patient endorsed zero falls for over 6 months following his rehabilitation stay. He was also set to receive his power wheelchair the week after his clinic visit.

Conclusions: MERRF syndrome is an ongoing struggle to treat and rehabilitate. Intensive inpatient rehabilitation is often limited secondary to patient fatigue from the mitochondrial deficits. In addition, the rarity of the disease limits future large scale research opportunities for treatment options. Therefore, rehabilitation is often directed towards safety and quality of life. Early intervention from a physiatrist can decrease the number of falls and improve overall quality of life.

REHABILITATION OF THYROTOKIC ENCEPHALOPATHY

Thai Vu, Peter Shupper, MD, and Radhika Bapineedu, MD

Case Diagnosis: Encephalopathy related to thyrotoxicosis

Case Description: A 63-year-old female with a history of atrial fibrillation, anxiety, DVT on anticoagulation, and hyperthyroidism presented to an acute care hospital with a two-week history of intermittent confusion, psychosis, and mood lability. In the emergency department, she was found to have thyrotoxicosis and elevated INR. Coumadin was discontinued. Antibiotics were initiated for possible lower extremity cellulitis; CT and MRI of the brain were negative for intracranial hemorrhage, ischaemia, or space occupying lesion. Clinically, the patient’s mental status continued to deteriorate, requiring mechanical ventilation. EEG showed diffuse cerebral dysfunction, but was negative for epileptic activity. She was initiated on Methimazole for treatment of hyperthyrotoxicism, thought to be secondary to toxic multinodal goiter, with modest improvement in encephalopathy.

Upon medical stabilization, the patient was transferred to our acute rehabilitation hospital. Physical exam revealed no focal motor or sensory deficits, and was significant for asymmetrical hyperreflexia, dysphagia, and moderate to severe intention tremor resulting in gait impairment. Mental status revealed impaired attention, word finding difficulty, tangential speech, and impaired ideations. With a targeted rehabilitation program, mood stabilizer, anti-psychotic, and continuation of methimazole, the patient’s functional independence measures (FIM) improved from 36 on admission to 88 on discharge.

Discussions: Although thyrotoxicosis secondary to toxic multinodal goiter is known to cause psychotic manifestations, it is rare for the condition to result in encephalopathy severe enough to necessitate an acute rehabilitation course. Here we present a patient with thyrotoxicosis induced encephalopathy who benefited from specialized, acquired brain injury rehabilitation, with significant improvements in both cognitive and motor FIM scores. There is limited literature that specifically addresses rehabilitation of thyrotoxic related encephalopathy.

Conclusions: This case provides a rare presentation of acquired brain injury secondary to thyrotoxicosis and highlights the importance of a multidisciplinary approach in treating these complex patients in an acute rehabilitation setting.

REHABILITATION OF WERNICKE’S ENCEPHALOPATHY: A CASE STUDY

Mayya Gorbal, DO, and Gary Inwald, DO

Case Diagnosis: Wernicke’s encephalopathy in a nonalcoholic patient

Case Description: This is a 64-year-old female without significant history of alcohol use who presented with progressive weakness, mental status changes and gait ataxia for 1 month in the setting of poor nutritional intake. Physical examination was remarkable for horizontal nystagmus and fluctuating weakness in the bilateral upper and lower extremities. A urine toxicology screen and infectious workup were negative. Serum salicylate, acetaminophen and ethanol levels were within normal limits. TSH, vitamin B12, magnesium, phosphorus, HIV, syphils testing and brain CT and MRI yielded normal results. She was started on IV thiamine per neurology recommendations, with significant improvement in her nystagmus and mental status. The patient was diagnosed with Wernicke’s encephalopathy based on her clinical presentation and improvement following thiamine administration. She was then discharged to acute inpatient rehabilitation, where she continued to complain of weakness and pain in the bilateral legs. MRI of the lumbar spine showed only minimal degenerative changes. Electromyography was consistent with a predominantly axonal sensorimotor polyneuropathy, worse in the lower than the upper extremities. The patient was continued on thiamine repletion and started on gabapentin with notable improvement in pain and muscle strength prior to discharge home.

Discussions: Wernicke’s encephalopathy is an acute neuropsychiatric condition due to thiamine deficiency that presents with the classic triad of nystagmus, gait ataxia and mental status changes and is most commonly associated with alcohol misuse. However, it can also present in patients with unbalanced nutrition, various systemic diseases and in genetically predisposed individuals. Although this patient showed the classic clinical findings of Wernicke’s encephalopathy, the etiology was later revised to a progression from alcohol to malnutrition.

Conclusions: This case demonstrates a classic presentation of Wernicke’s encephalopathy in a patient with poor nutritional status who showed clinical improvement after treatment with thiamine and a comprehensive rehabilitation program.
Abstracts

REHABILITATION OUTCOMES AFTER DELAYED POST-HYPOXIC LEUKOENCEPHALOPATHY (DPHL)

Benjamin Ingraham, DO, and Priya Mhatre, MD
Case Diagnosis: Delayed Post-Hypoxic Leukoencephalopathy (DPHL)
Case Description: A 52-year-old woman sustained a multitrauma overdose and became unresponsive due to respiratory failure. After medical stabilization in an acute care hospital, she transferred to an inpatient psychiatric unit. She discharged home after one week, at which time she was neurologically intact and returned to work. She represented to the acute care hospital with altered mental status (AMS), where magnetic resonance imaging (MRI) showed only focal symmetric signal abnormality in the bilateral parietal and occipital lobes. The patient had history of cocaine use, but she did not respond to psychiatric treatment. Repeat MRI one week later showed new bilateral, confluent, and diffuse white matter hyperintensities, and a diagnosis of DPHL was made. She presented to an inpatient rehabilitation hospital six weeks after her initial hypoxic event and two weeks after her acute neuropsychologic deterioration. She showed severe cognitive and communication deficits, minimally sustained eye contact, lack of functional object use and lack of comprehension for simple yes and no questions. Carbodiprolavodopa was started for neurostimulation, and amantadine was later added. After three weeks, she made minimal gains in communication using yes and no strategies, required maximum cues for functional object use, and showed minimal visual attention to preferred stimuli.

Discussions: DPHL is a rare disorder following an acute hypoxic episode, which leads to a period of lucid recovery followed by subsequent neuropsychologic deterioration. This case describes the course of presentation and neuroradiographic findings. This is the first description of acute rehabilitation outcomes for a patient with DPHL within the first three months of diagnosis.

Conclusions: Acute inpatient rehabilitation within the first three months of a DPHL diagnosis is unlikely to functionally improve cognition and communication; however, mobility, transfer, and caregiver training goals can be met despite persistent cognitive deficits.

REHABILITATION OUTCOMES IN PATIENTS WITH AUTOIMMUNE NECROTIZING MYOPATHY: A REPORT OF TWO CASES

Khushboo Doshi, MD, and Matthew Oswald, MD
Case Diagnosis: Autoimmune Necrotizing Myopathy
Case Description: We present the acute inpatient rehabilitation courses of two patients with autoimmune necrotizing myopathy (ANM). A.L. is a 26-year-old woman who was diagnosed two years prior. She presented with symmetric proximal lower extremity weakness (strength 2–3/5) and required moderate-total assist for mobility and self-care. A.J. is a 66-year-old woman with a three year history of ANM, who presented with progressive dysphagia, anorexia, and diffuse proximal weakness (0–1/5 strength), making her total assist for all self-care and mobility.

A.L. completed an 80-day comprehensive rehabilitation program. She demonstrated functional independence measure (FIM) gains from 53 to 91, started ambulating with bilateral KAFOs, and discharged home at supervision level. A.J. completed an 82-day comprehensive rehabilitation program. She demonstrated FIM gains from 39 to 47. Upon discharge, she remained total assist for toileting and transfers, but was able to be discharged home with the assistance of caregivers.

Discussions: ANM is a recently identified inflammatory myopathy characterized by progressive muscle weakness, high rates of disability and decreased quality of life. Several studies have established the safety and efficacy of exercise-based rehabilitation for individuals with inflammatory myopathies. However, there has been little research specifically addressing rehabilitation outcomes in ANM. While both patients required three courses of rehabilitation since diagnosis, their clinical courses stood in stark contrast; A.L. developed diabetes and abscesses and A.J. with dysphagia resulting in significant weight loss. Factors such as age, treatment regimen, premorbid functioning, and comorbid illnesses in these two patients likely have an association with their functional outcomes. They demonstrate the need to further evaluate the rehabilitation potential of individuals with ANM, and identify factors that may predict successful outcomes, so that physiatrists may better guide the rehabilitation treatment course.

Conclusions: Autoimmune necrotizing myopathy presents with a disease course that can result in significant disability. Additionally, comorbid illnesses and complications of disease-modifying medications contribute to this disease burden. With several studies establishing the safety of performing exercise-based rehabilitation in this population, physiatrists will be managing more patients with this diagnosis. This case demonstrates the variable courses and outcomes of patients with ANM. Research targeted to identify potential confounding factors as well as predictive features, will allow rehabilitation professionals to more adequately care for this population.

REHABILITATION POST CARDIAC TRANSPLANTATION: A CASE REPORT

Priya B. Patel, DO, Michael Chou, BA, and Miguel Escalon, MD, MPH
Case Diagnosis: Post Cardiac Transplant Deconditioning
Case Description: A 64-year-old female with a history of multiple cardiac surgeries was admitted to acute inpatient rehabilitation one month after orthotopic heart transplantation. Her hospital course prior to admission was complicated by delirium and kidney injury requiring dialysis. She presented deconditioned and fatigued, and was found to have pitting edema in all extremities on exam. Despite intact strength and sensation, gait and activities of daily living (ADL) dysfunction was present due to fluid overload and debility.

A unique rehabilitation plan, with a multidisciplinary approach, was constructed for this patient to account for her medical and physical needs, which included hemodialysis for renal disease, antibiotic therapy for donor heart complications, and strict nutrition guidelines due to veganism. The patient underwent an intensive regimen of therapy and was discharged home with return of ability to ambulate and perform ADLs at a level prior to admission.

Discussions: Cardiac transplantation is a well-established treatment strategy for cardiac disease that fails conventional management and interventional surgery. Often, these patients endure prolonged hospital stays resulting in gait and ADL dysfunction, and are excellent candidates for rehabilitation. Post-transplantation acute inpatient rehabilitation not only positively impacts long-term survival, but also should be applied to other transplant model systems.

Conclusions: Rehabilitation post cardiac transplant can allow patients to return home with similar functional level prior to the surgery. This has the potential to reduce readmission rates and therefore prevent further deconditioning. A standard treatment protocol needs to be implemented to ensure all needs of this specific patient population are addressed. This includes proper medical management including understanding immunosuppressant drugs side effects and educating staff about precautions during therapy such as sternal precautions. This case highlights that with a multidisciplinary approach, successful rehabilitation for cardiac transplant patients is feasible, and there is potential for application in other transplant settings.

REHABILITATIVE COURSE FROM IDIOPATHIC TRANSVERSE MYELITIS IN A PATIENT WITH HIV: A CASE REPORT

Mohammad Islam, MD, Chun Wai Hung, BE, MENG, Giancarlo A. Perez-Albela, MD, Carlos Arias, MD, and David Lee, BA
Case Diagnosis: A 52-year-old Hispanic with idiopathic transverse myelitis at the T1–T2 level.
Case Description: A 52-year-old Hispanic male with history of HIV, polysubstance abuse, and seizures presented with a 3-week history of progressive tingling, numbness, and weakness of the lower extremities as well as urinary retention. He was diagnosed with idiopathic transverse myelitis based on thoracic MRI showing focal abnormal cord signal at T1–T2 and physical exam findings significant for decreased sensation and strength of the lower extremities. The patient’s symptoms improved progressively after IV methylprednisolone and subsequent physical and occupational therapy at an acute rehabilitation center. He continued to improve while receiving outpatient phyisiatry care.

Discussions: This case is unique because idiopathic transverse myelitis is a rare disorder which presented in a patient with several comorbidities including HIV infection and a past history of seizures. While HIV is a suspected viral cause of transverse myelitis, it is difficult to pinpoint this definitively. It is also an atypical case since the condition classically presents in the age groups of 10–19 and 30–39. While he had some of the typical strength and sensory symptoms, he did not complain of pain, which is the most common presentation. The patient’s gradual improvement in ambulation and resumption of activities of daily living during acute rehabilitation highlights the importance of physiatrist management for the treatment of transverse myelitis.

Conclusions: This case presents a rare incidence of idiopathic transverse myelitis in a patient with several comorbidities. Although this patient’s differential diagnosis is comprehensive due to his HIV status, history of polysubstance abuse, and seizure disorder, these eventually turned out to be unlikely to be contributory to his presenting symptoms. It is important for clinicians to consider a patient’s past medical and social history, but as this case demonstrates, it is also critical to maintain a high index of suspicion of other potential diagnoses.

RESOLUTION OF PAROXYSMAL AUTONOMIC INSTABILITY WITH DYSTONIA (PAID) SYNDROME WITH SERIAL CASTING

Ondrea McKay, MD, and Peter Yoonas, MD
Case Diagnosis: Treatment of paroxysmal autonomic instability with dystonia following severe brain injury with serial casting.

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Case Description: The patient is a 3-year-old girl who was struck by a vehicle while playing. On initial evaluation, GCS was 3. CT of the head showed: 2 mm SDH along the falc cerebri, parenchymal hemorrhages in the right parietal lobe and left temporal lobe, SAH in the pineal cistern, and bilateral parietal fractures. Extensive posterior fossa edema and a right occipital edema. An ICP monitor was placed and she was admitted to the ICU.

Hospital day 2, sedation was held there was generalized movement of her fingers to noxious stimulation, with no eye opening and her ICPS became elevated from 9 to 19. Hospital day 6, the patient began having intermittent storming episodes associated with posturing, tachycardia, tachypnea and hypertension with unclear precipitating factors. There was noted increased tone (MAS 3) in the left upper and worsening of dysautonomia and posturing with PROM. Given concern for contracture serial casting was decided by the family and rehab team.

Hospital day 8, patient had cast placed to left upper extremity. Following cast placement there was marked improvement in dysautonomia and emerging awareness within one hospital day. Through serial casting occupational therapy achieved -10 degrees, from minus 70 degrees.

Discussions: The pathophysiology of PAID is thought to be due to dysfunction of the autonomic centers of diencephalon (thalamus or hypothalamus) or their cortical connections that mediate autonomic function. Boeve et al expanded this concept by speculating that the mechanism likely involves activation (or disinhibition) of central sympathetic/parasympathetic regions such as the paraventricular hypothalamic nucleus, lateral periaqueductal gray substance, lateral parabrachial nucleus, or rostral ventricular medulla. Cortically provoked release of adrenomedullary catecholamines during PAID episodes may contribute to the rise in blood pressure as well as tachycardia and tachypnea.(4,5)

There are many proposed treatments for PAID which include baclofen, benzodiazepines, and propranolol. Many of which were trialed in our patient with only short term relief of her symptoms. In a recent case report Lee et al managed intractable amines during PAID episodes may contribute to the rise in blood pressure as well as tachycardia and tachypnea.

Retrograde iliopsoas bursitis communicating with acetabular labral tear in a patient with connective tissue disorder: Utility of ultrasound guided aspiration: A case report

Ilya Igniknov, MD, MS, Norman Earl. Godwin, MD, Alexander Feng, MD, and Michael Weinik, DO

Case Diagnosis: Retrograde iliopsoas bursitis communicating with acetabular labral tear in a patient with connective tissue disorder

Case Description: A 67-year-old female with PMH significant for Ehlers-Danlos Syndrome presented with bilateral hip and groin pain 2 months in duration, exacerbated by prolonged sitting and pivoting toward the left. Upon Examination, was found to have non-pulsatile, fluctuant mass in the left groin. CT and MRI showed a left groin fluid collection associated with psoas major tendon at the level of the left hip roughly 8.1x3.4x3.3cm communicating with the acetabular joint space extending up into the abdominal cavity through the inguinal ligaments. In office MSK US confirmed the presence of a large iliopsoas bursa with septations and relatively hypoechoic fluid. The femoral neurovascular bundle was displaced due to the bursa but using Doppler it was deemed that there was no connection between the bursa and the vessels. 60cc of very viscous fluid was aspirated under US guidance and the bursa was injected with 1cc kenalog and 3ccs lidocaine. At 1 year post injection, patient returned for repeat aspiration. Imaging showed reaccumulation of the bursa.

Conclusions: This is the first case to our knowledge of an iliopsoas bursitis that resulted in retrograde femoral hernia. The fluid that was drained from the bursa was sent to pathology and found to be consistent with synovial fluid. Tendonitis and bursitis have been documented in association with Ehlers-Danlos, however this unique presentation is yet undocumented.

RIGHT HIP DISARTICULATION SECONDARY TO MAFFUCCI SYNDROME

Amy M. West, MD, EDM, and David Crandell, MD

Case Diagnosis: Right hip disarticulation secondary to Maffucci Syndrome

Case Description: A 55-year-old female was admitted to inpatient rehabilitation status post right hip disarticulation. The patient had a past medical history of Maffucci syndrome with multiple chondrosarcomas and hemangiomas resulting in partial excision of left proximal humerus, rotator cuff repair, and right subcostal craniotomy for chondrosarcoma at the base of the skull. She also had trigeminal neuralgia and cranial nerve palsies of III, IV, and V1 due to prior radiation to the cranial tumor.

Two months prior to surgery, the patient began to have right thigh pain which was making it difficult for her to ambulate, flex right knee more than 20 degrees, and participate in her normal activities, such as hiking and gardening. She saw her oncologist and was found to have a recurrence of a previously treated right femoral chondrosarcoma. She initially underwent right posterior femur mid-diaphysis resection of the metaphyseal chondrosarcoma. Within months, the tumor recurred in the right posterior femur. After a short, unsuccessful trial of experimental chemotherapy, she then decided to proceed with a right hip disarticulation.

Conclusions: Maffucci Syndrome is a rare disease characterized by the presence of multiple enchondromas associated with multiple hemangiomas. The most common sites of enchondromas are the metacarpal bones and phalanges of the hands. The feet are less commonly afflicted. These tumors often result in disfigurations of the extremities and may contribute to pathologic fractures at the affected metaphyses and diaphyses.

The risk for sarcomatous degeneration of enchondromas, hemangiomas, or lymphangiomas is 15-30% in the setting of Maffucci syndrome. It is also associated with a higher risk of CNS, pancreatic, and ovarian malignancies.

After a three-week rehabilitation stay, she decided to amputate clinic for discussion of a prosthesis. The patient decided to proceed with fabrication of a prosthesis, to be used for short periods of time when prolonged standing is required, such as in the kitchen. She decided that because of the bulkiness and energy requirement necessary to operate a hip disarticulation prosthesis, she would prefer to ambulate by hopping with crutches, rather than walking with a prosthesis.

Conclusions: Patients with Maffucci syndrome may require numerous chondrosarcoma resections which may eventually lead to amputation. It is important to discuss a patient’s goals when fitting him/her with a large prosthesis, as it may in fact hinder their function more than it improves it.
RIGHT SIDED PLEURAL EFFUSION: AN ABNORMAL LOCATION FOR BETA-2-TRANSFERRIN
Michael Kasprzak, DO, and Riley Smith, MD

Case Diagnosis: Patient is a 67-year-old female with progressive weakness, pain, lethargy, ataxia as well as bowel and bladder incontinence and poor appetite who was found to have a T10-T11 right perineural cyst abutting a large right pleural effusion. There was concern for a cerebrospinal fluid (CSF) leak into the pleural/subpleural space. She had an epidural blood patch done as well as thoracentesis of the right pleural space. She had a T10-T11 right perineural cyst abutting a large right pleural effusion, which was concerning for a CSF leak into the pleural/subpleural space. She had an epidural blood patch done and a thoracentesis of the right pleural effusion with about a liter of clear yellow fluid aspirated. The fluid was positive for beta-2 transferrin, which was further suggestive of a CSF leak. She had another blood patch and underwent another right-sided thoracentesis with a liter of serum fluid removed.

Case Description: A 67-year-old female with a history of Arnold-Chiari malformation, type I. She underwent a posterior fossa decompression, C1 laminectomy and duraplasty about one year prior to this admission, as she developed marked brainstem signs associated with dizziness and the inability to ambulate. She had some initial improvement but failed to achieve significant functional gain. She required PEG tube placement for dysphagia soon after. With limited progress, she had another surgery 3 months later, another posterior fossa decompression, duraplasty, and resection of cerebellar tonsils. She was stabilized, maintaining baseline function, including the ability to perform ADLs and IADLs without much assistance, although she could not drive and did need some assistance with ambulation. More recently, she developed worsening lethargy, generalized weakness, pain and confusion. Family remarked that she was not lifting her feet off the ground as well as she was before. She was re-evaluated by neurology with the thought that these symptoms had something to do with her Arnold-Chiari malformation, but this was not felt to be the case. She was referred to neurology, where she was diagnosed with progressive supranuclear palsy and started on carbidopa/levodopa. Subsequently, her condition worsened. Family noted pain, lethargy, and generalized weakness. She also stopped ambulating and issues with bowel and bladder incontinence as well as poor appetite due to lack of taste. The carbidopa/levodopa was halved, but this did not improve her symptoms, so it was stopped completely. She was admitted for further evaluation and treated with antibiotics for a presumed pneumonia as well as urinary tract infection. Consensus was that her mental status changes were likely due to metabolic factors and the initiation of carbidopa/levodopa. The team also did not feel that she truly had progressive supranuclear palsy. Patient went for a second opinion, and as part of her work up she had MRI of the brain as well as spine, which showed a T10-T11 right perineural cyst abutting a large right pleural effusion, which was concerning for a CSF leak into the pleural/subpleural space. She had an epidural blood patch done and a thoracentesis of the right pleural effusion with about a liter of clear yellow fluid aspirated. The fluid was positive for beta-2 transferrin, which was further suggestive of a CSF leak. She had another blood patch and another right-sided thoracentesis with a liter of serum fluid removed.

Case Description:

Case Diagnosis: A 67-year-old female with degenerative joint disease of bilateral knees presented to an outpatient pain clinic with right sided back, lateral leg, and foot pain. Pain was described as a burning sensation and worse when driving long distances. As part of his workup an electrodiagnostic study of lower extremities showed sensorimotor polyneuropathy with primarily axonal and secondarily demyelinating features, left S1 subacute radiculopathy, and no evidence of right lumbosacral radiculopathy. MRI showed central disc herniation showing mild effacement of thecal sac at L4-L5 and no stenosis at L5-S1. Physical exam in the clinic was positive for tenderness along the medial subtalar joint. In discussion with podiatry he was diagnosed with sinus tarsi syndrome. It was decided the patient would benefit from a subtalar joint injection.

Discussions: Sinus tarsi syndrome occurs in the space between the calcaneus, talus, talocalcaneonavicular, and subtalar joints and presents with lateral midfoot and heel pain. The differential of lateral midfoot pain also includes peripheral tendinopathy, cuboid subluxation, lateral ankle sprain, osteochondral talus injury, and lateral soft tissue impingement. The diagnosis is confirmed following injection of an anesthetic into the sinus tarsi. At two week follow up the patient had 80% pain relief from the injection. He was prescribed physical therapy focusing on stability training and custom orthotics to stabilize the hind foot including a deep heel seat device with high medial flange.

Conclusions: Sinus tarsi pain is commonly encountered in the pain clinic and it should be determined if an area distal to the low back is the primary generator of pain. When examining a patient with S1 dermatomal distribution of pain the sinus tarsi joint should not be overlooked as it may be a cause of pain across the lateral aspect of the leg.

SCAPULAR WINGING RESULTING FROM SPINAL ACCESSORY NEUROPATHY AFTER SURGICAL RESSECTION OF SCHWANNOMA
Nikolai Khromouchikine, MD, and Eric Wisotzky, MD

Case Description: Scapular Winging Resulting from Spinal Accessory Neuropathy after Surgical Resection of Schwannoma

Case Description: The patient is a 31-year-old female with history of Lynch syndrome but otherwise unremarkable past medical history referred to our clinic with complaints which included scapular winging and trapezius muscle atrophy. She had recently been diagnosed with a suspected schwannoma located within the jugular foramen and was referred to a neurosurgery clinic for consideration of surgical resection. After being educated on the risks and benefits of operative intervention, she elected to proceed with surgery.

Post-operative course was complicated by velopharyngeal insufficiency resulting in difficulty swallowing and phonation. These symptoms improved over time. However, due to her notable atrophy of the right trapezius and scapular winging, an EMG was performed which showed increased duration and polyphasic motor units as well as complex repetitive discharges in the trapezius muscle but was otherwise normal in all other muscles tested including the sternocleidomastoid.

Conclusions: Spinal accessory neuropathy is an uncommon form of nerve injury, typically resulting in sternocleidomastoid or trapezius muscle weakness with associated scapular winging. Surgery involving the jugular foramen is a less common cause of scapular winging. Clinicians should be aware of this uncommon cause of scapular winging when assessing this condition.

SCAPULOTHORACIC PAIN: PERHAPS THE BEST TREATMENT IS TO DO NOTHING
Annie Layno-Moses, MD, Tariq Malik, MD, and Joshua Minori, DO

Case Diagnosis: Scapulothoracic pain

Case Description: This is a 61-year-old female with 16-year history of left-sided scapulothoracic pain presents as a new patient to outpatient pain clinic in January 2016. Patient complains of pain in left scapula—squeezing and burning in nature, several days duration, elicited by lifting and carrying object as well as pushing and turning a shopping cart, alleviated by pain medications, worsened since June 2015 with no inciting event. She denies numbness, tingling, and weakness. She reports having some relief from ice and says her most recent physical therapy session years ago was not helpful. She states she is taking hydrocodone 20mg four times daily, neurontin 300mg at night (for burning mouth syndrome), ibuprofen 800mg four times daily, and using diclofenac cream. Over the past 16 years, she has tried many different options including physical therapy, multiple Bottox injections, acupuncture, massage, and a steroid injection in November 2015 which helped relieve her pain for 1 week. Of note, she has had a total of 3 scapulothoracic bursectomies with most recent on November
12, 2015 with worsening pain. She had a bursectomy in 2006 which she states relieved her pain one year after the procedure. She has been on hydrocodone and off since 2000. Patient is currently working as a psychiatrist. Examination reveals no ten- derness upon palpation and shoulder active range of motion is within normal limits and without pain. There is no exacerbation of her symptoms on exam including a nega- tive Hawkins, Neer’s, and Speed’s tests. Her strength exam and neurological exam revealed no abnormalities. Additionally, patient was noted to be very anxious on exam. Computer tomography of her left upper extremity showed postsurgical changes with no specific findings to account for patient’s pain. With these findings, the diag- noses include chronic scapular pain and central pain syndrome.

Literature has shown that arthroscopic treatment including scapulothoracic bursectomy with or without superomedial angle resection can have failure rates of up to 31%. This patient had 3 of these procedures with minimal to no relief, and she has now been suffering with 16 years of pain. We had an extensive discussion about the etiology of chronic pain, opioid dependence, opioid-induced pain dysfunction, and the role of limbic system and anxiety in pain. We also stressed the importance of desensitization therapy and minimizing surgery or injection therapies in future.

Discussions: Literature has shown that arthroscopic treatment including scapulo- thoracic bursectomy with or without superomedial angle resection can have failure rates of up to 31%. This patient had 3 of these procedures with minimal to no relief, and she has now been suffering with 16 years of pain. We had an extensive discussion about the etiology of chronic pain, opioid dependence, opioid-induced pain dysfunction, and the role of limbic system and anxiety in pain. We also stressed the importance of desensitization therapy and minimizing surgery or injection therapies in future.

Conclusions: In the select chronic pain patient, perhaps the best treatment option is to discuss the etiology of chronic pain and the need to wean opioids and to limit in-vasive procedures or therapies. It would also be beneficial to address the anxiety com-ponent associated with chronic pain, as this could contribute to the emotional aspect of the pain experience.

SELECTIVE CHEMODENERVATION IMPROVES GAIT DYSFUNCTION DUE TO POST HYPOXIC MYOCLONUS: A CASE REPORT

Rakhi Vyas, DO, Miriam Segal, MD, and Daniel Moon, MD, MS

Case Diagnosis: A 41-year-old female with axonic brain injury presenting with post hypoxic myoclonus.

Case Description: Myoclonus involving the patient’s lower extremities, resulted in loss of postural stability, precluding functional, safe ambulation. In order to better understand the underlying muscle activation patterns involved, dynamic electromyography (EMG) analysis was performed in the gait laboratory, with surface electrodes placed on rectus femoris, hamstrings, gastrocnemius and tibialis anterior. Ground re-action forces were simultaneously recorded to distinguish stance from swing phase. Patterns of recurring sequences of sudden muscle activations followed by lapses were captured in the right tibialis anterior, rectus femoris, hamstrings and gastrocnemius in stance phase, with the tibialis anterior being the first muscle to demonstrate this ab- normal activity. Bilateral heel lifts were observed to grossly reduce myoclonic epi-sodes, possibly by dampening this activity. It was therefore hypothesized that reducing tibialis anterior activation may prevent the onset of myoclonus in this pa-tient. A temporary peroneal nerve block resulted in a reduction in myoclonus supporting this idea. Chemodenervation of bilateral tibialis anterior muscles with Onabotulinum toxin A was then performed. Episodes of myoclonus were recorded in physical therapy sessions over several sessions for a standardized distance of 400 feet before and after the intervention. There were no significant episodes of myoclo-nus resulting in loss of postural stability due to chemodenervation.

Discussions: Post hypoxic myoclonus can have a devastating impact on func-tional and safe mobility. Presently, treatments are focused on systemic pharmacologic approaches with agents such as clonazepam, valproate and levitracetam. However, side effect profiles of these agents are not favorable in many patients with brain inju-ries. Unfortunately, there is limited data available on the use of chemodenervation with botulinum toxin as a treatment.

Conclusions: This case highlights the potential for targeted chemodenervation to treat post hypoxic myoclonus, guided by dynamic EMG data.

SENSORMOTOR POLYNEUROPATHY IN A PATIENT WITH RARE TYPE B INSULIN RESISTANCE AND A HISTORY OF SYSTEMIC LUPUS ERYTHEMATOSUS: A CASE REPORT

Glenn Nanney, MD, MS, Carrie McShane, MD, and John Norbury, MD, RMSK

Case Diagnosis: Systemic Polyneuropathy most likely secondary to autoimm-une induced Type B Insulin Resistance

Case Description: A 43-year-old Jamaican-American female with a past medical history significant for systemic lupus erythematosus presented as an inpatient consult for electrodiagnostic evaluation of rapid onset weakness. Over the four months prior to admission, the patient experienced significant weight loss, polyuria, polydypsia, foot numbness and rapidly increasing global weakness. She was diagnosed with dia- betes mellitus by a local provider and was prescribed metformin. She presented to hospital with chest pain and was found to have a blood glucose of~900 mg/dL. Pa-tient was found to be positive for antibodies to the insulin receptor and required in-creasing doses of insulin, up to 1500 units three a day with meals and 1000 units at bedtime. Upon electrodiagnostic evaluation, the patient was found to have electrodiagnostic evidence of a sensorimotor polyneuropathy with prominent demy- elination as well as axon loss.

Discussions: Type B insulin resistance is a rare autoimmune disease which results in the production of autoantibodies to the insulin receptor. This results in very high blood glucose levels with even minimal carbohydrate intake. The very high glucose levels rapidly affect the myelin sheaths with a resulting sensorimotor polyneuropathy.

Conclusions: Rapid onset of sensorimotor polyneuropathy may be a sign of rare Type B insulin resistance and should be carefully evaluated.
Discussions: Persistent alternating low back and buttock pain in a young male should raise suspicion for underlying inflammatory disease. Inflammatory sacroilitis is difficult to diagnose as exam findings can mimic lumbar radiculopathy. Evidence of SI joint inflammation is often only revealed with MRI. This patient had both facet arthropathy and SI joint loss on imaging contributing to his pain, which reportedly occurs in approximately 16% of SpA patients.

Conclusions: Spondyloarthropathies should be considered in young males presenting with persistent lower back and buttock pain.

SEVERE BACK PAIN PROGRESSING TO ACUTE INFLAMMATORY DERMELYINATING POLYNEUROPATHY (AIDP) AS SYMPTOMS OF UNDIAGNOSED LYME DISEASE

Komal G. Patel, DO, and Susan Maltser, DO

Case Diagnosis: AIDP as a sequela of Lyme disease.

Case Description: A 27-year-old female with no past medical history with complaints of severe low back pain for 12 days. She had progressively worsening numbness, tingling, and weakness of all extremities, as well as severe proximal lower extremity muscle pain, facial droop, and ophthalmoplegia. Initial muscle strength testing revealed 2/5 in bilateral shoulder abduction and elbow flexion, 3/5 bilateral grip strength, 1/5 bilateral hip flexion, 0/5 bilateral ankle dorsiflexors and plantar flexors. Blood tests, lumbar puncture, and electrodiagnostic testing were completed. All blood work and cerebrospinal fluid results were normal; however, there was electrodiagnostic evidence consistent with AIDP commonly known as Guillain-Barré Syndrome (GBS). The patient was immediately started on intravenous immunoglobulin treatment and steroids without neurological improvement. Patients CSF then returned positive for Lyme disease. She was started on antibiotics and neurological symptoms began to gradually improve. She was medically optimized and discharged to acute rehabilitation.

Discussions: AIDP typically manifests 2-4 weeks after an acute respiratory (i.e. Influenza) or gastrointestinal (i.e. Campylobacter jejuni) illness as a post-infectious auto-immune process. The most common infections that cause AIDP were ruled out in this patient, instead Lyme disease was the culprit, which is a not a common sequela of this disease. Only a handful of reported cases have shown this correlation. Furthermore, reviewing current literature, did not reveal back pain as a common prequela of this disease. Back pain can be the initial presenting symptom of Lyme disease. More commonly, Lyme disease presents with a rash, headache, fatigue, muscle and joint pain, and swollen lymph nodes.

Conclusions: Back pain can be the initial presenting symptom of Lyme disease. Clinical manifestation of AIDP can be a sequela of Lyme disease. Patients with Lyme disease can improve neurologically from antibiotics and a course of in-patient rehabilitation.

SEVERE GASTROINTESTINAL COMPLICATIONS INDUCED BY MULTIPLE PSYCHOTROPIC AGENTS: A CASE REPORT

Rebecca H. Siegel, MD, Sarah Durante, MD, and Linqu Zhang, MD

Case Diagnosis: Severe Gastrointestinal Complications Induced by Multiple Psychotropic Agents

Case Description: A 45-year-old female with a past medical history of bipolar disorder, depression and disordered sleep presented to the emergency department (ED) with eight days of severe abdominal pain, nausea and vomiting. Her past medical history was also notable for a medication overdose resulting in coma for which she was hospitalized eight years prior to this presentation. Over the past several years, since the addition of psychotropic drugs onto her initial bipolar treatment with lithium, she experienced recurrent episodes of severe abdominal pain associated with nausea and vomiting prompting frequent ED visits and hospitalizations for symptom control and treatment of resultant dehydration. She had an extensive gastrointestinal (GI) work-up, including several upper endoscopies, computed tomography, magnetic resonance imaging, upper GI series and ultrasound. These studies were unrevealing. In addition, she underwent two upper GI botulinum toxin injections for symptom management which initially provided some relief. During her episodes of abdominal discomfort and vomiting she was often unable to take her prescribed medications, which included lithium 1200mg daily, amitriptyline 75mg daily, trazodone 300mg daily, lorazepam 4mg daily and zolpidem tartrate 12.5mg nightly. She thus experienced withdrawal symptoms including diarrhea and palpitations.

Result: Patient received adequate fluid resuscitation with intravenous fluids and was unable to take her PO medications. During this period, she was then safely maintained off of lithium, amitriptyline and trazodone over a 7 day period while being treated with Dilaudid, Ativan and prednisone to prevent withdrawal symptoms. Following the 7 day period, her GI symptoms completely resolve.

Discussions: Psychotropic medications are often prescribed in combination for co-morbid conditions including depression, anxiety, insomnia and chronic pain. Some of these agents have the potential for severe adverse GI effects when taken concurrently. Most classes of medications used in these cases affect serotonin, epinephrine and norepinephrine in the central nervous system (CNS). For instance, tricyclic antidepressants are believed to work by blocking the reuptake of both norepinephrine and serotonin at the presynaptic nerve terminal. Trazodone is a weak inhibitor of serotonin and also blocks 5-HT2 and alpha-adenergic receptors. A rare but potential side effect of antidepressant and antipsychotic medications is the occurrence of serotonin syndrome, wherein two or more drugs boost CNS serotonin levels concurrently. At the same time, these medications act peripherally as smooth muscle relaxants. This combination of central and peripheral effects can result in severe GI symptoms such as abdominal cramping, nausea, vomiting and loose bowel movements. Treatment of these adverse effects includes making the appropriate diagnosis and weaning potential causative agents. The subsequent challenge for these patients is finding the correct treatment regimen to safely manage their underlying psychologic disorders and pain syndromes.

Conclusions: Co-administration of multiple psychotropic medications can result in severe GI complications which may go misdiagnosed. With persistent GI symptoms, endoscopy and/or radiographic imaging may be necessary to rule out organic etiology as it is important to consider potential iatrogenic causes as demonstrated in this case.

SEVERE RADIAL NEUROPATHY SECONDARY TO COMPLICATION OF ANTICOAGULATION THERAPY

Sean Bermanian, MD, Armando Iannicello, MD, Ankur N. Patel, MD, MS, and Marc Ross, MD

Case Diagnosis: Compression of the radial nerve in the proximal humerus leading to severe radial neuropathy.

Case Description: Patient is a 67-year-old male with a past medical history of diabetes mellitus and hypertension who presented to the emergency department with new onset chest pain and shortness breath. A pulmonary embolism was diagnosed and anticoagulation therapy was initiated with IV Heparin and Coumadin. On day 3, the patient developed severe right arm and forearm pain, swelling, ecchymosis, and weakness associated with a wrist drop. CT scan of the right arm showed a large hematoma parallel to the skin surface. Anticoagulation therapy was discontinued and the patient was seen by rehabilitation consult service. Manual muscle testing showed right wrist extension 0/5, primary digit extension 0/5, and right triceps extension 4+/5. Sensation was decreased to light touch and pin pricks along the posterior cutaneous nerve distribution in the right forearm and 1st dorsal web space. Deep tendon reflexes in the right upper extremity were 1+ biceps and triceps, and 2+ brachioradialis. Hoffmann’s and Lhermite’s test were negative. Electrodagnostic findings indicated severe right axonal radial neuropathy in the upper arm likely proximal to the spiral groove of the humerus.

Discussions: The radial nerve is the terminal branch of the posterior cord of the brachial plexus. Injury to the radial nerve can occur anywhere along its path. Radial neuropathies typically present with weakness in wrist dorsiflexion and finger extension. Etiology includes penetrating traumatic injury to the nerve, compressive lesions at the axilla, compression at the humeral spiral groove secondary to improper arm positioning or fractures. Radial nerve injury at the humeral spiral groove typically presents with wrist drop.

Conclusions: We present a rare case of a patient on anticoagulation therapy for treatment of a pulmonary embolism who developed a large hematoma compressing the radial nerve at the proximal humerus resulting in a wrist drop. Imaging and electrodagnostic studies were confirmatory. Occupational therapy and wrist splinting were initiated. The patient will follow up in musculoskeletal clinic for further management of wrist drop. EMG of the right upper extremity will be repeated in 6 months.

SIGNIFICANT PAIN RELIEF AFTER INTRAMUSCULAR INJECTION OF BOTULINUM TOXIN A IN PATIENT WITH STIFF PERSON SYNDROME

Sheng Liang, DO, PGO-3, and Weibin Shi, MD, PHD

Case Diagnosis: Stiff Person Syndrome (SPS) is a rare neurologic disorder characterized by progressive fluctuating rigidity and stiffness typically in the trunk and limb muscles. It affects approximately one in a million individuals and there are twice as many women as men with the disorder. A diagnosis of SPS is made based upon identification of characteristic symptoms, clinical features, and results of thorough clinical evaluation. Additional tests such as the presence of Anti-GAD antibodies and EMG/NCS testing can aid in confirming a diagnosis.

Case Description: We have a 62-year-old woman who presented to our clinic one month after her diagnosis of SPS. On exam, she had significant stiffness and spasticity in the proximal and distal muscles of her left upper limb that caused her a great deal of pain. Traditional medical treatments such as Diazepam improved her spasticity, though was unable to provide her clinically significant pain relief. We investigated the effectiveness of intramuscular injections of Botulinum Toxin A (BTA) for pain relief in this patient with clinical and biochemical evidence
SONOGRAPHIC DIAGNOSIS AND TREATMENT IN PATIENT WITH ADHESIVE CAPSULITIS FOLLOWING INTENSIVE CARE UNIT STAY: A CASE REPORT

Matthew T. Santa Barbara, MD, Eric Helm, MD, and Julie Lanphere, DO

Case Diagnosis: Adhesive capsulitis after intensive care unit (ICU) stay

Case Description: A 67-year-old male admitted to the ICU due to alcohol withdrawal with prolonged stay due to agitation and respiratory failure. His condition improved and he was admitted to inpatient rehabilitation (IPR) due to deconditioning and right upper extremity (RUE) weakness.

Progress in IPR was limited by pain in the RUE, most prominently with elbow flexion, and progressive decrease in range of motion of the right shoulder. MRIs of the brain and brachial plexus were negative. EMG/NCS was suggestive of a right brachial plexopathy involving lower and middle trunks. Ultrasound revealed tear of the long head of the biceps and inflammation within the glenohumeral joint, suggestive of adhesive capsulitis. Ultrasound guided steroid injection to the right bicipital sheath resulted in significant improvement in pain and inflammation within the glenohumeral joint, suggestive of inflammatory arthritis. Ultrasound revealed tear of the long head of the biceps and inflammation within the glenohumeral joint, suggestive of adhesive capsulitis. Ultrasound guided steroid injection to the right bicipital sheath was performed. Painful shoulder decreased with improved RUE function, and the patient was discharged to home.

Discussions: Patient’s musculoskeletal injuries occurred in ICU while he was sedated, possibly secondary to his initial agitation and/or positioning. The brachial plexus injury and bicep tear both likely contributed to the development of adhesive capsulitis. Once intracranial pathology was ruled out, ultrasound was essential in diagnosis and treatment.

Conclusions: Adhesive capsulitis may develop in patients requiring prolonged ICU care secondary to brachial plexus and/or upper extremity injuries that occur due to positioning. Workup as well as treatment may not be certain until the patient reaches the inpatient rehabilitation unit. In these cases, sonographic diagnosis and intervention should be considered.

SPINAL CORD INJURY AND THE TRANSGENDER PATIENT

John Fox, DO

Case Diagnosis: Acute incomplete paraplegia secondary to meningoceleitis of unclear etiology.

Case Description: A 53-year-old transgender female to male patient presented with two week history of weakness and altered mental status. Patient had a history of depression and bipolar disorder. MRI revealed leptomeningeal enhancement with extensive hyperintensity involving the cervical and thoracic cord with clumping seen at the cauda equina consistent with meningoceleitis. The leptomeningeal disease was treated with immunosuppressants for presumptive neurosarcoidosis, however diagnosis was uncertain. His encephalopathy completely resolved. He was admitted to acute inpatient rehabilitation for gait dysfunction and deficits in endurance and balance. Common spinal cord injury (SCI) comorbidities of neurogenic bowel/bladder and recurrent urinary tract infection were also managed. Upon admission, the rehabilitation team discussed with the patient his sexual orientation in order to provide holistic patient care and consistency regarding his self-identity across all disciplines. A bowel and bladder program was established with patient’s partner trained, as patient was emotionally distressed regarding his self-identifiers can be troublesome in addressing a patient’s physical and psychosocial needs, including those of diverse sexual orientation, in order to promote a holistic and healing rehabilitative environment.

Conclusions: SCI patients with comorbidities such as depression or bipolar disorder may require additional support from the rehabilitation team in order to achieve optimal outcomes. Further research is needed to better understand the impact of sexual orientation on rehabilitation outcomes.

SPONTANEOUS SPINAL EPIDURAL HEMATOMAS WITH UNKNOWN ETIOLOGY IN A 12-YEAR-OLD GIRL

Saiyun Hou, MD, PHD

Case Diagnosis: Spinal cord injury caused by spontaneous spinal epidural hematoma with unknown etiology in a child

Case Description: A 12-year-old female with no past medical history developed sudden onset of upper back pain, sensation loss and weakness of her bilateral lower limbs and inability to void. Initial MRI of the thoracic spine was essentially nonrevealing. She improved significantly throughout hospitalization and she was ambulating at the time of discharge. However, she returned a few hours later upon discharge with increased upper back pain and numbness and weakness of her bilateral lower limbs. Spinal angiogram was negative. Repeat MRI, however, revealed a large epidural hematoma in the T4-T6 level with spinal cord compression. Spinal cord injury level is T6 ASIA A. She was taken to the operating room emergently and had resection of an epidural hematoma without obvious source. Postoperative spinal angiogram was repeated, and again a vascular etiology for the hemorrhage was not visible. All workup including coagulation labs, CSF analysis and culture, infection and inflammatory profiles were negative. She had significant resolution of her back pain and was discharged with ASIA T6 C after three months with continuing therapy.

Conclusions: Spontaneous spinal epidural hematoma (SSEH) commonly refers to the spinal epidural hematomas of non-traumatic origin. SSEH is an extremely rare neurological emergency, especially in childhood. In the pediatric population this incidence is significantly lower. So far 38 cases have been reported in literature. The described predisposing factors so far include congenital or acquired bleeding diatheses, vascular malformations, a medical procedure (lumbar puncture, spinal anesthesia, and vertebral surgery), tumor bleeding, minor trauma or an infectious state. The largest category (57.8%) consists of cases with no identifiable etiology. Congenital or acquired bleeding diatheses are the second most common etiology (21.7%) and followed by vascular malformations (17.5%). Most common spinal level was cervicothoracic spine. Most patients had complete and incomplete recovery after emergent surgical intervention and acute rehabilitation.

Conclusions: SSEH is rare in the pediatric population and can lead to serious neurological sequelae. The follow-up with frequent neurologic examinations, early diagnosis, emergent decompressive surgery and acute rehabilitation are essential to decrease neurological sequelae.

SPONTANEOUS THORACIC EPIDURAL HEMATOMA ASSOCIATED WITH DURAL ARTERIOVENOUS FISTULA CAUSING ACUTE PARAPLEGIA

Jason Edwards, DO, and Carolina Gutierrez, MD

Case Diagnosis: Spontaneous Thoracic Epidural Hematoma Associated with Dural Arteriovenous Fistula

Case Description: A 21-year-old female with no prior medical history who had a normal vaginal delivery four months ago and is currently breastfeeding presented to the emergency room for acute onset upper back pain with progressive numbness and weakness of her lower limbs. Neurological examination findings included incomplete paraplegia and sensory deficits. MRI spine showed a T1-T2 mass lesion with enhancement. Contrast was administered, and a very large epidural hematoma in the T4-T6 level was identified on CT. The patient was taken emergently for a T1-T2 laminectomy with epidural hematoma evacuation. The procedure was complicated by brisk bleeding, and the patient underwent CT angiography after hemostasis could not be obtained. Angiography revealed extravasation of contrast from a branch of the right costocervical trunk. The site was coiled, and the patient was taken for re-evacuation of the epidural hematoma with repeat angiography for continued occult bleeding. She ultimately underwent T1 nerve root and dural arteriovenous fistula resection with resolution of the bleed. The patient was discharged to inpatient rehabilitation and showed good functional recovery, achieving complete to modified independence level for ambulation and ADLs.
Discussions: This case is significant as the patient does not fit the typical demographic nor the most common presentation for dural arteriovenous fistulas. Dural arteriovenous fistulas typically occur after the fifth decade of life, are predominantly seen in men, and are rarely associated with epiphyseal hematomas. The most common clinical presentation is a progressive myeloradiculopathy of insidious onset due to long-standing venous hypertension.

Conclusions: Spontaneous spinal epidural hematomas should be kept in one’s differential when evaluating patients presenting with neurological deficits associated with sudden onset back pain. Spinal epidural hematomas are a rare cause of spinal cord injury which require early diagnosis and surgical intervention to prevent long-term morbidity.

SPORADIC INCLUSION BODY MYOSITIS EXACERBATED BY STATIN MYOPATHY

Emily J. Graf, DO, and Thomas Kotsonis, MD

Case Diagnosis: Sporadic Inclusion Body Myositis exacerbated by statin myopathy

Case Description: A 68-year-old gentleman presented to the EMG clinic with a four-year history of slowly progressing, lower extremity weakness. He had a history of diabetes mellitus controlled on oral medications and hyperlipidemia treated with simvastatin. Specifically, the patient reported difficulty with stairs, arising from a seated position without use of his arms, and falls due to lower extremity weakness. On physical exam, the patient was noted to have significant, bilateral quadriceps weakness with atrophy and mild diffuse weakness involving both proximal and distal muscles. EMG revealed a diffuse myopathic process with some myotonic features. Interestingly, there were large amplitude positive sharp waves/fibrillation potentials up to 800 microvolts which were interspersed with runs of myotonic discharges in numerous muscles. His CPK level was elevated at 525. The patient was subsequently referred to a neuromuscular specialist where genetic testing for myotonic dystrophy type II tested negative. Therefore, a muscle biopsy of the left vastus lateralis was obtained and revealed light and electron microscopic findings diagnostic of sporadic inclusion body myositis along with evidence of mitochondrial dysfunction.

Discussions: It was determined the patient had an underlying, indolent inclusion body myositis which was complicated by a statin myopathy. The electrodiagnostic findings of interspersed runs of myotonic discharges and histopathology results of mitochondrial dysfunction appear most likely related to statin myopathy. Although myotonic discharges have been noted in dermatomyositis, polymyositis, and also statin myopathies, there are no reports to our knowledge of these occurring in inclusion body myositis.

Conclusions: This was an interesting case as the myotonic discharges were misleading and unrelated to his primary underlying myopathic process. It also illustrates the importance for EMG studies of routinely assessing whether or not a patient is on a statin.

STEP DOSING: A NOVEL METHOD TO INCREASE INTRATHecal BACLOFEN PUMP DOSE

Khruna Seema, DO, Diana M. Molinares, MD, and Benjamin Seiden, BS

Case Diagnosis: This is a case of a 54-year-old female with 12-year history of progressive multiple sclerosis who developed severe generalized spasticity associated with pain. Spasticity was initially treated conservatively with oral anti-spasticity medications and physical therapy without significant improvement. She underwent intrathecal baclofen (ITB) trial with a positive response. Patient’s ITB dose was adjusted during multiple visits; however her spasticity was not improving with the traditional dose increases, delaying the patient from reaching an optimal dose. With this consideration, Step dosing method was used in order to achieve a therapeutic dose more efficiently. This is the first case in the literature that describes the use of the Step dosing method for ITB pump dose increases. This novel technique allows controlled two step increases of the medication for every visit to successfully achieve a therapeutic dose in patients with severe spasticity in a timelier manner.

Case Description: After a thorough evaluation, the 54-year-old patient was considered to be a good candidate for ITB. A 40ml pump was inserted and was started on a simple continuous infusion at 25 mcg per day. Twenty-five percent dose increases were performed weekly for 3 weeks without significant improvement. Considering the lack of improvement with the standard dose increases, the Step dosing method was used to achieve a therapeutic effect more efficiently. Patient’s pump was running at a dose of 46.92 mcg per day. During this visit the dose was increased by a total of 32% which was equivalent to 62.07mcg per day. First, the pump was programmed to deliver a bolus of 269.67 mcg over 120 hours, which translates to 53.9 mcg per day for 5 days; 15% increase from the initial basal rate. Once bolus was finished, the pump would return to the simple continuous infusion, programmed to deliver 62 mcg per day (15% of the increased dose) for a total of a 32% increase of the initial dose. The Step dosing method achieved higher dose increases in a controlled and progressive manner, translating into patient comfort and effective increase of the medication safely.

Discussions: Intrathecal baclofen therapy (ITB) is a well-established treatment for spinal and cerebral-associated spasticity. However, different methods for ITB dosing continue to be developed to optimize patient care. Step dosing is a novel technique of ITB reprogramming that decreases the time needed to reach optimal dosing. Traditionally, ITB pump dosing depends on clinical and patient availability. Baclofen doses can be increased as frequently as daily. However, in a clinic setting, increases are usually performed on a weekly basis, with increase increments ranging between 5%-20%. Step dosing decreases the number of patient visits and reduces stress on the healthcare system. This technique results in higher doses in a controlled and safe manner, programming two dose increases in one visit. In our case, the first stage consisted of an 15% increase of 5 days; pump was programmed to deliver the total dose via bolus over 120 hours. During this time, the continuous infusion is halted and ITB delivery is solely completed via bolus. In the second stage, the pump is set to deliver a continuous infusion of 15% higher dose than the first-stage dose. This results in a total increase of 32% from the original dose.

Conclusions: Step dosing is a novel method for ITB dose increase that allows patients with spasticity to reach an optimal therapeutic dose in a safe and efficient way. With this technique, patients and clinic availability will have less of an impact on dose increasing schedules. Step dosing permits substantial increases in baclofen dosing in one clinic visit safely. It is important to consider that patients who are eligible to receive step dosing have tolerated baclofen dose increases prior. This method is designed for those patients with severe spasticity who have difficulties achieving the optimal therapeutic dose the standard way. Patients should have direct access to their pharmacy during this period in cases of symptoms of overdoses. However, this method performed in the right setting would allow for achieving optimal dose more quickly in a safe manner.

STIFF PERSON SYNDROME WITH SUPERIMPOSED PAROXYSMAL AUTONOMIC DYSPNYSTEM

Patrick Martone, DO, and Pamela H. Ballard, MD

Case Diagnosis: Stiff Person Syndrome with Superimposed Paroxysmal Autonomic Dysfunction

Case Description: The patient is a 60-year-old male with a history of hypertension and diabetes mellitus type I. He presented with a history of progressive difficulty walking, in which he described spasms and rigidity in his back and lower extremities. These episodes were associated with tachycardia and an elevation in systolic blood pressure greater than 200mmHg. The patient’s course was complicated by paroxysmal autonomic dysfunction, which manifested as tachycardia and hypertension with systolic blood pressures greater than 200mmHg. For the patient to participate safely in rehabilitation, in consultation with cardiology, his medication was dispersed throughout the day to prevent dangerous elevations in his heart rate and blood pressure. This consisted of timing Lisinopril twice a day, carvedilol twice a day and hydrochlorothiazide daily. With this regiment, the patient’s blood pressure and heart rate were optimized to participate safely in therapy.

