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Accepted Research Report and Case Report Abstracts

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ID: 88 (Poster)

Joseph Alexander

Title: CERVICAL SPINE MOBILIZATION AND EXERCISE IN A PATIENT WITH CHRONIC POST-STROKE SHOULDER PAIN: A CASE REPORT

Background/Purpose: Post-stroke shoulder pain (PSSP) is described as a report of pain in the affected shoulder after cerebrovascular accident (CVA) and has a prevalence of 22-60%. The diagnosis and treatment of PSSP is challenging given the number of potential diagnoses and possible alterations in pain processing, somatosensation, and muscle function. Although the cervical spine is known as a somatic referral site for shoulder pain; there is little evidence of the incidence of cervical spine referral in those with PSSP. Therefore, it is possible that the cervical spine may not be routinely screened in this population. The purpose of this case report is to illustrate the clinical reasoning and treatment of chronic PSSP through manual therapy and exercise directed at the cervical spine.

Case Description: A right hand dominant 52-year-old female presented to outpatient orthopedic physical therapy with a diagnosis of “Left Rotator cuff tear”. Shoulder and scapular pain occurred 18 months prior after sustaining a right pontine CVA. The pain was unsuccessfully treated with a subacromial injection and a suprascapular nerve block. The patient reported pain that impaired function with sleep, reaching, and hair grooming. Objective examination revealed pain limited cervical extension and left rotation active range of motion (AROM), left shoulder flexion AROM of 103° and limited hand behind back (HBB). Cervical spine passive accessory joint mobility testing revealed hypomobility at C5-6, C6-7, C7-T1 with reproduction of concordant pain. A painDETECT score of 19/35 indicated probable neuropathic pain. Initial treatment included non-thrust lower cervical spine accessory and physiologic mobilizations with immediate improvement in pain and shoulder AROM. Prescribed exercise simulated the manual techniques performed. After 5 visits, the patient reported no sleep disturbances and pain free cervical and shoulder AROM. Manual therapy and exercise was then directed at the shoulder as patient’s main complaint was shoulder stiffness.

Outcomes: The patient was seen for a total of 10 visits over a 7-week duration. Left shoulder flexion AROM improved to 150° and HBB to L3, and cervical AROM was full and non-painful. Maximal pain rating via the numeric pain rating scale (NPRS) decreased from 10/10 to 2/10, global rating of change (GROC) was reported “a good deal better” (+5), DASH score reduced from 76.7% to 50.8%, and painDETECT score reduced from 19/35 to 11/35. Outcomes were maintained three months following discharge.

Discussion/Conclusion: PSSP in this patient was hypothesized to occur due to C5-6 facet arthropathy and improved following non-thrust mobilization at the lower cervical spine. This case report demonstrates the importance of diagnostic reasoning to identify the source of the patient’s concordant pain that ultimately lead to successful treatment. Future research should investigate the incidence of referred pain from the cervical spine and the effectiveness of orthopedic manual physical therapy for management in those with PSSP.

ID: 64 (Poster)

Rashi Anand, Ryan Cummings, Julie Finocchiaro

Title: Using Symptom Irritability To Guide Management Of Cervical Radiculopathy: A Case Report

Background/Purpose: Cervical radiculopathy is characterized by pain along a dermatomal path with associated neurologic changes in response to mechanical compression of nerve root(s) leading to localized ischemia and conductivity alterations1. There is a plethora of research supporting conservative management for cervical radiculopathy; however, there is lack of research highlighting treatment recommendations based on a patient's level of symptom irritability. Therefore, this case report explores the clinical decision-making process and management of cervical radiculopathy based on irritability in a patient with high symptom irritability.

Case Description: Patient was a 49-year-old left hand dominant female presenting to outpatient physical therapy with referral for cervical radiculopathy with a 3-week insidious onset of acute left sided neck and arm pain radiating to the dorsal 4th-5th digits. Patient reported constant pain, including at night, with baseline pain of 7/10 on the numeric pain rating scale impacting driving, gripping, sleeping left sided, and performing activities as a server. Alleviating factors included sleeping right sided and rest. The imaging conducted was unremarkable. Initial evaluation revealed positive Wainner cluster2 with strength and sensory deficits at C7-C8 nerve roots. An irritability guideline was derived from the 2013 Shoulder Pain and Mobility Deficits: Adhesive Capsulitis Clinical Practice Guideline3 and was modified for this specific case. It classifies patients into high, moderate, or low irritability based on pain level, presence of night and/or resting pain, level of disability on outcome measure(s), and symptom peripheralization. Patient was classified as high irritability given her pain level, presence of night and resting pain, and instant peripheralization of symptoms with provocative activities. Thus, initial interventions based on the irritability classification focused on pain modulation and centralization interventions through foraminal opening4 and offloading strategies5, neurodynamic mobility6-7, and cervico-thoracic joint mobilization. These interventions were progressed as irritability level improved from high to low irritability. Additional interventions included periscapular strengthening and upper-mid thoracic manipulation. Patient demonstrated complete mitigation of symptoms by the 4th visit.

Outcomes: The patient completed four visits over the course of four weeks. Clinically important improvements demonstrated changes in Neck Disability Index from 33% to 0% and improvements across all domains of the Patient Specific Functional Scale. Objective changes included significant improvements in cervical rotation range of motion, left sided grip strength, neurodynamic mobility, myotomal testing, and dermatomal testing all being unremarkable at discharge.

Discussion/Conclusion: The treatment of cervical radiculopathy resulted in meaningful changes in a span of four visits over thirty days with subjective improvements in the patient's activity restrictions. This case demonstrates that an irritability guideline to classify a patient's irritability level can guide treatment interventions to decrease pain, centralize symptoms, and improve function to promote return to work-related responsibilities.

ID: 93 (Poster)

Jesse Anderson, Bret Greenberg, Josiah Sault

Title: THORACIC SOMATIC REFERRAL IN A PATIENT PRESENTING WITH ISOLATED SUBACROMIAL PAIN: A CASE REPORT

Background/Purpose: The thoracic spine can be a source of symptoms into the shoulder, however spinal or scapular pain is typically present. Due to the biomechanical link between these two regions, thoracic referred pain may mimic primary shoulder pain. The purpose of this case report is to describe the orthopedic manual physical therapy management of a patient with isolated subacromial pain referred from the thoracic spine.

Case Description: A 74-year-old female presented with chronic left shoulder pain, beginning insidiously 4 months prior to evaluation. She reported subacromial pain, intermittently extending to the lateral upper arm, intensity ranging from 0-8/10 on the numeric pain rating scale. She denied any other pains or paresthesias. The patient reported aching, sharp pain and popping with left arm use, especially with overhead activities.

During the objective exam, symptoms were reproduced with shoulder abduction active range of motion (AROM) and strength assessments. Manual cervical distraction during testing improved pain, AROM, and strength. Cervical spine AROM was limited in all directions, with familiar subacromial pain reproduction only when adding overpressures into extension, bilateral rotation, and left lower cervical extension quadrant. Passive accessory intervertebral mobility (PAIVM) assessment of the cervical spine did not elicit pain. PAIVM assessment of the thoracic spine revealed hypomobility and reproduced her pain, most notably at the left T1/2 facet joint.

To modulate pain and improve mobility deficits, grade 3 posterior-to-anterior mobilizations were applied to T1/2 (on evaluation) and T2/3 (on the first follow-up) for 4 and 8 minutes respectively, resulting in immediate improvements in abduction AROM and strength. The patient was instructed in an exercise to improve cervicothoracic mobility and educated to use her arm within tolerance.

Outcomes: The patient was seen for a total of 3 visits over 3 weeks. At discharge, she was pain free, denied any functional limitations, and popping symptoms had resolved. Shoulder and spine re-examination did not produce any symptoms. Shoulder AROM was symmetrical and full, and her shoulder strength was 5/5 throughout. The QuickDASH improved from 30% disability on evaluation to 9%. The global rating of change score was rated “a very great deal better” (+7).

Discussion/Conclusion: Isolated subacromial pain is an uncommon pattern for thoracic somatic referral, but needs to be considered as a potential source of shoulder pain. In this case, identification of thoracic joint referral and targeted treatment were integral to the rapid improvement of the patient’s pain, loss of shoulder AROM, and weakness. The resolution of the primary source of nociception may have facilitated restoring shoulder function via reduced nociceptive motor inhibition. Future research into treatment of the spine in instances of isolated limb pain may help elucidate the frequency that spinal structures cause peripheral pain or dysfunction without spine complaints.

ID: 95 (Poster)

Jesse Anderson, Emily Nicklies, Alison Duncombe

Title: PHYSICAL THERAPIST MANAGEMENT OF A PATIENT WITH CHRONIC TEMPOROMANDIBULAR DISORDER (TMD) FOLLOWING BUCCAL MUCOSA URETHROPLASTY: A CASE REPORT

Background/Purpose: Urethroplasty surgeries are performed to address urethral defects, commonly using the buccal mucosa from the inner cheek as a graft site. Evidence shows that the majority of patients do not experience pain after this procedure, however many have chronic limitations in mouth opening. There are currently no published reports outlining the management of TMD in this population. The purpose of this case report is to describe the successful management of a patient with TMD status post buccal mucosa urethroplasty utilizing manual therapy and exercise.

Case Description: A 64-year-old male presented with chronic right sided jaw pain two years post urethral reconstruction with a buccal graft. At initial evaluation, the patient reported a deep ache along the mandible, ranging from 2-10/10 on the numeric pain rating scale. He reported apprehension with maximal mouth opening, and would accidentally bite his inner cheek several times per day. He was unable to eat large, chewy, or hard foods due to pain.

Objectively, the cervical spine was examined without reproduction of jaw pain. Mouth opening, right and left lateral excursion were 30mm, 10mm, and 8mm, respectively. Palpation of the masseter reproduced local familiar pain with referral along the mandible. Hyperalgesia with palpation of the ipsilateral lateral pterygoid, suprahyoids, and the lateral pole of the mandibular condyle was noted. Tenderness and hypertrophic scarring were also identified along the graft site incision. The right TMJ was hypomobile in anterior and inferior directions upon passive accessory assessment.

Scar and soft tissue mobilization to the masseter muscle were performed for pain modulation. Right TMJ anterior and inferior mobilizations were applied into tissue resistance to address joint mobility deficits. The patient was taught self-mobilization techniques to reinforce these effects. Motor control exercises were utilized to improve lateral excursion and education on graded introduction to right-sided chewing was also incorporated.

Outcomes: After 3 follow-up visits, the patient reported no jaw pain or functional limitation. The patient's Jaw Functional Limitation Scale improved from 20% to 0% disability, and the Patient Specific Functional Scale item for "eating large pieces of food" improved from 0/10 to 10/10. The global rating of change score was +7 ("a very great deal better"). Mouth opening, right and left lateral excursion improved to 41mm, 15mm, and 13mm, respectively. The patient was able to eat a normal diet and denied biting his cheek at discharge.

Discussion/Conclusion: This case report outlines the successful management of chronic TMD in a patient following buccal mucosa urethroplasty utilizing manual therapy and exercise. In this case, spreading of pain from the graft site was likely associated with neuroplastic changes over time leading to chronic pain with biomechanical and functional deficits. Future research on the management of this post-surgical complication is warranted.

ID: 96 (Platform)

Meredith Atkenson, Christopher Hagan

Title: CERVICAL SPINE ASSESSMENT AND INTERVENTION FOR THE SUCCESSFUL MANAGEMENT OF A CANDIDATE FOR SHOULDER SURGERY: A FELLOW'S CASE REPORT

Background/Purpose: Imaging is not a strong predictor for pain location and severity. Interpretation of imaging findings alone can lead to an inaccurate diagnosis and management of a patient. The average cost of a total shoulder arthroplasty (TSA) is $23,000 in an outpatient surgical center, with a 10-12% complication rate. A recent study revealed that among 84 subjects with isolated shoulder pain, 47.6% were from a spinal source. The purpose of this case report is to highlight the importance of examination of the cervical spine in a patient who was recommended to have shoulder surgery.

Case Description: A 86-year-old, R hand dominant male presented to outpatient physical therapy (PT) with complaints of insidious right (R) shoulder pain beginning 4 months ago. This pain was limiting his ability to sleep, dress, and perform job tasks of stocking grocery store shelves. Eight days prior to PT consultation, he was evaluated by an orthopedic surgeon who recommended a TSA based on his x-ray findings. Upon PT evaluation, he demonstrated R shoulder flexion and abduction less than 100 degrees and glenohumeral joint (GHJ) passive accessory mobility deficits in all planes. Spinal examination revealed limited active cervical range of motion (ROM) in all directions, hypomobility of R unilateral posterior-anterior accessory (UPA) motion testing at C5-6 and C6-7, as well as thoracic spine segmental hypomobility at T1-3. Concordant R shoulder pain was reproduced with active cervical R rotation and R UPA at C5-6. Neurological exam revealed hypoesthesia along the R supraspinatus fossa. Clinical diagnosis was R C5-6 facet arthropathy with secondary hyperalgesia mimicking shoulder pathology. Manual therapy and therapeutic exercise was directed only at the cervical and thoracic spine.

Outcomes: The patient was seen for 4 visits over 9 days. He reported 95% improvement in function, demonstrated full, pain free shoulder AROM. Cervical rotation ROM improved 20 degrees and no longer reproduced shoulder pain. Static cutaneous mechanical detection at the R supraspinatus fossa was normal. The patient reported no pain with sleeping on his R side, dressing, or performing work duties. His FOTO and DASH scores improved from 53 to 74/100 and 35.8 to 9.2, respectively.

Discussion/Conclusion: Thorough examination of the cervical spine revealed somatic referred pain to the shoulder mimicking GHJ osteoarthritis. Manual therapy intervention performed exclusively at the cervical and thoracic spine resolved the patient's R shoulder pain. Unnecessary costs and potential complications related to shoulder surgery were avoided with conservative management. It is imperative to assess the cervical spine as a potential source of nociception in patients with shoulder pain, regardless of imaging findings. Future research should explore the effects of cervical spine intervention in patients with known shoulder pathology.

ID: 98 (Poster)

Meredith Atkenson, Christopher Hagan

Title: HYPOTHESIS DRIVEN DIAGNOSIS AND TREATMENT TO SUCCESSFULLY MANAGE A PATIENT WITH MEDIAL ELBOW PAIN: A FELLOW'S CASE REPORT

Background/Purpose: Outpatient diagnostic errors affect approximately 12 million adults every year in the United States. Patients rarely present with a clear clinical pattern, often showing overlapping signs of multiple patterns, making accurate diagnosis challenging. Clinicians should perform a hypothesis-driven examination and maintain a working hypothesis throughout the plan of care. The purpose of this case report is to illustrate the clinical reasoning process using multiple hypotheses to identify the correct diagnosis and successfully manage a patient with medial elbow pain.

Case Description: A 72-year-old male presented to outpatient physical therapy (PT) with complaints of left (L) medial elbow pain and weakness that began insidiously six weeks ago. He reported pain with pressure to his elbow and was dropping objects from his L hand. He was also limited at his job which required operating heavy machinery and tools. Upon evaluation, he demonstrated painful and limited cervical range of motion (ROM), particularly with L rotation, diminished static cutaneous mechanical detection at digits 4-5, allodynia at the medial epicondyle, and a positive Froment's sign. Initial clinical diagnosis was C8 radiculopathy with intervention directed at the cervical spine. No clinically significant change was observed at the second follow-up visit, which prompted further evaluation of the elbow. Examination revealed loss of elbow extension ROM, painful and weak grip strength, and pain with common flexor tendon palpation. Medial epicondylalgia became the updated working hypothesis. The patient was managed with both cervical and elbow interventions without improvement, warranting further assessment on visit 5. At re-evaluation, L ulnar nerve upper limb neural provocation testing revealed pain with a significant limitation in mobility. Implementation of ulnar nerve mobilizations resulted in near resolution of the patient's pain at the following visit.

Outcomes: The patient was seen for 9 visits over 6 weeks. Patient's Focus on Therapeutic Outcomes (FOTO) score improved from 69 to 98/100. His L cervical rotation ROM improved from 42 to 65 degrees, elbow extension ROM was full. Grip strength improved from 68 to 94lbs and Froment's sign was negative. Cutaneous mechanical detection in the hand was restored and allodynia at the elbow resolved. He was not limited at work and returned to resistance training workouts.

Discussion/Conclusion: Maintaining a working hypothesis was critical for the precise diagnosis of this patient. While the patient initially presented with signs of cervical radiculopathy, there were no significant improvements with treatment. Local elbow findings then directed treatment for medial epicondylalgia, still without change in outcomes. A third re-evaluation revealed findings consistent with ulnar nerve entrapment, ultimately leading to successful management of this patient. A systematic approach of "assess-treat-reassess" was necessary to find the pain driver. It is vital for clinicians to regularly assess patients throughout the plan of care to minimize the risk of misdiagnosis.

ID: 84 (Platform)

Anthony Baumann, Mingda Chen

Title: UPPER CERVICAL PATHOLOGY SCREENING USAGE AMONG PHYSICAL THERAPISTS WHEN TREATING NECK PAIN: A RETROSPECTIVE ANALYSIS

Background/Purpose: Screening for upper cervical pathology is a common yet controversial topic among clinicians providing conservative treatment for neck pain. Conflicting research has continued to polarize opinions concerning upper cervical screening (UCS). A comprehensive list of UCS tests involve VBI manual testing, ligament manual testing, and screening questions for various signs of serious upper cervical pathology. Little data exists on the current usage of UCS among physical therapists at this time. The purpose of this study is to contribute to this conversation concerning UCS by examining the usage of various screening methods by physical therapists among their actual patients.

Methods: The current study is a retrospective chart review (n=90 patients) from multiple outpatient clinics in a single health care system. Inclusion criteria included patients between the ages of 18-90 years old who received physical therapy treatment for neck pain. Exclusion criteria included patients with a history of cervical surgery. Data collected included age, sex, use of manual techniques for the neck, the presence or absence of manual upper cervical screening tests (any version of vertebrobasilar test, alar ligament test, transverse ligament test, and Sharp-Purser test), and the presence or absence of screening questions for common signs of upper cervical pathology (dizziness, double vision, blurry vision, headache, and any other signs of vascular pathology).

Results: Patients (n=90) had an average age (SD) of 67.2 years old (15.5) with the presence of hypertension (n=37) or the absence of hypertension (n=53) in their past medical history. About 85% of patients received manual techniques during treatment. For manual upper cervical testing, 5.5% received any form of vertebrobasilar testing, 5.5% received alar ligament testing, 8.8% received transverse ligament test, and 13.3% were tested with the Sharp Purser test. For screening questions for upper cervical pathology, 13.3% received questions about dizziness, 13.3% received questions about double vision, 12.2% received questions about blurry vision, 25.5% for headache, and 18.8% for signs of vascular pathology. No significance difference was found for the use of manual testing or screening questions between patients with or without hypertension (p=0.17 to p=1). There was no significant difference for upper cervical screening between patients who received cervical manual therapy compared to those who did not (p=0.22).

Discussion/Conclusion: UCS does not appear to be regularly used by physical therapists when treating patients with neck pain. There was no significant increase in upper cervical screening if the patient was treated with manual techniques or if they had increased risk of vascular pathology. This study adds to the ongoing discussion of the use of UCS when treating patients for neck pain.

ID: 83 (Poster)

Anthony Baumann, Mingda Chen

Title: CLINICIAN TREATMENT ADHERENCE FOR PHYSICAL THERAPY CLINICIAL PRACTICE GUIDELINE RECOMMENDATIONS FOR MECHANICAL NECK PAIN: A RETROSPECTIVE CHART REVIEW

Background/Purpose: Neck pain is a common orthopedic condition treated by physical therapists in the outpatient setting. Recently, the American Physical Therapy Association (APTA) published a clinical practice guideline (CPG), an original in 2008 and a revision in 2017, in order to help classify and provide treatment recommendations for neck pain. One subset of neck pain is described in the CPG as “Neck Pain with Mobility Deficits”, which can also be described as mechanical neck pain. Little evidence exists on whether that research is being utilized by physical therapists in the clinic. The purpose of this study is to examine clinician adherence to CPG recommendations for treating mechanical neck pain by examining their treatments of actual patients.

Methods: A retrospective chart review (n=94 patients) from a single hospital-based system that involves multiple outpatient physical therapy clinics. Patients were selected if they received physical therapy treatment for neck pain after 2018 and fit best into the CPG category of “Neck Pain with Mobility Deficits.” Exclusion criteria included patients with history of cervical or thoracic surgery, neck pain from whiplash or a motor vehicle accident, and neck pain with radiculopathy. The six interventions recorded include thoracic manipulation, cervical mobilization, transcutaneous electrical nerve stimulation (TENS), dry needling, advice to stay active (home exercise program), and scapular resistance exercises.

Results: Patients (n=94) had an average (SD) age of 63.0 (15.4) years old. The average duration of neck pain in days was 230.1 (301.04) days and the total number of physical therapy visits was 6.3 (4.4) visits. The only interventions to have widespread use was advice to stay active (97%) and scapular resistance exercises (80%). In descending order of use, cervical mobilization was used in 45% of patient encounters, dry needling was used in 21% of patient encounters, TENS was used in 14% of patient encounters, and thoracic manipulation was used in only 3% of patients. For overall usage, about 48% of patient encounters used only 0-2 interventions, 32% of patient encounters used at least 3 interventions, and only 18% of patient encounters utilized 4 or more interventions.

Discussion/Conclusion: About half of patient encounters utilized two or less of the CPG recommended interventions for treating patients with mechanical neck pain. Some interventions, such as scapular resistance exercises, were commonly used whereas other interventions, such as thoracic manipulation, were virtually absent. Overall, the synthesis of evidence recommended by the Neck Pain CPG is being poorly utilized during patient treatment. Future research needs to focus on causes for lack of clinician adherence, ways to improve adherence, and effect on patient outcomes.

ID: 73 (Poster)

Carter Bernier, Joseph Haverkamp, Candi Gardner, Kevin Farrell, Kristen Haverkamp

Title: UTILIZATION OF MANUAL THERAPY AND PAIN NEUROSCIENCE EDUCATION IN THE MANAGEMENT OF A PATIENT WITH CHRONIC ANKLE INSTABILITY: A CASE REPORT

Background/Purpose: Background & Purpose: Lateral ankle sprains are a common musculoskeletal injury, with 70 percent developing residual physical deficits including chronic ankle instability (CAI), typically treated conservatively with Physical Therapy (PT). The purpose of this case study is to describe the utilization of manual therapy (MT) and pain neuroscience education (PNE) techniques in the management of a patient with CIA.

Case Description: Case Description: A 20-year-old female presented to physical therapy with an acute exacerbation of CAI. She described ankle instability, difficulty with weight acceptance, and pain with closed chain active dorsiflexion. With light palpation, she described sensitivity at the sinus tarsus region, extending proximally throughout her entire lower leg to the mid-thigh region. It was apparent that PT management should begin utilizing manual therapy and neuromuscular retraining to improve ankle arthrokinematics and stability, but then had to address the apparent neural sensitivity if symptoms remained. Therefore, PNE, laterality training, and graded motor imagery (GMI) were utilized after the 2nd visit to reduce neural sensitivity.

Outcomes: Outcomes: The patient was seen a total of 5 visits over 5 weeks. She made significant improvements in ROM during the first 3 weeks utilizing traditional manual therapy and neuromuscular retraining. Manual interventions included talocrural and subtalar joint mobilization to impaired joint glide with dorsiflexion (DF) and pronation, while neuromuscular retraining included closed chain stabilization exercise. After 2 visits, DF ROM improved from 4 to 13 degrees and single leg stance time improved from 16 seconds to 30 seconds. However, pain remained consistent, only dropping from 9 to 6/10. After the first 2 visits, focus of treatment, therefore, shifted towards PNE emphasizing laterality in conjunction with neuromuscular retraining, and discontinuation of MT. GMI was incorporated at week 4. After initiating PNE, at one month follow up pain improved to 0/10, laterality improved from below 65% to 75%, and body mapping was unchanged.

Discussion/Conclusion: Discussion/Conclusion: Although ankle function and stability improved with traditional conservative management, symptoms during functional activity persisted. Once treatment shifted to include PNE and appropriate follow-up exercise, the patient had significant reduction in symptoms. Determining the dominant contributing system was essential to regain full functional capacity in this case, and addressing this early allowed conventional MT and NM to progress. This case study in a patient with CAI demonstrates how physical therapists should consider both the musculoskeletal system and neurophysiological systems and the appropriate timing of intervention for each system to optimize efficiency of treatment.

ID: 21 (Poster)

Mark Bertch

Title: PROXIMAL RADIOULNAR SYNOSTOSIS-AN UNEXPECTED DISCOVERY FOLLOWING DISTAL BICEPS BRACHII TENDON REPAIR: A CASE REPORT

Background/Purpose: Complete rupture of the distal biceps brachii typically involves substantial eccentric loading that leads to forced elbow extension/hyperextension. Interventions can include non-operative treatment; however, surgical repair is recommended for those living an active lifestyle and want/need to maximize elbow strength/endurance. The cortical Endobutton fixation technique, utilized in this case, allows for early, aggressive rehabilitation. Overall, the complication rate following distal biceps tendon repair is low (25% of cases) with 0.1% of these associated with proximal radioulnar synostosis. This case illustrates Orthopaedic Manual Physical Therapy (OMPT) management of a distal biceps tendon repair using a single-incision cortical Endobutton fixation technique, and provides potential clinical pattern recognition aligned with proximal radioulnar synostosis.

Case Description: A 44-year-old male, attempting to stop a fall, grabbed onto a door jamb with his non-dominant upper extremity (UE) and sustained a distal biceps brachii tear. OMPT was initiated seven weeks post-op to address his ongoing limited ability to play guitar and golf. Noteworthy initial OMPT exam findings included: a) reduced active supination (5 deg.) and pronation (46 deg.), b) limited passive supination and pronation (both having an empty end-feel), c) pain-described as soreness/stiffness (3/10), and d) QuickDASH scores of 54.5% (Disability/Symptom Score), 25% (Work Module), and 100% (Sports/Performing Arts Module). Clinical reasoning led to a working OMPT hypothesis of proximal radioulnar joint arthrofibrosis resulting in capsular pattern of restriction being his range of motion (ROM) restriction was also present with passive movement, unlike active/passive flexion and extension. Interventions delivered over 12 weeks (11 visits) included: soft tissue mobilization, non-thrust joint mobilization to the proximal radioulnar and radiohumeral joints, high and low amplitude uni- and multi-planar passive range of motion, passive stretching/splinting (Joint Active System), Proprioceptive Neuromuscular Facilitation techniques, active range of motion (AROM), and open-kinetic chain submaximal progressive resistance exercise.

Outcomes: Outcomes measured were: AROM emphasizing supination and pronation (primary-goniometer), pain intensity (secondary-0 to10 Numerical Pain Rating Scale (NPRS)), and self-reported function (secondary-QuickDASH). Active supination and pronation improved by 7 and 8 degrees, respectively. Pain intensity decreased by three points. QuickDASH score changes were as follows: 9.1% reduction of the Disability/Symptom Score; 25% reduction on the Work Module; and no change on the Sports/Performing Arts Module. Given these outcomes, the patient was referred to his surgeon whereby imaging revealed proximal radioulnar synostosis. Surgical excision and contracture release followed, thus restoring proximal radioulnar joint ROM.

Discussion/Conclusion: Despite a multi-modal OMPT care plan and home management, the patient developed a proximal radioulnar synostosis. Sustained limitations with supination/pronation ROM without concurrent flexion/extension deficits, and continued activity restrictions, following distal biceps tendon repair could serve as a clinical indicator of this. As such, a clinical decision to recommend earlier imaging to determine the presence of heterotopic bone formation would be warranted.

ID: 76 (Poster)

Hannah Blaske, Laura McEachern, Kevin Farrell, Candi Gardner, Dustin Hawk

Title: Integration Of Pain Neuroscience Education And Graded Motor Imagery With Manual Techniques For A Patient With Chronic Hip And Low Back Pain: A Case Report

Background/Purpose: Background/Purpose: Chronic pain affects 20% of the population. Although patients with chronic pain present with various musculoskeletal conditions, they don't always benefit from manual therapy techniques alone. Pain neuroscience education (PNE) and graded motor imagery (GMI) are shown to decrease the neural sensitivity in patients with chronic pain. The purpose of this case is to demonstrate the integration of PNE and GMI to decrease sensitivity, allowing for manual techniques in a patient with chronic pain.

Case Description: Case Description: A 38 year old female presented with complaints of pain in her left sacroiliac joint (SIJ) region, left hip, and left low back. She works as a manufacturing laborer, in January 2021 she felt pain in her left hip after lifting an object. Imaging revealed a labral tear, resulting in a labral repair with psoas lengthening in August 2021. After surgery, she experienced a sharp pain in her SIJ region. She received an epidural steroid injection in her lumbar spine which relieved all of her symptoms for one week. Later a SIJ cortisone injection provided one week of relief, however she has had worsening symptoms since. Numeric pain ratings were 8/10 at best, 10/10 at worst, a lower extremity functional scale (LEFS) of 15%. At initial evaluation her symptoms were reproduced with a left straight leg raise at 20°, left unilateral and central posterior-anterior (PA) mobilizations L2-4 grade III, and lumbar closing patterns. Initial treatment included lumbar opening mobilizations (unilateral PAs in lumbar flexion, left flexion physiological mobilizations), soft tissue mobilization, and flexion biased mobility exercises. She had decreased tolerance to manual therapy and her symptoms increased following treatment. PNE was then utilized at her fourth visit to educate on central sensitization. Two-point discrimination was found to be 12cm on her low back (normally 5.5cm). Treatment then focused on neural desensitization through PNE and GMI (2-point discrimination, localization grid, laterality).

Outcomes: Outcomes: After 7 visits of PNE/GMI, she improved her 2-point discrimination from 12cm to 5.5cm with 50% accuracy, centralization of symptoms, and ability to tolerate increased exercises. As her 2-point discrimination improved she was able to tolerate the integration of manual techniques (unilateral PAs grade II and STM of left paraspinals, gluteus medius, and piriformis). She has been seen for 11 visits over 5 weeks and is still being seen.

Discussion/Conclusion: Discussion/Conclusion: This case reports on a patient with chronic pain and signs of central sensitization who couldn't tolerate manual therapy techniques. She benefited from PNE and GMI to decrease neural sensitivity, allowing for reincorporation of manual techniques.

