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Applying Classification and Decision Rule to Predict Outcome of Whiplash in an Ambulatory Patient Recovering from Incomplete Spinal Cord Trauma

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ACCEPTED ABSTRACTS POSTER PRESENTATIONS AAOMPT 2009

EFFECTS OF MASSAGE BEFORE ISOKINETIC EXERCISE: A RANDOMIZED CONTROLLED CROSS OVER STUDY

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BACKGROUND: Our aim was to determine the effects on salivary flow rate, as indicator of parasympathetic activity, and knee extension peak torque after the application of a massage over the quadriceps muscle. **METHODS:** A placebo, controlled, repeated measures, crossover, single-blind, randomized trial was conducted over 23 recreational athletes (11 females; mean age: 22±2yr). Participants attended the laboratory on 2 occasions, with a 1-week interval between sessions. On each session, subjects received either a thigh massage protocol or a detuned ultrasound prior to the exercise in a randomized order. The exercise protocol consisted of isokinetic 5 concentric knee dominant exercises at 60, 120, 180, and 240°/s. Salivary flow rate and isokinetic knee extension peak torque were assessed at baseline and post-intervention by an assessor blinded to the intervention applied. The hypothesis of interest was group*time interaction. **RESULTS:** The ANOVA showed a significant group*time interaction for salivary flow rate (F=5.5; P=0.02), indicating an increase in salivary flow rate with the massage. The ANOVA also found a significant group*time intervention for

knee extension peak torque at 60°/sec (F=2.4; P=0.02), indicating a significant decrease after the massage. **DISCUSSION-CONCLUSION:** The application of massage over a quadriceps muscle before the application of isokinetic exercise produced an immediate increase of salivary flow rate as indicator of parasympathetic activity and a decrease in the knee extension peak torque in recreational athletes.

EFFICIENT ISOLATION OF THE MULTIFIDUS MUSCLE DURING REHABILITATION

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BACKGROUND: The lumbar multifidus muscle is needed for spinal stability, and proper strengthening is imperative for patients with low back pain (LBP). Traditional exercises can be effective for global back strengthening, but more recently, motor control retraining and the use of myofascial “slings” to rehabilitate the lower back and prevent future episodes of LBP has been suggested. The purpose of this study was to determine what synergistic “sling” pattern was most efficient when recruiting the lumbar multifidus muscle. **METHODS:** A 44 y/o female with no history of LBP participated. Six exercises were performed to determine which one would elicit a strong multifidus contraction. Baseline real-time ultrasound (US) measurements were taken prior to the active muscle contraction. Using US in the B-mode to examine the thickness of the multifidus muscle, we measured the cross sectional area changes during each exercise. **RESULTS:** The six exercises showed at least moderate recruitment of the lumbar multifidus, but the “sling” patterns in the quadruped and standing positions

showed more lumbar multifidus contraction compared to the traditional prone hip extension exercise. **DISCUSSION-CONCLUSION:** Although limited by its single case design, this study suggests LBP rehabilitation can take on a new, more effective approach by using the “sling” patterns. The traditional group of prone exercises may be useful initially, but advancing patients to the higher level “sling” pattern will yield greater recruitment of the multifidus muscle as stabilizer of the lumbar spine.

MOBILIZATIONS WITH MOVEMENT FOR IMPROVING PAINFREE CERVICAL SPINE RANGE OF MOTION OF A FEMALE WITH ACUTE HEADACHES FOLLOWING A WHIPLASH INJURY: A CASE REPORT

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BACKGROUND: Musculoskeletal injuries are a common result of motor vehicle accidents. Neck pain and headaches are the two primary complaints of patients with whiplash associated impairments. **CASE DESCRIPTION:** The patient was a 47 year-old female with complaints of neck pain and headaches following a motor vehicle accident in which the patient's vehicle was struck from behind by another vehicle. A 13-week episode of care for this patient diagnosed with cervical facet joint strain and acute headaches was undertaken. The patient presented with decreased cervical range of motion, segmental hypomobility of C2-3 and C5-6 and rated her neck pain at 7/10 and her headache pain at 3/10 on the Verbal Pain Scale. **METHODS:** The intervention strategy consisted of electro and thermal modalities, soft tissue massage and

Mulligan-based manual physical therapy techniques, including mobilizations with movement. Outcome measures included cervical active range of motion, the Verbal Pain Scale and the Neck Disability Index. **RESULTS:** Following physical therapy, the patient demonstrated normal, pain free cervical active range of motion and reported an absence of headaches. NDI scores improved from 34/50 (severe disability) at initial examination to 1/50 (no disability) at discharge. **DISCUSSION AND CONCLUSION:** The combination of electro and thermal modalities, soft tissue massage and mobilizations with movement was successful in eliminating neck pain, headaches, and disability of a patient diagnosed with cervical facet joint strain and acute headaches.