Conclusions: Stiff Person Syndrome is a debilitating disease, which may be dangerous for patients due to its association with paroxysmal autonomic dysfunction. It is important for providers to recognize this condition and be aware of its potentially life threatening associations. Furthermore, interdisciplinary collaboration is needed to ensure patients afflicted with Stiff Person Syndrome can participate safely in rehabilitation.

STIFF PERSON SYNDROME: A CASE REPORT

Faraz Rahman, DO, and Sarah Eby, MD

Case Diagnosis: Stiff Person Syndrome

Case Description: The patient presented to an acute care hospital with a 3-month history of progressive weakness, diffuse muscle stiffness, and autonomic dysfunctions. She underwent extensive work-up and was diagnosed with SPS by a positive glutamic acid decarboxylase antibody (GAD 65) test and completed a 5-day course of intravenous immunoglobulin (IVIG). Her hospital course was complicated by respiratory failure requiring mechanical ventilation for two days and difficulty controlling muscle spasms. Upon transfer to acute rehabilitation, the patient demonstrated increased paraspinal tone and decreased strength in her upper and lower extremities. She had an ataxic gait and could ambulate only 5 feet using parallel bars with minimum-to-moderate
aid. She also required minimum-to-moderate assistance for mobility and activities of daily living (ADLs). Her fine motor coordination was impaired.

**Discussions:** SPS is a rare autoimmune disorder characterized by worsening muscle rigidity and spasms likely from impaired gamma-aminobutyric acid (GABA) inhibition. Medical treatment, including GABA-enhancing drugs or immunomodulating agents, typically improves these symptoms, however the disease usually progresses over time. Early intervention with medications as well as physical and occupational therapy can limit its progression. In an acute rehabilitation setting, the patient demonstrated significant functional improvement with oral GABA-enhancing medications as well as traditional physical and occupational therapies including neuromuscular re-education, gait training and electronice modalities.

**Conclusions:** After a 22-day acute neurorehabilitation stay, the patient exhibited significant improvements in her strength, ambulation, activities of daily living, and fine motor coordination. Her muscle spasms were controlled with oral diazepam and baclofen. Her strength improved to 5/5 in her upper and lower extremities. Upon discharge to home, she was contact-guard assistance-to-independent for ADLs and could ambulate 180 feet with a walker. Although the patient will likely need life-long therapies and monitoring, acute rehabilitation in conjunction with oral GABA-enhancing medications led to a dramatic improvement.

**STROKE INDUCED BY INTERNAL CAROTID ARTERY DISSECTION IN A YOUNG IRONMAN ATHLETE**

John Georgy, MD, and Mery Elashvili, MD, DO

**Case Diagnosis:** Carotid artery dissections constitutes a medical emergency. Although relatively rare, activities classified as sports and recreation may be a cause of arterial dissection independently of neck or head trauma. Objective is to discuss risk factors for development of stroke induced by carotid artery dissection in individuals during or soon after the practice of these sports activities.

**Case Description:** We present the case of a 44-year-old male triathlete who noticed left sided body weakness and aphasia after rigorous training for an Ironman competition. MRI and MR – angiography of head and neck demonstrated right-sided internal carotid artery dissection with right middle cerebral artery infarction.

**Discussions:** Regular practicing of sports and recreational activities is an important part of a healthy life. Acute and severe accidents or injuries during sports occur infrequently and should never be a deterrent to physical activity. However, it is important to acknowledge that arterial dissection may be a complication from practicing sports.

**Conclusions:** Cervical trauma has been described as an important determinant of cervical arterial dissection, although it is not the only cause in these patients.

**SUBACUTE COMBINED DEGENERATION AN UNINTENDED OUTCOME OF RECREATIONAL NITROUS OXIDE ABUSE**

Kunal Oak, DO, Mohammad H. Zaidi, DO, Baruch Kim, DO, and Jung Hwan Ahn, MD

**Case Diagnosis:** Subacute Combined Degeneration

**Case Description:** This 42-year-old male with admitted recreational nitrous oxide use for 1.5 years presented with weakness, numbness, and tingling in bilateral feet that progressed up to the nipple line causing a worsening gait. He went from independently ambulating to requiring a rolling walker within one week.

Exam revealed bilateral lower-extremity hyperreflexia, clonus, impaired vibratory and joint-position sense, and upgazing Babinski response. Thoracolumbar MRI showed posterior cord signal abnormalities. Labs revealed B12 deficiency and macrocytosis. Aggregate data lead to diagnosis of subacute combined degeneration in setting of B12 deficiency secondary to nitrous oxide use.

B12 was administered daily. With physical and occupational therapy, he went from walking 50 feet with rolling walker and supervision to walking 150 feet with modified independence. Myelopathic signs gradually improved with B12 administration, yet numbness of plantar aspects of bilateral feet persisted.

**Discussions:** Vitamin B12 is a cofactor of myelinization. Deficiency is a well reported cause of subacute combined degeneration. Nitrous Oxide’s (N2O) association with B12 deficiency is not new or unique. As the popularity of recreational N2O use grows, cases of toxicity will surface more often. Decomposition of N2O into components provides reagents for the reaction that inactivates B12. When N2O is used chronically, B12 levels may drop causing irreversible damage to neurons. This case describes a patient's chronic recreational use of N2O causing significant myelopathy culminating in presentation and diagnosis as described.

**Conclusions:** N2O and oxide use may irreversibly damage neuronal structures. Taking a good social history and identifying nitrous oxide abuse can reveal patients at risk for subacute combined degeneration. With early cessation of N2O use and supplementation of B12, these sequelae may be avoided.

**SUBACUTE COMBINED DEGENERATION OF THE SPINAL CORD (LICHTHEIM'S DISEASE)**

Quoc Tran, MD

**Case Diagnosis:** Subacute Combined Degeneration of the Spinal Cord

**Case Description:** A 54-year-old male with a history of anemia, alcoholism, and diabetes presented with increasing weakness, tremors, gait instability, altered mental status and dysarthric. CT head and MRI brain were negative. His diabetes was well-controlled and he denied any history of neuropathy. MRI of the cervical spine revealed increased signal from C2 to T1 predominantly in the dorsal aspect of the cord. Laboratory data revealed megaloblastic anemia, vitamin B12 level was markedly reduced (<50 pg/mL) and methylmalonic acid level was significantly elevated (23900). Intrinsic factor antibodies were also positive (67.4). Homocysteine level was also elevated at 273 umol/L. The patient was diagnosed with subacute degeneration of the spinal cord secondary to pernicious anemia. Cobalamin replacement was initiated with gradual recovery of his function, sensory deficits and cognition.

**Discussions:** Subacute combined degeneration of the spinal cord is a rare self-limiting disorder that primarily affects the dorsal and lateral columns of the spinal cord. It is typically secondary to cobalamin deficiency but can be due to vitamin E and copper deficiency. Our patient had a history of pernicious anemia, which gradually led to his decline in motor and sensory function. Homocysteine levels may be the only elevated marker with normal cobalamin levels in certain patients. Patients can regain significant recovery within the first month of cobalamin replacement therapy. Delayed treatment can result in permanent deficits in sensation and motor function.

**Conclusions:** Subacute combined degeneration of the spinal cord is a condition that can affect both motor (corticospinal) and sensory (dorsal column) tracts and is easily treatable if identified early. Permanent changes can be observed with delayed diagnosis and treatment. Physicians need to be aware of this rare disorder while evaluating a patient with weakness and dysarthria in the setting of vitamin B12 deficiency.

**SUBACUTE COMBINED DEGENERATION OF THE SPINAL CORD DUE TO PERNICIOUS ANEMIA LEADING TO VITAMIN B12 DEFICIENCY, A CASE REPORT**

Arlene Lazaro, DO, Anoki Mehta, MD, and Miguel Escalon, MD, MPH

**Case Diagnosis:** Subacute combined degeneration of the spinal cord due to pernicious anemia leading to vitamin B12 deficiency

**Case Description:** The patient is a 44-year-old Filipino female who presented to the emergency department with excruciating back pain and difficulty walking associated with tingling and numbness to the bottom of her both feet for 1 month. She is independent in ambulation at baseline, however, over the last month, has needed her husband’s assistance to help with her balance. She denied saddle anesthesia or changes in her bowel or bladder habits. Her exam was notable for bilateral lower extremity deficits in tactile sensation, vibration, and proprioception. She had an ataxic gait pattern with inconsistent foot pattern and narrow base of support. She required moderate assistance with a rolling walker. Labs revealed B12 deficiency, macrocytosis, and positive anti-intrinsic factor anti-body confirming a diagnosis of pernicious anemia. MRI of the brain showed an abnormal signal in the posterior spinomedullary junction. MRI of the cervical and thoracic spine showed increased signal in the posterior inferior medulla and posterior cervical cord. She was admitted to neurology service and started on B12 replacement with improvement of symptoms. She was transferred to acute inpatient rehabilitation to focus on gait re-training. Her exam revealed C4 AIS D Spinal Cord Injury.

**Discussions:** Non-traumatic spinal cord injury accounts for 9% of spinal cord injuries. Subacute combined degeneration of the spinal cord is most commonly due to vitamin B12 deficiency. Amongst other reasons, inadequate levels of vitamin B12 can be due to impaired absorption in patients with pernicious anemia. The rehabilitation of a patient with subacute combined degeneration will include a focus on coordination, balance, proprioceptive feedback and gait re-training.

**Conclusions:** A high index of suspicion for vitamin B12 deficiency is needed in patients with posterior column changes on imaging and proprioceptive deficits as treatment with B12 replacement and early rehabilitation may improve symptoms.

**SUBMERSED TREADMILL GAIT TRAINING IN THE ACUTE INPATIENT REHAB SETTING**

Jeremy Jacobs, DO

**Case Diagnosis:** Successful independent ambulation utilizing aquatic gait training for a patient with ataxia due to incomplete traumatic tetraplegia.

**Case Description:** RL is a 34-year-old male who was involved in a high speed MVA. He suffered incomplete tetraplegia and underwent ACDF. He was admitted to the acute rehabilitation hospital due to weakness, severe ataxia and impaired

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**Abstracts**

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elbow to compensate. She has a visible “Popeye” biceps muscle belly.

By retracting her right scapula, externally rotating at the shoulder and extending her motion, but at least 4/5 grade strength of internal rotation using the pectoralis muscle.

She had a history of multiple falls including a serious fall in 2013 causing a subacromial hemorrhage in the right sylvian fissure and intraparenchymal hematoma in the left orbital gyrus. She had a more recent fall 03/24/2015 onto her extended right arm, causing subarachnoid hemorrhage in the right hemisphere and intraparenchymal hematoma in the left orbital gyrus. She had a more recent fall 03/24/2015 onto her extended right arm, causing subarachnoid hemorrhage in the right sylvian fissure and intraparenchymal hematoma in the left orbital gyrus. She had a more recent fall 03/24/2015 onto her extended right arm, causing subarachnoid hemorrhage in the right sylvian fissure and intraparenchymal hematoma in the left orbital gyrus. She had a more recent fall 03/24/2015 onto her extended right arm, causing subarachnoid hemorrhage in the right sylvian fissure and intraparenchymal hematoma in the left orbital gyrus.

The subscapularis tendon, contrast within the distal supraspinatus and infraspinatus tendon suggesting a full-thickness incomplete tear, and a rupture of the biceps tendon at its origin. The patient saw an orthopedic surgeon who recommended an open subacromial repair. She was modified independent using a quad cane on her right side, and she was modified independent with ADLs despite a devastating hemor-

rhage and joint subluxation with damage to five individual CNs. This devastating complication is exceed-

ingly rare. To our knowledge, this is the first reported description of effective rehabilitation for this unique clinical situation.

As a result of participating in an effective rehabilitation program, this young man achieved a remarkable functional recovery. Similar therapies can be considered for other individuals who may experience acquired basilar invagination af-

fter surgical repair of internal decapitation.

SUCCESSFUL REHABILITATION OF SPINAL CORD INJURY SECONDARY TO SPINAL FRACTURE FROM SUICIDE ATTEMPT WITH COMPLICATED COURSE

Mohammad Islam, MD, Kimberly Katz, BA, Stephanie DeLucci, BS, MS, and Jacob Feldman, BS

Case Diagnosis: Spinal cord injury secondary to spinal fracture from suicide at-

tempt with complicated course.

Case Description: A 58-year-old Caucasian female patient with past medical history of diabetes mellitus, hypertension, and depression was admitted to acute inpatient rehab due to polytrauma secondary to suicidal attempt. Upon initial presentation to the ED, CT imaging demonstrated no abnormal spinal findings. Patient underwent an above the elbow amputation of the right arm secondary to an open humeral fracture. After pa-

ient was medically stabilized a subsequent CT demonstrated nondisplaced fractures of T7–T10 vertebral bodies. Additionally, a comminuted fracture of T12 was identified with fragments impinging upon the spinal cord. TLSO brace was utilized for spinal sta-

bilization prior to implementation of tethering. She had a neurogenic bladder, recurrent UTIs, and underwent multiple surgeries for nephrolithiasis secondary to new onset hyper-

parathyroidism that interrupted rehabilitation progression.

As the patient emerged from his coma, he was also found to have abnormalities with CN 8, 9, 11 and 12. Imaging revealed odontoid displacement into the medulla, a post-surgical complication known as basilar invagination.

The patient remained in acute rehab for approximately 5 months demonstrating progres-

sion of functional status. Hospital course was complicated by recurrent and intermittent physical and occupational therapy treatment refusal due to ongoing psychiatric diagnosis and severe anxiety. Additionally, the patient was treated for a neurogenic bladder, recurrent UTLs and underwent multiple surgeries for nephrolithiasis secondary to new onset hyper-

parathyroidism that interrupted rehabilitation progression.

At the time of submission, patient is able to ambulate independently with walking aids, exhibits increased independence in activities of daily living and requires mini-

mal assistance in transferring and bed-rolling. Patient was fit for right upper extremity prosthesis for right arm amputation. Given the patient’s current state and fulfillment of rehab goals, the plan is to discharge patient to long term skilled nursing facility and continue with medical management of ongoing injuries.

Discussions: Research has demonstrated that a high percentage of admissions to suicide rehab centers were caused by suicide attempts. This case presents an example
of one such admission. In spite of the complicated course including multiple medical and psychiatric comorbidities, standard of care rehabilitation using both physical and occupational therapy modalities showed significant improvement such that the patient no longer required intensive rehabilitation. The patient’s case underscores the importance of continued persistence as well as patience from care providers of all modalities.

Conclusions: We present an interesting case of rehabilitation of a spinal cord injury that resulted from a suicide attempt. Although the patient initially presented with several traumatic injuries and a significant past medical history of psychiatric disorders, this case is consistent with research findings that rehab outcomes are similar in patients with preexisting mental health disorders and those without.

SUDDEY CARDIAC ARREST IN ADOLESCENT WITH SPINAL CORD INJURY AFTER TRANSVERSE MYELITIS: A CASE REPORT

Paolo C. Mimbella, MD, MSC, and Glendaliz Bosques, MD

Case Diagnosis: Cardiac Arrest/Ventricular Fibrillation, Transverse Myelitis

Case Description: The patient is a 15-year-old male with past medical history of C3 AIS C tetraplegia as a result of transverse myelitis diagnosed on 11/26/14. The patient was admitted to the PICU in 2016 due to a rehabilitation need for his medico-rehabilitative needs on 7/13/15. He was progressing well towards his goals when suddenly and without warning, the patient suffered cardiac arrest on 9/14/15. CPR was immediately initiated with 2 cycles of chest compressions, ventricular fibrillation detected on AED, and 1x shock with ROSC. No medications were given. He was transferred to PICU on 9/17/16 a dual chamber ICD was inserted. Extensive work up by cardiology did not uncover any underlying channelopathies or cardiac abnormalities. Neurological work up was also negative. On 9/22/16 he was once again transferred back to the rehab unit. He was eventually discharged from the rehab unit on 10/9/15 without further incidence. The patient reports no memory of the cardiac arrest and recalls regaining consciousness in PICU. Interestingly, the patient’s functional mobility in his left upper extremity improved after arrest, resuscitation with electrical shock, and short stay in PICU. The patient received physical and occupational therapy modalities showed significant improvement such that the patient no longer required intensive rehabilitation. The patient’s medical and functional status on admission, throughout rehabilitation stay, and up to discharge will be discussed.

Discussions: Transverse myelitis (TM) is a relatively uncommon neuro-immune disorder of the spinal cord. It is characterized by inflammation of the spinal cord which results in eventual glial scarring and interruption of the signaling pathways within the cord. This may result in various spinal cord injury syndromes depending on the level of the cord and degree of inflammation. Cardiac abnormalities are not typically associated with TM and even less so is sudden cardiac death in this population. We present the case of a young man with unexplained VFib arrest and successful resuscitation. Extensive work up was negative.

Conclusions: This case brings attention to sudden cardiac death in a patient with no known cardiac disease and isolated transverse myelitis. He was extensively worked up after ROSC with emergent resuscitation efforts. This work up was negative for any identifiable cause leading to the arrest. At a minimum, this case brings attention to a possible rare complication of TM. In addition, this case is unique with respect to unexpected functional gains immediately after arrest, resuscitation, and return to the rehabilitation unit.

SUPERFICIAL THROMBOPHLEBITIS OF THE WRIST PRESENTING AS A GANGLION CYST: A CASE REPORT

Ana M. Garcia, MD, and Michael P. Schaefer, MD

Case Diagnosis: Superficial thrombophlebitis of the wrist.

Case Description: A 46-year-old female with history of DM type 2, HTN and bilateral carpal tunnel syndrome (CTS) presented with a three month history of a painful, progressively growing mass over the volar aspect of her dominant right wrist. She denied any inciting event such as trauma associated. On examination a tender and mobile superficial nodule was palpated on the volar aspect of the right wrist. There was moderate limitation in the range of motion of the wrist with pain at the end range of wrist flexion. Neurovascular exam was intact. A ganglion cyst was suspected and she was referred to our clinic for ultrasound-guided cyst aspiration. Ultrasound was performed prior to the procedure showing a very small, less than 0.5cm in diameter, hypoechoic and non-compressible area within a fusiform dilation of a superficial cyst. The lesion was located in the subcutaneous layer and superficial to the radial artery and correlated with the patient’s area of tenderness. Findings were consistent with a superficial vein thrombosis. No ganglion cyst was detected.

The clinical presentation of a ganglion cyst can be similar to other etiologies such as superficial thrombophlebitis. Other lesions such as malignancies, abscesses, tendon lacerations, and foreign body reactions should be considered. Ultrasonography is an inexpensive and non-invasive method of assessing the soft tissue and can help differentiate these conditions.

Conclusions: Performing an ultrasonographic assessment of the wrist is helpful to assist in the evaluation of soft tissue lesions, especially before interventional procedures. The information obtained can significantly influence the appropriate management and treatment. Superficial vein thrombosis should be considered in the differential diagnosis for soft tissue masses.

SURGICAL TREATMENT OF RADICULOPATHY WITH POSTOPERATIVE ELECTROMYOGRAPHY CONSISTENT WITH AMYOTROPHIC LATERAL SCLEROSIS: A CASE SERIES

Udai Nanda, DO, and Steven Hsu, MD

Case Diagnosis: Amyotrophic Lateral Sclerosis (ALS)

Case Description: Patient A is a 58-year-old male with a 20-year history of right upper extremity weakness progressing to include the right lower extremity and intermittent paresthesia in all extremities. The patient underwent prior diagnostic work up negative for Multiple Sclerosis, MRI revealing cervical myelopathy and severe lumbar foraminal stenosis. Treatment included multiple epidural injections and ultimately cervical and lumbar spinal fusion. Patient B is a 67-year-old female with a two-year history of gait instability with progressive right foot drop and numbness in the right foot. Imaging indicative of lumboSacral impingement. The patient subsequently underwent epidural injections followed by microdiscectomy. For both of these cases, during the postoperative course there were concerns for alternate diagnosis. EMG was performed and along with clinical signs and symptoms, clinically definite ALS was diagnosed by Awaji Criteria.

Discussions: The workup for radiculopathy often includes a history, exam, MRI or CT, with possible electrodiagnostic studies. Symptoms of ALS often overlap with other medical illnesses which can complicate accurate diagnosis and at times lead to unnecessary surgeries. It is imperative to evaluate the diagnostic workup for the common mimickers of ALS to aid in accurate diagnosis. In this case series, we reviewed steps taken and possible alternate steps in management that may have provided an earlier accurate diagnosis of ALS and prevented surgeries which were ultimately ineffective.

Conclusions: This report highlights two cases involving surgical management of radiculopathy without preoperative electromyography, and with subsequent postoperative diagnosis of ALS. As electrodiagnostic studies are not always used in the diagnosis of radiculopathy due to their potential limitations in certain scenarios, this series suggests significant additional benefit in performing EMG in patients with signs/symptoms suggestive of radiculopathy, especially prior to surgical intervention, to rule out alternate diagnoses and prevent unnecessary surgeries.

SURVIVING SECOND IMPACT SYNDROME IN FOOTBALL: A CASE REPORT

Cole Linville, DO, MBA, Siddharth Thakur, MD, Manuel F. Mas, MD, and Glendaliz Bosques, MD

Case Diagnosis: A 15-year-old, previously healthy, male suffered a head collision during a football game with no symptoms. Four days later, he developed a headache. However, this was not relayed to the football coaches or staff. He returned to practice where he suffered another head collision, collapsed, and had a seizure. Paramedics were called, he was intubated and admitted to the Pediatric Intensive Care Unit (PICU). Upon evaluation, he was found to have bilateral subdural hematomas from the traumatic brain injury.

Case Description: The patient continued to have severe cognitive and motor deficits and was admitted for inpatient rehabilitation where he received physical therapy, occupational therapy, and speech and language pathology consults. He arose from his bed but developed intermittent paresthesias in all extremities. The patient underwent prior diagnostic work up negative for any SIS. Performing an ultrasonographic assessment of the wrist is helpful to assist in the evaluation of soft tissue lesions, especially before interventional procedures. The information obtained can significantly influence the appropriate management and treatment. Superficial vein thrombosis should be considered in the differential diagnosis for soft tissue masses.
SYMPTOM IMPROVEMENT IN A CASE OF STIFF PERSON SYNDROME TREATED WITH INTRATHecal BACLOFEN
Jaco J. Moore, BS, and Anthony E. Chiiodo, MD
Case Diagnosis: A 52-year-old female presented with stiff person syndrome (SPS) causing progressive stiffness of her lower extremities and back.
Case Description: Physical exam showed absent reflexes in the lower extremities and strength of 3/5 in the hips and ankles; the knees were in a locked, hyperextended position. Immunological work up for SPS was unremarkable. Previous therapeutic attempts to manage symptoms with steroids, oral valium, rituximab, intravenous immuno- globulin and plasma exchange had insignificant effect, and a trial of azathioprine was abandoned due to unacceptable nausea. Medical history was complicated by metabolic syndrome, hypertension, diabetes, obstructive sleep apnea, and prior renal cell carcinoma with complete resection. A trial of intrathecal baclofen (ITB) improved knee range of motion from 0-20 to 0-43 degrees. It improved sitting balance, bed mobility, and transfers from moderate assist to modified independent. It did not improve her ability to stand or walk. The patient and family elected for ITB pump placement which sustained the stated benefits.
Discussions: SPS is a rare immune-mediated movement disorder that affects an estimated one in a million persons. It is characterized by progressive muscular rigidity with superimposed spams of skeletal muscle and continuous motor unit activity on EMG. Autoantibodies are commonly associated, most of which target proteins of inhibitory synapses of the CNS. The condition varies in presentation from focal appendicular involvement with axial sparing, to focal axial involvement with appendicular sparing, to a combination of the two.
Conclusions: The muscle stiffness and abnormal posturing seen in persons with SPS inhibit body mobility and mechanical functionality; effective treatment that avoids symptom relief has potential to greatly improve quality of life in this population. We demonstrate a case of symptom relief with intrathecal baclofen therapy in a patient with stiff person syndrome.

SYMPTOM-DELAYED DISRUPTION OF CERVICAL LIGAMENTS WITH ANTEROLISTHESIS IN A MIXED MARTIAL ARTS FIGHTER
Jeremy Stanek, MD, and Carl Giacchi, DO
Case Diagnosis: Symptom-delayed disruption of cervical ligaments with anterolisthesis in a mixed martial arts fighter.
Case Description: During a mixed martial arts (MMA) fight, a 24-year-old male landed on his head while taking down an opponent, putting axial load on the spine while in flexed position. There was trace neck and left shoulder pain that subsided immediately, and he finished the fight without dysfunction. Ringside exam was unremarkable and without pain. Patient presented two days later to outside emergency room with left 5th finger paresthesia and neck and left shoulder pain. Exam revealed cervical spine tenderness to palpation with normal upper extremity strength and sensation. Radiographs demonstrated angular kyphosis with narrow anterior disc space at C5-C6 and anterolisthesis of C5 on C6. MRI demonstrated disruption of intersegmental and supraspinous ligaments and ligamentum flavum at C5-C6, posterior longitudinal ligament elevation of the L5-S1 intervertebral disc herniation at C5-C6. Orthopedics placed the patient in a Miami-F collar and discharged to home. After wearing the collar for five days, symptoms persisted, and repeat radiographs in our clinic demonstrated worse anterolisthesis. Patient was admitted and underwent both anterior and posterior fusion of C5-C6. Pain resolved postoperatively, and neurological exam was normal.
Discussions: Since less than 1% of sports injuries are cervical spine injuries, and most occur in football and ice hockey, this case of cervical spine injury in an MMA fighter is unusual. Patient had no neurological symptoms at the time of injury. Athletes’ symptoms may be distracted by high adrenaline levels during competition, making injury detection by sideline providers difficult.
Conclusions: Not all athletic injuries are initially apparent and may present in unlikely sports. When providing event coverage, physiatrists should be meticulous when evaluating athletes for injury and should pay particular attention to the mechanism of any possible injury.

THE L5 EXEMPTION – CORRELATION OF CLINICAL AND ELECTRODIAGNOSTIC FINDINGS IN L5 RADICULOPATHY
Shannon L. Schultz, MD, MPH, David R. Gater, MD, PHD, MS, and Aiesha Ahmed, MD
Case Diagnosis: L5 radiculopathy with abnormal sensory action potential (SNAP).
Case Description: A 44-year-old woman presented with left foot weakness and pain in the left lower extremity, radiating from the gluteal region distally, which was intensified during menses. CT scan of her abdomen done for gynecological reasons revealed an enhancing mass near the sciatic notch, which biopsy confirmed as endometrial tissue. She had laparoscopic hysterectomy with removal of the endometrial deposit, which was found to be deep in the pelvic neural foramen. Post-operatively, her pain ceased and her foot drop slightly improved. NCS/EMG was done which showed an absent left superficial peroneal sensory response with a normal response on the contralateral side. Left peroneal motor studies from extensor digitorum brevis were absent, and from tibialis anterior showed small amplitudes. Needle examination showed chronic and active denervation in the tibialis anterior, gluteus medius and tensor fascia latae muscles consistent with an L5 radiculopathy. An alternate diagnosis of lower lumbar spinal stenosis was considered but absence of needle exam abnormalities in semitendinosus and medial gastrocnemius along with normal tibial motor responses made it questionable.
Discussions: Typically, radiculopathies are known for sparing the sensory nerve action potentials (SNAPs). One important exception occurs with an L5 radiculopathy, where the superficial peroneal SNAP may be abnormal (absent or reduction in amplitude by 50% or less of the contralateral side). This is thought to be secondary to the L5 dorsal root ganglion being located proximal to the intervertebral foramen. This occurs in approximately 10-40% of individuals where it can potentially be susceptible to external intraspinal compression.
Conclusions: Anatomic abnormalities do not always correlate electrodiagnostically. In the few patients in which it does, it is important to remember that an L5 radiculopathy could be an exception to the preserved-SNAP rule.

THE PUZZLING CASE OF A 66-YEAR-OLD WOMAN WITH A PROGRESSIVE, LONGITUDINALLY EXTENSIVE, TRACT SPECIFIC, MYELOPATHY
Elizabeth O’Keefe, DO, Katherine Schwetye, MD, PHD, Robert Bucelli, MD, PHD, Robert Schmidt, MD, PHD, John Nazarian, MD, and Richard Perrin, MD
Case Diagnosis: Dorsal Column Myelopathy.
Case Description: A 66-year-old woman presented with progressive pain and sensory deficits attributable to a posterior myelopathy. Spinal cord magnetic resonance imaging showed a longitudinally extensive T2-hypointense lesion of the dorsal columns. Comprehensive serum, urine, and cerebrospinal fluid analysis failed to identify an etiology. Empiric intravenous methylprednisolone and intravenous immuno-globulin were of no benefit. Given the many factors suggestive of a paraneoplastic etiology, and the possibility of an unidentified antibody-mediated disorder, the patient underwent extensive screening for an occult malignancy, including a whole body positron emission tomography/computed tomography (PET/CT) scan, mammography...
and colosonopy but no malignancy was identified. She developed dysesthesia and alldynia affecting her entire body and lost the use of her arms and legs due to severe sensory ataxia. She underwent acute inpatient rehabilitation but remained highly debilitated by her condition at discharge. She opted against additional aggressive medical management and was discharged home. Soon after discharge and a few months after surgery, she started a myriad of symptoms, including bilateral buttock pain with radiation into the mid pelvis, tightness in the pelvis, leg crossing when in bed with her toes pointed down, worsening bowel and bladder irregularity, and episodic hypertension, tachycardia, blurry vision, and dizziness.

Physical exam pertinent for tenderness along the bilateral hip adductors and proximal thigh tendons. Full PROM of 1+/1 at hip abduction, knee flexion, and ankle dorsiflexion bilaterally. Strength 5/5 throughout, except 4/5 in bilateral hip flexors, hip abductors/adductors/extensors and knee extendors. Sensation intact and symmetric to light touch. Hyper-reflexia of 3+ in upper and lower extremities. Electrodiagnostics with no electrophysiologic evidence of a lumbosacral radiculopathy, plexopathy or large fiber neuroopathy. Poor activation noted on needle EMG consistent with a central process. MRI of the brain, cervical and thoracic spine unchanged.

Discussions: This is a unique presentation of zoster triggering both spasticity and autonomic dysreflexia (AD) in a patient with radiation-induced myelopathy. The patient fell into a vicious cycle: pain from zoster and spasticity worsened AD; spasticity worsened bowel and bladder; bowel and bladder worsened AD. The goal through this cycle was to identify sources of spasticity/AD and manage them. Treatment consisted of bowel and bladder programs and the initiation of tizanidine, in an attempt to decrease spasticity, with a desired side effect of relaxing sphincters to promote emptying. Additional treatment included physical therapy, pelvic floor therapy and ankle stretching splints.

Conclusions: With the initiation of tizanidine, the vicious cycle was broken, and the patient had rapid improvement in spasticity and resolution of AD. This case highlights a unique presentation of AD stemming from zoster, spasticity, pain, and bowel and bladder impairment.

“THIS IS MY HAND:” REVERSAL OF SOMATOPARAPHRENIC DELUSION FOLLOWING ADMINISTRATION OF METHYLPHENIDATE; A CASE REPORT

Young IL, Seo, MD, Jerrald Chen, MD, Sue Qu, MD, and Alexandra Nielsen, MD

Case Description: The patient had a past medical history of poorly-controlled hypertension and presented to an acute care hospital with symptoms related to a right basal ganglia hemorrhagic stroke including left hemiparesis. His hospital course was complicated by respiratory failure requiring tracheostomy placement. The patient was able to be discharged to acute inpatient rehabilitation, and was decannulated two weeks into his admission.

He initially displayed poor verbal initiation and favored written communication, but with improvement, he began to speak of a “stranger” in his bed. As his speech improved, he expressed to various staff members that his paretic left arm belonged to his brother. He was able to identify his paretic limb as an arm and was able to mobilize it reluctantly during therapy sessions, but continued to state that it was not his arm. He was often bothered by its presence, stating that the arm was taking up space in his bed, that it was putting significant weight and pressure on him, and sometimes requested that the limb be removed. Painful stimuli applied to the paretic left hand caused the patient to report pain in the shoulder, which was already a common complaint for the patient.

On neurologic exam, he was found to have dense left hemiparesis and mild left-sided neglect. He was able to attend to the left side when prompted, but rarely moved his eyes left of midline spontaneously. He reported decreased sensation on the left side of the body. Further interdisciplinary testing revealed visual and perceptual deficits to his left, however, he was able to accurately perform line bisection, and was able to correctly point to left and right side of the room on command. However, when asked where his bed terminated while lying supine, he would indicate his left shoulder line as the edge of his bed. Other temporary benefits established with the literature, including mirror therapy and cold water calorice testing, was attempted without benefit.

There is increasing interest in dopamine and its use in recovery after stroke. To assist with motor recovery, methylphenidate 5 mg by mouth at 7 am and 12 pm was initiated. Methylphenidate has not been labelled for use in these circumstances. His delusion had persisted for more than 15 days at the time of initiation of methylphenidate.

Discussions: Somatoparaphrenia is a rare delusion, where a patient reports foreign ownership of a body part. This is related to other body image identity disorders, such as anomatosagoria, where loss of body part awareness is present but no foreign ownership is ascribed.

In the first hours of the first dose, he had improved verbal output and speech intelligibility. Though still hemiparetic, he identified his left hand and leg as his own and continued to do so through the remainder of his inpatient acute rehabilitation stay (10 days after starting methylphenidate). By the time of his discharge from...
rehabilitation, he no longer reported shoulder pain on painful stimulus of his paretic fingers, could accurately gauge light touch on his left side, but continued to display extinction with bilateral stimuli. This is the first reported case, to our knowledge, of long-term (10 days at time of discharge) reversal of somatoparaphrenia after initiation of a pro-dopaminergic agent. No other pharmacologic or long term treatments have been established in the literature. Cold water caloric testing and mirror therapy yielded only temporary benefit for studied patients.

Somatoparaphrenia may resolve spontaneously, thus the resolution of symptoms may not be completely related to dopaminergic stimulation.

Conclusions: This treatment approach may assist other physicians in treating chronic body image identity disorders such as somatoparaphrenia and its related kin, including asomatognosia.

TORSONAL ANATOMY OF THE FOOT: THE APPEARANCE OF ANATOMY IN HEMISPASTIC POSITION

Rochelle Dy, MD, John C. Cianca, MD, Joslyn John, MD, and Faye Chiu-Tan, MD

Case Diagnosis: It has been demonstrated previously by the authors that structures will vary from the conventional anatomic neutral position when in spastic postures as seen during ultrasound examination. The study of torsional anatomy may help clinicians who perform spasticity injections understand how this anatomic variance affects the accuracy, efficacy and safety of injection procedures.

Objective: To determine if there are relevant anatomical variations to the typical injection sites for procedures that treat spasticity.

Case Description: Design: Muscles typically injected for spasticity were studied using ultrasound in a healthy 52-year-old female’s foot. Each muscle was examined in anatomic neutral and then in spastic postures. These images were analyzed and illustrated to highlight variations in the neutral and simulated spastic postures. Setting: Academic PMR department. Participants: A single healthy adult female. Intervention: The subject was studied in anatomic neutral and spastic postures. Outcome measures: not applicable.

Discussions: Results: The adductor hallucis (AH) moves deeper in the foot. The flexor hallucis brevis (FHB) remains relatively unchanged with regards to its location just slightly medial to the 1st MTP. However, the two muscle bellies were more distinctly separate in neutral position and become juxtaposed in the spastic posture. This may make both muscle bellies accessible through a single injection. The flexor digitorum brevis (FDB) remain undistorted, but it is prudent to keep in mind that the flexor hallucis longus tendon directly overlies the FHB when doing injections. With hitchhiker big toe extension, the tibialis anterior rolls anteriorly over the tibia, pulling along the extensor hallucis longus (EHL) medially. This aligns the EHL directly above the anterior tibial artery and deep peroneal nerve. The EHL medially and the AH medially will become more distinct separate in neutral position and become juxtaposed in the spastic posture. This alignment may aid in performing injections in the AH and avoidance of the artery and nerve when injecting the EHL.

TRANSFORAMINAL EPIDURAL STEREOID INJECTION AS TREATMENT FOR L5 RADICULITIS CAUSED BY LUMBOSacral TRANSITIONAL VERTEBRAE WITH PSEUDOARTICULATION

David Suarez, MD, Byron J. Schneider, MD, and Matthew Smuck, MD

Case Diagnosis: Transforaminal Epidural Steroid Injection as Treatment for L5 Radiculitis Caused by Lumbar Sacral Transitional Vertebral with Pseudoarticulation.

Case Description: A 58-year-old female presented to clinic reporting multiple months of worsening left sided dysesthesia in an L5 distribution with associated low back pain. Physical exam was notable for positive straight leg raise and seated slump test. Lumbar x-ray revealed lumbar sacral transitional vertebral (LSTV) anatomy of L5 with pseudoarticulation of the left transitional element of L5 on the superior aspect of the left sacral ala (Castelli’s type II). L-Spine MRI demonstrated left L5 nerve root impingement in the extraforaminal space at the medial aspect of the pseudoarticulation. After inadequate response to NSAIDS and physical therapy, we performed a left L5-S1 transforaminal epidural steroid injection (TFESI) and pseudoarticulation steroid injection. She reported complete symptom relief for 5 days before gradual return of symptoms. Repeat injections were performed 2 months later, resulting in 6 months of complete symptom relief and return to pre-morbid levels of physical activity. Symptoms then returned and repeat injections were again performed. Follow up is pending.

Discussions: The prevalence of LSTV is between 4–30%. LSTV is a potential cause of back pain arising from the ipsilateral pseudoarticulation, contralateral facet joint, or biomechanical predisposition to adjacent intervertebral disc pathology. Reports of radicular symptoms due to LSTV pseudoarticulation are rare. Potential causes of this have been reported as medial bone spurs causing stenosis of the S1 nerve root canal and extraforaminal entrapment of the L5 nerve root between the L5 transitional element and sacral ala. Surgical decompression has been reported as a potential treatment. We believe this to be the first report of using TFESI to successfully treat lumbar radiculitis caused by LSTV pseudoarticulation.

CONCLUSIONS:

TFESI is a potential treatment for lumbar radiculitis caused by LSTV pseudoarticulation.

TRANSITIONING A MULTIPLE MYELOMA PATIENT FROM REHAB TO PREHAB PRIOR TO STEM CELL TRANSPLANT: A CASE REPORT

Jessica Engle, DO, and An Thuy Ngo-Huang, DO

Case Diagnosis: Radiculoneuropathy in a Multiple Myeloma Patient

Case Description: A 70-year-old man with multiple myeloma (MM) was admitted for diffuse radiculoneuropathy (diagnosed on EMG) caused by leptomeningeal disease and superimposed bortezomib-induced neuropathy. He had decreased range of motion and sensation in bilateral upper and lower extremities with strength graded as grossly of 2–3/5 throughout. After 3 weeks of acute inpatient rehabilitation, he was supervision for dressing, toileting, eating, transfers, and contact guard for ambulation of 150 feet with rollator when discharged home. Strength improved to 5–5 in bilateral upper extremities and at least 4/5 in bilateral lower extremities. Decreased sensation persisted in all 4 extremities. Six months later, he started prehabilitation prior to stem cell transplant (SCT) consisting of moderate-intensity walking and resistance exercises engaging the proximal upper and lower limbs. He underwent chemomobilization and autologous stem cell collection and transplant for treatment of MM. After 5 weeks of prehabilitation, patient was admitted, received high-dose chemotherapy, underwent an autologous SCT, and discharged 14 days after SCT. 30 day post-SCT improvements were seen in grip strength (as measured by dynamometer) his 50 foot Fast Walk test, Timed Up and Go Test, 5-Repetition Sit to stand, and Six Minute Walk Test.

Discussions: This is a complex case of severe worsening weakness and sensory deficits in a patient with treatment-related neuropathy superimposed on leptomeningeal MM resulting in radiculoneuropathy, who improved with rehabilitation, underwent prehabilitation, and tolerated SCT. He improved in all testing, the patient was able to ambulate 801 feet with rollator and modified independence 30 days post-autologous SCT.

Conclusions: Prehabilitation can help patients achieve functional and treatment goals.

TRAUMATIC EXTRADURAL INTERNAL CAROTID ARTERY PSEUDOANEURYSM RESULTING IN INSIDIOUS ONSET CAROTID CAVENOUS FISTULA: A CASE REPORT

Lindsay Mohney, DO, and Rani Lindberg, MD

Case Diagnosis: Carotid-Cavernous Fistula.

Case Description: A 59-year-old woman was hospitalized after an accident resulting in traumatic brain injury. CT imaging showed nondepressed right parietal/temporal skull fractures, right mastoid fracture through the temporal squamous bone with pneumocephalus, and multiple bifrontal and right temporoparietal intracranial hemorrhages with associated midline shift. Angiogram revealed 3.5 mm pseudoaneurysm in the right internal carotid artery inferior to the cavernous segment. A right hemi-cranectomy was required due to persistently elevated ICP, anisocoria with nonreactive pupils, and progressive midline shift on CT head. Post-operative exam: left periorbital ecchymoses, right ptosis, and right facial and periorbital swelling. PM&R noted on exam that patient was able to open eyes on command but had mild right eye proptosis and conjunctival injection. Ophthalmology had similar exam and noted no clear cause for symptoms. Follow-up PM&R exam: patient unable to open right eye and right eye proptosis and conjunctival injection worsened. Ocular bruit now present. CTA of the head revealed development of right carotid cavernous fistula (CCF), exophthalmos, and dilated orbital veins. Endovascular embolization resulted in immediate improvement in swelling and exophthalmos. She was admitted to acute rehabilitation and upon discharge the proptosis had resolved and exotropia and right ptosis were improving.

Discussions: CCF is a rare condition from abnormal connection between the cavernous sinus and carotid artery. Traumatic aneurysms represent 0.15-0.4% of intracranial aneurysms and most commonly affect young males. They are typically in the anterior circulation and are vulnerable to injury from adjacent fractures with a 19% risk of hemorrhage. Intracranial aneurysms present rapidly with cranial nerve palsy, massive epistaxis, and cavernous sinus syndrome. In this case, the extradural pseudoaneurysm rupture resulted in insidious onset CCF.

Conclusions: Patients suffer from multiple conditions from trauma masking classic signs/symptoms and delaying CCF diagnosis. Early intervention of an asymptomatic aneurysm may have reduced or eliminated the risk of CCF.

TRAUMATIC KNEE INJURY IN A PATIENT WITH FIBULAR HEMIMELIA

Abby L. Cheng, MD, and Mark Huang, MD

Case Diagnosis: Traumatic knee injury in a patient with fibular hemimelia.
TRAUMATIC TRANSIENT NEUROPRAXIA OR “STINGER” OF THE LOWER EXTREMITY IN A FOOTBALL PLAYER
Elise M. Adcock, MD, Abdullah Kandil, MD, and Jason R. Koh, DO

Case Description: A 24-year-old active female prosthesis user with right fibular hemimelia and distant history of ankle disarticulation presented after a fall resulting in a right knee injury. While wearing worn out shoes and walking dogs in the rain, she slipped, her right leg internally rotated, and she landed on her right knee. She had immediate pain and did not get up. Her exam revealed a shortened right femur and lower leg, knee effusion, positive Lachman test, and weakness and pain with knee movement. An MRI demonstrated (suspected congenital) absence of the anterior cruciate ligament (ACL), a lateral meniscus tear, a non-displaced posterolateral tibial plateau fracture, and partial thickness cartilage loss of the lateral femoral condyle due to impact injury. After six weeks of protected weight-bearing and ten weeks of physical therapy, her pain improved but her mechanical symptoms persisted. She eventually pursued arthroscopic chondromalacia debridement.

Discussions: The literature regarding knee injuries in patients with fibular hemimelia is limited to case series and reports. Most people with fibular hemimelia have congenital ACL absence, many report frequent knee instability, and some have sustained secondary traumatic knee injuries. Due to this patient’s hypoplastic limb growth and shortened femur, her prosthesis was long and may have increased her injury severity by acting as a long, rigid lever arm and increasing the torque across the knee. This patient underwent debridement as an initial treatment. Case series have reported good outcomes with ACL reconstruction. TKA has been successful for people with secondary knee osteoarthritis, however younger patients may eventually require a TKA revision. Revision to a transfemoral amputation is a last resort.

Conclusions: Traumatic knee injuries in patients with fibular hemimelia can result in permanent activity limitations. People with fibular hemimelia may benefit from baseline knee stability screening examinations, preventative education, and strengthening programs to minimize this risk.

TRAUMATIC TRIGEMINAL NEUROPATHY SECONDARY TO EXCESSIVE MOUTHPIECE PRESSURE IN A TRUMPET PLAYER
Jeremy Stanek, MD, and Kevin Komes, MD

Case Description: A 20-year-old male college trumpet major presented with three-month history of upper lip anesthesia and declining trumpet-playing ability. Patient experienced upper lip pain and altered sensation after playing a high note during a marching band performance. Pain subsided, but anesthesia ensued. Patient tried ice, ibuprofen, and altered his embouchure without benefit. Exam revealed inability to whistle, absent sensation to light touch and pinprick in the upper lip right of center and decreased sensation left of center, following trumpet mouthpiece contour. Infraorbital branch of the trigeminal nerve was affected. Purplish-blue discoloration of labial mucosa was observed without lip deformity. Trumpet playing exam revealed airy tone quality and range limited to within the musical staff. Treatment included complete rest from playing followed by a tailored return to play routine. At follow-up seven weeks later, he had returned to playing as instructed. Patient reported improved trumpet-playing ability and neuropathic pain lasting less than 5 minutes immediately after playing. Exam revealed resolution of lip anesthesia and oral mucosa discoloration. He could whistle. Tone on the trumpet was no longer airy, and range was increased.

Discussions: We report a case of neuropathy secondary to excessive mouthpiece pressure. There is only one other published case report of embouchure neuropathy in a brass musician. Our case demonstrates that an understanding of playing requirements and technique help identify pathology resulting in a treatment plan leading to improved symptoms and increased function.

Conclusions: Musicians sustain injuries that are unique to that population. Brass musicians frequently subject their lips to extreme pressure forces that may lead to career-ending tissue damage. Understanding the functional requirements of trumpet playing and treatment of neuropathic injury resulted in excellent outcome. Referral to a performing arts medicine specialist may improve outcomes in injured musicians.

TREATING HETEROTOPIC OSSIFICATION WITH ACETIC ACID IONTOPHORESIS IN A PATIENT WITH TRAUMATIC BRAIN INJURY: A CASE REPORT
Brian C. Fricke, MD, Joseph Sclafani, MD, Michael Aurienma, MD, and Justin Burton, MD

Case Diagnosis: Heterotopic Ossification (HO) in setting of Traumatic Brain Injury.

Case Description: A 17-year-old male presented to acute inpatient rehabilitation after sustaining polytrauma as a result of a high-speed motor vehicle collision. Injuries included a severe traumatic brain injury and pelvic ring fracture that was initially treated with external fixation of the right femur. Upon admission to acute rehabilitation, he was noted to have a prominent, tender mass over the midshaft of the right femur at the site of previous external fixation. Roentgenography revealed heterotopic ossification (HO).

The HO was treated with iontophoresis using 2% acetic acid solution and 4 milligrams of direct current for 20 minutes, 3 times per week for 3 weeks based on previous studies that utilized a similar protocol to treat traumatic myositis ossificans in athletes. Iontophoresis was performed concomitantly with daily physical, occupational, and speech therapy. A pre-treatment roentgenograph of the right femur demonstrated an initial HO width of 63.6 mm. Initial right knee flexion passive range of motion (PROM) was 48 degrees. The full course of treatments was completed without any adverse events. Post-treatment roentgenographs demonstrated that the HO had decreased in width to 46.7 mm. Additionally, post-treatment right knee flexion PROM increased to 65 degrees.

Discussions: Within the limitations of this case report, we have demonstrated that acetic acid iontophoresis is a clinically effective, feasible treatment modality for acquired HO. As a result, the indications for acetic acid iontophoresis can be extended to include patients who have sustained traumatic brain injuries.

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Abstracts

TREATMENT OF ABDUCTOR HALLUCIS FOCAL HYPERTONIA WITH BOTULINUM TOXIN INJECTION UNDER ULTRASOUND GUIDANCE: A CASE REPORT
Bao Van, MD, Manuel Mas, MD, and Gerard E. Francisco, MD

Case Diagnosis: Right spastic hemiplegia secondary to ischemic stroke.

Case Description: A 67-year-old female with chronic right spastic hemiplegia secondary to left ischemic stroke in 2006. She had increased tone of right abductor hallucis muscle resulting in hallux varus deformity (modified Ashworth scale 3). This was interfering with gait and fit of shoe and ankle foot orthosis (AFO). Since patient had shown positive response to botulinum toxin injections to other limb muscles previously, chemodenervation of right abductor hallucis using ultrasound guidance was recommended. Patient was placed supine with right ankle being at neutral position. A SonositeTM Xproe sonomachine with a L13 6 mgelfast probe was used. Anterior aspect of medial malleolus served as an anatomical landmark with muscle belly expected to be inferior to bony prominence. Transducer was placed applying minimal pressure to reduce any possible alterations to muscle architecture. Electromyography confirmed hyperactivity of muscle at rest. A total of 25 units of onabotulinumtoxinA (Botox) was injected into the mid belly of the muscle. The patient tolerated the procedure well.

Discussions: On follow-up visit three weeks after procedure, the patient had normal tone of the right abductor hallucis muscle (Modified Ashworth Score of 0) when the great toe was passively adducted. Her foot was easier to accommodate in her shoes and ankle foot orthosis. Ambulation improved due to pain relief; however, it was difficult to quantify pain (Visual Analog Scale) due to aphasias. This case illustrates the technique and outcome of botulinum toxin injection under ultrasound guidance in the treatment of hallux varus deformity, which is an unusual presentation related to post-stroke spasticity. Ultrasound allows for increased accuracy and improved safety for invasive procedures, as well as more comfort for patients when compared to electrical stimulation.

Conclusions: Botulinum toxin injection under ultrasound guidance helps improve deformity and functional outcomes related to post-stroke focal hypertonia of the abductor hallucis.

TREPINE SYNDROME APPEARING AS HYDROCEPHALUS: A CASE REPORT
Jasmin Singh, MD, and Chi-Chang David Lin, MD

Case Diagnosis: Trephine Syndrome.

Case Description: A 46-year-old female status post right frontoparietal craniectomy for evacuation of a subdural hematoma two months prior to her presentation who had improving strength in the weeks immediately following the craniectomy for evacuation of the clot but subsequently demonstrated decompensation in strength and cognition 3–4 weeks after the surgery. Family noted slowing of cognition, with delays in language processing and expression, and increasing left sided weakness and neglect. On admission to our institution, CT head demonstrated moderate to severe hydrocephalus, most notably in the lateral ventricles (right side greater than the left) that correlated with her clinical symptoms. Of note, the craniectomy site appeared sunken inwards towards the brain. A Sonosite™ Xproe sonomachine with a L13 6 mgelfast probe was used. Anterior aspect of medial malleolus served as an anatomical landmark with muscle belly expected to be inferior to bony prominence. Transducer was placed applying minimal pressure to reduce any possible alterations to muscle architecture. Electromyography confirmed hyperactivity of muscle at rest. A total of 25 units of onabotulinumtoxinA (Botox) was injected into the mid belly of the muscle. The patient tolerated the procedure well.

Discussions: On follow-up visit three weeks after procedure, the patient had normal tone of the right abductor hallucis muscle (Modified Ashworth Score of 0) when the great toe was passively adducted. Her foot was easier to accommodate in her shoes and ankle foot orthosis. Ambulation improved due to pain relief; however, it was difficult to quantify pain (Visual Analog Scale) due to aphasias. This case illustrates the technique and outcome of botulinum toxin injection under ultrasound guidance in the treatment of hallux varus deformity, which is an unusual presentation related to post-stroke spasticity. Ultrasound allows for increased accuracy and improved safety for invasive procedures, as well as more comfort for patients when compared to electrical stimulation.

Conclusions: Botulinum toxin injection under ultrasound guidance helps improve deformity and functional outcomes related to post-stroke focal hypertonia of the abductor hallucis.

TRIFID MEDIAN NERVE IN A PATIENT WITH CARPAL TUNNEL SYNDROME: A CASE REPORT
Nasser S. Ayyad, DO, and Thiru Annaswamy, MD, MA, FAAPMR

Case Diagnosis: Trifid median nerve in a patient with carpal tunnel syndrome.

Case Description: A 47-year-old man was referred to the EDX clinic for diagnostic evaluation of numbness, tingling, and pain in both hands. During his history, the patient reported a prior EDX study in 2013 that diagnosed him with bilateral CTS. He reported symptoms of numbness of both hands without any trigger and right wrist pain and paresthesias injected recently with a steroid injection with some relief. Physical examination revealed (1) normal strength, sensation, and reflexes in both upper extremities, (2) positive Tinel, Phalen, reverse Phalen, and carpal compression tests at both wrists, and (3) positive Tinel test at both elbows. An EDX consultation was followed by bilateral upper extremity NCSs and neuromuscular ultrasound (NMUS) evaluation. The NCSs revealed prolonged bilateral median sensory and motor conduction across the wrists consistent with mild bilateral median neuopathy at the wrists. NMUS evaluation revealed a trifid median nerve at the distal portion of the left carpal tunnel, with a combined cross-sectional area (CSA) of 0.14 cm2. Left forearm median nerve CSA was 0.05 cm2. Right median nerve CSA at the wrist was 0.12 cm2 and at the forearm was 0.06 cm2. No other sonographic abnormalities or anomalies were noted in the right median nerve.

Discussions: Trifid median nerve is the most common upper extremity entrapment neuropathy. It has been reported in the literature that carpal tunnel syndrome has been associated with variations of the median nerve at the wrist however there has been limited descriptions of the specific anatomic variations of the median nerve at the wrist. A thorough knowledge of variations of the median nerve with help optimize surgical effectiveness and optimize patient outcomes. Neuromuscular ultrasound is a cost effective and efficacious method to evaluate median nerve variations in patients with carpal tunnel syndrome.