ID: 33 (Poster)

Peter Bowman, Ethan Feder, Alisa Pravdo, Roy Film

Title: THE DIFFERENTIAL DIAGNOSES OF ANTERIOR TIBIALIS TENDINOPATHY VERSUS LUMBAR RADICULITIS IN A 34-YEAR-OLD RUNNER: A CASE REPORT

Background/Purpose: Anterior tibialis tendinopathy occurs most frequently in middle-aged women presenting as swelling and pain over the muscle insertion typically as a result of overuse. Resistance training with a focus on eccentric and isometric strength training, movement retraining and functional loading management has been found to be successful for treating tendinopathies. Lumbar radiculitis is a possible differential diagnosis for anterior lower leg and ankle pain. Radiculitis affects 3-5% of the general population with a variety of symptoms in the lower back and LE. These symptoms can appear from overuse or without a specific mechanism of injury.

Case Description: A 34-year-old female runner with a 6-year history of anterior ankle, foot pain and occasional lower back pain. She was referred to physical therapy (PT) with a diagnosis of anterior tibialis tendinopathy. The patient presented with intermittent sharp and aching pain in her left anterior foot and ankle with running and after working a long shift or standing for too long. The patient presented with full and pain-free lumbar AROM, and demonstrated left ankle weakness and limited range of motion globally. Initial PT intervention focused on restoring ankle joint play and exercises focused on strength training for the gastrocnemius/soleus, tibialis posterior, and foot intrinsic muscles. Running analysis was also performed. After 8 weeks she displayed 5/5 foot intrinsic and LE strength but continued to report pain. Lumbar spine and neurodynamic screening was reassessed at this time. The patient presented with positive neurodynamics with symptoms into her left LE and repeated motions reproduced low back pain. The patient demonstrated excessive lumbar extension during running and displayed proximal limb weakness and weak core musculature. Neuromuscular re-education exercises were introduced focused on core musculature.

Outcomes: The patient completed PT over 3.5 months. Interventions included manual therapy on the ankle, lumbar spine and hip, stretching and strengthening of the posterior calf musculature, strengthening of gluteus medius, transversus abdominis, multifidi and return to running activities. Outcome measures included manual muscle testing, AROM and numeric pain scale. Findings at discharge revealed resolution of foot, ankle and low back pain with an improved score on the LEFS, full ankle AROM and strength in addition to running without symptoms.

Discussion/Conclusion: It is important for clinicians to assess neurodynamics, and consider alternative diagnoses' when their patients are not improving with evidence-based interventions. Anterior leg and foot pain can be referred pain from the lumbar spine. Incorporating neuromuscular re-education exercises focusing on local trunk stabilizers and treating acute impairments could possibly return individuals back to running when their LE symptoms are radicular in nature. Trials involving young running athletes with larger sample sizes and a longer-term follow up are needed to further determine the efficacy of this treatment approach for this population.

ID: 6 (Platform)

Robert Boyles, Michaela Corbitt, Amber Odo

Title: RESILIENCY, ANXIETY AND DEPRESSION AMONGST DPT STUDENTS- A SURVEY OF THREE COHORTS DURING THE COVID-19 PANDEMIC

Background/Purpose: The purpose of this study was to assess resiliency, anxiety and depression across the three Doctor of Physical Therapy (DPT) cohorts at a single time point assessed during the COVID-19 Pandemic.

Methods: This study was a cross-sectional survey to assess levels of anxiety, depression, and resilience across the 3 DPT cohorts during the recent COVID-19 Pandemic. At the time of this study, there were published studies establishing baseline ratings graduate nursing and medical school students, but not in DPT students. The study was in the form of a voluntary online survey containing questions on demographics, Connor Davidson Resilience Scale (CD-RISC 25) and Hospital Anxiety and Depression Scale (HADS). No names or email addresses were collected from the survey in order to maintain anonymity and privacy of participants. Means and standard deviations (SD) were performed on demographic information, HADS, and CD-RISC scores.

Results: 56.5% (61/108) students responded to the survey, 7% were positive for symptoms of depression (mean/SD: 3.07/2.68), 30% were positive for symptoms of anxiety, and 21% were borderline for symptoms of anxiety (mean/SD: 8.18/4.39). Overall, mean and SD resilience scores for the three DPT student cohorts was 76.89 ± 11.18.

Discussion/Conclusion: Our finding showed that a small portion of the responders experienced positive symptoms of depression (7%), about half (51%) of the responders were either borderline or positive for symptoms of anxiety. As a whole, the students were somewhat resilient, although they had a lower mean score on the CD-RISC 25 (76.89) than the general U.S. population (mean= 80.7). The fact that DPT students appear to be less resilient than the general population may be a cause for concern, as resiliency may be a buffer against work-place stress and burnout, both of which can affect patient care. Knowing the mental health status of DPT students may help universities develop programs to build resiliency in students prior to entering the workforce, to improve mental health, prevent burnout, and overall improve patient care. New research is needed to determine a standard level of anxiety, depression and resilience in DPT students, to see if these cohorts behaved differently due to the uncertainty during the pandemic, or were these considered normal values.

ID: 29 (Platform)

Kindyle Brennan, Sydney Andrews, Aaron Ceja

Title: EFFECT OF DRY NEEDLING ON BLOOD GLUCOSE LEVELS IN DIABETIC PATIENTS: A CASE SERIES

Background/Purpose: Diabetes Mellitus (DM) is a chronic disease that affects over 415 million individuals across the world. Maintaining consistent and healthy blood glucose levels (BGL) is essential in all aspects of life. Some of the most common medications used for pain management have an adverse effect on blood sugar.1–6 Dry needling has demonstrated effectiveness in pain management for a variety of conditions, but no data has been published about the effects of DN on BGL.7–13 The purpose of this case series was to collect preliminary data on possible trends of BGL in response to DN.

Case Description: Two volunteers were recruited for participation in an IRB approved research study to investigate whether DN in combination with intramuscular stimulation leads to improved clinical outcomes in participants with neck/shoulder pain when compared to those receiving DN alone or no intervention. When considering the participation of these two diabetic volunteers who also had Dexcom continuous blood glucose monitoring devices, the researchers proposed a separate question. What impact does DN have on blood glucose? The researchers received IRB approval to modify the protocol for these two subjects to include the collection of data stored by their Dexcom devices. Due to the timing of the IRB submission, approval for retrospective data collection for one participant and prospective data collection on the second participant was obtained. Each participant received DN to the trigger points in the involved upper trapezius muscle once a week for 6 weeks according to the protocol outlined in the original study. Using the BGL measured automatically by the Dexcom, BGL during treatment were compared within subjects, as well as, mean BGL in the six week periods prior to, during, and following the intervention protocol. Data was then reviewed for trends and described.

Outcomes: The average BGL for both participants was within the window preset by their healthcare provider through the Dexcom in all time periods, indicating no adverse response to the DN. Both participants spent a higher percentage of their day within the window during the six week intervention protocol compared to pre and post protocol time periods. The mean daily BGL was lower for both participants in the periods during and after the treatment protocol than prior to treatment. Standard deviation for mean daily BGL was also lower in the periods during and after the treatment protocol when compared to the period prior to treatment.

Discussion/Conclusion: This case series is the only documented account of the effect of DN on BGL. This initial observation suggests a need to further explore the impact of DN on a larger sample of diabetic patients with and/or without pain.

ID: 35 (Poster)

Anthony Carroll, Craig Wassinger, Fredrich Breidenbach

Title: "A REAL PAIN IN THE ARM" SHOULDER INJURY RELATED TO VACCINE ADMINISTRATION (SIRVA): A CASE STUDY

Background/Purpose: Shoulder injury related to vaccine administration (SIRVA) was first described in 2010 by Atanasoff et al, however it remains underreported with a total of 1006 reports between 2010 and 2016. The Vaccine Injury Compensation Program defines SIRVA as those who experience pain within 48 hours of vaccination, have no prior history of pain or dysfunction in the affected shoulder prior to vaccine administration and have symptoms limited to the shoulder in which the vaccine was administered with no other abnormality present to explain these symptoms . The purpose of this case report is to provide insight into the evaluation and physical therapy management of a patient presenting with SIRVA.

Case Description: The patient is a 77yo male who is right hand dominant that was referred to outpatient physical therapy with a 1 month history of diffuse right proximal lateral shoulder pain that he described as sore and achy with pins and needles. He also reported significant shoulder stiffness, all of which began immediately after receiving a Shingles vaccine in the right shoulder the month prior. He reported this pain did not improve with self management with NSAIDS or rest and reported that his pain had been worsening over time. As the patient had no other MOI or prior injury to this shoulder there was no imaging was ordered, and the patient was taking OTC ibuprofen PRN for pain control. The patient reported his pain was waking him up at night due to difficulty laying on either side and reaching overhead. Functionally this limited his ability to perform his ADLs, as well as yardwork. His initial DASH score was 23%. The patient had R shoulder non capsular pattern limitations in flexion, abduction, external rotation, internal rotation, and horizontal adduction ROM due to both pain and stiffness. He also demonstrated joint mobility deficits in the glenohumeral joint posteriorly and AC joint posteriorly and inferiorly. Palpation recreated his pain at the long head of the biceps tendon, supraspinatus tendon, as well as the teres minor and infraspinatus muscle bellies. He was both weak and painful in right shoulder abduction and flexion resisted isometrics and was positive for Neer's and Hawkin-Kennedy testing. Treatment was initiated targeting these impairments and included soft tissue mobilization (STM), electrical stimulation, joint mobilizations, glenohumeral and scapular muscle strengthening and sleep position education. At the third visit, shoulder handheld dynamometry was assessed, with noted strength asymmetries in flexion (55%), abduction (48%), external rotation (73%) and IR (88%). His home program was updated to include self STM, stretching and a progressive shoulder loading program.

Outcomes: At visit 10 the patient was independent with his strengthening program, he no longer needed to take his NSAIDS, and was seeing improvements in his sleep quality and daily functional abilities per self report. His ROM was normal and symmetrical without pain, and his joint mobility had normalized side to side. Strength improved per HHD in flexion (55% to 75%), abduction (48% to 78%) and IR (88% to 91%). His ER strength did not improve as the pt reported he was not increasing the reps/weights for this exercise between visits. Although his DASH was reduced from 23.3% to 17%, this did not meet the MCID this is consistent with his need for continued strengthening upon discharge to address his remaining strength deficits.It should be noted that the patient's resolution of symptoms with ROM and joint mobility deficits, along with his report of improved function without the use of NSAIDS demonstrated a positive overall response to treatment compared to self management.

Discussion/Conclusion: SIRVA is a likely under-documented source of shoulder pain and dysfunction; however, physical therapy could play an important role for patients who are left with recalcitrant shoulder pain and impairments following vaccination. The patient had noted improvements in his sleep quality and functional abilities, as well as impairment-based measures over the course of his 10 visits of physical therapy. This case demonstrates the use of physical therapy interventions can be quite useful in the SIRVA population where self management is ineffective.

ID: 77 (Poster)

John Castro, Matthew Pugliese

Title: THE USE OF MANUAL ASSESSMENT AND ADVANCED IMAGING TO DIAGNOSE AN INDIVIDUAL WITH A FACET CYST

Background/Purpose: Advanced imaging of the lumbar spine is routinely performed but often fails to identify the underlying cause of patient symptoms. Furthermore, degenerative changes and pathological findings are frequently observed in both symptomatic and asymptomatic individuals. Accessory motion testing can be used to successful identify lumbar segments that reproduce concordant symptoms. Advanced imaging findings may be deemed more relevant if they correspond to physical examination results. This case study details the successful use of manual assessment and advanced imaging to manage an individual with unrelenting leg pain and numbness.

Case Description: A 74 -year-old male presented with a 6-month history of right posterolateral buttock, thigh, and lateral calf pain and numbness of insidious onset. The patient had participated in three previous bouts of physical therapy and a lumbar spine epidural injection without significant relief of his symptoms. He reported aggravating factors of prolonged standing, ambulation, stair negotiation and activities involving lumbar spine extension. Pain was reported as 7/10 on the Numerical Pain Rating Score (NPRS) and disability was rated at 44% on the Oswestry Disability Index. His concordant symptoms of pain and numbness were reproduced with a right unilateral PA accessory motion testing at L4-L5. Four sessions of joint mobilization, neurodynamic sliders and therapeutic exercise, however, failed to provide significant relief of symptoms. The therapist requested to review the patient's lumbar spine MRI to better understand the cause of the symptoms. A previously unmentioned cyst at the right L4-L5 facet was identified and corresponded to the segment that reproduced the patient's concordant symptoms. The patient was referred back to his physician and underwent a surgical procedure to remove the cyst and decompress the involved facet.

Outcomes: Physical therapy was discontinued after 5 visits and the patient underwent surgery. Upon re-evaluation, 6 weeks after spine surgery, the patient reported 0/10 pain, 0% on the ODI and +7 on the GROC. He was able to ambulate, stand and perform all functional activities without pain or limitation.

Discussion/Conclusion: A patient with leg pain and numbness was successfully referred for a surgical intervention after a facet cyst was identified on an MRI scan. Joint specific techniques help clinicians determine if advanced imaging findings are meaningful. Therapists should consider reviewing imaging in cases where conservative care does not result in relief of symptoms or restoration of function. Advanced imaging findings may be most valuable when they are interpreted in the context of the patient's clinical examination findings. Physical therapists have a detailed understanding of anatomy and physical examination and are well suited incorporate advanced imaging in clinical practice.

ID: 51 (Poster)

Sheryl Comet, Alan Lam

Title: A RARE CASE OF ILIOPSOAS BURSITIS: A FRAMEWORK FOR CLINICAL REASONING

Background/Purpose: The prevalence of iliopsoas bursitis (IB) ranges from 2.2% to 6.8%. It is commonly caused by increased intra-articular pressure and fluid entering the bursa, friction from the iliopsoas tendon, or a capsule weakened by inflammation, degeneration, or osteonecrosis. There is a paucity of evidence detailing the differential diagnosis and the conservative intervention for IB. This case report outlines the physical therapists' clinical reasoning and management of a patient with a medical diagnosis of osteoarthritis (OA), when signs and symptoms are not consistent with an intra-articular pathology.

Case Description: A 67-year-old female presents with insidious onset of anterior right hip and knee pain limiting her ability to sit and ambulate. Pain was managed with Aleve, and multiple cyst drainages were performed. Imaging revealed moderate hip OA, labral tear, joint effusion, and an iliopsoas cyst. The patient was referred to PT for "hip OA", in preparation for possible arthroplasty. On evaluation, the Lower Extremity Functional Scale (LEFS) score was 26/80, the Numeric Pain Rating Scale (NPRS) was 8/10, and centralization of knee pain with repeated lumbar flexion was noted. Hip range of motion (ROM) was moderately limited in all directions with an empty end-feel. Hip manual muscle testing (MMT) was painful and weak in all directions. The patient was treated for 5 months which consisted of centralization exercises, Grade III-IV lumbar/hip mobilizations, myofascial release of the posterior hip, and core/hip strengthening. Interventions were modified depending on the patient's pain and function, which correlated with cyst size.

Outcomes: At discharge, pain and function improved to 4/10 and 64/80, on the NPRS and LEFS, respectively. Hip PROM improved throughout all planes by a minimum of 10°. Gross MMT of the right hip was 4+/5 without pain. The patient was able to ambulate > 15 blocks and resume Pilates without modifications.

Discussion/Conclusion: Salient subjective and objective findings were used to inform the clinical reasoning process to identify this patient's root cause of hip dysfunction. This case report demonstrates the necessity of utilizing differential diagnosis in situations that do not follow typical musculoskeletal patterns. The insidious nature of onset, non-mechanical pain, absent hip capsular pattern, and painful weakness in all directions suggest pathology that is unlikely intra-articular. Although imaging ruled out red flags, results must be carefully interpreted. The positive correlation between repeated cyst drainage and alleviation of symptoms, along with clinical findings, support the primary diagnosis of IB. Consequently, carefully selected manual therapy techniques and exercises were undertaken depending on the irritability of the surrounding tissues. Rather than conceding to the persuasion of imaging and medical diagnoses, this case report highlights the importance of applying knowledge of anatomy and identifying key findings that guide the clinical reasoning process to formulate the framework for differential diagnosis in hip dysfunction.

ID: 48 (Platform)

Marc Crawford, Jean-Michel Brismée, Marc-Olivier St-Pierre, Phillip Sizer, Nicolas Bellot, Stéphane Sobczak

Title: CERVICAL INTRADISCAL PRESSURE RESPONSES TO SUPINE SAGITTAL PLANE END-RANGE POSTURES: A CADAVERIC INVESTIGATION

Background/Purpose: Sagittal plane end-range postures increase cervical intradiscal pressure (CIDP) and contribute to intervertebral disc (IVD) pathologies. Despite prevalence of cervical flexion and protraction postures and potential impact on cervical IVD health, no studies have assessed CIDP during protraction and retraction end-range postures. The purpose of this study was to investigate (1) CIDP measurements reliability during supine sagittal plane end-range cervical postures; (2) CIDP differences between neutral posture with cervical traction and six sagittal plane end-range cervical postures; and (3) CIDP differences between each IVD level during end-range cervical postures.

Methods: Four female and three male cadaveric specimens mean age 80.6±7.2 years were used to measure CIDP responses to supine neutral with traction and sagittal plane end-range postures including chin to neck, chin to sternum, protraction with flexion, occiput to neck, occiput to thorax, and retraction with extension. The CIDP was measured at C4-5, C5-6, and C6-7 IVDs using fiberoptic pressure sensors. The CIDP was assessed for reliability and differences between IVD levels and end-range postures.

Results: Reliability was established for the fiberoptic pressures sensor CIDP measurements using intraclass correlation coefficient (ICC3,5>.92, 95%CI .86-.95). The CIDP was higher during chin to sternum as compared to traction at C4-5 (104.07±245.61 and -51.13±68.41 mm Hg, p = .011), C5-6 (52.80±69.63 and -101.45±168.12 mm Hg, p = .007), and C6-7 (32.55±47.85 and -45.69±60.61 mm Hg, p = .018); chin to sternum as compared to retraction-extension at C5-6 (52.80±69.63 and -103.45±129.90 mm Hg, p = .027) and C6-7 (32.55±47.85 and -16.85±36.07 mm Hg, p = .027); and chin to sternum as compared to protraction-flexion at C5-6 (52.80±69.63 and -69.84±130.48 mm Hg, p = .042). Moderate effect sizes were calculated at C4-5 (ES=.31), C5-6 (ES=.46), and C6-7 (ES=.36) using Kendall's coefficient of concordance.

Discussion/Conclusion: Chin to sternum and traction were most consistent with CIDP increases and decreases, respectively, at all IVD levels. Flexion end-range tended to increase CIDP at all IVD levels, while extension, protraction, and retraction tended to decrease CIDP at C5-6, C6-7 and increase at C4-5. The CIDP varied greatly within and between cervical IVD segments and cadaveric specimens with large positive or negative pressure changes.

ID: 87 (Poster)

Michael Cropes, Craig Hensley, Evan Nelson

Title: PHYSICAL THERAPIST REFERRAL FOR MULTIDISCIPLINARY MANAGEMENT OF PATIENT WITH UNDIAGNOSED DIABETIC AMYOTROPHY: A CASE REPORT

Background/Purpose: Physical therapists (PTs) play an important role in early identification of sinister pathology and have a duty to refer patients with conditions beyond the scope of PT practice. Diabetic lumbosacral radiculoplexus neuropathy (or diabetic amyotrophy) is a rare neuropathic condition which mimics other spinal pathologies and warrants multidisciplinary care. While most cases of diabetic amyotrophy improve with time, neuropathic pain, strength loss, and functional impairment may persist for months to years. This case report describes a PT's role in the management of a patient with undiagnosed diabetic amyotrophy.

Case Description: A 54-year-old male was referred to a PT for lumbar radiculopathy, bilateral hip pain, and left knee pain, with plans to undergo arthroscopic left knee surgery. The patient had multiple comorbidities, including type 2 diabetes mellitus. Lumbar spine radiographs revealed multilevel degenerative changes. He reported a two-month history of fatigue, nausea, chills, perineum discomfort, voiding difficulties, diminished walking endurance, progressive bilateral thigh pain and weakness, left knee pain, left lower leg and foot burning pain, and bilateral foot paresthesias, limiting his ability to participate in occupational cooking and recreational disc golf. The patient was afebrile, denied low back pain, and did not use intravenous drugs. Physical examination revealed bilateral weakness in L2, L3, L5 and S1 myotomes, absent bilateral patella and Achilles reflexes, and diminished light touch sensation in left L4-S1 dermatomes. Given the diffuse neurologic impairments and constitutional symptoms, the PT immediately contacted the primary care provider to recommend further evaluation, including magnetic resonance imaging (MRI) of the lumbar spine. MRI revealed degenerative L3-S1 spinal stenosis without evidence of spinal malignancy or cauda equina syndrome. The patient was referred to both neurology and spine clinics for further evaluation. Following additional examination, including blood tests and electrodiagnostic studies of bilateral lower extremities, the patient was diagnosed with diabetic amyotrophy, diabetic distal symmetrical polyneuropathy, and bilateral L4 radiculopathy secondary to intervertebral disc herniation. Over seven months, the patient underwent arthroscopic left knee surgery, epidural lumbar spinal injections, pharmacologic pain management, and PT-directed rehabilitation.

Outcomes: The patient demonstrated improvements in voiding difficulty, perineum discomfort, bilateral lower extremity pain and strength, 30-second chair stand test performance, and self-reported physical function. However, there were no improvements in lower extremity paresthesias or light touch sensory impairment, and the patient did not return to occupational cooking.

Discussion/Conclusion: This case report describes how examination and timely referral by a PT facilitated accurate diagnosis and multidisciplinary management of a patient with multiple health conditions. The PT made an evidence-based advanced imaging recommendation that ruled out sinister spinal pathology and streamlined the management pathway.

ID: 89 (Platform)

Amber Custodi, Joel Bialosky, Trent Harrison

Title: A MECHANISTIC BASED APPROACH TO MANAGING A PATIENT WITH CHRONIC PAIN FOLLOWING A COMPLEX SURGICAL HISTORY AT THE ANKLE

Background/Purpose: Chronic postsurgical pain (CPSP) is common with an incidence of nearly 20% following orthopedic procedures to the foot and ankle. Pain is often classified based on proposed mechanisms. Nociceptive pain results from local tissue damage, whereas nociplastic pain results from altered nociception in the absence of tissue damage. Nociplastic pain is characterized by a disproportionate pain response to an innocuous mechanical stimulus both at the site of injury (peripheral sensitization) and remotely (central sensitization). Additionally, nociplastic characteristics include pain greater than three months, a regional pain distribution, and comorbidities including sleep disturbances, cognitive deficits, and fatigue. A higher incidence of CPSP is observed in patients presenting with nociplastic characteristics. The purpose of this case study is to describe a mechanistic approach to recognizing nociplastic pain in a patient with chronic pain following a complex surgical history at the ankle, as well as to describe the clinical decision-making process behind the selected interventions.

Case Description: A 61 year-old female presented to physical therapy with a history of 8 surgeries on her foot and ankle over the past 8 years; the most recent being a fibularis longus tendon reconstruction via allograft eight months prior. Pertinent past medical history includes multiple joint replacements, anxiety, depression, sleep disturbances, and restless leg syndrome. The patient scored 37/100 on the Central Sensitization Inventory (CSI), suggesting clinical symptoms of nociplastic pain. Upon examination, she presented with moderate deficits in ankle mobility and strength. Her average pain was 5.33/10 on the Numeric Pain Rating Scale (NPRS), which was negatively impacting her sleep and limiting prolonged ambulation. Mechanical hypersensitivity was noted at the ankle as evidenced by reduced pressure pain threshold (PPT) using a handheld dynamometer.

The clinical impression was peripheral sensitivity superimposed on a nociplastic pain mechanism as supported by both discrete and regional pain greater than three months, hypersensitivity to mechanical stimuli, sleep disturbances, anxiety and depression, restless leg syndrome, and her CSI score. Treatment targeted nociceptive and nociplastic mechanisms through a multimodal approach including cold immersion, in conjunction with light touch desensitization techniques directed at the ankle to address the local sensitization, as well as manual therapy, pain neuroscience education (PNE), and graded exercise addressing peripheral and central contributors.

Outcomes: Following 10 treatment sessions the Lower Extremity Functional Scale and NPRS improved by 3 and 0.33 points, respectively. PPT at the Achilles tendon improved from 0 to 10.00ft/lbs. Her CSI score decreased by 19 points (37 to 18).

Discussion/Conclusion: This case describes a mechanistic approach to managing a patient with CPSP at the ankle with an underlying probable nociplastic contribution. Treatment modification included desensitization approaches, manual therapy, PNE, and graded exercise. Clinicians should consider identifying and addressing nociplastic contributors as part of a comprehensive approach to managing this patient population.

ID: 60 (Poster)

Tristan Barrera, Michael De La Cruz, Chelsea Van, Stephen Rodriguez, Karl Rusch

Title: Improvements Seen in Muscle Activation and Shoulder Mobility Following Infraspinatus Manipulation in a Healthy Population

Background/Purpose: The purpose of this study is to determine the effects of a single high-velocity, low-amplitude thrust (HVLAT) manipulation to the infraspinatus on (1) glenohumeral (GH) external rotation (ER) strength, (2) GH internal rotation (IR) active range of motion (AROM), (3) electromyographic (EMG) root mean square (RMS) activity of the infraspinatus, (4) prevalence of palpable humeral head anterior translation (malposition), (5) prevalence of overhead (OH) shoulder flexion deviation, and (6) degrees of OH flexion AROM. We hypothesize there will be a significant increase from pre to post GH ER strength, GH IR AROM, EMG RMS activity of the infraspinatus, and degrees of OH flexion AROM; with a significant decrease in the prevalence of suspected malposition and OH flexion deviation.

Methods: In this single-group, pre-posttest study healthy individuals were recruited. Six outcomes were measured: GH ER strength; infraspinatus muscle EMG RMS; OH flexion deviation; degrees of OH flexion AROM, humeral head malposition; and GH IR AROM, at pre and post receiving a single HVLAT infraspinatus manipulation. The EMG activity (uV) was recorded using a Delsys Trigno™ Wireless EMG Systems and strength (lb) was measured using the ActivForce Handheld Dynamometer. OH flexion was recorded using the Technique: Slow Motion Video Analysis iOS app. OH flexion deviation was determined with video analysis from the anterior view. Position of the humeral head was measured by palpating the humeral head in relation to the coracoid process. GH IR AROM was recorded using a conversion formula estimating the thoracic vertebral level a person can reach when reaching behind the back. Paired comparisons were made with either Wilcoxon Signed Ranks Test or McNemar tests depending on the variable types.

Results: The results of this study showed statistically significant changes in degrees of OH flexion AROM ($z=-4.814$, $p < 0.001$) with the mean increase from 161.45 degrees to 165.55 degrees pre to post. Significant changes in GH ER strength ($z=-2.068$, $p < 0.039$) with mean increase from 20.59 lb to 21.38 lb pre to post. There was a significant effect on malposition (McNemar-Bowker $?2=13.31$, $df=3$, $p=0.004$) with 12 out of 24 participants previously rated for presence of malposition rated no presence after treatment. Additionally, flexion deviation was significantly changed by the treatment (McNemar test, $p=0.008$) with 8 out of 10 participants previously rated for presence of deviation rated absent deviation after treatment. There were no statistically significant changes in GH IR AROM or EMG RMS activity of the infraspinatus.

Discussion/Conclusion: This study demonstrated that degrees of OH flexion AROM, GH ER strength, prevalence of malposition, and prevalence of OH flexion deviation have been significantly changed by the infraspinatus manipulation. Therefore, we reject our null hypothesis and accept some local influences of a HVLAT manipulation. It should be noted again that these findings take place within a healthy population.

ID: 94 (Poster)

Brianna DeBiasi, Josiah Sault

Title: LUMBAR MOBILIZATION AT ENDRANGE EXTENSION AS AN EFFECTIVE TREATMENT APPROACH FOR RECURRENT LOW BACK AND LEG PAIN AFTER LUMBAR DISCECTOMY

Background/Purpose: Low back pain (LBP) and leg pain after microdiscectomy are common with a cumulative risk of 65% and 45% at 3 years respectively. While passive accessory intervertebral motions (PAIVMs) are often assessed in neutral spine position, symptom provocation may not be elicited in this position. Placing a patient in lumbar extension to assess PAIVMs may be necessary to identify the segmental source of nociception and is a potential position for treatment. This case describes the successful management of acute low back and spine-related lower extremity pain 2 years after lumbar discectomy at L5/S1 using end-range spinal joint mobilizations.

Case Description: A 29-year-old female presented to physical therapy with a 2-month history of low back and left posterolateral leg pain after being pain-free following L5/S1 discectomy 2 years prior. Her pain was exacerbated after performing double unders and hang-cleans during CrossFit. She was performing prone press ups and seated sciatic nerve mobilizations daily without relief. LBP was associated with high-impact activities like jumping rope and sitting >30 minutes, which interrupted her work as a college professor. The patient scored a 10/10 at worst on the Numeric Pain Rating Scale (NPRS) and 28% disability on the Oswestry Disability Questionnaire (ODI). Active range of motion (AROM) assessment demonstrated limited lumbar flexion with L posterior thigh pain and limited extension without pain. Initial central and unilateral posterior-to-anterior PAIVM assessment performed in neutral at the lumbar spine was pain-free and demonstrated mild hypomobility at L5. Slump testing on the left was limited to 45? of knee extension due to low back and L posterior thigh pain. On visit 2, PAIVMs were reassessed with the patient in prone-on-elbows to achieve end-range joint range of motion into extension. Central posterior-to-anterior (CPA) assessment at L5 reproduced familiar low back and left posterior thigh pain. Treatment included non-thrust CPA mobilization into a painful range rated at no more than 5/10 on the NPRS at L5 while prone on elbows.

Outcomes: The patient was seen for a total of 3 visits over 2 weeks with both intra-session and inter-session improvements in pain and AROM in flexion. Her NPRS improved to 0/10 at worst and ODI improved to 0%. She scored a +7 on the Global Rating of Change. These changes were maintained at 3-month follow-up and the patient reported being able to deadlift 275lbs.

Discussion/Conclusion: This case demonstrates that PAIVMs may need to be assessed in end range positions to localize segmental nociceptive sources of pain. Additionally, spinal mobilizations at end-range may be necessary to engage conditioned pain modulation for successful management of low back pain. Future research should address the effectiveness of end-range mobilizations for pain modulation.

ID: 15 (Platform)

Chris Dickerson, Brett Neilson, Mark Shepherd, Jodi Young, Dan Rhon, Eric Chaconas

Title: Patients Presenting to Physical Therapy for Spine Pain Receive Sleep Medication Without Sleep Advice or Education.

Background/Purpose: Sleep impairments are a strong predictor of pain, estimated to be present in approximately 50% of individuals with spine pain, making proper sleep a potential target of interest for manual therapists treating patients with pain.. Educating patients about proper health behaviors, especially those that could contribute to their pain experience, is an important step for improving outcomes and the efficacy of manual therapy interventions. The type of education and interventions, for sleep, that patients have received prior to seeking care for spine pain has not been previously identified. The purpose of this study was to describe the advice, education, and medication received by patients seeking care for spine pain.