IMMEDIATE EFFECTS OF THE LUMBOSACRAL REGION MANIPULATION ON HIP PASSIVE RANGE OF MOTION IN PATIENTS WITH LOW BACK PAIN: A CASE SERIES

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BACKGROUND: Recently published clinical prediction rules for patients with low back pain that respond to lumbar manipulation include hip rotation measurements. Anecdotal findings of improvement of hip range of motion in patients with low back pain following lumbar manipulation have been reported suggesting regional interdependence between the spine and surrounding joints. The purpose of this case series was to describe the immediate effects of the lumbosacral region manipulation on hip passive range of motion in patients with low back pain. **METHODS:** Nine consecutive active duty Army patients (5 males and 4 females, mean age 27.4, SD= 6.6) referred to physical therapy with a primary diagnosis of low back pain and met the clinical prediction rule criteria for lumbar manipulation were included in the case series. All patients underwent bilateral hip range of motion measurements during a physical examination. Patients then received

a unilateral lumbosacral manipulation followed immediately by post-manipulation hip range of motion measurements. **RESULTS:** Eight out of 9 patients (89%) demonstrated a mean increase of 7 degrees (95% CI 5–9 degrees) in hip internal rotation and a mean increase in total rotation of 10 degrees (95% CI 2–18 degrees) contralateral to the side of manipulation. **CONCLUSION:** These findings along with other observed clinically meaningful changes in hip range of motion suggest regional interdependence between the hip and lumbar spine in patients with low back pain. It is plausible that other patients with hip range of motion deficits may benefit from the lumbosacral region manipulation to help improve these deficits.

EFFECT OF HIP MOBILIZATIONS ON CHRONIC LOW BACK PAIN: A CASE REPORT

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BACKGROUND: The prevalence of lumbar and hip pathology has risen significantly without corresponding improvement in treatment outcomes. Sub-optimal outcomes in the treatment of chronic low back pain (LBP) have led to preference for regional interdependence and the biopsychosocial models. There is little evidence to clearly identify a clinical connection between the lumbar spine and the hip. **DESCRIPTION:** A 62-year-old male with a 5½ month history of chronic LBP with concomitant right hip pain. His Oswestry Disability Index (ODI) was 18%, average back numeric pain rating scale (NPRS) 4/10, fear avoidance beliefs questionnaire (FABQ) work subscale 0, FABQ physical activity subscale 18, lower extremity functional scale (LEFS) 74/80 and patient specific functional scale (PSFS) 7.33. Physical examination revealed lumbar flexion 42°, extension 18°, right hip internal rotation 18°, hip extension lacking 5° to neutral,

and gluteus medius and maximus strength of 4+/5. He was treated for four visits consisting of joint mobilization and strengthening exercises directed at the hip. The joint mobilizations were long-axis distraction thrust technique, caudal glide, supine anterior-posterior (AP) and prone posterior-anterior (PA) in figure 4 position mobilization progressions. At discharge, his ODI = 0%, NPRS = 0/10, FABQ-W = 0, FABQ-PA = 0, LEFS 80/80 and PSFS 10. At 3 and 6 month follow-ups, his outcome measures remained equal to his discharge values. **DISCUSSION-CONCLUSION:** Hip mobilizations may benefit some individuals with chronic low back pain. This case study indicates that there may be a regional interdependence between the lumbar spine and hip joints. Hip joint impairments should be evaluated and managed in patients with chronic low back pain.

PROFILING ADVERSE EVENTS ASSOCIATED WITH THE USE OF CERVICAL MANIPULATION OR MOBILIZATION FOR THE TREATMENT OF NECK PAIN IN ADULTS: A SYSTEMATIC REVIEW

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BACKGROUND: Adverse events are a concern for manual therapy practitioners utilizing cervical manipulation or mobilization. While efficacious, these techniques are associated with catastrophic adverse events (AE). **METHODS:** PubMed, CINAHL, PEDro, AMED, EMBASE and gray literature was searched from 1998 to 2009 for minor to major AE associated with cervical manipulation or mobilization for the treatment of adults with neck pain compared to a control or a comparison treatment in RCTs and prospective or cross sectional observational studies. All phases of the review were performed in duplicate. Risk of bias was assessed using the Cochrane system and a modified CASP form. Data was analyzed for relative risk (RR) using the Mantel-Hansel method with a random effects model. Clinical and statistical (I^2 , $p < .05$) het-

erogeneity was assessed. **RESULTS:** Full text screening identified 8 of 76 studies that met the inclusion criteria. Excellent agreement for the selection phase was obtained [weighted Kappa = 0.8880 95% CI (0.8244, 0.9516)]. No major AE were found. Two pooled estimates were derived for the minor AE of (1) Transient neurological symptoms RR = 1.96, 95% CI (1.09, 3.54) and (2) Increased neck pain RR= 1.23, 95% CI (0.85, 1.77). There was no heterogeneity. Forty-six studies (60%) were excluded for not reporting AE. **DISCUSSION-CONCLUSION:** No definitive conclusions can be made due to a small number of studies, weak association, moderate study quality and notable ascertainment bias. Improved reporting of AE in manual therapy trials as recommended by the CONSORT statement extension on harms reporting is warranted.