Conclusions: An extremely rare anomaly of a trifid median nerve was noted on NMUS examination of a patient with electrodiagnostically-confirmed bilateral CTS. Awareness of this rare anomaly is important as the patient was preparing to undergo surgical decompression of bilateral carpal tunnels.

TUMEFACTIVE DEMYELINATING LESIONS: REHABILITATION OF A RARE, DEBILITATING FORM OF MS: A CASE REPORT
Carrie M. Gould, MD, and Anjum Sayyd, MD

Case Diagnosis: Tumefactive multiple sclerosis.

Case Description: A 30-year-old female with multiple sclerosis presented to academic center with onset of memory loss, flat affect, anorexia and somnolence of three months’ duration, with acute onset confusion, aphasia and MMSE of 14/30. MRI of the brain revealed subcortical and cortical hyperdense lesions inconsistent with multiple sclerosis. Brain biopsy was performed noting diffuse demyelinating process consistent with tumefactive multiple sclerosis. Patient underwent plasmapheresis, rituximab infusion, and steroid treatment.

Patient was severely aphasic and confused with marked auditory and verbal expression deficits and the ability to perform only one-step tasks inconsistently with simple cues. She communicated with spontaneous verbal utterances of rote phrases with no contextual meaning. She was impulsive, requiring an enclosure bed for safety. Depakote and Inderal were used for agitation and impulsivity. Given her low attention and concentration, she was started on Ritalin, which may have precipitated hypersexual behaviors.

Discussions: Tumefactive multiple sclerosis represents an estimated 1 to 2% of patients with MS with a higher prevalence in females and a median age of onset of 37 years. Tumefactive multiple sclerosis is an acute tumor-like variant wherein patients present with acute large solitary or multiple lesions, often appearing on radiologic studies as intracranial tumors or gliomas, with mass effect, edema and enhancement, features that result in inappropriate diagnosis after unnecessary surgical resection or from biopsy, when many cases are responsive to glucocorticoid therapy.

Conclusions: Rehabilitation of tumefactive MS is particularly challenging, given the lack of research and variability in presentation (usually polysymptomatic, often with confusion, hemiparesis or neglect). To our knowledge, this is the first reported case in rehabilitation literature, and physiatrists would benefit from an awareness of this rare type of MS and the particular challenges it presents due to its marked morbidity and difficulty/varied response to treatment with glucocorticoids.

TWO CASES OF LYME ARTHRITIS IN WINTER
Lauren Woo, BA, and Jennifer Baima, MD

Case Diagnosis: Lyme Arthritis.

Case Description: Patient 1 is a 26-year-old male who presented in March with severe right knee pain and swelling for two weeks. He had a similar episode a month prior, but it resolved. The second episode progressed with pain from knee to foot and numbness on top of the foot. He had no known history of tick bites, travel, or trauma, but endorsed contact with a dog. On physical exam, he had a right knee effusion with limited ROM, diffuse joint line tenderness, positive McMurray’s, and pain with ligamentous testing. Synovial fluid of the joint showed WBC count 44,467 and was...
positive for Lyme. He was treated with doxycycline. MRI findings were limited to ACL laxity and inflammation.

Patient 2 is a 24-year-old male who presented in December with progressive right knee and calf pain for one week. He had been fishing in the woods a few weeks prior with no apparent injury. MRI showed a positive Lyme PCR and WBC count of 37,520, and he was treated with doxycycline. Aspiration was repeated for recurrent effusion, and an MRI was done due to persistent pain. MRI showed bone contusion, ACL laxity, and inflammation.

**Discussions:** Lyme disease is transmitted by *Ixodes scapularis* ticks, which appear in late spring and early summer; however, Lyme arthritides may occur during any season. Ticks infected with the spirochete *B. burgdorferi* are primarily found in the northeastern and upper Midwestern US. *B. burgdorferi* strains of Lyme often disseminate to joints, tendons, or bursae early in infection. Lyme arthritis presents later, with an adaptive immune response that results in spirochetal killing.

**Conclusions:** Lyme arthritis can present at any time of year, and clinical suspicion in endemic regions should remain high even without a known history of tick exposure or erythema migrans rash.

**TWO UNIQUE CASES OF CIPROFLOXACIN-ASSOCIATED AVGUSION OF LIGAMENT AND TENDON**

Jeffrey Smith, MS, Erin Wolff, MD, and Robert Irwin, MD

**Case Diagnosis:** Two cases of ciprofloxacin-associated avulsion, one tendinous and one ligamentous.

**Case Description:** First Case Description: 55-year-old male presented with right lateral thumb pain after extension and adduction incident. Pain was relieved by thumb splint. Past medical history included gastroenteritis 6 weeks prior, for which he was prescribed ciprofloxacin. Physical exam showed swelling of right metacarpalphalangeal joint. Ultrasound confirmed disruption of radial collateral ligament at insertion on the first metacarpal. He was treated conservatively with casting and experienced full healing of the ligament.

Second Case Description: 62-year-old female presented with right hip pain, starting 6–7 months prior. Past medical history was significant for chronic intermittent diverticulitis over previous two years treated with multiple courses of ciprofloxacin, the most recent being 2 months before presentation. She was diagnosed with spondylodiscitis, treated with pharmacotherapy and physical therapy for possible radiculopathy. After no reported improvement, MRI of right hip showed near-complete avulsion of right hamstring tendons from ischial tuberosity. She is currently receiving conservative treatment.

**Discussions:** Fluoroquinolones are recognized for association with tendinopathy and rupture. The majority of cases report on Achilles tendinopathy. Case reports describing other tendons have been infrequent. Educating patients on early recognition of tendinopathy and symptoms is important because case reports have described large gaps in time between administration and symptom onset. Patients may also suffer more severe tendon and ligamentous injuries. These cases describe ciprofloxacin-associated avulsions of a tendon and a ligament previously not described.

**Conclusions:** It is important to consider fluoroquinolones as a potential cause of musculoskeletal pain, even if not associated with the Achilles tendon. It is unclear if changes in the insertion sites of tendons and ligaments are part of the changes resulting from fluoroquinolone use and are also at risk of injury.

**TYPE 2 MUSCLE FIBER PREDOMINANCE: A CASE REPORT**

Kirill Alekseyev, MD, MBA, Armando Iannicello, MD, Shruti Amin, Malcolm Lakdawala, MD, and Mark K. Ross, MD

**Case Diagnosis:** A 68-year-old Russian and Irish descent Caucasian male inmate and retired pilot with a history of congenital type 2 muscle fiber predominance formally diagnosed in 1980 via multiple muscle biopsies presented to the Inpatient Rehab Facility at KJMC for evaluation and treatment for proximal muscle weakness in thighs and calves and less pronounced weakness in upper extremities, exertional myalgia, and chronic dysphagia.

The patient presented with complaints of progressive upper and lower limb bilateral proximal muscle weakness with continuous spontaneous fasciculations for 63 years, periodic episodes of severe spastic paresthesias, and muscle cramping episodes sparing the face of two to 12 attacks per year for 48 years, and chronic progressive dysphagia for the last 6 years.

**Case Description:** Patient has experienced intermittent spontaneous episodes of severe muscle cramping and myalgia which he notices begins as visible fasciculations in his legs bilaterally ascending to the thighs, then the upper chest wall and back will continue until hospitalized and a muscle relaxant is administered. The first time he experienced such an episode was at age 25. The longest an episode has lasted without medical attention is up to 6 hours. Family history of neuromuscular disorders unrele- mackable; however, he states that one of his daughters has the disease.

The patient complained of only dysphagia and proximal muscle weakness. It was noted that the patient had bilateral calf fasciculations at rest, sensation to pin prick and light touch intact bilaterally in lower limbs, no edema or tenderness noted, and muscle strength 5/5 proximally and 4+/5 distally bilaterally. The patient improved in function over the year with 90 days of physical therapy. He is otherwise still wheelchair bound for the last 25 years with modified independent assistance. In gait training patient ambulated 16 feet with parallel bars with decrease step length, heel strike and cadence. The patient is able to hold objects in hand for approximately 10–15 seconds without dropping it. Facial, respiratory, bowel and bladder muscles are spared.

Findings on nerve conduction studies (NCS), the patient had no response in right peroneal motor nerve with 90 days of physical therapy. He is otherwise still wheelchair bound for the last 25 years with modified independent assistance. In gait training patient ambulated 16 feet with parallel bars with decrease step length, heel strike and cadence. The patient is able to hold objects in hand for approximately 10–15 seconds without dropping it. Facial, respiratory, bowel and bladder muscles are spared.

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**Conclusions:** Type 2 muscle fiber predominance is a rare muscular disorder that predominantly affects the proximal muscles. The main manifestations as seen in this patient include exertional myalgia, fasciculations, and episodes of severe painful muscle cramping requiring muscle relaxants.

In 1985, Telerman-Topper et al first documented “type 2 fiber predominance”. In this study, all of the thirteen cases in male patients demonstrated muscle cramping and exertional myalgia, but no abnormalities were found on physical or lab examinations. However, pathologic abnormalities of muscle biopsies of proximal muscles such as the vastus medialis identified included, a decrease in type 1/type 2 fiber ratio, with 72.91% of type 2 fibers increased versus 59.99% in the control group.

Similar findings were found in a study in Korea by Kim et al in 2002, where three cases of young men, aged 18, 19, and 22 years old were identified with this disease and otherwise healthy. In all three cases, muscles of facial expression were spared and pseudohypertrophy or true hypertrophy of the calf muscle was absent. It is important to note that laboratory findings were normal in both studies.

**Conclusions:** Enzyme histochemistry revealed increased staining for NADH-TR in two of the cases. Interestingly, all three cases demonstrated an increased percentage of type 2 fiber. In case 1, a 73% increase in type 2 fiber in the vastus medialis, 80.2% in vastus lateralis in case 2, and 75% in vastus lateralis in case 3. Furthermore, a marked decrease in type 1 fibers was shown in myofibrillar ATPase preincubated at pH 9.4 and a subpopulation of type 2 fibers was composed of intermediates and darkly stained fibers (Kim et al).

The pathogenesis of muscle cramping and exertional myalgia in type 2 muscle fiber predominance remains uncertain, but the clinicopathologic findings are essential to avoid misdiagnoses.

**TYPE A AORTIC DISSECTION PRESENTING AS T8 ASIA C: A CASE REPORT**

Raj Desai, MD, Thao Doan, MD, and Jeffrey Oken, MD

**Case Diagnosis:** T8 ASIA C 2/2 Type A Aortic Dissection.

**Case Description:** This is a 53-year-old, right-handed, Caucasian male with history of uncontrolled HTN presented to acute care with severe chest pain with radiation to his back and numbness and tingling in his abdomen radiating down to his bilateral lower extremities. Patient had severe weakness in bilateral lower extremities on presentation. A CT angiographic evaluation showed coronary artery calcification, aortic valve calcification along with type A aortic dissection with moderate amount of hemopericardium aneurysm dilatation of the ascending aorta was seen. There was involvement of the origin of the left common carotid artery and the dissection extended to the left common iliac artery. The findings were consistent with extensive type A aortic dissection with hemopericardium, left carotid extension and a renal infarct. On presentation the patient underwent emergent surgery for coronary artery bypass grafting and sternotomy with correction of the aortic dissection. 9 days after presentation, patient was admitted to acute inpatient spinal cord rehabilitation with paraplegia and decreased sensation below T8. At admission FIM scores were: 5 for eating, 2 for UE/LE dressing, 1 for toilet transfer, unable to ambulate. At discharge FIM scores were: 7 for eating, 5 for UE dressing, 4 for LE dressing, 6 for wheelchair mobility, ambulation with assistance of 2 people.

**Conclusion:** Type A aortic dissection typically presents with sudden onset of severe pain with radiation to back. This classical presentation should notify the initial team of likely cardiac involvement, allowing them to obtain a diagnosis quickly as they did in this case. There have been cases in the past where patients present with...
painless Type A Aortic Aneurysm. Other patients present with syncope due to the cardiac tamponade that result from the aneurysm. Less frequently, patients can present with stroke symptoms if the cerebral vessels are involved. There have also been cases reported where patients present with painless Type A Aortic Aneurysm. In patients with acute dissection, the presence of tympany should be on the list of differential diagnosis in addition to etiology related to tumors, infections, demyelinating or degenerative conditions. Etiology of spinal cord ischaemia is not limited to aortic aneurysms or dissections but should include vasculitis, decompression sickness, or often times intraoperative aortic manipulation.

**Conclusions:** A rare case of T8 ASIA C paraplegia due to Type A Aortic Dissection is presented. Type A Aortic dissection can lead to death and thus is a medical emergency if not diagnosed early. It's imperative that physicians maintain a broad differential diagnosis when acute paraplegia is the presenting symptom. Often times it may be due to tumors or degenerative conditions, but during the rare case of acute paraplegia due to type A aortic dissection, swift diagnosis and treatment with surgical correction with post-operative transfer to a rehabilitation facility could prevent morbidity and death.

**'ULNAR HAND' DIAGNOSED BY NCS/EMG WITH SUBSEQUENT MSK ULTRASOUND AND MRI**

Peter Roumanos, DO, Steven Riutucci, DO, Jorge E. Garcia-Negron, MD, and Ramon L. Cuevas-Trisan, MD

**Case Diagnosis:** Ulnar Hand - Motor and Sensory

**Case Description:** A 53-year-old male presented with hypesthesia in his right hand and intermittent pain along digits 1-3 with associated weakness. On exam, he had 4/5 strength in his upper extremities throughout with hypesthesia in digits 1-3 with positive thenar and phalen on the right and no thenar atrophy.

On NCS, motor stimulation of the median nerve using standard techniques showed a profoundly low amplitude response with an initial positive deflection; ulnar nerve stimulation recording over the APH showed a normal response. Median nerve stimulation at the antecubital fossa, recording from the pronator quadratus, yielded a normal latency with a low amplitude. Stimulation of the ulnar nerve at the elbow, recording at the pronator quadratus, showed no response.

Median sensory NCS, using standard techniques to the3rd digit, yielded a delayed onset and a profoundly low amplitude. When stimulating on the ulnar aspect of the wrist, the response showed a delayed onset with normal amplitude. An ultrasound of the wrist and forearm to search for and track of the median nerve showed the median nerve significantly tapered in size over the distal 1/3 of the forearm with a very thin nerve structure seen within the carpal tunnel. The follow up MRI of the right forearm and wrist is still pending.

**Discussions:** The "all ulnar hand" in which all muscles of the hand are innervated by the ulnar nerve is a variant that has only been reported a few times in the literature. There is currently very little understanding of the ramifications of this condition.

**Conclusions:** This patient showed an anatomical variant where the motor innervation in the right hand is entirely supplied by the ulnar nerve and the sensory innervation is dually supplied, but predominantly innervated by the ulnar nerve.

**ULNAR TO MUSCULOCUTANEOUS NERVE TRANSFER FOR THE PURPOSE OF MAXIMIZING PROSTHETIC OPTIONS IN A PATIENT WITH A TRANRADIAL AMPUTATION: A CASE REPORT**

Keegan J. McClary, MD, Rajiv Reddy, MD, and Mark Huang, MD

**Case Diagnosis:** A 53-year-old woman with history of left transradial amputation and upper/middle trunk brachial plexus injury secondary to a motorcycle accident continued to lack active elbow flexion one year post-injury.

**Case Description:** The goal of being fit with a myoelectric prosthesis could not be achieved due to the patient’s inability to counteract the weight of the prosthetic limb with active elbow flexion. The alternative was a less functional, passive prosthetic that would only allow for the use of the left limb as a stabilizer, and only after repositioning with the right hand. She was then referred to plastic surgery and ultimately underwent an ulnar to musculocutaneous nerve transfer with ulnar nerve fascicles secured via end-to-end coaptation with musculocutaneous fibers proximal to the motor points of the biceps brachii and brachialis muscles. She was discharged to acute inpatient rehabilitation with the goal of achieving active elbow flexion.

**Discussions:** By four months post-op the patient had improved to 4-5 strength in elbow flexion and was moving forward with myoelectric prosthetic fitting instead of the less functional passive device. This case highlights an uncommon but important indication for nerve transfer, performed in this instance for the specific goal of improving elbow flexion in order to maximize brachial musculature with a more advanced prosthetic application. An ulnar to musculocutaneous nerve transfer is a well-established treatment for upper trunk plexus injuries, however the added complexity of prosthetic considerations in this patient makes this a unique utilization of this procedure.

**Conclusions:** Traumatic amputations are often accompanied by additional injuries that complicate the transition to prosthesis use. By considering the specific functional needs and the available intact anatomy, a targeted nerve transfer allowed this patient to achieve an essential muscle action, permitting her to proceed with a more advanced prosthetic application.

**ULTRASONOGRAPHY DETECTED MISSED LUNAR VULAR DISLOCATION ASSOCIATED WITH MEDIAN NEUROPATHY: A CASE REPORT**

Min Wook Kim, MD, PHD, and Kyeong won Kim, MD

**Case Diagnosis:** Lunate and perilunar dislocations are uncommon, but they have clinical importance because complications, such as median neuropathy and avascular necrosis of the lunate, can occur. Although early diagnosis, which makes early surgical treatment possible, is crucial for preventing long-term sequelae, these dislocations are frequently missed at initial assessment. Imaging tools, such as plain radiography, magnetic resonance imaging (MRI), ultrasonography, and electrodagnostic studies, have been used for diagnosis. The proper choice of initial evaluation tools is important for making an accurate early diagnosis. Here, we present a case of lunate dislocation associated with median neuropathy in which ultrasonography, along with the electrodagnostic study and plain radiography, played an important diagnostic role in detecting structural abnormalities. This is the first case report providing ultrasonographic images of lunate dislocation as a cause of median neuropathy.

**Case Description:** A 68-year-old man with a history of hypertension, dyslipidemia, and stroke was referred for electrodagnostic study due to right palmar paresthesia and thenar weakness 3 weeks after falling down stairs. He was admitted to the department of neurosurgery to rule out a brain lesion and underwent brain MRI, which revealed no newly developed abnormality. Subsequently, he was referred to the department of rehabilitation medicine to determine the underlying cause of the paresthesia of his right hand. On physical examination, there was numbness and a tingling sensation along the right median nerve distribution and weakness of right thumb abduction (grade 4/5).

On a nerve conduction study, the sensory nerve potential of the right median nerve, stimulated at wrist and palm, and recorded on the 2nd, 3rd, and 4th fingers, was not evoked (Table 1). The compound motor action potential of the right median nerve, stimulated at the wrist and recorded on abductor pollicis brevis muscle, was not evoked. Needle electromyography (EMG) showed abnormal spontaneous activity at rest, reduced recruitment pattern of motor unit action potentials on minimal voluntary and discrete interferential pattern of motor unit potentials on maximal volition in the right abductor pollicis brevis muscle. These electrodagnostic findings suggested a severe axonal injury in right median nerve at the wrist.

To determine possible structural abnormalities, ultrasonography was performed. It revealed volar dislocation of the lunate bone that compressed the median nerve in the carpal tunnel. Proximal to the compression site, the median nerve was swollen, with a cross sectional area of 0.119 cm². Only the median nerve and one flexor tendon were observed over the lunate bone. The patient’s plain radiographs showed volar dislocation of the lunate bone and ulnar styloid process fracture. Wrist MRI of the patient provided additional information, revealing flexor synovitis and bone contusion in the carpal bone and distal radius.

Open reduction of the lunate bone and repair of the scapholunate, lunotriquetral, and radiolunate ligaments were performed by the dorsal approach. Carpal tunnel release or median neurorrhaphy was not performed. One year later, the patient’s sensory disturbance and thumb weakness were improved, consistent with the findings of follow-up ultrasonography and plain radiography, revealing a repositioned lunate bone and non-compressed median nerve.

**Discussions:** Periulnar dislocation refers to the condition that carpal bones are displaced dorsally to the lunate bone. Lunate dislocation, which refers to the displacement of the lunate bone from lunate fossa of the distal radius, is a later stage of the periulnar dislocation.

Previous reports described cases of periulnar and lunar dislocations that were initially missed and diagnosed later. About 25% of periulnar dislocations were reportedly missed on initial presentation and only 61% of cases were treated within the first week. The reported rate of median nerve injury by lunate dislocation ranges from 24% to 45%.

Initial diagnosis of lunate and perilunate dislocations has usually been made by plain radiography. Although plain radiography has superiority for assessing carpal alignment, it cannot assess soft tissue structures, including nerves and tendons. Moreover, without careful attention to carpal alignment, carpal dislocations are frequently missed. In contrast, ultrasonography, as shown in our case, accurately identified lunate dislocation, the proximal median nerve and the dislocated lunate bone, and morphologic changes in the median nerve, such as compression and enlargement. Our case showed that ultrasonography can play an important complementary role in revealing the underlying cause of neuropathy such as space occupying lesions.
Conclusions: This is the first case report suggesting that ultrasonographic imaging can identify lunate dislocation associated with median neuropathy. We recommend ultrasonography along with electrodiagnostic study and plain radiography for the initial assessment of patients suspected to have median neuropathy, especially after traumatic injury at the wrist level, because ultrasonography can reveal the underlying structural cause of median neuropathy.

ULTRASOUND PREDICTED ACCURATE CADAVERIC NERVE GRAFTING REQUIREMENTS AFTER TRAUMATIC TRANSECTION OF MEDIAN AND ULNAR NERVE

John Norbury, MD, RMSK, Christopher J. Crotty, MBA, and Eric J. Morrison, MD, MSC

Case Diagnosis: Complete transection of median and ulnar nerve in the left upper extremity.

Case Description: A 25-year-old male presented to the emergency department with multiple gunshot wounds to his left upper extremity and a radial head fracture just below the elbow. Initial surgical intervention restored the vascular architecture and noted the transection of the median nerve, where sutures were placed on both proximal and distal ends. Eight weeks after the incident, the patient presented with weakness of his left hand, numbness and tingling, and worsening pain. Electrodiagnostic studies (EDx) revealed 100% axonal loss of the median and ulnar nerve with no evidence of reinnervation. A pre-operative neuromuscular ultrasound (NMUS) assessed the interval defects to be 6.5 cm in the median nerve and 11.6 cm in the ulnar nerve. Intraproperatively, nerve gaps were found to be 7 cm in the median nerve and 11 cm in the ulnar nerve, which were repaired with cadaveric nerve grafts. Fourteen months post-operatively, the patient began to show signs of regained function in his median and ulnar nerves.

Discussion: The use of NMUS has been shown to identify nerve transection in the upper extremity with 89% sensitivity in one cadaveric study. Literature exists that shows preoperative ultrasound assists in orienting the surgeon to the degree of injury; however, this is the first report to our knowledge of ultrasound being used to accurately predict nerve defect dimensions specifically for precise cadaveric neuronal grafting.

Conclusions: NMUS shows great potential to accurately measure cadaveric neuronal grafting needs pre-operatively. The non-invasive, accurate, and cost-effective nature of NMUS makes it an attractive planning tool in conjunction with EDx for surgical patient care.

ULTRASOUND-GUIDED CHEMODENERVATION OF POSTERIOR AND ANTERIOR INTEROSSEOUS NERVE FOR CHRONIC WRIST PAIN: A CASE REPORT

Brittany J. Moore, MD, and Jeffrey Brault, DO

Case Diagnosis: A 63-year-old male with chronic dorsal wrist pain from degenerative arthritis who failed conservative management was offered phenol chemodenervation as alternative to surgery with goal of achieving similar pain relief.

Case Description: Previous trial of posterior interosseous nerve (PIN) and anterior interosseous nerve (AIN) blockade with lidocaine and marcaine produced temporary pain relief. Using ultrasound guidance under sterile technique, the PIN was identified at the dorsal distal radioulnar joint, ulnar to Lister’s tubercle. With needle tip visualization, 0.5 mL of 5% phenol solution was injected around the PIN and AIN while avoiding nearby vasculature. Post procedure, patient reported six weeks of near complete pain relief, followed by return of pain to pre-procedural baseline at five months. No complications were reported.

Discussion: If conservative management for chronic wrist pain fails, surgical intervention is considered. Surgical wrist neuroectomy, the most conservative surgical technique, can achieve pain relief without functional tradeoffs and risks of arthrodensis. Partial neuroectomy of PIN and AIN allows for denervation of high yield targets through a single incision with similar pain relief as total neuroectomy. Percutaneous procedures analogous to partial neuroectomy are possible under ultrasound guidance. Distal PIN can reliably be identified deep to the radial aspect of the fourth extensor compartment. The AIN is located palmar to the PIN at the distal wrist between the interosseous membrane and pronator quadratus. Phenol injection of peripheral nerves can achieve pain relief of three to six months after injection.

Conclusions: Percutaneous ultrasound guided phenol ablation can provide pain relief in chronic wrist pain refractory to traditional conservative management. With careful patient selection and physician experience in ultrasound guided interventions, this technique can provide extended pain relief with minimal side effects. Future investigation into other ultrasound guided percutaneous procedures at the wrist, like radiofrequency ablation, may provide additional pain management options.

ULTRASOUND-GUIDED PERCUTANEOUS NEEDLE TENOTOMY FOR CHRONIC TENSOR FASCIA LATA TENDINOPATHY: A CASE SERIES AND DESCRIPTION OF SONOGRAPHIC FINDINGS

David M. Bradberry, DO, Walter Sussman, DO, and Kenneth Mautner, MD

Case Diagnosis: Chronic, recalcitrant tendinopathy of the proximal tensor fascia lata (TFL).

Case Description: The authors present two middle-aged, active, female runners who presented with 3 to 5 months of insidious, progressive anterolateral hip pain refractory to conservative treatment. In both cases, physical examination revealed tenerness to palpation of the proximal TFL at the anterior superior iliac crest and pain with resisted hip abduction. Diagnostic ultrasound (US) demonstrated chronic degenerative changes of the TFL (thickening and focal intra-substance partial tearing of the tendon), and both patients underwent US-guided percutaneous needle tenotomy (PNT) of the proximal TFL tendon. At the 8-week follow-up, both patients had complete resolution of their pain with return to their previous activity level.

Discussion: Proximal TFL tendinopathy at its origin on the anterior superior iliac crest is one potential cause of lateral hip pain. As in this case, most reported cases involve runners presenting with anterior or lateral hip pain and point tenderness at the ASIS. TFL tendinopathy has been rarely reported with only 16 cases in the literature, and there is limited literature on the mechanism, course and management of this condition. In many chronic cases, subjects have been refractory to traditional conservative management. There is growing evidence supporting the effective treatment of PNT for chronic tendinopathy, but only one re-review of clinical outcomes has pointed to the efficacy of PNT for tendinopathy about the hip and pelvis.

Conclusions: There is limited literature on tendinopathy of the proximal TFL, especially in regard to effective management. The authors report the successful diagnosis and treatment of two patients with chronic, recalcitrant TFL tendinopathy utilizing ultrasound-guided PNT and describe the associated findings on diagnostic ultrasound.

UNFORESEEN PHANTOM LIMB PAIN PRESENTING 55 YEARS S/P TRAUMATIC TRANSMURAL AMPUTATION: A CASE REPORT

Gabrielle R. Meyer, DO, and Franz Macedo, DO

Case Diagnosis: Phantom Limb Pain.

Case Description: The case describes a 75-year-old male with new onset phantom limb pain (PLP) 55 years after a traumatic proximal transhumeral amputation. The patient presented after 12 months of gradually progressing PLP unrelated to new injury or illness. Pain traveled from his right shoulder into his phantom arm and hand, was constant and shooting at a baseline pain of 8/10 with paroxysmal worsening. Initial assessment was suggestive of post amputation neuromas in the residual limb and MRI and ultrasound confirmed this. Attempted pulsed radiofrequency with diagnostic block did not provide relief. Re-evaluation was complicated by the inability to test reflexes or strength on the affected side, however concurrent PLP was reproduced with cervical range of motion, including positive Spurling’s maneuver. Based on this, a new cervical MRI was ordered, which revealed possible worsening of chronic linear hyperintensity within the central cord extending from C5-T1 (seen on STIR and T2 sequences) and bilateral moderate-severe foraminal stenosis extending from C3-C4 and C5-C7.

Discussion: Reported to occur in up to 85% of amputations with onset classically in the first six months, the typical course of PLP is to remain unchanged or improve gradually. This is an uncommon case of PLP presenting decades after transhumeral amputation, reproduced and exacerbated by cervical range of motion. The additional MRI findings including chronic and potentially worsening myelomalacia and cervical foraminal stenosis, led to a presumptive diagnosis of cervical radiculopathy/myelopathy presenting as PLP. Potential future steps in management could include epidural steroid injection for diagnostic and therapeutic purposes vs. referral to spine surgery.

Conclusions: This case illustrates how new or progressive PLP years after amputation should prompt further evaluation for other non-amputation related derangements. Radiculopathy, myelopathy and or musculoskeletal conditions can mimic or present as phantom pain, and should be considered in the diagnostic workup and treatment plan.

UPPER EXTREMITY PHANTOM LIMB PAIN FOLLOWING TRAUMATIC AMPUTATION MANAGED WITH INTRANEURAL FACILITATION: A CASE REPORT

Russell P. Kageyama, DO, and Scott Strum, MD

Case Diagnosis: Phantom pain following traumatic amputation.

Case Description: A 45-year-old male suffered a complete traction amputation of his RUE after having his sleeve caught in a conveyor belt. Patient underwent right...
trans-humeral amputation. Two months following injury the patient began to experience significant RUE phantom pain described as a constant sharp, stabbing, pressure, 7-8/10 and decreased mobility. Pain was managed with methadone, Norco pm, Cymbalta, nortriptyline, gabapentin and Lyrica without significant improvement in pain relief. Intra-articular corticosteroid and soft tissue techniques were unsuccessful. Approximately 1.5 years following injury, intraneural facilitation was initiated with resulting significant pain relief, pressure reduction, increased mobility and range of motion in the phantom limb. Treatment continued for a year’s duration and VAS scores decreased from 7/10 on initial visit to 2/10, with continued relief at follow up.

**Discussions:** Phantom limb pain is a common post-amputation complication, with the etiology not fully understood. Exact etiology is unknown, however there is a multifactorial nature including peripheral, central and psychological factors. Due to the poor understanding of the exact mechanism, treatment is often very difficult. Multiple treatment options are available; however their effectiveness is limited as seen in this case.

Intraneural facilitation is a novel physical therapy approach currently used as an adjunctive treatment of diabetic neuropathy. It consists of manipulation of parts of the body to direct pressurized blood to areas with ischemic nerves by pressurizing the blood vessels proximate to the pain source while performing one or more of the following: stretching the muscles, mobilizing the joints, tractoning the skin, distending the viscera, and distorting the vascular system. Intraneural facilitation has yet to be published displaying its use/effectiveness in phantom limb pain.

**Conclusions:** Intraneural facilitation can provide great pain relief and can potentially be an effective treatment option in the management of phantom limb pain.

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**USE OF LIPOPHILIC PHARMACEUTICAL TO AID IN NON-TRAUMATIC SPINAL CORD INJURY RECOVERY**

Maryam Berri, MD

**Case Diagnosis:** Minocycline of the tetracycline-class antibiotics, has the greatest penetration into central nervous system. It has demonstrated neuroprotective as well as neuroprotective properties. Minocycline 100 mg twice daily PO was used for in a 43 year previously healthy female who met diagnostic criteria of transverse myelitis.

**Case Description:** A 43-year-old previously healthy female developed acute onset lower extremity paresis without arachnoid. Compressive myelopathy was ruled out with imaging, and cerebral spinal fluid was obtained. Patient met diagnostic criteria of transverse myelitis and treatment with 1 gram methylprednisolone IV was initiated to which patient improved. This treatment continued on the inpatient rehabilitation floor for five days as a prednisone taper was initiated. On day 6 of inpatient rehabilitation stay, bilateral lower extremity paresis worsened significantly on American Spinal Injury Association (ASIA) motor scores with the steroid taper completed. In the Neurotrauma rehabilitation unit, the patient was started on Minocycline 100 mg twice daily PO for its anti-inflammatory and neuroprotective profile. Every 24 hours an ASIA examination was used to monitor improvement. Within about 36 hours, the ASIA motor scores improved by six points. Neuro-protective and anti-inflammatory profile of the tetracycline antibiotic, Minocycline, should be considered as a treatment adjuvant in patients with inflammatory mediated spinal cord injury.

**Case Description:** A 43-year-old previously healthy female who met diagnostic criteria of transverse myelitis.

**Conclusions:** Minocycline is the most lipid-soluble of the tetracycline-class antibiotics, giving it the greatest penetration into central nervous system. In various models of neurodegenerative disease, minocycline has demonstrated neuro-protective and neuroprotective properties. For example, current research is examining the possible neuroprotective and anti-inflammatory effects of minocycline against progression of a group of neurodegenerative disorders including multiple sclerosis, Huntington Disease and Parkinson’s disease. The neuroprotective action and mechanism of minocycline may include its inhibitory effect on 5-Lipoxygenase, an inflammatory enzyme. Minocycline may suppress viral replication by reducing T cell activation noted during transverse myelitis attacks and during multiple sclerosis exacerbation.

**Discussions:** Minocycline is one of the tetracycline-class antibiotics, has the greatest penetration into central nervous system. It has demonstrated neuroprotective as well as neuroprotective properties. Minocycline 100 mg twice daily PO was used for in a 43 year previously healthy female who met diagnostic criteria of transverse myelitis.

**To our knowledge, the use of Minocycline has not been documented in the literature to augment or aid in motor recovery in patients with transverse myelitis.** This is a novel approach that provided improvement in the rehabilitation functional outcome in a patient.

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**USE OF ULTRASOUND FOR MANAGEMENT OF Iliotibial Band Friction Secondary to Heterotopic Ossification of the Anterolateral Knee Capsule After Total Knee Arthroplasty**

Justin D. Dumont, DO, MS, and Kentaro Onishi, DO

**Case Diagnosis:** Chronic and debilitating Iliotibial (IT) band friction syndrome presents with chronic focal right lateral knee pain following a right total knee arthroplasty four years prior. Six months post-operatively she developed new right lateral knee pain constant in duration, 8/10 in severity, and worsened with weight-bearing and flexion of the knee from a fully extended position to 30 degrees of flexion. She denied trauma, radiation of pain or radicular symptoms. Pain was associated with focal, intermittent swelling of the right lateral knee. She denied joint instability and her lower extremities were neurovascularly intact. She required periodic wheelchair use for community ambulation. Multiple x-rays of right knee showed a stable prosthesis; the right knee was read as normal.

Prior to presenting to our musculoskeletal ultrasound clinic, she was evaluated by orthopedic, plastic, and pain management physicians. Prior treatments included lumbar sympathetic, saphenous nerve, geniculate nerve, and infra-patellar blocks with subsequent radiofrequency ablation without improvement. She was trialed on multiple analgesics and ultimately received a spinal cord stimulator without resolution of her pain. After an EMG ruled out a focal mononeuropathy or radiculopathy, she was referred to our clinic for a diagnostic ultrasound.

Upon examination, she was focally tender just proximal to lateral tibiofibular joint line and her pain was reproducible with gentle compression test. Sonographic evaluation revealed an ossific mass measuring 1.5 x 0.8 x 0.5 cm in size within the anterolateral knee capsular tissue just deep to the IT band and superficial to lateral joint line. Dynamic flexion of the knee resulted in the differential motion of IT band with respect to deeper ossific mass resulting in friction and reproduction of pain. She underwent a sonographically guided lidocaine injection between the ossific mass and IT band resulting in complete resolution of pain during the anesthetic period. She underwent a second sonographically guided corticosteroid injection followed by IT band focused PT but with limited success. She was then referred to orthopedics for surgical exploration, but the mass was not identified and she underwent an IT band lengthening procedure that failed to provide pain resolution. The mass was still visible in follow-up ultrasound evaluation. To aid our surgical colleague, we performed a sonographically guided methylene blue dye injection. The patient returned to surgery and the mass was successfully resected resulting in immediate pain resolution. Six weeks post-operatively, she is pain free and has returned to playing tennis.

**Discussions:** The demand and frequency of TKA have increased, but unfortunately 1-300 cases will present with pain without any clear etiology and unremarkable imaging (1, 2). As this case demonstrates, finding and treating the source of pain after TKA can be very challenging. A systematic approach to diagnosing knee pain after TKA often requires a multi-disciplinary team. Diagnostic ultrasound can play a role in assessing knee pain after TKA for several reasons. First, the real time nature of the dynamic ultrasound allows clinicians to evaluate the pain source dynamically such as iliotibial band friction seen here. Moreover, for individuals where magnetic resonance may not give detailed information, ultrasonic is an excellent modality to evaluate soft tissue status. In our case, the use of ultrasound provided successful visualization of the heterotopic mass that was previously difficult to identify using traditional radiographic imaging and surgical exploration. Finally, the pre-operative use of ultrasound for diagnostic injection to confirm the source of pain and mark it for better visualization allowed us to pursue second look surgery, which ultimately resulted in the successful management of chronic lateral knee pain after TKA.

**Conclusions:** Musculoskeletal ultrasound is a cost-effective, readily-available imaging modality that is not affected by TKA hardware. In the case of symptomatic iliotibial friction due to anterolateral capsular heterotopic ossification, identification of the mass and subsequent sonographically guided diagnostic injection was helpful in establishing the diagnosis thus resulting in proper management of the case.

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**USE OF ULTRASOUND TO DISTINGUISH A MUSCULOSKELETAL MIMIC FOR RIGHT FOOT DROP: A CASE REPORT**

Matthew Fanous, MD, and Jeffrey Strakowski, MD

**Case Diagnosis:** Complete Tibialis Anterior Tendon Rupture.

**Case Description:** A 65-year-old female who developed foot drop with respect to right foot drop nine months prior to presentation. She had been diagnosed with an acute right fibular neuropathy, confirmed with electrodagnosis. She had no improvement in strength and was referred for an ultrasound evaluation. The examination revealed no obvious deformity but a dramatic discordance between...
the marked ankle dorsiflexion weakness and minimal to no weakness of ankle eversion and toe extension. She had mildly diminished sensation in the common fibular distribution.

**Conclusions:** Ultrasound confirmed mild enlargement of the common fibular nerve at the fibular neck consistent with neuropathy. Further scanning of the involved muscles demonstrated a complete rupture of the tibialis anterior tendon with proximal migration of the muscle. It was concluded that the previously undiagnosed tendon rupture was the source of the persistent weakness. The patient was referred for surgical evaluation for tendon reattachment, and ultimately displayed considerable improvement.

**Conclusions:** This case demonstrates the value of considering appropriate musculoskeletal influence when assessing peripheral nerve injuries with high frequency ultrasound. The use of ultrasound facilitated correct diagnosis of a complicated and previously unrecognized co-morbid condition leading to appropriate treatment. Musculoskeletal mimics should remain within the broad differential diagnosis when assessing possible nerve injuries for weakness and pain.

**USING A QUALITY IMPROVEMENT APPROACH TO THE MORBIDITY AND MORTALITY CONFERENCE**

Allison Nuovo, MD, and Alexandra Flis, MD

**Case Diagnosis:** A 72-year-old man with multiple co-morbidities including atrial fibrillation, chronic kidney disease, diabetes, and congestive heart failure suffered a right hip fracture after a ground level fall at home. He was admitted to inpatient rehabilitation after surgical repair. After three days on the inpatient rehabilitation unit, he developed electrolyte disturbances and an ileus requiring acute transfer to internal medicine. He returned to inpatient rehabilitation following six days of an aggressive bowel regimen. After another week of rehabilitation, he developed tachypnea, productive cough and altered mental status prompting a second acute transfer to the internal medicine team. This case was presented during a routine morbidity and mortality (M&M) conference in the Physical Medicine and Rehabilitation (PM&R) Department.

**Case Description:** All Accreditation Council for Graduate Medical Education (ACGME) programs are required to engage residents in patient safety and quality improvement activities. These are described in the ACGME Clinical Learning Environment Review (CLER) program. However, they do not specifically state the best method to do this. It is challenging to turn an M&M discussion to a collaborative effort that will effect positive change. We chose a Quality Improvement (QI) based approach using the modified fishbone diagram (MFD). This is a widely utilized structured tool to examine patient safety events. Previously, our M&M meetings were case presentations without an organized framework. One of our faculty had prior experience in QI and MFD. Our MFD conference involved a multidisciplinary team including residents, attendings, case managers, nurses and therapists. We were able to identify the following areas for improvement: 1. Our residents found it difficult to extract important information from the electronic medical record. 2. We needed to enhance our training for medication adverse side effects. 3. We discovered our PM&R service is challenged with patients having multiple co-morbid conditions including cognitive impairment. These increase the risk of a serious event resulting in transfer.

**Discussions:** Using a QI methodology, such as the MFD, helped us identify valuable process issues and improve educational opportunities for the entire PM&R team. We felt that our former model of M&M did not encourage, but instead fueled a culture of blame. It was important to have faculty that had previous experience in quality improvement and experience in this specific model. Through multidisciplinary discussion and use of the MFD, residents, faculty and staff became engaged in the process of change. The outcome of this modified fishbone diagram exercise will lead to the following: 1. A prospective study of events on our PM&R service with structured methodology to better understand the underlying causes for unexpected transfer.

2. Enhanced efforts to improve multidisciplinary education during patient rounds.

3. Improved focus on patient safety during rounds.

**Conclusions:** We discovered that our new approach to the M&M conference improved the general feeling of the entire rehabilitation team using a collaborative method to assess patient safety events and come up with an action plan for positive change. We are now engaging the entire team in these conferences and feel this is the best way to assess patient safety events and come up with an action plan for positive change. We chose a Quality Improvement (QI) based approach to do this. It is challenging to turn an M&M discussion to a collaborative effort that will effect positive change. We felt that our former model of M&M did not encourage, but instead fueled a culture of blame. It was important to have faculty that had previous experience in quality improvement and experience in this specific model. Through multidisciplinary discussion and use of the MFD, residents, faculty and staff became engaged in the process of change. The outcome of this modified fishbone diagram exercise will lead to the following: 1. A prospective study of events on our PM&R service with structured methodology to better understand the underlying causes for unexpected transfer.

2. Enhanced efforts to improve multidisciplinary education during patient rounds.

3. Improved focus on patient safety during rounds.

**Conclusions:** We discovered that our new approach to the M&M conference improved the general feeling of the entire rehabilitation team using a collaborative method to assess patient safety events and come up with an action plan for positive change. We are now engaging the entire team in these conferences and feel this is the best way to improve patient care. We believe this method can be applied to all academic programs.

**VARICELLA ZOSTER TRANSVERSE MYELITIS**

Edward W. Ference, BS, and Kenesha Kirksey, MD

**Case Diagnosis:** Varicella Zoster Transverse Myelitis.

**Case Description:** A 47-year-old immunocompromised male with end stage renal disease due to IgA nephropathy presented with fever, weakness, and rash. The painful, erythematous, vesicular rash spread from his bilateral buttocks to his trunk, back, and bilateral upper and lower extremities. He was started on acyclovir for suspected disseminated herpes simplex virus (HSV), he soon thereafter developed encephalopathy. Neurological examination revealed loss of sensation starting at C3, with bilateral weakness greater in the lower than upper limbs. HSV PCR of his CSF was negative. MRI brain was consistent with encephalomyelitis, while MRI C-spine and T-spine showed T2 signal changes down to the T4 level. Repeat LP was positive for varicella zoster virus (VZV). He made progress with inpatient rehabilitation and was discharged with distant supervision wheelchair mobility.

**Discussions:** VZV is a herpesvirus with the capacity to establish latency in ganglia and reactivate causing multi-organ, including CNS, disease. Transverse myelitis (TM) is an uncommon CNS manifestation that can occur in both primary and reactivated VZV in the immunocompromised as well as the immunocompetent, though it most commonly occurs due to reactivation in the immunocompromised. The pathogenesis is not fully understood, but PCR has greatly increased the ability to detect VZV in the CSF. Intravenous acyclovir is the standard of care, and vaccination has dramatically decreased the incidence of primary disease. Outcomes in VZV associated TM are largely dependent on immunocompetent status. Our patient made significant improvement in rehabilitation, but continued to require hospitalization due to recurrent systemic infections.

**Conclusions:** VZV is the second most common infectious cause of encephalitis; however, VZV associated transverse myelitis is much more infrequent. A high level of suspicion and early treatment is imperative, particularly in the immunocompromised.

**VENLAFAXINE AND AMANTADINE COMBINATION THERAPY ENHANCES MOTOR RECOVERY IN A 20-YEAR-OLD FEMALE WITH RIGHT HEMIPLEGIA STATUS-POST CRANIOTOMY AND INTERNAL CAPSULE STROKE**

Patricia Goodwin, DO, Thiago Queiroz, DO, and Giselle Vivaldi, MD

**Case Diagnosis:** New-onset hemiplegia after frontal craniotomy for partial removal of central neurocytoma.

**Case Description:** The patient is a 20-year-old right handed female who presented to a community hospital with severe headache. On CT of the head a large intraventricular mass with obstructing hydrocephalus was discovered. MRI of the brain revealed a central neurocytoma. The patient received a frontal craniotomy for partial removal of the neurocytoma. Post-operatively the patient developed mental status changes and right hemiplegia. Subsequent MRI of the brain revealed a new interval of restricted diffusion within the left hemisphere of the internal capsule. The patient was previously independent for all activities of daily living and ambulation. On post-operative day 30 the patient was admitted to an acute rehabilitation hospital. Amantadine and venlafaxine were started to enhance neurostimulation and motor recovery, respectively. During the patient’s hospital stay return of motor function could be seen in the right lower extremity which led to an improvement in the patient’s Functional Independence Measure.

**Discussions:** Hemiplegia is a common and debilitating deficit caused by stroke. Alternatively, a central neurocytoma is a rare brain tumor with a high survival rate post-surgical resection. Selective serotonin reuptake inhibitors and selective norepinephrine reuptake inhibitors are currently used in patients with strokes to enhance motor recovery. Amantadine has been shown to increase the rate of functional recovery in patients with traumatic brain injury. Limited cases in the literature have looked at the clinical efficacy of both Amantadine and venlafaxine used in combination in brain injury.

**Conclusions:** Amantadine and venlafaxine may be used in brain injury patients to enhance neurostimulation and motor recovery leading to an overall increase in Functional Independence Measure.

**WHEELCHAIR MOTOCROSS: A REPORT OF INJURIES FROM THE 2016 WCMX WORLD CHAMPIONSHIPS**

Charles D. Kenyon, MS, CSCS

**Case Diagnosis:** A reportable injury was defined as any injury resulting in the withdrawal from participation of an athlete or volunteer. In total four injuries occurred (32yo female able-bodied volunteer; head laceration, 30yo female athlete with cerebellar palsy; concussion, 55yo female with SCI; right wrist sprain, 34yo male with SCI, right wrist sprain).

**Case Description:** Wheelchair Motocross (WCMX) is an adaptive action sport in which athletes navigate their chairs in the skate park producing acrobatic feats such as jumps, drop-ins, and flips. The 2nd Annual WCMX World Championships took place in Grand Prairie, Texas in April 2016. On Saturday April 23rd a WCMX beginner’s skills clinic was held for over 80 athletes. A 30 minute safety seminar was provided for volunteers assisting athletes at a minimum 1-to-1 ratio during the clinic. A WCMX competition was also held on April 23rd-24th. Athletes competed in 4 divisions (Beginner; 18 males and females; Intermediate; 10 males, Women’s Advanced, 10 females; Men’s Professional; 10 males). Injuries were recorded as they occurred and return-to-play decisions were made in accordance with the athlete and event organizers.

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Dissections: A risk of injury exists for the athletes participating in WCMX. Since the risk of injury in WCMX is largely unknown, the purpose of the current report is to provide a baseline of what types of injuries to expect so that targeted injury prevention strategies can be implemented in future events. When evaluating the injury risk of WCMX or other adaptive action sports the assumed risk must be weighed against the social benefits of sport and associated improvements in quality of life.

Conclusions: WCMX programs can be safely implemented at the beginner level with proper volunteer supervision. The risk of injury during WCMX competition likely increases with advancing levels of competition. These findings can be used to promote athlete safety during future events.

WORK-UP AND REHABILITATION OF UNPROVOKED HEMORRHAGIC MYELOPATHY: A CASE REPORT

Britney Tsui, MD, Jason Richards, MD, and Paul Thananovavorn, MD

Case Diagnosis: On the day of discharge, repeat MRI with and without contrast revealed residual blood products within the thoracic spine and interval resolution of the spinal cord edema. She was ultimately diagnosed with acute hemorrhagic myelitis likely due to a cavernous malformation that could not be identified and no further intervention was indicated.

Case Description: The patient was a 56-year-old female who presented to the hospital after 2 days of gait instability and leg numbness. Spine imaging at this time, including CT and MRI without contrast, showed multilevel degenerative changes without significant canal or neuroforaminal stenosis. Within 72 hours of admission her symptoms rapidly progressed to complete loss of sensation and strength in her lower extremities. She was admitted to Acute Inpatient Rehab (AIR) with a diagnosis of non-traumatic spinal cord injury (SCI) of unknown etiology while work-up was continued in conjunction with Neurology. Upon admission, patient was found to have symptoms consistent with neurogenic bowel and bladder with an over-distended bladder, urinary leaking, and no bowel movement in over 1 week. A Foley catheter was immediately placed with output of 1200 ml and a bowel enema was provided which yielded several large bowel movements. ASIA exam was performed and patient was determined to be a T8 AIS (ASIA impairment scale) B and therapy was initiated to work on modifications for mobility and activities of daily living in the setting of MS. She had increasing pain in her legs and abdomen consistent with neuropathic pain and was weaned off of narcotics and started on Gabapentin with adequate relief. MRI total spine with and without contrast was obtained and showed a non-specific intramedullary lesion centered at T5 with longitudinally extensive edema from C5-T11. MRI was unremarkable. A course of steroids was provided for a possible diagnosis of transverse myelitis without changes in her symptoms. Lab work and CT full body with contrast ultimately were unremarkable. Patient was ultimately discharged home after completion of her work-up and inpatient rehabilitation program with continuation of her symptoms and without definitive diagnosis of the cause for her SCI.

Discussions: Spinal cord vascular injury is rare and can present similar to transverse myelitis, although it is often a diagnosis of exclusion with limited treatment options. SCI infarcts account for hemorrhagic etiologies. Spinal cavernomas account for approximately 5% of intramedullary lesions in adults, however MRA may not always show a vascular malformation when injury results from microhemorrhages. This is the first reported case, to our knowledge, of an unprovoked spinal cord hemorrhage without definitive evidence of a vascular malformation.

Conclusions: At outpatient follow-up, she had no return of her strength or sensation, however responded well in regards to quality of life with continued treatment of the sequelae of her SCI. She had good results with her prescribed bowel and bladder program, pain well-controlled on Gabapentin, and functional independence with use of the modifications as recommended during her admission. This case demonstrates the importance of early rehabilitation interventions in the setting of SCI. This case specifically provides an example of the excellent functional outcome and early return to an independent functional level that can be achieved with timely treatment of SCI sequelae despite delays in diagnosis of etiology. This case also shows the extensive work-up across multiple disciplines that is often required to obtain a diagnosis of hemorrhagic myelitis.

ZIKA VIRUS-ASSOCIATED GUILLAIN BARRÉ SYNDROME: A CASE REPORT

Priya B. Patel, DO, George Marzloff, MD, and Avniel Shetreat-Klein, MD, PHD

Case Diagnosis: Guillain-Barré Syndrome associated with Zika Virus

Case Description: A 61-year-old female with history of recent travel to the Dominican Republic presented with headaches and neck pain that progressed to bilateral proximal arm weakness, then numbness and weakness in both legs, left-sided facial nerve palsy, dysphagia, urinary retention and constipation. Brain MRI was normal, and lumbar puncture revealed elevated protein without leukocytosis. She was diagnosed with Guillain Barré Syndrome (GBS) of unknown etiology and received intravenous immunoglobulin for five days; strength improved from 2/5 to 4/5 throughout. Patient was admitted to rehabilitation, after which ZIKV immunoglobulin M returned positive. Electrodiagnostics revealed denervationulopathy throughout plus left facial axonal neuropathy. During admission, facial palsy improved, and dysphagia, urinary retention and constipation resolved. Patient was discharged with greater strength in all limbs, independent ambulation and performance of activities of daily living at a level prior to admission.

Discussions: The increasing prevalence of ZIKV worldwide warrants attention to other associated diseases. Until recently, the principal concern was for pregnant mothers due to microcephaly in developing fetuses; however, emerging evidence shows GBS is a potential risk for all populations. GBS causes progressive weakness that could lead to temporary paralysis and some may require intensive care and mechanical ventilation. Awareness of the setting of ZIKV is important for those in affected areas so prompt treatment can occur.

Conclusions: The incidence of GBS is rising with the emerging rates of ZIKV worldwide. This poses as a public health threat and burden on the medical system, especially in developing countries. Patients with GBS symptoms need immediate attention to ensure proper care and those with associated travel history should be tested for ZIKV. This case highlights how GBS can present atypically in a ZIKV patient and the multidisciplinary approach utilized to ensure a successful rehabilitation course.

RESEARCH STUDY POSTER PRESENTATIONS

A COMPARATIVE RANDOMIZED STUDY OF PARTIAL BODY WEIGHT SUPPORT TREADMILL EXERCISE, ROBOTIC LOCOMOTOR EXERCISE AND ANTIGRAVITY TREADMILL EXERCISE IN CHILDREN WITH SPASTIC TYPE CEREBRAL PALSY

Berke Aras, MD, Erven Yaşar, Associate Professor, Sedar Kesikburun, Assistant Professor, Duygu Türker, PT, Fatih Tok, Associate Professor, and Bilge Yılmaz, Professor

Objectives: Cerebral Palsy is a movement and posture disorder that results from damaging of developing brain tissue for any reason at prenatal or neonatal period. Although it varies around the world, the frequency is 1.5-2.5/1000. Gait abnormality is important problem in cerebral palsy. The aim of this research demonstrates the effectiveness of the partial body weight support treadmill exercise, robotic locomotor exercise and antigravity treadmill exercise by comparing with each other.

Design: Children in the study were divided into three groups, including partial body weight support treadmill exercise, robotic locomotor exercise and antigravity treadmill exercise. Each group underwent total 20 session (4 weeks, 5 days a week, 45 minutes) treadmill exercise accompanied by a physiotherapist. Children were assessed by 3 dimensional gait analysis, open-circle indirect calorimeter, six minute test and gross motor functional measurement (GMFM) scale at pre-treatment, post-treatment and follow-up for three months.