Methods: This was a secondary analysis of a prospective, cross-sectional study that used self-report measures from adult patients presenting to multiple outpatient physical therapy clinics across the U.S. for spine pain, defined as pain from the coccyx to the occipital region. Eligible participants completed questionnaires at their initial physical therapy appointment including demographics, medical history, pain interference (PEG-3), dysfunctional beliefs, attitudes about sleep (DBAS-16), and sleep-related impairment (PROMIS). Descriptive and frequency statistics were calculated.

Results: Two hundred and four (n=204) participants were enrolled in the study. Three out of four participants (74%) reported getting fewer than the recommended seven hours of sleep per night and one in three participants (35.8%) achieved fewer than six hours of sleep on average. Only 14.2% of participants (n=29) reported receiving sleep health education, advice, or recommendations from a health care professional and only 7.4% (n=15) saw a sleep medicine expert. Nearly half (45.6%) of participants reported using sleep medication and of those (n=93), 37.6% used sleep medication very often or always. and only 19.4% (n=18) of those using sleep medication received sleep health education from a medical provider.

Discussion/Conclusion: The results of this study highlight a significant gap in the care of musculoskeletal spine pain. Despite a majority of participants reporting sleep disturbance, very few received sleep health education or advice from a referring medical provider, and less than 10% sought help from a sleep medicine expert. Although sleep medication was used by nearly half of the participants in the study, fewer than 20% of those using sleep medication had received any advice, education, or recommendations about sleep. There are no sleep medications that are effective and without negative side effects or consequences. Sleep health education is considered an important pillar of improving disturbed sleep. If two-thirds of individuals who consume sleep medication have not received any advice, education, or recommendations, an important step of the process is being missed and could be addressed by orthopedic manual physical therapists.

ID: 2 (Poster)

Heather Disney, Elijah Jolly

Title: PHYSICAL THERAPY MANAGEMENT OF A PATIENT WITH TIBIALIS ANTERIOR HERNIATION SECONDARY TO TRAUMA: A CASE REPORT

Background/Purpose: There are less than 200 cases of lower extremity muscle herniations with the true incidence unknown. The tibialis anterior (TA) is the most commonly herniated muscle in the lower extremity due to its superficial and tight fascial compartment. Traumatic fascial defects are caused by direct trauma that tears the fascia. Patients may present with an array of impairments and functional limitations including diffuse chronic leg pain and soft tissue swelling. There is little research on the conservative rehabilitative treatment of TA herniations. The purpose of this study was to demonstrate the impact of an individualized multi-modal physical therapy rehabilitation program on the ability to decrease pain and improve function in a patient with a TA herniation.

Case Description: An active 29-year-old-male was referred to outpatient physical therapy for anterior tibialis herniation. Surgical repair was not recommended due to the large herniation, risk of compartment syndrome, and likelihood of reoccurrence. The patient presented weight-bearing as tolerated in a controlled ankle motion (CAM) boot with an antalgic gait. His primary complaints were severe sensitivity to cold and constant 8/10 pain uncontrolled with medications. At initial evaluation, the herniation measured 7cm x 6.5cm. The patient's ankle active range of motion (ROM) dorsiflexion measured -13 degrees from neutral and plantar flexion was 18 degrees. The patient was able to walk with CAM boot for 10 minutes and stand for 5 minutes. Transcutaneous electrical nerve stimulation, dry needling, and manual therapy were emphasized for the initial visits until the patient could tolerate active treatments. Later visits included toe and ankle ROM and progressed toward full weight-bearing exercises. The individualized multi-modal treatment consisted of dry needling, therapeutic exercise, neuromuscular education, balance training, electrical stimulation, kinesiotaping, and manual therapy. The patient's outcomes and progress were measured using Lower Extremity Functional Scale (LEFS), Numerical Pain Rating Scale, circumferential measurements, and measurements of the fascial defect.

Outcomes: The patient completed 12 visits and made significant progress with ankle and toe ROM, pain management, and functional activities. At discharge, patient reported the ability to walk 30 minutes with less pain. The patient's dorsiflexion ROM improved from -13-5 degrees and plantarflexion increased from 18-28 degrees. LEFS increased from 57% to 85%. Circumference measurements at TA muscle belly decreased by one cm and the herniation decreased in size by 38%.

Discussion/Conclusion: This diagnosis lacks high-level evidence regarding conservative rehabilitation options. Utilizing passive treatments and modalities was beneficial in reducing the patient's pain and improving ROM, while slowly integrating active treatment as tolerated to improve active ROM and strength. Based on the patient's positive response to physical therapy treatment, this case study demonstrated an individualized rehabilitation program may be an effective non-surgical approach to treating and managing the symptoms of a patient with a TA herniation.

ID: 32 (Poster)

Thomas Eck, Jody Musick

Title: Differential diagnosis and management of lumbar compression fracture: a case report

Background/Purpose: Radiography is the introductory imaging modality in patients with lumbar pain, despite relatively low sensitivity for atraumatic, age-related osteoporotic fractures. The American College of Radiology Appropriateness Criteria allows for advanced imaging with high clinical suspicion in identifying lumbar fractures. The purpose of this case study is to highlight the use of sound clinical examination and differential diagnosis despite interpreted unremarkable imaging findings.

Case Description: Case Description: An 82-year-old male was referred to OP PT by PCP with low back pain 2 weeks ago after an axial load in sitting while riding a lawn-mower. He had a history of prostate cancer and prolonged use of corticosteroids. He described extreme central low back pain at rest, pain with sitting, standing, walking and the inability to find a comfortable position at night. A series of radiographs were performed and interpreted as normal. ROM was not tested due to patient presentation and irritability. The most comparable signs were palpation of L1 spinous process and pain with sitting.

A high suspicion of significant injury was present based on history, exam, and current imaging; thus, he was referred out for further assessment and imaging. The patient underwent another set of radiographs from a different provider and interpreted as unremarkable. It was then decided the need for advanced imaging was warranted, a MRI was performed that revealed a compression fracture of L1.

Outcomes: The patient was treated conservatively with a LSO for 6 weeks and physical therapy intervention for 8 visits over 8 weeks after cessation of bracing.3 Interventions based off the SINSS principles5 included education, lumbar mobilizations in prone (grades III- to III+), grade III lumbar rotations, multifidus motor control training and gluteal strengthening. After treatment, the Oswestry improved from 70% to 30% and NRPS from 7/10 to 2/10.

Discussion/Conclusion: As we know, imaging studies are useful and are an essential part of diagnostics. We also know that what we see, hear, and feel, as described by Maitland are an integral part of our daily examination and treatment process. The initial imaging modality of radiography demonstrates limitation as there is relatively low sensitivity as in persons his age and medical history, thus allowing the advancement of imaging. The MRI revealed not only a deformity but a high signal intensity indicating bone marrow edema, consistent with a compression fracture. Based on the ACR criteria and this patient's presentation, both conventional radiography and MRI without contrast are complimentary in this variant. The balance between imaging results and clinical suspicion is the key to decision making.

ID: 50 (Poster)

Ali El-Kerdi

Title: Second Sternocostal Joint High Velocity Low Amplitude Manipulation for The Immediate Relief of Chest and Axillary Radicular Pain: A Case Report

Background/Purpose: The ribs play an important role anatomically and for the optimal function of shoulder movements and thoracic cage expansion. Second rib movement impairments may contribute to localized and shoulder pain, weakness, and paresthesia. The purpose of this report is to demonstrate the effectiveness of manipulative intervention on the immediate relief of pain and improvement of function.

Case Description: A 23-year-old male rugby player with an 18-month chronic history of localized right-sided chest and axillary shoulder pain was referred to manual therapy following a diagnosis of pectoralis major tendonitis. Current symptoms were recently exacerbated despite several courses of failed medical and physical therapy management over the past year. Previous episodes were partially resolved following a course of three cortisone injections. Relief following each injection was short-lived (< 1 - week).

Outcomes: Gross examination of the patient's neck and shoulder did not reveal any discernable glenohumeral joint dysfunction. Evaluation of the patient's cervical motion revealed pain with extension and decreased extension range of motion. Thoracic spine segmental evaluation revealed stiffness and pain with T2 mobility. Sternocostal joint assessment revealed localized pain and a "bump" over the second sternocostal joint. Manual therapy treatment consisting of mobilization and HVLA of the second Sternocostal joint and the cervicothoracic junction produced immediate symptom relief (7/10 to 1/10) and upon 0/10 follow-up (1 and 4 weeks). There was also immediate improvement in cervical extension ROM (52 deg to 71 degrees) and functional rating on the Patient-Specific Functional Scale (PSFS) from an average of 4/10 to 9.2/10 upon follow-up (1 and 4 weeks).

Discussion/Conclusion: Several diagnoses have the potential for causing localized chest pain or referring pain into the axillary region, oftentimes mimicking tendonitis and neuralgia. Manual physical therapy may be an effective approach in identifying joint dysfunctions and managing patients with sternocostal pain.

ID: 65 (Poster)

Mark Erickson, Gabriel Panebianco Huffman

Title: INTRODUCTING THE GLOBAL MOVEMENT SYSTEM MODEL – OUTCOMES FOLLOWING COMPREHENSIVE MANAGEMENT OF AN ELITE ATHLETE WITH PERSISTENT LOW BACK PAIN: A THEORY TO PRACTICE CASE REPORT

Background/Purpose: To realize the AAOMPT vision, manual physical therapists must accurately diagnose pain sources and contributing factors. This is especially challenging with patients who have persistent LBP. Several paradigms including the Biopsychosocial, APTA Movement System, and Movement System Impairment models have been implemented, yet favorable outcomes remain elusive. Additionally, two recent PT publications indicate 1) clinical practice guideline implementation did not improve patient outcomes, and 2) commonly used diagnostic classification systems did not provide clinically meaningful effects. These researchers recommended the use of more comprehensive indicators to improve patient outcomes. Thus, there is a need for a new perspective to effectively manage these difficult cases. The purpose of this case report is to introduce the Global Movement System Model and describe its application to a complex patient and thereby inspire therapists to adopt effective strategies.

Case Description: A 40 y.o. male elite tennis player and coach presented with a 10 year history of LBP exacerbated with activity. Prior medical, athletic training, strength and conditioning, chiropractic, PT, Pilates and Yoga did not provide significant relief. Primary positive findings included high stress, kinesiophobia, low back and buttock pain, overpronation, LLD, malposture; impaired ROM, strength, power, balance, flexibility, breathing patterns, rib mobility; neuromuscular recruitment at the hips, trunk, shoulder and neck; hypertonicity with myofascial restrictions and trigger points, and decreased body awareness. Notable negative findings included neuro screen, lumbar and SI joint play assessment, and neurodynamic testing.

Treatment frequency ranged from 2x/week to 2x/month over 8 months totaling 26 visits. Interventions included 1) soft tissue mobilization/myofascial release, 2) joint manipulation, 3) positional inhibition, 4) manual differentiation technique, 5) therapeutic exercise for ROM, body awareness, balance, strength, power, flexibility, and 6) orthotic prescription, 7) pain neuroscience education, 8) cardiorespiratory fitness, and 9) functional training.

Outcomes: Low back and buttock pain were eliminated, and remarkable functional gains were achieved. Self-perceived functional rating increased from 50% to 90% WNL. He resumed high intensity occupational requirements, competitive hockey, and physical training without symptom exacerbation. All impairments were completely resolved except for mild LE myofascial and restrictions. The patient attributed improvements primarily to the global approach emphasizing manual therapy, body awareness, therapeutic exercise and functional training. ODI score improved from 17/50 to 2/50. TSK improved from 49/68 to 26/68.

Discussion/Conclusion: A patient with persistent LBP underwent a comprehensive neuro-orthopedic PT plan of care targeting impairments using a global movement system approach emphasizing manual therapy and neuromuscular re-education. Outcomes were extremely positive and illustrate the potential value of assessing and treating all impairments that are potential contributing factors to a patient's pain

syndrome. Additional investigation into the Global Movement Model seems warranted and physical therapists are uniquely poised to spearhead this exploration.

ID: 100 (Poster)

Jeffrey Fairley, Harshavardhan Deoghare, Doug Walsh, Randy Johnson

Title: IMPACT OF A SENSORIMOTOR MANUAL FACILITATION APPROACH TO ADDRESS EXERCISE-ASSOCIATED MUSCLE CRAMPING OF A HIGH SCHOOL ATHLETE WHILE IN GAME: A CASE STUDY

Background/Purpose: Exercise-associated muscle cramping (EAMC) is a common condition that often requires medical attention during sports events. EAMC is a temporary but intensive and painful involuntary contraction of skeletal muscle often occurring during or shortly after a physical activity. Despite the high prevalence of this condition the etiology of EAMC in athletes is still not well understood. EAMC is highly unpredictable and can profoundly limit athletes from optimal participation. Causes of EAMC have historically been attributed to dehydration and electrolyte (e.g., sodium) losses. Newer experimental and observational data suggest that cramping may be due to changes in the nervous system. Altered neuromuscular control theory suggests that EAMC ensues when several factors (e.g., fatigue, inadequate conditioning, and muscle damage among others) coalesce to increase alpha motor neuron excitability.

Dr. Vladimir Janda (1928-2002) was a Czech neurologist and physiatrist, who postulated a “sensorimotor system” that has an interdependence of the musculoskeletal system and central nervous system. Further, he proposed that the muscular system often reflects the status of the sensorimotor system, due to the information inputs from both the musculoskeletal and central nervous systems. Janda identified two groups of muscles based on their phylogenetic development, classified as “tonic” or “phasic”. The tonic system consists of the “flexors” and is phylogenetically older and dominant. Functionally, these muscles are involved in repetitive or rhythmic activity and are activated in flexor synergies. The phasic system consists of the “extensors” and emerges shortly after birth. These muscles work eccentrically against the force of gravity and emerge in extensor synergies.

The purpose of this case report is to describe the application of a manual sensorimotor facilitation technique attributed to Janda that proposes to balance the tonic and phasic muscle systems as a direct intervention to manage EAMC of the hamstrings and calf in a high school football player.

Case Description: The athlete was a 17-year-old high school football player who was seen on the sideline during competition. After approximately 2 hours of intense athletic football performance as two-way player, (defensive safety and featured offensive running back), the athlete went down on the field with EAMC of the hamstrings and calf muscles. The medical team lead by the physical therapist onsite attempted to address the EAMC and assist the athlete to return to sport. The athlete was in his senior year and was a four-year varsity three sport athlete who had no history of cramping and a regular regimen of hydration and electrolyte replenishment before and during athletic competition. The EAMC sequence began in the midway through the 3rd quarter of play. While the athlete was on the sidelines, continued hydration, static stretching, cryotherapy, massage, manual therapy to the lumbar spine in conjunction with neurodynamic mobilization were tried in succession, all without sustained resolution. The EAMC would stop briefly only to return when the athlete attempted to run or move dynamically. Ultimately a manual facilitation intervention of the “phasic muscles” including maximal eccentric loading of the contralateral upper extremity, followed by the facilitation of the phasic muscles of the unilateral upper extremity resulted in relief of the EAMC. Following the intervention the athlete was able to walk normally demonstrating a normal stride length and ability to fully extend and adequately flex his knee

during gait. Squat testing and squat jumps were performed without cramping and the athlete demonstrated full lower extremity range of motion during these functional tests. Tests of explosion and agility on the sideline were performed without complaint or deficit. The athlete was cleared to return to the game and sustained ability to participate without further cramping. The athlete was able to compete for the remainder of the game including scoring the go ahead touchdown.

Outcomes: Restoration of participation capacity for a high school aged football player impaired by EAMC. In game impairments of pain, limited flexibility, altered gait patterns of walking and running were all resolved. Possible restoration of more optimal homeostasis in the neuromuscular control system in response to a manual facilitation technique adapted from the teachings of Janda.

Discussion/Conclusion: The causes of EAMC is not fully understood, and altered neuromuscular control theory, although supported by a greater number of higher quality studies, is not perfect and several questions remain unanswered. Schwellnus et. al. postulated a sequence of events leading to EAMC beginning with premature fatigue. The pathway may include increased muscle spindle activity leading to increased central nervous system (CNS) excitatory drive to the affected muscles, or alternatively activation of muscle in a shortened length that has an inhibitory impact on the Golgi tendon organ and consequential decreased CNS inhibitory drive. The combined result of is increased muscle activation centrally and the absence of inhibition centrally combining to create the uncontrolled cramp. The application of a manual facilitation technique appears to have had a positive impact in this case. This technique proposes to impact the neuromuscular system by stimulating the “phasic” muscles. The proposed impact on the sensorimotor system would be to have an inhibitory impact on the “tonic” muscle outflow of the CNS. In this case, the athlete was experiencing EAMC in the hamstrings and calf muscles, presumably due to premature fatigue and increased muscle spindle activity. Per the model proposed by Schwellnus, this would result in increased CNS excitatory drive. The maximal effort eccentric manual resistance to the upper body flexor muscles, designated as phasic muscles by Janda, potentially facilitated a moderating impact on the excitatory drive of the CNS resulting in improved electrophysiological homeostasis in the muscle and elimination of the EAMC sequence. Further research of interventions to the tonic and phasic muscle systems in relationship to cramping is warranted.

ID: 97 (Poster)

Matthew Fitch

Title: KEEPING AN OPEN MIND WHEN YOUR PATIENT RETURNS "WORSE."

Background/Purpose: Differential diagnosis of lumbar spine disorders can present a unique challenge to clinicians. Due to the vast amount of structures that can induce low back pain including local structures, somatic referral, and visceral referral, a broad hypothesis list is required for clinicians during the evaluation. At times, patients will return and report a “worsening” of symptoms. This is an important crossroads for clinicians to return to the basic parts of their examination to determine if the current exacerbation of symptoms is part of the treating diagnosis, or if there is a new explanation for the worsening of symptoms.

PURPOSE: To describe a case where global differential diagnosis during a reported symptom exacerbation of low back pain using subjective and objective data improved patient outcomes with correct diagnosis of referred pain from the kidney.

Case Description: The patient was a 68 year old female who initially sought physical therapy treatment for right side lumbar spine, posterior hip, and posterior right thigh area pain. These original symptoms were described as extending from the middle of the lower lumbar spine to the right illiac crest area and moving distal into the right gluteal region and posterior thigh. Initial diagnosis was sacroiliac joint dysfunction with concurrent L5/S1 facet arthropathy creating neural sensitivity per the physical exam. Physical therapy intervention was improving these symptoms to a sixty-percent subjective reported improvement by the patient. Five days after a treatment session, the patient returned to physical therapy and reported she could not get out of bed three days post-intervention due to lumbar and right side illiac crest area pain similar to her current areas of pain that were improving. Patient reported no change in symptoms after the previous treatment session for three days prior to this new onset of pain. Patient reported no mechanism of injury for these new symptoms. Patient denied fever, night sweats, infections, bowel or bladder changes, numbness and tingling, malaise, painful/burning urination, blood in the urine, and no change in symptoms after eating. Utilizing a verbal body chart, patient was asked to point to the area with most symptoms at which time she pointed directly to the flank area on the R side. Kidney percussion test was performed to which the patient described a large increase in symptoms and described them as her current concordant pain. Patient was immediately referred to primary care physician. Patient was diagnosed with nephrolithiasis, kidney infection, and urinary tract infection by primary care physician and managed with antibiotics.

Outcomes: The outcome of this case is the proper triage, diagnosis, referral by a physical therapist to the appropriate healthcare professionals to adeuqately manage a patient with visceral referred pain mimicking an exacerbation of lumbopelvic pain already being managed by a physical therapist.

Discussion/Conclusion: This case report describes the importnace of utilizing basic components of the physical therapy evaluation to appropriately manage a patient with visceral referral in the same areas as a concurrent musculoskeletal dysfunction. Utilizing a body chart and maintaining a broad differential diagnosis hypothesis list, further subjective and objective testing can be employed to properly manage patients with both musculoskeletal conditions and more serious visceral referred conditions.

ID: 47 (Platform)

Jeffrey Ferguson, Adam Fritsch, Jodi Young, Dan Rhon

Title: HOW WELL ARE ADVERSE EVENTS REPORTED IN MANUAL THERAPY TRIALS OF THE EXTREMITIES ? –A SYSTEMATIC REVIEW

Background/Purpose: Manual therapy (MT), including thrust, non-thrust manipulation, and soft tissue mobilization, is an effective treatment for musculoskeletal conditions of the upper and lower extremity. However, MT can be accompanied by potential adverse events (AE). Existing data suggests MT is a safe and effective treatment for many extremity conditions but little is known about how well it is reported in clinical trials. While AEs are perhaps rare, reporting guidelines such as the Consolidated Standards of Reporting Trials (CONSORT) statement, require reporting of adverse events for clinical trials. Furthermore, the nomenclature used within these studies is unknown. The primary purpose of this review was to describe the rate and extent of AEs reported in clinical trials assessing efficacy or effectiveness of MT interventions for extremity conditions, and how those AEs are defined. The secondary purpose was to determine if reporting improved after publication of the CONSORT statement.

Methods: A literature search from inception to December 2021 was conducted in PubMed, CINAHL, and OVID Medline to identify trials using MT for extremity conditions. Percentages of AEs reported and frequency of trials reporting AEs before or after the development of the CONSORT statement were calculated along with categorization of how AEs were defined.

Results: Our search identified 55,539 abstracts, after screening and full text-review, 192 trials met all criteria for final inclusion. The presence or absence of AEs was reported in 66 (34.4%) studies. Of the 155 trials performed after the CONSORT statement, 50 (32.3%) reported if an AE occurred while 16 of 37 (43.2%) trials performed before the CONSORT statement reported if an AE occurred. Of the 66 studies reporting AEs, 20 (30.3%) trials had a “minor”, “non-serious”, or “transient” AE occur in groups receiving MT, 5 (7.6%) trials had an AE occur that was not attributed to MT. Of 66 studies reporting whether or not AEs occurred, seven (7.5%) reported AEs in the abstract. Proportionally, trials where groups receiving MT to the knee had the most AEs occur (30%).

Discussion/Conclusion: There is an overall lack of AE reporting in trials investigating MT for the extremities and inconsistency in nomenclature used to describe AE. The arrival of trial reporting checklists that include a focus on AEs (e.g. CONSORT) did not result in better reporting. Physical therapists are obligated to obtain informed consent prior to performing a treatment, which requires disclosure of the potential risks of treatment that can be derived from AEs reported in the research. Improved reporting would provide better information to help support this requirement. We recommend improved awareness of tracking and reporting of AEs, along with adequate detail of reporting, in all future clinical trial reports.

ID: 27 (Poster)

Gina Gatmaytan

Title: DIFFERENTIAL DIAGNOSIS AND PHYSICAL THERAPY MANAGEMENT OF T4 SYNDROME: A CASE REPORT

Background/Purpose: Thoracic outlet syndrome (TOS) and T4 syndrome are both conditions that disrupt blood flow to the upper limb. While TOS is relatively well-researched and understood, T4 syndrome is a less-appreciated condition that may present a challenge to physical therapists and physicians alike. This condition is characterized by changes in arterial vascular tone related to the T1-T5 sympathetic ganglia, which can be affected by increased afferent input to the spinal cord at a given level related to aberrant joint position (Irvin Korr's facilitated segment model). The effect is an associated increase in efferent output that results in increased arterial muscle tone and decreased blood supply to the limb, which is the mechanism of numbness, tingling, and pain. The purpose of this case presentation is to describe the successful treatment of one individual diagnosed with TOS and who was found on clinical exam to have T4 syndrome.

Case Description: Patient was a 37 year old male with a moderate level of occupational and life stress who worked a desk job. He was referred to physical therapy for upper extremity numbness and observed positional impairment of the radial pulse. History and examination determined that he did not have significant subclavian artery compression at the thoracic outlet structures with clinical testing, but did present with signs of upper thoracic segmental dysfunction. These included moderate tenderness on palpation of T2-T4 spinous process and paraspinals right, decreased soft tissue mobility with skin rolling right vs left throughout the cervicothoracic junction region and over the right scapula, diminished reflexes at right C5, C7, and C8 levels (1+), diminished sharp senation over the mid cervical spine, at the lateral elbow, and in the dorsal thumb right. Roos test was positive at 30 seconds, radial pulse diminished when lying flat after 15 seconds and brought on subjective symptoms, and was restored with the head inclined to 20° flexion. Clavicle depression was negative, anterior scalene test was negative, and pectoralis minor test was slightly positive right vs left but did not produce full onset of signs symptoms. Biomechanical exam revealed limited right lateral gliding at C5-C7 (grade 2), limited superior glides from C3-C6 (grade 2), and limited upper thoracic PA and costovertebral glides (grade 1) with soreness right vs L.

Treatment included a combination of joint mobilization/manipulation, therapeutic exercise for mobility and postural stabilization, and positional aides for work and sleep.

Outcomes: After 7 sessions, the patient demonstrated negative Roos test, negative neurologic exam, straight upper thoracic spine with some flexion at the CT junction, but resolution of the upper thoracic lordotic curve, and nearly normalized cervicothoracic segmental motion. He was able to maintain mobility and remain symptom-free using HEP activities.

Discussion/Conclusion: This case demonstrates the effectiveness of thoracic mobilization, manipulation, and therapeutic exercise in patients presenting with changes in upper extremity arterial pulse, but without positive thoracic outlet structural tests. Differential diagnosis of upper extremity numbness and tingling is a critical factor in appropriate treatment. Physical therapy is an appropriate, minimally-invasive intervention for T4 syndrome.

ID: 11 (Poster)

Jason Guennel, William Temes

Title: PAIN NEUROSCIENCE EDUCATION AND MANUAL THERAPY FOR PATIENTS WITH PERSISTENT LOW BACK PAIN: A SCOPING REVIEW

Background/Purpose: Most recent estimates (2019) state that approximately 20.4% of the United States population experiences persistent pain, with the low back being the most commonly reported area of persistent pain. Pain neuroscience education has been one of the more recent and currently examined treatments for persistent pain. Historically, manual therapy is another technique that has been frequently utilized. Often seen as opposing models, can pain neuroscience education and manual therapy be complimentary for the treatment of persistent low back pain?

Methods: Cochrane, PubMed, CINAHL/EBSCO, ProQuest, and Physical Therapy & Rehabilitation Journal were searched between 11/6-9/21. Inclusion Criteria included randomized control trials published in English after 2016. Key words: Chronic pain AND low back AND Pain Neuroscience Education And Manual Therapy.

Results: 5996 articles were identified and screened. Of which, 11 were assessed for eligibility. 8 were excluded due to 4 duplicates, 3 were not randomized control trials, and 1 did not have full text available. 3 randomized control trials were included for meeting inclusion criteria. Between the articles, 78 patients were examined in the experimental groups and 89 in the control groups.

Discussion/Conclusion: Two articles supported the use of manual therapy and pain neuroscience education for the treatment of patients with persistent low back pain. The first article found a clinically significant improvement in pain level, disability, low back performance, and kinesiophobia in the experimental group, with pain level and kinesiophobia experiencing the largest improvements compared to the control. The Second article found increased straight leg raise range of motion in the experimental group, but no difference between groups regarding pain level and forward trunk flexion range of motion. The third article did not find a statistically significant difference for pain level, disability, kinesiophobia, and self-efficacy between the experimental and control group. However, there were significant improvements in both groups from baseline to follow up.

The results of this review should be interpreted with caution, as it is limited by the number of randomized control trials available, as well as the variation in frequency and type of therapeutic intervention, study duration, follow up, and outcome measures. However, since the articles demonstrate a neutral to positive effect, current recommendations can include the use of pain neuroscience education and manual therapy for the treatment of patients with persistent low back pain. This is consistent with the current clinical practice guidelines, which state that pain neuroscience education should be provided with other interventions, such as manual therapy.

ID: 18 (Poster)

Kyle Buckham, Christine Williams, Brent Harper

Title: Blood Flow Restriction, Strength, and Power Training in the Management of Chronic Ankle Instability in a Recreational Runner

Background/Purpose: Chronic ankle instability occurs secondary to common, re-occurring ankle sprains. Patients often present with proximal lower extremity weakness due to altered loading mechanics. Traditional physical therapy treatment focuses on ankle mobility and lower extremity balance. Blood flow restriction training increases muscle hypertrophy and strength at low loads. The purpose of this case study was to describe the use of blood flow restriction training in the management of chronic ankle instability as a supplement to traditional treatment approaches.

Case Description: A 20-year-old female recreational runner with left lateral ankle pain and a feeling it might “sprain at any time” complained of being unable to run one mile. She had a history of four major ankle sprains. Evaluation revealed limited active and passive, open and closed chain dorsiflexion mobility with soleus tightness; hypomobility of anterior-to-posterior talocrural, subtalar medial-to-lateral, and distal tibial-fibular planar glides; impaired static and dynamic one-leg balance; imbalance and fatiguability during functional movements including single leg squats, lunges, and 12” step-ups, indicating dynamic valgus. Findings indicated movement system impairments unrelated to non-musculoskeletal causes.

Interventions: Treatment sessions were one-hour once a week. Manual therapy techniques, including soft tissue work and non-thrust and thrust mobilizations to the talocrural, subtalar, and distal tibial-fibular joints which normalized joint arthrokinematics, allowing for normal osteokinematics. Static and dynamic balance exercises on variable surfaces, functional single-leg training (lunges, step ups, step downs, single leg squats), and ankle specific exercises (single-leg heel raises, ankle eversion) were given. After 4 weeks, positive gains resulted in normalizing motion, static balance, and isolated muscle strength with manual testing. Dynamic deficits remained during functional single-leg exercises and no significant improvement in running tolerance. At week 5, blood flow restriction training was added during the functional single-leg exercises. The cuff was placed at the proximal thigh using 80% limb occlusion pressure per the Delfi personalized tourniquet unit with 15-30% 1RM and performed during 30/15/15/15 repetitions.

Outcomes: At initiation of blood flow restriction training, the patient demonstrated 85% limb symmetry in the triple hop test. Twelve weeks later, overall distance improved from 311 cm to 420 cm on the left resulting in 98% limb symmetry. Functional single-leg exercises were pain free with minimal to no dynamic valgus collapse or loss of balance, and were symmetrical relative to the right. The lower extremity functional scale improved from 54/80 to 77/80 and the patient could run 10 miles/week with minimal to no ankle pain.

Discussion/Conclusion: There is limited blood flow restriction training research on chronic ankle instability. This case study describes the successful use of blood flow restriction training for a runner with chronic ankle instability. This is a non-generalizable case study and observed changes cannot be directly related to the intervention. Further research with a control group is warranted.

ID: 19 (Poster)

Larry Steinbeck, Brent Harper

Title: Manual Therapy for Persistent Postural-Perceptual Dizziness: Case Series

Background/Purpose: Sixty-nine percent of U.S. adults over 40 years of age have unknown etiology vestibular disorders with persistent dizziness and balance deficits.