PHYSICAL THERAPY MANAGEMENT OF A PATIENT WITH AN EXTRUDED LUMBAR INTERVERTEBRAL DISC IN A DIRECT ACCESS SETTING

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BACKGROUND: Conservative treatments of patients with lumbar intervertebral disc (IVD) extrusion have been proposed as an alternative to discectomy. The purpose of this case report is to describe the successful physical therapy management of a patient with an extruded lumbar IVD. **METHODS:** The patient was a 40-year old Caucasian male presenting with an acute exacerbation of low back pain with radiculopathy. Upon examination the patient demonstrated a positive straight leg raise test (SLR) with the contralateral leg at 35 degrees. Decreased sensation was noted to light touch in the anterior thigh and medial lower leg. A magnetic resonance image demonstrated the extrusion occluding 72.2% of the spinal canal. The patient was treated by the physical therapist for 14 visits over 6 weeks. Treatment consisted of backward bending exercises, neuromuscular trunk control exercises, positional distraction and patient education. **RESULT:** The patient experienced

full restoration of sensation, negative SLR and improved function as demonstrated in the Oswestry disability score from 44% to 8%. **DISCUSSION-CONCLUSION:** After 10 visits the patient was offered the option of microdiscectomy by an orthopedic surgeon despite a significant decrease in symptoms. The patient declined the surgical intervention and continued conservative management. More research is needed to establish the value of conservative treatment for decreasing levels of pain and disability in patients with extruded lumbar IVD.

SPONDYLOARTHRTIS IN A PATIENT WITH UNILATERAL BUTTOCK PAIN AND HISTORY OF CROHN'S DISEASE: A CASE REPORT

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BACKGROUND: Although rare in occurrence, patients with a history of inflammatory bowel disease (i.e. Crohn's disease) and chronic low back or buttock pain should be carefully examined for the presence of spondyloarthritis as proper management may include referral for further medical management. **CASE DESCRIPTION:** A 27 year-old female with a 6-month history of posterior buttock pain and a history of Crohn's was referred to physical therapy with a diagnosis of piriformis syndrome. A mechanical sacroiliac disorder was suspected due to absence of lumbar provocation signs and centralization, positive cluster of sacroiliac provocation tests, positive active straight leg raise, and positive response to manual pelvic mobilization. On the second physical therapy visit, the patient reported a worsening of symptoms, but upon re-examination, a non-mechanical source of sacroiliac pain was suspected. A physician was notified and lumbopelvic radiographs were taken. The patient underwent evaluation by a rheumatologist and was diagnosed with spondyloarthritis associated with Crohn's. **OUTCOME:** The patient initiated treatment with anti-tumor necrosis factor medication to ad-

dress the spondyloarthritis and outcomes involved a significant improvement in all measures of pain, disability, and function. **DISCUSSION-CONCLUSION:** Clinical suspicion of spondyloarthritis should be raised when specific historical, examination, and imaging findings are present. The post-test probability of spondyloarthritis is increased with the presence of inflammatory back pain and specific spondyloarthritic features, such as positive history of Crohns, radiographic evidence of sacroiliitis, and improvement with anti-inflammatory medication and referral of patients with these findings for a rheumatological evaluation is warranted.

A MULTIMODAL APPROACH TO THE MANAGEMENT OF CERVICOGENIC HEADACHE AND NECK PAIN: A CASE STUDY

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PURPOSE: This case study demonstrates physical therapy diagnosis and multimodal management of a patient presenting with neck pain and cervicogenic headache (CGH). **SUBJECT:** A 36 y/o female presented with a five-month history of neck pain and headaches. Her initial injury occurred when she arose and struck her head on playground equipment. She was treated by her primary care physician with muscle relaxers, over-the-counter medications, self stretching and heat. She underwent 8-week physical therapy intervention using passive modalities with little benefit. **METHODS:** Examination restricted and painful neck ROM, muscle weakness, multi-level cervical and thoracic joint hypomobility, tenderness and increased tone of cervical muscles. Neck pain and daily headaches were measured using a Visual Analog Scale. Management included non-thrust mobilization of cervical and thoracic spine, soft tissue mobilization, passive stretching, therapeutic exercises, and postural education, for a total of 10 visits over a 7-week period. **RESULTS:** At discharge, she reported a 90% improvement with respect to neck pain and intensity and frequency of headaches. Residual headaches occurred occasion-

ally during times of increased stress, with a VAS score of 2/10. Strength, ROM and segmental mobility returned to normal with the exception of restriction to left rotation in the upper cervical spine. A follow up phone call, 2 months later, revealed continued relief with compliance to a home exercise program. **DISCUSSION-CONCLUSION:** This case study demonstrates that with an accurate differential diagnosis, CGH and neck pain may respond to multimodal physical therapy treatment program consisting of manual therapy, exercise and education.