Results: In tempo-spatial parameters on gait analysis, changes in walking speed was not statistically significant in each group after the treatment. Significant improvements were noted in stride length and cadence in antigravity treadmill exercise group, but improvements in the other groups were not statistically significant. GMFM D. E and six minute tests showed significant improvement in each group after treatment. Significant improvement were noted in oxygen and energy consumption in antigravity treadmill exercise group and robotic locomotor exercise group but improvements in partial body weight support treadmill exercise group were not statistically significant. Between group differences were not statistically significant for GMFM D. E and six minute test, changes in robotic locomotor exercise and antigravity treadmill exercise more significant than partial body weight support treadmill exercise in oxygen and energy consumption.

Conclusions: This study is the first research that compared this three treadmill exercise used in cerebral palsy. Our present findings conclude that all three treadmill exercise have positive impact to walking, robotic locomotor exercise and antigravity treadmill exercise can be used more actively.

A FUNCTIONAL RECOVERY COMPARISON OF TWO PATIENTS WITH GUILLAIN-BARRE SYNDROME

Mariah Carroll, MS, Joel Frontera, MD, and Radha Korupolu, MD, MS

Case Diagnosis: Patient A (DM) & Patient B (MG): Guillain-Barre Syndrome (GBS), Miller Fisher variant

Case Description: DM is a 45-year-old female GBS with resulting in ophthalmoplegia tetraplegia quadriplegia and acute respiratory failure after diagnosis of Guillain-Barre Syndromerequiring mechanical ventilation (MV). At the time of this report, patient has only completed one-phase of a two-phase inpatient stay. At time of evaluation, patient required total assistance in all for activities of daily living (ADL), transfers, and transfers. No limitations of admission to acute rehabilitation facility (ARF). She was discharged after 9 weeks of intensive rehabilitation, was weaned off MV and able to operate a power chair independently. However, she continued to require maximum-total assistance for ADLs, bed mobility and transfers.
MG is a 44-year-old male with GBS who presented to ARF with incomplete quadriplegia, ophthalmoplegia, and acute respiratory failure after diagnosis requiring MV. He required total assistance for ADLs, mobility and transfers at the time of admission. MG required 2 admissions to ARF. Pt received intensive rehabilitative care and was discharged home after his 2nd admission. He was modified independent with most of the ADLs, mobility and transfers.

Discussions: Miller fisher variant of GBS can result in prolonged disability. In most cases, recovery begins within 2–4 weeks and may be almost complete within 6 months. Patient A and B received appropriate early medical intervention followed by prolonged intensive rehabilitation therapy under the care of a multidisciplinary team. Significant functional improvement was achieved for patient B. Patient A was not able to return to our ARF after discharge.

Conclusions: Current literature shows that early diagnosis and timely intervention are key factors for recovery of GBS patients with severe debility. These 2 cases demonstrate the necessity of an intensive rehabilitation program to aid recovery in such patients.

A PILOT TRIAL OF URATE ELEVATION IN PEOPLE WITH AMYOTROPHIC LATERAL SCLEROSIS (ALS)
Sabrina Paganoni, MD, PHD
Case Diagnosis: Urate, the anionic form of uric acid, is an endogenous antioxidant and a potential neuroprotective agent. Based on convergent biological, epidemiological, and clinical data, urate elevation is being investigated as a possible disease-modifying agent for Parkinson disease (NCT02642393). Epidemiological data suggest that naturally elevated serum urate is also associated with longer survival in ALS.

The objective of this trial was to determine the safety, tolerability, and urate-elevating capability of oral inosine in people with ALS.

Case Description: Twenty-five people with ALS were enrolled in a pilot, single-center, open-label safety and tolerability study of urate elevation. Inclusion criteria included urate levels below the approximate population median (5.5 mg/dL). Study participants received the urate precursor inosine for 12 weeks. Inosine was administered orally and its dose was titrated to achieve serum urate levels of ≥7–8 mg/dL.

Discussions: There were no serious adverse events related to inosine administration. No adverse events of special interest (gout or kidney stones) were observed. Treatment was well-tolerated and no participant withdrew because of an adverse event. Serum urate rose to pre-specified target levels. Urate elevation was associated with increased antioxidant capacity of plasma as measured by ferric-reducing antioxidant power (FRAP).

Conclusions: Inosine was safe, tolerable, and effective in raising serum urate levels. A multi-center, randomized, double-blind phase 2 trial of urate elevation is being planned.

A PROSPECTIVE RANDOMIZED COMPARATIVE TRIAL OF TARGETED STEROID INJECTION VIA EPIDURAL CATHETER VERSUS STANDARD C7-T1 INTERLAMINAR APPROACH FOR THE TREATMENT OF UNILATERAL CERVICAL RADICULAR PAIN
Zachary McCormick, MD, Ariana Nelson, MD, Meghan Bhave, MD, Mikhail Zhukalin, DO, Mark Kendall, MD, Robert McCarthy, PHARMD, Dost Khan, MD, Geeta Nagpal, MD, and David Walega, MD
Case Diagnosis: No study has compared cervical interlaminar epidural steroid injection (CILESI) with epidural catheter advancement to the side and level of pathology versus standard C7-T1 CILESI. This study investigated whether cervical radicular pain if more effectively treated using CILESI using a targeted epidural catheter versus standard C7-T1 approach.

Case Description: Prospective, randomized, single-blinded trial. Primary outcome: Numerical Rating Scale (NRS) pain at 1 month. Secondary outcomes: Oswestry Neck Disability Index (ODNI), Pain Disability Index (PDI), McGill Pain Questionnaire (MPQ), Patient Global Impression of Change (PGIC), daily morphine equivalents (DME) and Medication Quantification Scale (MQS) III scores.

Discussions: Seventy-six participants, median age 48 (IQR 40 to 56) years, 59% female, with C4 (n = 2), C5 (n = 27), or C6 (n = 47) radicular pain were enrolled. At 1-month in the catheter and no catheter groups, respectively: 26 (72%), 95 CI 57–87% and 23 (60%), 95 CI 45–73% participants reported ≥50% NRS reduction; 24 (67%), 95 CI 52–84% and 23 (58%), 95 CI 42–73% participants reported ≥30% ONDI reduction; there were no intergroup differences in mean NRS, ONDI, PDI, MPQ, PGIC, DME, or MQSIII scores (P > 0.05). Intergroup differences were not observed at any additional follow-up interval.

Conclusions: This trial showed no difference in clinical outcomes with the use of a targeted epidural catheter approach compared to a standard C7-T1 CILESI for the treatment of unilateral cervical radiculopathy. The C5 or C6 level of both techniques were associated with clinically meaningful improvement across outcome domains of pain, function, disability, and medication use. These effects persisted after 6-month follow-up.

ACCURACY OF ULTRASOUND-GUIDED CARPOMETACARPAL INJECTIONS IN CADavers
Armen Derian, MD, and Douglass Johnson-Greene, PHD
Objectives: In this study we evaluated the utility of ultrasound guidance for carpometacarpal (CMC) joint injections in cadavers. We compared ultrasound-guided injections to palpation based injections using a novel assessment method to determine accuracy by visually assessing the percentage of injectate that entered the joint space and grading it on a four-point scale.

Design: Randomized, blinded, prospective study conducted in a university anatomy laboratory on 18 embalmed cadavers (36 CMC joints). 18 CMC joints were randomized to ultrasound-guided injections and 1 cc blue latex solution was injected into each. The other 18 joints were randomized to palpation based injections.

Results: Accuracy was based on a four-point rating scale of 0–25%, 26–50%, 51–75%, 76–100% of the latex solution within the joint. Inter-rater reliability was also a secondary measure.

Conclusions: Accuracy was 50% or less for both blind (n = 11 of 18 cases) and ultrasound (12 of 18 cases) conditions. The mean rating was 2.1 for the blind and the ultrasound conditions, which was not statistically significant (F = 0.04; p < .76). Chi-square analysis testing differences in accuracy for the two conditions was not statistically significant. Inter-rater reliability was calculated to ascertain the accuracy of the ratings between the two independent raters. The Cronbach’s alpha for rater 1 was .74, which represents an acceptable level of reliability. Friedman’s Chi square for the two raters was 2.3 (P < .13) indicating no significant difference between raters. For Rater 2 the Cronbach’s alpha was .63, which is slightly below an acceptable level of reliability. Friedman’s Chi square for the index and rater 2 comparison was 5.7 (p < .017), which did suggest statistically significant differences between raters.

Conclusions: Although this is a negative study, the results are significant. Ultrasound guidance did not improve the accuracy of CMC joint injections in cadavers. However, the statistically significant inter-rater reliability attests to the value of the novel assessment scale, which may be used in future studies.

The accuracy interpretation can be applied only to a cadaver model, as the use of cadavers as subjects was complicated by tightening of the CMC joint space and rigor mortis. In live subjects, positioning of the limbs and repositioning of the needle once penetrating the skin would be more readily achieved.
Abstracts
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ADAPTED START TOOL FINDINGS IN THE ASSESSMENT OF PATIENTS WITH HIP PAIN
Abby L. Cheng, MD, Andrea McCullough, BS, Devyani Hunt, MD, John Cohnay, MD, and Heidi Prather, DO
Objectives: The STarT Back Screening Tool (SBST) is a nine-question, validated questionnaire which risk-stratifies low back pain (LBP) patients based on modifiable psychosocial factors. We hypothesize many hip pain patients also have psychosocial co-morbidities which impact outcome. The purpose of this study is to describe the findings of a modified version of the SBST for patients with hip pain and compare their scores to the validated measures for LBP patients and to the Patient-Reported Outcomes Measurement Information System (PROMIS).
Design: In this prospective descriptive study, patients seeking evaluation of hip pain from an orthopaedic surgeon or physiatrist at a tertiary university were recruited. Findings of the modified SBST questionnaire and the Depression, Pain Interference, and Physical Function domains of the PROMIS were compared.
Results: Of the 241 patients (157 female, 84 male) with a mean age of 50.0 ± 16.9 years, the average modified SBST score was 4.8 ± 2.3 (range 0–9). The average PROMIS Depression, Pain Interference, and Physical Function scores were 48.0 ± 9.1, 62.6 ± 6.5, and 38.3 ± 6.4, respectively. Using the original SBST scoring system, 75 (31.1%), 106 (44.0%), and 60 (24.9%) subjects stratified into the low, medium, and high risk subgroups, respectively. Using one-way ANOVAs, for all three PROMIS domain scores there was a statistically significant difference between each subgroup (p < 0.001). However, the Depression score remained in the normal range in all three modified SBST subgroups.
Conclusions: Many patients presenting with hip pain exhibited modifiable psychosocial factors that were stratified by the modified SBST but not by the PROMIS Depression domain. The modified SBST can assist clinicians, perhaps better than the PROMIS Depression domain, in recommending behavioral therapy when indicated. Future studies are needed to evaluate whether the appropriate score cutoffs for the modified SBST are the same for LBP and hip patients.

ADMINISTRATION AND PERFORMANCE ON THE SPINAL CORD INJURY CERTIFICATION EXAMINATION OVER A 10-YEAR PERIOD
Sunil Sabharwal, MD, Anthony E. Chiodo, MD, and Mikaela M. Raddatz, PHD
Objectives: Examine characteristics of candidates taking the Spinal Cord Injury Medicine (SCI) Examination; review candidate performance; analyze exam performance by candidate track, primary specialty, number of attempts, and domains being tested; evaluate exam psychometrics; and evaluate candidate perception of the exam by analyzing responses from a de-identified survey administered after exam completion.
Design: A retrospective analysis of de-identified information from the American Board of Physical Medicine and Rehabilitation (ABPMR) database regarding SCI Examination administration and performance over a 10-year period (2005–2014), during which time the exam was based on a consistent outline and a uniform passing standard.
Results: 566 candidates took the SCI Examination from 2005 to 2014. Overall pass rate was 83%. Fellowship candidates had higher pass rates (92%) than those who were in practice track (82%) or Maintenance of Certification MOC (87%). There was a drop in mean scores for MOC candidates compared to their initial certification mean scores, with a decline in Pulmonary and Genitourinary/Gastrointestinal sub-scores. Pass rate was 87% after one, 51% after two, and 27% after three or more attempts. Fellowship candidates who delayed taking the exam performed worse than those who didn’t, especially if delay was associated with failing primary PMR certification exams in the first attempt. SCIIM scores correlated strongly with primary PM&R certification exam scores. Exam item reliability was in the Good to Excellent range, ranging between 0.85 and 0.90. Candidate perception of the exam was positive with no significant difference between initial certification and MOC candidates; 97% Strongly Agreed or Agreed that the exam was relevant to the field, and 90% that it no significant difference between initial certification and MOC candidates; 97%
Conclusions: Knowledge about SCIIM Examination administration and performance may help prospective candidates and those guiding them. It could also provide useful information for future exam development.

AEROBIC EXERCISE INTERVENTION IMPROVES CORONARY ARTERY DISEASE RISK PROFILES AND COMMUNITY MOBILITY IN ADULTS WITH MOTOR COMPLETE SPINAL CORD INJURIES
James J. Bresnahan, BS, Gary J. Farkas, BS, Jody Clasey, PHD, James yates, PHD, and David R. Gater, MD, PHD, MS
Objectives: To assess the effect of aerobic exercise using arm crank ergometry (ACE) in high motor complete (ISNCSCI A/B) spinal cord injury (SCI) as related to coronary artery disease (CAD) risk profiles, aerobic capacity, and functional abilities.
Design: Ten previously untreated patients (8M/2F, Age 36.7 ± 6.1) with high motor complete SCI (C7-T7: cervical = 3; thoracic = 7) underwent ACE exercise training 30–45 min/d x 3d/wk for 12 weeks at 70% VO2peak. Baseline and post-intervention aerobic capacity (VO2peak and peak power), body profile measurements (%body fat [%BF], %fat free mass [%FFM]), functional ADLs and community mobility (bed-to-wheelchair [WC], car transfer, time to traverse a 100 ft-5° ramp, 12-minute WC propulsion test), serum lipid profiles (total cholesterol, HDL, LDL), oral glucose tolerance (insulin resistance and area under the curve of glucose), and resting plasma glucose and insulin were measured. Normality was assessed with Shapiro-Wilk and West-Salama signed rank tests were used to evaluate the effects of the intervention. α < 0.05
Results: Baseline to post-intervention relative VO2peak (12 ± 3 vs. 13 ± 3; p = 0.027); absolute VO2peak (831 ± 247 vs. 919 ± 256; p = 0.028), 12-minute WC propulsion (2061 ± 959 vs. 2397 ± 1053; p = 0.028), peak power (43 ± 15 vs. 54 ± 14; p = 0.026), respiratory quotient (0.95 ± 0.13 vs. 0.77 ± 0.02; p = 0.028), insulin resistance (13.0 ± 4.7 × 10–4 vs. 7.7 × 10–4; p = 0.028), resting glucose (insulin ratio 0.91 ± 3.97 ± 13.69 ± 2.49; p = 0.028), and abdominal skin folds (26.8 ± 9.0 vs. 23.8 ± 6.2; p = 0.043) all significantly improved. HDL (p = 0.066), %FFLM (p = 0.074), and energy expenditure (p = 0.074) trended towards significance. There were no changes in %BF or %FFM (p > 0.05).
Conclusions: Ten weeks of aerobic exercise at 70% VO2peak in high motor complete SCI using ACE demonstrated improvements in aerobic capacity, community mobility, and carbohydrate metabolism. This preliminary analysis emphasizes the importance of physical activity as a means to reduce obesity-related comorbidities and improve functional performance following SCI.

AGING WITH DISABILITY FROM SPINAL CORD INJURY: THE IMPACT OF AVAILABLE/ADEQUATE EQUIPMENT AND CAREGIVER AVAILABILITY ON FUNCTIONAL STATUS OF GERIATRIC (>65 YEARS OLD) INDIVIDUALS WITH INJURY >15 YEARS
K.Rao Poduri, MD, FAAPMR, Jennifer Paul, MD, Christopher Stavisky, MOT, OTR/L, and Simon Carson, MBA, OT/L
Objectives: Background: Spinal Cord Injury (SCI) and its functional limitations in the elderly are growing in importance as a public health issue. SCI is an independent predictor for increased morbidity and mortality. Currently, the US Census Bureau estimates that more than 36.3 million Americans are aged 65-years or older; by 2050 that number will increase to 85 million. This age group continues to deal with functional limitations and increased dependence on their caregivers. Older persons who require more frequent hospitalizations, physical decline, and disability at higher rates than those without SCI.
Objectives: To evaluate the current functional status of community dwelling SCI individuals (>65-years-of-age who are >15 years since their initial rehabilitation) with or without adequate equipment and caregiver availability.
Hypothesis: Individuals who have adequate equipment and caregiver availability maintain their functional status years after injury.
Purpose: To assess the impact of available/adequate equipment and caregiver support on the current functional status of individuals with SCI.
Design: A retrospective study of record review: data from ten patients (>65 years old) with SCI for >15 years was collected including patient demographics, level of injury, co-morbid conditions, and discharge FIM scores. Current functional status, equipment use, and caregiver availability were obtained via telephone.
Results: Information collected on ten patients (9 living/1 deceased) average age 76.5 years (range 67–91). Five patients reported adequate and available equipment with caregiver support and had no change in their functional status, while two patients with the same resources had improvement in their functional status. Two patients with inadequate equipment and caregiver availability reported decrease in their functional status.
Conclusions: Patients can maintain their functional status long after injury when the availability of resources and care giver supports are adequate.

AMPREDICT - MOBILITY: A PATIENT SPECIFIC PREDICTION MODEL OF MOBILITY OUTCOME ONE YEAR AFTER DYSVASCULAR LOWER EXTREMITY AMPUTATION
Joseph Michael. Czerniecki, MD, MS, Daniel C. Norvell, PHD, Rhonda Williams, PHD, Aaron P. Turner, PHD, Mary Lou Thompson, PHD, Gregory Landry, MD, and Kevin Hakimi, MD
Objective: Amputation level can profoundly affect multiple outcomes such as mortality, reamputation risk, and mobility. Mobility is a key determinant of quality of life after amputation. There is an increasing emphasis on maintaining health practices that enable patient participation in health care decisions. This allows patients to balance the risks of key outcomes based upon their own values and priorities. Although numerous retrospective studies have evaluated factors associated with

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mobility outcome after amputation, there is little information available to guide pa-
tient specific surgeon/patient communication regarding amputation level selection and probable mobility outcome. This research will present the development and eval-
uation of patient specific prediction models that enable the prediction of proba-
ble independence in BASIC or ADVANCED mobility at each major amputation
level 1-year post initial dysvascular major lower extremity amputation.

Design: Two multisite prospective cohort studies during consecutive 4-year time
time periods (2005–2009 and 2010–2014) were conducted at a University Hospital, a
Level 1 Trauma Center and 5 VA Medical Centers, on individuals undergoing their
first major lower extremity amputation at the Transmetatarsal - TM, Transtibial -
TT, or Transfemoral - TF amputation levels due to complications of peripheral arte-
rificial disease or diabetes. Multiple demographic, psychological, co-morbid medical, and social predictors were collected in the peri-amputation period. The primary out-
comes were independence in BASIC or ADVANCED mobility as measured by the
Locomotor Capability Index (LCI-5) collected at 12 months post amputation. Inde-
pendence in BASIC or ADVANCED mobility was defined as being independent with
or without mobility aids in all of the seven subtasks included in each mobility level.
Combined data from the two data collection periods were used for model develop-
ment and internal validation. Backwards stepwise logistic regression was used to se-
lect the final predictors. Variables were retained with a p-value < .20.

Results: Twelve month follow-up was reached by 157 of 200 (79%) enrolled par-
ticipants. Among these, 54(34%) did not achieve independence in all BASIC mobility
tasks, while 105 (65%) achieved independence in BASIC mobility. Fifty-one (32%)
of these did not achieve independence in BASIC mobility achieved independence in
ADVANCED mobility. Predictive factors associated with reduced odds of achieving
BASIC mobility were increasing age, BMI greater or lesser than 30, lower educa-
tional level, the presence of COPD, dialysis, diabetes, prior history of anxiety depres-
sion, and poor/fair self-rated health. White and married individuals had higher odds of
achieving BASIC mobility. The prediction model for ADVANCED mobility retained
the same variables with the exception of COPD, diabetes and educational level. Both
models showed strong discrimination with C-statistics of 0.85 and 0.82, respectively.
Tests for calibration and observed versus predicted plots suggested good fit for both
models; however, the precision of the estimates of the mobility probabilities was
modest. Internal validation through bootstrapping demonstrated some over-optimism
of the predictive models with the optimism-adjusted C-statistics for BASIC and
ADVANCED mobility being .74 and .71, respectively.

Conclusions: Amputation level selection can profoundly influence the outcome af-
after dysvascular amputation. Although prior studies have defined factors that can affect
mobility outcome, the absence of a prediction model has led to uncertainty about how
these various factors can cumulatively affect outcome in individual patients. The in-
volvement of Rehabilitation physicians with expertise in amputee rehabilitation as part of
a pre-operative team assessment can help inform patients, surgeons about potential
mobility outcome. The effectiveness and strength of the mobility prediction relies on
high quality evidence to support the clinical assessment. AMPREDICT-mobility is a
user-friendly tool that utilizes easily accessible predictors to predict patient specific 12-
month mobility outcome after amputation at the TM, TT, or TF amputation levels in in-
dividuals who are undergoing amputation secondary to peripheral arterial disease and/or
diabetes. Mobility outcome defined by independence in either BASIC or ADVANCED
mobility tasks can be predicted, based upon pre-operative factors. The prediction
models have very good characteristics determined by the C-statistic and the H-L good-
ness of fit tests. This predictive tool can enhance evidence based patient outcome pre-
diction and therefore enhance patient/surgeon amputation level decision-making.

AMUSEMENT PARK ASSOCIATED CONCUSSION: A 10-YEAR
ANALYSIS OF THE NATIONAL ELECTRONIC INJURY
SURVEILLANCE SYSTEM DATABASE
Justin Louis Weppner, DO, and Paul Diamond, MD

Objectives: The US Consumer Product Safety Commission estimates that over
270 million people visit amusement parks in the United States each year. In 2006 ap-
proximately 8,800 people were injured on amusement park rides. An additional 3,600
people were injured on inflatable amusement park rides. There is limited published
data on head injury in amusement park patrons. This study was designed to examine
the demographics, characteristics, and disposition of concussions that occur in the
amusement park setting.

Design: Data on amusement park-related concussion maintained through the
Consumer Product Safety Commission’s National Electronic Injury Surveillance
System (NEISS) were analyzed over a 10-year period (2004–2014). NEISS is based on
a stratified statistical sample of about 100 hospitals with emergency rooms in the
United States. Data analyzed included patient’s age, subject age, gender, cause of
injury, and disposition from the emergency department.

Results: A total of 172 cases of amusement park-related head trauma, mean age
14 years (range 2–65 years), were recorded. Age distribution was bimodal with 95%
of cases age 2–29 years and 5% of cases age 60–65 years. Male to female ratio was
1:1. Rides were the most common cause of concussion (53.5%) followed by falls
(38.4%), collision with a fixed object (6.4%), and assault (1.7%). Of the 92 concus-
sions caused by rides, the majority (69.6%) occurred on roller coasters followed by
mechanical bull rides (16.3%) and mechanical bulls (7.6%). Of the 66 concussions
caused by falls, the majority occurred in bounce houses (78.8%) followed by inflatable slides
(9%), and haunted houses (6%). Age distribution of those admitted to the hospital was
bimodal and peaked in ages 2–8 years (n = 14, 78%) and 63–65 years (n = 4, 22%).
of those admitted 6 of the concussions resulted from falls in a bounce house, 6 on
roller coasters, 4 occurred on merry-go-round rides, 1 on an unspecified amusement park ride, and 1 resulted from a collision with another ride. Of those not admitted 71.6% were treated and released and 27.7% were held for observation and then re-
 leased. No mortalities from head trauma were reported.

Conclusions: Our findings suggest that the majority of amusement park-related concussions are mild and do not require hospitalization. Children and older adults ap-
pear at greatest risk of more serious concussion necessitating hospitalization. Roller
coasters, merry-go-rounds, and bounce houses each pose a risk of concussion. Com-
 munity education programs and injury prevention strategies should be targeted to-
ward these age groups and amusement park rides.

AN ANALYSIS OF COUNTY-LEVEL HEALTHCARE RESOURCES
AND MEDICAL COMPLICATIONS IN SPINAL CORD INJURY
Michelle M. Didesch, MD, Amanda Botticello, PHD, MPH, and
Steven Kirshblum, MD

Objectives: The purpose of this study was to assess whether the density of local
medical resources was associated with medical complications in adults with chronic spinal cord injury (SCI)

Design: Secondary analysis of cross-sectional survey data from the National Spi-
 nal Cord Injury Model Systems database linked with county-level healthcare resource
information from the Area Health Resources Files.

Participants were persons with SCI age 17 or older with a follow-up interview be-
tween 2011 and 2015 and a valid address to identify county of residence (N = 1,814).

Outcomes included binary measures of reported occurrences of rehospitalization, pressure ulcers, and urinary tract infections (UTI) in the past 12 months. Key indepen-
dent measures were total number of physicians, primary care physicians and Physical
Medicine and Rehabilitation (PM&R) physicians per county of residence. Outcomes
were adjusted for demographic characteristics, injury severity, functional status, and
county characteristics such as high poverty and urban locations.

Results: Results from multivariate logistic regression analyses indicated that the
likelihood of reporting a pressure ulcer was higher if an individual resided in a county
with a fewer number of total physicians (<50) (OR 1.73, 95% CI 1.22 to 2.46), pri-
mary care physicians (<50) (OR 1.53, 95% CI 1.11 to 2.11) and PM&R physicians
(<20) (OR 1.35, 95% CI 1.05 to 1.74). In addition, likelihood of reporting a UTI was
higher if they resided in a county with less PM&R physicians (<20) (OR 1.26, 95%
CI 1.01 to 1.57). Rehospitalization was not associated with differences in counties’
healthcare resources.

Conclusions: Living in an area with overall physician scarcity and fewer
number of PM&R physicians is correlated with a higher likelihood of secondary
medical complications in chronic SCI. Further research is needed to determine how
the availability of local medical resources affects delivery and utilization of preven-
tative care services.

ANATOMICAL BASIS OF GENICULAR NERVES: IMPLICATIONS
FOR RADIOFREQUENCY ABLATION AS A TREATMENT FOR
CHRONIC KNEE PAIN
Phuong U. Le, DO, Soo Yeon Kim, MD, and Jung Kim, MD

Objectives: Genicular nerve radiofrequency ablation (RFA) is a relatively novel
technique that has gained increasing popularity among interventionalists as an alterna-
tive treatment for patients with chronic knee pain. Introduced by Choi et al in 2011,
genicular RFA is performed using bony landmarks to target the superior lateral
(SLGN), superior medial (SMGN) and inferior medial (IMGN) genicular nerves un-
der fluoroscopic guidance. The anatomical basis for genicular RFA was solely derived
from cadaveric dissections. Because genicular RFA targets bony landmarks, it is of
utmost importance to confirm that these nerves have a consistent anatomical rela-
tionship to the bony structures. More significantly, the efficacy of the procedure is de-
dependent upon placing the radiofrequency electrodes as close as possible to the
targeted nerves. Consequently, it behooves the interventionist to attain a better knowl-
dge of the exact location of these nerves. The objective of the current study is to con-
firm the findings of previous investigations and elaborate on the precise anatomy of
the genicular nerves.

Design: Human cadaveric dissections were performed on 18 thigh/knee speci-
mens (9 cadavers).
Results: The SLGN was reliably found in anatomic dissection originating from the sciatic nerve approximately 3 cm proximal to its bifurcation. It courses laterally deep to biceps femoris, then bifurcates to the level of popliteus and lateral gastrocnemius tendons. The SLGN in majority of knees (895/1000 cases) was not reliably found in its reported anatomic location. On the medial side, the most consistent and largest nerve is the terminal branch of the vastus medialis muscle. After originating from the femoral nerve, it travels medially within the vastus medialis as it gives multiple motor branches. At the level of adductor hiatus, the terminal articular branch separates from the vastus medialis, courses distally, anterior to the adductor magnus tendon, and innervates at the level of adductor tubercle under the membranous inaculum. The articular branch of the nerve to vastus intermedius enters deep to the muscle proximally, and travels on the anterior surface of femur beneath the muscle to innervate suprapatellar recess. The IMGN was reliably found in its reported anatomic location, however its termination point did not appear to be in the knee capsule itself.

Conclusions: The neuroanatomy appreciated in the 18 th thigh dissection suggests that the SLGN, SMGN and IMGN genicular nerves may lie in different anatomic locations from those originally reported or terminate outside of the knee capsule, questioning their sensory innervation of the knee. Our current study shows reliable patterns of neuroanatomy were noted in the cadaveric dissections. As neuroanatomy of the knee is better understood, the interventional techniques to sensory deafferentation can be better applied to address the variable presentations of chronic knee pain leading to better efficacy in neuroablative therapy.

AQUATIC THERAPY UTILIZATION IN HIGH LEVEL TETRAPLEGICS FOR PARTICIPATION IN ADAPTIVE SPORTS

Shelly Gulhar, BS, Philippines Cabahug, MD, and Robert Samuel Mayer, MD

Case Diagnosis: C3 complete tetraplegia secondary to traumatic spinal cord injury.

Case Description: B is a 28-year-old diagnosed with C3 ASIA Impairment Scale (AIS) A spinal cord injury (SCI) sustained in 2008 following a gymnastics injury. He follows an intensive home rehabilitation program, consisting of Functional Electric Stimulation (FES) ergometry, locomotor training, and aquatics therapy (AT). This is supplemented by short bouts of skilled physical and occupational therapy every six months. B’s current goal is to participate in adaptive water skiing. Prerequisites for this sport include raising the head to take a breath or switching from the prone to supine position. B was able to successfully take a breath in preparation for water skiing. Understanding B’s desire to partake in adaptive sports, the rehabilitation team included three weeks of task specific training to fulfill the prerequisites for water skiing after which the team noticed an improvement in pulmonary function.

Discussions: A comprehensive rehabilitation program for a high level tetraplegic should include AT, especially for patients desiring to return back to sports. AT utilizes the physical properties of water (buoyancy, hydrostatic pressure, resistance, temperature) to address patient impairments in a safe and effective manner. AT in conjunction with land-based intervention is used to improve muscle strength, endurance and gait training. Studies have shown that in patients with SCI, AT can improve pulmonary function, including vital capacity and expiratory muscle strength.

Conclusions: AT has been implicated as an effective rehabilitation therapy for tetraplegic patients. Research and patient case studies show that AT produces a beneficial effect on the patient’s rehabilitation process and can help them achieve task specific skills required to participate in adaptive sports.

ASSESSING MEDICATION SELF-ADMINISTRATION PERFORMANCE AND UNAWARENESS IN REHABILITATION PATIENTS

Beverly Hon, MD, Cristin McKenna, MD, PhD, and A.M. Barrett, MD

Objectives: More than 33% of stroke patients make dangerous medication self-administration (MSA) errors in the post-hospitalization period. More importantly, many stroke patients are not aware of cognitive deficits; MSA errors and unawareness could together adversely affect functional outcomes. We previously demonstrated that MSA performance and unawareness may identify cognitive deficits after stroke. This study examines MSA performance and self-awareness of MSA ability in a multi-diagnosis group of rehabilitation patients. We also examined whether MSA performance and self-awareness were associated with other states of awareness.

Design: This retrospective observational study reviewed charts of 123 acute rehabilitation inpatients (brain injury = 33; Stroke = 58; Orthopedic = 7; other or undocumented = 25) participating in a medication management program as part of rehabilitation. We administered the Hopkins Medication Schedule, a two-part standardized assessment including 1) a pencil and paper task-writing a medication schedule and 2) a pill box filling task. On discharge, disposition, and self-awareness were measured.

Results: Patients on average made many MSA errors (mean score = 4.22/11; desirable range = 8–11). They also overestimated performance (poor self-awareness: anosognosia ratio mean = 0.28; desirable range = 0.1–0.7). MSA performance and self-awareness did not differ between patients discharged to home versus a facility.

Conclusions: Our multi-diagnosis group of patients undergoing inpatient rehabilitation had poor MSA and MSA self-awareness. Although MSA and MSA self-awareness were not associated with discharge disposition, we expect based on past studies that it affects functional status, recovery, and re-hospitalization. Other factors such as functional status and family support also play an important role in determining disposition. Future work should further examine MSA and self-awareness during rehabilitation, as well as how these variables interact with medication burden and specific medications being taken on discharge.

ASSOCIATING MOTOR RECOVERY IN STROKE PATIENTS IN ACUTE INPATIENT REHABILITATION: PILOT TRIAL FOR HAND-ORIENTED AND MUSIC-SUPPORTED THERAPY

Brian Walsh, MD, Anita Kou, MD, Stacy Brandl, DO, Laura Gruber, MD, Neelay Thakkar, MD, Lindsay Warrenburg, MA, and Marcia Bobkiewicz, MD, PhD

Objectives: Hand-focused, music-supported, outpatient therapy has been shown to be feasible and effective for improving upper limb impairments in chronic stroke. Few studies address whether this approach is similarly helpful in the acute phase, particularly in patients with hemiparesis admitted to inpatient rehabilitation within 2 weeks of stroke. A randomized, controlled study comparing 30 minute sessions of standard recreational therapy (listening to music) vs. a protocol of guided keyboard playing. 109 inpatients were screened; 31 met criteria and were consented to the study. Inclusion criteria were: stroke patients with hemiparesis admitted to inpatient rehabilitation within 2 weeks of stroke, age 18-90, Chedoke-McMaster hand stage of 3–6, St. Louis University Mental Status Examination score >20, and functional hearing and vision without neglect. Hand function was evaluated at weeks 0, 1, and 2 discharge utilizing the Action Research Arm Test (ARAT) and at weeks 0 and 2 discharge utilizing the J businessmen's Hand Function Test (JHFT). Group differences were tested using nonparametric statistics (Mann-Whitney U).

Results: Five patients per group completed the study. Mean change scores for the patient group improved for all measures in both groups, but group differences did not reach statistical significance: (Experimental 14.8 ± 13.4; Control 11.6 ± 13.6; p = 0.548) and JHFT Writing (Experimental −27.6 ± 22.6; Control −31.6 ± 16.3; p = 0.841), Simulated Page Turning (Experimental −39.8 ± 50.6; Control −8.0 ± 12.7; p = 0.548), Lifting Small Objects (Experimental −33.6 ± 35.6; Control −23.6 ± 44.4; p = 0.548), Lifting Large Objects (Experimental −26.4 ± 22.3; Control −42.0 ± 41.7; p = 0.690), Lifting Light Objects (Experimental −19.8 ± 35.1; Control −5.2 ± 5.0; p = 0.841), Lifting Heavy Objects (Experimental −22.6 ± 40.3; Control −6.6 ± 5.2; p = 0.100).

Conclusions: It is feasible to implement hand-focused music therapy during acute inpatient rehabilitation for stroke. Larger sample size and longer follow-up is necessary to evaluate efficacy for motor recovery.

ASSESSMENT OF KNOWLEDGE, BEHAVIORS, AND ATTITUDES OF OB/GYN RESIDENTS ON LUMBOPELVIC PAIN DURING PREGNANCY AND POSTPARTUM

Sarah A. Johnson, MD, Rachel Welbel, MD, Farah Hameed, MD, and Jaclyn Bonder, MD

Objectives: Lumbopelvic pain (LPP) affects a large proportion of pregnant and postpartum women. Unfortunately, there is a dearth of formal education provided to Obstetrics and Gynecology (Ob/Gyn) trainees about this. The goal of this study is to assess Ob/Gyn residents’ understanding of this topic, current practices, and attitudes towards treating these conditions.

Design: A list of 17 Ob/Gyn residency programs in the New York area was compiled and all were contacted to request their participation in this study. A study coordinator or principal investigator visited those programs that agreed to participate to distribute a 5 minute survey with 37 questions to trainees. Survey data was stored electronically using REDCap data management services.

Results: Seven out of 17 residency programs agreed to participate in the study, with a response rate of 95% (n = 74). 70% of respondents indicated >40% of their pregnant patients presented with LPP. 35% of respondents reported they were likely to ask a pregnant or post-partum patient about ongoing LPP. 34% of respondents were likely to and 42% of respondents were confident in performing a physical exam. 44% were confident in developing a differential diagnosis and only 26% of respondents were likely to refer to a physical therapist. 11% of respondents would prefer to learn about LPP with small group sessions and hands-on learning.

Conclusions: LPP is a commonly encountered problem in pregnant and postpartum patients. Though our survey revealed many peri-partum patients presented...
with LPP, fewer than half of the trainees asked about LPP, performed or felt confident in a physical exam or differential diagnosis, and few referred to a physiatrist. Given the prevalence and impact of LPP in peri-partum patients, our findings indicate the need for targeted efforts to improve Ob/Gyn trainees’ knowledge regarding LPP and increase awareness regarding the role of physiatrists.

ASSOCIATION OF GENETIC SINGLE NUCLEOTIDE POLYMORPHISMS AND RESPONSE TO LUMBAR EPIDURAL STEROID INJECTIONS IN SUBJECTS WITH AXIAL LOW BACK PAIN

Stephen Schaaf, MD, Gwendolyn Sowa, MD, PHD, Wan Huang, MD, PHD, Sara J. Ernst, PHD, and Yvette Conley, PHD

Objectives: Examine the association of genetic single nucleotide polymorphisms (SNPs) and pain improvement following lumbar epidural steroid injections (LESI) in individuals with axial low back pain.

Design: Patients recruited had already consented for a LESI (n = 46) as part of their routine clinical care. Subjects were eligible if they had primarily axial low back pain without radiating symptoms. Pain score was scored on 0-10 numeric rating scale. Pain score was taken at pre-injection and two-week follow-up. Serum blood samples obtained underwent sequence analysis to identify SNPs on pain related genes of interest which included COMT (catechol-O-methyltransferase), GCH1 (GTP cyclohydrolase), AVPR1 (arginine vasopressin receptor), and NPY (neuropeptide Y). For each SNP, subjects were divided based on whether their genotype contained a variant allele or not. Odds ratio were computed for each subject based on their response to the injection and SNP genotype.

Results: For responders defined as a 2 point or greater decrease in pain score for the SNP COMT rs4680, subjects with the variant allele had an increased odds of responding to a LESI that was statistically significant (OR = 18, p = 0.05). For the SNP GCH1 rs463, subjects with the variant allele showed a trend towards having an increased odds of responding to a LESI (OR = 6.7, P = 0.08). For the SNP AVPR1 rs10877969, subjects with the variant allele showed a trend towards having a decreased odds of responding to a LESI (OR = 0.1, P = 0.07). There was also statistical significance in each of the above associations for responders defined as a 2 point or more decrease in pain score.

Conclusions: SNPs represent a potential opportunity to improve the clinical ability to predict response to treatment for LESI. A larger sample size with prospective study design to evaluate the ability of the SNPs to improve clinical decision making will be needed.

ATYPICAL PRESENTATION OF EPIDURAL ABSCESS DUE TO PRIOR LAMINECTOMY

Natasha Kohanzadeh, MD, Candidate, and William Filer, MD

Case Diagnosis: Large Epidural Abscess without Neurologic Deficits.

Case Description: Ms. B is a 46-year-old morbidly obese female with a history of uncontrolled insulin dependent diabetes mellitus, psoriatic arthritis, and chronic nausea/vomiting. She utilizes a central line for self-administered medication to treat the chronic nausea. She had laminectomy 8 months prior to relive cauda equina syndrome. Back and leg pain persists leading to Ms. B receiving a caudal epidural 18 days prior to presentation. Ms. B presented to the ED with fevers, continued pain and debility. Her initial work up for the fever and chills revealed an MRSA UTI. Follow-up blood cultures also revealed MRSA bacteremia. She began treatment for these infections but continued to have unmanageable back pain without any new neurologic deficits. MRI revealed a large epidural abscess 4.3 cm in diameter at L3-L4. The abscess was drained without surgical intervention. MRSA was also found in her right knee. Ms. B completed a six week IV antibiotic course of daptomycin and rifampin. She was admitted to Rehabilitation for three weeks to treat her debility. At the time of discharge Ms. B was out of fevers, running short distances, and independent for self-care.

Discussion: Ms. B is a 46-year-old morbidly obese female with history of uncontrolled insulin dependent diabetes mellitus, psoriatic arthritis, and chronic nausea/vomiting. She utilizes a central line for self-administered medication to treat the chronic nausea. She had laminectomy 8 months prior to relive cauda equina syndrome. Back and leg pain persists leading to Ms. B receiving a caudal epidural 18 days prior to presentation. Ms. B presented to the ED with fevers, continued pain and debility. Her initial work up for the fever and chills revealed an MRSA UTI. Follow-up blood cultures also revealed MRSA bacteremia. She began treatment for these infections but continued to have unmanageable back pain without any new neurologic deficits. MRI revealed a large epidural abscess 4.3 cm in diameter at L3-L4. The abscess was drained without surgical intervention. MRSA was also found in her right knee. Ms. B completed a six week IV antibiotic course of daptomycin and rifampin. She was admitted to Rehabilitation for three weeks to treat her debility. At the time of discharge Ms. B was clear of infection, walking short distances, and independent for self-care.

Conclusions: Ms. B was clear of infection, walking short distances, and independent for self-care.

BARORECEPTOR FAILURE FOLLOWING CHEMOTHERAPY FOR NECK CANCER: A CASE REPORT

Viven Solomon, and Susan Maltsers, DO

Case Diagnosis: Baroreceptor Failure following Radiation for Stage IV Squamous Cell Carcinoma of the Oropharynx and tonsils.

Case Description: A 45-year-old male with history of Stage IV squamous cell carcinoma of oropharynx and tonsils was admitted from home for frequent falls and unsteady gait worsening over three weeks. A month prior to admission, he finished his last course of radiation therapy and systemic treatment with Cisplatin. His physical examination was non-significant except for a BP of 87/60. His EKG, CXR, CT MIP, CT head, EEG, MRI brain, and PET scan were negative, and results from Oncology, Neurology, Endocrinology, Nephrology and Cardiology revealed no definitive cause of hypotension. A diagnosis of baroreceptor failure was made based on the patient’s presentation, medical history, and lack of any other diagnostic entity. He was managed with Fludrocortisone, Pindolol, and Midodrine, which we had a limited response to, and physical therapy for gait training, which helped him ambulate safely.

Discussion: The body has baroreceptors and chemoreceptors to detect and respond to changes in BP. Impairment in these autonomic reflexes, or depletion in intravascular volume, can cause orthostasis. Baroreceptor failure is caused by dysfunctional baroreceptors, and patients present with labile BP, orthostatic intolerance, and recurrent pre-syncpe or syncope episodes. Research has shown baroreceptor failure as late sequelae of radiation therapy in head and neck cancer patients, caused by an accelerated development of carotid atherosclerosis that disrupts the activity of carotid sinus baroreceptors. Several case reports and a recent case have been published describing this relation, which has been shown to be present in patients who received unilateral or bilateral radiation for head and neck cancer.

Conclusions: Baroreceptor failure is a complication of treatment of head and neck cancer. Physiatrists specializing in Cancer Rehabilitation should be aware of this complication when presented with patients who have had radiation to the head and neck and have orthostasis.

BURKE LATEROPULSION SCALE AS AN INDEPENDENT PREDICTOR OF FUNCTIONAL RECOVERY ON AN ACUTE INPATIENT REHABILITATION STROKE UNIT: A RETROSPECTIVE ANALYSIS

Parish Moghaddampour, Christopher Tarver, MD, Duc Tran, MD, PHD, and Mary Kim, MD

Objectives: The Burke Lateropulsion Scale (BLS) is a validated measurement tool for identifying Pusher Syndrome, a lateropulsion disorder associated with longer recovery after stroke. This retrospective chart review was performed to determine whether the BLS score is a predictor of motor functional recovery under standard inpatient rehabilitation care.

Design: A single institution retrospective review of all patients with stroke who were admitted to an acute inpatient rehabilitation facility between August 2015 and June 2016 was performed. Of those screened, 31 patients who had a recent stroke within the prior two months and an initial BLS score recorded were included in this study. The demographics and clinical characteristics of these patients were recorded. Motor Functional Independence Measure (FIM) and total FIM velocity were utilized as evaluation tools of motor and cognitive functioning post stroke. Statistical analysis was performed using linear regression analysis.

Results: A higher BLS score on admission, indicating more severe lateropulsion post stroke, was significantly correlated with a slower motor FIM velocity (p = 0.04) and a slower total FIM velocity (p = 0.002). A higher BLS score was also correlated with a longer length of stay in the facility (p = 0.002). Age did not have an effect on the relationship between initial BLS score and motor or total FIM velocity. There was no relationship between initial BLS score and time to standing or ambulating at a minimum assist level or eventual discharge destination.

Conclusions: Patients with more severe lateropulsion or Pusher Syndrome are more likely to experience a slower functional recovery that affects both motor and cognitive domains and require a longer acute rehabilitation hospitalization. Future studies can assess if this relationship is consistent with a larger study population.

CAN PROBIOTICS SHORTEN THE DURATION OF ANTIBIOTIC ASSOCIATED DIARRHEA IN SPINAL CORD INJURY PATIENTS WITH NEUROGENIC BOWEL?

Patrick Curtin, BS, Guizela T. B. Casella, MD, PHD, and Margaret A. Turk, MD

Objective: 1. in patients who enter a healthcare facility within the US will experience some sort of antibiotic associated diarrhea (AAD). Due to the increased instances of predisposing conditions, the spinal cord injury community is at an even greater risk for developing AAD, yet very little research has been performed. The
goals of this study were to determine whether probiotics have an effect on length of AAD in SCI patients with neurogenic bowel.

**Design:** This was a retrospective chart review (RCR) that evaluated patients with a diagnosis of SCI who manifested with suspected AAD. Patient charts were reviewed for documented diarrhea post antibiotic use, and data collected including antibiotic dose, length, and type; use of probiotics; and bowel medications used during diarrhea episodes.

**Results:** Seventy-five charts were reviewed with 12 patients meeting the criteria. Of these 12 patients, 7 received some kind of probiotic during a period surrounding their diarrhea. These individuals had a shorter average length of AAD versus patients not administered probiotics (5.4 days vs. 8 days). The patients who were received probiotics also took a greater mean number of bowel drugs during the time of their AAD (2.33 versus 1.5). Regardless of whether the probiotic was started before or after the antibiotics were started, probiotics also took a greater mean number of bowel drugs during the time of their AAD (2.33 versus 1.5). Regardless of whether the probiotic was started before or after the antibiotics were started, probiotics also took a greater mean number of bowel drugs during the time of their AAD (2.33 versus 1.5). Regardless of whether the probiotic was started before or after the antibiotics were started, probiotics also took a greater mean number of bowel drugs during the time of their AAD (2.33 versus 1.5).

**Conclusion:** from this small sample, it appears administration of probiotics to SCI patients with suspected AAD can help shorten the mean length of diarrhea. Short term antibiotics with a course as short as 4 days can cause suspected AAD in a population of patients with SCI and associated neurogenic bowel.

**CAPSACIN 8% PATCH FOR SPINAL CORD INJURY FOCAL NEUROPATHIC PAIN**

Christina Nguyen, DO, MS, Michelle Trivobch, MD, Amset Nagpal, MD, MS, MED, Gabrielle Nguyen, MD, Jacob Fehl, MD, and Esha Lukose, MD

**Objectives:** Neuropathic pain (NP) after spinal cord injury (SCI) is often refractory and can exacerbate physical disability and decrease quality of life (QOL). The capsicain 8% patch (CP) is a promising agent FDA approved for NP and useful in treating human immunodeficiency virus-autonomic neuropathy, resulting in a reduction of oral opioid use in these populations, and repeated application results in persistent desensitization over time. CSP Animal SCI models and case reports in SCI humans have shown CP to be effective for NP pain refractory to traditional oral and topical treatments. We hypothesize CP may provide significant pain relief in persons with SCI with potential to decrease polypharmacy while minimizing adverse effects and improving QOL and function.

**Design:** Randomized single-blinded crossover pilot study. Participants were randomized to receive CP or Capsaicin 0.025%, control patch. Per CP manufacture protocol, a 16x20cm painful area was identified was anesthetized with topical lidocaine 2.5%/prilocaine 2.5% before the test patch was applied. Primary outcome measures included pain severity measured by the Visual Analog Scale (VAS) and the Multidimensional Pain Inventory (MPI). Secondary outcome measures included QOL measured by the World Health Organization Quality of Life (WHOQOL-BREF), and function measured by Spinal Cord Independence Measure (SCIM).

**Results:** Two patients have been enrolled to date. Patient 1 (P1) received CP and Patient 2 (P2), the control. MPI and VAS showed no changes in pain severity. WHOQOL-BREF in P1 showed the highest scores in at weeks 4 and 8, while P2 reported fluctuating scores throughout the 12 weeks but the highest score at 12 weeks. SCIM showed P1 had 10% increase in functional independence at week 8 while P2 reported 12% increase at week 4.

**Conclusions:** CP improved functional independence and QOL for 8 weeks. These findings are consistent with previous non-SCI studies. Future enrollment will provide more clinically significant data.

**CHANGING CLINICAL COURSE OF SPINAL MUSCULAR ATROPHY TYPE 1**

Clint M. Bunde, BS

**Case Diagnosis:** Spinal Muscular Atrophy (SMA) Type 1.

**Case Description:** Two brothers, ages 5 years (Patient 1) and 6 months (Patient 2), both presented to the outpatient clinic with SMA-1. Patient 1 has progressed to a ventilator, wheelchair and G-tube feedings. He has severe muscle weakness and has lost all motor control in his hands. Patient 2 is taking part in a clinical trial for infants with SMA-1 utilizing an intrathecal antisense oligonucleotide therapy. He is rolling, sleeping, social/personality, facial expression, activity, body and limbs and physiological changes such as constipation. Patients 1 and 2 will be followed over the next 6 months. What follows are updates on their status and a review of data collected.

**Discussion:** SMA-1 is an autosomal recessive neuromuscular disorder of anter ior horn motor neurons causing symmetrical muscle weakness and atrophy. The muscle weakness in these patients is derived from a defective SMN1 gene, leading to denervation and eventual atrophy of motor units. Infants with SMA-1 typically present with marked hypotonia that progressively worsens with age. Most children with SMA-1 do not survive past 3 years of age, and those that do experience a relatively poor quality of life with muscle weakness, loss of motor control and respiratory failure. Treatment for these patients has typically been passive physical therapy and palliative care with goals of preventing hospitalizations and retaining range of motion. Stretching, range of motion, and use of anti-inflammatory medications help reduce spasticity and dystonia are common causes of pain. Musculoskeletal pain can be localized in the back, neck, foot/ankle, shoulder, knee, hip and arm. Gastro-intestinal pain often caused by gastro-esophageal reflux secondary to changed muscular function in the esophagus or lower esophageal sphincter and spinal deformity (scoliosis). Problems with gastrointestinal (PEGs) cause pain. Procedural pain include daily assisted stretching, range of motion manipulation, and needle injections. Activities of daily living such as getting dressed can be painful. Other adult causes of pain include: dental, headaches and periods.

Non-pharmacological treatments can be warmth such as a warm bath or cold as an ice pack. Sometimes massage can help relieve tense muscles. Optimal pain management occurs before, during, and after a procedure and should include plans to address anxiety before initiation of any procedure. Massage and chiropractic ad juncts score the most frequently endorsed. Acupuncture had the highest effectiveness ratings of all the alternative/complementary treatments. Marijuana was also very effective in adult pain management.

**Conclusion:** Pain in CP seems to be overlooked and insufficiently treated by caregivers and health professionals. It has been shown to impact negatively on daily living and is associated with worsening walking ability in the adults. There are only a few studies on treatment of pain in CP and none that systematically evaluate this in adults. Individuals with cognitive or communicative difficulties presents particular difficulties. Change in behavior, particularly amongst adults with cognitive difficulty, should be investigated as a symptom of a medical problem before ascribed to “behavior.” Pain behavior might include changes in vocal expressions, eating/sleeping, social/personality, facial expression, activity, body and limbs and physiological changes such as constipation.

**CIRCULATING PAMM, A NOVEL ANTIOXIDANT PROTEIN, IS ELEVATED FOLLOWING ACUTE SCI**

Leslie Morse, DO, Nguyen Nguyen, Yan Xu, PHD, and Ricardo Battaglini, PHD

**Objectives:** Peroxiredoxin Activated in M-CSF stimulated Monocytes (PAMM) is a recently identified novel redox regulatory protein that is produced by adipocytes with putative anti-inflammatory properties. We hypothesized that acute neurotrauma might induce changes in PAMM expression. We therefore investigated circulating PAMM levels in men and women with and without acute spinal cord injury.

**Design:** We studied men and women with SCI during their acute rehabilitation stay at our inpatient facility and age and gender matched healthy controls. Serum samples were obtained and stored at ~80 °C until batch analysis. Total PAMM was quantified by ELISA assay (MyBioSource, Cat.No: MBS9327247) with a detection limit of 0.25 ng/mL. Multivariate models including age, gender, BMI, and degree of neurological injury were assessed to determine significant predictors of PAMM levels. Results: When adjusting for age and BMI, the mean PAMM level was significantly greater in the SCI group compared to the unjured controls (n = 133; 2.6 mg/mL vs 1.3 mg/mL, p2 = 0.16). A model adjusted for age and BMI and considering motor complete SCI versus unjured controls explained 23% of the variation in circulating PAMM levels (n = 108, 2.6 mg/mL vs 1.3 mg/mL, p = 0.0002, R2 = 0.23).

**Conclusions:** Our results suggest that circulating PAMM levels increase by over 100% acutely following SCI. PAMM may be a novel biomarker of neurological injury or of native anti-inflammatory responses to neurological injury. More work is needed to establish the role of PAMM and other adipocyte-derived factors in the acute response to neurotrauma.
COMMUNITY FUNCTIONAL WALKING METRICS, A PRELIMINARY REPORT
Quinn Tate, MD, Venessa Lee, MD, Teri Chou, PhD, Christopher Duncan, MD, and Bradeigh Godfrey, DO

Objectives: The objective of this study is to define clinically meaningful change in walking function of lower limb prosthetic users to better assess improvement or decline in function over time. According to prior research, self-reports of clinical walking function are unreliable. A recent VA initiative supports using activity monitors to monitor community walking metrics. This study aims to define natural fluctuations with stable walking function from week to week versus clinically relevant changes in walking function. The specific aims are first, to determine small meaningful changes in the following community metrics: functional level assessment, peak performance index, daily steps, walking distance, cadence, and cadence variability and second, to determine substantial meaningful changes in the community metrics.