The purpose of this case series was to investigate short-term outcomes of Fascial Manipulation®, a systematic regional interdependence movement-based approach, in subjects with persistent postural-perceptual dizziness. Symptoms of this condition are impacted by a loss of proprioception. Decreased fascial mobility negatively influences proprioception. The Fascial Manipulation® manual method was chosen as an adjunct following traditional vestibular rehab.

Case Description: After completing vestibular rehab, participants continued to experience persistent dizziness. Fascial Manipulation®, a soft tissue mobilization intervention consisting of tangential oscillations, was applied to the deep fascia over points of limited fascial mobility. These strategic points are hypothesized to influence muscle function and motor control. There were 12 Caucasian participants in this case series with an equal number male and female, and a mean age of 60 and 68, respectively. Independent t-tests were performed for gender differences. Pre- and posttest nonparametric paired sample t-tests (Wilcoxon signed-rank) measures consisted of Dizziness Handicap Inventory, Timed Up and Go, bilateral tandem balance, and bilateral single-limb stance.

Outcomes: There were no significant differences between outcome metrics and gender, except tandem pre-right, $t(10) = -3.09$, $p = .01$, tandem post-right, $t(10) = -2.36$, $p = .04$, and tandem pre-left, $t(10) = -3.38$, $p = .007$, with females having longer stance times. Treatment visits ranged from 2 to 8, with a mean and standard deviation of $4.5 \pm .54$. Pre-post Dizziness Handicap Inventory decreased 43.66 points. Pre-post Timed Up and Go decreased 3.17 seconds. Pre-post tandem left increased 8.66 seconds, while right increased 7.5 seconds. Pre-post left single limb stance increased 6.75 seconds and right increased 6.58 seconds. Significant gains included Dizziness Handicap Inventory ($z = -3.1$, $p = .002$), Timed Up and Go ($z = -2.8$, $p = .005$), bilateral tandem stance ($z = 2.8$, $p = .005$), and single-limb stance (left: $z = 2.9$, $p = .003$; right: $z = 2.9$, $p = .004$).

Discussion/Conclusion: Two to eight Fascial Manipulation® treatment visits resulted in significant improvements in those with persistent dizziness who had exhausted benefits through standard vestibular rehabilitation. This is a case series and, therefore, not generalizable, nor can observed changes be directly related to the intervention. Further research, inclusive of a control group, is warranted implementing Fascial Manipulation® for those with persistent dizziness after completing standard vestibular rehabilitation.

ID: 34 (Poster)

Sean Harris

Title: CAN DISC HERNIATIONS HEAL? ABSOLUTELY

Background/Purpose: Lumbar disc injuries are an extremely common occurrence in the general population, with prevalence rates approaching 75% by the 5th decade. Recent imaging studies have shown that disc injuries, especially sequestrations and herniations, resolve at least 50% after 6 to 12 months. These same studies have shown that symptoms can resolve ahead and/or behind of documented healing via advanced imaging. Some medical providers rely on imaging alone to make clinical decisions, while others rely solely on clinical assessment. This leaves high variability in patient management, treatment, and outcomes. The purpose of this case report is to discuss assessment and treatment approaches that can be utilized to identify individuals who would do well managing disc herniations conservatively.

Case Description: Subjective: The patient is a 37-year-old male who presents to physical therapy with a diagnosis of lumbar radiculopathy. He reports onset of pain 3 weeks ago while lifting his child out of a crib. He felt a sharp, shooting pain and had to lay on the ground for several minutes before being able to get up. Due to severe pain, he reports going to urgent care, where he received an x-ray, muscle relaxants, and tramadol. After 2 weeks with no resolution of symptoms, he then went to a sports medicine physician who assessed him and ordered a lumbar MRI. The patient reported posterior thigh and calf pain on the right, and intermittent paresthesias in the right lower leg distal to the knee. He reported difficulty with sitting, bending, lifting, and twisting: all of which would increase his distal symptoms. He reported no bowel or bladder changes but did express difficulty sitting on the toilet due to pain.

Objective: The MRI report showed a L5-S1 disc extrusion with a migrated fragment measuring 7mm anterior to posterior and extending 18mm above the level of the disc with L5 and S1 nerve root compression. Clinical exam showed fatigable weakness to R ankle eversion and dorsiflexion, all other myotomes WNL. He had altered sensation along L4-5 dermatome and mildly decreased R achilles reflex. All of the above listed neurologic deficits resolved after 2 minutes of standing/walking. He had limited active lumbar flexion with peripheralization of symptoms and WNL lumbar extension with centralization of symptoms. Neurodynamic examination revealed extremely sensitive nervous tissue with straight leg raise and slump, both of which greatly peripheralized symptoms. Physical performance assessment revealed fear with certain movements and inability to maintain endurance test positions longer than a few seconds due to pain. His modified Oswestry disability index (mODI) score showed moderate to high disability at 68%.

Treatment: This individual attended physical therapy (PT) 2x a week for 6 weeks, then 1x a week for 6 weeks, and then 1x a month for 3 months. After a total of 21 PT sessions across a 6-month period, he was discharged. PT consisted of extension-based exercises at the beginning to help with symptom centralization, thoracic gapping and lumbar closing manipulations, and general strengthening/conditioning. He was given a daily home exercise program as well as a separate routine to perform if he had an increase in nerve pain/symptoms.

Outcomes: Following 6 weeks of PT, he had considerable improvement in distal symptoms, range of motion, and function with a mODI score of 30% (improved from 68%). He continued with PT 1x weekly

for an additional 6 weeks, with emphasis on rebuilding strength, confidence, and resiliency with motions and activities of daily living. After this period of time, his mODI score dropped from 30% to 12% with remaining deficiencies in high level activity and prolonged sitting. At this time, he continued with in-person PT only 1x a month with regular contact maintained through email. At this final visit, he reported no pain or symptoms with any activities and had a mODI score of 0%. Due to the nature of the case, the patient was interested in getting a repeat MRI to see how the disc was healing now that his symptoms had resolved. The referring MD was consulted and an MRI was ordered. The original MRI was performed on 7/26/18 and the subsequent MRI was performed on 2/18/2019, resulting in just under 7 months between images. The follow-up MRI showed almost complete resolution of disc herniation, with only a 1mm bulge at L5-S1.

Discussion/Conclusion: The results from this case report indicate that even large disc herniations can resolve with time. Due to this individual having mild neurologic deficits that resolved with specific movements and a lack other red-flags, he was a safe and appropriate candidate to receive conservative care. Physical therapists and other healthcare providers need to be aware of the healing capacity of disc injuries and to be weary of solely using advanced imaging to make diagnosis and prognosis. More research is needed to determine if specific treatments or interventions contribute to speed or capacity of recovery of certain disc injuries.

ID: 69 (Poster)

Kailie Hazer, Jill Hipskind, Kevin Farrell, Candi Gardner

Title: Acute Development of Cervicogenic Dizziness Immediately Following Treatment of Unilateral Vestibular Hypofunction: A Case Report

Background/Purpose: Background and purpose: The purpose of this case report is to emphasize the importance of re-evaluation with changes in symptoms and understanding how a patient's description of dizziness could indicate a change in origin of dizziness.

Case Description: Case Description: 39 -year-old female who presented with ongoing, intermittent dizziness for the past 2 months. Aggravating factors included: looking between the treadmill screen and TV when running, scrolling on the computer for work, and quick eye movements. Relieving factors were looking straight ahead, Meclizine, and rest. She described her dizziness as a "shift in vision". These symptoms lasted only a few seconds but occurred frequently throughout the day.

Initial Examination: Negative neuro findings including sensation, UE strength, reflexes, and Hoffman's. Cervical AROM showed no limitation or reproduction of symptoms with rotation, side bending, flexion, extension, and extension quadrants. Positional tests for BPPV including roll test and Dix-Hallpike were negative on both right and left. Oculomotor exam revealed normal smooth pursuit, saccades, gaze-evoked nystagmus, VOR x 1, and VORc. However, symptoms reproduced with increased repetitions of horizontal smooth pursuit and saccades. Pt with positive L head thrust test. 1 Cervicogenic differentiation tests were negative. Initial DHI score was 24/100.

Re-assessment: On visit five she returned with a new symptom description of feeling "off kiltered". Aggravating factors included looking up from reading and quick head movements. Due to this change in status and different types of symptoms, a full reassessment was performed. Oculomotor exam and BPPV tests were negative. Patient's symptoms were now reproduced with right cervical rotation and extension, cervical torsion, and head rotation portions of the head-neck differentiation test, and smooth pursuit neck torsion test, Patient also had limited motion and symptoms reproduction with cervical flexion-rotation to the right. She also reported a new onset of right-sided neck pain.

Outcomes: Initial Intervention and Outcome: Patient was treated for four visits with gaze stability, habituation, and balance exercises. Patient showed significant improvement in the frequency of her symptoms.

Second Intervention and Outcome: Patient was treated for six more sessions with the following interventions: R unilateral PAs to the upper cervical spine, R unilateral SNAG MWM at R C2 into R rotation, stretching to maintain mobility gained from mobilization, and postural exercises Patient had a full resolution of symptoms with a DHI score of 0/100 and no limitations with any activities.

Discussion/Conclusion: Discussion/ Conclusion: This case demonstrated the importance of performing a full re-assessment when a patient presents with a sudden change in symptoms. In this case, the patient's description of her dizziness changed causing the therapist to consider other sources for patient's symptoms. Patient description of dizziness can aid in differential diagnosis and origin of dizziness.

ID: 81 (Poster)

David Hurley, Bret Greenberg, Ted Kurlinkus

Title: THRUST AND NON-THRUST MANIPULATION AT THE THORACIC SPINE TO IMPROVE MULTI-QUADRANT PAIN AND PARESTHESIA IN A PATIENT POST COVID-19 VACCINATION

Background/Purpose: A wide array of neuropathic symptoms has been reported after COVID-19 vaccination, with more severe symptoms persisting into sub-acute and chronic stages. T4 syndrome is a clinical diagnosis of exclusion related to dysfunction at the thoracic spine with potential autonomic contribution that can trigger upper and even lower extremity paresthesia. There is paucity in the literature for this condition, particularly related to orthopaedic manual physical therapy management. The purpose of this case report is to highlight how physical therapist management consisting of manual therapy and therapeutic exercise was used to successfully manage a patient with a T4 syndrome presentation post COVID-19 vaccination.

Case Description: The patient was a 23 y/o female who presented to outpatient physical therapy for chronic paresthesia in all four limbs that initially began hours after administration of the COVID-19 vaccine. The patient was referred to physical therapy 10 months after vaccination, symptoms presented as intermittent self-reported “vein” burning and tingling paresthesia symptoms in the anterior forearms and posterior thighs that were aggravated with increased physical activity levels. She also complained that her body felt “colder” when symptoms were aggravated. Examination findings included positive thoracic sympathetic slump, positive median nerve upper limb neurodynamic tests, bilateral forearm hypoesthesia, and hypomobility with thoracic passive accessory joint assessment at T3-5 that increased the familiar paresthesia in the bilateral upper extremity. The course of treatment consisted of 11 sessions over the course of 2 months. Manual therapy interventions consisted of thrust and non-thrust mobilization directed at the mid and upper thoracic spine. Carryover was promoted with thoracic spine mobility and self-mobilization home exercises.

Outcomes: Reduction of the bilateral arm and leg paresthesia occurred initially through the first few treatment sessions. By discharge, the patient had no familiar symptoms produced with objective testing. The patient initially was able to walk in the clinic for 15 min at 3.5 mph prior to symptom onset with perceived exertion (RPE) 12 and heart rate (HR) 135, and by discharge was running intervals up to 5.5 mph for 20 min at RPE 18 and HR 185 without any symptom onset. The patient overall reported 100% return to daily function with activities and 80% return to prior physical activity levels with her workout routine of weightlifting, yoga, and running. Global rating of change at discharge was rated at +5.

Discussion/Conclusion: Thrust and non-thrust mobilization at the thoracic spine has been suggested as a treatment option in patients that present with T4 syndrome. This case report demonstrates physical therapist management of symptoms associated with T4 syndrome occurring post COVID-19 vaccination and may offer treatment options for future patients with onset of neurological paresthesia post vaccination.

ID: 23 (Poster)

Jeremy Jackson

Title: MULTIPLE SCLEROSIS MASKING AS LUMBAR RADICULOPATHY

Background/Purpose: To demonstrate the value of clinical reasoning utilizing a detailed subjective examination, symptom pattern recognition, and a tailored neurological examination to assist in the differential diagnosis of a patient with a lumbar radiculopathy that turned out to have underlying multiple sclerosis.

Case Description: The patient was a 50 year old female with a past medical history significant for obesity, prediabetes, and asthma. She presented to Physical therapy via a virutal video visit with the chief complaint of intermittent ache in low back, intermittent right gluteal ache, intermittent pain and weakness in her right leg and intermittent tingling in her right 3rd and 4th digits. She also complained of difficulty lifting her right leg to get in and out of the car, some impaired balance, and her worst pain in her back when she stood for greater than 30 minutes. The synmptoms started nearly 2 years ago after attending high intensity interval training exercise classes. Symptoms improved with prednisone taper and therapeutic exercise but she had to stop physical therapy due to the COVID-19 pandemic and stopped performing the prescribed exercise. A limited physical exam revealed her pain with lumbar extension. The patient was issued a basic home exercise program of lumbar rotations and pelvic tilts. Initial assessment was that symptoms may be due to lumbar radiculopathy but needed further assessment in clinic.

Outcomes: Patient was seen in mentorship slot and further questioning revealed that patient had been feeling more weakness than pain over the past few months. Her legs were feeling increasingly heavy and she had fallen twice in the shower which led her to start using a cane while walking. She also reports a general feeling of fatigue. Physical exam revealed a wide based gait with single point cane and reproduction of her back and buttock symptoms with lumbar extension. Due to the differential of lumbar radiculopathy a segmental neurological exam was performed which revealed a brisk right patellar reflex but no loss of sensation to light touch or strength deficits except 4+/5 right hip flexor. Due to the repeated falls, difficulty lifting leg, and fatigue a central neurological exam was also performed. This revealed a positive Hoffman's, Babinski and clonus bilaterally. Patient was unable to perform Tandem Rhomberg. Further strength testing beyond myotomal testing which revealed 3+/5 bilateral hip abduction and 4-/5 hip extension. Due to the concerning subjective and objective measures the patient was referred to a neurologist who subsequently performed brain, cervical, and thoracic MRI's which revealed several lesions confirming the diagnosis of multiple sclerosis. The neurologist then referred the patient to a neuorehabilitation physical therapist who focused on strenght and functional traning as well as educating patient on multiple sclerosis.

Discussion/Conclusion: In our modern era of physical therapy practice, virtual care is preferred by many patients, practitioners, and health care systems due to its convenience, cost savings, and ease. This case describes the value of how a detailed subjective exam can lead a clinician to streamilne a patients care by having them come into the clinic for a focused physical exam that can aid to a proper differential diagnosis and treatment plan.

ID: 3 (Poster)

Cynthia Jacobson, Jason Moses, Steve Karas, Teresa Legerski

Title: EFFECTS OF ACROMIOCLAVICULAR JOINT MANIPULATION ON SHOULDER PAIN, RANGE OF MOTION AND OUTCOMES: CASE SERIES

Background/Purpose: Shoulder impingement involves multiple pathologies that require integrative clinical reasoning and treatment. Recent literature replaces subacromial impingement syndrome with subacromial pain syndrome (SAPS). The current care guidelines for SAPS include modalities, exercise, motor control strategies, and manual therapy (MT). MT addresses the glenohumeral joint, cervical, thoracic spine, but rarely the acromioclavicular joint (ACJ).1 2

The ACJ may be a source of shoulder pain and disability related to hypomobility. A restricted ACJ may contribute to decreased subacromial space associated with SAPS, and restricted UE elevation due to a scapular posterior tilt and posterior clavicular rotation. ACJ MT may provide favorable neurophysiological effects of hypoalgesia and enhanced range of motion.3 Because the ACJ and pectoral musculature share common innervation, ACJ MT may influence pectoral length, allowing posterior scapular tilt, and increased UE elevation. 4,5

No study has examined an ACJ distraction manipulation in treating SAPS, despite being part of an accredited PT program's curricula. Therefore, we described the addition of an ACJ manipulation in individuals with SAPS.

The purpose of this research is to determine the immediate and short-term effects of adding ACJM on pain, range of motion, pectoral length, and function in SAPS.

Case Description: Nine patients with SAPS were treated with the addition of ACJM twice weekly for two weeks, coupled with a home program. Outcomes for Pain, disability, patient perception of change, ROM, and pectoralis minor muscle length (PMML) were measured at the initial visit, after ACJM and discharge

Outcomes: Improvements in pain, disability, patient perception of change, ROM, and PMML were noted following treatment. Five of the 9 patients reported elevation pain improvements that exceeded MCID. Eight of the 9 patients showed improvements in Quick Disability of the Arm, Shoulder, and Hand questionnaire scores exceeding the MCID. Two of 9 patients reported Moderate improvement in the perception of change (4+ GROC score). Seven of 9 reported Moderate improvement and 1 of the 9 of the patients reported large improvement (7+GROC score). The median discharge ranks were statistically significant than the baseline for the GROC. Eight of the 9 patients demonstrated improvements in shoulder elevation. The median discharge ranks were statistically significant for ROM and PMML. Two of 9 demonstrated increased PMML that exceeded the MDC.

Discussion/Conclusion: Clinically meaningful changes were found in pain, perception of change, and disability, with statistically significant improvements in ROM and PMML with the inclusion of ACJM in individuals demonstrating painful limitation in end range UE elevation. The outcomes of this case series support the consideration of ACJM in the treatment of SAPS.

ID: 92 (Platform)

Holly Jonely, Dhinu Jayaseelan, Joseph Signorino, Ellen Costello, Josh Woolstenhulme, Liana Wooten

Title: Thoracic Spinal Manipulation to Improve Pulmonary Ventilation

Background/Purpose: Pathology in ventilatory function (VF) is often treated by pharmacologic agents. However, the musculoskeletal components of thoracic excursion (TE) made possible by combined movements from costovertebral, costotransverse and sternocostal joints, which may play a role in mediating VF, are not targets of pharmacologic interventions. For those with respiratory pathology, identifying modes of improving respiratory function should be a priority. Few studies have systematically examined joint manipulation procedures for the purpose of improving VF. This exploratory pilot study examined the immediate and short-term effects of thoracic spinal manipulation on VF.

Methods: The George Washington University Institutional Review Board approved this study. Twenty-one sedentary participants without respiratory disease aged 50 years or older were randomly assigned to either an intervention group (n=10) to receive 3 sessions of thoracic manipulation or to a sham treatment group (n=11) to receive 3 sessions of "intercostal training". Participants were blinded to the nature of the interventions. Prior to randomization, all participants completed the Human Activity Profile to assess self-reported physical fitness and undergo an assessment to determine their Beighton Score (level of joint hypermobility) and evidence of local thoracic hypermobility using passive, joint accessory motion testing using prone, posterior-anterior force on the thoracic spine. During the initial session, data were collected before and immediately after the experimental or sham intervention. The intervention for the experimental group included a grade V, high-velocity low-amplitude joint manipulation extension glide at the thoracic spine. The sham intervention comprised spinal flexion-extension movements in the sagittal plane, avoiding end ranges. All interventions were provided by fellows of the American Academy of Orthopedic Manual Physical Therapy. Intervention sessions included one during the first week and two sessions during the second week. Data were collected again one week following the final experimental or sham intervention session. The primary outcome measure collected was vital capacity (VC). Secondary outcome measures were maximal voluntary ventilation (MVV) and thoracic excursion measured during maximal inhalation.

Results: One-Way Repeated Measure ANOVA was run to assess within-group differences pre/post session and one week following the third session. A MANOVA was run to assess between-group differences pre/post the first session and within one week following the third session. Statistically significant differences were not observed in VC or thoracic excursion within or between groups immediately following the first session or between groups following three sessions. However, a statistically significant difference in MVV ($p=0.007$, effect size .71) was observed within the intervention group within one week following the third session.

Discussion/Conclusion: This study examined the effect of spinal manipulation compared to a sham intervention on VF and TE in sedentary subjects over the age of 50 years. Based on the results of this study, spinal manipulation used independently of other interventions to improve VC cannot be supported in this population. The lack of significant change within- or between groups may be related to the small relatively healthy population used. Additional studies investigating the use of manual therapy to improve respiratory capacity are warranted.

ID: 41 (Platform)

Jeegisha Kapila, Troy Hooper, Jean-Michel Brismée, Phillip Sizer, Stéphane Sobczak, Roger James, Aaron Likness

Title: Cervical Multifidus Muscle Stiffness During Active Neck Movements: A Shear Wave Elastography Study

Background/Purpose: Background: Neck pain is a common problem associated with deep cervical muscle impairments and proprioceptive deficits. Shear wave elastography (SWE) measures regional tissue stiffness, which provides a safe method to evaluate deep cervical muscle function.

Objective: The purpose was to compare two neck extensor movements to determine which maximally activates the cervical multifidus. The secondary purpose was to establish intra rater reliability of cervical extensor SWE stiffness measurements.

Methods: Methods: Twenty-five subjects (8 males and 17 females) between the ages of 22-29 years (mean= 23.9 years) without any history of neck pain completed the study. Subjects performed three trials of the following activities while in 4-point kneeling: a) neck retraction movement, and 2) crainocervical extension using a stabilizer. Three shear wave elastograms were recorded during each trial. A paired t-test was used to compare multifidus stiffness during the two activities. All measurements were repeated after a minimum of 24 hours period in the first fifteen subjects to establish intra-rater reliability (ICC3,9).

Results: Results: Cervical multifidus stiffness during neck retraction (5.55 ± 1) was significantly higher compared to craniocervical extension movement (4.86 ± 0.66) at ($p = 0.02$, $d = 0.8$). The multifidus SWE stiffness measurements demonstrated moderate reliability (0.75-0.77).

Discussion/Conclusion: Conclusion: Maximal multifidus stiffness, which is an indirect measurement of muscle activation, is greatest during neck retraction. The results of this study may assist clinicians to design interventions targeting maximal multifidus activation.

ID: 56 (Platform)

Steve Karas, Joshua Biernacki, Elizabeth Pierce, Rowan Unger, Jason Woollard

Title: Use of Joint Mobilization After Total Joint Arthroplasty of the Knee, Hip, and Shoulder: A Scoping Review of the Literature

Background/Purpose: Manual therapy, including joint mobilization techniques, has been shown to reduce pain, increase range of motion, and improve extremity function postoperatively. However, there does not appear to be consensus on the use of joint mobilization after total joint replacement. Therefore, we undertook a review of the literature for rehabilitation guidelines for safe and effective use of joint mobilization after total shoulder, hip, or knee joint arthroplasty and attempted to synthesize the available information to propose recommendations for clinical practice.

Methods: We searched several online databases (APTA, EBSCO, JOSPT, Google Scholar, PubMed,) for primary literature examining or mentioning the use of joint mobilization after joint replacement. We found one clinical practice guideline, 2 reviews, and 2 case series for the knee. There were 5 clinical practice guidelines, 1 randomized controlled trial, and 1 case series for the hip. Lastly, for the shoulder, 7 clinical practice guidelines and one case study were found that mentioned joint mobilizations after joint arthroplasty.

Results: A discrepancy in the definition of joint mobilization was a considerable limitation to this review, and many articles did not specifically mention the use of joint mobilization techniques. Some studies reported range of motion exercises and ambulation as joint mobilization. Furthermore, the literature regarding accessory joint mobilization as a treatment after total joint arthroplasty appears to be extremely sparse.

Discussion/Conclusion: Clinical recommendations and evidence for the use of accessory joint mobilization following total joint arthroplasty are limited. However, to our knowledge, no studies have reported any adverse events or contraindications to accessory motion joint mobilization after total joint arthroplasty. Our review appears to suggest that the use of joint mobilizations after total joint arthroplasty is safe and may be appropriate as part of a full package of evidenced based care. Further research is needed to determine the most advantageous parameters and appropriate characteristic of patients who may benefit from their application.

ID: 57 (Poster)

Steve Karas, Emily Hill, Samuel Kinney

Title: Pain Neuroscience Education may Enhance the Effects of Manual Therapy in Patients with Low Back Pain: A Scoping Review

Background/Purpose: There has been a growing interest in the effects of teaching people with low back pain (LBP) about pain, commonly referred to as pain neuroscience education (PNE). Additionally, manual therapy (MT) has repeatedly and consistently been recommended by clinical practice guidelines in the treatment of LBP. Historically, LBP has been viewed through a biomechanical lens; however, studies have shown that pathological findings likely do not correlate with pain. MT techniques have been shown to have a neurophysiological effect on the area targeted, resulting in endogenous mechanisms acting on the central nervous system. The goal of PNE is to allow the patient to understand pain as an interpretation of inputs to the brain. Considering the proposed mechanisms by which manual therapy influences the central nervous system, it has been hypothesized that providing PNE and MT simultaneously may improve their individual treatment effects.

Methods: Our objective was to identify randomized controlled trials that have examined this potential enhanced effect of PNE and MT when applied to patients with LBP. Two researchers performed searches of common physical therapy databases to identify randomized controlled trials that examined the combination of MT and PNE.

Results: Four randomized controlled trials were identified which examined varying combinations of MT and PNE. All studies had at least one group receiving both MT and PNE. Two studies showed a significant improvement in LBP for the group receiving PNE and MT compared to a control group. One study showed a significant improvement in straight leg raise; however, there were insignificant between group findings for LBP, leg pain, and trunk flexion. An additional study found no difference between two treatment groups.

Discussion/Conclusion: Overall, no group receiving PNE performed worse than a control intervention and three of the four studies found a positive result when PNE was applied. These results appear to suggest that PNE may help certain patients with LBP reconceptualize their pain, decrease fear of movement and pain catastrophizing, and reduce pain when combined with MT. It may be that those that are helped by this combination are a subset of patients with LBP who meet criteria conducive to both MT and PNE. Another possible conclusion may be that all patients with LBP may benefit from an approach which utilizes both MT and PNE from the initial assessment. It appears that the current evidence supports an ‘in addition to’ approach over an ‘either, or’ strategy. Further research to find those who respond best appears warranted.

ID: 1 (Platform)

Gary Kearns, Jean-Michel Brismée, Sean Riley, Sharon Wang-Price, Thomas Denninger, Margaret Vugrin

Title: LACK OF STANDARDIZATION IN DRY NEEDLING DOSAGE AND ADVERSE EVENT DOCUMENTATION LIMITS OUTCOME AND SAFETY REPORTS: A SCOPING REVIEW OF RANDOMIZED CLINICAL TRIALS

Background/Purpose: The purpose of this scoping review was to examine: (1) whether variability in dry needling (DN) dosage affects clinical pain outcomes and (2) how adverse events (AEs) were documented, and whether DN safety was determined.

Methods: Nine databases were searched for randomized controlled trials (RCTs) investigating DN in symptomatic musculoskeletal disorders. Methodological quality was assessed using the Physiotherapy Evidence Database (PEDro) scale. Included RCTs met PEDro criteria #1 and scored > 7/10. Data extraction included DN dosage, pain outcome measures, inclusion or absence of AE reporting, and means to categorize AEs. Clinically meaningful differences were determined using the minimum clinically important difference (MCID) for pain outcome measures.

Results: Out of 22 identified RCTs, 11 demonstrated significant between-group differences exceeding the MCID, suggesting a clinically meaningful change for pain outcomes. Nine documented whether AEs occurred. However, only five provided AEs details, and four cited a standard means to report AEs.

Discussion/Conclusion: As there was inconsistency in reporting DN dosing parameters and AEs, we could not determine whether DN dosing affects outcomes or establish a superior DN dosage in treating symptomatic musculoskeletal disorders. Without more detailed reporting, replication of methods in future investigations is severely limited. A standardized method to report, classify, and provide context to AEs from DN is lacking. Without more detailed AEs reporting in clinical trials investigating DN efficacy, a more thorough appraisal of relative risk, severity, and frequency was not possible. Based on these inconsistencies, adopting a standardized checklist for reporting DN dosage and AEs may improve internal and external validity and the generalizability of results.

ID: 42 (Poster)

Frederick Maurin, Christopher Keating

Title: GRADED MOTOR IMAGERY AFTER DISTAL RADIUS FRACTURE IMPROVES PAIN-FREE ROM AND DECREASES SELF-REPORTED FEAR AVOIDANCE

Background/Purpose: Distal radius fractures (DRF) make up 17.5% of fractures, and can result in pain, disability, and complications. There is currently no consensus in the literature as to best practice for surgical vs non-surgical management of DRF. Graded motor imagery has been known to help with deficits in other patient populations, but studies involving the use of mirror box therapy and/or laterality training for DRF are lacking. The purpose of this case report is to demonstrate how physical therapy integrating graded motor imagery can improve outcomes in a patient s/p DRF.

Case Description: 72-year-old caucasian female referred to outpatient physical therapy s/p DRF that she sustained 6 weeks prior after falling off her bike. She was casted for 5 weeks and transitioned to a volar thumb spica. At initial evaluation, the patient reported 84% on the Quick DASH and pain 10/10 with movement. Wrist pain was accompanied by constant numbness, tingling, and feeling of coldness in her first 3 digits. Manual therapy was used to improve ROM and decrease symptoms. Progressive ROM, tendon gliding, nerve gliding, and grip strength exercises were assigned for HEP. After failing to achieve desired outcomes (13 visits), laterality training via the recognise app and mirror box therapy were introduced. These interventions were utilized to assist with decreasing fear-avoidance and to promote normal use of L hand. The course of treatment consisted of 20 sessions that took place over 10 weeks.

Outcomes: Quick Dash improved from 84% to 36.36%, hand and wrist pain decreased from 10/10 to 3/10, Grip strength from 0 to 10lbs, and all wrist and finger ranges of motion were improved. On first assessment, she averaged 3.05s speed for L hands and 2.25s for R hands with an average accuracy of 82.5% for L hands and 67.5% for right hands. After 4 sessions of laterality training, patient displayed an average recognition speed of 1.525s (L) and 2.125s (R) with an average accuracy of 75% (L) and 85% (R). By discharge she had pain free AROM and was able to perform ADLs and light tasks around her home with improved function and with less pain.

Discussion/Conclusion: The patient displayed an exceptional amount of pain, fear of movement, and self-stated avoidance. Without addressing the possible central cortical reorganization from the injury, the peripheral issues could have persisted. This case report describes physical therapy management of symptoms associated with DRF and may offer cost effective treatment options for future patients with similar presentations.