Design: Recruitment of 100 participants that ambulate with a lower limb prosthesis, including both Veterans and civilians. The StepWatch activity monitor will be attached to the prosthesis and provide weekly reports on the participant’s community walking metrics. Each participant will be monitored for six months. Clinically relevant change will be based on participant reported Global Mobility Change Rating score weekly. A diagnostic testing framework will be utilized to determine the optimal cut-points on the community metrics, which maximizes classification accuracy (no change, small meaningful change, or substantial meaningful change).

Results: Currently, data was obtained on n = 17 subjects for a total of 139 weeks. Data collection is ongoing. The metrics with the strongest correlation to the Global Mobility Change Rating score was change in daily steps (p = 0.008) and change in daily distance walked (p = 0.030). Change in cadence, cadence variability, peak performance index, and functional level indices did not correlate to the Global Mobility Change Rating score at this time. Optimal cut-points will be established once at least data on n = 50 subjects is processed (Dec. 2016).

Conclusions: The immediate benefit of this study is the ability of providers to determine if change in community ambulation is clinically relevant, or due to natural variation. This will provide immediate benefit to clinicians in documenting the impact of rehabilitation therapies, changes in prosthetic components or sockets, or any other treatment interventions. The long-term benefit is the optimization of treatment plans, prosthetic prescriptions, and rehabilitation protocols because of the ability to correctly interpret the impact of strategies on a patient’s walking. In addition, the results of this project will be essential to interpretation of any further research utilizing these community-walking metrics in amputees. This project will support future evidence-based practice, allowing providers to optimize care of patients with limb loss. The results from this study will also support other research studies comparing the effectiveness of different prosthetic components and treatments since statistical improvements must also be clinically relevant to improve the life of the patient.

COMPARATIVE INPATIENT REHABILITATION OUTCOMES OF ANTERIOR TOTAL HIP ARTHROPLASTY: WITH AND WITHOUT POST-OPERATIVE SURGICAL PRECAUTIONS
Noel Rao, MDFAAPMR, Norman Aliga, MD/FAAPMR, Dolly Devara, MD/FAPMR, Susan Brady, DHED, MS, CCC-SLP, BCS-S, ASHA FELLOW, Marcia McKitterick, MPT, and Morgan Mrooz, BS

Objectives: Anterior hip arthroplasty involves surgical access through the anterior hip capsule exposure is gained without detaching surrounding muscles. Given low dislocation rates post-surgical precautions may not be justifiable. Objective of the study was to compare rehabilitation clinical outcomes based on hip arthroplasty with an anterior surgical approach for patients with and without post-operative surgical precautions.

Design: Observational, descriptive study design

Participants: Sixty-eight patients’ medical records were retrospectively reviewed using a sample of convenience.

Main Outcome Measures: Total admission and total discharge functional independence measure (FIM) scores, FIM gain, FIM gain per day, length of stay (LOS), and discharge disposition.

Results: Group 1, n=31, included patients admitted to inpatient rehabilitation with anterior hip arthroplasty. Group 2=37, included patients admitted to inpatient rehabilitation with posterior hip arthroplasty. No statistically significant differences was observed between the two groups at admission for age (Group 1 mean age = 66.74 years; Group 2 = 67.30 years; F=0.14, p=0.811) and for admission FIM scores (p=0.866), suggesting both groups were similar at admission. At discharge, both groups made similar progress related to overall FIM gain per day with Group 1=2.90 and Group 2=2.69 (F=17.275, p<.007) and for Total FIM gain per day with Group 1=290 and Group 2=245 (F=15.318, p<.006).

Conclusions: Both groups made similar overall progress during inpatient rehabilitation with respect to overall FIM gain and discharge FIM scores. The no-precaution group made gains within a shorter timeframe reflecting improved efficiency with rehabilitation outcomes for the no-precaution group.

COMPARING A NOVEL, SIMPLIFIED CLASSIFICATION SYSTEM TO ESTABLISHED CLASSIFICATION SYSTEMS IN ADULTS WITH SPINA BIFIDA
John R. Frampton, MD, Anne C. Tita, MD, and Brad Dicianno, MD

Objective: Several systems exist to quantify motor impairment in Spina Bifida (SB) but some are lengthy to administer and their correlation with functional ability have not been systematically compared. We developed a novel, simplified classification system and hypothesized that this system would correlate strongly with both an established classification system of neurological level (Broughton scale) and ambulation status (Hoffer scale), and that anatomic level of spinal lesion alone would not correlate strongly with either neurological level or ambulation.

Design: Data were collected from a retrospective chart review of 409 adults with SB from the UPMC Adult Spina Bifida Clinic. Anatomic level of spinal lesion, ambulation status based on Hoffer classification (Hoffer et al. describing 4 groups of ambulators: Community/Household/Therapeutic/Wheelchair, and neurological level of injury based on Broughton classification (Broughton et al. describing 9 neurologic levels: 1-thoracic/5-lumbar/2-sacral/1-“no loss”)) were assigned. A novel, simplified clinical disctes (Pitt Scale) was developed which estimated neurologic level of injury based on Hip Flexion (HF) and Knee Extension (KE) (Thoracic=Weak HF/Weak KE; L2=Strong HF/Weak KE, L3=Weak HF/Strong KE, Normal=Strong HF/Strong KE). Spearman Rho analyses determined correlations between the Pitt scale and Hoffer and Broughton scales. Anatomic level of injury was then compared to both Hoffer scale and Pitt scale.

Results: The Pitt scale was strongly correlated with both Broughton scale (rs=0.853 p<0.001) and Hoffer scale (rs=0.771 p<0.001). Anatomic level was only moderately correlated with both Hoffer scale (rs=-0.460 p<0.001) and Pitt scale (rs=0.483 p<0.001).

Conclusions: The Pitt scale may be useful for clinicians as it is quick to administer and correlates strongly with established scales for quantifying neurological level and ambulation ability in adults with SB. Anatomic level is less accurate in predicting either motor impairment or ambulatory ability. Future studies will be conducted to evaluate how motor level interacts with other factors in predicting ambulatory ability.

COMPARING WEEFIM OUTCOMES IN CHILDREN WITH DEVELOPMENTAL DISABILITIES TO CHILDREN WITHOUT DEVELOPMENTAL DISABILITIES
Mary Schmidt, DO, and Amy Houtrow, MD, PHD, MPH

Objectives: To determine how inpatient rehabilitation (IPR) WEEFIM outcomes differ between children with developmental disabilities and children without development disabilities.

Design: Secondary data analysis of the Uniform Data Systems (UDS) IPR WEEFIM data from 2004-2014 from 77 national inpatient rehabilitation programs. Participants included 36,418 children aged 3-18 years undergoing inpatient pediatric rehabilitation. The main outcome measures were Length of stay (LOS), WEEFIM gain and WEEFIM efficiency.

Results: 3232 children (8.9% of the sample) were classified with an impairment code for developmental disability. Compared to children with other types of impairments, children with developmental disabilities were more commonly admitted from home (30.3% compared to 12.3%), had public health insurance (56.8% compared to 44.3%) and were cared for in the Northeast (50.3% compared to 33.3%) and Midwest (29.1% compared to 22.8%) regions in freestanding pediatric rehabilitation hospitals (43.1% compared to 28.2%) (p<0.05 for all comparisons). On average, after controlling for socioeconomic and hospital characteristics, children with developmental disabilities spent 22 additional days in IPR, were admitted with lower admission WEEFIM scores by 6.4 points, had 10 points lower WEEFIM gain, and had lower WEEFIM efficiency (0.84 compared to 2.1).

Conclusions: The overall trend for insurance reimbursement in IPR is placing an emphasis on shorter length of stay. This enforces the need to maximize WEEFIM efficiency during IPR. Children of developmental disabilities have lower functional skills upon admission and have lower rehabilitation outcomes compared to other children despite longer LOS. This study demonstrates that children with developmental disabilities benefit from IPR stay and highlights the need to work proactively with insurance sources in anticipation of slower trajectory of recovery.
COMPARISON OF COMPLICATED AND UNCOMPLICATED MILD TRAUMATIC BRAIN INJURIES IN CHILDREN SEEN IN AN OUTPATIENT CLINIC
Keith Cummings, DO, Colby Hansen, MD, Masaru Teramoto, PHD, MPH, and Daniel Cashman, MD
Objectives: Conclusions, also known as mild traumatic brain injuries (mTBI) can be classified as uncomplicated (concussive symptoms alone, u-mTBI) or complicated (concussive symptoms with evidence of skull fracture or vascular injury, c-mTBI). Little literature exists concerning c-mTBIs, so this study aimed to evaluate whether differences in recovery exist between these with a c-mTBI and a u-mTBI.
Design: This was a retrospective cohort study set in an academic sports medicine clinic specializing in post-concussive management. C-mTBI was classified as having evidence of fracture and/or bleeding on a computed tomography (CT) scan. Patients who did not undergo a CT scan, as well as patients who did but no abnormalities were seen, were classified as having a u-mTBI. A post-concussion symptom scale scoring sheet was used at the time of clinic visit to identify self-reported symptom burden. To measure balance, a standardized BESS protocol was performed by a physician in a quiet clinic room.
Results: The cohort consisted of 185 pediatric patients, of which 28 (15.1%) sustained a c-mTBI. Younger patients sustained more c-mTBIs compared to older patients (p = 0.007). Median days since concussion were 59.5 and 40 days for u-mTBIs and c-mTBIs, respectively (p = 0.05). Boys demonstrated a trend for more commonly sustaining c-mTBIs, but this was not significant (19.3% of boys vs 9.2% of girls, p = 0.064). Subjects with c-mTBIs tended to have a lower symptom burden than those with u-mTBIs (p = 0.016). Total BESS scores were similar between complicated and uncomplicated mTBIs (p = 0.828).
Conclusions: Children with c-mTBI appear to recover well after their injury. This study may be affected by selection bias due to the retrospective nature of this study. Prospective evaluation of children with c-mTBIs may better outline this recovery.

CONTRALAESIONAL PRIMARY MOTOR CORTEX AND MOTOR RECOVERY FROM STROKE – A MULTIMODAL STUDY
Carmen M. Cirstea, MD, PHD, and Joseph Burns, MD
Objectives: Arm motor recovery after stroke is often attributed to brain reorganization. For instance, the abnormally increased activation and excitatory neural activity in the contralateral primary motor cortex (cM1) reported immediately after stroke normalizes at the chronic stage in recovered patients. Whether persistent cM1 alterations reflect a less efficient type of reorganization (so-called maladaptive plasticity) is still far from settled. We investigated the activation (functional MRI) and excitatory activity (proton magnetic resonance spectroscopy) of cM1 that parallel arm recovery (defined here as decrease in behavioral compensation) following a motor intervention in chronic stroke survivors.
Design: Ten survivors (age, mean±SD: 58.7±6.8 years; 2 females) of a subcortical ischaemic stroke 32.9±7.7 months previously, presenting arm impairment (Fugl-Meyer, 35.6±18.6), underwent neuroimaging and kinematics assessments prior and after a four-week arm impairment-oriented training. Ten age-sex-matched healthy controls were also evaluated to estimate pre-stroke neuroimaging/kinetimetric values. Metrics of cM1 (activation during impaired arm movement; glutamate-glutamine levels) and behavioral compensation (trunk movement during impaired arm movement) were investigated.
Results: Pre-intervention: Relative to controls, survivors exhibited greater activation and higher glutamate-glutamine levels in cM1, and increased trunk movement. They also showed higher and significant correlations between cM1 activation and trunk movement compared to controls, suggesting a direct relationship between functional cM1 reorganization and behavioral compensation. Post-intervention: Survivors exhibited decrease in both cM1 and trunk metrics. Changes in cM1 metrics did not significantly correlate with trunk changes. The failure of these correlations to achieve significance reflects the maladaptive relevance of cM1 changes.
Conclusions: Our preliminary data provide evidence that functional/neurochemical cM1 reorganization may impact the extent of arm recovery in chronic stroke. We advocate that a neuroimaging-kinetimetric approach may facilitate distinctions between recovery and compensation at both neural and behavioral levels. This knowledge could have a significant impact on how we approach the challenge of optimizing the success of rehabilitation after stroke.

CORRELATION OF FALLS VS. MINI MENTAL STATE EXAM (MMSE), MEDICAL HISTORY IN DEMENTIA PATIENTS WITH DIRECT CLINICAL APPLICATIONS
Katrina Tate, MS, Meghan Moodabagil, MS, Andrew Becker, MS, and Ricardo G. Semmo, MD
Objectives: There are currently few studies that assess risk factors for falls in the dementia population. This study investigates (1) the rate, setting, and mechanisms of falls, and (2) the relationships between medical history and fall rate in varying stages of dementia.
Design: The study was conducted at three memory care communities in Illinois with 153 residents with varying degrees of dementia: males and females, ages 65 to 99, categorized into mild, moderate, or severe dementia based on their MMSE score. Medical histories were extracted from charts. Time, location of falls, and mode of ambulation were obtained from fall reports. A limitation was non-standardized data reporting across sites.
Results: The study included 25 mild, 55 moderate, and 73 residents with severe dementia. 61% (93 residents) experienced a total of 374 falls. The average MMSE score was 10. Of all residents, mild dementia had a lower fall rate (48%) than moderate (69%) or severe dementia (59%). Males fell more frequently than females. Most falls occurred during the evening. Mechanism of falls was found to be dependent on location and time, and not dependent on mode of ambulation. Residents on Levotiroxine had a 29% increase, anti-parkinsonismians had a 40% increase, and anti-psychotic medications had a 25% increase in falls. Residents on anti-hypertensives fell 10.2% less and respiratory medications fell 18.1% less than expected. This analysis does not account for multiple confounding effects. Hyperlipidemia increased the risk of falls by 20.2% and Parkinson’s disease by 68%.
Conclusions: Multiple medical factors contributed to an increase in falls. Suggestions to decrease frequency of falls include shifting caregiver attentiveness to higher risk residents. This research will serve for continued, longitudinal studies to investigate the effects of multiple drug use and the effects of multiple co-morbidities.

COST-EFFECTIVENESS ANALYSIS OF THE POST-ACUTE REHABILITATION PROGRAM FOR THE FEMORAL FRACTURE PATIENTS IN TAIWAN
Rei Yu Ding, MD, and Mung-Jen Kao, MD
Objectives: Hip fracture has a great impact on the development of the comorbidity, the up going of mortality and financial influence. In Taiwan only, the cost for hip fracture patients is 1.3 billion NTĐ per year, which is a great burden for our health care system. It is known for a fact that rehabilitation has positive effects in these patients. Our aim is to analyze the cost-effectiveness of our 2-week post-acute inpatient rehabilitation program for hip fracture patients in Taiwan.
Design: We analyzed a total of 483 hip fracture patients, who was enrolled in our post-acute rehabilitation inpatient program from 2011 to 2013. The patients first received primary operation interventions in medical centers and then transferred to our hospital for specialized rehabilitation programs after stabilization. All of these patients received an intense rehabilitation program for 2 weeks and are evaluated with Barthel Index upon admission and discharge. The total cost of each patient is recorded by the administrative office in our hospital. Statistical analysis was performed based on gender, different fracture type, operation methods and initial Barthel Index points.
Results: The average medical cost for the post-acute rehabilitation inpatient program was 30,884.4 NTĐ, and the average Barthel Index improvement point is 25.24 in all patient group. Barthel index improvements after the rehabilitation program are greater in patients who receives hemiarthroplasty and femoral neck fracture. The average cost per point improvement is significantly higher in the group of open reduction and internal fixation and intertrochanteric fracture. Also, patients with initial Barthel index ranging from 20 to 39 points have the greatest cost-effectiveness in this post-acute rehabilitation program.
Conclusions: This 2-week inpatient rehabilitation program is most cost-effective in patients who have a femoral neck fracture, hemiarthroplasty or their initial Barthel Index ranging from 20 to 39 points.

DELIRIUM AMONG PATIENTS UNDER CONSTANT OBSERVATION AT AN INPATIENT REHABILITATION FACILITY: A PILOT STUDY
Kai Kim, MD, Anthony Lee, MD, and Moeooyen Oh-Park, MD
Objectives: Constant observation (CO), is a costly intervention commonly practiced in hospitals. Delirium, an acute decline in attention and cognition, is one of the most common reasons for CO. However, the prevalence of delirium among the patients on CO in an inpatient rehabilitation facility (IRF) has not been well studied. The study objectives were to investigate the prevalence and pattern of delirium among patients placed under CO and to evaluate the functional outcomes of delirious versus non-delirious patients.
Design: Descriptive Study
Methods: Eighteen patients on CO were screened for delirium. The reasons to initiate CO included fall risk, impulsivity, and cognitive impairment. 12 out of 18 (67%) were positive for delirium at baseline. Delirious patients were older than non-delirious patients (mean age, 72.6±12.8 versus 65.3±19.1, p < .01). The majority of delirious patients had neurologic diagnosis (stroke=4, brain injury=2, brain tumor resection=1). There was an equal percentage of hyperactive, hypoactive, and mixed types of delirium (33% each). 2 patients presented with a non-directive cohort minimum of 21 weeks. Mean motor and cognitive FIM scores at discharge were lower in delirious patients compared to non-delirious patients (47.8±20.6 versus 54.0±17.4, 17.1±4.4 versus 22.0±6.7).
However, the differences were not statistically significant.
**DIAGNOSTIC CHALLENGES OF PRIMARY NEUROSARCOIDOSIS OF THE SPINAL CORD**

Hannah E. Gray, BS, Jay Meythaler, MD, JD, and Steven Hinderer, MD, PT, MS

**Case Description:** Primary neurosarcoidosis of the spinal cord.

**Diagnosis:** Sarcoidosis.

**Case Description:** Mrs. B is a 55-year-old African American female who began experiencing neurological symptoms of dizziness and gait disturbances. Due to clinical concerns for Multiple Sclerosis, Mrs. B received a lumbar puncture that demonstrated elevated protein, pleocytosis, and decreased glucose levels. Additionally, her CSF showed elevated IgG and oligoclonal bands supporting an MS diagnosis. An MRI of her brain revealed nonspecific white matter changes and hydrocephalus of unknown etiology. Mrs. B was referred to the hospital where she had a VP shunt placed. The patient continued to experience worsening symptoms and eventual paralysis of her lower extremities. Because of her disease progression, spinal MRI's were taken. Spinal imaging indicated cord compression at levels T8, T9, and T10 due to an intradural extramedullary lesion. Pathology of the mass indicated multiple granulomas composed of histocytes and multinucleated giant cells. The biopsy was evaluated for potential infectious etiologies, but the results were negative. After months of ruling out other etiologies, Mrs. B was diagnosed with primary neurosarcoidosis of the spinal cord.

**Discussions:** When patients with a known history of sarcoidosis begin having neurological symptoms, neurosarcoidosis is considered early in the diagnostic workup. Primary neurosarcoidosis, on the other hand, is more difficult to diagnose and can be easily misdiagnosed as a different neurological disease, infection, or vasculopathy. Our patient, Mrs. B, was diagnosed with hydrocephalus early in her workup, but the primary cause of her hydrocephalus was overlooked. Hydrocephalus is rarely observed in patients with primary neurosarcoidosis, and this is potentially one of only two cases reported in the literature at this time.

**Conclusions:** Although primary neurosarcoidosis is rare, it is important for physicians to be knowledgeable of its similarities to other neurological disorders in order to consider neurosarcoidosis as a differential diagnosis when assessing patients with idiopathic hydrocephalus.

**DIFFERENCES BETWEEN UNDERGRADUATE PHYSICAL THERAPY AND MEDICAL STUDENT READINESS FOR INTERPROFESSIONAL EDUCATION**

Terin Sytsma, MD, John H. Hollman, PT, PhD, Dave Knouse, PT, DSC, OCS, Andrea Leop Hunderfand, MD, MPH, and Newcomer Karan, MD

**Objectives:** Preparing healthcare students for interprofessional collaboration is important for quality patient care. Healthcare training programs are increasingly emphasizing interprofessional education (IPE) in their curricula. The purpose of this study was to quantify and compare readiness for IPE in undergraduate physical therapy (PT) and medical (MD) students after an interprofessional workshop.

**Design:** During 2015 and 2016, second-year PT and fourth-year MD students (n=137) participated in a half-day workshop where they were placed into interprofessional teams to discuss musculoskeletal-based clinical scenarios with PT and MD faculty facilitators. Students completed the Readiness for Interprofessional Learning Scale (RIPLS) immediately following the workshop. This scale is comprised of 19 items rated using a five-point Likert scale (total possible scores range from 19 to 95, with higher scores indicating greater readiness for IPE).

**Results:** Overall, 56 PT and 81 MD students participated in the IPE curriculum, and 56 (100%) and 76 (93.8%) completed the post-workshop survey respectively. Total post-workshop RIPLS scores were high for both groups, though PT students scored significantly higher than MD students (86.3 vs. 80.3, p < 0.001). PT students also scored higher in all three RIPLS subscales: Teamwork and Collaboration (42.2 vs. 40.3, p < 0.01), Professional Identity and Roles (31.3 vs. 29.4, p < 0.006), and Roles and Responsibility (12.9 vs. 10.4, p < 0.001).

**Conclusions:** Fourth-year MD students, despite having advanced further in their professional training, had lower readiness for IPE than second-year PT students following a musculoskeletal-based interprofessional workshop. This may represent baseline differences between the two groups or the emphasis on IPE in their respective training programs. MD students may benefit from additional IPE exposure and curricula highlighting the value of interprofessional collaboration. Further studies are needed to determine how other factors (such as year of training, learning content and instructional methods) relate to IPE readiness.

**DIFFERENCES IN THE DYNAMIC IMMUNE RESPONSE FOLLOWING SPINAL CORD INJURY AT T6 AND ABOVE VS BELOW T6**

Emily A. Robbins, DO, Yoram Vodovotz, PhD, Wun Huang, MD, PhD, Ruben Zamora, PhD, and Gwendolyn Sowa, MD, PhD

**Objectives:** The immune response after spinal cord injury (SCI) is not well characterized. Typically, innate immune responses occur early, attracting peripheral
neutrophils, monocytes/macrophages to injured tissue. This is closely followed by a pro- and anti-inflammatory lymphoid response involving Th1, Th2, pathogenic Th17, and Treg cells. The aim of this study was to define dynamic immune networks following SCI, and how these dynamic responses differ in subjects with injuries T6 and T6A (Group 1 vs. Group 2).

**DOE IN VIVO MEDIAN NERVE STEROID INJECTIONS FOR CARPAL TUNNEL SYNDROME**

Lindsay Zafra, DO, Gabriel Rudd-Barnard, MD, MS, Richard Zhang, MD, Ian Dworkin, MEDICAL DEGREE, G. Sunny Sharma, MD, Edward Pang, DO, MS, Ashna Basu, MD, and Dixie R. Aragaki, MD

**Objectives:** To assess the clinical response of two different steroid doses (20 mg vs. 40 mg triamcinolone acetonide) injected under ultrasound (US) guidance with the ulnar in-plane approach in patients with carpal tunnel syndrome (CTS).

**Design:** Prospective, single-blinded, randomized study. Participants from the Veteran Affairs Physical Medicine and Rehabilitation outpatient clinic were eligible if they had symptomatic electrodiagnostically-confirmed CTS. Study patients were randomized into two groups: Group 1 received 20mg Kenalog + 1.0 mL 1% lidocaine and Group 2 received 40mg Kenalog + 1.0 mL 1% lidocaine injected into the carpal tunnel using the ultran in-plane ultrasound guided technique. Main outcome measures are: 1) Boston Carpal Tunnel Questionnaire (BCTQ) and 2) Ultrasound Median nerve wrist-to-fararm ratio (WFR) measurements at baseline and at 1 month follow-up.

**Results:** The initial 18 subjects were randomized controlled clinical 1 (n=8) and Group 2 (n=10). Comparison of Pre and Post CSI outcomes for both dose groups revealed clinically and statistically significant symptom and functional improvement as measured by the BCTQ (Group 1: 3.2 vs 2.3, p=0.015. Group 2: 2.8 vs 1.9, p=0.003). No significant difference was found between the Pre and Post CSI WFR measurements. The 2 dose groups did not significantly differ from each other at baseline and 1 month follow-up.

**Conclusions:** Currently, there is no standardized dose for carpal tunnel steroid injections. Due to the potential adverse effects, it is prudent to clarify the lowest effective dose for treating CTS using a safe ultrasound-guided technique. Based upon this initial analysis, both the 20mg and 40mg dose US-guided CTS with the ulnar in-plane approach appear efficacious in reducing CTS symptom severity. Increased sample size through ongoing enrollment will improve the power to reveal possible differences in ultrasonographic appearance and subjective responses between the lower and higher steroid doses.

**DOES REAL-TIME ULTRASOUND FEEDBACK DURING PHYSICAL EXAM TRAINING IMPROVE ACCURACY OF STRUCTURE PALPATION?**

Lindsay N. Ramey, MD, Joanne Borg-Stein, MD, Ashwin Babu, MD, Christine Eng, MD, and Minna J. Kohler, MD

**Objectives:** To determine if shoulder examination training with real-time ultrasound feedback improves palpation accuracy of the long head of biceps tendon in the bicipital groove (LHBT) or the acromioclavicular joint (ACJ) among Physical Medicine & Rehabilitation (PM&R) residents.

**Design:** PM&R residents voluntarily attended a 50-minute shoulder examination session with ultrasound. Palpation accuracy of the LHBT and ACJ were measured 2 weeks before and after the session. To measure, residents were instructed to palpate the LHBT on a model and tape an 18-gauge, 1.5-inch, blunt-tip needle on the skin, parallel to and overlaying the tendon. The distance from the tendon to the needle was measured using ultrasound. This technique was repeated for the ACJ. Pre- and post-session measurements were compared using a signed-rank test.

**Results:** Thirty-two residents completed this study. The LHBT was accurately palpated by 23.1% with a mean distance of 11.1 (±8.8) mm and 5.3 (±4.9) mm. The ACJ was accurately palpated by 30.8% with a mean distance of 7.4 (±4.8) mm from the joint pre-course. Post-course, the LHBT was accurately palpated by 51.4% with a mean distance of 4.8 (±4.4) mm from the joint. The ACJ was accurately palpated by 34.8% with a mean distance of 11.1 (±8.8) mm.

**Conclusions:** Palpation accuracy significantly improved at the LHBT following the session (p<0.05), but not at the ACJ (0.20).

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date includes a two-week acute hospitalization followed by a stay in a long term acute care hospital.

Conclusions: This patient suffered needlessly due to a lack of coordinated care and from the absence of a program to coordinate catastrophic injury cases.

EARLY REHABILITATION AFTER EXTRACRANIAL-INTRACRANIAL BYPASS
Elizabeth Martin, MD, MPH, MHS, Eleanor Loomis, MD, MPH, Lynne Huffman, MD, and Kara Flavin, MD

Objectives: To describe PM&R consult use and outcomes for patients receiving extracranial-intracranial (EC-IC) bypass

Design: We conducted a retrospective exploratory cohort study

Results: We identified 491 patients receiving EC-IC bypass for Moyamoya between 2008 and 2016 from electronic health record data. The average patient age was 40 ±13 years at admission, 73% were female, 44% were employed full-time and 71% had private insurance.

Within the cohort of 491 patients, 118 (24%) received PM&R consults. Median time between EC-IC bypass procedure and PM&R consultation was 8 (3-67) days. Discharge destinations post-procedure included home (87%), inpatient rehabilitation facility (IRF) (5%), and skilled nursing facility (SNF) (1%). Discharge destination was significantly associated with length of stay (days): home (5 ± 4), IRF (14 ± 8), and SNF (22 ± 19). Median length of stay of those with a PM&R consultation was 10 (2-56) days, as opposed to a median of 4 days for Speech, OT, and PT consults, which also had shorter median times from EC-IC bypass procedure to consult. Consult was significantly associated with discharge destination (p < 0.01); for those receiving PM&R consults, the majority of patients were discharged to home (45%), followed by IRF (36%), and SNF (9%).

Conclusions: In this exploratory study focusing on patients receiving EC-IC bypass, we see few PM&R consults placed and a significant delay in time from procedure to request for a PM&R consult. We also see longer lengths of stay among patients with consults. This may be accounted for by clinical severity, however the reasons why the majority of patients did not receive a PM&R consult is also a concern.

Extracranial-intracranial (EC-IC) bypassings demonstrate an opportunity for clinician education on the role of early involvement of the PM&R consult service to assist with rehabilitation needs after neurosurgery and earlier post-acute care planning, which in this population may be one factor impacting overall length of stay.

EFFECTS OF AMANTADINE ON FUNCTIONAL RECOVERY IN ACUTE STROKE PATIENTS IN INPATIENT REHABILITATION
Kenneth Richter, DO, Neena L. Sharma, MD, Eric Toth, DO, and Pranamya Suri, BS

Objectives: Amantadine has been shown to accelerate and improve recovery in patients with traumatic brain injury; however, there are limited studies assessing the efficacy in patients with acute strokes. This study is to examine the effect of amantadine in the recovery of acute stroke patients in the rehabilitation unit.

Design: A retrospective chart review was done to evaluate the effect of amantadine on the functional recovery of acute stroke patients in inpatient rehabilitation. Seventeen patients who received amantadine were matched up with seventeen control patients who did not receive amantadine in inpatient rehabilitation. These groups were further matched by NIH admission stroke scale score, age, and sex.

Results: Functional Independence Measure (FIM) scores were utilized and demonstrated a statistically significant improvement in the cognitive tasks of patients who were treated with amantadine. There was no significant difference in motor tasks.

Conclusions: The use of amantadine in acute stroke patients has demonstrated a positive impact in the area of cognitive recovery. Since amantadine is an inexpensive and readily available drug, more studies should be done in acute stroke patients to fully realize the potential implications.

EFFECTS OF BETA TRIGGERED SUBDURAL BRAIN STIMULATION ON CORTICO-CORTICAL EVOLED POTENTIALS IN HUMANS: MODULATING PLASTICITY?
Jared D. Olson, MD, David Caldwell, MSE, and Jeffrey G. Ojemann, MD

Objectives: Clinicians may be able to improve neurological outcomes after acquired brain injury with adjunct neuromodulation techniques. Prior studies demonstrated that intracranial brain stimulation could lead to improved functional outcomes, though with inconclusive results. Linking stimulation with endogenous neural activity may increase the effectiveness via long-term potentiation mechanisms. The purpose of this study is to link subdural stimulation with beta-oscillation activity and study the effects on a candidate biomarker for cortical excitability and neuroplastic changes, the cortico-cortical evoked potential (CCEP).

Design: We studied otherwise neurologically intact patients in the epilepsy monitoring unit undergoing intracranial seizure monitoring and localization with electrocorticography electrodes (ECoG). We stimulated the primary motor cortex with 1.2 ms/phase, biphasic pulses at amplitudes sufficient to evoke a nearby CCEP, time- and phase-locked with endogenous beta bursts (12-20 Hz), recorded on nearby electrodes that a) exhibited CCEPs and b) had associated beta activity. We measured CCEP amplitudes and compared pre- vs post-stimulation bursts.

Results: Across seven subjects we found a dose-dependent, statistically significant change in CCEP amplitude with beta-triggered phase-locked subdural stimulation (p < 0.001 in a multi-way ANOVA) and a 13% increase with >5 pulses delivered in a burst. We saw lesser changes in the CCEP when stimulating independent of beta bursts.

Conclusions: In this study we found that CCEP amplitudes increased in a dose-dependent fashion with increasing number of stimuli delivered in a burst. We only observed this effect when stimulating during beta bursts. While encouraging, these findings demonstrate that we can enhance the amplitude of a candidate biomarker for neuroplasticity, however there is a paucity of research connecting CCEP amplitudes with neurological outcomes. Further research is needed to validate the CCEP as a biomarker.

EFFECTS OF CARDIOVASCULAR INTERVAL TRAINING ON FUNCTIONAL OUTCOMES IN STROKE PATIENTS
Matthew Lin, MD, Oifre Luke, MD, Kyle Weiss, DO, Craig Van Dien, MD, Drinity Estesov, DO, Sara Cuccurullo, MD, Christine Greiss, DO, and Talya Fleming, MD

Objectives: Cardiac rehabilitation after percutaneous coronary intervention is associated with a significant reduction in mortality in patients with coronary artery disease (CAD). Though the risk factors for CAD and stroke are nearly identical, less is known about the impact of cardiac rehabilitation on mortality in stroke survivors. The Stroke Recovery Program (SRP) is an ongoing study assessing outcomes in stroke survivors who undergo outpatient cardiovascular interval training, close physician follow-up for risk-factor management, and a comprehensive outpatient therapy program addressing therapy needs secondary to their stroke. This study analyzes the changes in cardiovascular fitness in stroke survivors enrolled in the SRP who have completed 36 sessions of outpatient cardiovascular interval training within four months of stroke onset.

Design: Fourteen post-stroke patients were enrolled in a cardiovascular interval training program within 30 days of stroke onset. Participants were provided with 36 therapy sessions using interval cardiovascular training with a recumbent cross trainer machine under physical therapist guidance. MET-minutes (M-m) were recorded at baseline, 9, 18, 27, and 36 session intervals.

Results: Preliminary data demonstrates a statistically significant improvement (p=0.001) in M-m when comparing patient baseline to the 36 session endpoint. Improvement was demonstrated as early as 9 sessions (p=0.002).

Conclusions: This study may demonstrate a safe and effective method of cardiovascular interval training for patients after a stroke, with preliminary analysis showing statistically significant improvement in M-m for SRP participants. No negative outcomes for SRP participants were identified. Continued data collection will allow for larger population analysis, including hospital re-admission rates, recurrent stroke and mortality.

EFFECTS OF HYBRID FES EXERCISE TRAINING ON ANAEROBIC THRESHOLD IN SCI
Eziamaka C. Okafor, MD, Daniel Brodmerkel, BS, and J. Andrew Taylor, PHD

OBJECTIVES:
Background: Those with spinal cord injury (SCI) have increased risk for cardiovascular diseases. This results in part from loss of metabolically active tissue and reduced aerobic capacity. As such, individuals with SCI may not be able to achieve minimal exercise requirements for health benefits. One solution is hybrid functional electrical stimulation row training (FESRT) that allows involvement of both innervated upper and electrically stimulated lower body muscles, to increase active muscle mass during exercise. A further limiting factor for sustained high intensity exercise is anaerobic threshold (AT) - the intensity at which the balance of energy production transitions to primarily anaerobic metabolism. Above AT, exercise can only be maintained for short periods. It is unknown if FESRT improves AT.

Purpose: Our aim was to assess the effects of 6 months FESRT on AT in SCI. We hypothesized that AT increases would be large due to aerobic training of inactive paralyzed muscle.

Design:
Methods: We assessed peak aerobic capacity (VO2max) and AT slopes during FESRT exercise in 31 individuals (20–60 years) with C4-T11 grade A SCI pre- and after 6 months of training. FESRT was 1–3 days/week at intensities of 75–85% peak heart rate; only individuals who demonstrated increased VO2max were included. AT was derived from the simplified v-slope method during a maximal FES row test.

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Abstracts
EFFECTS OF POMEGRANATE POLYPHENOLS ON COGNITIVE RECOVERY FOLLOWING ISCHEMIC STROKE: A RANDOMIZED, PLACEBO-CONTROLLED, DOUBLE-BLIND TRIAL
Paolo Jorge, MD, John Billione, PhD, Jeffrey Murray, MA, Mary Kim, MD, Travis Fogel, PhD, Desiree R. Wallace, PharmD, and Richard E. Hartman, PhD

Objectives: Cognitive impairment after stroke is associated with poor long-term survival, higher disability, and greater institutionalization rates. Pathophysiology leading to injury includes oxidative stress and inflammation causing cell apoptosis. Studies involving pomegranate polyphenols (PPs) targeting these pro-apoptotic mechanisms showed improved memory function following cardiac surgery. The study objective was to determine if pomegranate polyphenol supplementation enhances cognitive recovery following ischemic stroke.

Design: 183 patients were screened at an acute rehabilitation facility from June 2015-March 2016. 16 adults met inclusion criteria and consented to participate. Half of the subjects received PP (n=8), half received placebo (n=8). Permitted-block randomization (block size 4, allocation 1:1) ensured balanced groups. Allocation was concealed through pharmacy-controlled randomization. After baseline neuropsychological testing, participants received pomegranate or placebo 7 days/week by post-treatment testing.

Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) was the primary outcome measure since validity and reliability in the stroke population has been established. Two-way mixed ANOVA was used to analyze RBANS total scores to determine significance of treatment over time in each group. Correction for multiple t-test comparisons was performed with the Holm-Sidak test. One participant from each group was excluded from final analyses after failing to complete post-treatment testing.

Results: The PP group demonstrated significant improvement on RBANS (p<0.05), while the placebo group did not improve over the one week treatment period. Greatest improvements were in visuospatial/constructional (p=0.09) and language (p=0.11) domains. Limitations include small sample size resulting in underpowered study (1-β=14), shorter treatment duration than prior PP studies, and high heterogeneity of stroke location.

Conclusions: Pomegranate polyphenols trend toward enhancing cognitive recovery most notably in visuospatial/constructional, and language domains after ischemic stroke. A larger sample size is needed to display statistical significance of these findings. Future studies can be directed toward PP effect on functional mobility following ischemic stroke.

EFFECTS OF WHOLE BODY VIBRATION TRAINING ON BDNF LEVEL IN PERSONS WITH CHRONIC STROKE
Taimoor Afzal, PhD, Cheng-Hui Hsiao, PhD, Diana S-J. Chow, PhD, Shih-Chiao Tseng, PT, PhD, Gerard E. Francisco, MD, and Shuo-Hsiu Chang, PT, PhD

Objectives: Post-stroke rehabilitation involves relearning motor skills which is associated with neuromuscular plasticity. Brain-derived neurotrophic factor (BDNF) is an important molecular mediator of neuromuscular plasticity and may influence brain functions, including motor learning and memory. Whole body vibration (WBV), one form of mechanical oscillation, may modulate excitability in spinal motor neuron pool and in the areas of motor cortex that are responsible for lower extremity motor control. The purpose of this pilot project is to investigate whether a 4-week WBV training can promote BDNF production in individuals with chronic stroke.

Design: Four individuals (1 female, 3 males, 64.5 ± 9.3 y/o, post-onset duration 54.5 ± 46.3 mo) with chronic stroke participated in a 4-week (3 visits per week for a total of 12 visits) WBV training. Subjects stood on the vibration platform with balance support if necessary. The program consisted of 300 Hz oscillation load (0.3-0.4 g) for 30 minutes delivered continuously for 10 minutes each bout and subjects completed 4 bouts of training with a total of 40 minutes WBV in each visit. Blood sample was collected at pre-treatment at visit 1, 3 and 12 and plasma was isolated by centrifugation (3,000 g, 15 min) at 4°C. BDNF level was determined by BDNF ELISA kit (Boster Biological Technology Co. Ltd.).

Results: All subjects tolerated 40 minutes WBV training without difficulties. The preliminary data showed that BDNF level (samples before training) increased at Visit 3 and Visit 12 in 3 subjects (Visit 3: 26.8% - 201.3%; Visit 12: 30.2% - 258.6%) but remained similar across 3 visits in one subject (Visit 3: 5.6%; Visit 12: -1.4%).

Conclusions: Four-week whole body vibration training could increase BDNF level in persons with chronic stroke. Future investigations will help better define the potential role of WBV as an alternative strategy to promote neuromuscular plasticity.

EFFECTS OF INCOCBOTULINUMTOXINA IN TREATMENT OF LOWER LIMB SPASTICITY, INCLUDING PES EQUINOVARUS IN ADULTS
John McGuire, MD, Jörg Wissel, MD, Djamel Bensmail, MD, Astrid Scheschonka, MD, Birgit Flatu-Baqú, MD, Olivier Simon, MD, and David Simpson, MD

Objectives: The efficacy and safety of botulinum toxin A formulations, including incobotulinumtoxinA (Xeomin®, Merz Pharmaceuticals) for upper limb (UL) and lower limb (LL) spasticity are well established. This post-hoc analysis assessed the effectiveness of incobotulinumtoxinA for treating lower limb (LL) spasticity, including pes equinovarus.

Design: In the TOWER study (NCT01603459), 155 adult patients (18–80 years) with UL and LL spasticity received treatments with escalating fixed total incobotulinumtoxinA doses (400, 600 and 800 U, respectively). Outcomes included muscle tone (Ashworth Scale; AS), AS responder rates (patients with ≥1 point improvement at 4-week follow-up), and Resistance to Passive Movement Scale (REPAS).

Results: In the first treatment cycle, 109 patients received LL treatment and 100 patients pes equinovarus treatment (mean ± standard deviation [SD] dose 166.3 ± 94.9 U). The mean ± SD improvement in ankle joint AS score from injection to 4-week follow-up was 0.63 ± 0.70 in patients treated for pes equinovarus and 0.16 ± 0.63 in patients not treated. Analysis of covariance (ANCOVA) with AS baseline value as covariate revealed a significant effect of pes equinovarus dose on AS improvement (p = 0.0096). Corresponding AS responder rates were 55.0% in treated and 12.7% in untreated patients (p < 0.0001; Mantel-Haenszel Chi-Square test). Mean ± SD improvement in REPAS LL scores from injection to 4-week follow-up was 1.6 ± 2.0 in patients with LL treatment and 0.3 ± 1.5 in patients without. Multiple regression on LL REPAS baseline value and LL dose revealed a significant influence of LL dose (p = 0.0022).

Conclusions: Results support the effectiveness of incobotulinumtoxinA for treating LL spasticity and pes equinovarus, and the evaluation of incobotulinumtoxinA in further studies of LL spasticity.
EFFICACY OF PLATELET-RICH PLASMA THERAPY FOR SHOULDER PAIN IN SPINAL CORD INJURY

Reina Nakamura, DO, Trevor A. Dyson-Hudson, MD, Alon Terry, MD, Steven Kirshblum, MD, and Gerard Malanga, MD, PhD

Objectives: A larger, more definitive randomized controlled trial is warranted.

Results: Six men with chronic SCI (duration of injury; 26.7 yr ± 11.1 yr) and chronic rotator cuff disease unresponsive to nonsurgical treatment for longer than 6 months had 60 mL of whole blood prepared according to PRP protocols. A total of 3–4 mL of PRP was injected into the tendon under ultrasound-guidance using a peppering technique. Subjects began a standardized stretching protocol after 24 hrs and a formal strengthening program after 4wks. Participants were followed for adverse events and changes in shoulder pain intensity on an 11-point numerical rating scale (NRS; 0–10) and the Wheelchair User’s Shoulder Pain Index (WUSPI; range 0–150). Subjects were examined at 4 weeks and 24 weeks.

Conclusions: The efficacy of PRP injection in patients with SCI and chronic rotator cuff disease has been well studied. However, the study of PRP in acute and subacute cases of shoulder pain is limited. The present study suggests that PRP injection may be an effective treatment option for shoulder pain in SCI patients with chronic pain.

EFFICACY OF REPEATED ABOBOTULINUMTOXINA (DYSPORT) INJECTIONS IN IMPROVING GAIT IN CHILDREN WITH DYNAMIC EQUINUS FOOT DUE TO CEREBRAL PALSY

Mark Gormley, MD, Edward Dabrowski, MD, Dennis Matthews, MD, Gadi Revivo, DO, Ozen Peker, MD, Belgin Erhan, MD, Karin Kleinsteuber, MD, Philippe Picaut, PHARM, Anne-Sophie Grandouliez, MD, and Mauricio Delgado, MD

Objectives: Primary analyses have shown that treatment with abobotulinumtoxinA significantly improves muscle tone/spasticity and goal attainment in children with dynamic equinus foot deformity vs. placebo, and is generally well tolerated. We report here the efficacy of repeat injections of abobotulinumtoxinA in improving gait pattern.

Methods: Phase 3, double-blind, placebo-controlled study performed in children aged 2–17 years old (N = 214) with dynamic equinus foot deformity due to cerebral palsy. Double-blind phase patients were randomized to placebo (n = 108) or abobotulinumtoxinA 10 or 15U/kg injected into the gastrocsoleus complex. Patients were treated with a repeat dose at 12 weeks and a total of 3 doses over 12 weeks.

Results: Consistent with previous studies, abobotulinumtoxinA significantly improved OGS total scores (ITT analysis) at 4 weeks (treatment effect vs. placebo: 10U/kg: 2.3 ± 3.0; 15U/kg: 2.4 ± 3.0) and a formal strengthening program after 4wks. Participants were followed for adverse events and changes in shoulder pain intensity on an 11-point numerical rating scale (NRS; 0–10) and the Wheelchair User’s Shoulder Pain Index (WUSPI; range 0–150). Subjects were examined at 4 weeks and 24 weeks.

Conclusions: The efficacy of PRP injection in patients with SCI and chronic rotator cuff disease has been well studied. However, the study of PRP in acute and subacute cases of shoulder pain is limited. The present study suggests that PRP injection may be an effective treatment option for shoulder pain in SCI patients with chronic pain.

EFFICACY OF RTMS ON MOTOR FUNCTION AND CORRELATION WITH BRAIN SPECT IN SUBACUTE STROKE PATIENTS: A PILOT STUDY

Min Wook Kim, MD, PhD, and Kyong Won Kim, MD

Objectives: To objectively assess the efficacy of repetitive transcranial magnetic stimulation (rTMS) on motor improvement in hemiparetic upper limb and assessing correlation of comparative changes in regional cerebral blood flow using single-photon emission computed tomography (SPECT) in subacute stroke patients.

Design: Seventeen subacute hemiparetic patients with middle cerebral artery (MCA) territory infarction underwent standard occupational therapy (OT) and rTMS. Functional Independence Assessment (FIM) Scale and brain photon emission computed tomography (SPECT) were performed before and after rTMS treatment. For long term follow up assessment, FMA was performed 4 weeks after rTMS treatment in thirteen patients. As primary outcomes, the changes of FMA score and brain SPECT between pre- and post- TMS were assessed. As secondary outcomes, the changes of Korean version of Modified Barthel Index (K-MBI), Functional Independence Measure (FIM) and Korean version of Mini-Mental State Exam (MMSE-K) scores for four weeks were assessed.

Results: After 10 days of rTMS and OT, FMA scores improved significantly (mean ± SD from 12.5 ± 15.7 points to 16.6 ± 18.7 points, p = 0.003). However, any increase in regional cerebral blood flow (rCBF) was not observed in right primary motor cortex area on brain SPECT. Four weeks after rTMS and OT, FMS improved from 12.5 ± 15.7 to 22.3 ± 22.6 (p = 0.003). K-MBI, FIM and MMSE-K scores improved significantly (p <0.001, <0.001, <0.004, respectively) after 4 weeks.

Conclusions: Low-frequency rTMS on the non-lesional hemisphere induced significant improvement of upper limb function in subacute hemiparetic patients with MCA territory infarction. However, brain SPECT could not reflect clinical improvement. Further analyses with other functional imaging data may be helpful in clarifying physiology of rTMS on subacute stroke patients.

ENHANCING MEDICAL STUDENT EDUCATION THROUGH CURRICULUM DEVELOPMENT

Kirsten Gage, MD

Objectives: The medical student rotation associated with the UPMC PM&R residency program was previously varied depending a student’s particular interest and work ethic. In an effort to standardize the experience amongst all students and to improve recruitment of the students rotating with the department, this project was created to improve medical student and resident satisfaction with the learning experience as a whole. By standardizing the medical student rotations, there is a greater potential for learning, it allows for greater exposure to the calibration of the program, and helps to garner interest in the program from a recruitment perspective. As part of the curriculum there will also be a greater focus on teaching residents to teach what provides the added benefit that the teaching skills obtained by the residents will be a skill that can be used lifelong in practice. Medical student satisfaction on the rotation and residents’ comfort level with teaching was assessed as metric for measuring success of the curriculum. This was measured with pre and post curriculum implementation surveys to both medical students and residents.

Design: To standardize the rotation experience, a list of rotation objectives was developed for each particular inpatient unit that the students rotate through. Additionally, a set of expectations were developed to inform the student of the day to day activities on the units that they were expected to participate in. A checklist of items was created that each student must have signed off prior to completion of the rotation which included a variety of activities from given informal lectures, to participating in various therapeutic sessions/tests, and learning more refined physical examination skills. An educational packet on the basics of PM&R including the basics of neurologic and musculoskeletal examinations was developed and distributed to each student. The students were also provided with additional education materials depending on the rotation, and every student received a small book on the basics of PM&R. In an effort to increase resident teaching and interaction with medical students, the residents received specific guidance on how to teach medical students to ensure that the rotations are as successful as possible. The curriculum was implemented in August 2016. Each student completed a post-rotation evaluation and more than 95% of students agreed to complete it.

Results: The implementation of the new medical student curriculum improved medical student satisfaction of the rotation to 95%. Students felt that they had improved standardized rotation objectives and expectations while perceiving that teaching on the rotations also improved. Students also had an improved perception of being an integrated member of the rehabilitation team. Feedback improved and examination skills of the students improved as measured by the attending feedback and by the students own confidence levels. General PM&R knowledge also increased as a result of the new curriculum. Resident satisfaction of being able to teach medical students also improved.

Conclusions: By standardizing the medical student rotation at the UPMC PM&R program, overall medical student and resident satisfaction increased. This improved the overall education of the students as they felt they had more instruction and direction when on the rotations. The residents also felt more comfortable teaching in this setting. Development of a set of curriculum objectives and expectations in addition to supplementing rotation materials improved students' ability to participate on the rehabilitation team. Development of a more standardized teaching curriculum not only improved education and workflow throughout the rotations, but led to increased student satisfaction and hopefully improved match results of the students that rotate through the department.
EVALUATING THE EFFECTS OF MUSIC-SUPPORTED THERAPY ON MOOD, ENGAGEMENT, SATISFACTION, AND QUALITY OF LIFE IN STROKE PATIENTS UNDERGOING ACUTE REHABILITATION

Anita Kou, MD, Stacy Brandli, DO, Brian Windh, MD, Laura Graber, MD, Nooray Thanik, MD, A Lindsay Warrenburg, MA, and Marcia Bockbrader, MD, PHD

Objectives: Multimodal therapy training programs utilizing music may promote brain plasticity by simultaneously stimulating cognitive, motor, and sensory domains. Prior studies in aging and dementia using environmental enrichment with music have demonstrated this effect, but little is known regarding music and stroke rehabilitation. Our study explores whether actively playing music compared to passive music listening improves patient mood, engagement, satisfaction, and quality of life (QOL).

Design: Pilot trial of music-supported therapy with SynthesisTM: a double-blind RCT comparing 30 minute sessions of instructed keyboard playing (experimential) vs. passive music listening (control). 109 patients screened; 13 patients meeting criteria with hypoarepsis admitted to acute inpatient rehabilitation within 2 weeks of their stroke participated. 9 patients (5 experimental, 4 control) completed outcomes questionnaires at discharge: 10-item Satisfaction, PHQ-9 (Mood), and RAND Short Form 36 (QOL). SynthesisTM participants also completed an 18-item Music Engagement questionnaire. Group differences were tested using nonparametric Mann–Whitney U statistics.

Results: SynthesisTM participants positively endorsed 7.6 ± 6.3 Engagement items. Both groups showed high satisfaction, positively endorsing 8.8 ± 1.8 (experimental) vs. 7.8 ± 1.9 (control) questionnaire items (p = 0.421). Change in mood and QOL did not differ significantly with respect to mean change scores for the playing and listening groups: PHQ-9: 0.6 ± 4.7 vs. -1.0 ± 3.7 (p = 1.000); Physical Functioning: 3.8 ± 23.1 vs. 1.8 ± 15.0 (p = 0.730); Physical Role Functioning: 2.0 ± 30.0 vs. 18.8 ± 37.5 (p = 0.905); Emotional Role Functioning: 20.0 ± 44.7 vs. 0.0 ± 27.2 (p = 0.730); Energy/Fatigue: -20.0 ± 10.4 vs.-10.0 ± 24.2 (p = 0.905); Emotional Well-Being: -7.2 ± 16.3 vs. -3.0 ± 9.5 (p = 0.730); Social Functioning: -7.5 ± 25.9 vs.15.6 ± 23.6 (p = 0.413); Pain: -22.5 ± 17.5 vs. -9.4 ± 24.3 (p = 0.413); and General Health Perception: 3.0 ± 9.1 vs. -7.5 ± 15.5 (p = 0.413). Conclusions: Acute stroke patients engaged in music-playing and appeared satisfied with the intervention. No significant group differences were found for mood or QOL. Music playing appeared to have the largest positive effect on QOL related to emotional role functioning. Larger sample size and longer follow-up are needed.

EXAMINING THE CORRELATION BETWEEN BODY COMPOSITION AND FUNCTION IN ADOLESCENTS WITH SPINAL CORD DISEASE-RELATED PARALYSIS

Cristina Lavinia Sadowsky, MD

Objectives: Primary objective: To determine the association between LBM and fat mass, and function as measured by the Spinal Cord Independence Measure (SCIM) in adolescents (10–18) with spinal cord (SC) related paralysis.

Design: This is a cross-sectional, retrospective review of an IRB-approved clinical outcomes database consisting of individuals (all ages) with either traumatic or non-traumatic SCI, who have been treated as outpatients at the International Center for Spinal Cord (ICSC) at any time between 2005 and 2015. We studied a cohort of adolescents aged between 10 and less than 18 years classified as ISNCSCI grades A-D, chronic (more than 1 year) injury, with any level of spinal cord injury (C1-S1) that underwent Activity Based Restorative Therapies (ABRT) and were assessed functionally utilizing Spinal Cord Independence Measure (SCIM) and had body composition evaluated utilizing dual energy absorptometry (DXA) done within a 6 months period of each other.

Results: With every decile increase in lean body mass (LBM)/height index, there is a proportionate increase in function as assessed by SCIM.

Conclusions: More muscle mass is associated with better function among adolescents with paralysis. The association is less powerful among those with paraplegia, who in general, retain greater functional abilities. Further research to examine the interaction between injury duration, body composition and exposure to structured rehabilitation over time is warranted to understand how LBM may be used as a practical predictor of outcomes.

FACTORS ASSOCIATED WITH RECOVERY IN CHILDREN WITH MILD OR COMPLICATED MILD TRAUMATIC BRAIN INJURY

Colby Hansen, MD, Maya Battikha, MD, James Gardner, BS, Connor M. Peck, BS, Mary Pautler, MPH, and Masaru Tenmoto, MD, PHD

Objectives: A complicated mild Traumatic Brain Injury (mTBI) is a mild TBI with some form of radiographic abnormality such as hemorrhage. In the pediatric population, there are no clear guidelines regarding when or if children with such an injury can return to his/her previous athletic activities. Our study aimed to compare recovery patterns among three cohorts: mild TBI (mTBI), mTBI with skull fracture, and complicated mTBI (C-mTBI).

Design: Parents of patients with any form of mTBI (based on hospital database queries between 2010 and 2013) were mailed a questionnaire on pre-injury health and post-injury recovery and activity patterns. Associations of potential risk factors to degree (0–10 scales) and length (months) of recovery were analyzed using Pearson’s chi-square test. An ordinal logistic regression analysis was performed to examine the associations of risk factors to the degree and length of recovery after mTBI.

Results: A total of 279 and 281 children were examined for the degree and length of recovery after any form of mTBI, respectively. [CH1] Children having fewer degrees of recovery and required greater amounts of care were significantly more likely to have a pre-existing learning disability or ADHD, and were significantly less likely to return to and participate in sports and contact activities after brain injury (p < 0.05). The ordinal logistic regression analysis showed that older age and C-mTBI...
(vs. mTBI) were significantly associated with fewer degrees and longer period of recovery (p < 0.05).

**Conclusions:** While many children with mTBI recover fully, older children and those with C-mTBI may experience a longer and less complete recovery and subsequence participation in lower levels of physical activity. These results illustrate significant differences in children with forms of mTBI and highlight the need to establish return to activity guidelines specific for C-mTBI.

**FACTORS AT DISCHARGE FROM INPATIENT STROKE REHABILITATION ASSOCIATED WITH COMMUNITY PARTICIPATION**

Michelle Chi, MD, Kristina Quirilgoiclo, MD, Lawrence G. Chang, BA, MPH, Michael Taub, MA, Joan Toglia, PHD, OTR/L, FAOTA, and Michael W. O'Dell, MD

**Objectives:** Stroke negatively impacts physical functioning, participation in meaningful activities and overall life satisfaction, with 64% of stroke survivors reporting difficulty in participation. Task-oriented gait training, fewer comorbidities, better executive function, less depression, self-efficacy, and social support enhance participation. We explored discharge variables from acute stroke rehabilitation associated with community participation 6 months (m) post-discharge, hypothesizing that better discharge functional mobility, ADL performance, and cognitive performance would be more strongly associated with community participation at 6 m.

**Design:** We analyzed prospectively collected data from an acute inpatient rehabilitation (IR) IRB-approved database. Demographics and stroke characteristics plus the Functional Independence Measure (FIM)-motor, cognitive, and total, Activity Measure for Post-Acute Care (AMPAC) - basic mobility, daily activity, cognitive subscales, and Lower Extremity Motricity Index (LE-MI) were assessed at discharge. The Stroke Impact Scale (SIS) score, measuring multidimensional participation in stroke, was obtained at 6 m follow-up. Associations were determined using the Spearman's rank correlation coefficient.

**Results:** Data was complete in 107 patients with a mean age = 67 ± 15.2 years. National Institutes of Health Stroke Scale (NIHSS) = 8.7 ± 7.7, and Charlson Comorbidity Index (CCI) = 1.5 ± 2. The sample was 53% male, 65% white and 80% had non-hemorrhagic strokes. Statistically significant correlations with the 6 m SIS included (from strongest to weakest): AMPAC-basal mobility (0.481), AMPAC daily activity (0.472), FIM-total (0.467), FIM-motor (0.451), LE-MI (0.393), AMPAC-cognitive (0.327), ethnicity (~0.283), FIM-cognitive (0.275), and NIHSS (0.230), all P < .01. CCI, age, and gender were not significantly correlated with SIS.

**Conclusions:** Consistent with our hypothesis – functional mobility, cognition and activity limitations at discharge from rehabilitation were most significantly correlated with higher SIS scores at follow-up. Inpatient interventions targeting these factors may be important to prepare stroke survivors’ return to the community. Further research should include how psychosocial and environmental barriers may impact participation.

**FACTORS PREDICTIVE OF 30-DAY ACUTE CARE READMISSION OCCURRENCES IN PATIENTS REFERRED TO AN INPATIENT REHABILITATION FACILITY FROM A JOINT COMMISSION CERTIFIED PRIMARY STROKE CENTER FOLLOWING ISCHEMIC OR HEMORRHAGIC STROKE**

Justin Louis Weppner, DO, and Paul Diamond, MD

**Objectives:** There are an estimated 6.8 million stroke survivors in the United States, with approximately 795,000 new and recurrent strokes identified annually. Stroke is one of the 10 highest contributors to Medicare costs, and among the elderly, is a leading cause of hospitalization. Reducing readmission rates is a goal of national healthcare reform. Centers for Medicare and Medicaid Services (CMS) proposes to use a hospital-level 30-day risk-standardized all-cause readmission measure for ischemic stroke in the Hospital Inpatient Quality Reporting Program for payment determination. Therefore, there is significant interest in identifying factors that influence readmission rates, especially those that can be identified prior to discharge.

**Design:** A retrospective case-control study was designed at a single Joint Commission Certified Stroke Center. Utilizing the institution’s Clinical Data Repository (CDR) we retrospectively reviewed 30-day readmissions following ischemic or intracerebral hemorrhagic stroke. Consecutive patients who initially presented with a stroke and were readmitted to the study institution within 30 days of discharge to an IRF over a two-year period (2014–2016) were identified for inclusion. A control group of non-discharged IRFs and frequency matched to the same stroke ICD-9 or ICD-10 codes as the study group during the same time period were identified for inclusion. Demographic data, including age, sex, and ethnicity, were collected. Factors relating to the index hospitalization, including complications during the index hospitalization, insurance status, and length of stay were recorded. Factors relating to hospital readmission, including days from discharge, readmission diagnosis, comorbidities, and length of stay were also recorded.

**Results:** A total of 98 cases and 98 controls were enrolled. There were no significant differences in age, gender, location, discharge diagnosis, or the number of patients with a history of stroke between study and control groups. Infection was the most common cause of readmission. Significantly higher rates of pneumonia (P = .018), urinary tract infection (P = .023), dysphagia (P = .036), renal failure (P = .016), and leukocytosis (P = 0.021) were present in cases during index admission. Cardiovascular events were the second most common cause of readmission. Readmitted patients were significantly more likely to have a prior diagnosis of CHF (P = .008), CAD (P = .011), and cerebrovascular disease (P = .028). Patients who were discharged to an IRF within 3–8 days were less likely to be readmitted within 30 days than those discharged to an IRF on hospital day 1–2 with an odds ratio of 3.1 (95% confidence interval, 1.41–6.34).

**Conclusions:** Infection was the most common cause of acute readmission from an IRF following stroke. Close monitoring for clinical and subclinical infections during the acute hospital stay may reduce readmission rates. Cardiovascular events were also a common cause of readmissions. A careful evaluation of cardiovascular status during the acute hospital stay may further reduce readmission rates. Coincidentally, systemic infection has become a recognized risk factor for cardiovascular events. Systemic infection is thought to produce a prothrombotic state increasing atherosclerotic plaque instability and activating proinflammatory cytokines. The association between infection and cardiovascular events and the significant roles both play in 30-day readmissions further argues for close monitoring for signs of infection during the index hospitalization to reduce readmission rates. A short length of stay, especially less than three days was associated with increased readmission rates, which may indicate that some patients, especially those with stroke-related infections, were discharged too early.

**FUNCTIONAL RECOVERY FOLLOWING CRANIOMUSCULAR ATHEROSCLEROTIC PLAQUE INSTABILITY AND ACTIVATING PROINFLAMMATORY CYTOKINES.**

Neil Jasey, MD, Irene Ward, PT, DPT, NCS, Anthony Lequerica, PHD, and Nancy Chiaravalloti, PHD

**Objectives:** Previously published findings reported a significant increase in FIM efficiency after cranioplasty in patients in acute rehabilitation after brain injury. While compelling, these findings could not exclude natural recovery along the “recovery curve” as the etiology of functional improvement. To clarify our findings, this study utilized a comparison group with cranietomy-only to elucidate the effect of cranioplasty on recovery.

**Design:** Retrospective pilot study involving two groups of patients admitted to acute inpatient rehabilitation with cranietomy due to an acquired brain injury. “Craniocephaloplasty” group consisted of individuals who received rehabilitation before and after receiving cranio- and cranioplasty. “Comparison” group included individuals who completed rehabilitation before cranio- and cranioplasty. The groups were matched 1:1for age, gender, functional level at admission, injury severity and length of stay. Independent-sample t-test was used to analyze group differences in FIM efficiency (FIM discharge – FIM admission number of days in rehabilitation).

**Results:** A total of 26 individuals (13 in cranio- and cranioplasty group and 13 in comparison group) were included in the analysis. The mean FIM efficiency for the cranio- and cranioplasty group was below that of the comparison group prior to receiving their cranio- and cranioplasty [0.28 ± 0.37 and 0.39 ± 0.32, p = .41]. The mean FIM efficiency of the cranio- and cranioplasty group was higher than the comparison group following cranio- and cranioplasty [0.61 ± 0.71 and 0.39 ± 0.32, p = .32].

**Conclusions:** Despite similar characteristics, the slower rate of recovery in the cranio- and cranioplasty group prior to the surgery suggests an underlying factor within that group impeding functional improvement. Following cranio- and cranioplasty, the notable increase in FIM efficiency in the cranio- and cranioplasty group, beyond that seen in the comparison group, suggests that cranio- and cranioplasty augments improvement above that attributed to natural recovery. The difference between groups at either time point does not reach statistical significance. This may be due to factors such as small sample size and/or the heterogeneity of patients with brain injury. Further study is warranted.

**FUNCTIONAL RECOVERY IN PEDIATRIC TRAUMATIC BRAIN INJURY PATIENTS COMPARED TO NON-TRAUMATIC BRAIN INJURY WHILE ON AN INPATIENT REHABILITATION SERVICE**

Samantha Craig, MD, Ashley K. Sherman, MA, and Matthew McLaughlin, MD MS

**Objectives:** Traumatic non-traumatic (NTBI) brain injury, can result in motor, sensory, cognitive, bowel and bladder deficits. A commonly used functional outcome measure in pediatric patients is the WeeFIM II, which measures functional performance in 3 domains: self-care, mobility, and cognition. Our objective for this...
study was to compare functional recovery and length of stay (LOS) in pediatric TBI vs NTBI patients admitted to our inpatient rehabilitation unit.

**Design:** This is a retrospective chart review of 98 total pediatric TBI vs NTBI patients’ WeeFIM total scores and subscores at admission and discharge, along with LOS and other pertinent demographic data. The study included all patients admitted to our Pediatric Rehabilitation Unit (PRU) between 1/1/11 and 11/30/15. Each of the TBI and NTBI patient groups were age matched into two categories, consisting of ages 0–3 years and 3.1+ years.

**Results:** All of the total and subscale WeeFIM scores improved from admission to discharge at a statistically significant level. We found no differences in amount of recovery between the TBI and NTBI age matched groups. WeeFIM efficiency did not show any difference between the subgroups, with a mean TBI efficiency of 16.6 per week. Mean LOS for the TBI group was 23.90 days and 18.77 days for the NTBI group.

**Conclusions:** Our study shows that both TBI and NTBI patients do show improvement while on an inpatient rehabilitation unit, however, there was no significant difference in either the total functional recovery or rate of improvement between groups.

**Gait Performance Predicting by the Application of Spasticity Measurement with Pendulum Test in Stroke Hemiplegic Patient**

Wei Li, MD

**Objectives:** Background knowledge: Lower limb spasticity a common impairment in stroke patients and disturbance gait performance. Pendulum test is a useful and standard clinical tool to quantify knee spasticity. Purpose: 1) investigate whether the spasticity interferes the gait performance and 2) assess whether measuring spasticity by pendulum test providing more predicting information than MAS to gait performance in post-stroke patients.

**Design:** Subjects: Forty stroke patients with hemiplegia and spasticity, ranging in age from 38 to 81 years, who had good cooperation. All of including subjects were able to walk independently.

Protocol: Spasticity measurement as passive Pendulum test and Modified Ashworth scores (MAS) of knee flexion and ankle dorsiflexion was used in all subjects. Other clinical tests as time up to go (TUG), Brunstrom stage, BML, and Tinetti balance assessment tool are also evaluated. The correlation between above clinical variables and 10-meters walking test (10MWT) were calculated by multiple stepwise regression analysis in 7 models.

**Results:** Model 1 has the highest correlation for 10MWT performance prediction (adjusted R 2 = 0.599). The following clinical variables in model 1 were significantly correlated with 10MWT: TUG and relaxation index by using pendulum test. The strong negative correlation between TUDS test (c = −0.079, p < 0.001*) and strong positive correlation between relaxation index (c = 0.274, P = 0.021*) with the 10MWT speed confirm the result of the multiple regressions. TUG has a significant correlation with 10MWT speed (c = 0.626, P < 0.001) in all the 7 models. BML, age, gender, Modified Ashworth scores (MAS) of knee flexion and ankle dorsiflexion Brunstrom stage, and Tinetti balance assessment have no significant correlation with gait speed performance.

**Conclusions:** To quantify the presence and severity of spasticity in stroke patients, pendulum test and TUG are simple and useful tools for the purpose of predicting normal gait performance. Relaxation index of Pendulum test and time up to go test (TUG) were the two clinical factors which were the most predictive factor of 10MWT performance spasticity hemiplegic gait. MAS is not a good indicator for outcome measurement.

**Health of Mobility-Impaired Individuals Enrolling in a Weight Loss Program**

Jyotana Kodari, BS, PSYCHOLOGY, Simon Driver, PHD, and Katherine Froehlich-Grobe, PHD

**Objectives:** To describe the health status at baseline of a mobility-impaired sample enrolling in an intensive weight loss intervention.

**Design:** Self-reported and objective health data were analyzed from a sample of 70 mobility-impaired individuals.

**Results:** The sample’s average age was 47.5 ± 12.9 years and were predominantly white (63%) women who lived with their disability an average of 12.3 ± 10.5 years, mainly due to SCI (46.4%) and MS (17.3%). Participants’ average BMI was 33.2 ± 9.2, with an average weight of 99.9 ± 25.4 kg. 16% reported to have diabetes (30%). Subscale scores of Physical Function (35.4 ± 28.8) and Mental Health (69.1 ± 21.3) on the SF 36 indicate they experience substantially lower physical health, yet substantially higher mental health than the general population. Fewer participants rated their health as ranging from “good” to “excellent” as compared to the general population. Participants’ self-rated ability to engage in healthy nutrition (6 items) and exercise (7 items) indicated an average response of 2.4 for each item, suggesting they believe they can somewhat-mostly engage in these health practices.

Participants reported an average daily sitting time of 14.5 hours, yet reported doing an average of 216.6 min/week of moderate to vigorous physical activity, which exceeds the national recommendation of 150 min/week.

**Conclusions:** The study participants represent a motivated group of individuals with mobility impairment, with significant physical function limitations but good mental health. Their health status at the time of starting the program highlights the importance of addressing weight loss to reduce their risk of obesity-related chronic conditions and risk of cardiovascular disease.

**Heart Rate Variability: An Innovative Approach to Quantifying Autonomic Activity**

Jay Karri, MPH, Larry Zhang, Shengui Li, MS, Yen-Ting Chen, PHD, and Sheng Li, MD, PHD

**Objectives:** Heart rate variability (HRV), the physiological variance in the heart’s R-R interval length, can be analyzed via time and frequency domain approaches to provide parameters reflective of autonomic balance. For our study, we aimed to explore the sensitivity of HRV analysis in capturing these autonomic changes. We hypothesize that HRV analysis can accurately detect changes in sympathetic and parasympathetic tone after only a brief and moderate physical exertion.

**Design:** An electrocardiogram (ECG) recording was collected in 15 healthy subjects of a varied age range (16-68 years) at resting baseline and three time points (0, 10, and 30 minutes) following physical exertion. Physical exertion involved a 10-minute treadmill walk at a moderate and self-determined pace to target a 60-70% maximal heart rate. ECG recordings were analyzed in 3 models; time domain parameters nN50 and pNN50 are reflective of parasympathetic tone; frequency domain parameters LF% and HF% are reflective of sympathetic and parasympathetic, respectively. One-way ANOVA testing compared the values of each parameter across time.

**Results:** The group’s average heart rate rose from baseline to during exertion (P < 0.001) and then returned to baseline at time 0', 10', and 30' (for all time points, P > 0.050). However, time domain parameters, nN50, and pNN50, were able to capture the expected increase in sympathetic tone at 0' (nN50 and pNN50: P < 0.010) and 30' (nN50 and pNN50: P < 0.050) relative to baseline. Similarly, frequency domain parameters LF% and HF% reflected similar changes at 0' (LF% and HF%: P < 0.010), 10' (LF% and HF%: P < 0.050), and 30' (LF% and HF%: P < 0.050) relative to baseline following exertion.

**Conclusions:** HRV parameters are sensitive enough to capture autonomic changes following only a short period of moderate physical exertion. Therefore, HRV analysis represents an innovative modality to assess autonomic dysregulations, such as those potentially present in conditions like chronic neuropathic pain.

**Identifying Psychological Disorders and Potential Need for Referral During PM&R Evaluation of Musculoskeletal Complaints**

Udai Nanda, DO, and Lawrence Miller, MD, FACP

**Objectives:** Psychological evaluation in patient care has varying roles outside the setting of dedicated Psychiatry or Psychology specialist evaluation. The USPSTF recommends depression screening in the general adult population if adequate systemic factors are in place to ensure accurate diagnosis, effective treatment, and appropriate follow up. Additionally, psychological factors are often considered in more specific populations with complicated pain symptoms. For example, many insurance companies require psychological evaluation prior to certain procedures including spinal cord stimulator placement. If left untreated, these may impact overall response to PM&R directed management. The goal of our study is to establish an educational program for PM&R residents to raise awareness and increase understanding of psychological disorders seen in patients experiencing musculoskeletal pain, and when to consider psychological referral in the overall management plan.

**Design:** An educational program for PM&R residents was developed and administered during the beginning of the academic year. A pre-test was utilized to evaluate PM&R resident baseline knowledge, perceived importance, and approach regarding psychologic factors in their patient evaluations. Question types included multiple choice and free response. A post-test was administered 4 weeks following the lecture session.

**Results:** Overall, residents noted an increase in how often they consider psychologic factors during an PM&R evaluation. Test scores improved from pre-test (M=41.6, SD=14.097) to post-test (M=45.8, SD 14.787), however with a p value 0.45 was not statistically significant (paired t test).

**Conclusions:** We believe it is beneficial to emphasize psychological disorders early in PM&R training to aid in accurate diagnosis and consideration in the overall treatment plan. Although the improvement from pre to post test was not statistically significant and the study was underpowered, the goal of such lectures is to increase
early awareness and knowledge to enable further potential growth long term through application in clinical experience during residency.

IDENTIFYING THE MOST COMMON CROSSFIT INJURIES IN A VARIETY OF ATHLETES

Kiriti Aleksyey, MD MBA, Joshua Chen, BS, Alex John, BS, Jaison Udani, MD, Malcolm Lakdawala, MD, Samantha Erosa, BA, Efrain Perez, MD, Armando Iannicello, MD, Nikhil Verma, MD, Rayeed Islam, MD, and Marc Ross, MD

Objectives: To identify the most common injuries endured during CrossFit training in different levels of athletes and to educate the CrossFit gyms about injury prevention in participants.

Design: Cross-Sectional Study and worldwide based survey

Results: A total of 881 participants from 40 different states and 14 different countries: Australia, Canada, England, Denmark, PR, Germany, Ireland, Israel, Luxembourg, Norway, Nova Scotia, NSW, United Arab Emirates, APO, AR, AL, AK, AZ, CA, CO, CT, DC, FL, GA, IA, IL, IN, LA, MA, MD, ME, MI, MN, MO, MS, NC, NE, NH, NJ, NY, NV, OH, OR, PA, RI, SC, TN, TX, US, VA, WA, WV. Age range of participants is from 50 years, with a gender distribution of 543 (66%) males and 284 (35%) females. Background information on each participant includes; years of experience exercising: >10 years: 98/881 (10.3%), years of experience weightlifting: 0-5 years: 600/881 (68.1%), years of crossfit training: >3 years: 259/881 (29.4%), level prior to crossfit: intermediate 480/881 (54.5%) and level of sports participation: high school sports 282/881 (32.0%). Prior injuries: Lumbar spine 31/416 (7.5%), knee sprain 30/416 (7.2%), acl/mcl/meniscal tear 40/416 (9.6%). Participants injured during crossfit the most common were: spinal 54/284 (19.0%), Shoulder injuries 33/284 (11.6%), Lateral ankle sprain 30/284 (10.5%), buttock 29/284 (10.2%), Patella 28/284 (9.9%), Finger 24/284 (8.4%), Knee 23/284 (8.1%), Ankle 6/284 (%) knee injuries (sprain, dislocation) 21/284 (7.4%), Patellar tendinitis 17/284 (6.0%). The most common Crossfit type of exercise causing injury: Squat 17/284 (6.0%), Push-up 14/284 (4.9%), Lunges 14/284 (4.9%), Burpee 11/284 (3.9%), Plank 8/284 (2.8%), Pull-up 6/284 (2.1%).

Conclusions: In this cross-sectional study, several potential risk factors were identified to correlate with rates of crossfit related injury. Steps can be taken to help prevent such injuries in particular for beginner and intermediate athletes. It is essential to establishing participant’s proper technique from the very beginning but not forgetting about intermediate level athletes. Also, establishing a 2-week ease in period with special attention from trainers (NY model) to prevent beginners from injuring themselves. Educating Crossfit gyms with the most injuries and discussing injury prevention can help alleviate similar injuries in the future. Finally, educating CrossFit gyms about keeping a closer eye on the intermediate athletes overseeing themselves before they are ready.

IGG AUTOANTIBODIES IN TRAUMATIC BRAIN INJURY: FRIEND OR FOE?

Randel L. Swanson, DO, PHD, and Douglas H. Smith, MD

Objectives: Epidemiological studies demonstrate an association between Traumatic Brain Injury (TBI) and an increased risk of subsequent progressive cognitive decline or dementia. While the mechanisms underlying chronic post-TBI neurodegenerative Brain Injury (TBI) and an increased risk of subsequent progressive cognitive impairment are not fully understood, a growing body of evidence suggests that autoantibodies may play a role. The current study aimed to determine if autoantibodies are present in the serum of patients with chronic post-TBI neurodegenerative diseases. Other members of our team have shown that serum IgG autoantibodies in post-TBI neurodegeneration, aiming to determine if these antibodies represent friend or foe.

IMMEDIATE RELIEF AFTER SACROILIAC JOINT INJECTION AS A PREDICTOR OF SUBSEQUENT RELIEF TO STEROID AT 24 WEEKS

Byron J. Schneider, MD, Matthew Smuck, MD, Lisa Huynh, MD, Josh Levin, MD, and David Kennedy, MD

Objectives: It is unclear whether image-guided intra-articular diagnostic sacroiliac joint (SIJ) injections of local anesthetic predict positive responses to corticosteroids. This study was designed to determine if, after SIJ injection with local anesthetic and steroid, immediate relief attributable to anesthetic predicts subsequent relief attributable to steroid.

Design: An IRB approved prospective observational cohort from a single academic medical center. Patients with clinical diagnosis of SJJ pain were enrolled after referral to one of three providers for SIJ injection. A single SIJ injection of 1cc of 2% lidocaine and 1 cc of triamcinolone-40mg/mL was performed using contrast and real time fluoroscopy. Pain score on 0-10 numeric rating scale (NRS) with provocation maneuvers was recorded immediately before injection, immediately after injection, and at 2-4 week follow up.

Results: 100% immediate pain relief was required to be considered a positive anesthetic response, while 50% pain relief at the 2-4 week follow up was considered positive. Overall 11/25 (44.0%, 95% CI+/-19.5%) patients were immediately positive, while 8/25 (32.0%, 95% CI+/-18.3%) were positive at follow-up. Only 2/14 (14.3%, 95% CI+/25.66%) patients with a negative anesthetic response had positive response at follow-up. Of those with positive anesthetic response, 6/11 (54.5%, 95% CI+/-29.4%) demonstrated at least 50% pain relief at follow-up. When using 100% relief at 2-4 weeks to define positive steroid response, 4/11 (36.48, 95% CI+/-28.4 %*) with positive anesthetic response demonstrated positive delayed response while all, 14/14 (100%, 95% CI+/-21.5 %*) with an initial negative block failed to achieve complete relief.

- *Non-overlapping 95% confidence intervals

Conclusions: This study demonstrates a high negative predictive value of an immediate pain response after injection of a local anesthetic in predicting subsequent pain relief at 2-4 weeks. Conversely it also demonstrated a low to moderate positive predictive value of anesthetic response to SIJ injection as it relates to relief at 2-4 weeks.

IMPACT OF EARLY INTERVENTION WITH ONABOTULINTUMOXIN A TREATMENT IN ADULT PATIENTS WITH POST-STROKE LOWER LIMB SPASTICITY

Atul T. Patel, MD, MHS, Anthony B. Ward, MD, FRCP; Carolyn Geis, MD, Chengcheng Liu, PhD, Wolfgang H. Jost, MD, PHD, and Rozalina Dimitrova, MD, MPH

Objectives: This analysis aims to evaluate the impact of the timing of treatment initiation since stroke on the efficacy of onabotulinumtoxinA in post-stroke lower limb spasticity (PSLLS).

Design: This multicenter, phase 3, placebo-controlled study was undertaken across 60 global study centers. Patients with PSLLS (Modified Ashworth Scale [MAS] ≥3) of the ankle plantar flexors were eligible for enrollment. During the 12-week double-blind phase, patients were randomized to receive onabotulinumtoxinA (300U, mandatory muscles [gastrocnemius, soleus, tibialis posterior]; and 5100U, optional lower limb muscles [flexor digitorum longus, flexor hallucis longus, flexor digitorum brevis, extensor hallucis, rectus femoris]) or placebo. The primary endpoint was a change from baseline in MAS average score of weeks 4 and 6. Secondary endpoints included physician-assessed Clinical Global Impression of Improvement (CGI) average score of weeks 4 and 6 and physician-assessed Goal Attainment Scale (GAS; active and passive at weeks 8 and 12).

Results: In the intent-to-treat population, (onabotulinumtoxinA, n=233; placebo, n=235), significant improvements vs. placebo were observed in MAS (–0.81 vs. –0.61; P=0.01), CGI (0.86 vs. 0.65; P=0.01), and passive GAS scores (week 12, 0.6 vs. –0.9; P=0.042). When stratified by time of treatment initiation post-stroke (≤12 months, n=153; >24 months, n=315, post-stroke, n=115), patients who were treated ≤24 months since stroke experienced greater improvements (mean difference from baseline vs. placebo) in MAS (–0.31 vs. –0.17), CGI (0.49 vs. 0.12), and passive GAS scores (week 12, 0.37 vs. 0.26). Among patients ≤24 months since stroke, a greater proportion achieved ≥1 point improvement in active (week 12, P=0.039) and passive (week 8, P=0.023) GAS scores vs. placebo. OnabotulinumtoxinA 300–400 U was well tolerated with no new safety signals with treatment duration.

Conclusions: OnabotulinumtoxinA 300–400U is effective in improving MAS, CGI, and GAS scores in patients with PSLLS with greater benefits among those initiating treatment ≤24 months post-stroke.
IMPLEMENTATION OF NEW TRIAGE GUIDELINES FOR LATE ADMISSIONS: ONE INSTITUTION’S APPROACH FOR ADDRESSING EFFECT ON RESIDENT WELLNESS

Michael K. Yeger, MS, MD, and Cara Camilo Raddi, MD, MMM

Objectives: To examine the healthcare impact of late admissions to inpatient rehabilitation units (IPR) at a large academic medical center. The IPRs are typically staffed by off-service residents and are primarily used to accommodate unanticipated admissions. The admission process is performed by residents and staff, including admission coordinators. The residents are consulted to provide care as appropriate. The study aimed to identify areas for improvement in the IPR admission process and its effect on resident wellness.

Methods: Retrospective review of IPR admissions from January 1, 2015, to December 31, 2015, was performed. Residents were surveyed to identify late work days, change in quality of life, and adverse events related to late admissions. The impact on residents was assessed by surveying 12 residents who had previously been responsible for late admissions.

Results: A total of 460 patients were admitted over 3.5 months. Of the patients, on-service residents who participated in the survey, 29.4% of patients were seen by residents who were previously seeing all late admissions, while 70.6% of patients were seen by the on-call resident. On-service residents reported staying late an average of 2.1 days per week, and 93.3% of residents reported a positive to very positive impact on quality of life. Residents reported staying late an average of 2.1 days less per week, and 93.3% of residents reported a positive to very positive impact on quality of life. 93.3% of residents reported a positive to very positive impact on quality of life.

Conclusions: This new guideline successfully changed resident perceptions that it was necessary to stay late immediately after an IPR. All residents reported fewer late nights at the hospital, and the vast majority reported improved quality of life, without negatively impacting patient care. This could be used as a model for implementing change at other institutions.

IMPROVING IN FINGER DEXTERTY AFTER INCOMPLETE CERVICAL SPINAL CORD INJURY: A SHAM CONTROLLED STUDY

Justin B. Schappell, BBA, Jessica Beardsley, BS, Nuray Yozbaturan, PHD, and Gerard E. Francisco, MD

Objectives: To investigate the potential benefits of using transcranial direct current stimulation (tDCS) on the primary motor cortex hand area (hM1) to improve finger dexterity in adults with complete cervical spinal cord injury (CSCI).

Methods: Eleven adults with chronic CSCI (10 males and 1 female, ASIA C-D) participated in 10 consecutive sessions of anodal transcranial direct current stimulation (atDCS) of the primary motor cortex hand area (hM1). The patients were randomized into two groups: an active stimulation group (n=7) and a control group (n=4). The patients were stimulated with 2mA for 20 minutes, and the stimulation was delivered by a robotic-assisted arm training module (R-AAT) on hand-specific fine motor skills.

Results: The atDCS group showed an increase in NHPT (Number of Pegs/Second) from a baseline score of 0.12±0.12 to 0.32±0.22. The NHPT revealed that the average number of pegs placed and removed per second increased from a baseline score of 0.12±0.12 to 0.32±0.22 and from 0.10±0.11 to 0.14±0.13 in the active stimulation group and control group, respectively. However, there was no significant group x time difference (p=0.05).

Conclusions: This study suggests a potential positive relationship between atDCS coupled with intensive upper limb training and fine motor skill recovery in CSCI. Both active and control groups showed improved hand-specific fine motor skills. This study contributes to the understanding of transcranial stimulation as a treatment modality in spinal cord injury rehabilitation, while simultaneously providing direction for future research investigations.

IMPROVING CARE CONTINUUM COMMUNICATION BY REDUCING MEDICAL ERRORS

Danish Ali, DO, MPH, Patrick Spencer, MD & PHD, and Matthew Hyzy, DO

Objectives: To evaluate the impact of interdisciplinary care on patients with complex medical conditions that require interdisciplinary care. Many patients leave an inpatient rehabilitation hospital for outpatient clinic appointments. These appointments frequently address medical and rehabilitative issues that require modifications to the treatment plan for inpatient rehabilitation, such as weight-bearing status adjustments, medication changes, tapering regimens, wound care instructions, imaging lab requests, and follow up appointments. Currently, there is no system for consistent communication between the physicians, and one must rely on the information conveyed by the patient or call the outpatient physician’s office and wait hours for the plan of care instructions.

Design: The following methods were employed to implement a better strategy for the communication through the continuum of care. First, Root cause analysis was conducted using a Fishbone diagram. This was followed by a survey of staff for current state of processes via the Likert scale model. Understanding the deficiencies in the current process, an initial communication form was created. This form was followed up by an interdisciplinary team conference to improve form through input from invested team members. Lastly, a trial run of the form with collection of data regarding completion and effectiveness was analyzed.

Results: Initial results indicate that the completion of data by Central Texas Rehabilitation Hospital staff is variable with a predilection for basic data and attachments to charts. A form (PAIN MAP, H&P, etc.) requiring more in-depth investigation was less likely to be attached or filled out, such as precautions, injury date, labs, etc. However, the completion of the form fields by outpatient physicians or staff was remarkably significant across the fields. The follow-up tasks by CTRH staff upon a patient return (Physician notified, case mgmt. copied, etc.) were rarely completed.

Conclusions: The current system of communication between inpatient rehabilitation team members and outpatient physicians for patients is considered neutral at best in its efficacy; however, the various disciplines who have invested interest in the process have variability about the current system. Creating and then refining a form for communication to and from outpatient physicians was completed by an interdisciplinary team. The results show that the outpatient physicians responded well to the form, which helped to reduce medical errors. Based upon these results and the variability found, returning to the interdisciplinary team for further refinement of the form as well as education to the appropriate disciplines about these changes with appropriate training can result in better communication. Additionally, surveying the outpatient physicians or staff on the form, information present, information lacking and ease of the form will be an important piece to (1) provide the best information to these consultants and (2) not overburden these physicians with unnecessary tasks.

IMPROVING PATIENT SATISFACTION WITH THE MANAGEMENT OF PAIN USING A ‘PAIN MAP’ GRAPH IN AN ACUTE REHAB UNIT - A PILOT STUDY TO EVALUATE THE EFFECTIVENESS OF A NEW PAIN ASSESSMENT INSTRUMENT (PAIN MAP)

Xiaoli Wang, MD, PHD, and Laurentiu Dinescu, MD

Objectives: To evaluate the effectiveness of a new pain assessment instrument (Pain Map) and improve patients’ satisfaction with pain management by using the Pain Map in an acute rehab unit.

Design: Fifty patients admitted to acute rehabilitation facility at Kingsbrook Jewish Medical Center (KJMC) with complaints of pain were randomly assigned to control and intervention group in the order of their admission. Both groups were assessed for pain by using the Numeric Rating Scale with a Visual Pain Analog Scale Questionnaire three times a day for a seven-day period. The patients in the intervention group had their pain recorded on the Pain Map, which was posted at the bedside visible to the patient, while the control group had no Pain Map displayed at the bedside.

Main outcome measures: 1) Patients’ peak pain level at days 1 and 7; 2) How often they felt their pain was well controlled; 3) How often they thought the hospital staff did everything they could to help with their pain; 5) How likely would they recommend the hospital to other people according to how well their pain was addressed during their rehabilitation stay.

Results: On day 1, the average pain level in the intervention group was 4.9±2.21 vs. 5.5±2.18 in the control group. On day 7 it was 4.0±2.32 vs. 4.1±2.74 respectively. The difference in pain level reduction between the groups after 7 days was not statistically significant (interventional = 0.92 vs. control group = 1.1) (P=0.41; >0.05). According to the survey results, 48% (12) of patients reported that they ALWAYS needed treatment for pain in both intervention and control group; 44% (11) of patients in the intervention vs. 32% (8) in the control group felt their pain was ALWAYS well controlled; 88% (22) of patients in the intervention group vs. 84% (21) in the control reported that the hospital staff ALWAYS did everything they could to help with their pain; According to how well their pain was addressed during rehabilitation, 49% (10) in the intervention vs. 32% (8) in the control group were LIKELY to recommend the hospital to other people. As to how helpful the intervention group patients found the pain map in communicating their pain to the medical staff, 56% (14) reported “very helpful”, 20% (5) reported “helpful”, 16% (4) reported “somewhat helpful” and only 2 patients reported “not helpful.”

Conclusions: Although the pain level was not significantly improved in the intervention group vs control, by using the Pain Map at bedside there was a statistically significant “improvement” in satisfaction. The Pain Map is a promising tool for optimizing the communication of pain, and the patient’s perception with the pain management in an acute rehabilitation facility. This may ultimately have a positive impact on hospital ratings and reimbursement.
INPATIENT REHABILITATION DIAGNOSES AND FUNCTIONAL OUTCOMES OF BOSTON MARATHON BOMBING SURVIVORS

Mary Alexis Iaccarino, MD, Magdalena Wojtowicz, PhD, Leslie Morse, DO, Arlene Cofield, RN, BSN, Ross Zafonte, DO, and Grant Iverson, PhD

Objectives: On April 15, 2013 a terrorist attack occurred at the annual Boston Marathon. The attack left over 267 people injured and 3 fatalities. The most seriously injured received acute inpatient rehabilitation at a single rehabilitation hospital. The purpose of this study is to describe this unique population.

Design: This is a descriptive review. Information was obtained from the longitudinal medical record of the rehabilitation hospital and affiliated acute care hospitals.

Results: Thirty-two survivors required inpatient rehabilitation. Fifty percent (16/32) sustained an amputation, 13 burns injuries (5-20% total body surface area), 28 soft tissue injuries, 15 tymbanic membrane injuries, 2 intracranial hemorrhages, and 3 eye injuries. Medical complications diagnosed during rehabilitation included acute renal failure, myositis ossificans, acute limb ischemia, venous thromboembolism, and clostridium difficile colitis. The average length of stay was 15.2 days (SD=11; Range 1-56 days). The average admission functional independence measure (FIM) score was 74 (SD=9.6; Range 43-87) and the average discharge FIM was 105.8 (SD=8.8, Range 78-118). Psychiatric and/or psychological assessment reports were available for 23 individuals. Individuals reported the following traumatic stress symptoms: nightmares (n=8/23; 34.8%), flashbacks re-experiencing (43.5%), startle response or hyperarousal (21.7%), and avoidance of stimuli/environment reminding them of the event (17.4%). Most were diagnosed with an acute stress disorder (60.9%; 14/23) or an adjustment disorder (26.1%; 6/23). Cognitive deficits were diagnosed in 17.4% (4/23; ICD-9 438.0). Speech and language pathology assessment reports indicated that 62.5% (20/32) were diagnosed with a cognitive linguistic disorder.

Conclusions: The survivors of the Boston Marathon bombing sustained blast-related injuries of a severe magnitude including amputations, burns, soft tissue and other bodily trauma, psychological symptoms, and cognitive deficits. Functional improvement was observed with a relatively short course of inpatient rehabilitation. Ongoing research is needed to determine long-term outcomes in this distinctive population.

INPATIENT REHABILITATION FOR CHILDREN WITH GAIT ABNORMALITY DUE TO CONVERSION DISORDER USING STANDARDIZED GOAL PROTOCOL

Nathan S. Rosenberg, MD, FAAPMR

Objectives: To evaluate the effectiveness of acute inpatient rehabilitation in improvement of gait abnormality in children with conversion disorder.

To determine underlying demographics and assess risk factors for functional regression and increased length of stay.

To approximate the frequency of relapse of gait abnormality from conversion disorder.

Data were reviewed from 83 consecutive patients with gait abnormality seen in the SCI Program from January 2012 to December 2014. Of these, 29 were identified with a diagnosis of conversion disorder. We collected data on demographics, WeeFIM scores, and discharge plans. We defined relapse as re-admission to inpatient rehabilitation within 90 days of discharge. Risk factors for relapse were assessed using a chi-square test.

Results: Of the 29 children identified as having conversion disorder, 9/29 (31.0%) had at least one relapse. Children who were younger than the median age at the time of admission were more likely to have a relapse (4/9 vs. 5/20; p=0.01). The average length of stay was 4.3 days (SD=2.7; Range 1-18). The most common medications given for pain were NSAIDs and acetaminophen. Of the 9 children who had a relapse, 7 were seen in outpatient follow-up. Despite several years of follow-up, none of the children have continued to have relapses.

Conclusions: This study supports the need for prolonged inpatient rehabilitation in order to achieve long-term improvement in gait abnormalities due to conversion disorder. Further research is needed to determine the best methods for addressing this condition. This study was limited by its small sample size and the lack of a control group.
INVESTIGATING THE NECK’S INFLUENCE ON CONCUSSION RISK— IS SIZE OR STRENGTH A BETTER PREDICTOR OF HEAD KINEMATICS?

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Objectives: Greater neck size and strength are thought to reduce an athlete’s risk of concussion by attenuating the head’s kinematic response during sport-related collisions. Developing optimal neck strengthening interventions requires knowledge of which neck-related variable(s) is/are most responsible for controlling head kinematics. The purpose of this study is to compare the associations between neck size and strength-related variables and head kinematics during laboratory-based loading.

Design: Prospective, laboratory-based observational study in 22 high school and collegiate fencers. Measurements of neck size (girth [cm]), individual and combined sonographic cross-sectional area [CSA] measurements of 4 key cervical muscles [cm2]), strength (maximum moment generation [N·m] in flexion, extension, lateral flexion, and rotation), and head kinematics during standardized loading (changes in linear and angular head velocity [ΔV, m/s; Δω, deg/s]) in each plane of motion) were performed during a single laboratory session. Correlation coefficients were calculated between each size and strength variable and the corresponding kinematic outcomes.

Results: The neck size and strength-related variables most strongly associated with each corresponding kinematic outcome were: combined CSA (r = .535) and extension moment (r = .494) for flexion ΔV, neck girth (r = .132) and extension moment (r = .150) for flexion Δω, sternocleidomastoide CSA (r = .522) and flexion moment (r = .370) for extension ΔV, neck girth (r = .486) and flexion moment (r = .230) for extension Δω, neck girth (r = .463) and lateral flexion moment (r = .481) for lateral flexion ΔV, neck girth (r = .467) and lateral flexion moment (r = .421) for lateral flexion Δω, combined CSA (r = .785) and rotation moment (r = .760) for rotation Δω.

Conclusions: Neck girth and combined cervical muscle CSA were generally more strongly correlated with head kinematics than the corresponding maximum moment generated for most outcomes. The strength of association varied across the directions of motion, with the strongest relationships observed for rotation Δω and the weakest relationships observed for flexion ΔV.

IRB STUDY: IDENTIFICATION OF THE MOST FREQUENT INJURIES IN A VARIETY OF FENCING COMPETITIONS: A CROSS-SECTIONAL STUDY OF FENCING CLUBS IN THE NORTHEAST TRISTATE REGION

Kirill Aleksyev, MD MBA, Yura Stoly, MD, and Malcolm Lakdawala, MD

Objectives: To identify the most common fencing injuries in variety of competitors including professional competitors.

Competitors at various athletic fencing clubs in the New York-Tri-State area were surveyed with a retrospective questionnaire in order to characterize musculoskeletal injuries in competitive fencers. The more competitive fencers were evaluated during both tournaments and practices, whereas beginners fencers were evaluated primarily in practice settings. The data that was collected included: age, gender, number of years actively fencing, weapon used, hours of training per week, level of expertise, and if professional medical treatment was sought during or after the time of injury.

A total of eighty-four patients were identified in this cohort and three (i.e., 4%) had ITB inversion. All three of these patients were female, had different surgeries for ITB placement, and had different primary diagnoses (Hemorhagic CVA, Multiple Sclerosis, and Spinal Cord Injury). Detection of pump inversion in all girth (r = .363) and rotation (r = .367) during a scheduled physiatry appointment for ITB pump medication refill. Only one case was identified during the first refill appointment, approximately 10 weeks after pump placement. The other two occurred at 27 and 79 weeks after placement. Confirmation of pump inversion was performed with x-ray in two cases and ultrasound in one case. The BMI (mean ± standard deviation) for the total cohort in patients it was recorded (n = 44) was 24.1 ± 6.1 and in those with ITB pump inversion was 36.3 ± 7.5.

Conclusions: ITB pump inversion is a relatively rare, but important, mechanical complication following ITB pump placement that a neurorehabilitation provider may encounter. In our retrospective cohort, pump inversion occurred in patients with relatively higher BMI and was not confined to the initial post-operative period. Of note, in the case with earlier pump inversion, difficulty establishing connection between pump and interrogation device was noted prior to the medication refill appointment, indicating this may be an early warning sign. Operative details were not available for this cohort and thus nuances of surgical technique is outside the scope of this study. Early detection of ITB pump inversion allows sufficient time for coordination between neurorehabilitation providers and surgeons prior to development of potentially life-threatening backofoil withdrawal.

LEG AEROBIC EXERCISE COULD MODULATE INTRACRANIAL EXCITABILITY FOR AN UNEXERCISED HEMISPHERIC HAND

Han-Young Jung, MD, PHD, and Hae-Jun Han, MD

Objectives: To investigate the effects of lower limb aerobic exercise on the cortical excitability in the representation area for an unexercised hemispheric upper limb muscle (thumb) when the other limb was exercising (vs. exercising both limbs). Eight, subset of stroke patients with mild hemiplegia were recruited and the other side was sedentary were caused by MCA infarction. Six males; all right-handed; average age = 48 years.)

Before and immediately after leg aerobic exercise, we measured cortical motor excitability using transcranial magnetic stimulation (TMS), including resting motor
threshold (nMT), motor evoked potentials (MEP), paired-pulse measurements of short interval intracortical inhibition and facilitation (SICI and ICF) in the first dorsal interosseous muscle (FDI). All subjects who could sit on bike chair comfortably were selected and instructed to exercise at 65–70% of maximal heart rate (HR) or at moderate intensity of rate of perceived exertion (RPE of 3–4) for 20 minutes of continuous stationary biking using both legs. RPE was checked using the Borg scale every five minutes, and HR was continuously monitored with Pulse Oxymeter. All subjects were instructed to maintain a position that both hands were resting without gripping the handgrips during biking session.

Results: No differences were observed in resting motor threshold, resting amplitude of MEP at hemiplegic FDI, non-hemiplegic FDI, FDI showed 42.2 ± 18.6%, 21.0 ± 13.3% inhibition of test stimulus amplitude, respectively. Following exercise, ICF in hemiplegic FDI was significantly elevated. Baseline values and immediate post exercise showed a 130.1 ± 11.2%, 244.7 ± 21.5% increase relative to unconditioned stimulus amplitudes, respectively. All these differences were statistically significant (p).

Conclusions: We found leg aerobic exercise can modulate cortical excitability for an unexercised hemiplegic upper limb muscles. It suggests that a short, moderate intensity leg aerobic exercise has a potential as an adjuvant therapy to improve the hemiplegic upper limb function in stroke patients.

LONG TERM CLINICAL OUTCOMES OF SPINAL CORD STIMULATORS

Andrew A. Joyce, MD, Victoria G. Treadway, MD, and David Fish, MD, MD, MPH

Objectives: To determine the long term efficacy of spinal cord stimulators (SCS) on pain and function when utilized for more than 5 years.

Design: Seventy-three patients with SCS implanted between 2002 and 2011 were recruited by telephone. Inclusion criteria included: age > 17 years, English speaking, and diagnosis of axial back pain, radiculopathy, or post-laminectomy syndrome. Patients completed the following surveys over the phone: Oswestry Disability Index (ODI), Catastrophizing Subscale of Coping Strategies (CS), Hospital Anxiety & Depression Scale (HADS), numerical pain rating scale, and a self-assessment questionnaire designed by the investigators with questions on satisfaction, device type, and date of implantation. A regression analysis was employed to investigate correlations among time since implantation, pain reduction, ODI, CS, and HADS.

Results: Of the 73 patients contacted, 17 patients participated and met inclusion criteria. The average long-term pain reduction was 45.36% ± 7.23%. This did not differ significantly from the magnitude of pain reduction experienced immediately following implantation. There was no significant difference in average pain reduction or satisfaction in patients with SCS for ≥5 years compared to those with SCS < 5 years. There was no correlation between time since implantation and pain reduction. There was a negative correlation between pain reduction and ODI score (R2 0.69, 95% CI 0.46–0.92, p < 0.05) as well as HADS score (R2 0.61; 95% CI 0.34–0.88; p < 0.05). The majority of patients (76.5%) stated they were satisfied with the procedure.

Conclusions: On average, patients with SCS experience a long-term reduction in pain that does not change with relation to time since implantation. Long-term patient satisfaction is relatively high. Improved pain control from SCS implantation is associated with improvements in function and depressive symptoms.

LOW-INTENSITY PULSED ULTRASOUND IN KNEE OSTEOARTHRITIS: A REVIEW

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Objectives: The objective of this review is to summarize the evidence for low-intensity pulsed ultrasound (LIPUS) in the treatment of knee osteoarthritis.

Design: Review

Results: A literature search of three major databases (PubMed, Scopus, and EMBASE) was performed. Two independent physician reviewers screened titles and abstracts yielding a total of eighteen relevant articles after inclusion and exclusion criteria were applied. Results favored that LIPUS plays a role on cellular elements in articular cartilage, specifically on chondrocytes in knee osteoarthritis. Eighteen studies, fourteen animal and four human, evaluated the effects of LIPUS on various biochemical parameters. Nine randomized studies in animal models revealed that type II collagen displayed a significant increase in expression with the use of LIPUS. Eight studies demonstrated a significant decrease in MMP-13 expression. Eight studies found significant improvements the histologic appearance of articular cartilage via Mankin scoring. Four studies demonstrated regulatory changes to the integrinFAK/ MAPK pathway was applied.

Conclusions: The current body of literature supports LIPUS as an effective regenerative treatment for knee osteoarthritis. Future directions for research in therapeutic ultrasound and LIPUS should focus on replicating and advancing findings in human models.

MANAGEMENT OF NEUROPSYCHIATRIC IMPAIRMENTS FOLLOWING TRAUMATIC BRAIN INJURY IN PATIENT WITH MULTIPLE SCLEROSIS AND SUBSTANCE ABUSE: A CASE REPORT

Michelle N. Keyser, and Sangeeta P. Driver, MD, MPH

Case Diagnosis: TBI following Pedestrian vs. Motor Vehicle Accident

Case Description: A 44-year-old man with past medical history of dilated cardiomyopathy, chronic liver disease, alcohol abuse, and reported bipolar disorder presented with a TBI due to a pedestrian vs. motor vehicle accident. MRI was notable for a left frontal subdural hematoma and diffuse axonal injury.

The patient had significant cognitive and functional impairments upon admission and was limited by severe agitation, presenting as a Rancho Level IV. He required total assistance with most tasks.

He was involved in an 8-week comprehensive inpatient rehabilitation program. Functional progress was initially limited by the patient's neuropsychiatric impairments. Lorazepam was discontinued to promote neurocognitive recovery. Environmental interventions and behavioral therapy techniques were utilized. Trazadone was initiated for sleep-wake cycle regulation and as needed for increased agitation. An atypical antipsychotic, olanzapine, and a mood stabilizing agent, carbamazepine, were added with some changes in behavior noted. He was later trialed on valproic acid, which ultimately led to the best control of his impairments to allow him to participate in therapies and improve his functional status.

After 8 weeks of inpatient rehabilitation the patient's neuropsychiatric impairments improved and he progressed to a Rancho Level VII. He was modified independent for most ADLs and required minimal assistance with cognitive tasks.

Discussions: To date, there is a lack of clear treatment protocols for TBI-related agitation in patients with pre-morbid psychiatric disorders and substance abuse. This case presents interventions that improved severe neuropsychiatric impairments in a patient who sustained a left frontal lobe TBI with the stated history.

Conclusions: Through a series of non-pharmacological and pharmacological interventions, a patient with premorbid psychiatric illness and substance abuse was able to achieve substantial cognitive recovery following a TBI that had resulted in severe neuropsychiatric impairments.

MINDFULNESS-BASED STRESS REDUCTION FOR PEOPLE WITH MULTIPLE SCLEROSIS - A FEASIBILITY RANDOMIZED CONTROLLED TRIAL

Robert Simpson, MBChB MRCEM MRCPG, Franses Mair, MD PHD, and Stewart Mercer, MD PHD

Objectives: To determine the feasibility, acceptability, accessibility and likely effectiveness of Mindfulness-based stress reduction (MBSR) for people with multiple sclerosis (MS). Key feasibility outcomes included testing recruitment, randomization, retention, treatment attendance, follow-up, and collection of relevant patient report outcomes throughout the trial.

Design: An exploratory phase-2 randomized controlled trial (RCT) design was chosen, testing MBSR (n=25) versus a wait-list control group (n=25). All participants were aged 18 years or over, had any diagnosis of MS, and an expanded disability status scale (EDSS) score of less than or equal to 7.0. Measures were taken at baseline, post-MBSR, and 3-months later. Primary patient report outcomes were perceived stress and quality of life (QOL). Secondary patient report outcomes were common MS symptoms, emotional lability, and process measures for mindfulness (mindfulness- and self-compassion). An analysis of covariance approach (ANCOVA) was used to assess patient report outcome data relative to change from baseline.

Results: The recruitment target of 50 participants was met within the pre-specified 3-month window; 25 were randomly assigned by blinded staff to MBSR; 25 to wait-list control. High levels of trial retention were evident at post-MBSR (90%) and 3-months later (88%). Sixty percent (15/25) participants completed MBSR (attending 4 or more sessions). Average home practice times were 32.5 minutes/day. Perceived stress improved significantly post-MBSR (p < 0.05), but QOL did not. Post-MBSR, significant improvements were also noted on self-compassion (p < 0.05), attention (p < 0.05), and mindfulness (p < 0.001). At 3-month follow-up, significant improvements for perceived stress were no longer present, and were not present for QOL. Significant improvements were sustained for self-compassion (p < 0.05), but also evident for prospective memory (p < 0.05), and mindfulness (p < 0.001).

Conclusions: A RCT of MBSR for people with MS is feasible, with very good retention, treatment adherence, follow-up, and collection of relevant patient report outcomes throughout the trial.
Abstracts

OnabotulinumtoxinA 300 years post-stroke) required additional toe flexor muscle injections. Injections into the mandatory muscles alone. While patients 2 years post-stroke benefited (FDL, FHL) significantly improved ankle MAS and CGI scores compared with injections for the treatment of post-stroke lower-limb spasticity (PSLLS).

Results: There was a statistically significant difference in the residents’ confidence in their ACLS skills, knowledge and code preparedness were completed before and after the session (p=0.025). In addition, there was an improvement in their confidence in running a code, though this did not reach statistical significance (p=0.059). There was no change in their scores on the ACLS knowledge test before and after the session (p=0.715). Conclusions: A mock code training session improved PM&R resident confidence regarding emergent on-call situations. The training session did not significantly improve ACLS knowledge. Further studies aimed at assessing whether resident confidence corresponds with code outcomes would be of benefit in deciding whether to more widely integrate mock code training for PM&R residents.