ID: 43 (Poster)

Jeffrey Paskewitz, Christopher Keating

Title: SHARED DECISION MAKING IN THE MANAGEMENT OF AN ISOLATED FLEXOR HALLUCIS BREVIS RUPTURE AND SURGICAL REPAIR AND REVISION IN A COLLEGIATE WRESTLER

Background/Purpose: Closed ruptures of the hallux flexor tendons are rare injuries. The physical therapy management following flexor hallucis brevis (FHB) repair and return to sport testing is poorly studied. Shared decision-making (SDM) is an intervention approach that elicits patient involvement in decision making following clinician education of the intentions, benefits, and harms to several intervention approaches. This case study serves to provide rationale for SDM in the context of limited research evidence to support intervention selection and return to competitive wrestling decisions.

Case Description: A 20 year old male wrestler who sustained a traumatic FHB tendon rupture while competing in wrestling in Fall of 2020 as his foot and 1st MTP joint was excessively dorsiflexed with overpressure. He underwent surgical open repair of the FHB tendon and was referred to physical therapy. The patient verbalized the need to assume a lunge position, skepticism in regaining the motion required for successful participation in wrestling, and concern of reinjury on longevity and long-term mobility. Physical therapy interventions included those that have demonstrated efficacy in outcomes for dancers following hallux tendon repair surgery. The applicability of these exercises were thought to be adequate because both dancing and wrestling are sports that require a large amount of motion and loading of the 1st metatarsophalangeal joint. The intended purpose, benefits, and harms of interventions were relayed to the patient. He continued to experience pain local to his 1st MTP joint and underwent ultrasound which showed a displaced suture in the 1st metatarsophalangeal joint. Surgical debridement and suture removal was performed in late Fall of 2021. Following this education and performance of all interventions, he was asked to provide input regarding the relative effectiveness of each intervention. His beliefs elicited through this questioning helped to guide intervention in future physical therapy sessions.

Outcomes: The patient demonstrated clinically important improvements in pain and functional outcome measures (FAAM). Improvements in 1st MTP dorsiflexion to 92 degrees. He returned to exercise including running, jumping, and noncompetitive wrestling activities. He has not returned to competitive wrestling as he can not maintain closed chain 1st MTP dorsiflexion required for wrestling participation.

Discussion/Conclusion: This case study illustrated a physical therapy intervention approach that utilized SDM in a collegiate wrestler who sustained an isolated FHB tendon rupture which required surgical repair and revision. SDM helped to determine relative patient-perceived effectiveness of interventions in order to restore mobility to the patient's 1st MTP joint. This case demonstrates that return to daily activities and noncompetitive exercise activities in a pain free manner is feasible, but highlights the difficulty in restoring wrestling function following FHB tendon ruptures and specific return-to-sport tests to aid in the decision making process.

ID: 44 (Poster)

Taylor Zelitsky, Christopher Keating

Title: ELBOW DISLOCATION WITH ANTERIOR INTEROSSEOUS NERVE PALSY IN A 16-YEAR-OLD MALE ATHLETE: A CASE REPORT

Background/Purpose: Elbow dislocation is the most common joint dislocation in the pediatric population. Nerve injury accompanying posterior elbow dislocations is rare and diagnosis is often delayed. Research is lacking in describing impairments to the anterior interosseous and median nerves following an elbow dislocation. This case report presents clinical findings, and management of anterior interosseous nerve palsy following a posterior elbow dislocation in a 16-year-old male football player.

Case Description: A 16- year-old male football player presented to outpatient physical therapy 10 days following an acute left posterior elbow dislocation after falling on an outstretched arm, with pain, instability, and "popping" sensation. Radiographs revealed no fracture, and He was splinted with the elbow in 90 degrees after relocation. Complaints included pain, swelling, stiffness, weakness in his hand, and numbness along lower wrist, palm and thumb. He reported NPRS 6/10 and QuickDASH of 51%. Physical examination revealed swelling, tenderness to palpation, elbow ROM of 10-115º, grip strength 42 kgs, and pinch grip 2kgs. He presented with a positive anterior interosseous sign and sensation altered along the median nerve distribution. Two-point discrimination (Thenar eminence: 18mm, 2nd digit: 10mm, 3rd digit: 9cm) and graphesthesia testing (3/8 correct). Early management focused on patient education regarding nerve related injury and pain modulation interventions. GMI and TPD, were utilized to address the chronic nature of altered sensation into the hand and laterality training, with an initial score of >35 seconds and 3 errors. Blood Flow Restriction training was implemented early in care to promote strength and hypertrophy before increases in load were introduced. Submaximal limb occlusion pressure (60-80%) has no adverse effect on nerve conductance, for short periods of time (< 2 0 mins) and therefore, BFR was applied to prevent further limitations in muscle function. The Injury-Psychological Readiness to Return to Sport Scale (I-PRRSS), was used for readiness to return to sport. Plyometric capabilities and psychological readiness scores guided clinical decision making for return to sport progression.

Outcomes: In 3 months, ROM, grip strength, and strength were restored. Clinically important improvements with all objective measures including: NPRS 0/10, I-PRRSS: 50.5, and QDASH of 21%. Patient reported that deficits noted on the QDASH were due to hand dominance. TPD and graphesthesia measurements remained unchanged, but numbness and laterality training (< 25 seconds and 0 errors) improved.

Discussion/Conclusion: This case demonstrates successful management of a posterior elbow dislocation with anterior interosseous nerve palsy. Early phases of rehab primarily focused on pain modulation and later phases emphasized strengthening, plyometrics, and targeted nerve interventions due to sensory impairments. BFR training was implemented early in rehab despite signs of nerve compression to mimic effects of higher intensity exercise and prevent disuse atrophy and return patient to sport.

ID: 45 (Poster)

Hunter Handel, Christopher Keating

Title: MIRROR BOX THERAPY FOR DISTAL SENSORY DEFICITS OF THE 1ST DIGIT: A CASE REPORT

Background/Purpose: Systematic reviews have been published suggesting mirror box therapy can be an effective means of treating motor and pain deficits in several patient populations but not as an intervention to address sensory impairments. The purpose of this case report is to describe mirror box therapy to improve sensory deficits. This case is unique due to patient anxiety and hesitation towards manual therapy at the neck, as well as limited research regarding intervention-impairment relationship.

Case Description: Patient is a 44-year-old stay at home mother of 5 kids that presented to outpatient physical therapy clinic reporting intermittent pain in the right lateral neck and consistent numbness in the right distal 1st- 3rd digits with patient anxiety. Examination revealed increased median nerve mechanical sensitivity and no change in symptoms with manual glides of the cervical spine. Palpation of R UT increased tingling in the 2nd digit which elicited a negative pt response. Sensory testing on the 2nd digit showed 6/10 correct sharp dull prods correct and 10/10 on the L. Graphesthesia testing showed 7/10 correct on the R and 9/10 on the L. Two-point discrimination was measured at 2 mm for both L and R. Upon inquiring regarding manual manipulation pt reported increased fear due to unrelated history with chiropractors and videos she has seen. Management consisted of cervical and thoracic mobility interventions, manual therapy, and mirror box therapy. Pt would complete 15-20 minutes of mirror box therapy consisting of graded exposure of sensory tools leveled 1-10 on the unaffected hand while pt observed mirror over affected hand. Sharp/dull and graphesthesia testing would also be performed on the unaffected hand. Afterwards the patient would remove the hand from the mirror box and the same sequencing would then be performed on the affected hand while the patient observed.

Outcomes: After 12 sessions, she improved her short form Orebro Musculoskeletal Pain Questionnaire from 17/100 (5/10 anxious, risk of persistence 3/10) to 16/100 (3/10 anxious, risk of persistence 1/10). She improved to 10/10 correct responses with sharp dull testing and 9/10 graphesthesia testing. Median nerve sensitivity had diminished, and no numbness elicited with palpation, although localized soreness persisted.

Discussion/Conclusion: This case described the management of a case in which a pt had lingering numbness following a subjective report of a recent bout of cervical radiculopathy. Pt demonstrated several yellow flags prior to treatment which were reduced though a passive approach primarily consisting of mirror box graded sensory exposure as well as manual therapy. This case may be used as a way for other clinicians to successfully manage patients presenting similarly with sensory impairments utilizing mirror box therapy.

ID: 39 (Poster)

Jared Kipnis, Robert Fleming, Chris Showalter

Title: Utilization of Spinal Mobilization in a Lumbar Radiculopathy Patient to Return to Pickleball, a case report

Background/Purpose: Pickleball is the fastest growing sport in the United States with an estimated 4.8 million participants nationwide. As a result of this growth, there has been more racket sports-related injuries reported nationwide with trunk injuries making up 16.7% of all pickleball-related injuries. Utilization of spinal mobilization has been shown to decrease pain and improve range of motion (ROM) for patients with lower back pain. The purpose of this case report is to demonstrate the use of spinal mobilization to return a patient to their prior level of function.

Case Description: A 65-year-old female retired teacher presented for evaluation due to back and left posterior leg pain for approximately 6 weeks. Patient reported spontaneous onset of pain and quickly accessed care receiving magnetic resonance imaging, epidural steroid injection and ultimately physical therapy. Patient noted that she is an avid pickleball player and wanted to return to sport. While the patient noted that she did not injure her back during play, she did note playing day prior to onset of pain and reported that she was tired and sore after last game played. She presented with loss of lumbar AROM and positive straight leg raise that reproduced her left leg pain at 45 degrees hip flexion. There was pain with unilateral posterior-to-anterior (UPA) assessment at the left L5 transverse processes that was concordant with her back pain.

Over the course of 15 visits over 15 weeks, patient received left UPA L5 mobilizations that had a positive effect on her back pain with minimal changes in her left thigh pain. At that point, right rotational L4-5 mobilization was employed due to it having been shown in the literature to improve leg pain and motion. A pragmatic approach to exercise was employed progressing from table to weight-bearing and eventually sport-specific.

Outcomes: Patient functional progress was monitored by using the ODI/MDQ that she exceeded the MCID going from 44% on initial evaluation to 14% on discharge and her pain did as well going from 6 to 1 on the verbal analog scale. Patient had return of full active ROM in all planes and strength that allowed for safe re-entry into sport.

Discussion/Conclusion: The use of oscillatory segmental rotational mobilization, has been proven to decrease lower back pain as well as leg pain that was confirmed by this patient's treatment plan. The patient presented with thoughts that she would not be able to return to her PLOF. Patient improvements in ROM and pain from rotational mobilizations and increased muscle tone/activity associated with the UPA mobilizations, helped to facilitate her to perform split squats to simulate swinging during play and weighted deadlifts to simulate lifting her grandchild, an activity that she was unable to prior perform, without pain.

ID: 67 (Poster)

Keeley Knobloch, Kevin Farrell, Candi Gardner, Janelle Smith , Carly Jones

Title: Apparent Bilateral Foot Drop In A 9 Year Old Post COVID-19 Infection: A Case Report

Background/Purpose: Background/Purpose: The COVID-19 impact has demonstrated many unique and varied presentations across all ages and severity of infection. There is little research into the frequency and physiological mechanism of neurological and musculoskeletal impairments witnessed in those recovering from COVID-19. The purpose of the study is to share the clinical reasoning in the monitoring for neurological and musculoskeletal changes in the treatment of a 9 year old experiencing bilateral foot drop post COVID-19 infection.

Case Description: Case Description: The patient was an otherwise healthy 9 year old female presenting to the emergency room with bilateral leg weakness 5 days after testing positive for COVID-19. Lower extremity EMGs were performed and revealed inflammation around peroneal nerves. Differential diagnosis by the Primary Care Physician was inconclusive towards COVID-19 origin vs Charcot Marie Tooth Disorder vs acute inflammatory demyelinating polyneuropathy (AIDP). Upon referral to PT, she demonstrated limited bilateral ankle dorsiflexion and eversion AROM (unable to achieve neutral position), decreased bilateral ankle strength (1/5 on MMT into dorsiflexion and eversion), limited single limb stance and visible “foot slapping” L>R with ambulation. Additionally, she was provided with and advised to wear bilateral AFOs by a neurologist. Therapy sessions focused on regaining bilateral ankle AROM, strength, motor re-education and function. Throughout the course of treatment, regular neuro exams were performed at the beginning of sessions to monitor for any ascending weakness, asymmetrical reflexes, sensation changes or other signs/symptoms. She was seen 1-2x a week for approximately 12 weeks.

Outcomes: Outcomes: There were no changes in neurological presentation throughout the course of therapy sessions. The patient demonstrated consistent improvement in ankle strength (5/5 into all planes bilaterally) over the course of 14 visits. Additionally, patient denied pain over the course of treatment. Significant improvements were also seen in function (Foot and Ankle Disability Index: 11.5% on eval, 97% on discharge). She was weaned from bilateral AFOs starting with ½ day wearing schedule at session 9 with cessation of braces altogether by session 13. Absence of “foot slapping” by 11th session and gait improvements seen with symmetrical stance time and heel strike upon initial contact. On discharge, she was able to complete >10 heel raises and SLS time improved to >1 minute bilaterally.

Discussion/Conclusion: Discussion/Conclusions: This case example emphasizes the special care in monitoring for new onset of neurological symptoms when treating insidious onset of foot drop such as this case presentation. The role of physical therapists from a screening aspect can not be undermined in today’s age of COVID-19 infection recovery within the outpatient setting. Further research continues to develop on COVID-19 as the medical field keeps up with potential neurological and musculoskeletal impairments seen across all ages of recovering patients.

ID: 38 (Platform)

Alan Lam, Lane Liddle, Crystal MacLellan

Title: THE EFFECT OF UPPER CERVICAL SPINE MOBILIZATION/MANIPULATION ON TEMPOROMANDIBULAR JOINT PAIN, MAXIMAL MOUTH OPENING, AND PRESSURE PAIN THRESHOLDS: A SYSTEMATIC REVIEW AND META-ANALYSIS

Background/Purpose: Approximately 2.5-4.5% of adults experience temporomandibular joint (TMJ) dysfunction. The convergence of upper cervical (UC) and trigeminal sensory afferents provides a clinical basis for treating the UC spine in those with TMJ dysfunction. However, benefits of UC manual therapy (MT) to treat TMJ dysfunction remain unclear. Current systematic reviews include limited trials utilizing a wide range of MT techniques directed to the UC and/or TMJ region. None have evaluated the sole use of UC joint mobilization/manipulation for TMJ dysfunction. An updated review including additional RCTs may shed light on the impact of UC joint mobilization/manipulation on TMJ dysfunction. This systematic review and meta-analysis evaluated the efficacy of UC (C0/1, C1/2, C2/3) joint mobilization and/or manipulation on reducing pain and improving maximal mouth opening (MMO) and pressure pain thresholds (PPTs) in adults with TMJ dysfunction, compared with sham or other intervention.

Methods: MEDLINE, CINAHL, EMBASE and Cochrane Library were searched for RCTs. Two reviewers independently extracted data and quality assessment was done using Cochrane Risk of Bias Tool (v2.0). Quality of evidence was evaluated through Grading of Recommendations Assessment, Development and Evaluation (GRADE). Meta-analysis was conducted using random-effects models to determine the efficacy of MT on pain, MMO, and PPT of masseter and temporalis. Analysis of the earliest and latest assessments from each study determined whether there were benefits of MT on TMJ dysfunction. Wherever possible, publication bias was analyzed using funnel plots and Egger regression.

Results: Eight trials of MT vs. sham, MT vs. other intervention were included. Manual therapy of the UC spine resulted in a statistically significant, but not clinically meaningful reduction in pain and MMO compared to sham or other intervention. Manual therapy did not statistically improve PPT of the masseter or temporalis muscles compared to sham and other intervention, but effects were large and potentially clinically meaningful. Efficacy of MT remains unclear due to imprecision of treatment effects.

Discussion/Conclusion: Using the GRADE approach, evidence quality was moderate for the effects of MT on pain and MMO, and low for PPT of the masseter and temporalis muscles. There may be benefits of UC spine MT on TMJ dysfunction, but definitive conclusions cannot be made due to heterogeneity and imprecise estimates of treatment effect. Clinicians must recognize that provider preference and expectations of MT may influence subjective outcomes. Future studies could explore specific patient characteristics to guide clinical decision making. For now, further high-quality trials are needed to draw definitive conclusions about the impact of UC spine joint mobilization/manipulation on TMJ outcomes.

ID: 55 (Poster)

Alan Lam

Title: THE EFFECT OF LUMBAR INTERVENTION ON CUBOID SYNDROME IN A DANCER: NEUROLOGICAL AND BIOMECHANICAL IMPLICATIONS WITHIN A CLINICAL REASONING APPROACH

Background/Purpose: Cuboid syndrome is prevalent in roughly 17% of professional ballet dancers and is commonly attributed to trauma or overuse. While studies support various interventions to treat cuboid dysfunction, none have examined the role of the lumbar spine (LS) nor the efficacy of spinal interventions in treating this condition. This case report highlights the neurological and biomechanical relationship between the LS, peroneus longus (PL), and cuboid to inform the treatment of a dancer with cuboid pain.

Case Description: A 24-year-old female ballet dancer reports new, insidious onset of 4-month history of pain over the right plantar cuboid and PL, with weakness and apprehension when going on her right tiptoes. She has a history of recurrent lateral ankle sprains which resolved with physical therapy and exercises directed to the foot/ankle; currently, these approaches have not afforded relief. The Lower Extremity Functional Scale (LEFS) was 56/80, the Numeric Pain Rating Scale (NPRS) was 0/10 at rest, 4/10 when jogging, and 7/10 when going on her right tiptoes. Examination reveals key muscle weakness of right L5/S1, atrophy and weakness (3+/5) of the right PL and decreased single-leg plantarflexion (right: 14 repetitions, left: 25 repetitions). Hypomobility of L2/3, L5/S1 anterior instability, and painful laxity of the plantar ligaments were noted; ankle/foot mobility was unremarkable. There was tenderness and hypertonicity of the PL, plantar cuboid, and lumbar paraspinals, with sympathetic activity elicited during lumbar palpation. An 8-week treatment program included postural education and spinal awareness, upper lumbar distraction manipulation, muscle-assisted-mobilization, lumbar paraspinal dry needling, PL proprioceptive exercises, and static progressing to dynamic activation of the multifidi and deep stabilizers in functional dance positions.

Outcomes: Cuboid and PL pain decreased from NPRS 2/10 (Week 4) to 0/10 (discharge) during jogging and from 5/10 (Week 4) to 1/10 (discharge) when standing on the right tiptoes. At discharge, the LEFS score was 70/80, the PL was strong and painless (4+/5), and key muscle testing and lumbar mobility were WNL. Laxity at L5/S1 resolved with active bracing techniques, and single-leg plantarflexion on the right increased to 27 repetitions pain-free.

Discussion/Conclusion: Application of functional anatomy and biomechanics was critical to guide the clinical reasoning process. Insidious pain, recalcitrance to localized treatment, neurological weakness, signs of spinal facilitation, and biomechanical findings at the LS suggest a spinal cause for the patient's distal impairments. The neurological association between L5/S1 and the PL supports treating the spine to improve the health and function of the PL. The biomechanical link between the PL and the cuboid-pulley system necessitates the importance of restoring motor integrity of the PL to achieve cuboid stabilization during load transfer activities. This case outlines the importance of integrating key findings with knowledge of regional interdependence in formulating a diagnosis and treatment to ensure successful outcomes.

ID: 13 (Poster)

Caitlyn Lang, Abbey Phelps, Elizabeth Knoble, Iago Pinto, Sean Harris, Nicole Baker

Title: Predictors Associated with Revision Surgery for Patients with Low Back Pain

Background/Purpose: Low back pain (LBP) is the leading cause of disability worldwide creating a global healthcare burden. Approximately 1.8% of individuals with LBP receive surgery, and of those that receive an initial surgery, 2% go on to receive a second surgery, known as revision surgery. Revision surgeries are typically more challenging to perform, are associated with increased hospitalizations, and increase an individuals risk for developing complications including chronic pain and disability. Healthcare costs for LBP fall between $300-$600 billion spent annually. Revision surgery costs account for approximately 10% of the annual cost at $30-60 billion. Predictors found in the current literature for revision surgery include previous lumbar surgery, age, obesity, duration of symptoms, smoking, physiological distress, fear avoidant behaviors, and low education or socioeconomic status. However, no associations have been found between objective outcomes and risk of revision surgery. Therefor, it is the purpose of the study is to determine what objective and self-reported variables at initial physical therapy examination are associated with the need for a revision surgery for their LBP.

Methods: In this study, a retrospective chart review was performed to identify 191 individauls with LBP between the ages of 18 and 80 who were evaluated by a physical therapist immediately before receiving lumbar surgery. Of these 191 individuas, 178 had significant enough improvement in symptoms to avoid receiving another surgery, while 13 received a revision surgery within a 2 year period. Individuals with additional surgeries unrelated to the initial complaint, neurologic condition, or any red flags such as bowel and bladder changes, saddle anesthesia, or paralysis were excluded from this study. The instrumentation utilized consists of several physical performance tests (PPT) with a novel criterion-based scoring system called the Functional Lumbar Index (FLI). The FLI has been shown to be reliable and valid on this patient population in recent studies and has a minimum score of 0 (poor overall performance) and a maximum score of 11 (high overall performance). For between group analysis, independent t-tests were used for continuous variables and chi-square for categorical variables were performed. A manual, backward Poisson regression analysis was used to predict the likelihood of receiving a lumbar revision surgery.

Results: Results from between group baseline comparisons found nonsignificant differences ($p>0.05$) between surgical success (n = 178) and surgical revision (n = 13) groups for the following variables: gender (50.6% female vs 30.7% female), race (82.6% white vs 84.6% white), pain below knee (64.6% present vs 53.9% present), advanced imaging (98.3% vs 100%), neurologic examination (64.6% present vs 61.5% present), limited range of motion (89.3% vs 84.6%), neurodynamic examination (82.0% positive vs 84.6% positive), age (64.79 vs 64.0), BMI (29.66 vs 27.4), pain at worst (0-100) (29.66 vs 27.4), pain at best (0-100) (31.71 vs 26.08), modifieid Oswestry Disability Index (45.33 vs 36.62), and FLI (3.67 vs 4.85). The above listed variables were included as predictors using a manual, backward Poisson regression analysis to predict likelihood of needing a lumbar revision surgery. The results of this Poisson regression were non-significant ($p = 0.436$) with a final model likelihood ratio of 3.785. None of the included variables added to the prediction of surgical revision in this model.

Discussion/Conclusion: Results indicate no significant difference in all outcome measures assessed when comparing the surgical success group to the surgical revision group. This further speaks to the

complexity in diagnosing and appropriately treating individuals with LBP. These results are also consistent with other studies where it has been difficult to associted objective measures with risk or severity of LBP. Though not statistically significant, the revision group demonstrated higher pain, lower disability, and higher function. These findings might be explained by fear-avoidant behavior that was not assessed in this study and with a larger sample size could result in statistical significance. Further research could utilize the FABQ to assess the cognitive component associated with pain internalization and patient perceived need for spinal revision surgery.

ID: 52 (Platform)

Felix-Antoine Lavoie, Marc-Olivier St-Pierre, Kerry Gilbert, Jean-Philippe Paquin, Richard Ellis, Stéphane Sobczak

Title: Neurodynamic management of superficial fibular entrapment neuropathy: when cadaveric research assists clinical practice

Background/Purpose: Superficial fibular nerve entrapment could represent up to 3,5% of chronic lower limb pain. A specific neurodynamic mobilization for the superficial fibular nerve (SFN) has been suggested in the reference literature for manual therapists to evaluate nerve mechanosensitivity in patients. Mechanosensitivity is linked to mechanical strain applied to a nerve by a manual therapist. However, no biomechanical studies examined the ability of this technique to produce nerve strain. Therefore, mechanical specificity of this technique is not yet established.

The purpose of our study was to test whether this examination technique was producing nerve strain in a cadaveric setting and the contribution of each motion to total longitudinal strain. Arising from this study, safety data from this mobilization could also be established

Methods: We inserted a differential variable reluctance transducer in ten SFN exiting from the crural fascia of six fresh frozen cadavers to measure strain during the mobilization. A specific sequence of plantar flexion (PF), ankle inversion (INV), Straight Leg Raise (SLR) position and 30° of hip adduction (ADD) was applied to the lower limb. The mobilization was repeated at 0°, 30°, 60° and 90° of SLR position to measure the impact of hip flexion position. Each measure was repeated 3 times and an intraclass correlation coefficient (ICC) was established to ensure data reliability.

Results: Compared to a resting position, this neurodynamic mobilization produced a significant amount of strain in the SFN (7.93% ± 0.51, P ± 25.82) and INV (32.80% ± 21.41) accounted for the biggest proportion of total strain during the mobilization. No significant difference was reported between different hip flexion positions. Hip ADD did not significantly contribute to final strain (0,39% ± 10.42, P> 0,05) although high subject variability exists.

Discussion/Conclusion: Clinicians should consider ankle motions the most important during neurodynamic assessment of the SFN. Hip flexion positions significantly increased strain in the SFN regardless of the degree of flexion during SLR. Clinically, a high subject variability would mean clinicians have to investigate neuropathic pain and neurodynamic assessment from different angles and motions. These results suggest that this technique produces sufficient strain in the SFN and could therefore be evaluated In Vivo for correlation with mechanosensitivity. Additionally, this technique can be considered safe as maximal strain was lower than the amount known to cut off neural blood flow (15,7%). Further studies on live tissue should be conducted to evaluate strain in the living and it's clinical efficacy using tools such as shear wave elastography.

ID: 85 (Platform)

Kara Lee, Rob Swayze, Matthew Lee

Title: BOOSTING MANUAL THERAPY SKILLS AND CLINICAL REASONING BY THE APPLICATION OF A CURRICULUM DURING A TERMINAL CLINICAL EXPERIENCE: A QUALITATIVE PERSPECTIVE FROM PT STUDENTS AND CLINICAL INSTRUCTORS

Background/Purpose: Physical therapy (PT) student clinical education is a standard part of professional graduate education with the purpose of facilitating students' application of didactic knowledge in authentic clinical environments. However, there is significant variation in outpatient sites specific to patient caseload and conditions seen, which may impact experience quality, specific to the breadth and frequency of clinical reasoning (CR) strategies and manual therapy (MT) skill utilization. This variation may influence knowledge transfer, skill exposure and student career trajectory. Traditionally, most clinical sites do not offer structured learning formats, focused on fundamental skill application and teaching of MT and CR. A clinical course curriculum implementing weekly objectives for the PT student and a structured teaching format for CIs, may augment MT and CR knowledge transfer. This pilot project aimed to compare Physical Therapy (PT) student and Clinical Instructor (CI) experiences with and without use of a structured clinical educational outpatient experience curriculum, focusing on the implementation of MT techniques (thrust and non-thrust, upper and lower quarters) and CR concepts.

Methods: A mixed method educational research survey using both quantitative and qualitative components was used with six PT/CI pairs, three using a curriculum and three a traditional approach. All participants completed electronic pre- and post-course surveys. Additionally, one investigator interviewed those in the curriculum group 1-2 weeks after course completion.

Results: Three experienced academic and clinical educators utilized a grounded theory approach to extract common themes from the clinical curriculum group. Several PT student themes emerged. Applying greater content breadth than the patient caseload reflected (for both MT and CR domains). The explicit structure empowered the PT students to know how to prepare, plan and prioritize weekly. A layered learning strategy (information was taught, then reinforced contextually) resulted in deeper knowledge. Common CI themes emerged. Applying a greater content breadth than what the patient caseload reflected. The curriculum empowered PT students to prepare, therefore driving their learning experience for greater CR. Newer CIs gained confidence, experienced Cis could prepare weekly. Additional shared themes were frequent and intentional communication and curriculum flexibility, allowing for clinical realities.

Discussion/Conclusion: Use of a clinical experience curriculum resulted in several shared themes. Greater content breadth (both for MT and CR). Regular, intentional communication. And the capability for both parties to prepare and plan for layered learning in the context of patient care.

This pilot study's themes suggest positive learning and teaching experiences with a curriculum, during a clinical experience with clinical application of more MT and CR skills compared to a traditional approach where the caseload dictates clinical content.

ID: 58 (Poster)

Griffin Lee

Title: PRACTICAL USE OF THE INTERNATIONAL CLASSIFICATION OF HEADACHE DISORDERS, 3rd EDITION, IN THE DIAGNOSTIC PROCESS FOR A PATIENT PRESENTING WITH MIXED-HEADACHE: A CASE REPORT

Background/Purpose: The International Classification of Headache Disorders, 3rd edition (ICHD-3), is a well-accepted guide for classification of headaches. The ICHD-3 is of particular interest to physical therapists, as it provides guidance on diagnosis of headache subtypes not addressed in the Clinical Practice Guidelines for Neck Pain. Evidence suggests, however, that physical therapists' consistency of classification of headaches with ICHD-3 criteria is low, which may lead to inappropriate management and poor outcomes. The purpose of this case study is to illustrate physical therapist use of the ICHD-3 in diagnosis of a patient with mixed-headache.

Case Description: A 39-year-old female presented to physical therapy with a referring diagnosis of mixed-headache. Based on subjective reports, she met the criteria for chronic tension-type headache, as she noted daily headaches for over three months, headache lasting hours to days, and bilateral location with a tightening quality. She did report a second, distinct headache that was unilateral and could occur in the occipital and/or frontal region and was often felt behind the eye. She denied sensitivity to light and sound, as well as nausea and vomiting with both headache types. There was strong suspicion of cervicogenic headache as the second type of headache based on a positive cervical flexion-rotation test. However, diagnosis based on the ICHD-3 criteria for cervicogenic headache was questionable, in part due to no lesions found on imaging within the cervical spine or soft tissues of the neck known to cause headache and she had not had a diagnostic blockade performed. The only criteria that she clearly met was cervical range of motion being reduced and headache made worse by provocative maneuvers (posterior to anterior mobilization of C1-2 facet joints). Based on the overall presentation and use of the ICHD-3, it was assumed the patient was experiencing both tension-type and cervicogenic headaches. The patient participated in 11 visits of physical therapy over an 8-week period with interventions that have been demonstrated to address both tension-type and cervicogenic headaches, including joint mobilizations to the upper cervical and thoracic spine, soft tissue massage to the upper quarter and neck, and scapulothoracic muscle strengthening.

Outcomes: Headache frequency was reduced from daily to one headache per week. Neck Disability Index scores improved from 30% to 18%.

Discussion/Conclusion: Use of the ICHD-3 has potential to improve physical therapists' ability to classify headaches and improve outcomes, especially when diagnosis is uncertain, or the patient is experiencing multiple headache types. The ICHD-3 is a useful tool, but the entirety of the clinical picture should be used in the diagnostic process and to inform clinical management.