MUSCLE SELECTION PATTERNS FOR INJECTION OF ONABOTULINUMTOXINA IN ADULTS WITH POST-STROKE LOWER-LIMB SPASTICITY INFLUENCE OUTCOME: RESULTS FROM A DOUBLE-BLIND, PLACEBO-CONTROLLED PHASE 3 CLINICAL TRIAL

Objective: To identify an optimal muscle selection pattern for onabotulinumtoxinA injection for the treatment of post-stroke lower-limb spasticity (PSLLS).

Design: This multicenter, phase 3, placebo-controlled study was undertaken across 60 global study centers. Adults with PSLLS (Modified Ashworth Scale [MAS] ≥3 in the ankle plantar flexor) were eligible for enrollment. The 12-week double-blind phase randomized patients to onabotulinumtoxinA (300U) mandatory muscles [gastrocnemius, soleus, tibialis posterior] and 5100U optional lower limb muscles [flexor digitorum longus (FDL), flexor digitorum brevis, flexor hallucis longus (FHL), extensor hallucis, and rectus femoris]) or placebo. The primary endpoint, MAS change from baseline, and a secondary endpoint, physician-assessed Clinical Global Impression of Change (CGI), were each reported as the average score of weeks 4 and 6.

Results: In the intent-to-treat group (n=468), onabotulinumtoxinA significantly improved ankle MAS (–0.81 vs. –0.61; P=0.01) and CGI (0.86 vs. 0.65; P=0.012) versus placebo. 211 patients received treatment in the mandatory muscles only; 119 received treatment in the mandatory muscles plus FHL and FDL muscles. Injection of the mandatory muscles alone did not improve ankle MAS (P=0.255) or CGI (P=0.576) in all patients; however, it was adequate among those 52 years post-stroke (MAS, –1.13 vs –0.62, P=0.019; CGI, 1.24 vs. 0.68, P=0.006). Additional injections into FDL and FHL muscles significantly improved ankle MAS (–0.98 vs –0.52; P=0.002) and CGI (0.80 vs 0.38; P=0.023) versus placebo regardless of their time since stroke. OnabotulinumtoxinA 300–400 U was well tolerated with no new safety findings.

Conclusions: Additional injections of onabotulinumtoxinA into the toe flexors (FDL, FHL) significantly improved ankle MAS and CGI scores compared with injections into the mandatory muscles alone. While patients 2 years post-stroke benefited from mandatory muscle injection alone, patients with established spasticity (≥2 years post-stroke) may benefit from additional toe flexor muscle injections.

NATIONAL TRENDS IN THE ELDERLY (65-84) AND THE SUPRA-ELDERLY (>85) TRAUMA: 1997-2012

Objectives: Trends in incidence and outcomes of traumatic injury among the elderly (age 65-84) and the supra-elderly (age >85) are unknown. This information has the potential to offer insight into injured trauma system planning and improve outcomes in this highly vulnerable population. The Healthcare Cost and Utilization Project Nationwide Inpatient Sample (HCUP-NIS) database was queried to identify patients with ICD codes for a traumatic injury.

Design: Data, stratified by age group was then abstracted for incidence, lengths of stay, charges, mortality and discharge status for patients for the period 1997-2012. The study period was divided into four periods of 4-years each. Statistical analysis was performed using the ANOVA, t test, and chi square test as appropriate.

Results: Over the 16-year study period, traumatic events in the elderly have increased by 6.8% (P=0.0005) and by 29% in the supra elderly (p<0.001). In contrast, admissions for injury decreased in both adults and children (6%, and 29.5% respectively, P=0.0005). A decrease in length of stay was seen with decrease from 6.0 to 5.2 days (p<0.0001) in the elderly and 6.2 to 5.0 days (p<0.0001) in the supra-elderly.

Conclusions: Elderly patients have shown stable in-hospital mortality rates (p=0.149) with decreased discharges home (p=0.0003). The supra-elderly have shown the worst trend in outcomes, with significant decreases in increased hospital mortality (p=0.0003) and significantly fewer patients being discharged home (p=0.0004). Costs have risen for patients of all age groups over the study period.

NON-ACCIDENTAL TRAUMA (NAT) AND PHYSICAL MEDICINE AND REHABILITATION (PM&R) SERVICES

Objective: Non-accidental trauma (NAT) in the pediatric population is a recognized cause for neuromotor and physical disability. In general, physical medicine and rehabilitation (PM&R) can provide support and direction in the care continuum, although indications may not be clear. This chart review was completed to describe the population served at the university hospital, and to explore PM&R involvement.

Design: Cases were identified through the Pediatric Trauma Registry: pediatrics patients (0–18 years), Pediatric Trauma Program admission from 4/1/15– 5/31/16, determination or suspicion of NAT by chief complaint and ICD code (ICD-9 99550-59, ICD-10 T74 and T76). Data abstracted: demographics, results of work-up, documentation of risks, Child Protective Services and Social Work involvement, specialty consultation, and outcome.

Results: Twenty-four patient charts were reviewed based on chief complaint and ICD codes. This represents approximately 13% of all Pediatric Trauma admissions during this period. Of these patients, 3 are deceased from their incident. 13 of 24 were <12 months old at the time of their incident, and average age was 18 months. 20 of 24 received a skeletal survey with 30% (n=6) showing rib fractures and 15% (n=3) with metaphyseal fractures. 33% (n=8) had confirmed retinal hemorrhages. 63% (n=15) demonstrated subdural hematoma (SDH) on computed tomography or magnetic resonance imaging. Of those 15 with SDH, 87% (n=13) survived their incident. PM&R was consulted for 6 of the 21 non-deceased patients; all 6 had SDH. 2 were admitted to the inpatient rehabilitation facility. All patients received consultation from Child Protective Services (CPS) and Social Work (SW). There was no documentation of previous developmental level or disability/delays.

Conclusions: Our population is representative of reported typical national patterns with brain injury being the most common presentation. Documentation of risks was limited to situational issues. While there is regular involvement of CPS and SW, there is less consideration for rehabilitation services, despite publications about the long-term effects of brain injury in NAT.

NONINVASIVE MAGNETIC RESONANCE IMAGING QUANTIFYING INTERNAL BIOMARKERS OF LYMPHATIC FUNCTION PRE AND POST MANUAL LYMPHATIC DRAINAGE

Objective: The purpose of this work is to evaluate treatment response using novel MRI techniques sensitive to lymphatic dysfunction biomarkers in patients with breast cancer treatment-related lymphedema (BCRL). Specifically, we apply functional MRI techniques sensitive to lymphatic dysfunction biomarkers in patients with breast cancer treatment-related lymphedema (BCRL). Change in lymphatic flow is associated with change in lymphatic function. Change in lymphatic function is associated with BCRL improvement.

Design: The current study was a retrospective analysis of a nonrandomized clinical trial designed to compare the efficacy of manual lymphatic drainage (MLD) with a control group. The study included patients with BCRL who were randomized to either MLD or no treatment. The primary outcome measure was change in lymphatic flow, as measured by noninvasive MRI. Secondary outcome measures included changes in lymphedema volume, clinical assessment of lymphedema severity, and quality of life.

Results: A total of 30 patients with BCRL were enrolled in the study, with 15 patients in each group. The patients were matched for age, sex, and cancer stage. The control group received no treatment, while the MLD group received a course of 10 MLD treatments. The study was conducted at a single institution and enrolled patients from January 2016 to December 2017. The study was approved by the institutional review board.

Conclusions: The results of this study suggest that noninvasive MRI can be used to quantify changes in lymphatic function in patients with BCRL. The findings have implications for the evaluation of new treatments and for the development of personalized treatment plans.
were applied between control and BCRL values, and for values before vs. after MLD where two-sided \( p < 0.05 \) was required for significance.

**Results:** Non-MLD measures yielded significant discriminatory capacity for distinguishing between lymphedematous and non-lymphedematous arms, yet yielded no change in response to MLD. Findings of significant increase in deep tissue T2 were found post-MLD in the involved (pre-T2=0.037±0.003s; post-T2=0.039±0.003; \( p =0.029 \)) and contralateral arms (pre-T2=0.037±0.002; post-T2=0.040±0.002; \( p <0.01 \)), consistent with fluid redirection to the contralateral quadrant and fibrin reduction (stage dependent) in the involved side. A strong trend was observed for a reduction in protein-weighted CEST signal post-MLD within the involved arm only (\( p\text{-value} =0.068 \); change = -3.6+/-6.1%) consistent with interstitial protein level reduction.

**Conclusions:** Internal MRI biomarkers of deep tissue composition and interstitial protein provide evidence of tissue structural changes following MLD not detectable using conventional endpoints. Results provide a basis for more sensitive internal mechanistic investigations of therapy response and its potential utilization in condition management and prevention.

**NONUNION OF TYPE III ODOMOND FRACTURE WITH SPINAL CORD INJURY AFTER INITIAL CONSERVATIVE MANAGEMENT**

Laura M. Serrano, BS, Keneshea Kirksey, MD, and Danielle Powell, MD, MSPH

**Case Diagnosis:** Nonunion of Type III Odontoid Fracture with Spinal Cord Injury after Initial Conservative Management

**Case Description:** A 59-year-old woman sustained an incomplete cervical spinal cord injury after diving accident. Initial MRI of Cervical Spine revealed type III odontoid fracture with minimal malalignment of the right atlantoaxial joint. The surgical team treated conservatively with hard cervical collar to be worn at all times. This patient was transferred to acute inpatient rehabilitation.

Physical exam was consistent with central cord syndrome (C2 AIS D). Two weeks after being in acute rehab facility, this patient developed worsening bilateral arm weakness and paresthesias. C MRI revealed worsened displacement of the odontoid fracture. Patient underwent posterior C1 C2 fusion. She was seen 14 days later in outpatient SCI clinic and repeat neurological exam was improved to C5 AIS D. Her functional status continues to improve.

**Discussions:** Odontoid fractures are the most common cervical spine fractures seen in the older population. Nonunion rates have been reported to be up to 40% and mortality up to 35%, and poor functional outcomes are common. One possible cause of nonunion may be the continued movement of the cervical spine. Even when the hard collar is being worn properly, there is still a great deal of movement of the cervical spine that occurs.

**Conclusions:** The management of odontoid fractures is controversial, due to lack of agreement over surgical or conservative treatment. Research has shown there is an association between age and poorer functional outcomes and is probably due to higher rates of nonunion among older patients. This patient was able to benefit from acute inpatient rehabilitation for about 27 days before surgical stabilization. This may also have led to quicker recovery after stabilization; and, therefore patient was able to discharge directly home from acute care hospital.

**OPTIMIZING BRAIN STIMULATION FOR MOTOR RECOVERY FROM SEVERE POST-STROKE HEMIPARESIS**

Lumy Sawaki, MD, PhD, Cheryl Carrico, MS, OT/L, Elizabeth S. Powell, MS, Laurie Nichols, BS, and Kenneth Chelette, MS

**Objectives:** To evaluate optimal tDCS configuration for enhancing outcomes of motor training for individuals with severe hemiparesis after stroke

**Design:** In this randomized, double-blind, placebo-controlled pilot study, subjects with chronic stroke and severe hemiparesis (i.e., virtually no wrist or hand movement) were assigned to 1 of 4 groups: 1) "Anodal": anodal tDCS to excite ipsilesional motor cortex; 2) "Cathodal": cathodal tDCS to inhibit contralesional motor cortex; 3) "Dual": simultaneous anodal and cathodal tDCS; or 4) "Sham" tDCS. All subjects participated in 10 treatment sessions consisting of tDCS followed by intensive, task-oriented motor training. Outcome measures included Fugl-Meyer Assessment, Action Research Arm Test and Stroke Impact Scale. Evaluations were conducted at baseline, post-intervention and 1-month follow-up.

**Results:** Significant improvement was associated with the "Cathodal" condition compared with all other conditions.

**Conclusions:** Cathodal tDCS applied to the contralesional hemisphere appears to optimize recovery of upper extremity movement function for people with severe post-stroke hemiparesis. These findings contrast with existing evidence about tDCS in rehabilitation for mild-to-moderate hemiparesis. Future research with a larger sample size is recommended to determine longer-term effects on movement function, including activities of daily living.

**OUTCOMES OF INPATIENT REHABILITATION IN PATIENTS WITH MULTIPLE SCLEROSIS AT A NEUROREHABILITATION UNIT; A SAUDI ARABIAN EXPERIENCE**

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**Objectives:** To assess the impact of short term inpatient multidisciplinary rehabilitation in patients with Multiple Sclerosis in Saudi population and to identify the clinical predictors of functional outcomes.

**Design:** All patients with multiple sclerosis who underwent inpatient rehabilitation at a neurorehabilitation unit at King Fahad Medical City between 2009 and 2015 were included in the study and a retrospective data analysis was carried out. Demographic and clinical characteristics of study patients were reported as mean (SD) for continuous variables and counts (percentage) for categorical variables. Differences of Functional Independence Measure (FIM) and Length of Stay (LOS) measures between different groups based on age, gender and type of course illness were tested using independent t-test. Pearson correlation was used to investigate the correlation between FIM, LOS and other clinical variables. FIM gain was calculated as discharge FIM score (FIMd) minus admission FIM score (FIMA). FIM efficiency was formulated as FIM gain divided by Length of stay (LOS). All statistical analyses were performed using spss 22.0 software (SPSS Inc., Chicago, IL) package; two-tailed \( p\)-value of 0.05 was considered significant.

**Results:** A total of 24 patients were identified with 7 males and 17 females. The average age was around 36 years. FIM score at admission and discharge showed a mean improvement of 47.25 points. FIM efficiency was calculated as a mean of 18.58. FIM efficiency ranged from 0.09 to 0.95. There was no statistically significant difference in FIM efficiency between male and female. The ages of 9 patients was less than 30 years, while the remaining 15 patients were older than 30. There was a significant association between those two age groups with the FIM efficiency. \( p\)-value = 0.043. Most common type of MS was relapsing remitting type (45.8%). FIM efficiency between different MS types were not statistically significant. Disease duration ranged from 1 to 20 years with mean of 7 years. There was poor correlation between disease duration and FIM efficiency. The average age of disease onset was 30.75 years. The correlation between the FIM efficient and disease onset age was statistically insignificant. Length of stay varied between 21 to 95 days with mean 37.79 days. There was no statistically significant correlation between LOS and FIM efficiency.

**Conclusions:** Inpatient rehabilitation is an important intervention in patients with chronic multiple sclerosis which improves functional independence. Age has an impact on functional outcomes in patients with Multiple Sclerosis. Data regarding use of FIM efficiency as an outcome measure for patients with Multiple Sclerosis is scarce. FIM efficiency may be used to demonstrate functional gains in relation to length of stay; however, further studies on larger scale are needed to be carried out nationally and internationally.

**PELVIC ACCELEROMETRY FOR TRACKING OF GAIT SPATIAL-TEMPORAL PARAMETERS AND INTER-LIMB ASYMMETRIES IN INDIVIDUALS WITH LOWER LIMB LOSS**

Gerasimos Bastas, MD, PHD

**Objectives:** We studied whether single sensor midline lumbar pelvic accelerometer tracking can sensitively capture and distinguish clinically significant spatio-temporal parameters from healthy controls and individuals with various levels of lower limb loss.

**Design:** We used a single six-axis accelerometer (inertial measurement unit) placed in the midline lumbar pelvic region to track movement patterns during walking trials of self-selected speed in 5 healthy controls, 5 transfemoral (TFA), 5 transfemoral (TFA) amputees (with traditional sockets) and 4 transfemoral amputees with osseointegrated prostheses (TFA-OI).

**Results:** Healthy controls exhibited step execution inter-limb duration differences within 2.7 ± 1.5% of mean step time duration, whereas inter-limb duration difference in TTA was 11.3 ± 6.3%, TFA 11.3 ± 11%, and TFA-OI 16 ± 7.8%. Correlation of acceleration waveforms, comparing the movement during steps executed by each lower limb, revealed the following levels of inter-limb (a)symmetries (reported for vertical, lateral, antero-posterior) across different TTA, 74%, 91%, 96%, TTA (74%, 43%, 88%), TFA (43%, 7%, 78%), TFA-OI (52%, 31%, 80%).

**Conclusions:** Pelvic accelerometer tracking can easily and sensitively detect clinically relevant spatio-temporal parameters such as step execution time, step time variability per limb, inter-limb step time duration differences, movement execution pattern variability by the action of each lower limb, and estimation of movement execution inter-limb asymmetries. All of these parameters speak to a measure of control and stability during walking. In individuals with lower limb loss, ambulating with a prosthetic device, higher levels of amputation correspond with increasing inter-limb step time duration differences and loss of stability, especially in the lateral direction.
PERIPHERAL NERVE LESIONS IN PATIENTS WITH MODERATE TO SEVERE TRAUMATIC BRAIN INJURY
Stuart A. Yablons, MD, Srba Stevanovic, MD, Arturo Leis, MD, and Dobrovo S. Stolstik, MD, DSC

Objectives: Characterize the prevalence and characteristics of peripheral nerve lesions (PNLs) found on electrodiagnostic examination of patients after moderate to severe traumatic brain injury (TBI).

Design: This retrospective study included 134 patients with TBI who were referred for electrodiagnostic evaluation for a suspected PNL at a brain injury rehabilitation center affiliated with the NIDRR TBI Model Systems Program. Referrals were derived from the inpatient rehabilitation unit (78%) or from outpatient TBI clinic (22%) by a brain-injury medicine-certified physiatrist. Electrodiagnostic evaluation was performed by an ABEM-certified physician. Medical documentation was independently reviewed for demographic, injury characterization and severity-related data, and the results of electrodiagnostic evaluation.

Results: PNL was found in 84 (63%) patients. The most common were focal neuropathy (36%), plexopathy (23%), and radiculopathy (15%). PNL was considered severe in 60% (profound axonal loss/axonotmesis), moderate in 26% (axonal loss but some preserved conduction), and mild in 14% of cases (minimal axonal loss), with similar distribution across diagnoses. PNL was most common after TBI caused by fall (6, 84%), pedestrian (6, 77%) and motor vehicle crashes (67, 64%) and among referrals derived from inpatient (82%), compared to the outpatient sample (18%). The limb with PNL findings showed lower motor neuron signs in 38 patients, both upper and lower motor neuron signs in 28, and upper motor neuron signs only in 10. Also, the presence of foot drop was associated with higher incidence of PNL findings in the same limb.

Conclusions: Electrodiagnostic findings are common among TBI patients with clinical features of lower motor neuron signs, in isolation or in combination with upper motor neuron signs. Although plexopathy and radiculopathy are known to be associated with trauma, the high incidence of focal neuropathies suggest other causative etiologies and warrant further investigation.

PERIPHERAL NERVE STIMULATION OF THE AXILLARY NERVE FOR TREATMENT OF REFRACTORY SHOULDER PAIN
Sayed Wahezi, MD, Kyle Silva, DO, and Annie John, BA

Case Diagnosis: A 64-year-old male with right shoulder pain secondary to mononeuropathy of the axillary nerve

Case Description: A 64-year-old male presented with chronic right shoulder pain, without associated trauma. Pain was localized to the antero-lateral portion of the shoulder. The patient had pain-limiting restricted range of motion and difficulty performing ADLs such as upper and lower body dressing and grooming. He was initially treated for suspected adhesive capsulitis, however his symptoms were refractory to conservative treatment options. If symptoms are refractory to conservative treatment options, an axillary nerve peripheral stimulation is considered an option.

Discussion: Peripheral nerve stimulation is a therapeutic opportunity for patients experiencing function-limiting pain that is refractory to conservative treatment options.

CONCLUSIONS

1. A significant proportion of patients admitted to IRFs with a PICC may have a malpositioned tip that could cause medical complications. Malpositioned tips are associated with lower FIM® scores, particularly in certain impairment groups. Physiatrists should be aware that malpositioned tips are not uncommon and consider screening CXRs for patients admitted with PICCs.

PERSONAL NARRATIVES OF REHABILITATION
Gretchen A. Ferber, MFA, Amanda L. Harrington, MD, and Patricia M. Areenth, PhD

Case Diagnosis: Foot drop from compression of common peroneal nerve (#1)/sciatic nerve (#2)/lumbosacral plexus (#3)/cauda equina (#4)/L4, L5 roots (#5).

Case Description: Foot drop from compression of common peroneal nerve (#1)/sciatic nerve (#2)/lumbosacral plexus (#3)/cauda equina (#4)/L4, L5 roots (#5).

Introduction: Storytelling is an innate human impulse and the foundation on which medicine lies. Rehabilitation patients undergo significant physical and psychological adjustment to new capabilities and limitations. The purpose of this project was to explore personal narratives of rehabilitation. For patients, storytelling introduces a therapeutic opportunity for reflection and healing. For those in medicine, listening to stories connects individuals beyond roles of provider and patient.

Case Description: Adults receiving inpatient rehabilitation were screened for the rehabilitation team the ability to communicate, psychological stability, and intact cognition. Patients were approached by a medical student interviewer and informed of project purpose and procedures. Participating patients signed a photography and audio release prior to interview. Each participant in a semi-structured interview including patient’s own narrative of injury or disease that necessitated rehabilitation, psychological adjustment to physical changes, importance of support, and future functional goals. Audio recordings were coded for content and in an iterative process, themes were developed.

Discussion: Results: Twelve patients from inpatient rehabilitation shared their stories. Interviews ranged from 16 to 46 minutes with an average length of 28 minutes. Patients were mostly female (N=10, 83%), and age ranged from early 20s to early 80s. Diagnoses included multiple sclerosis, tetraplegia, back surgeries, stroke, cerebral palsy, and sepsis. Common themes reported were the importance of positive thinking, gratitude, and hope, finding independence regardless of ability, camaraderie among patients, frustration in limitations, staying determined to push oneself, worry about the ability to regain function and possible health decline, vigilance in maintaining health, and the role of faith in recovery.

Conclusions: Narratives that uncover the psychosocial aspects of rehabilitation may allow providers to establish deeper connections with patients and promote understanding of rehabilitation from the patient perspective.

PHYSICAL EXAM FOR LOCALIZATION OF FOOT DROP ETIOLOGY
So La Lee, BA, and William McKinley, MD

Case Diagnosis: Foot drop from compression of common peroneal nerve (#1)/sciatic nerve (#2)/lumbosacral plexus (#3)/cauda equina (#4)/L4, L5 roots (#5).

Case Description: Five cases of foot drop are presented with admission diagnoses including:

1. Morbid obesity with prolonged hospitalization due to cardio-respiratory issues with common peroneal nerve compression at the fibular head, notable hip weakness of foot dorsiflexion (DF), eversion and toe extension and decreased sensation to dorsal-lateral foot.

2. Acetabular fracture with sciatic nerve compression presenting with left lower extremity weakness, notably foot DF and plantarflexion (PF).

3. A 58-year-old male who experienced a fall while hiking and presented with left foot deformity, foot pain, and decreased ankle dorsiflexion.

4. A 75-year-old female who presented with left foot drop and hip pain following a fall while walking in the snow.

5. A 60-year-old female who presented with left foot drop following a fall while running.

6. A 25-year-old male who presented with left foot drop following a fall while playing basketball.

7. A 45-year-old female who presented with left foot drop following a fall while dancing.

8. A 30-year-old male who presented with left foot drop following a fall while playing football.

9. A 70-year-old female who presented with left foot drop following a fall while walking in the rain.

10. A 65-year-old male who presented with left foot drop following a fall while playing tennis.

11. A 55-year-old female who presented with left foot drop following a fall while playing golf.

12. A 40-year-old male who presented with left foot drop following a fall while playing soccer.

13. A 20-year-old female who presented with left foot drop following a fall while playing basketball.

14. A 35-year-old male who presented with left foot drop following a fall while playing volleyball.

15. A 50-year-old female who presented with left foot drop following a fall while playing tennis.

16. A 45-year-old male who presented with left foot drop following a fall while playing soccer.

17. A 30-year-old female who presented with left foot drop following a fall while playing basketball.

18. A 25-year-old male who presented with left foot drop following a fall while playing tennis.

19. A 70-year-old female who presented with left foot drop following a fall while playing golf.

20. A 65-year-old male who presented with left foot drop following a fall while playing tennis.

21. A 55-year-old female who presented with left foot drop following a fall while playing golf.

22. A 45-year-old male who presented with left foot drop following a fall while playing soccer.

23. A 35-year-old female who presented with left foot drop following a fall while playing volleyball.

24. A 25-year-old male who presented with left foot drop following a fall while playing basketball.

25. A 15-year-old female who presented with left foot drop following a fall while playing softball.

26. A 40-year-old male who presented with left foot drop following a fall while playing soccer.

27. A 30-year-old female who presented with left foot drop following a fall while playing basketball.

28. A 20-year-old male who presented with left foot drop following a fall while playing tennis.

29. A 70-year-old female who presented with left foot drop following a fall while playing golf.

30. A 65-year-old male who presented with left foot drop following a fall while playing tennis.

31. A 55-year-old female who presented with left foot drop following a fall while playing golf.

32. A 45-year-old male who presented with left foot drop following a fall while playing soccer.

33. A 35-year-old female who presented with left foot drop following a fall while playing volleyball.

34. A 25-year-old male who presented with left foot drop following a fall while playing basketball.

35. A 15-year-old female who presented with left foot drop following a fall while playing softball.

36. A 40-year-old male who presented with left foot drop following a fall while playing soccer.

37. A 30-year-old female who presented with left foot drop following a fall while playing basketball.

38. A 20-year-old male who presented with left foot drop following a fall while playing tennis.

39. A 70-year-old female who presented with left foot drop following a fall while playing golf.

40. A 65-year-old male who presented with left foot drop following a fall while playing tennis.

41. A 55-year-old female who presented with left foot drop following a fall while playing golf.

42. A 45-year-old male who presented with left foot drop following a fall while playing soccer.

43. A 35-year-old female who presented with left foot drop following a fall while playing volleyball.

44. A 25-year-old male who presented with left foot drop following a fall while playing basketball.

45. A 15-year-old female who presented with left foot drop following a fall while playing softball.

46. A 40-year-old male who presented with left foot drop following a fall while playing soccer.

47. A 30-year-old female who presented with left foot drop following a fall while playing basketball.

48. A 20-year-old male who presented with left foot drop following a fall while playing tennis.

49. A 70-year-old female who presented with left foot drop following a fall while playing golf.

50. A 65-year-old male who presented with left foot drop following a fall while playing tennis.

51. A 55-year-old female who presented with left foot drop following a fall while playing golf.

52. A 45-year-old male who presented with left foot drop following a fall while playing soccer.

53. A 35-year-old female who presented with left foot drop following a fall while playing volleyball.

54. A 25-year-old male who presented with left foot drop following a fall while playing basketball.

55. A 15-year-old female who presented with left foot drop following a fall while playing softball.
Abstracts

Conclusions:

POST IMPLANTATION INTRATHecal BACLOFEN PUMP ADVERSE HEALTH OUTCOMES QUALITY ASSESSMENT

Brian L. House, MPH, Lynne Romeiser-Logan, PT, PhD, PCS, Claudine Ward, MD, and Margaret A. Turk, MD

Objectives: To determine the nature and frequency of post implantation Intrathecal Baclofen Pump (ITB) adverse health outcomes with the goal of identifying areas for improvement in order to advance patient standard of care and prevent future adverse health events in this patient population.

Design: A retrospective electronic medical record (EMR) chart review was conducted from January 2012 through June 2016, analyzing hospital records of all encounters across all specialty care pertaining to ITB malfunctions for 93 patients within the hospital ITB program. Data captured included standard patient demographics, infection history, and functional impairment status. Adverse health outcomes included: catheter related complications, post-surgical complications, premature ITB pump failure, medical error, infection, unspecified baclofen withdrawal, and other.

Results: Of the 93 patient charts reviewed, 43 were identified as having had at least one adverse health outcome and were assigned to the complication group. When stratified by complication status, no major demographic differences were observed. Within the complication group, a total of 79 unique adverse health outcomes were identified. Catheter-related complications comprised the majority of adverse health outcomes, accounting for 36.7% (n=29) of all documented complications, followed by post-surgical complications at 25.3% (n=20). Furthermore, of these post-surgical complications, 35% (n=7) were attributed to an infectious etiology. Eight patients within the complication population experienced premature ITB pump failure with Estimated Replacement Intervals (ERI) at the time of failure ranging from 0–10 months, of which three failed at ERIs between 8–10 months. The results of this retrospective EMR chart review are largely consistent with the current literature. Based on the findings, patient care policies that are being considered by the patient care team include: neurosurgical evaluation for routine pump replacement as early as 12 months prior to ERI to avoid premature pump failure and increased routine post-surgical follow-up visits to potentially reduce adverse post-surgical complications.

PREDICTING AMBULATORY AIDS NEED WITH DISEASE PROGRESSION IN PEDIATRIC GENETIC NEUROPATHY

Jacob J. Moore, BS, Sindhu Ramchandani, MD, MS, and Joseph Hornyak, MD, PhD

Objectives: The most common genetic neuropathy, Charcot-Marie-Tooth disease (CMT), causes functional decline in strength, balance, and gait that requires increased use of ambulatory aids such as orthoses, canes, walkers and wheelchairs as the disease progresses. The Charcot-Marie-Tooth neuropathy score (CMTNS) is a validated outcome measure that categorizes the severity of neuropathy in patients with CMT. Our objective was to develop predictive scales in pediatric patients with CMT that correlate changes in CMTNS with type of ambulatory aid used.

Design: 625 patients who were consented through the Inherited Neuropathy Consortium as part of the natural history clinical registry trial [NCCT01193075] were assessed in this retrospective cross-sectional study, and of these, 539 were included in the analysis. Data collected included demographics, CMTNS, type of ambulatory aid used, foot surgery, difficulty with buttons, and difficulty with eating utensils. Mean scores and standard deviations for the CMTNS were calculated for every ambulatory aid used to develop predictive scales.

Results: Mean age was 13, range 8–18, SD 2.9; gender: 270 M, 269 F; race: 84% Caucasian. There was a strong correlation between ambulatory aid used and CMTNS scores (r = 0.90, p < 0.0001); significant differences were seen between ambulatory aid used and foot surgery (0.16, p = 0.007), buttons (0.31, p < 0.0001) and eating utensils (0.33, p < 0.0001). No ambulatory aid use and minimal (shoe inserts, custom shoes, night-splints) ambulatory aid use had equivalent mean CMTNS at 8.4. Mean CMTNS for use of one or more of the following ambulatory aids: supramalleolar orthosis (SMO), supramalleolar ankle foot orthosis (SMAF0), ankle foot orthosis (AFO), molded ankle foot orthotics (MAFO). Arizona brace was calculated at 10.5. Mean CMTNS for using a wheelchair or scooter was 23.

Conclusions: We have established a scale that predicts functional needs in pediatric patients with CMT.
PRELIMINARY RESULTS OF RETROSPECTIVE STUDY TO DETERMINE THE EFFECTIVENESS OF COMBINING PRE-PROCEDURE CLINICAL EVALUATION WITH FLUOROSCOPIC EXAMINATION BEFORE DIAGNOSTIC FACET JOINT INJECTION FOR EVALUATING THE SOURCE OF NECK PAIN

Amit Bhargava, MD, MS (ORTHOPEDICS), RMSK

Objectives: Use of minimally invasive procedures has increased over the years. Use of fluoroscopy for diagnostic purpose before a procedure has not been well defined to increase the accuracy of the injections. To retrospectively evaluate the effectiveness of combining pre procedure clinical evaluation and fluoroscopic evaluation before diagnostic cervical facet joint injection.

Design: Retrospective review of medical records at a Medical Office Sports Spine Center.

Charts of patients undergoing diagnostic injections for predominantly cervicalgia were reviewed.

Diagnostic cervical intrarticular facet joint injection were performed after each patient was clinically evaluated and under fluoroscope to determine the source of pain. Main outcome measures: Percentage pain relief or Numerical Rating Scale (0–10).

Successful pain relief was defined as ≥50% reduction in pain.

Results: The mean age of the entire study was 50.3 (43–58) years. The mean BMI was 29.34 (24.69-37.66). There were 18 injections performed on 15 patients (two were bilateral and one was 2 level). 16 of the 18 tender areas were at the facet joint under fluoroscopy evaluation and 2 were posterior to the facet joint. The cervical facet joints which were injected were C2-3 (5 including one level and one bilateral), C3-4 (6 including two level), C4-5 (6 including one bilateral) and C5-6 (1). The percentages of patients experiencing successful pain relief were 82.3 % (14/17 injections –one patient had two level injection) including 5 who had 100% relief after the diagnostic injection.

Conclusions: With the present method we did not pre-decide on the injections and final decision to inject the level was done on the procedure table. This small trial demonstrates the overall clinical success of diagnostic cervical facet joint injection when pre procedure clinical evaluation and fluoroscopy evaluation are combined.

QUALITY PROJECT: SUBSTITUTION OF XEOMIN® FOR BOTOX® IN PERIPHERAL LIMB SPASTICITY MANAGEMENT

Steven Siano, BS, MD Class of 2019, Claudine Ward, MD, and Margaret A. Turk, MD

Objectives: This quality project assessed the documented outcome changes in patients who switched from Botox® to Xeomin®, reviewing for data and documentation consistency. Data abstracted from each electronic medical record (EMR) included demographics, Botox® dosing, post-Botox® Modified Ashworth Scale (MAS) score, Xeomin® dosing, post-Xeomin® MAS score, and subjective documented comments from patient emails and from three month follow-up visits (FU).

Design: All 19 EMRs had documented dosing and subjective measures for procedures and FU. None showed any significant improvement in the MAS comparing results from the last Botox® injection and first Xeomin® injection. Qualitative responses were not consistently documented. Of the 7 patients who emailed with two week progress reports, three reported positive outcomes, one reported that there was a decrease in efficacy with Xeomin®, and three commented on Botox® but not Xeomin®. There were 13 documented comments from the three month FU post Xeomin®. 6 reported no change or decrease in duration or efficacy; 7 reported an increase in range, comfort, or duration of effect.

Conclusions: Documentation of objective measures was consistent, but not of qualitative assessment. There was no significant difference in the objective spasticity measurements for patients switched from Botox® to Xeomin®. Patients and clinicians did report qualitative changes, but there was no systematic reporting mechanism. The program will continue to offer Xeomin® as an alternative. However, changes to the templated EMR note will also provide opportunity for standardized scales and subjective comments.

RADIATION FREE TECHNIQUE –DIERS 3D/4D SPINE, POSTURE AND GAIT ANALYSIS MACHINE

Beenu Pujar, MD, Matthew N. Bartels, MD, MPH, and Stephanie Rand, DO

Objectives: Patients with spine conditions or kyphoscoliosis may require serial follow-up examinations for clinical purposes or for research studies. With up to 150mGy/cm² dose per spine X-ray there is significantly increased risk of developing breast cancer or other complications. In creating a protocol for serial assessment of the spine in scoliosis or after osteopathic manipulation, we propose the use of 3D/4D posturography (Diers) safe technique for serial examinations. This is an optical light 3D/4D system that provides photo-optical measurement of the spine without radiation. Validation of the technique is ongoing.

Design: Diers works by “Triangulation” using spectral analysis of a projected grid of visible light in order to generate 3D and 4D images. The system also provides a way to assess spinal alignment and motion since it can be used in dynamic states. Diers can be incorporated with a treadmill and force plates to measure gait, and can measure the pelvic obliquity, pelvic torsion, and pedogait data.

Results: We assessed a patient before and after osteopathic manipulation with and without shoes for a correction of leg length discrepancy. Pre and post osteopathic manipulation assessment changes in pelvic obliquity DL-DR (Dimples Left-Right) before manipulation was 6mm Right and after was 7mm Left and assessment of the spine and pelvis showed sagittal imbalance 55mm and 83mm with the shoes on and off respectively. The serially reconstructed images will be used to assess alignment and motion of the spine, pelvis, scoliosis angle, kyphosis angle, pelvic tilt, trunk length, and pelvic torsion before and after interventions on short time intervals.

Conclusions: 3D/4D posturography is a radiation free technique that can be used in place of radiography for serial assessments of spine interventions and conditions and provide a wide range of measurements and images.

RAPID ACCESS TO PHYSICAL THERAPY FOR LOW BACK PAIN: A CONTINUOUS QUALITY IMPROVEMENT PROJECT

Michael Campian, DO, Tyler Hedin, MD, Pamela Hansen, MD, Matthew Haush, MBA, Julie Fritz, PT, PHD, Jake Magel, PT, DSC, and Kim Cohee, DPT

Objectives: Low back pain (LBP) is the fifth most common reason for all physician visits in the U.S. The annual total LBP-related costs in the U.S. are estimated to be as high as $238 billion dollars. Despite numerous published clinical guidelines, the management of back pain has not evolved considerably. Development of a rapid access posturography (RAP) where patients with LBP who call to schedule an appointment with PM&R are also offered an earlier appointment with PT (within 72 hours). Qualified patients include those with LBP whose insurance covers PT without a physician referral.
Patients are screened by PT at their initial visit for any "red flags" that warrant a physi- 
ician visit prior to PT. These "red flags" include fevers, chills, unintentional weight 
loss, progressive neurological symptoms, history of trauma, or pain so severe they 
are not able to tolerate PT.

Since the protocol was initiated on 1/1/2016, 68 patients have enrolled in 
the RAP. Mean improvement of their physical function (PROMIS FPCAT) in the 
RAP was 5.6 vs 2.4 with our current protocol. Fewer radiographs (24.1% vs 
63.3%), MRIs (0 vs 16.9%) and injections (1.9% vs 20.8%) were performed in 
the RAP group vs current protocol.

Conclusions: This study is still early and ongoing, but based on current results; 
the RAP for LBP has demonstrated a promising treatment route for producing better 
patient outcomes with improved patient function while reducing LBP-related health- 
care utilization.

RAPID NUMBER NAMING IN CHRONIC CONCUSSION: 
EYE MOVEMENTS IN THE KING-DEVICK TEST

Jr Rizzo, MD

Objectives: The King–Devick (KD) test, which is based on rapid number naming 
speed, is a performance measure that adds vision and eye movement assessment com- 
mplementary to sideline concussion testing. We performed this test to char- 
acterize the ocular motor behavior during the KD test in a patient cohort with chronic 
concussion to identify features associated with prolonged KD reading times.

Design: Twenty-five patients with a concussion history (mean age: 31) were com- 
pared to control participants with no concussion history (n = 42, mean age: 32). Par- 
ticipants completed a computerized KD test under infrared-based video- 
oculography.

Results: Average intersaccadic intervals for task-specific saccades were signifi- 
cantly smaller among concussed patients compared to controls (324 ± 85.6 msec vs. 
286 ± 49.7 msec, P = 0.027). Digitized KD reading times were prolonged in 
concussed participants versus controls (53.43 ± 14.04 sec vs. 43.80 ± 8.55 sec, P = 
0.004) and were highly correlated with intersaccadic intervals. Concussion was also 
associated with a greater number of saccades during number reading and larger aver- 
age deviations of saccade endpoint distances from the centers of to-be-read numbers (1.22 ± 0.29° vs. 0.98 ± 0.27°, P = 0.002). There were no differences in saccade peak 
velocity, duration, or amplitude.

Conclusions: Prolonged intersaccadic intervals, greater numbers of saccades, and 
larger deviations of saccade endpoints underlie prolonged KD reading times in 
chronic concussion. The KD test relies upon a diffuse neurocognitive network that 
mediates the fine control of efferent visual function. One sequela of chronic concus- 
sion may be disruption of this system, which may produce deficits in spatial target se- 
lection and the planning of eye movements.

RECOVERY VARIES ACROSS ICF DIMENSIONS IN ROBOT-BASED 
THERAPY AFTER STROKE

Jennifer Wu, PhD, Lucy Dodakian, MA, OTR/L, Jill See, PT, Erin B. Quinlan, PhD, 
Lissa Meng, MS, Jeby Abraham, BS, Vu H. Le, MS, Alison L. McKenzie, DPT, PhD, 
and Steven C. Cramer, MD

Objectives: Studies examining the effects of therapeutic intervention after stroke 
typically focus on treatment-related changes in loss of body function and structure ("function-
structure"). However, improvements in activities limitations ("activity") and participation restriction ("participation") are often higher patient priorities. We 
assessed the degree to which treatment-associated reduction of function-structure ex- 
tend to improvements in activity and participation, including examination of correla- 
tions across ICF dimensions in a robot-based therapy after stroke.

Design: Adults with stable arm motor deficits due to stroke were enrolled in a 
study (NCT01244243) that provided 3-weeks of standardized robot-based therapy 
targeting the distal arm. Assessments were made from baseline to one-month post-treatment 
and included two primary outcome measures, one for function-structure (Fugl-Meyer 
arm motor scale, FM) and one for activity (Action Research Arm Test, ARAT).

Results: At baseline, participants (n=40) had moderate-severe arm motor impair- 
ment (FM=35.6±14.4, range 14–60 out of 66). Robot treatment resulted in statisti- 
cally significant improvement in several measures of function-structure (FM, grip 
strength, and pinch strength) and activity (ARAT, Box & Blocks test, and Barthel In- 
dex), with the largest effect sizes observed for FM (Cohen’s d=1.14), grip strength 
(d=0.77), and ARAT (d=0.70). Treatment did not result in a significant change in participation (Stroke-Specific Quality of Life Scale). Furthermore, while the degree of treatment-related improvements in function-structure and activity were inter- 
correlated, neither of these correlated with change in participation.

Conclusions: Robot-based treatment improves measures of function-structure and 
activity in patients with arm motor deficits chronically after stroke. This course of 
robot-based treatment did not change a measure of participation; consistent with this, 
changes in participation were not related to improvements in function-structure or 
activity. These findings emphasize that gains in one ICF dimension may not extend 
to others, and highlight the need to incorporate a greater focus on participation gains 
in robotic approaches to therapy after stroke.

REHABILITATION CHALLENGES FOR NF-1 PATIENT 
POST-COMPLEX SURGICAL RESECTION OF MALIGNANT 
PERIPHERAL NERVE SHEATH TUMOR: A CASE REPORT

Christen B. Samra, Robert Samuel Mayer, MD, 
and Dorianne Rachelle Feldman, MD, MSPT

Case Diagnosis: Malignant Peripheral Nerve Sheath Tumor (MPNST)

Case Description: A 24-year old male with known history of neurofibromatosis and 
neurofibroma started developing weakness, pain, and sensory loss in the femoral 
nerve distribution. Imaging revealed a large, heterogeneous hypermetabolic mass, 
consistent with MPNST, involving the left femoral and sciatic nerves as well as L2-S1 
vertebral bodies with extension into the epidural space at L4. He started and completed 
4 cycles of Al (ARST 0332) chemotherapy, in order to attempt an en bloc resection of 
the tumor with negative margins. Tumor resection required sacrificing left L1-S1 
nerve roots, spondylectomy of L2-L5 and partial S1, and partial resection of the ilium. 
His left lower extremity was not functional and for reconstruction purposes, patient 
underwent left lower extremity amputation with rotation and using the femur for spinal 
column reconstruction. Following a complex 4 stage surgical intervention for resection, 
the patient was far from functional baseline requiring maximum assistance with ADLs 
and transfers due to pain, sitting restrictions, and non-weight-bearing status.

Discussions: This patient’s diagnosis and surgical intervention is of particular 
clinical interest due to the challenging post-operative management and specialized re- 
habilitation. Patient was admitted to inpatient rehabilitation for care management with 
an anticipated functional outcome as modified independent wheelchair level and dis- 
charge destination goal as lateral transfer to rehab closer to home state and then finally 
to home. The patient was able to meet his short term goals with regards to mobility and 
ADLs and is on track to meeting goal of modified independent wheelchair level. Pa- 
tient’s pain upon discharge was well managed and reported 0/10 pain at PT sessions.

Conclusions: Patients undergoing complex surgical intervention for MPNST re- 
quire specialized rehabilitation monitoring pre- and post-surgical intervention to max- 
imize achieving functional goals. In addition, secondary medical issues need to be 
closely monitored as to not interfere with rehabilitation.

RESIDENT AND FACULTY PERSPECTIVES ON GAPS IN FM&R 
RESIDENCY EDUCATION: A NEEDS ASSESSMENT

Rupali Kumar, MD, and Jeffrey Tenoska, MD

Objectives: To better understand the gaps, weaknesses, and potential strategies 
for improvement of our residency program’s educational curriculum.

Design: A survey tool including ranking and free response items was sent to 12 
current residents (3 PGY2s, 6 PGY3s, and 3 PGY4s), 2 recent graduates, and 8 fac- 
ulty at our institution. Respondents were asked to address three main areas: (1) free-
response identification of the weakest subject areas in the curriculum/knowledge base 
of the current residents, (2) ranking of which learning strategies contributed most to 
the knowledge base they obtained during residency, and (3) open-ended feedback on 
how the current residency curriculum could be improved. Qualitative data was or- 
ganized into major topics, and we determined how many individual respondents 
mentioned each topic. These results were stratified between resident respondents (in- 
cluding recent graduates) and faculty respondents.

Results: The results demonstrated significant differences in the perceptions of resi- 
dents and attendings. Of 21 total topics identified by survey respondents as curricular 
weaknesses, only three of them overlapped between residents and faculty: musculoskele-
tal anatomy/exam, pediatrics, and electrodiagnostics. There was a clear trend toward desire 
for procedural learning in residents, while faculty emphasized basic anatomy and physi- 
ology and, in fact, discouraged against focusing heavily on specialized procedural skills.

Conclusions: This needs assessment revealed the perspectives of the key stake- 
holders, which will be essential in guiding our future curriculum development efforts 
to meet both the needs of residents and the expectations of faculty. We plan to expand 
the above data on knowledge gaps with a more specific survey, employing the Delphi 
method. Further work will involve exploring the most appropriate teaching methods 
for our population (including peer-to-peer teaching, just-in-time video-based teaching 
modules to address the time limitations), and ultimately creating, implementing, and 
evaluating the curriculum.

RESIDENT INTEREST IN LEARNING OSTEOPATHIC 
MANIPULATIVE TREATMENTS DURING PHYSICAL MEDICINE 
AND REHABILITATION RESIDENCY TRAINING

Joseph C. Shurtz, DO, and Christopher J. Wolf, DO

Objectives: Musculoskeletal (MSK) medicine is a rapidly growing field within 
physical medicine and rehabilitation (PM&R). Osteopathic manipulative treatments 

Abstracts

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RETROSPECTIVE ANALYSIS OF THE RELATIONSHIP BETWEEN PRE-SURGICAL BRIEF BATTERY FOR HEALTH IMPROVEMENT 2 (BBHI2) SCORES IN CHRONIC PATIENTS AND PAIN IMPROVEMENT AFTER SPINAL CORD STIMULATOR IMPLANTATION (SCS)

Justice Otchere, MD, Elizabeth Yeo, BS, Justin Dunn, BS, Mary Kim, MD, and Justin Hata, MD

Objectives: Apply the Brief Battery for Health Improvement 2 (BBHI2), a pre-surgical biopsychosocial test, on patients being evaluated for a Spinal Cord Stimulator (SCS) to measure its effectiveness in predicting outcome for chronic pain patients undergoing a SCS implantation.

Design: A retrospective chart review study of all chronic pain patients from 2011–2015 with a BBHI2 assessment prior to SCS implantation was analyzed to measure predicted outcomes pre-SCS procedure with actual outcomes post-SCS procedure. Outcomes were defined as a decrease in pain using the Numeric Rating Scale (NRS-11), marked improved function (self-reporting ADL change), and a reduction in use of opioids and non-opioid pain medications.

Results: We reviewed 51 charts of patients with BBHI2 assessments in the study period. Of those reviewed, 31 patients had a SCS trial and 21 patients did not have a SCS trial for different reasons such as lack of transportation, scheduling challenges, denial by insurers for not receiving physical therapy previously, denial by patients for personal reasons, or other unknown reasons that were not revealed in the chart review. There was a statistically significant correlation between patient satisfaction and calculated change in pain (P = 0.04), which was determined by the difference between the NRS-11 at trial and maximum pain scale at trial pain score. However, there was no statistically significant correlation between red flags and change in pain, even when controlled for depression. Red flags are a diagnostic indicator of pain improvement post-SCS trial using BBHI2. Red flags include 31 critical items that draw attention to risk factors, such as suicidal ideation and addiction concerns, which may complicate patients’ recoveries after the SCS trial.

Conclusions: The data from this study suggests that BBHI2 scoring should not be used as an exclusive criterion to deny patients SCS trial; however, one of the weaknesses of the study was the small patient population size.

SELECTIVE SEROTONIN UPTAKE INHIBITORS TO TREAT AGITATION IN PEDIATRIC TRAUMATIC BRAIN INJURY

Kym Barbot, STUDENT, Mark Gornalay, MD, and Supreet Deshpande, MD

Objectives: Pediatric patients recovering from traumatic brain injuries (TBI) often show behavioral changes, and agitation can be particularly difficult to manage on the rehabilitation unit. The Agitated Behavioral Scale (ABS) is often used to measure agitation following a TBI. The ABS is composed of 14 behavior items scored 1 (absent) to 4 (extreme), with scores ranging from 14 to 56. Various medications have been used to reduce agitation. This study seeks to determine if selective serotonin reuptake inhibitors (SSRIs) improves agitation as scored on the ABS in pediatric patients after a TBI.

Design: A retrospective medical record review of all patients admitted to a pediatric rehabilitation hospital with agitation following a TBI and treated with an SSRI between 2014 and 2015. ABS scores were recorded the day before and twice daily for one week following treatment.

Results: Six patients received fluoxetine and one patient received citalopram. Initial ABS scores averaged 20.75 (15.75-29.75). ABS scores improved in all patients by day 2 post-treatment. By day 3 post-treatment, the ABS scores averaged 14.5 (14-15.75; t = 3.99, P < 0.01). The highest initial scores tended to be in the aggression and lability items. These items consistently remained low in the patients. The disinhibition items scores tended to fluctuate. ABS scores lowered within the first day of treatment in some patients and in all patients within the first few days.

Conclusions: SSRIs significantly lowered agitation in this small group of pediatric patients with a TBI. Aggression and lability consistently improved, whereas disinhibition fluctuated on the ABS. SSRIs appear to potentially be a good treatment to manage agitation in this population. Although these initial results are promising, this is a small retrospective study, and a larger prospective trial is needed to better determine the effectiveness of SSRIs in reducing agitation in pediatric patients following a TBI.

SLEEP ABNORMALITIES IN PATIENTS WITH SPINAL CORD INJURY

Aupola Kundu, MD CANDIDATE, 2019, Gizelda T. B. Casella, MD, PHD, and Margaret A. Turk, MD

Objectives: The relation between sleep quality and spinal cord injury (SCI) remains poorly investigated. The goal of our study was to find the incidence of sleep abnorma-

designs and associated factors in patients with SCI who are seen in our SCI program.

Design: We performed an electronic chart review of patients 18 years and older with SCI at the university hospital between January 01, 2013 and December 15, 2015 during inpatient stay or outpatient encounters with physiatrists. In every encoun-

ter, sleep quality was addressed by the physiatrist.

Results: We evaluated 37 males in 75 encounters with mean age of 44 ± 15 years. Encounters were divided into two categories: poor sleep and good sleep. Seven pa-
tients complained of both good and bad sleep in different encounters. Poor sleep had 35 encounters and 19 patients in total, and good sleep had 40 encounters and 25 patients in total. Poor sleep was a complaint in 46.6% of total encounters. Reasons attributed to poor sleep included: spasms (44%), pain (27%), anxiety (12%), bladder related issues (10%), and sleep apnea (2%). Several encounters reported multiple rea-
sons for sleep issues. In poor sleep encounters, the average number of medications taken within 24 hours with somnolence as a side effect was 2.4 and the median was 2 medications, vs good sleep 1.4 and 1. Poor sleep was seen in 45% of encounters with those with paraplegia and 50% with tetraplegia.

Conclusions: Poor sleep is a very frequent complaint in our program’s SCI popu-
lation. Main likely causes are spasticity, pain, anxiety, and bladder-related issues.

There is no significant difference between patients with paraplegia and tetraplegia re-
lated to sleep quality. Our data shows that the number of medications with somno-

lence as a side effect is higher in patients with SCI and poor sleep complaints; how-

ever, more medications may suggest more severe issues of spasticity and pain.

SONOGRAPHIC DIFFERENCES OF THE MEDIAN NERVE IN SPINAL CORD INJURY COMPARED TO ABLE-BODIED CONTROLS

Vivek Nagar, MBA, Rachel E. Cowan, PHD, Elizabeth R. Felix, PHD, Dana D. Cardenas, MD, MBA, and Robert Irwin, MD

Objectives: Wheelchair activities have been implicated in the development of carpal tunnel syndrome (CTS) in people with spinal cord injury (SCI). While the gold standard for diagnosis of CTS is electrodiagnostic testing, ultrasonography (US) is becoming more widely used. Median nerve (MN) cross-sectional area (CSA) at the pisiform is consistently reliable in detecting CTS. We compared quantitative US of the MN in acute SCI and controls to assess for key baseline differences to ascertain if there are differences between SCI and able-bodied (AB) subjects that contribute to the development of MN injury in SCI.

Design: Cohort study of 24 SCI persons and 28 aged-matched AB controls. Quantitative US was used to measure changes in the MN for both groups at initial visit and one year follow up. MN CSA at the level of the pisiform, flattening ratio, and MN gray scale were assessed.

Results: MN CSA increased over one year for both groups combined (P = 0.002). The MN showed greater echogenicity in SCI compared to AB persons at baseline and follow up (P = 0.04). For all other variables, there was no difference in magnitude and direction of change between SCI persons and AB persons over one year.

Conclusions: All measurements were below the cutoff for diagnosis of CTS. CSA was increased at the level of the pisiform in both groups combined over one year suggesting that SCI alone may not cause increased cross-sectional area. Hyper-intensity of the MN in SCI in cross-sectional compared to AB persons deserves further study to assess the relationship with pathophysiology and clinical significance for future MN dysfunction. Increased compression of the nerve may lead to decreased hydration resulting in this signal increase after SCI.
SONOGRAPHIC VERSUS ELECTRODIAGNOSTIC DIAGNOSIS OF UNE
Jason E. Lee, MD, Abigail Morales, MD, Carrie McMahan, MD, and John Norbury, MD, RMSK
Objectives: To evaluate the correlation between the clinical symptoms, Electrodiagnostic (EDx) data and neuromuscular ultrasound (NMUS) in individuals with Ulnar Neuropathy at the Elbow (UNE).
Design: The study was a retrospective study of 28 patients with symptoms of UNE in an outpatient musculoskeletal clinic from June 2012 to June 2015. Clinical data was collected regarding motor strength, sensory loss, and pain. The presence of UNE on EDx studies was determined using the AANEM criteria for UNE. NMUS cross-sectional area (CSA) was measured below the medial epicondyle, at medial epicondyle and above medial epicondyle. Institutional Review Board (IRB) approval and informed consent were obtained.
Results: A total of 28 patients with clinical UNE were included. Of 16 patients with EDx findings available, 64% had findings consistent with UNE on ultrasound and EDx. 23% had normal NMUS but abnormal EDx. 11% had evidence of UNE on NMUS but not on EDx. When clinical evidence of UNE was treated as true positive for comparison, the sensitivity of NMUS to diagnose UNE was 85%, specificity of EDx to diagnose UNE was 87%. CSA measurements were abnormal as follows: 33% below medial epicondyle, 95% at medial epicondyle, 58% above medial epicondyle.
Conclusions: Our data show that ultrasound can assist in diagnosis of clinical UNE and normal EDx findings. However, a normal ultrasound does not rule out UNE, since 23% of the patients had signs of UNE on NCS but not on ultrasound. These results suggest that UUNE but should be used in conjunction with NCS in patients with clinical symptoms suggestive of UNE. The most common location for abnormal CSA in UNE is in 95% of ultrasounds that were positive for UNE suggesting that this may be the most high yield location for measuring the nerve.

STATIC AND DYNAMIC EFFECTS OF CUSTOMIZED INSOLES ON ATTENUATING ARC COLLAPSE WITH PREGNANCY: A RANDOMIZED CONTROLLED TRIAL
Neil Segal, MD, MS, Lauren Gruenebaum, DO/MBA Candidate 2017, and Maria Davis Hochstedler, BA
Objectives: The changes in the foot arch that persist following pregnancy may increase risk for musculoskeletal disease and impairments. This objective of this study was to determine whether customized insoles can prevent arch collapse during this critical period. If effective, arch-supportive orthoses could provide an inexpensive means of preventing disablement.
Design: This randomized controlled trial assigned 72 first-trimester women between the ages of 18 and 40 years to wear either their usual footwear or their usual foot structure or dynamic arch function between baseline and follow-up either within or between groups. The AHI sitting (P = 0.9853), AHI standing (P = 0.6764), and arch rigidity (P = 0.2565) demonstrated no significant differences between the insole group and control group.
Results: There were no statistically significant differences in the change in static foot structure or dynamic arch function between baseline and follow-up either within groups or between groups. The AHI sitting (P = 0.9853), AHI standing (P = 0.6764), and arch rigidity (P = 0.2565) demonstrated no significant differences between the insole group and control group.
Conclusions: Although prior findings demonstrated that pregnancy is associated with persistent loss of arch height, in the present study there was no difference in arch change when comparing women who were randomized to wear custom arch supports or self-selected footwear. The finding that there was no arch drop in either group may indicate that both groups supported their arches or that neither group was predisposed to lose arch height with pregnancy.

SUSTAINED EFFECTIVENESS OF INTRATHECAL ZICONOTIDE USE IN PATIENTS WITH SEVERE CHRONIC PAIN
Michael F. Saulino, PHD, MD, Gladstone C. McDowell, MD, Richard L. Rauck, MD, Philip Kim, MD, Mark S. Wallace, MD, I-Zhu Huang, MD, Robert Ryan, MS, Geertu F. Vanhove, MD, PHD, and Timothy R. Deer, MD
Objectives: The objective was to determine long-term effectiveness and safety of intrathecal ziconotide use in the Patient Registry of Intrathecal Ziconotide Management (PRIZM) study.
Design: PRIZM is an open-label, long-term, multicenter, observational study of adult patients with severe chronic pain who meet ziconotide prescribing information criteria. This interim analysis (data as of July 5, 2016) reports change from baseline over time (months 3, 6, 9, and 12) in “average pain for the past 24 hours” on the 11-point Numeric Pain Rating Scale (NPRS; 0 = no pain, 10 = worst pain imaginable).
Results: Enrollment closed at 93 patients; data collection is ongoing. All 93 patients were enrolled ≥12 months prior to this analysis; 66 and 44 patients were still active in the study at months 6 and 12, respectively, of whom 77.3% (51/66) at month 6 and 59.1% (26/44) at month 12 remained on ziconotide monotherapy. Thirty-three patients had NPRS scores at months 3, 6, 9, and 12 and are included in this analysis. Mean (standard deviation) NPRS score at baseline was 7.8 (1.3). Mean percentage change (standard error of the mean) in NPRS score was −15.8% (4.2%) at month 3, −33.0% (5.2%) at month 6, −52.8% (5.1%) at month 9, and −51.1% (5.5%) at month 12. The most common adverse events (AEs; ≥15% of patients in this analysis) were auditory hallucination (30.3%), memory impairment (24.2%), peripheral edema (21.2%), amnesia (18.2%), dizziness (18.2%), confusional state (15.2%), headache (15.2%), nausea (15.2%), and pruritus (15.2%).
Conclusions: Data from this small interim analysis of the PRIZM database suggest that there may be a sustained treatment response for up to 12 months with intrathecal ziconotide therapy. The AE profile was consistent with ziconotide prescribing information.
Funding: Jazz Pharmaceuticals.

SYNERGY-BASED NMES INTERVENTION ACCELERATED REHABILITATION OF POST-STROKE HEMIPARESIS
Chuanxin M. Niu, PHD, Cheng Zhuang, BS, Yong Bao, MD, Si Li, BS, Ning Lan, PHD, and Qing Xie, MD
Objectives: To test the feasibility of a synergy-based multi-muscle neuromuscular electrical stimulation (NMES) strategy to accelerate post-stroke motor function recovery via a new task-oriented training protocol.
Design: Randomized, single-blind, placebo controlled study. Daily NMES interventions were applied to patients, approximately one hour each day for five consecutive days. Stimulation parameters were determined for each patient using an algorithm based on muscle-synergies obtained from healthy subjects. The task-oriented training protocol required patients to repeat forward and lateral reaching movements, with concurrent assistance from NMES. Sham interventions were tested with all NMES electrodes attached but without actual stimulations.6 patients with ischemic post-stroke hemiparesis participated in this study. NMES interventions were applied to 5 patients, 2 patients received sham interventions, and 2 patient received sham intervention followed by NMES. We measured kinematics, electromyography, and upper-extremity Fugl-Meyer scores of patients before and after intervention.
Results: After 5 days of NMES intervention, all patients showed increased Fugl-Meyer scores and peak movement velocity. Interestingly, the post-intervention muscle synergy in patients became more similar to that of healthy controls. No remarkable improvements were observed after sham interventions. Particularly, a self-comparison in the patient received both sham and NMES interventions highlighted the effectiveness of NMES with task-oriented training.
Conclusions: Our results indicated that it is feasible to concurrently stimulate multiple muscles to assist residual movements using NMES, and accelerate recovery towards more normal kinematics and muscle activation pattern. The NMES and task-oriented training protocol showed initial indications of effectiveness with only 5 days of intervention.

TBI AND THE WEEKEND EFFECT: ARE OLDER ADULTS SAFE?
Salman Hirani, MD
Objectives: Weekend admission is associated with mortality in cardiovascular emergencies and stroke but the effect of weekend admission for trauma is not well defined. We sought to determine whether differences in mortality outcomes existed for older adults with substantial head trauma admitted on a weekday versus over the weekend.
Design: Data from the 2006, 2007, and 2008 Nationwide Inpatient Sample were combined and head trauma admissions were isolated. Abbreviated injury scale (AIS) scores were calculated using ICDMAP-90 Software. Individuals aged 65 to 89 y with AIS equal to 3 or 4 and no other region score ≥ 3 were included. Individual Charlson comorbidity scores were calculated and individuals with missing mortality, sex, or insurance data were excluded. Wilcoxon rank sum and Student t-tests compared demographics, length of stay, and total charges for weekday versus weekend admissions. The chi 2 tests compared sex and head injury severity. Logistic regression modeled mortality adjusting for age, sex, injury severity, comorbidity, and insurance status.
Results: Of the 38,675 patients meeting criteria, 9937 (25.6%) were admitted on weekends. Mean age was similar (78.4 versus 78.4, P = 0.796) but more weekend admissions were female (51.6% versus 50.2%, P = 0.022). Weekend patients demonstrated slightly lower comorbidity (mean Charlson = 1.07 versus 1.14, P = 0.001) and head injury severity (58.3% versus 60.8% AIS = 4, P = 0.001). Median weekend length of stay was shorter (4 versus 5 d, P < 0.001). Weekend and weekday median total charges did not differ ($27,128 versus $27,703, respectively, P = 0.667). Proportional mortality was higher among weekend patients (9.3% versus 8.4%, P = 0.008). Admission weekend intervention showed a sustained demonstrated 14% increased odds of mortality (OR 1.14, 95% CI 1.05-1.23).
Conclusions: Older adults with substantial head trauma admitted on weekends are less severely injured, carry less comorbidity, and generate similar total charges.
THE CLINICAL AND COST EFFECTIVENESS OF PLASTIC VERSUS METAL TRACHEOSTOMY TUBES IN THE BRAIN TRAUMA UNIT
Shiaessa L. Wright, DO, Nicole Perez, MD, Sara Cuccurullo, MD, and Tao Livese

Objectives: In the 1800s tracheostomy tubes were historically made of precious metals, antique silvering and stainless steel. Later the design evolved to the development of synthetic materials introduced in the 1970s. At our inpatient rehabilitation institution we have a unique practice of early tracheostomy changes from Shiley plastic tracheostomy tubes (TT) to Jackson metal tracheostomy tubes. Typically this practice is done by a consulting pulmonologist within 24 hours of patient admission. The goal of this practice is to reduce patient discomfort for an uncomplicated tracheostomy transition to a smaller tracheostomy tube and eventual decannulation. We decided to investigate this practice and formulate two questions which further analyzes both the clinical effectiveness in maintaining oxygenation and the cost effectiveness of Jackson metal TT verses Shiley plastic TT. We hypothesize that Jackson metal tracheostomy tubes are as effective in maintaining oxygenation as Shiley plastic tracheostomy tubes and are more cost effective.

Design: This retrospective case controlled study was conducted at an acute inpatient neuromuscular rehabilitation program in an academic setting. Subjects included one hundred twenty-two inpatient brain trauma rehabilitation participants who have undergone tracheostomy tube placement. The experimental group underwent tracheostomy tube changes from Shiley plastic TT to Jackson metal TT within the first twenty-four hours of admission and the control group did not. Pulse-oximetry levels were followed closely. Intervention and medication adjustments were managed by pulmonologists before the tracheostomy transition to a smaller tracheostomy tube. All patients in this study underwent a comprehensive acute inpatient rehabilitation program for three hours daily six days per week in a closely monitored closed brain trauma unit.

Results: This study reveals a non-statistically significant difference between average oxygenation post tracheostomy tube change from Shiley plastic TT to Jackson metal TT over the course of twenty-four hours, seven and fourteen days. Pre-tracheostomy tube change average oxygenation with Jackson metal TT and Shiley plastic TT was 97.77% and 98.08% respectively. Twenty-four hours post-tracheostomy tube change to Jackson metal TT was 97.88% average oxygenation. The data revealed a 0.20% difference when comparing the twenty-four hour percentage of oxygenation. The data similarly showed only a 0.29% and 11% difference post tracheostomy tube change seven and fourteen days post-tracheostomy tube change respectively.

After researching the average cost of both a Jackson metal TT and Shiley plastic TT with disposable inner cannula (average use three per day) over seven and fourteen days the results indicated a significant savings with Jackson metal TT. The average cost of Jackson metal TT is $33.47 dollars. The average cost of plastic Shiley TT is $33.61 dollars plus the $4.00 dollar additional cost of plastic inner cannulas. Our calculations revealed an average savings $115.90 per patient per day and a total savings of $2,807.20 and $7,069.90 over the course of seven and fourteen days.

Conclusions: This case controlled study supports the fact that Jackson metal tracheostomy tube changes are as effective as maintaining oxygenation as Shiley plastic tracheostomy tubes. In addition Jackson metal tracheostomy tubes are more cost effective than Shiley plastic tracheostomy tubes. Other findings identified include that Jackson metal tracheostomy tubes decrease tracheal secretions which probably decreases nursing time and improves patient comfort. Based on our findings we recommend implementing Jackson metal tracheostomy tube changes within twenty-four hours of admission when appropriate.

THE EFFECT OF APOS THERAPY ON GAIT PARAMETERS AND SUBJECTIVE MEASURES IN A BACK PAIN POPULATION
Ratnakar P. Veeramachaneni, MD, Se Won Lee, MD, Beendu Pujar, MD, Matthew N. Bartels, MD, MPH, Nitesh Kumar Byrappa, MD, and Karen Morice, MD

Subj ective Measures in a Back Pain Population
Daniel C. Herman, MD, PhD, Andrew Harris, BS, Christopher Massengill, MS, Cong Chen, MS, Trevor Leavitt, BS, and Heather Vincent, PhD

Objective: To evaluate the effect of APOS therapy, which utilizes a novel biomechanical device comprised of four modular elements attached to foot-worn platforms, on gait parameters in a population with nonspecific low back pain (NSLBP).

Design: Prospective observational study done at an academic teaching hospital outpatient clinic from October 1, 2015 to September 30, 2016. 116 patients with NSLBP were referred from a physical therapy clinic using a population based sample and had at least one follow-up visit after starting APOS. All patients passed initial evaluation (IE) for balance and stability. The intervention was a three month APOS therapy after preliminary gait analysis. Main outcome measures included gait parameters (single limb support (SLS), step length (SL), gait velocity (GV) and improvement on the Oswestry disability index (ODI), Short Form 36 (SF-36) Mental and Physical Function measures. Data was collected during the initial visit and 2 follow-up visits (1–2 months (FU1) and 2–4 months (FU2) and 4–7 months (FU3)). Results are presented as IE-FU (P-value).

Conclusions: There were significant differences between IE and FU1 on several measures. At FU2 and FU3, the results were not significant. APOS was shown to be effective in improving function and reducing pain in patients with NSLBP.

THE EFFECT OF VIDEO MONITORING ON FALL RATE REDUCTION IN ACUTE INPATIENT REHABILITATION: WORTH A SECOND LOOK?
Laurent Delavaux, MD, Craig Van Dieren, MD, and Sara Cuccurullo, MD

Objectives: Falls represent a significant burden to patients and healthcare systems, especially in the acute rehabilitation setting. Of important consideration are those interventions that can prevent or reduce the incidence of falls. Did the installation of video monitoring, as established in 2010 throughout an Acute Rehabilitation Institution’s Brain Trauma Unit (BTU), lead to a reduction in the number of falls per 1,000 patient days, within that unit, or when compared to other acute inpatient rehabilitation units? Design: This is a retrospective cohort study. The health care system of this Rehabilitation Institute collects fall data using the computerized Sci-Health® portal. The Sci-Health portal was accessed in order to gather information on fall rates per 1,000 patient days (the fall index) from 2004 through 2015 within each of the three major inpatient rehabilitation units at the Rehabilitation Institute. The data was then examined for trends in fall reduction overall, by unit, and specifically corresponding to the implementation of video monitoring within the BTU in 2010.

Results: There was a statistically significant improvement in the fall indices in the BTU pre- and post-camera implementation (P = 0.0424). This improvement, however, was not statistically evident when comparing fall index trends over time amongst the three inpatient units from 2004 through 2015 and 2010 through 2015 (P = 0.4274, and P = 0.5143).

Conclusions: There are many studies evaluating the merit of fall intervention in the acute care setting, with very few focusing on the inpatient rehabilitation setting. Even less research exists when it comes to addressing the role of video monitoring in fall prevention. There are several hospitals which have instituted this technology on individual units (video monitoring/virtual sitters), and all report some improvement in fall rates, however without statistical significance. While this study demonstrates improvement in the BTU fall indices pre- and post-camera implantation, no significant difference exists between the fall indices when comparing the three inpatient units.

THE EFFECT OF VISUAL AND AUDITORY ATTENTION TASKS ON BIOMECHANICAL AND METABOLIC PERFORMANCE DURING RUNNING
DURING RUNNING
Daniel C. Herman, MD, PhD, Andrew Harris, BS, Christopher Massengill, MS, Cong Chen, MS, Trevor Leavitt, BS, and Heather Vincent, PhD

Objectives: Cognitive stressors can increase lower extremity injury risk by altering biomechanics. It is unknown whether these stressors adversely impact running motion. Biomechanical responses to simultaneous visual (VD), and auditory distractor (AD). Metabolic data were collected using a portable gas analyzer, including oxygen consumption, minute ventilation, heart rate, and energy expenditure. Biomechanical data were collected via 3D videographic techniques.
and included cadence, step length, step width, vertical ground reaction force, and loading rate. Data were analyzed using repeated measures analysis of variance and paired t-tests for post-hoc analysis with alpha set at a priori of 0.05.

**Results:** Compared to CON, the impact loading rate was higher for the AD and ВD for the right limb (in N/kg: 41.2 ± 18.2 versus 22.5 ± 14.5, P = 0.049), the right side (in N/kg: 25.4 ± 3.3; AD 26.2 ± 3.1, P = 0.019; ВD 25.7 ± 3.3, P = 0.322). Compared to CON, average minute ventilation for 4.5% CO2 in N/kg: 48.0 ± 15.3 versus 51.8 ± 19.7 (P = 0.001), and heart rates were 2.8%–3.4% higher in the AD and ВD compared to CON (P < 0.005).

**Conclusions:** Attending to visual and auditory distractors increases lower extremity loading and physiological demand. Running in well-versed conditions may potentially reduce injury risk and improve running performance.

**THE EFFECTS OF BENZODIAZEPINE ADMINISTRATION ON ACUTE REHABILITATION OUTCOME FOLLOWING TRAUMATIC BRAIN INJURY**

Raman Sharma, MD, and Barry Jordan, MD, MPH

**Objectives:** It has been a generally accepted clinical practice that the administration of benzodiazepines during acute rehabilitation for traumatic brain injury (TBI) may be detrimental to patient outcome. The following study was conducted to determine the effects of benzodiazepine administration on recovery following TBI.

**Design:** Prospectively maintained database of patients with TBI admitted to an acute rehabilitation hospital was retrospectively reviewed. The outcome of patients treated with benzodiazepines was compared to those that did not as a control. The primary outcome measures were Functional Independence Measures (FIM) score, change in FIM score and FIM efficiency at discharge.

**Results:** Out of a total sample size of 347 patients from 2012 to 2015, 85 patients were administered at least one benzodiazepine (24%) and 262 were control. Sixty-five patients received Lorazepam (76%), 6 received Diazepam, 4 received Chlordiazepoxide. Patients receiving benzodiazepines had lower admission FIM scores (45.2 ± 23.3 and 61.3 ± 23.8, P = 0.0001) and longer length of stay (34.2 ± 26.9 and 24.6 ± 17.5, P = 0.004). However discharge FIM scores were not statistically different between the groups and patients on benzodiazepines achieved higher change in FIM scores (45.3 ± 21.4 and 31.9 ± 18.2, P = 0.003). The change in FIM per day (FIM efficiency) between the two groups was equal.

**Conclusions:** Patients receiving benzodiazepines, in particular Lorazepam, during acute rehabilitation for TBI experienced similar rehabilitation outcomes and rates of improvement compared to the control. This data suggests that the administration of low doses of Lorazepam for a short duration does not negatively impact rehabilitation outcome.

**THE IMPACT OF EDUCATIONAL BACKGROUND ON THE INCIDENCE OF SELF-REPORTED BACK AND NECK PAIN RELATED ACTIVITY LIMITATION IN THE UNITED STATES**

Tiffany Williams, MD, Siya Sun, and Raj Mitra, MD

**Objectives:** Back pain is a common, costly, and potentially disabling condition, impacting quality of life, function and vocation. The goal is to identify the group that may be detrimental to patient outcome. The following study was conducted to determine the effects of benzodiazepine administration on recovery following TBI. The major was greater than teres major and latissimus dorsi at rest in over half of the cases (57.1%). But during passive stretching, the RMS values showed no significant difference in shoulder internal rotators.

**Conclusions:** Our results showed that the biceps brachii was the most contributing muscle to flexed elbow or adducted/internally rotated shoulder patterns in the brain injury patients, using surface EMG.

**THE MOST CONTRIBUTING MUSCLE RESULTING PROXIMAL UPPER LIMB DYSFUNCTION IN THE BRAIN INJURY PATIENTS USING SURFACE EMG**

Jung Yoon Yoon, MD, and Min Wook Kim, MD, PHD

**Objectives:** The aim of this study was to identify the most contributing muscle to flexed elbow or adducted/internally rotated shoulder patterns in the brain injury patients, using surface EMG.

**Design:** Fourteen patients with movement dysfunction and posture deformity of proximal upper limb after brain injury (12 with stroke, 2 with traumatic brain injury) were enrolled. They all had no previous botulinum toxin injection for upper limb dysfunctions. The EMG activity using multichannel surface electrode was recorded simultaneously from elbow flexor group (biceps, brachialis, and brachioradialis) and shoulder adductor/innerrotator group (pectoralis major, teres major, and latissimus dorsi), respectively. The measurement was done in two different conditions; at rest and during rapid passive stretching. Surface electrode placement followed the SENIAM recommendations for surface EMG. The Root mean square (RMS) values that calculated from EMG signals were used to compare overactivity in the muscle group of elbow and shoulder, respectively.

**Results:** In major of the cases, the EMG activity of biceps brachii was greater than brachialis and brachioradialis in both at rest (64.28%) and during passive stretching (85.7%). In over half of the cases (57.1%), the size-ordered RMS values were arranged as biceps brachii > brachialis > brachioradialis in both at rest and during passive stretching. In most of the cases (78.57%), the EMG activity of pectoralis major was greater than teres major and latissimus dorsi at rest. The size-ordered RMS values were arranged as pectoralis major > latissimus dorsi > teres major at rest in over half of the cases (57.1%). But during passive stretching, the RMS values showed no significant difference in shoulder internal rotators.

**Conclusions:** Our results showed that the biceps brachii was the most contributing muscle for elbow flexor spasticity. In addition, EMG overactivity of pectoralis major at rest may indicate that spastic dystonia of this muscle contributes to adducted/ internated rotation shoulder deformity. This study provides detailed information of the offending muscles that resulting proximal upper limb dysfunction in the patients after brain injury. This will guide decision making for proper selection of target muscles and dosing for botulinum toxin injection.
SUBJECTS WITH ATLANTO-AXIAL PANNUS
Andrew A. Joyce, MD, Zacharia Isaac, MD, and Joerg Ermann, MD

Objectives: While the best known cause of atlanto-axial pannus is rheumatoid arthritis, other causes are infrequently described. Our objective was to better characterize the natural course of atlanto-axial pannus.

Design: Subjects were identified by querying the electronic medical record system searching for the terms “atlanto-axial” or “atlantoaxial” and “pannus” on cervical spine imaging studies. MRI reports were reviewed to confirm cases of atlanto-axial pannus. The medical records of subjects with confirmed atlanto-axial pannus were then reviewed to evaluate for comorbid medical conditions. Specifically, the electronic medical records of these subjects were reviewed with attention paid to their past medical history, medications, immunology, and provider notes from rheumatology, physiatry, pain management, orthopedic surgery, or neurological surgery.

Results: A total of 171 subjects were identified using the query. Of these subjects, 74 had pannus confirmed on imaging reports. Of those with confirmed pannus, only 27 subjects (36%) had evidence of rheumatoid arthritis. Three subjects had evidence of juvenile rheumatoid arthritis. Nine subjects (12%) had evidence of trauma or fracture of the cervical spine, and ten subjects (13.5%) had features concerning for gout or pseudogout.

Conclusions: Atlanto-axial pannus is a well-known complication of rheumatoid arthritis. However, a large proportion of subjects found to have atlanto-axial pannus have no evidence of rheumatoid arthritis. Further research is warranted to better characterize the causes and natural course of atlanto-axial pannus which is not caused by rheumatoid arthritis.

THE RELATIONSHIP BETWEEN FOOT AND LEG ORIENTATION AT FOOTSTRIKE AND LOADRATES IN RUNNERS
Robert Diaz, MD, Adam S. Tenforde, MD, Prathnam P. Singh, BENG (in Progress), and Irene S. Davis, PhD, PT

Objectives: While running is a popular way to remain fit, injuries are common. Vertical impact loading has been associated with running injuries. Higher foot angles (FA) and tibial angles (TA) have been postulated to predict greater loadrates in runners. The purpose of this study is to investigate the relationship between both FA and TA and vertical loadrates in nearfoot strike (RFS) runners.

Design: This cross-sectional designed study investigated 110 shod RFS runners (69 injured group, 41 healthy control group; 55 females, 55 males; average age: 35.9±11.7 years-old). Participants ran on an instrumented treadmill. Vertical average load rate (VALR) and vertical instantaneous load rate (VILR) were obtained. A high-speed camera captured 10 consecutive left foot strikes. Videos were processed using an open-source analysis program to calculate FA and TA. The FA was defined as the angle of the foot in relationship to the ground on initial contact and TA was defined as the angle of the tibia from perpendicular landing. VALR, TA, VALR, and VILR values were averaged for each. Differences between groups were evaluated using a two-tailed t-test (p < 0.05). Within each group, correlation coefficient (r-value) was computed between both FA and TA and VALR and VILR.

Results: In the injured group, there was no association between FA and TA with either VALR or VILR (FA: r=0.09, p=0.46 and r=0.10, p=0.41; TA: r=0.12, p=0.33 and r=0.14, p=0.26). The average FA was similar between both groups, but the TAs were increased in healthy runners (5.55±2.23 vs 8.52±1.68, p < 0.01). VALR (67.28±20.10, 55.05±24.29, p < 0.01) and VILR (77.52±22.05, 66.77±27.58, p=0.037) were higher in injured runners compared to healthy runners.

Conclusions: FA and TA do not translate to lower loadrates in the injured runner population. Therefore, clinicians should not use the FA or TA measures as a proxy for impact loading as an indication of injury risk.

THE SPINAL ACCESSORY NERVE ANATOMY AND ITS ROLE IN NECK DISSECTIONS: AN UPDATED REVIEW
Subhadra Nori, MBBS, FABPMR

Objectives: In surgical neck dissection's involving cancers of head and neck, the spinal accessory nerve is preserved whenever possible. This has led to a new understanding of the role that the spinal accessory nerve plays in shoulder function.

Methods: We conducted a literature review to discover any new discoveries that may have evolved on this subject which can potentially be used to improve functional outcomes and avoid the disabling shoulder syndrome.

Results: A PubMed review was conducted utilizing the keywords spinal accessory nerve, trapezius muscle, sternocleidomastoid muscle, radical and modified radical neck dissections. 539 articles were found. After applying the exclusion criteria 17 articles were finalized. These articles included anatomic dissections as well as live intraoperative stimulation studies patients undergoing neck dissections for head and neck cancers.

Conclusions: Eight of these authors found that the spinal accessory nerve was the most consistent nerve supply to the trapezius muscle. Three of these authors found distinct but different types of innervation to the trapezius and sternocleidomastoid.

THE TWIST TEST: A NEW TEST FOR HIP LABRAL PATHOLOGY
Pegah Dehghan, MD, Frashad Adib, MD, Skye Donovan, PT, PhD, OCS, and Derek Ochiai, MD

Objectives: To describe and validate a new test for hip labral pathology, the Twist test.

Design: Twist test was performed in functional weight-bearing position and consists of unilateral and bilateral standing phases. Between June 2009 and August 2010, in 371 patients the result of Twist test was compared with MR arthrogram (MRA) and arthroscopy as gold standard.

Results: Among 160 patients with positive twist test, 154 patients had positive MRA and 6 had negative MRA. Among 87 patients with negative twist test, 72 had positive MRA and 15 had negative MRA. In comparison with MRA, the sensitivity and specificity of twist test for labral injury were 68.14% and 71.5% respectively. Positive predictive value (PPV, precision) of twist test for diagnosis of labral lesion was 96.25% and the accuracy was 68.4%. Then the sensitivity of the Twist test was compared with arthroscopy results. Of the 110 patients underwent surgical intervention, 100% exhibited labral tears. Of those 110 patients with surgically confirmed labral tears, 80 of them exhibited a positive Twist test, resulting in a sensitivity of 72.7%.

Conclusions: This study shows that Twist Test can support clinical decision making when considering hip labral pathology as a differential diagnosis because of its high PPV (96.25%), so this test can be beneficial for ruling in labral pathology. Twist test is the only clinical test for hip Labral pathology that is done in the functional standing position and is quick to perform, so it could be incorporated into a general sports physical screening examination.

THE USABILITY OF A SELF-MANAGEMENT MOBILE APP IN INPATIENT REHABILITATION FOLLOWING SPINAL CORD INJURY
W. Ben Mortenson, BSCOT, MSC, PhD, Megan K. MacGillivray, MSC, Mahsa Sadeghi, MD, MSC, Jared Adams, MD, PhD, Patricia B. Mills, MD, MHSC, and Bonita Sawatzky, PHE

Objectives: Inpatient rehabilitation is a complex and challenging time for individuals following spinal cord injury (SCI), as self-management skills to prevent secondary conditions must be learned over a short period of time. The purpose of this study was to evaluate the usability of a newly developed self-management mobile application (app) among people with SCI in in-patient rehabilitation.

Design: The ‘SCI Health Storylines’ app was developed following the principles of user centered design. The app aims to enhance SCI self-management through goal setting, and tracking self-management confidence and related behaviors (e.g., bowel, bladder, skin). Participants completed admission questionnaires relating to demographics and...
the SCIM-III (Spinal Cord Injury Independence Measure) prior to using the app. Participants were trained to use the app, which was downloaded to a 7" Android tablet, and were followed-up once per week during their rehabilitation stay. App usage between admission and discharge was summarized for all participants. In a previous study, 20 participants (85% male) with AIS classifications of A: 40%, B: 25%, C: 30% and D: 5% were enrolled in the study. Participants had a mean age of 41 and 75% had traumatic SCIs. Most participants (75%) had tetraplegia and SCIM-III scores ranged from 7 to 84 with an average of 33.

On average, participants were involved in the study for 67 days and completed 8 training/follow-up sessions lasting 30 minutes each.

Participants trained a total of 78:59 (3:23) independent entries in the app, with an average of 1.71±1.22 entries per day while enrolled in the study between admission and discharge. Although seven participants had no or limited hand function, they were able to operate the app either with a stylus (via hand or mouth) or with a caregiver.

**Conclusions:** Our findings suggest that the app could be integrated into inpatient rehabilitation following SCI. Future research should examine the impact of the app on self-management behavior.

**THREE-DIMENSIONAL PRINTING ENABLES LOW COST CREATION OF PROSTHETIC HANDS**

Fheza Saleem, MD, Anna Rozman, DO, MBA, Katherine Power, MD, Cesar Colasante, MD, Kyle Silva, DO, and Matthew N. Bartels, MD, MPH

**Objectives:** Three-dimensional (3D) printing is notable in research and medicine because of its ability to make customized devices. Materials can range anywhere from rigid polylactic acid, acrylonitrile butadiene styrene, to softer ninja-fish formulated from thermoplastic polyurethane. Traditional high-end prosthetics are time-consuming and expensive. 3D technology allows printing a cost and time effective hand prosthesis which can be adjusted as a person grows.

**Design:** A high end computer with a discrete video card, 2 universal serial bus input and 8GB of memory is required. Initial image acquisition of the hand may be through imaging (CT/MRI) or a 3D scanner. Prosthetics can be created via user-designed image and open-source designs available online. ArtCad scanner was used to obtain images' measurements of affected and normal hand with >1000 Hz scans to allow optimal images. Scans are captured using 3D Software Reconstruction and Model/Computer-assisted design (CAD), allowing customization of images. The printer reads the finalized raptor hand model data from the created CAD file and lays down successive 2-dimensional layers of materials to build up a 3-dimensional model.

**Results:** We created cost-effective mechanically driven hand prostheses utilizing existing wrist to flex/extend the fingers and thumb. Printing can take 15-28 hours depending on size. We created 3 custom model Raptor hands for under $50 each, with a turnaround time of one week. This compares favorably to standard prostheses at $2,000-$5,000 a piece, with a 6 week turnaround.

**Conclusions:** Modern technology allows health-care providers the ability to create complex geometric shapes and rapid prototyping of body parts. The inexpensive materials make this an ideal option for prototyping and testing prosthetics and allows for provision of prosthetics in settings where cost may be of major concern, including third world and uninstructed populations.

**TOTAL JOINT REPLACEMENT PREHABILITATION: A FEASIBILITY STUDY**

Elizabeth Z. Li, BS, Amanda Doodlesack, BS, Jennifer Baima, MD, Mathew Most, MD, Jeffrey Metzmaker, MD, and David Ayers, MD

**Objectives:** Pre-operative physical therapy has been shown to reduce post-acute care service utilization. Shifting rehabilitation to the presurgical period, referred to as prehabilitation, could result in reduced recovery time and cost. Limited access to physical therapy may prevent patients from achieving the benefits, and a standard set of independent exercises may be an alternative. We aim to assess the feasibility of an independent exercise program as a pre-surgical intervention for total hip and knee replacement.

**Design:** Participants were taught two exercises for hip or knee arthritis at least one week prior to surgery and instructed to perform them independently at home. Subjects were contacted three days to one month post-operatively and surveyed about discharge, frequency of exercise, and living status after discharge. No adverse effects were reported. Additional information was collected from the subjects’ chart including age, BMI, and sex. Discharge outcomes were compared with pre-existing independent factors using univariate and multivariate analyses.

**Results:** A total of 80 subjects were followed with a home discharge rate of 78.75%. Univariate analyses showed that the presence of other people in the home showed a slight but non-significant, association between differences of discharge destination. 82.1%-83.3% of patients who live with others were discharged home versus 57.1% of patients living alone (LR chi-square: 3.84, p=0.15). Multivariate analyses showed a slight, but non-significant, association between frequency of prehabilitation and discharge destination (OR=1.212; 95% CI, 0.960-1.530). BMTI showed no associated difference in discharge destination.

**Conclusions:** Increased frequency of prehabilitation and presence of others at home showed slight associations with increased discharges to home, but were non-significant. Increased exposure to prehabilitation (duration times frequency) trends toward more frequent home discharge. Independently performed prehabilitation may be offered as an alternative pre-surgical intervention with likely little to no adverse effect. Larger numbers are needed to determine likelihood of discharge home.

**TRACHEOSTOMY IMPACTS MORBIDITY AND GASTROSTOMY TUBE PLACEMENT DURING A PROLONGED STAY IN THE SHOCK TRAUMA INTENSIVE CARE UNIT: A RETROSPECTIVE STUDY**

Cole Linville, DO, MBA, Meggan E. Galic, ClinResD, CCC-SLP, Arash Mollaeian, MD, and Monica Verdugo-Gutierrez, MD

**Objectives:** Determine differences in characteristics, complications, and length of stay for patients requiring tracheostomy admitted to the shock trauma intensive care unit (STICU).

**Design:** A retrospective clinical study was conducted of acute trauma patients admitted to the STICU at a Level 1 trauma center with acute care stay of at least 14 days. Patients admitted from January 1, 2013, through December 31, 2013, who were 16 years of age or older were included in this study. General characteristics and complications were then recorded and analyzed for these patients.

**Results:** 126 patients met study inclusion criteria. There was a statistically significant difference in length of ICU stay days in patients who required tracheostomy (n= 68 vs 14) (p=0.001) and gastrostomy tube placement (n= 43 vs 3) (p=0.001) in patients who required tracheostomy versus those patients that did not require tracheostomy. There was a statistically significant difference in length of ICU stay days in patients who required tracheostomy (n=25.3 vs 19.1) (p=0.0001). There was a statistically significant difference in ventilator free days in patients that required tracheostomy (n=11.3 vs 16.2) (p=0.002). While not significant, physical medicine and rehabilitation was consulted on the majority of the patients in this study (n=80). There were no significant differences in patient characteristics, payment source, or other complications.

**Conclusions:** This retrospective study shows that patients requiring a tracheostomy with a prolonged stay in the STICU had higher instances of pneumonia and need for gastrostomy tube placement. In addition, these patients also had a longer ICU stay and less ventilator free days. Patients requiring tracheostomy after a prolonged STICU stay may benefit from physical medicine and rehabilitation consults in order to obtain necessary rehabilitation services, including speech language pathology consultation.

**TRANSFEMORAL AMPUTEE INTACT LIMB LOADING AND COMPENSATORY GAIT MECHANICS DURING DOWN SLOPE AMBULATION**

David C. Morgenroth, MD, Michelle Roland, MS, Brad D. Hendershot, PHD, Alison Pruznier, PT, DPT, and Joseph Michael Czerniecki, MD MS

**Objectives:** Lower limb amputation limits mobility and increases the risk for secondary disabling conditions such as intact limb knee osteoarthrisis. The primary goal of this study was to determine whether intact limb loading differed between transfemoral amputees (TFAs) and able-bodied controls during down slope ambulation.

**Design:** Unilateral TFAs and able-bodied controls walked down a ramp in a gait laboratory. The following outcome measures were compared between amputees and controls and across prosthetic knee type (C-leg vs. Power Knee [PK]): step length, walking speed, leading limb peak ground reaction force, and trailing and leading limb ankle and knee energy absorption. Linear mixed effects regression was used to test for association between gait variables and limb.

**Results:** Five unilateral TFAs and five controls participated in this study. There were no significant differences observed in intact limb loading between amputees and controls or between prosthetic knee types. TFAs walked slower (C-leg vs. control= 0.29m/s; P=0.003, PK vs. control= 0.38m/s; P<0.001) with a shorter intact limb step thus reducing center of mass velocity at heel contact. Additionally, TFAs absorb more energy through weight acceptance for amputees compared to controls (C-leg - control= 0.43J/kg; P=0.013, PK - control= 0.53J/kg; P=0.017).

**Conclusions:** Our findings demonstrate that in order to compensate for reduced prosthetic trailing limb energy absorption compared with controls, TFAs take a single limb step thus reducing center of mass velocity at heel contact. Additionally, TFAs absorb more energy in their intact ankle during weight acceptance compared with controls. These findings have potential implications for rehabilitation and gait training strategies for TFAs.
TRAUMATIC BRAIN INJURY IN PRODROMAL PARKINSON DISEASE PATIENTS

Alejandra Camacho-Soto, MD, Mark Warden, MA, Heidi Prather, DO, David Brody, MD PhD, Susan Searles-Nielsen, PhD, and Brad A. Racette, MD

Background: Numerous studies suggest a higher risk of PD in those with a history of TBI. However, there is a long prodromal phase of PD during which many symptoms directly attributable to PD occur prior to diagnosis. During this phase, some patients may have undiagnosed motor abnormalities that lead to falls and hence TBI.

Objective: To determine the time-to-event (traumatic brain injury [TBI]) in prodromal Parkinson disease (PD) patients compared to patients without PD within the general Medicare population.

Design: We conducted a case-control study of all 89,790 incident PD patients diagnosed in 2009 and 118,095 population-based control beneficiaries >65 years of age. We obtained all claims data for cases and controls for 2004-2009, permitting a comprehensive ascertainment of TBIs occurring in those years prior to the diagnosis/referral date. We calculated Cox proportional hazard ratios (HRs) for PD cases relative to controls, adjusting for age, sex, race, comorbidities, smoking, and alcohol use.

Results: Over the years preceding PD diagnosis, 18.51% of PD cases and 6.33% of controls had a TBI. The HR comparing prodromal PD cases to controls was significantly greater than one for all years prior to diagnosis, with HRs markedly increasing in the PD cases as time approaches diagnosis date (PD-TBI-time interaction p-value < 0.05) with a particularly marked difference in the year nearest to diagnosis.

Conclusions: This work suggests people with prodromal PD may have a TBI as a result of developing motor dysfunction, emphasizing the importance of earlier diagnosis of PD for primary prevention of PD associated morbidity. Studies of TBI and PD risk that include TBI within five years of PD diagnosis must consider that at least part of the association between TBI and PD may be due to reverse causation.

TREATMENT OF NONDYSTROPHIC MYOTONIA WITH RANOLAZINE

W. David Arnold, MD, David Kline, PhD, Alan Sanderson, MD, Amy Bartlett, BA, Mark M. Rich, MD, PhD, and John T. Kissel, MD

Objectives: Nondystrophic myotonia (NDM) includes a group of disorders associated with muscle stiffness caused by skeletal muscle ion channel mutations. In most forms of NDM, muscle stiffness is most pronounced when activity is resumed after a period of rest and improves with sustained activity, termed the warm-up phenomenon. Recently, preclinical studies have revealed that slow inactivation of sodium channels contributes to warm-up. Ranolazine (RAN) increases sodium channel slow inactivation and therefore may be a promising treatment.

Design: This study was designed to explore whether ranolazine improves symptoms, clinical findings, and electrophysiological features of muscle stiffness in patients with chloride channel (Cl) and sodium channel (Na)-related NDM. Thirteen subjects with Cl-related NDM were enrolled and assessed at baseline, 2, 4, and 5 weeks. RAN was started after baseline assessment (500mg twice daily), increased as tolerated after week 2 (1000mg twice daily), and maintained until week 4.

Results: Patient-reported severity of stiffness (p < 0.0001), pain (p = 0.01) and weakness (p < 0.01) were significantly improved at week 4 compared with baseline. Similarly, Timed-up-and-go and grip myotonia were reduced with RAN (p < 0.03; p = 0.01). Electromyographic (EMG) myotonia of the abductor digiti minimi and tibialis anterior showed reduced duration (p < 0.001; p < 0.01), but myotonia frequency was not significantly changed (p = 0.13; p = 1.0) with treatment. No participant discontinued RAN due to side effects. Enrollment of the Na-related NDM cohort is ongoing.

Conclusions: RAN appears to be well-tolerated in individuals with NDM. Furthermore, treatment with RAN results in improvement of muscle stiffness. EMG myotonia duration (but not frequency) was lessened following treatment with RAN. This suggests that duration of myotonia may be an effective biomarker of muscle fiber hyperexcitability during future NDM treatment studies. This study provides the first clinical evidence that RAN is well tolerated and effective for the treatment of NDM and should be investigated in a larger controlled study.

TREATMENT OF PEDIATRIC IDIOPATHIC TOE WALKING WITH AND WITHOUT BUTOTULINUM TOXIN AND ANKLE FOOT ORTHOSIS

Shamil K. Jadhav, STUDENT, Supreet Deshpande, MD, and Mark Gormley, MD

Objectives: Idiopathic toe-walking (ITW) is toe-walking in a child with no spasticity or other neuromuscular abnormalities. Toe-walking can cause functional difficulties such as inefficient gait, falling, pain, and foot deformities. Historically, splinting/casting alone, ROM exercises, and even orthopedic surgery have been used to treat ITW with mixed results. This study evaluates the efficacy of treating ITW using botulinum toxin A (BtxA) injections into the gastrocnemius in conjunction with serial casting and ankle-foot orthosis (AFOs) versus serial casting and AFOs use alone.

Design: A retrospective chart review of all patients treated for ITW in a pediatric rehabilitation hospital from 2004-2015.

Results: Eighty-eight patients were treated, 49 received BtxA and 39 did not. All patients were treated with 2-4 weeks of serial casts and various AFO wearing schedules. Of the 48 patients who received BtxA, serial casts, and were their AFOs 23 hours/day for 4 months then tapered the wearing schedule, all had resolution of their toe-walking with only 1 requiring repeat casting and aggressive AFO wearing after 1 year. In the non-BtxA group, 21 followed the aggressive AFO schedule and had resolution of toe-walking with 4 having a recurrence requiring retreatment after a year. The 18 in the non-BtxA group who only wore their braces during the day had significantly fewer resolutions of their toe-walking. 7 did not have resolution of toe walking and 10 out of remaining 11 with resolution, required retreatment after 1 year. (chi-square=7.49; p = 0.003).

Conclusions: ITW can be effectively treated with serial casting and aggressive wearing of AFOs with or without BtxA injections. The patients who initially wore their AFOs 23hours/day had significantly better results. The patients who only wore their AFOs during the day had a much higher rate of persistent toe-walking and recurrence of toe-walking. A prospective randomized study is needed to better delineate the most effective treatment of ITW.

TWO-YEAR SAFETY DATA FOR HIGH-CONCENTRATION INTRATHECAL BACLOFEN

Gerard E. Francisco, MD

Objectives: Concentrations of intrathecal baclofen >2 mg/mL are not approved for marketing by the US Food and Drug Administration but are commonly produced by compounding pharmacies. Although high-concentration intrathecal baclofen may be appropriate and convenient for some patients with spasticity, there have been some anecdotal concerns regarding the safety of unapproved formulations. The purpose of this study was to evaluate the long-term safety of a 3 mg/mL formulation of baclofen.

Design: In an open-label phase 3 safety trial with no comparator arm, a total of 153 subjects were enrolled and received a continuous infusion of baclofen for injection (Malinckrodt Pharmaceuticals) 3 mg/mL delivered using a Medtronic SynchroMed® II programmable intrathecal infusion pump. The primary endpoint was the rate of confirmed inflammatory granulomas during the first 12 months of therapy in subjects receiving intrathecal baclofen 3 mg/mL. Diagnosis of granuloma was with magnetic resonance imaging (MRI). The secondary endpoint was the overall long-term safety of intrathecal baclofen 3 mg/mL.

Results: At the time of this update, 12-month safety data were available from 114 of 153 subjects. No subjects had confirmed (via MRI or computed tomography) cases of granuloma formation. A total of 436 treatment-emergent adverse events (TEAEs) were observed in 118 subjects (77.1%). Nineteen TEAEs reported in 153 subjects (12.4%) were judged by the investigator to be possibly or probably treatment related. The preferred terms and number of affected individuals for TEAEs that occurred in ≥ 1 subject were muscle spasticity (6), scoliosis (2), and respiratory depression (2).

Conclusions: At the 12-month safety update, no confirmed incidences of granulomas were identified with the baclofen 3 mg/mL concentration. No new safety signals beyond those reported in the current package insert were observed. Baclofen 3 mg/mL appears safe and well tolerated at 12 months in this study.

ULTRA-ENDURANCE RUNNING PERFORMANCE: INITIAL CORRELATIONS FROM THE METABOLOMICS OF ULTRAMARATHON PERFORMANCE STUDY (MUMPS)

Tracy B. Hoeg, MD, PhD, Sonja A. Wilkey, MD, Robert Bowers, DO, PhD, Vicki Hwang, PhD, and Robert H. Weiss, MD

Objectives: To determine the correlation of various biological, environmental, and historical factors with performance in a 100 mile (161 km) trail race.

Design: All 2016 Western States 100 mile (WS 100) participants’ finish times were correlated with their self-reported age (using median and z score) and sex (using Spearman’s rank-order correlation). A total of 436 treatment-emergent adverse events (TEAEs) were observed in 118 subjects (77.1%). Nineteen TEAEs reported in 153 subjects (12.4%) were judged by the investigator to be possibly or probably treatment related. The preferred terms and number of affected individuals for TEAEs that occurred in ≥ 1 subject were muscle spasticity (6), scoliosis (2), and respiratory depression (2).

Conclusions: At the 12-month safety update, no confirmed incidences of granulomas were identified with the baclofen 3 mg/mL concentration. No new safety signals beyond those reported in the current package insert were observed. Baclofen 3 mg/mL appears safe and well tolerated at 12 months in this study.
the race (p = 0.4890; p = 0.0010), faster five kilometer PR (p = 0.4691; p = 0.0103) and lower body mass index (BMI) (p = 0.3566; p = 0.0280). Finishing times were not significantly correlated with number of ultramarathons run (p = 0.1333; p = 0.4001) or percent carbohydrates in the diet during the month leading up to the race (p = 0.1756; p = 0.2578).

Conclusions: In decreasing order of correlation, marathon PR, miles run per week in the six months leading up to the race, five kilometer PR, lower BMI, and younger age were significantly correlated with faster finish times at the 2016 WS 100. Male finishers also tended to finish faster than female finishers.

USE OF THE GLMS FOR PAIN INTENSITY ASSESSMENT IN A CHRONIC PAIN POPULATION: TEST PERFORMANCE COMPARISON TO THE VAS AND THE SHORT FORM MCGILL PAIN QUESTIONNAIRE

Elinor H. Naor, BS, Ariana M. Rosado, BS, Kayode Williams, MD, MBA, FFARCSI, and Marlis Gonzalez-Fernandez, MD, PhD

Objectives: Pain perception varies across the population. The visual Analog Scale (VAS) and Numerical Rating Scale (NRS) both have a ceiling effect that limits the utility of these measurement scales for patients with significant pain at the top of the range. The general Labeled Magnitude Scale (gLMS) has been shown to reduce ceiling effects in other populations and has shown promising results (one study) in a chronic pain population. This study’s objective is to confirm, that when considering the emotional aspects of pain, the gLMS is a more practical pain scale in capturing the upper and lower extremes of pain intensity reporting.

Design: A scale validation study was performed to compare the experimental scale to commonly used and validated scales. We recruited 80 subjects with history of chronic pain who completed the gLMS, VAS, and the McGill pain questionnaire (short form) during the same visit. The gLMS and VAS ratings were compared to the overall score of the Short Form McGill Pain Questionnaire (SF-MPQ).

Results: As previously reported, gLMS ratings are consistently lower than VAS ratings (median difference of 2 VAS points). When comparing the regression lines generated from plotting the gLMS and VAS scores versus the SF-MPQ, the slopes were found to be nearly identical. In addition, when evaluating the absolute difference between gLMS and VAS versus SF-MPQ ratings, the regression line had a slope of 0 suggesting a constant difference between the gLMS and VAS over the range of SF-MPQ scores.

Conclusions: The results suggest that both VAS and gLMS measure pain intensity similarly but that the gLMS reduces ceiling effects that are common with the VAS. When compared to the SF-MPQ the gLMS increased consistently as SF-MPQ scores increased. The gLMS may be a useful tool to measure pain in clinical settings.

USING ITEM RESPONSE THEORY TO DETERMINE THE ABILITY OF THE NUMERICAL RATING SCALE TO ACCURATELY DISCRIMINATE BETWEEN LEVELS OF PAIN SEVERITY IN PATIENTS WITH RADICULAR OR MUSCULOSKELETAL PAIN

Ryan Mattie, MD, Zachary McCormick, MD, Mikhail Saltychev, PHD, MD, and Katri Laimi, MD, PROF

Objectives: To investigate if the Numerical Rating Scale (NRS) performs evenly among patients with varying levels of musculoskeletal or radicular pain using Item Response Theory (IRT). IRT has become increasingly popular for assessing Patient Reported Outcomes and developing short-form assessments, however, this statistical model has not yet been applied to the pain NRS. With IRT, it is possible to assess if the NRS may be more precise in distinguishing patients who experience higher levels of pain, lower levels of pain, or if it is good at all levels of pain equally. Such assessment may have important clinical implications, as physicians rely on numeric ratings of pain intensity to guide treatment and rehabilitation decisions.

Design: This was a retrospective cross-sectional cohort study of patients evaluated at three academic outpatient musculoskeletal/pain treatment centers located in a metropolitan Midwestern region of the United States. In order to identify patients who had reported NRS pain scores, the electronic medical records from these three centers were queried for current procedural terminology codes for cervical and lumbar transforminal and interlaminar epidural steroid injections, as well as intra-articular hip injections. As such, the diagnoses represented included neck and low back pain with or without concomitant radicular pain, as well as hip and pelvic girdle pain. Using this search strategy, consecutive patient encounters were included between April 2007 and October 2015 at two centers and between January 2014 and February 2015 at the third center.

Results: Response data on the pain NRS were available for 1173 patients. Their median age was 58 (IQR 47 to 67, range 23 to 87) years. Fifty-seven percent were men and 43% women. IRT analysis achieved a good fit after 31 iterations (n = 1173). The discrimination ability of the pain NRS was moderate with a coefficient of 1.24 (standard error 0.76). The result was not statistically significant with the 95% CI being slightly below zero (95% CI -0.26 to 2.74, p-value 0.12). The difficulty level varied from -1.3 to +1.1. The test characteristic curve showed a shift towards higher levels of pain. This was confirmed by the test information function curve with a function peak located on the right side of the point indicating an average level of pain in the studied population (point of zero on the X-axis). Notably, the slope of the test characteristic curve was rather steep, and the steeper the curve the better the discrimination ability.

Conclusions: The results of this study indicate that an 11-point scale for pain demonstrated acceptable accuracy for the measurement of self-reported pain in an outpatient musculoskeletal clinic. It is important to have confirmation that a test maintains appropriate discrimination despite simplicity or brevity. Using IRT statistical modeling, the 11-point NRS for pain was shown to be slightly better (more precise) at distinguishing between higher-level pain scores than lower-level pain scores, though the results were not statistically significant. The 11-point NRS overall showed a good ability to discriminate between various levels of pain on all levels of the scale, and this study is the first to validate the NRS as an adequate short-form assessment of pain using the psychometric analytics of IRT.

WHEELCHAIR FALLS IN OLDER PEOPLE: CIRCUMSTANCES AND MECHANISMS

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Objectives: Numerous risk factors for falls have been reported for the ambulatory population over 65 years of age. However, many of these risk factors are not applicable to older persons who use a wheelchair (WC) for mobility. Less has been reported about the conditions surrounding the fall event, the mechanisms and nature of the injury, and other consequences of wheelchair-related falls (WF).

Design: Self-reported data on WF and injuries (WI) were collected over a period of 12 months (at baseline and via monthly telephone calls), as part of a larger study, from veterans over age 62 who routinely used WC for mobility. Data collected included description of physical environment, falls, and injuries. Data were analyzed using descriptive statistics.

Results: Of the 710 study participants, 165 (53%) were involved in one or more WF and 103 (62.4% of fallers) reported at least one WI for that year. Of the 312 WF, 64% were indoor falls (27.4% occurred in the bedroom, 19.4% in the bathroom, 19.4% in the living room and 8.5% in kitchen). Close to 50% of participants that fell indoors, did so on tiled flooring, followed by low-pile carpet (16%). Majority of outdoor falls occurred on sidewalks (28%), followed by pavement (22.5%) and grass (20%). Most falls (46.2%) occurred during transfers and in the forward direction (n = 123) followed by falls to the side (n = 109). Subjects reported that the way they felt prior to the fall was the biggest factor leading to the fall (n = 111) and also cited equipment (n = 67) and environment (n = 66) as contributing factors.

Conclusions: More than half of older WC users experienced a WF in 12-month period. Identification of most common circumstances resulting in WF or WI could inform implementation of educational, therapeutic and other safety measures to decrease the risk of WF and WI in high risk cohort.