ID: 99 (Poster)

Matthew Lee, Tara Buckles

Title: CLINICALLY REASONING THE MULTIFACTORIAL PAIN MECHANISMS CONTRIBUTING TO CHRONIC OROFACIAL AND CERVICAL SPINE PAINS FOLLOWING TOOTH EXTRACTION: A CASE REPORT

Background/Purpose: Clinical reasoning for neck and orofacial pains may be challenging when multiple pain mechanisms are simultaneously present. Neck and orofacial symptoms may exhibit nocioception. Nocioplastic pain from prolonged or intense symptoms and sensorimotor mismatches involving vestibular oculomotor dysfunction may yield unconventional symptom behaviors. Movement dysfunction compounded by extreme or prolonged lack of physical activity and poor health may influence symptoms. Furthermore, psychosocial factors may amplify or augment symptoms. The purpose of this case report is to describe multifactorial pain mechanisms and the clinical reasoning process for treating these mechanisms for a complex patient reporting persistent orofacial and neck pains with unsteadiness following a tooth extraction.

Case Description: A 64 year old, wheel chair bound man was referred from an orofacial pain clinic reporting a painful left sided tooth extraction the prior year. He reported left orofacial and neck pains, feeling of left facial swelling (until the eye closed) and dizziness. He was limited with talking, chewing, smiling and computer/TV use. He was cleared by pulmonology, cardiology, ophthalmology, ENT and dentistry. Symptoms worsened throughout the day or with fatigue. His wife assisted with home care. He was unemployed, reported poor sleep and had multiple co-morbidities.

Significant physical exam findings were painful palpation and hypersensitive light touch sensation to the left face. Cervical spine range of motion was limited and painful (neck and face). Visual tracking and convergence reproduced facial pains and sensations of unsteadiness and facial swelling. Joint mobility testing left C1/2 reproduced neck and face pains. Numeric pain rating scale (NPRS) 5/10. Neck Disability Index (NDI) 50%. TMD Disability Index Questionnaire (TMDDIQ) 45%. Patient Specific Functional Scale (PSFS) 3.68 (chewing, talking, smiling). Treatment included manual therapy, exercise, vestibular oculomotor interventions and home-based education.

Outcomes: After five treatments the patient exceeded minimally clinically important differences: NPRS 0/10, NDI 34%, TMDDIQ 5%, PSFS 10. Global Rating of Change +5. 95% perceived improvement with symptoms and overall function. Six-month follow-up reported full function.

Discussion/Conclusion: Clinical reasoning and treatment selection relied on examination findings, suggesting multiple pain mechanisms simultaneously: Unique symptoms, (facial swelling), symptom pattern/behavior, hypersensitivity, sensorimotor mismatches, unusual and long history, lack of movement and disability/poor health.

Intra-session reassessment provided guidance because each intervention influenced all symptoms, potentially suggesting treatment decreased neural excitability. Manual therapy diminished oculomotor dysfunction, sensation of facial swelling and neck pain. Oculomotor interventions improved neck symptoms and sensation of swelling. Exercise and education diminished all symptoms.

This patient with uncharacteristic symptoms post tooth extraction, appeared to benefit from a manual therapy, exercise, vestibular intervention after a clinical reasoning process utilizing a pain mechanisms approach and reassessment.

ID: 62 (Poster)

Michael Losensky, Sabrina Wang, Joel Bialosky, Jason Beneciuk

Title: Successful Management of Flexor Hallucis Longus Dysfunction In a Patient With Severe Midfoot Sprain - a Case Report

Background/Purpose: Dorsiflexion of the metatarsal phalangeal joints assists in stiffening of the foot through the windlass mechanism; proper mechanics of the osseous structures along with proper muscle function are critical to the windlass mechanism for dynamic force transfer during stance phase of gait. Severe midfoot sprains may potentially lead to excessive hindfoot and midfoot valgus-flat foot during weightbearing. This loss of ligamentous stability can increase force demands placed on muscles as the secondary stabilizers and lead to pain, gait abnormalities and muscle dysfunction. This case report illustrates the successful management of a patient with flexor hallucis longus (FHL) dysfunction utilizing manual therapy and exercise to improve functional mobility.

Case Description: A 51-year-old female presented to an outpatient physical therapy clinic with right anterior and medial ankle pain, secondary to a severe midfoot sprain four months prior. Radiographs were negative for acute fracture. Upon evaluation, the patient reported a 9/10 on the numerical pain rating scale (NPRS) during ambulation and a 21/100 on the Lower Extremity Functional Scale (LEFS). Physical examination included following: decreased medial arch in standing compared to uninvolved side, decreased ankle range of motion (ROM) in all planes due to pain, limited passive great toe extension to 7° compared to 45° on uninvolved side, hypermobility of the talonavicular joint, hypomobility of subtalar joint, and decreased FHL motility/flexibility. The patient wasn't able to perform double or a single leg heel raise secondary to pain and weakness. Gait assessment demonstrated hindfoot valgus and decreased medial arch height in stance phase of gait with decreased step length. Treatment included soft tissue work of the FHL distal tendon, manual mobilization of the subtalar joint, progressive stretching of FHL, and eccentric plantar flexion strengthening to maximize gait efficiency. The patient's HEP reinforced these eccentric exercises and ergonomic modifications for better tolerance in walking.

Outcomes: The patient completed 5 visits over the course of 6 weeks. Once treatment focused on proper function of the FHL, the patient demonstrated increased great toe extension active range of motion to 40° and increased single leg heel raise height from 0 cm to 6 cm. Clinically meaningful improvements included decreased pain to 1/10 during ambulation and increased LEFS score from 21 to 57.

Discussion/Conclusion: This case describes the successful management of FHL dysfunction to assist in weight transfer during stance phase of gait in a patient with severe midfoot sprain. There is limited research on the relationship of those with midfoot sprains and FHL function, therefore further research is warranted.

ID: 54 (Poster)

Tatiana Malkina, Robert Fleming, Chris Showalter

Title: THE EFFECT OF CERVICAL JOINT MOBILIZATIONS ON THE SELF-REPORTED VOICE QUALITY AND FUNCTION IN A PATIENT WITH CERVICAL DYSPHONIA

Background/Purpose: Cervical dysphonia is a condition affecting voice production, resulting in a significant negative impact on the quality of life and work performance. Postural biomechanics and alignment related to cervical spine and shoulder have been shown to play a vital role in voice production and have a direct impact on voice quality.1,2 Increased frequency and intensity of musculoskeletal pain in the cervical, thoracic and shoulder areas have been linked to various vocal complaints in women, including cervical dysphonia.3 Despite a reported lifetime prevalence of as much as 30% in a general population, and a 57% lifetime prevalence in professional voice users, little scientific evidence is available regarding effective treatment modalities and strategies.4 Behavioral voice therapy, as well as manual circumlaryngeal massage are some of the currently accepted treatment techniques for cervical dysphonia.5 Low-level evidence exists supporting the benefit of education and therapeutic exercises to address posture, muscular imbalances, and cervical mobility in order to improve voice quality and production.

The purpose of this case study is to evaluate and report the effects of orthopedic manual therapy (OMT), particularly the use of accessory joint mobilizations of the cervical spine and its effects on the quality of voice production, self-reported pain scale, and upper quarter function in a patient with cervical dysphonia.

Case Description: A 26-year-old Female with a 5-year history of cervical pain, presented with a progressive onset of vocal complaints over the past 6 months without an aggravating event. The patient reported upper cervical and anterior neck stiffness, pain, vocal strain and fatigue. Prior treatment included evaluation by a neurologist and ENT, vocal therapy, trigger point and Botox injections without symptom relief. The patient was currently undergoing physical therapy treatment and completed 21 sessions without functional or subjective improvement and was referred to an orthopedic manual specialist (COMT) for a second opinion.

The patient presented with cervical and thoracic impairment, which included postural dysfunction, moderate deep neck flexor weakness, as well as intervertebral and accessory joint hypomobility of upper and mid-cervical vertebral segments. The patient subjectively reported a high Numeric Pain Rating Scale (NPRS) score of 8/10 related to her neck pain and a perceived Neck Index Disability (NDI) score of 46%.

Over the course of 4 sessions, cervical joint mobilizations to upper and mid cervical spine were applied for durations of up to 10 minutes, followed by corrective cervical and thoracic stabilization and strengthening exercises to improve postural alignment and muscular endurance.

Outcomes: At discharge, an improvement in active physiological and accessory cervical joint mobility was achieved. A reduction of vocal strain and an overall improvement in self-perceived quality of voice and function was reported. There was a self-reported reduction in pain level by 6 points on NRPS scale and an 18-point improvement of NDI score.

Discussion/Conclusion: Significant improvement in cervical mobility, pain level and functional disability were observed following the application of targeted joint mobilizations to the cervical spine over the course of 4 sessions in a 26-year-old female with cervical dysphonia. Improvement in self-perceived voice quality and fatigue were also reported and must be further objectively evaluated with the use of Voice Handicap Index (VHI).

ID: 12 (Poster)

kevin Maloney, Michelle Sutherland, Ian Aviles Lopez, Kaitlyn Boyer, Sean Harris

Title: WHAT IS THE RELATIONSHIP BETWEEN THE NUMBER OF PT VISITS AND POST-OPERATIVE OUTCOMES FOLLOWING LUMBAR OR CERVICAL SURGERY?

Background/Purpose: Spine related pain is a common musculoskeletal complaint that poses a huge burden from an individual and socioeconomic standpoint. Surgical costs associated with spine related pathologies have increased ~64% from 2001-2015. With the increasing costs/frequency of spine surgery, it is important to understand the post-operative outcomes from these surgeries. Physical therapy (PT) is commonly received by patients following their surgery to aid in recovery and return to previous levels of function. There is very little research analyzing the relationship between the frequency of PT visits and post-operative outcomes after lumbar and cervical surgery.

Purpose: (1) To examine the relationship between frequency of PT visits and post-operative outcomes after lumbar or cervical surgery. (2) Determine what factors predict PT utilization during post-operative care for lumbar or cervical surgery.

Methods: A retrospective chart review was performed using data from an ongoing clinical registry with UT Orthopedic Spine Surgery and Mischer Neuroscience Center. Participants were included into the study if they received a spine surgery from a participating physician and were between the ages of 18-80 years. Patients were excluded if they received multiple surgeries within the same plan of care or had neurologic conditions such as stroke, TBI, etc.). Patient-reported outcome measures included Numeric Pain Rating Scale (0-100), Neck Disability Index (NDI), and modified Owswestry Disability Index (mODI). Objective criteria consisting of range of motion, strength, and physical function was also collected.

Results: Results from within group analysis show statistically significant differences ($p < 0 .05$) between baseline and post-operative timelines for the following variables: Pain (68.31 vs 34.12), mODI/NDI (35.19 vs 21.39), limited ROM (90% vs 59%), neurologic exam (67% present vs 45% present), and distal pain (57% present vs 11% present). The average number of PT visits was 13.27 over an average of 9.24 weeks of PT. Change score correlations were performed using a Pearson correlation, which found a non-significant correlation ($p=0.634$) between number of PT visits and pain with an R-value of -0.043. A statistically significant, negative correlation was found ($p=0.035$) between number of PT visits and disability score with an R-value of -0.186. A multiple linear regression was performed with age, BMI, pain, distal pain, disability, neurologic examination, and limited ROM as predictors of number of PT visits with an inclusion of 0.05 and exclusion of 0.1. The results of this model were non-significant ($p=0.766$) with an R-squared value of 0.038. None of the predictors were found to significantly predict number of PT visits.

Discussion/Conclusion: The results from this study indicate that all patients receiving spine surgery demonstrated improvements in subjective and objective measures over time. Although it was weak, a significant negative correlation was found between number of PT visits and disability. This would indicate that as the number of PT sessions went up, disability went down. It is possible a non-linear relationship exists that would need a more advanced analysis to discover. The lack of linear relationship between number of PT sessions and outcomes could be explained by multiple factors. Some possible contributing factors include patient relationship with therapist, patient's schedule availability, differences in pain

levels contributing to arrival rate, cost of therapy, and use of other conservative treatment options. These results suggest that we may need more information outside from this subjective and objective measures to be able to predict post-operative outcomes in spine surgery patients.

ID: 31 (Platform)

Garrett Mandel, Todd Bourgeois

Title: MANUAL SOFT TISSUE MOBILIZATION TO OBTURATOR MUSCLES IMPROVES SYMPTOMS OF DISCOGENIC BACK PAIN

Background/Purpose: Pathology to the lumbar disc can place pressure on nerve roots, impacting signs and symptoms from the low back through the lower extremity. Research has been directed to the investigation of discogenic low back pain and intervention strategies. However, there is a paucity of literature connecting the obturator muscles as a pain-generating tissue imitating discogenic symptoms. The purpose of this case report is to highlight how manual intervention applied to the obturator muscles can improve discogenic symptoms.

Case Description: The patient was a 35-year-old male self-referred to physical therapy for complaints of low back and posterior hip pain. The patient experienced a sudden onset of pain in the low back while lifting a 45-pound kettlebell. The initial visit took place one week later where symptoms were reported in the left low back and posterior left hip primarily with bending and sitting. Lumbar active range of motion and a squat with left hip internal rotation was limited and painful. The patient was also positive with a slump test on the left, palpable gluteal tenderness, and a reproduction of symptoms with palpation to the obturator internus/externus. The PT proceeded as though discogenic pathology was present. The patient was seen for a total of 5 visits over the course of 5 weeks. Interventions were primarily directed to the obturator muscles via dry needling and soft tissue manipulation. The patient completed prescribed supportive interventions directed towards core stability.

Outcomes: Reduction in low back pain and significant improvement of the squat with left hip internal rotation occurred after the first visit. Remaining symptoms in the deep gluteal region resolved over the course of the plan of care from an 8/10 at the initial visit to 0/10 at the final visit using the visual analog scale. A significant improvement was found on the Oswestry Low Back Pain Disability Questionnaire from 27/50 (54% disability) day 1 to 0/50 (0% disability) after the final visit. At discharge, the slump test was negative and lumbar active range of motion was fully restored. The patient reported an ability to bend, sit as needed for his occupation, and return to unrestricted activities.

Discussion/Conclusion: Manual therapy was performed via dry needling and soft tissue techniques applied to the obturator musculature. This case report demonstrates the effectiveness of physical therapy intervention directed towards the obturator muscles in the management of symptoms related to discogenic back pain. In the presence of discogenic symptoms, physical therapists should consider the concomitant impact of the obturator musculature.

ID: 91 (Poster)

Sarah McAuliffe, Alex Bengtsson

Title: BACK TO THE EMERGENCY ROOM: A CASE SERIES DEMONSTRATING THE CLINICAL REASONING BEHIND CELLULITIS

Background/Purpose: Physical therapists (PTs) are increasingly being recognized as direct access providers. Consequently, PTs must be able to recognize potentially life-threatening conditions to make appropriate medical referrals without assuming appropriate medical screening by previous providers. The purpose of this case series is to describe the clinical reasoning for emergency department (ED) referral for two patients with cellulitis that had previously seen other healthcare providers (HCPs).

Case Description: The first patient was a 56-year-old male with past medical history (PMH) of hypertension, diabetes mellitus, and amputation following osteomyelitis of right first and second toes. He was seen in the ED nine days prior to PT evaluation, where he was diagnosed with "sciatica," prescribed valium, Norco, ibuprofen and discharged. He had a follow up with his primary care physician (PCP) and was referred to an outpatient orthopaedic PT clinic. Upon PT examination, the patient reported disequilibrium, swelling in the right lower extremity, and feeling feverish. His resting heart rate was 105 beats per minute (bpm) and blood pressure was 86/56 mmHg. Additional concerning findings included redness of the right shank and foot, pitting edema, warmth, and impaired sensation in a non-dermatomal pattern on his right shank. The second patient was a 44-year-old female referred to PT by an orthopedic surgeon for "right knee osteoarthritis." The PMH included complex surgical history and right lower extremity deep vein thrombosis (DVT) following motor vehicle collision a year prior. She reported onset of right knee pain and swelling four weeks ago, for which she had been prescribed antibiotics by her nurse practitioner and diuretics by her PCP without any lab testing for infection. Upon physical examination, the patient demonstrated pitting edema, warmth, and redness of the right lower extremity. Her vital signs were abnormal, with a resting heart rate of 125 bpm and blood pressure of 137/93 mmHg. Based on these findings, the evaluating PT was concerned for DVT or infection in both patients.

Outcomes: Both patients were immediately referred to the ED where they received medical work up for the diagnosis of cellulitis. The male patient was hospitalized for five days with intravenous (IV) vancomycin. The female patient was hospitalized for five days, requiring IV vancomycin and surgical drainage of a 20x19x10 cm abscess in the right medial thigh.

Discussion/Conclusion: Since the adoption of direct access practice, PTs must be able to recognize a variety of acute medical conditions that require referral to other healthcare providers. In both cases, the patients had previously been seen by multiple HCPs that did not appropriately recognize a potentially life-threatening condition and applied treatment without appropriate diagnostic testing. The PT was able to recognize signs and symptoms requiring urgent medical referral, leading to the patients receiving appropriate treatment and making full recoveries.

ID: 71 (Poster)

Renzo Mendoza, Alexandra Anderson, Carol Courtney

Title: A pain mechanisms approach in the successful management of a patient with a history of cerebrovascular accident and lower extremity pain

Background/Purpose: The lumbar spine may be a source of lower extremity symptoms even in the absence of spinal pain, typically due to centrally mediated secondary hyperalgesia. Furthermore, in patients with health disparities and inequities, the dominant pain driver can be challenging to identify and manage optimally. The purpose of this case report is to discuss the successful treatment of a patient with spine-related knee pain with a complex medical and social history.

Case Description: A 59-year-old female with a consult for physical therapy presented with left chronic knee and acute heel pain. Left anterior knee symptoms were described as a constant 6/10 burning pain, which her physician attributed to an intracranial hemorrhage as symptom onset followed her discharge from in-patient rehabilitation 6 years prior to her evaluation. The pain spread to the thigh and shin with walking long distances, bending, and uninterrupted sleeping. Left heel symptoms were described as a sharp and quick 3/10 nail-like pain occurring with weight bearing activities. Additional examination findings included a recent history of falls and emotional distress due to functional decline.

Neurological exam findings included allodynia at her anterior knee, which was mapped and measured. Other neurological exam findings were unremarkable. Both knee and heel symptoms were reproduced with active range of motion of the lumbar spine, a slump test and passive joint accessory intervertebral mobility testing at L2-3/L3-4.

Initial scores on the patient specific functional scale (PSFS) were 2/10, 5/10, and 6/10 for walking 2 blocks, sleeping 6 hours, and bending down to clean at work, respectively. She initially scored a 5/80 on the lower extremity functional scale (LEFS) and 12/24 on the Leeds assessment of neuropathic symptoms and signs pain scale (S-LANSS). Timed-Up Go score was 20 seconds, indicating fall risk.

A progression of lumbar flexion-rotational physiological mobilizations was implemented to address referred nociplastic pain to the left lower extremity. Exercises included lumbar rotation-based activities to reinforce pain modulatory effects of manual therapy. Patient education was tailored towards stress management, patient safety with an assistive device, and symptom-based activity progression.

Outcomes: At follow up Visit 5, the patient's knee, and heel pain as well as allodynia were completely resolved. Clinically significant changes on the PSFS included an 8/10 in walking and 7/10 in sleeping, with no change in bending attributed to continued balance deficits. Her LEFS improved to 48/80 and her S-LANSS improved to 1/24.

Discussion/Conclusion: This case report details the importance of considering pain drivers from the spine, comorbidities, and yellow flags as contributing to chronic lower extremity pain. This reinforced the development of a multifaceted plan of care that optimized recovery. Further research is warranted to determine benefits of a pain mechanisms-based approach in patients with a history of a cerebrovascular accident.

ID: 72 (Poster)

Renzo Mendoza, Leanna Blanchard, Alison Duncombe

Title: Manual therapy of the cervical spine and temporomandibular region for successful management of Trismus following Maxillofacial reconstruction and craniocervical radiation

Background/Purpose: The use of maxillofacial surgery and reconstruction in addition to radiation therapy has been emphasized in recent decades to improve survival rates in patients with head and neck cancer. Trismus is a well-recognized secondary complication of oral surgery that can limit quality of life. The purpose of this case report is to discuss the use of orthopedic manual physical therapy in the management of a patient with trismus after maxillofacial reconstruction and craniocervical radiation.

Case Description: A 57-year-old female presented to physical therapy with trismus and pain following right partial maxillectomy and sternocleidomastoid rotational flap to address squamous cell carcinoma of her maxilla. The patient's right scalp and jaw pain were described as a constant ache and ranged from 6-10/10 on the numeric pain rating scale (NPRS). Symptoms would spread to her right neck and shoulder, worsening with activities such as yawning, eating, and prolonged speaking. Due to functional limitations after the initial surgery, she had a percutaneous endoscopic gastrostomy (PEG) placed for medication administration and nutrition.

Mandibular depression, right, and left lateral deviation were 14 mm, 5 mm, and 0 mm, respectively. Right cervical rotation was limited at 42 degrees, compared to 55 degrees to the left. Palpation of the right masseter produced referred jaw and neck pain. Right unilateral posterior-anterior (PA) glides of C3-4 facet provoked familiar symptoms at the jaw and superior shoulder. The right temporomandibular joint (TMJ) was limited in anterior, inferior, and lateral glides, and the left was limited anteriorly and inferiorly. The jaw functional limitation scale (JFLS) at initial evaluation indicated 76% disability.

A progression of TMJ passive accessory mobilization in the inferior, anterior and combined directions were used bilaterally to address mechanical deficits in depression and lateral deviation. This was reinforced through instruction of long duration stretching in each respective direction. A progression of unilateral C3-4 PA glides was applied to address referred pain and was reinforced by towel assisted self-mobilization exercises. Patient education was tailored towards addressing risk of radiation fibrosis, and grading progression of activities based on mobility and symptoms.

Outcomes: At discharge, the JFLS reduced to 53% disability. TMJ depression and left lateral deviation improved to 25 mm and 12 mm, respectively. Cervical rotation improved to 70 degrees bilaterally. She was scheduled for obturator prosthesis fitting. Patient had her PEG tube removed and was able to eat dense foods like chicken. The global rating of change score was graded at a great deal better (6+) and NPRS ranged from 3-7/10.

Discussion/Conclusion: This case report describes successful use of manual therapy in the management of a patient with a history of maxillofacial reconstruction and radiation. Further research is warranted to determine benefits of manual therapy in patients receiving medical treatment for head and neck cancers.

ID: 86 (Poster)

Amanda Montbriand, August Winter

Title: DIFFERENTIAL DIAGNOSIS OF PLANTAR HEEL PAIN OF LUMBAR ORIGIN IN A 9-YEAR-OLD FEMALE: A CASE REPORT

Background/Purpose: Adolescent plantar heel pain is common with differential diagnoses including plantar fasciopathy, fat pad atrophy, Sever's disease, bone tumors, and calcaneal stress fracture. Clinicians frequently fail to consider the lumbar spine as a potential cause of plantar heel pain, particularly in adolescents, which can occur even in the absence of spinal symptoms. The purpose of this case report is to describe the use of an orthopedic physical therapy examination in the discovery of segmental lumbar spine dysfunction with secondary hyperalgesia creating isolated plantar heel pain in an adolescent.

Case Description: A 9-year-old female presented direct access to the physical therapy setting complaining of insidious right plantar heel pain 10 weeks prior. She denied symptoms in any other body region. Five sessions of physical therapy interventions directed locally at the foot and ankle resulted in no change in symptoms. The heel pain was described as "sharp" and rated 8/10 on the Numeric Pain Rating Scale (NPRS) with walking. Active range of motion (AROM), manual muscle testing (MMT), and palpation of the foot and ankle failed to reproduce her pain. A neurologic examination was unremarkable. Lumbar flexion AROM and straight leg raise (SLR) test recreated the heel pain. Passive accessory joint exam of the lumbar spine produced referred pain from the lateral upper leg to the ipsilateral calf. Initial intervention of graded lower extremity neural mobilization resulted in reduction to 5/10 pain with walking. Subsequent manual therapy including L4-L5 oscillatory rotation and L4-L5 unilateral passive accessory mobilization resulted in a complete reduction of symptoms.

Outcomes: At her second visit, the patient was able to walk without heel pain. Significant improvements from 37/80 to 80/80 in the patient's Lower Extremity Functional Scale score were achieved by visit 7. Subject reported Global Rating of Change Scale of +7 at visit 9. By visit 10 her single leg triple hop distance was symmetrical and heel raise strength improved from 5 to 20 repetitions. Neural mobilization, lumbar manual therapy, and spinal AROM exercise resulted in return to prior level of participation in all activities, including sports, with resolution of symptoms.

Discussion/Conclusion: Utilizing a pain mechanisms approach resulted in successful identification and management of the patient's condition. With persistent input to the dorsal horn from spinal structures, spreading distribution of symptoms can occur, even when patients may deny symptoms in the spine. While the lumbar spine has been shown to produce lower extremity pain referral patterns in adult populations, this research does not include adolescents. This case highlights the importance of the lumbar spine as a potential symptom driver in the pediatric population.

ID: 8 (Poster)

Brett Neilson, Chris Dickerson, Jodi Young, Dan Rhon

Title: MEASURES OF SLEEP ARE NOT ROUTINELY CAPTURED IN CLINICAL TRIALS FOR LOW BACK PAIN

Background/Purpose: Because there is such a well-established association between disturbed sleep and chronic pain, leading research guidelines recommend that a measure of sleep disturbance be captured as part of a core set of outcomes in intervention trials for chronic pain. More than 50% of patients with chronic low back pain (LBP) report sleep disturbance, and sleep quality is directly associated with outcomes of pain and function in patients with LBP. Four published guidelines (2005, 2014, 2017, 2019) for best research practices in clinical trials for chronic pain have recommended the inclusion of sleep disturbance measures in order to better understand treatment effects. It is unclear if clinical trials for chronic LBP have adhered to these recommendations. The purpose of this systematic scoping review was to investigate the rate and extent to which intervention trials for chronic LBP capture and report measures of sleep.

Methods: The Preferred Reporting Items for Systematic reviews and Meta-Analysis extension for Scoping Reviews (PRISMA-ScR) guidelines were used. Literature search strategies were developed for MEDLINE (OVID interface) and PsycINFO using medical subject headings (MeSH) and keyword searches related to chronic LBP. Two independent reviewers screened abstracts and reviewed full-texts for randomized trials published from January 1, 2010 – February 28, 2021, in English of adults with chronic LBP or who met the criteria for chronic LBP consisting of symptoms persisting beyond 12 weeks. All interventions addressing pain or disability related to chronic LBP, regardless of comparator, were included. Rates of studies capturing and reporting sleep measures were calculated, as well as rates of compliance by year.

Results: There were 234 trials conducted in 41 different countries included in the final review. Only 19 (8.1%) trials assessed any sleep measure and only 9 (3.8%) utilized a reliable and valid sleep disturbance measure captured at multiple time points. This review highlights poor adherence to guideline recommendations in chronic LBP trials to date. Rates of compliance were unchanged over the 11-year review period.

Discussion/Conclusion: Intervention trials for chronic LBP do not consistently capture any measures of sleep or sleep disturbance as recommended by several published guidelines. This limits the ability to understand how sleep may influence the effects of interventions trials for chronic LBP to date.

Clinical Relevance: Given that sleep is a relevant and potential effect modifier for LBP interventions, including manual therapy, clinical trials miss an opportunity to better understand true treatment effect sizes when they do not capture sleep measures. Future intervention trials for chronic LBP should be designed with a strong methodological consideration for capture of sleep disturbance measures.

ID: 70 (Poster)

Meghan Nolting, Kevin Farrell, Candi Gardner, Danny Fleener, Joseph McEachern

Title: MODIFICATION OF MANUAL THERAPY TECHNIQUES FOR A PATIENT S/P C4-C6 ANTERIOR CERVICAL INTERBODY FUSION WITH CERVICAL RADICULOPATHY: A CASE REPORT

Background/Purpose: Background and purpose: Anterior cervical interbody fusions (ACIBF) are a common surgical procedure for cervical radiculopathy. Prevalence of cervical radiculopathy symptoms reoccurring following ACIBF is widely understudied, as is appropriate treatment for these symptoms. There are however, clinical practice guidelines indicating that manual therapy is an effective treatment tool to alleviate chronic radiating neck pain1, but this is often felt contraindicated at fused levels. The purpose of this case report is to discuss modification of common manual therapy techniques to help alleviate symptoms consistent with cervical radiculopathy in a patient who is 16 years post-op from a multi-level ACIBF.

Case Description: Case Description: A 52-year-old female presented with a 16-year history of chronic left neck pain (S1) with left arm pain (S2) that radiated down into the thumb (S3). This patient had an ACIBF at C4-C6 in 2008 due to multiple symptomatic disc bulges. The patient's current chief complaint was S3, described as tingling in the left thumb that worsened with work (assembling office chairs) for >1 hour. S1 was described as pain through the cervical spine. S2 was described as a radiating "line" from the cervical spine down the lateral shoulder and forearm to the thumb.

Initial examination findings: A) Normal neurological screen (Myotomes, Reflexes, and Sensation). B) Positive base ULTT of the right upper extremity. C) Cervical ROM: left side-bend (30°) and rotation (40°) reproduced S2 and S3. D) Joint mobility: posterior-anterior (PA) mobilizations demonstrated hypomobility with C6-C7 and C7-T1 left unilateral PA mobilizations. Patient was grossly hypomobile through thoracic spine with PA mobilizations. E) Special Tests: Spurling's compression test reproduced S2 and S3; Spurling's Distraction centralized S2 and S3.

Outcomes: Outcomes/Interventions: The patient was seen once to twice weekly for six weeks. S1 and S2 improved within three weeks utilizing manual interventions focused on opening the facet joint at C6-T1 and C3-C4, including unilateral and central PA's and neural side glides2. S3 improved following manual intervention within session but did not carryover between sessions. At three weeks, manual intervention became centered around moving the fused cervical segments as a whole with neural side glides. With this, the patient demonstrated objective improvements in the base ULTT that carried over between sessions. The patient was able to tolerate the base ULTT without an increase in S3 by the end of week six. Patient's chief complaint of "thumb tingling" improved over the 6 weeks of treatment.

Discussion/Conclusion: Discussion/Conclusion: This case presents the effect of addressing fused levels of the cervical spine to address chronic neck pain and neurological symptoms in a patient with cervical radiculopathy. This patient did not demonstrate improvement in S3 until the levels of the fused cervical vertebrae were included in manual treatment.

ID: 7 (Poster)

Thomas Olesko, Rachel Campagna, Amanda Grant, Paige Schreiner

Title: THE SHORT-TERM EFFECTS OF MANUAL LYMPHATIC DRAINAGE (MLD) ON A PATIENT FOLLOWING A TOTAL KNEE ARTHROPLASTY (TKA): A CASE REPORT

Background/Purpose: Manual lymphatic drainage (MLD) has been shown to improve lymphatic flow following post-surgical oncologic procedures. Increasing research suggests potential benefits of MLD utilization for elective orthopaedic procedures. The lymphatic system is an important component to consider while treating acute swelling for those orthopaedic procedures. Swelling can be challenging to manage with standard post-operative interventions, such as basic therapeutic exercises and neuromuscular re-education activities. The acute stage of swelling management is vital for an appropriate initial tissue healing response and for acceleration of tissue homeostasis.

Case Description: The patient was a 49 -year-old male 2 days post-op right knee total knee arthroplasty. The patient began physical therapy with extensive pain and swelling. Based on the initial evaluation, the patient was referred to a Certified Lymphedema Therapist and was medically cleared for treatment. 23 visits were utilized over a course of 13 weeks. The MLD application was front loaded at the beginning of the patient's rehab with 2 out of the 3 visits per week devoted to MLD. This was done for the first 4 weeks then tapered off to 1 time a week for 1 month and, finally, every other week for the remaining 4 weeks. All other visits were devoted to neuromuscular re-education, therapeutic activities and exercises. The patient was educated on the application and sequencing of the MLD technique and was instructed to perform 2 times a day until visible swelling and pain decreased.

Outcomes: Results showed at 4 weeks the patient demonstrated 120 degrees of active knee flexion and 0 degrees of active knee extension and was maintained at 13 weeks post-op. The Timed Up and Go results were 12.5 seconds at 4 weeks and 9.47 seconds at 13 weeks. The 6 Minute Walk Test results were 243.3 meters at 4 weeks and 365 meters at 13 weeks. In addition to functional measures, circumferential swelling measurements were taken on the affected limb. Measurements included the metatarsal heads, ankle and 10 cm increments from the base of the calcaneus. There was an improvement at every girth measurement from 7 days compared to 13 weeks post-op. Most notably at the 20 cm, 40 cm and 50 cm landmarks, there was an improvement of swelling of -6.7 cm, -6.4 cm and -8.5 cm respectively.

Discussion/Conclusion: This case report describes the short-term benefits of managing the lymphatic system acutely, in conjunction with normal post-operative management. This report describes necessary stimulation of the lymphatic system following an elective orthopaedic surgical procedure. It is unknown the amount of effect that the lymphatic management had on outcomes compared to normal rehabilitation-based strategies. Further reports should investigate the duration and amount of MLD needed and identify those individuals who would benefit from this course of rehabilitation versus standard care.

ID: 25 (Poster)

Adam Peetz, Cameron MacDonald, Bryan Dennison

Title: MANAGEMENT OF PERSISTENT POST-MASTECTOMY PAIN USING A MULTIMODAL APPROACH: A CASE REPORT

Background/Purpose: Breast cancer is the most common cancer in the world accounting for 14.8% of all new cancers in 2021. Persistent Post-Mastectomy Pain (PPMP) is a common post-surgical complication with prolonged effects that is prevalent between 42-50% of patients 2 to 12 years after surgery. Patient's with PPMP typically present with increased scapular upward rotation, similar to adhesive capsulitis motor impairments, with increased activation of upper trapezius and serrates anterior muscles. This case report describes the management and 6-month outcomes of a patient with chronic PPMP using a multimodal treatment approach.

Case Description: A 59-year-old female presented with PPMP complaining of limited shoulder motion while donning clothing and reaching into cupboards. She was 6 years status post left mastectomy with flap reconstruction and radiation treatment. Since surgery, she had an increase in left shoulder pain and tightness at the scapula and radiated to the anterior rib cage to her left hand. Her pain was 2/10 at rest and 6/10 with activity. Examination findings included impaired left shoulder strength (grossly 3+/5), limited passive and active shoulder range of motion with the largest restrictions in abduction and internal/external rotation. Prior treatments included chiropractic, acupuncture and home exercises.

Management of the patient included functional dry needling to the rotator cuff and scapula stabilizers, manual therapy directed to scapulothoracic, thoracic cage and glenohumeral joints, neurodynamics and shoulder exercises progressing motion and strength.

Outcomes: Her self-reported QuickDash score at the first visit, 5th (final) visit and 6-month follow-up were 43%, 4.5% and 4.5% respectively. Her initial patient specific functional scale (PSFS) for donning clothing was 4/10 and reaching in the cupboard 3/10. At her 5th visit and 6-month follow-up, her PSFS scores were 10/10 for both activities. Her numerical pain rating scale at baseline was: rest 2/10, activity 6/10; 5th visit and 6 months were rest 0/10, activity 1/10.

Discussion/Conclusion: Research regarding the management of patients with PPMP and chronic shoulder pain with range of motion impairments is limited. This case report describes the multimodal management of a patient with PPMP. As PPMP shares common characteristics with adhesive capsulitis, a similar multimodal approach, previously used to manage patients with adhesive capsulitis, was applied to a patient with PPMP with noted improvements in her self-reported function and pain levels. The patient had received components of the current multimodal approach in prior treatments provided by chiropractic and acupuncture providers. The differences in outcomes with this current approach was the emphasizes on serratus anterior musculature and the addition of neurodynamcic interventions. A multimodal approach may be considered as a possible treatment option for patients with similar long-term presentations.

ID: 40 (Platform)

Seth Peterson, Brett Halpert, John Heick

Title: What Do Patients with Lumbar Spinal Stenosis Think is Physical Therapy's Best Card? A Survey of Perceived Message Strength

Background/Purpose: The combination of rising surgical rates for lumbar spinal stenosis (LSS) and potential underutilization of physical therapy could add healthcare cost while exposing patients to unnecessary risk. One potential contributor to this problem may be patient beliefs, which vary between those who do and do not opt for surgery. It is possible to influence patient beliefs through awareness campaigns, particularly when the message conveyed is perceived as strong by patients. The purpose of this study was to determine which messages about physical therapy for LSS were perceived as strongest by patients and whether those messages were influenced by patient factors.

Methods: Participants reporting to outpatient physical therapy clinics with imaging or clinical evidence of LSS were asked to complete a survey containing different messages about physical therapy for LSS. Messages were designed using the Health Belief Model. Perceived message strength was scored using the Perceived Argument Strength Scale (PASS). Pain catastrophizing, pain self-efficacy, and patient expectations for physical therapy were also measured.

Results: Seventy-two patients with LSS (35 males, 37 females; mean [SD] age, 70.41 [9.86] years) with symptoms ranging from 2 months to 260 months participated in the current study. A confirmatory factor analysis was run for the scales used in this study. The message emphasizing a benefit of physical therapists as listeners who would customize a plan scored highest on the PASS (#3). Similar scores were seen for messages that emphasized benefits of education and home exercise (PASS, #2) and de-emphasized severity (PASS #4). The message that emphasized research findings was rated the least strong (PASS #1). There was a moderate correlation between expectations for improvement in physical therapy and perceived argument strength (r=0.71). Pain catastrophizing and pain self-efficacy did not influence perceived argument strength.

Discussion/Conclusion: Patients with LSS preferred a message that emphasized physical therapists as listeners who would customize a plan. The message about research outcomes was perceived as the least strong. Awareness campaigns attempting to influence beliefs or behavior of those with LSS should emphasize the individualized nature of physical therapy rather than research evidence.

ID: 37 (Platform)

Patrick Pham, Trent Harrison, Joel Bialosky

Title: Isometrics for exercise-induced hypoalgesia with an individual with patellofemoral pain syndrome

Background/Purpose: Patellofemoral pain syndrome (PFPS) is one of the most common causes of anterior knee pain in the outpatient setting in adults younger than 60 years of age. Exercise can reduce pain sensitivity in pain-free participants, as well as those with ongoing pain conditions; however, the response to exercise differs between pain free and clinical populations. Furthermore, submaximal isometric exercises result in exercise induced hypoalgesia (EIH). The purpose of this case is to describe the inclusion of sustained, submaximal isometric exercise, previously shown in experimental studies to result in EIH as a modification to the treatment approach of a patient with PFPS who was limited in exercise participation due to pain.

Case Description: A 24-year-old female was referred by her orthopedic physician to physical therapy for left knee pain with a history of an osteochondral lesion treated with a patellar osteochondral allograft approximately 3 years prior to this episode of physical therapy. The initial onset of her present symptoms occurred insidiously one year ago with gradual progression of anterior knee pain. Pain was worsened with stair climbing and prolonged walking leading to the working diagnosis of PFPS. Her salient goal includes recreational dancing. Guideline adherent treatment included open-kinetic chain exercises for the quadriceps; however, she was unable to tolerate closed chain weight-bearing activities such as the forward lunge and bodyweight squat due to pain rated as 2/10 during these activities. Treatment was subsequently modified to include isometric knee extension as submaximal isometrics have been shown to result in EIH in laboratory studies. Isometrics were performed in full extension against a cable column at 60% of her one repetition maximum for 3 sets of 60 seconds. Immediately following the isometric exercises closed chain exercises were performed with 0/10 pain.

Outcomes: Following 8 visits over 4 weeks, in which isometrics were performed prior to closed kinetic chain exercises as a means to manage her pain, clinically meaningful improvements were observed in her Lower Extremity Functional score from 46/80 to 72/80, Patient Specific Functional Scale from 2/30 to 28/30, numeric pain rating scale from 3.00 to 1.00/10. Additionally, she reported the ability to return to recreational dancing without limitations.

Discussion/Conclusion: Exercise is recommended in the management of patients presenting with PFPS; however, exercise may be painful and poorly tolerated by some patients. This case describes the modification of care for a patient with PFPS who was intolerant of exercise progression due to pain by including an isometric protocol known to result in EIH in laboratory studies. The inclusion of isometric protocol was associated with clinically meaningful improvements in pain and function.

ID: 68 (Platform)

Matthew Pugliese, Jean-Michel Brismée, Sean Riley, Brad Allen, Justin Tammany

Title: MENTORSHIP PARTICIPATION IS ASSOCIATED WITH LOWER BURNOUT LEVELS IN PHYSICAL THERAPISTS PRACTICING IN THE UNITED STATES

Background/Purpose: Burnout is an occupational and psychological syndrome defined as a state of mental and physical exhaustion caused by one's professional life. The syndrome is associated with prolonged workplace stress, feelings of exhaustion, increased mental distance and reduced professional efficacy. To date, no study has investigated the association between the modifiable factors of post-professional education, mentorship, professional organization membership or self-efficacy with physical therapists' burnout in various clinical settings.

The purpose of this study was to survey licensed physical therapists in the United States and determine: (1) the prevalence of burnout using a validated measurement tool called the Burnout Clinical Subtypes Questionnaire 12 (BCSQ-12) and self-report; (2) the relationships between burnout dimensions and (a) academic degree level; (b) mentorship received; (c) mentorship provided; (d) continuing education coursework attendance; (e) advanced professional certifications; (f) professional organization membership; (g) number of unique job roles; and (h) self-efficacy level measured using the General Self-Efficacy Scale (GSES).

Methods: An electronic survey was distributed to physical therapists across the United States. The survey included questions regarding demographics, education, mentorship, self-efficacy and the BCSQ-12 with higher scores representing greater burnout levels.

Results: Invitations to participate in the survey were emailed to 80,112 physical therapists. A total of 3,197 physical therapists completed the survey and 384 surveys were excluded as respondents were not involved in clinical practice. A final sample of 2,813 physical therapists was included in the study. The majority of respondents were female (68.72%) and Caucasian (80.13%). Respondents from home health (median=42.00) and skilled nursing facility (median=43.00) settings had the highest total BCSQ-12 scores across practice settings. Total BCSQ-12 scores were significantly lower for those who provided formal mentorship (p=.0001) (median=39.00) when compared to no mentorship (median=41.00). Respondents who received formal mentorship (p=.0028) (median=38.00) displayed significantly lower scores than those who received no mentorship (median=41.00). A moderate negative correlation was observed between General Self-Efficacy Scale (GSES) and neglect BCSQ-12 (rho=-.49) scores. A strong positive correlation was found between self-reported burnout status (Do you currently consider yourself to be burned out as a physical therapist?) and total BCSQ-12 Scores (rho=.61).

Discussion/Conclusion: Burnout appears to be prevalent in the physical therapy profession as almost half of respondents (49.34%) considered themselves burned out. Providing or receiving mentorship and higher self-efficacy was associated with lower burnout levels. Asking physical therapists a single question regarding burnout may be a quick and effective means to determine if they are burned out. Organizations should consider measuring burnout levels, investing in mentorship programs and may implement strategies to improve self-efficacy.

ID: 63 (Platform)

Lawrence Ramiscal, Lori Bolgla, Chad Cook, Jake Magel, Stephen Parada, Raymond Chong

Title: IS THE YES/NO CLASSIFICATION ACCURATE IN SCREENING SCAPULAR DYSKINESIS IN ASYMPTOMATIC INDIVIDUALS? - A NOVEL VALIDATION STUDY IN THE USE OF SURFACE ELECTROMYOGRAPHY AS A SURROGATE MEASURE IN IDENTIFYING MOVEMENT ASYMMETRIES

Background/Purpose: Scapular dyskinesis is considered a risk factor for shoulder pain that may warrant screening for prevention. Physical therapists (PT) screen scapular dyskinesis by visually comparing scapular movement asymmetries in overhead reach using the Scapular Dyskinesis Test Yes/No classification (Y/N). Scapular kinematics have been utilized to quantify the presence of scapular dyskinesis and validate the Y/N. However, all current scapular kinematic measurement techniques are inaccurate. Optimal muscle activity of the scapular muscles (upper, lower, and middle trapezii and serratus anterior) is responsible for the scapular motion required to maintain normal shoulder function. Muscle activity is accurately measured by surface electromyography (sEMG). Data suggests that impaired scapular muscles contribute to scapular dyskinesis. Despite evidence that kinematics may be a poor reference standard, no method designed to identify movement asymmetries, including the Y/N, has been validated using muscle activity as an alternative. We utilized sEMG to establish Y/N's validity. We hypothesized that Y/N is a valid tool using EMG as a viable surrogate measure for identifying scapular dyskinesis.

Methods: We utilized a known-groups validity design using 72 consecutive asymptomatic subjects. Using the Y/N as the index test, two musculoskeletal PT experts (? = 0.92) identified 26 symmetrical, 32 asymmetrical, and 14 bilaterally dyskinetic (excluded) shoulders. While subjects performed the Y/N, bilateral scapular muscle activities measured in percentage maximum voluntary isometric contraction (%MVIC) were collected using the sEMG. We created a criterion to assign the sEMG as the reference standard to identify symmetrical and asymmetrical shoulders. Using ten subjects each from the symmetrical (leaving 16) and asymmetrical (leaving 22) groups identified by the expert PTs (38 total for Y/N), we employed the receiver operating curve analysis to calculate threshold values from the %MVIC difference of each muscle pair. We applied the sEMG criterion to the muscles of the 38 subjects as the reference test that identified 11 symmetrical and 27 asymmetrical shoulders (38 total for sEMG). We calculated the sensitivity (Sn), specificity (Sp), positive and negative predictive values (PPV, NPV), likelihood ratios (LR+, LR-), and diagnostic odds ratio (DOR) using a 2x2 table analysis.

Results: The diagnostic accuracy values were Sn = 0.56 (0.37-0.74), Sp = 0.36 (0.08-0.65), PPV = 0.68 (0.49-0.88), NPV = 0.25 (0.04-0.46), LR+ = 0.87 (0.50-1.53), LR- = 1.22 (0.50-2.97), and DOR = 0.7.

Discussion/Conclusion: The Y/N's diagnostic accuracy was poor against the sEMG, suggesting clinicians should rely less on Y/N to screen scapular dyskinesis in the asymptomatic population. Our study demonstrated that sEMG might be a suitable alternative as a reference standard in validating methods designed to screen movement asymmetries.

ID: 14 (Platform)

Ryan Reed, Shannon Logan, OCS, Tatiana Bobbio, Ph.D., Tobi Baldwin, EdD, Joseph Leech, OCS, FAAOMPT, Peyton Sykes, OCS

Title: Student Physical Therapist Pain Knowledge Assessment for Pain Science Curricular Development

Background/Purpose: The healthcare costs of managing patients with chronic pain continue to rise. Guidelines recommend non-pharmacological approaches like pain neurophysiology education (PNE). Physical therapists are frontline providers of chronic musculoskeletal pain treatment. Studies indicate that student pain knowledge improves when PNE is taught within a PT curriculum, yet current?PNE content in physical therapy curricula is lacking. This study aimed to assess students' pain knowledge regarding biological pain mechanisms and pain perception across eight DPT programs using the same curriculum.

Methods: Participants included a cross-sectional convenience sample of 838 students across eight DPT programs within the same university. The cross-sectional sample was assessed at entry (YR0), year one (YR1), and at year two (YR2) of the program. Students completed the Revised Neurophysiology of Pain Questionnaire (rNPQ) during Fall 2021. Analysis included descriptive categories to provide a composite score, average, and trends. One-way and two-way ANOVA, followed by a post hoc test and a paired t-test, were used to compare rNPQ scores between curricular progression points. The rNPQ questions were categorized into two subscales: biological mechanisms (rNPQbm) and pain perceptions (rNPQpp).?

Results: The overall mean (SD, % correct) rNPQ score was 8.6 (1.6, 71.9%).? A one-way ANOVA indicated that rNPQbm scores differed significantly between curricular progression points ($p < 0.001$). A post hoc analysis showed that students' rNPQbm scores at YR0 (M=54.8%) were significantly lower than in YR1 (M=67.1%) ($p < 0.001$, 95% CI [-.81, -.40] and YR2 (M=68.8%) ($p < 0.001$, 95% CI [-.86, -.45]). No difference was found between YR1 (M=67.1%) and YR2 (M=68.8%), p=0.86, 95% CI [-.57, - .11]. Data indicated that rNPQpp scores differed significantly between progression points ($p < 0.001$). A post hoc analysis showed that students' scores in YR0 (M=72%) were significantly lower than in YR1 (M=81.1%). A paired t-test comparison between the rNPQbm and rNPQpp subscales in the group total indicated the rNPQpp subscale score (73.1%) was significantly higher compared to rNPQbm score (57.5%), $p < 0.001$, 95% CI [-17.0, -14.1]. When comparing the subscale scores at each progression point, results showed that rNPQbm scores were lower at all points (54.8% YR0, 67.1% YR1, 68% YR2) compared to rNPQpp (72.0% YR0, 81.1% YR1, 83.7% YR2), $p < 0.001$ 95% CI [-.84, -.42]. No difference was observed between YR1 and YR2, p=0.12, 95% CI [-.26-.16].

Discussion/Conclusion: The rNPQbm and rNPQpp subscales revealed significant findings within the curriculum. The students' average rNPQbm score by the end of the didactic portions of the curriculum was 68%. PNE has been shown to improve pain and function in patients with chronic pain. PNE may be difficult to provide by future DPTs without a foundational knowledge of the biological pain mechanisms. These findings support curricular changes with increased focus on biological pain mechanisms and scaffolding of PNE to address the identified deficits. ?

ID: 78 (Platform)

Sean Riley, Brian Swanson, Stephen Shaffer, Matthew Somma, Daniel Flowers, Steven Sawyer

Title: Is the quality of systematic reviews influenced by prospective registration: A methods systematic review

Background/Purpose: To determine the prevalence and fidelity of the prospective registry of systematic reviews (SRs) and the randomized clinical trials (RCTs) in published musculoskeletal physical therapy SRs.

Methods: Data originated from SRs related to musculoskeletal physical therapy interventions published in International Society of Physiotherapy Journals Editors (ISPJE) member journals indexed in MEDLINE and published in English between January 1, 2018 and August 18, 2021. Two blinded reviewers identified the SRs meeting the inclusion and exclusion criteria using Covidence. Data were extracted independently for the variables of interest by two sets of blind reviewers for the identified SRs and RCTs contained within the SRs. The data were synthesized based on consensus and were presented descriptively or in frequency tables.

Results: Two of the 15 ISPJE member journals required prospective SR registration. Twenty SRs were identified that met the inclusion and exclusion criteria, and there were 169 unique, retrievable RCTs included within those SRs. One of the 20 SRs and seven of the 169 RCTs contained within the SRs were prospectively registered and published consistent with prospective intent. The single prospectively registered SR included 6 RCTs. Of those 6 RCTs, one was prospectively registered and had one primary outcome consistent throughout the discussion and conclusion.

Discussion/Conclusion: For ISPJE member journals, prospective registration is more prevalent for RCTs than SRs. This is counterintuitive, given that SRs are considered to represent the highest level of evidence. Given the current lack of fidelity of SRs and the RCTs used to create them with prospective intent, there should be concern about the accuracy of research findings. Ensuring that SRs and RCTs fulfill their prospective promise from conception through to publication may help to rule out low-value interventions and decrease the variability in physical therapy practice.

ID: 30 (Platform)

Ronald Schenk, Joseph Lorenzetti, Michael Ross

Title: THE YELLOW FLAG RISK FORM AS A PREDICTOR OF OUTCOME IN PATIENTS TREATED FOR LOW BACK PAIN WITH MECHANICAL DIAGNOSIS AND THERAPY

Background/Purpose: Psychosocial aspects of pain are often associated with chronic low back pain, a condition for which the specific etiology is unknown. Psychosocial risk tools, such as the Yellow Flag Risk Form (YFRF), have been used to identify these factors and subclassify patients into clinically relevant subgroups which are aligned with a specific intervention. The purpose of this investigation was to analyze patient outcomes in people with low back pain referred to physical therapists who utilize the YFRF as well as Mechanical Diagnosis and Therapy (MDT) and Pain Mechanism Classification (PMCS) principles.

Methods: One hundred seventy-nine people with low back pain (LBP) were referred to a hospital-based physical therapy outpatient clinic in western New York state. Of the 179 patients, 26 met the exclusion criteria and 13 had incomplete data, resulting in an analysis of 140 patients. The patients were examined and classified based on MDT and PMCS classification by physical therapists trained in both systems. Patients were administered the YFRF, the Numerical Pain Rating Scale (NPRS), and the Focus on Therapeutic Outcomes (FOTO) tools at initial evaluation, at the 4th visit, and at discharge.

Results: Of the 140 patients, 76% were experiencing chronic duration of symptoms and 60.7% of these individuals scored greater than or equal to 50 on the YFRF. Among these patients, 92/140 (65.7%) of the sample were classified as Responders and 48/140 (34.3%) were classified as Non-responders based on a statistically significant change score on the FOTO and the NPRS. In a regression analysis of YFRF findings and outcome, the covariates of chronicity, number of visits, number of treatment days, and the change in the YFRF were included in the model as well as the two-way interactions between them. Based upon the model output, a one-point increase in the change of the YFRF increased the odds of a patient being a responder by approximately 7.2%, indicating that the model performed well in classifying patients as responders or non-responders (p

Discussion/Conclusion: The Lumbar Clinical Practice Guidelines (2021) indicate good evidence for MDT being used along with prognostic risk stratification, or a pathoanatomical-based classification to reduce pain and disability in patients with chronic low back pain. Previous reseach found similarly trained physical therapists were able to classify participants using the PMCS into classifications that drove intervention. This investigation suggests that the YFRF may be a valid predictor of outcome in people with chronic LBP managed with MDT and the PMCS.

ID: 53 (Poster)

Ronald Schenk, Eric Miller, LanLin Pu

Title: UTILIZING DIRECTIONAL PREFERENCE IN THE MANAGEMENT CERVICOGENIC HEADACHE: A CASE SERIES

Background/Purpose: Headaches are among the most common complaints causing people to seek medical care and an estimated 14 billion dollars are spent annually on treating this condition. Impairments and disabilities related to headaches include depression, social isolation, frequent use of medications, and lost time from work. The International Headache Society (IHS) describes primary and secondary headaches. Primary headaches include migraines, tension type headaches, and cluster headaches, while cervicogenic headache (CGH) is described as a secondary type of headache characterized by pain which emanates from the cervical spine and is potentially referred to one or more regions of the head and/or face. Although CGH has been well described, the specific etiology and pathophysiology of CGH remains unclear. In Mechanical Diagnosis and Therapy (MDT), CGHs can be classified into derangement, dysfunction, postural and other categories and management may be guided by directional preference. The purpose of this case series was to demonstrate the MDT assessment, classification, and management of a sample of patients with cervicogenic headache.

Case Description: This study was a prospective case series regarding 15 consecutive patients with complaints of headache who met the inclusion criteria for a CGH and who were evaluated in an outpatient physical therapy clinic by a Diploma trained MDT clinician. Inclusion criteria were people between the ages of 18-70 who presented with unilateral or bilateral head/neck pain and/or stiffness or dizziness or tinnitus which was affected by cervical spine movements, positions, or postures. To be included in the study, the patient's headaches were required to be experienced at least 1 time/week and for greater than a 3 month period. People with headaches of non-cervical origin including migraine, cluster headache, or tension headache or those with malignancy, infection, cranial or vascular disorders or vertigo with nystagmus were excluded from the study. Patients who met the inclusion criteria were consented to participate and received a standard physical therapy examinaton which included but was not limited to patient self report forms and the testing of repeated end range movements. The Numerical Pain Rating Scale (NPRS), Neck Disability Index (NDI), Headache Disability Index (HDI), Yellow Flag Risk Form (YFRF), Cervical Flexion Rotation Test (CFRT), and the Craniocervical Flexion Test (CCFT) were administered at the initial visit, 5th visit, and 10th visit. The NPRS, NDI, and HDI were re-administed at a 3 month follow up. Following the initial examination, the patients were classified into derangment, dysfunction, postural, or other categories and intervention was based on directional preference exercises and manual procedures guided by directional preference. Data collection took place from June 2021 through May 2022.

Outcomes: Friedman's test indicated statistically significant improvements in NPRS, NDI, and HDI scores at the 10th visit and at 3 month follow up, and the changes exceeded the minimal clinical important difference (MCID) for each of the measures. The CCFT scores were found to improve significantly from the initial examination to the 5th visit and YFRF scores improved significantly between the inital examination and 10th visit.

Discussion/Conclusion: Currently, there is no specific tests or clinical findings that can be used to confirm the diagnosis of CGH. The use of pathoanatomical assessment to differentiate different

headaches has not been determined and the use of diagnositic imaging tools such as plain film imaging, magnetic resonance imaging (MRI), and computerized tomography scans (CT), have demonstrated limited value and cannot confirm the diagnosis of CGH. The Cervical flexion rotation test is a diagnostic tool recommended for CGH which has a sensitivity and specificity of 78% and 85%, however, this test is biased toward detecting CGH at C1/C2 level and may not helpful in identifying CGH at other levels.

MDT is a treatment-based classification system which does not rely on determining a specific pathoanatomical diagnosis to guide treatment. The patient's response to repeated end range movements may indicate a directional preference which can be used in management of musculoskeletal conditions such as CGH. The results of this case series suggest that directional preferences exercises and manual procedures guided by directional preference may be helpful in the managment of patients experiencing headaches of mechanical origin.

ID: 36 (Poster)

Dominic Severino, Sean Sibley, Nathan Moore

Title: THE INTEGRATION OF BLOOD FLOW RESTRICTION STRENGTHENING AND ORTHOPEDIC MANUAL THERAPY IN THE MANGAGMENT OF LUMBAR SPINAL STENOSIS: A CASE SERIES

Background/Purpose: Lumbar spinal stenosis (LSS) is a degenerative spinal condition resulting in significant pain and limitations in older adults. It is the most common indication for spinal surgery in patients over the age of 65 with a subsequent annual expenditure of over 1.5 billion dollars. The clinical presentation of LSS consists of buttock and/or lower extremity pain, both of which can occur with or without back pain. Neurogenic claudication is the cardinal symptom of LSS and manifests as the result of degenerative spinal canal narrowing that occludes neurovascular structures causing ischemia. The resultant sequalae of lower extremity pain, numbness and weakness often makes standing or walking intolerable, thus impairing functional mobility. Although surgery is a common intervention for LSS, no clear benefit over conservative care has been shown. Poor tolerance of weight-bearing activity is a common occurrence in LSS, thus limiting the amount of lower extremity strengthening that can be accomplished via traditional methods. To that end, blood flow restriction (BFR) presents a training method for increasing muscular strength and hypertrophy without the excessive spinal loading required with traditional resistance training. The purpose of this case series is to describe a novel treatment strategy combining manual therapy and BFR in the management of lateral lumbar spinal stenosis in the adult population.

Case Description: Three patients (F:1, M:2) with a recent exacerbation of chronic low back pain (>1 year), presented to an outpatient physical therapy clinic. Their mean age was 61.5 years and BMI was 28.8 kg/m2. Chief complaints consisted of low back and bilateral leg pain with short-term participation with full weight-bearing activities. Observation revealed a flattened lumbar spine and bilateral quadricep and gluteal muscle atrophy. Physical examination revealed multi-segmental hypomobility in the thoracolumbar spine and in bilateral hip joints. Slump test was positive bilaterally. Lastly, dermatomes and myotome testing revealed varying impairments in the L4-5 and L5-S1 distributions. Treatment included joint mobilization/manipulation of the thoracolumbar spine, stretching/joint mobilization of hips, neurodynamic mobilizations of the lower extremities, and BFR strengthening of the lower extremities. Lumbopelvic motor control interventions were provided to address trunk coordination deficits. The average plan of care was 10 sessions, 1-2x/week.

Outcomes: Improvements in pain and disability were observed post intervention. The mean NPRS score decreased from 6.5 to 2 (MCID=2); the mean ODI score decreased from 41.3 to 27 (MCID=12.9); the mean SSS decreased from 83.5 to 53; the mean GROC increased from -4.5 to 5.5 and the mean 30CST increased from 7 to 13.5. All patients were able to return to all self-determined recreational activities without restrictions.

Discussion/Conclusion: This series demonstrates the successful outcomes of an impairment based orthopedic manual therapy treatment coupled with a practical and novel strengthening regimen in the management of LSS.

ID: 9 (Platform)

Austin Sheldon, James Leonard, Roslyn Williams

Title: NECK OR K(NOT): VITAL SIGNS ASSESSMENT BY REHABILITATION PROFESSIONALS IN A DIRECT-TO-EMPLOYER, DIRECT ACCESS, INTERDISCIPLINARY CLINIC SYSTEM

Background/Purpose: An estimated 116 million U.S. adults have hypertension (HTN), while 92 million of these adults have uncontrolled HTN (blood pressure > 130/80), and 34 million are untreated (not taking prescription medication). Within orthopedic manual physical therapy (OMPT), attention has been on the cervical spine and risk/benefit of manual therapy. Kerry and Taylor called for "vascular profiling" as "an aid for clinical reasoning and decision making." The IFOMPT 2020 Cervical Framework calls for BP assessment to distinguish musculoskeletal disorders from "vascular masqueraders." Frese notes the Guide to Physical Therapy Practice recommends BP and heart rate (HR) be assessed on every new patient, yet 8% of phyiscal therapists surveyed measured BP 50% or more for new patients. Millar found PTs measured pre-/post HR and BP 3% and 1% of time, respectively. Recent works by Arena and Severin explored beliefs, attitudes, and practices regarding outpatient PTs assessing vital signs. Severin found 14.8% of respondents measured BP and HR on initial examination for every new patient. With the push for direct accesss by PTs, and given the above statistics, the likelihood of rehabilitation professionals encountering patients with undiagnosed HTN is probable. Therefore, the purpose of this study was to implement a standardized blood pressure assessment and referral protocol for rehabilitation professionals working in a direct-to-employer, direct access, interdisciplinary clinic system.

Methods: Rehabilitation professionals were trained in a standardized BP assessment using criteria established by American College of Cardiology/American Heart Association HTN Clinical Practice Guidelines 2017 and assessment principles adapted from Severin. A pilot study was conducted in a single city, three-clinic system prior to adoption and implementation to thirty clinics nationally.

Results: Over three months in the pilot study, 225 direct access patients were seen: 45% were screened appropriately, 21.5% were referred to primary care, and 36.3% of referrals (8 patients) were newly diagnosed with hypertension. Since the pilot study was completed, 8,472 patients were seen for direct-access rehabilitation needs: 30% of these patients were screened, 22% were referred, and 48% (268 patients) were newly diagnosed with HTN. The five most common reasons for seeking care were low back pain, shoulder pain, knee pain, hip pain, and neck pain.

Discussion/Conclusion: To date, this may be the first attempt of implementing a standardized BP screening protocol by rehabilitation professionals in a direct-access setting. This program is now standard practice within a large, national clinical system, and may serve as a model to others. Thus far, in total, 276 patients were newly diagnosed with hypertension and are now under primary care and rehabilitation management for hypertension. Updates and cost-effectiveness of this program are currently underway. Rehabilitation professionals should look beyond the neck when considering assessing BP, think "upstream prevention" when doing so, and consider adopting best practice standards.

ID: 59 (Platform)

David Shirey, Joel Bialosky, Abigail Wilson

Title: LOWER LEVELS OF MINDFULNESS ARE CHARACTERIZED BY YOUNGER AGE, INCREASED CATASTROPHIZING, AND HIGHER PAIN AND DISABILITY IN PATIENTS SEEKING PHYSICAL THERAPY FOR LOW BACK PAIN

Background/Purpose: Mindfulness influences the clinical presentation of patients presenting with musculoskeletal pain. Specifically, lower levels of mindfulness are associated with higher levels of pain and worse function. However, there is a dearth of evidence describing how baseline levels of mindfulness relates to clinical outcomes in patients seeking physical therapy for low back pain. The purpose of this study was to determine baseline levels of mindfulness and determine this relationship with key demographic factors, psychological factors, and outcomes of pain and disability in patients seeking physical therapy for low back pain.

Methods: Forty-seven patients (16 male) referred to outpatient physical therapy (PT) for low back pain (LBP) and agreed to enroll in the current study. Patients completed the Mindful Attention Awareness Scale (MAAS) at baseline. The MAAS is a 15-item questionnaire scored from 1 to 6 based on the average of the 15 items with higher scores indicating greater mindfulness. Primary outcomes of pain and disability were assessed at baseline and 4 weeks. Pain was assessed via a 101 point numeric pain rating scale (NPRS). Disability was assessed via the Oswestry Disability Index (ODI) on a scale of 0% to 100% with higher scores indicating greater disability. Patients were classified into upper (5.27, n= 12), middle (4.47, n=23), and lower quartile (3.87, n=12) levels of mindfulness based on the median responses to the MAAS at baseline.

Results: Age related differences ($p = 0.01$) were observed with the lower quartile significantly younger (mean = 38.67, sd= 15.42) as compared to middle quartile (mean = 55.3, sd= 15.31) and upper quartile (mean = 56.58, sd=17.19). Group related differences were not observed in sex or duration of pain ($p>0.05$). Group related differences were observed in catastrophizing ($p=0.03$) with higher values in the lower quartile (19.08, sd= 11.78) than the upper quartile (7.92, sd= 5.88). Group differences were not observed in fear avoidance beliefs, kinesiophobia, or pain self-efficacy ($p>0.05$). A trend was observed for higher pain in the lower quartile 51.19 (sd= 18.60) compared to the upper quartile 38.11 (sd=19.35) with a medium effect size (cohen's d= 0.69). A trend was observed for higher disability in the lower quartile 38.83 (sd=14.00) compared to the upper quartile 29.08 (sd= 16.18) with a medium effect size (cohen's d=(0.64). A main effect for time was observed for improvements in pain ($p < 0 .01$) and function ($p=0.03$) over four weeks; however, group differences were not observed.

Discussion/Conclusion: We observed differences in age and catastrophizing by mindfulness score. Trends were observed for differing levels of pain and disability based on mindfulness. Consequently, physical therapists treating patients with low back pain may wish to screen for mindfulness and consider psychologically informed approaches to management of patients presenting with low levels of mindfulness.

ID: 66 (Poster)

Emily Sing, Alisa Pravdo, Ethan Feder, Peter Bowman, Roy Film , Jill Sparkes

Title: IDENTIFYING FIBULAR HEAD DYSFUNCTION FROM CHRONIC EXERTIONAL COMPARTMENT SYNDROME: A CASE STUDY

Background/Purpose: Chronic exertional compartment syndrome (CECS) is a rare medical condition that can cause irreversible muscle, nerve, and vascular damage as a result of increased pressure in an inelastic fascial compartment. Build up of intracompartmental pressure can cause neurovascular compromise and resulting symptoms. There is limited evidence to support conservative management for CECS. Chronic ankle instability (CAI) is defined as the failure of an acute ankle sprain to return to its original mechanical and functional performance within 6 weeks of recovery, and can lead to deficits in joint integrity, postural and neuromuscular control, and strength. Fibular head dysfunction can be associated with CAI, and can impact the deep fibular nerve. Deficits associated with fibular head dysfunction may manifest as symptoms consistent with CECS. It is important to thoroughly assess for underlying biomechanical impairments and accurately diagnose these patients, as treating a latent joint dysfunction may resolve the presenting symptoms.

Case Description: A 24-year-old male runner was referred to physical therapy (PT) with a diagnosis of CECS of the anterior compartment of the leg by an orthopaedist. The patient presented with a 6-month history of intermittent left anterior leg pain, foot drop, and first dorsal webspace numbness, which began when initiating a running program 7 months following an acute ankle sprain. Symptoms occurred exclusively with running, with onset between the first and second mile. The patient presented with full and pain-free trunk active range of motion (AROM) and a negative neurological screen, while demonstrating limited left ankle AROM and weakness in all planes. We initially hypothesized the presence of fibular head dysfunction. Treatment intervention included manipulation of the proximal tibiofibular, talocrural, and subtalar joints, and soft tissue mobilization. His exercise program consisted of strength training of the gastrocnemius/soleus complex, tibialis posterior and anterior, and foot intrinsic musculature, proprioceptive training, running analysis, and gait training.

Outcomes: The patient completed 8 sessions of PT over 2 months. Outcome measures included ankle AROM, strength testing, and the LEFS. Findings at discharge revealed restoration of ankle AROM, full ankle strength, LEFS score of 80/80, and return to symptom-free running.

Discussion/Conclusion: When evaluating patients with signs and symptoms consistent with CECS, it is important to obtain a thorough history and assess for underlying biomechanical causes, such as fibular head dysfunction. This is essential due to the strong likelihood that patients with CECS may undergo surgery even though the root cause of the problem may be resolved with OMPT. It is important to consider regional interdependence, including fibular head involvement, and the associated implications at the foot and ankle. Correlational studies assessing the relationship between CECS and fibular head dysfunction would help to quantify the clinical utility of this treatment approach.

ID: 82 (Poster)

Christa Smith, Michael Bourassa, Craig Wassinger, Allison Bourassa

Title: Utilization of the Clinical Practice Guidelines and Physical Therapy Interprofessional Collaboration for a Patient with Whiplash Associated Disorder: A Case Report

Background/Purpose: Neck pain is a common yet complex condition seen clinically based on its multifactorial nature with psychosocial factors playing a large prognostic role. Whiplash associated disorder (WAD) often presents with signs and symptoms that overlap with a variety of other conditions including vestibular-oculomotor disorders and autonomic dysfunction. Therefore, a thorough clinical exam is essential in order to aid in the differential diagnosis. This case report offers a unique approach of interprofessional collaboration between a neurological clinical specialist and orthopaedic physical therapist in the examination and intervention of a patient with neck pain.

Case Description: The patient is a 55-year-old Caucasian female being treated in outpatient physical therapy 6 weeks after experiencing a rear-end collision motor vehicle accident. The physical therapy diagnosis of WAD with impairments of neck pain, decreased range of motion (ROM), weakness of deep neck flexors, and decreased proprioception. Additionally, this patient presents with psychosocial factors that could contribute to a poorer prognosis of full recovery. Interventions included manual therapy to improve pain and ROM; therapeutic exercise to improve muscular endurance; neuromuscular re-education to improve coordination; and education to address psychosocial factors.

Outcomes: Outcomes that were utilized included the Patient-specific Functional Scale (PSFS), Numeric Pain Rating Scale (NPRS), cervical ROM, deep neck flexor endurance test, and joint position error assessment. PSFS improved from 3.3 to 6.6; NPRS improved from 8/10 to 3/10. ROM improved from 50 degrees to 80 degrees of flexion; 30 degrees to 50 degrees of extension, 45 degrees to 80 degrees of left rotation; and 55 degrees to 80 degrees of right rotation. The initial cervical joint position error test resulted in the patient having greater than 6 dg of error for all directions using proprioceptive input. At the time of re-assessment, the patient's joint position error test measures improved to: 4.5 degree of error for left rotation and flexion; 6 degree of error for right rotation; and extension greater than 6 degrees. Deep neck flexor endurance test improved from 10 seconds to 26 seconds.

Discussion/Conclusion: Interprofessional collaboration between physical therapists can be an essential tool to complete a thorough systems review during examination in order to know when to refer appropriately. In this case, this patient was referred to a vestibular clinical specialist by a physician for complaint of dizziness post-MVA. Referral was made to an orthopaedic PT when the other systems were ruled out and the cervical spine was suspected. Due to the complexity of neck pain, it is important to take a multimodal approach that is patient-centric in order to maximize outcomes. The Clinical Practice Guidelines provide a general framework for treatment and intervention; however clinical reasoning is essential to guide an individualized and patient-centric approach based on current impairments.

ID: 74 (Poster)

Jill Sparkes, Peter Bowman, Alisa Pravdo, Roy Film , Ethan Feder, Emily Sing

Title: Lumbar Radiculitis And Onset Of Symptomatic Hip Osteoarthritis After Acute Fall in Geriatric Runner: A Case Study

Background/Purpose: Lumbar radiculitis should be considered in the differential diagnosis of lateral hip and groin pain after acute injury. Altered mechanics and muscle inhibition after acute lumbar radiculitis can lead to new onset or increase of previous symptoms from underlying hip osteoarthritis (OA). Hip OA is the most common cause of hip pain in patients above the age of 50 and may present as lateral hip and groin pain, and limitations in active range of motion (AROM) and passive range of motion (PROM). Manual therapy, flexibility, endurance, and strengthening exercises have been shown to be effective in treatment of hip OA.

Case Description: The patient was a 74-year-old male runner who presented to physical therapy (PT) after a fall while running 4 weeks prior. He was referred to PT with a diagnosis of hip contusion. The patient presented with complaints of sharp low back, right hip, and right groin pain with running, and a dull pain with walking and weight bearing activities. The patient presented with limitations in lumbar AROM, right hip AROM and PROM, and right hip muscle strength. The patient also demonstrated a positive right sided slump adverse neural tension test. Evaluation findings were consistent with both lumbar radiculitis and OA of the right hip. Initial treatment focused on restoring lumbar ROM, hip ROM, and gluteal strength. At 1 month the patient demonstrated improvements in Lower Extremity Functional Scale (LEFS) score, lumbar ROM, hip musculature strength, lumbar symptoms and negative Slump test; the patient continued to have right hip and groin pain. Further assessment identified excessive lumbar extension with gait, poor gluteal recruitment, and altered recruitment of transversus abdominis and multifidus, which was addressed with neuromuscular re-education.

Outcomes: The patient completed PT over the course of 1.5 months. Interventions included manual therapy techniques to the hip and lumbar spine, strengthening of gluteal musculature, and neuromuscular re-education focused on muscle recruitment of gluteal muscles, multifidi, and transversus abdominis. Outcome measures included manual muscle testing, AROM, PROM, and LEFS. Findings at 4-week re-evaluation demonstrated improvements in hip muscle strength, lumbar AROM, and symptoms during walking and weight bearing activities. Addition of neuromuscular re-education exercise resulted in the patient's return to asymptomatic running prior to performance of a formal running analysis. The patient self discharged before final measurements.

Discussion/Conclusion: Clinicians should consider chronic conditions that may influence current presentation despite acute onset. Hip and groin pain in an older population may be consistent with hip OA. Additionally, hip OA and lumbar radiculitis may have overlapping symptomatology that make differential diagnosis challenging. Incorporating an OMPT program of manual therapy, neuromuscular re-education, and strengthening to address underlying OA along with treating acute lumbar components could help a patient return to baseline function after injury.

ID: 28 (Poster)

Marc-Olivier St-Pierre, Mohammad Reza Effatparvar, Mickaël Begon, Stéphane Sobczak

Title: Strains within the iliofemoral ligament during the FABER test: a segmental and cadaveric approach

Background/Purpose: The FABER test is one of the most used tests during the clinical assessment of the hip joint (Tijssen et al. 2012, Martin et al. 2009). However, its low specificity might limit its clinical significance (Tijssen et al. 2012). A better understanding of the anatomical stress and intra-articular structure behavior might improve clinical assessment regarding pain during the application of the FABER test. Although ligaments might limit the range of motion during this test, no information has been provided regarding their strains. Purpose: To report strains within the lateral and medial borders of the medial band (MBIFL) and lateral band (LBIFL) of the iliofemoral ligaments during the FABER test.

Methods: 10 hips were harvested, and all muscles were removed. Hemispherical markers (2.6 mm) were glued on the lateral and medial borders of each band. Markers were separating the borders into proximal, mid, and distal portions. External fixators were used to stabilize the hemipelvis on the testing frame. The lower limb was placed in a FABER test position using a heavy-duty clamp placed on the mid-portion of the femur without any extra torque during the testing. A laser scanner allowed to do a surface scan of the hip joint, then the digitalization of each marker was done on the 3D surface before and after testing. A T-test was used to compare the medial and lateral bands. Strains within borders and between portions were compared with a two-way ANOVA (borders, portions) and a Bonferroni post-hoc test was used to assess differences within factors.

Results: Globally, the LBIFL showed greater strains (14.6 ± 11.4 %) compared to the MBIFL (-12.5 ± 5.7 %) (p ± 24.1 %) of the LBIFL compared to its medial border (6.3 ± 11.4 %) (p ± 7.3 %) than the mid (-27.9 ± 8.9 %, p ± 5.5 %, p = 0.003). In the LBIFL, the strains measured in the distal portion of the lateral border (51.1 ± 21.5 %) were significantly greater than the one measured in the proximal (9.5 ± 7.0 %, p = 0.003) and mid portions (7.8 ± 4.4 %, p = 0.003)

Discussion/Conclusion: This is the first study to assess strains in the iliofemoral ligament during the FABER test. While the MBIFL is globally released during this test, the LBIFL is stretched and more precisely the distal portion of the lateral border. The proximal portion of the inferior border of the MBIFL showed an increase in tension while the other portions showed a release.

ID: 22 (Poster)

Bryan Tachibana, Oriana Hua

Title: Physical therapy management of an older, female adult with low back pain complicated by Eagle-Barrett Syndrome: a case report.

Background/Purpose: Eagle-Barrett Syndrome is a rare congenital disorder that primarily affects males (95% of reported cases) and presents with deficiency of the abdominal wall muscles, malformation of the urinary tract, and bilateral cryptorchidism. Patients may experience delays in care due to co-management of complications from multiple systems. There are less than 30 cases reported with females, and most articles discuss treatment of pediatric cases without mentioning physical therapy intervention. Thus, the purpose of this case report is to demonstrate the effectiveness of manual therapy and exercise for the management of an individual with lower back pain complicated by Eagle-Barrett Syndrome.

Case Description: The patient was a 69-year-old female referred to physical therapy for chronic, bilateral low back pain. The patient described her symptoms as tightness around her lower back, posterior hip, proximal posterior thigh, and superior iliac crests. She began experiencing persistent low back pain 4-5 years ago after an ankle injury that caused a reduction in her physical activity level. Given her reduced core and lower extremity strength deficits, plus complaints of increased difficulty with unsupported sitting, transfers, walking, and stair negotiation, this patient presented with low back pain with movement coordination and stability deficits. The course of treatment consisted of 12 sessions across 6 months focusing on movement re-training, isolated strengthening of deep lumbar stabilizers, and global strengthening of the lower quarter.

Outcomes: Over the course of treatment, the patient has subjectively reported significant improvement in all activity limitations. However, she does continue to have difficulty with floor transfers. Towards the end of this patient's course of care, her step down test score progressed from +2 to +1 and Sarhmann abdominal progression from 0 to 4. She also scored an 8 on the 30-second sit-to-stand test and 18 seconds on the prone double limb straight leg raise test. However, she was unable to side plank without excessive lumbar extensor activation. While Focus on Therapeutic Outcomes scores are not finalized at this time, we anticipate the patient has significantly improved from her original score.

Discussion/Conclusion: Although this patient presented with an innate lack of trunk rotational stability due to a lack of abdominal obliques, management of care using the principles of the International Classification of Functioning, Disability, and Health treatment-based categories still led to positive outcomes. This case report demonstrates physical therapy management of symptoms associated with Eagle-Barrett Syndrome, and may offer treatment options for future patients. Further research should be conducted to provide objective data to support the findings of this case report.

ID: 80 (Platform)

Jeffrey Thompson, Jean-Michel Brismée, Phillip Page, Troy Hooper, Stéphane Sobczak, Dwayne Anderson, Kathleen Rosendahl-Garcia

Title: Novel musculoskeletal ultrasound methodology to measure cervical intervertebral disc height found reliable and valid against MRI.

Background/Purpose: Cervical degenerative disc disease is associated with intervertebral disc (IVD) height loss leading to neck pain and disability that is most prevalent in the lower cervical spine. The IVD height is an indirect measurement of IVD hydration and health. The purpose of this study was to determine reliability and validity of musculoskeletal ultrasound (MSU) in measuring anterior cervical IVD height compared to magnetic resonance imaging (MRI) reference standard at C4-5, C5-6 and C6-7 spinal segments.

Methods: This study was performed in three phases comparing the average of three measurements at each IVD segment. Phases I and II each obtained 10 MRI and MSU images of subjects for anterior cervical IVD height measurements to determine inter-rater reliability and standard error of measurement (SEM). Two trained independent and blinded raters measured MRI and MSU images for anterior IVD heights. Phase III assessed 20 subjects for validity between MRI and MSU measurements while controlling for extraneous variables including time of day, timing between imaging modalities, and subject position. Each subject underwent MRI and MSU to obtain images for measurement comparison by a blinded rater to determine intra-rater reliability, SEM, and a Bland-Altman analysis to assess agreement between MSU and MRI measurements.

Results: Phase I: MRI intraclass correlation coefficient (ICC2,3) for each IVD height segment was ?.91(95%CI=.66-.98) and SEM between raters was ?.2mm (8%). Phase II: MSU intraclass correlation coefficient (ICC2,3) for each IVD height segment was ?.68(95%CI=.27-.92) and SEM between raters was ?.43mm (7.9%). Phase III: Neither significant difference nor significant proportional bias was found between MRI and MSU measurements (p?.05) at any IVD segment and Pearson's r for MSU measurements (Pre and Post MRI) were equal to or smaller than r(18)=.825, p compared to MRI were ? -.10mm (-2.2%).

Discussion/Conclusion: This study was consistent with previous reports of good MSU measurement reliability but its design improved upon MSU imaging methodology, which resulted in good validity of measuring anterior cervical IVD height. The methodology of this study provides the foundation for future MSU studies investigating the effect of various positions, movements and interventions on cervical IVD height and hydration. Future studies should investigate MSU reliability and validity in symptomatic populations with acute and chronic neck pathologies, as well as the effects of interventions on cervical IVD height.

ID: 26 (Poster)

Eric Trauber, David Poulter

Title: NARRATIVE STRATEGIES TO OPTIMIZE THE INITIAL INTERVIEW: A THEORY REPORT

Background/Purpose: Background: The initial interview is the cornerstone of the physical examination, diagnosis, plan of care, prognosis, and overall efficiency of the therapeutic experience.1 The initial interview provides approximately 75% of the information needed for a diagnosis, even before performing a physical examination.2 An initial assessment allows the clinician to understand the biological, psychological, and social factors contributing to pain and disability.3 The initial assessment provides an opportunity to build a foundation for a positive clinician-patient therapeutic alliance.3

The patient experience may be improved by enhancing our approach during the initial interview. Changing the idea from “taking” to “receiving” a patient’s history may give a sense of more active inclusivity, compassion, and collaboration. Patient-centered communication seeks first to understand what matters most to a patient, then to incorporate patient preferences into shared decision-making.4

Case Description: Purpose: The purpose of this theory report is to identify how utilizing a narrative strategy can enhance the initial interview process and lead to positive clinical outcomes.

Outcomes: Evidence: Narrative medicine is the “ability to acknowledge, absorb, interpret, and act on the stories and plights of others”, as well as being able to recognize various factors that can affect our ability to adapt to the current situation.5 Efficient history taking(or as we will suggest “receiving”), and a thorough physical examination can lead to a positive therapeutic effect, short-term decrease in pain, decreased catastrophizing of symptoms, improved functional mobility, and decreased sensitivity to pain pressure threshold.6 The history portion alone yielded the most positive effects when compared to the physical examination.6 “Receiving” a patient’s history may encourage more active listening and allow clinicians to be receptive to understand what the patient is experiencing. Active listening is a powerful strategy to acknowledge an individual’s experiences, fostering the therapeutic alliance.6

The subjective interview should help identify maladaptive beliefs and behaviors that can be identified as a potential target of treatment.1 It is essential to understand the individual’s thoughts, belief systems, and behaviors concerning physical activity and pain to formulate an individualized plan of care.3 Data collected during the interview can influence the treatment plan and impact the overall outcome and prognosis.1

Discussion/Conclusion: Importance: The initial interview needs to be received as an active component of the initial evaluation, and not as a checklist. The initial interview can enhance adherence to recommendations and lead to improved outcomes of care.4 Making the patient an active

ID: 49 (Poster)

Jason Villarin, George Railton

Title: MANUAL THERAPY TREATMENT OF PAINFUL COCCYX: A CASE REPORT

Background/Purpose: The coccyx is an attachment point for hip and pelvic musculature as well as a load bearing structure in certain sitting postures. This latter function is evident when sitting becomes exquisitely painful with coccyx impairments.

Case Description: Patient is a 56 year-old male data analyst and high-level motorcycle enthusiast. He presented to orthopedic physical therapy with four months of coccyx pain without definitive mechanism of onset. An orthopedic physical therapist identified localized tenderness at coccyx, advised the patient on sitting options, and referred on to pelvic physical therapist for further evaluation.

The pelvic manual therapist identified that symptoms were provoked with leaning back in sitting, forward motorcycle position, and contracting gluteal muscles in standing. Pelvic exam was notable for tender distal coccyx segment in approximately 70 degrees of extension, with strong and moderately overactive posterior pelvic floor muscles. Lumbosacral active range of motion and passive accessory intervertebral mobility testing did not reproduce coccyx symptoms.

Treatment focused on manual therapy interventions to correct the coccyx extension deformity. Soft tissue mobilization of the neighboring musculature was necessary to access the coccyx, including medial aspect of gluteus maximus and internal posterior pelvic floor muscles. Multiple bouts of high grade slow oscillatory mobilizations were performed until the deformity yielded and partially corrected. Tolerance to mobilization was much improved with traction of the distal coccyx segment using an internal and external handling technique. Each treatment session finished with a mobilization with movement approach, where manual coccyx mobilization was performed with the patient in quadruped doing anterior and posterior pelvic tilts and moving back into flexion positioning of the pelvis. Patient was seen every two weeks for a total of three sessions using the above treatment framework each time.

Outcomes: Coccyx extension angulation improved from approximately 70 degrees at start of care to 30 degrees at end of care. Pelvic floor muscles remained overactive, but with improved control of voluntary relaxation which integrated into daily functional activities. Patient reported significantly reduced pain (NPRS 8/10 intake, 3/10 discharge) and improved tolerance to ride his motorcycle for high-level track training and travel. Patient reported subjective improvement with global rating of change (GROC) of 80%, which he found satisfactory for discharge.

Discussion/Conclusion: This case describes collaboration between orthopedic and pelvic physical therapists successfully using manual therapy to treat a painful coccyx deformity with meaningful functional impact for the patient. It serves as a reminder that principles of skilled orthopedic manual therapy can be applied to the coccyx with an understanding of the unique functions, joint mechanics, pain patterns, and muscular attachments of this structure.

ID: 24 (Poster)

Miller Williams

Title: Management of a Sedentary Worker Presenting with Neck Pain with Radiating Pain

Background/Purpose: Individuals with neck pain with radiating pain often experience neck and upper extremity pain, reduced cervical motion, paresthesia, burning, and hypersensitivity along a segmental distribution. These symptoms can be challenging to overcome in the sedentary worker with consideration to the prolonged postures and positions that limit tissue healing and contribute to muscle guarding. The purpose of this case report is to describe an evidence- based management approach including specific attention to the challenges of individuals within this population to produce optimal outcomes.

Case Description: The patient was a 33-year-old Caucasian male that was employed as a computer programmer that required long hours at a desk in front of a monitor. The patient's medical history included recovery from IV drug use as well as a previous ankle injury but was otherwise unremarkable. He was referred by his primary care physician to outpatient physical therapy to address a three-month history of left sided neck pain, reduced left cervical rotation, paresthesia, and hypersensitivity through the C6 dermatomal distribution. His functional complaints were reduced capacity to work as a computer programmer, limited ability to turn his head while driving, and pain in the left side of his neck and shoulder region that hindered him from concentrating at work. Manual therapy interventions included a supine C1-C2 thrust technique and a seated CT junction thrust technique to improve mobility at the respective segments and reduce muscle guarding. It was found that the patient had poor endurance and limited motor control of the deep cervical flexors and scapular stabilizers. These muscular impairments were addressed with therapeutic exercise dosed to improve control and endurance. Additionally, upper limb tension testing revealed symptom reproduction and gentle neural gliding exercise was initiated. At the end of his second session, two specific recommendations were made in consideration of his workspace ergonomics: to begin using a foot stool because of his short stature and to bring his keyboard closer to his lap to reduce hypothesized neural tension.

Outcomes: At his third physical therapy follow up, the patient reported notable improvement in his chief symptoms and functional complaints. The patient reported an ability to work for 5-6 hours without an increase in his symptoms. He was able to demonstrate symmetrical cervical rotation to the right and left. His episode of care was concluded after 10 weeks. The neck disability index (NDI) has been recognized as a valid and reliable outcome tool in this population and was utilized as the primary outcome measure for this patient. Upon initial presentation he scored a 20% on the NDI with a reported score of 3/10 as his worst pain over the previous 24 hours. After 10 weeks with physical therapy, self-reported compliance of a home exercise program, and self- reported adherence to suggested ergonomic changes to his workspace, the patient scored a 0% on the NDI with a reported pain score of 0 over the previous 24 hours.

Discussion/Conclusion: A multimodal evidence-based approach was utilized in the management and treatment of this patient. This case highlights the importance of an individualized approach inclusive of the challenges that sedentary workers with neck and radiating pain face. An individualized ergonomic assessment and education on mindful positioning at work are tools that can be considered in conjunction with evidence-based management. Literature is scarce on specific ergonomic intervention

for individuals in this population. Further studies to investigate what aspects of ergonomic assessment and intervention has the greatest impact on outcomes would be beneficial.

ID: 90 (Poster)

Katherine Zisk, Oliver Rivera

Title: DIFFERENTIAL DIAGNOSIS AND TREATMENT USING MANIPULATION AND A PAIN MECHANISMS-BASED CLASSIFICATION APPROACH OF A PATIENT WITH CLAVICULAR AND SCAPULAR PAIN: A CASE STUDY

Background/Purpose: Upper quarter pain can arise from local and distant structures. Consideration of the cervical spine is necessary in the presence of upper quarter pain. A pain mechanism-based classification approach has been described to improve physical therapy management of patients, yet literature is lacking in the implementation for the upper quarter. This case report seeks to describe the differential diagnosis and treatment utilizing manipulation and a pain mechanism-based classification approach of a patient presenting with clavicular and scapular pain.

Case Description: A 31-year-old female cardiac ultrasonographer presented with a 4-month history of right clavicular (P1) and scapular (P2) pain. Patient sustained a work injury with acute onset after being pulled by a patient. She was placed on light duty. Past medical history was significant for anxiety. P1 during functional reaching was reduced with cervical distraction and increased with cervical compression. Shoulder and thoracic screen were unremarkable. Cervical active ROM was limited and produced P1 with right rotation, lateral flexion, extension quadrant, and lower cervical extension. Passive accessory intervertebral motion revealed hypomobility and P1/P2 with C6 and C7 central posterior to anterior joint glides (CPA) as well as right C5-6 and C6-7 unilateral posterior to anterior joint glides (UPA). Palpation of right scalenes reproduced P1. The primary diagnosis was right C5-6 and C6-7 facet arthropathy with superimposed right scalene trigger point. Peripheral nociceptive and central nociplasticity were hypothesized as primary pain mechanisms.

Initial treatment included cervicothoracic junction and upper thoracic manipulation eliminating pain with overhead reaching and improving right cervical rotation from 58 to 76 degrees. Despite objective improvement, she continued to demonstrate fear avoidance, pain catastrophizing, and inconsistent non-mechanical exacerbations of pain. Treatment was altered to address psychosocial-influenced centrally mediated pain processes with pain education, graded exposure, manual therapy, and exercise.

Outcomes: Patient was seen for 12 sessions over 4 months. Disability of Arm, Shoulder and Hand improved from 23.3 to 8.3. Global Rating of Change improved from 0 to +6. Pain Catastrophizing Scale at discharge was 15. Patient returned to full work duty without limitations.

Discussion/Conclusion: Examination of a patient with clavicular and scapular pain revealed the primary diagnosis of cervical facet arthropathy and scalene trigger point. A pain mechanism-based approach directed the management of this patient. In the presence of upper quarter pain, differential diagnoses from the cervical spine should be considered. Spinal manipulation may yield positive results, and a pain mechanism-based approach should be utilized to guide management