MANUAL THERAPY APPROACH IN CARPAL TUNNEL SYNDROME: A CASE REPORT

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BACKGROUND: There is no consensus regarding the best management strategies for patients with carpal tunnel syndrome (CTS). **METHODS:** A 36 years old female with an electro-myography diagnosis of left CTS of 3-year duration participated. The patient received 2 treatment sessions over a 2-week period. The initial treatment consisted of soft tissue mobilization of scalene, pectoralis minor, pronator, digitorum flexor and hand muscles. At the 2nd visit, she received neural mobilization techniques directed at the median nerve. Outcomes included current level of pain and the worst level of pain during the preceding week, quality of life (SF-36 questionnaire, greater score indicates better quality of life) and functional status/severity symptoms (Boston Questionnaire (BQ), lower scores suggest better outcome). They were assessed at baseline (pre), 1 month, 6 months, 1 year and 2 years. **RESULTS:** At the initial visit the patient's current pain was 5/10 and 8/10 for the worst pain. The domains of the SF-36 revealed a moderate reduction of quality of life (33%–82%). The BQ functional sta-

tus score was 2/5 and the symptom severity score was 2.8/5. One month after discharge, current pain was 2/10 and worst pain 3/10. All dimensions of the SF-36 reached 100%, the functional status score was 1/5 and the symptom severity score 1.3/5. Finally, at 6 months, 1 and 2 years follow-up the patient was asymptomatic with the SF-36 showing 100% quality of life and the BQ 1/5 score. **DISCUSSION-CONCLUSION:** A manual therapy program may be beneficial to improve outcomes for patients with CTS.

MEDICAL MANAGEMENT AND PHYSICAL THERAPY OF A PATIENT WITH SUSPECTED BOW HUNTERS SYNDROME: A CASE REPORT

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BACKGROUND: Bow Hunters Syndrome (BHS) refers to the anatomical abnormality of poor or absent blood flow through the vertebral artery (VA) creating ischemic symptoms triggered during head rotation. Vertebrobasilar artery insufficiency and upper cervical ligament laxity can predispose an individual to BHS. There is minimal literature regarding the non-surgical management of this presentation when diagnostic imaging is negative. The purpose of this case report is to demonstrate how physical therapy (PT) can compliment pharmacological intervention in a patient with a clinical diagnosis of BHS. **METHODS:** The patient was a 37-year-old male presenting with non-traumatic neck pain, dizziness and cervical motion induced symptoms. Primary diagnosis generated from clinical examination was BHS secondary to transverse ligament instability despite the fact that dedicated dynamic catheter angiography induced symptoms but did not reveal VA compromise. The patient was prescribed pentoxifylline, a rheologic agent, and PT. Initial manual PT was focused on thoracic spine mobilization and soft tissue techniques in attempt to minimize upper cervical ligamentous and vascular stress. **RESULTS:** Outcomes at baseline (B), discharge (DC) and three month follow up

(TMF) were: Neck Disability Index (B-25; DC-8, TMF-8), Dizziness Handicap Inventory (B-72; DC- 42, TMF-20), and Activities-specific Balance Confidence Scale (B-61%; DC-81%, TMF-91%). **DISCUSSION-CONCLUSION:** At TMF he reported continued need for pentoxifylline, suggesting a degree of vascular involvement. PT complemented medical management providing symptomatic relief and increased function when initial manual cervical spine intervention was contraindicated. Careful diagnosis and intervention of a patient with suspected BHS can result in successful non-surgical management.

PROGNOSIS OF OUTCOME IN PATIENTS WHO DEMONSTRATE A LUMBAR DIRECTION OF PREFERENCE

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BACKGROUND: The purpose of this study was to determine if a score based on responses to repeated end-range lumbar movements is related to perceived level of function and pain levels in patients with low back pain. A Repeated Movement Scoring System (RMSS) was designed by the authors to rate the responses to repeated end-range lumbar spinal movements as determined at the initial examination. **METHODS:** Following the initial examination, seven subjects with acute Low Back Pain (LBP) who met the Clinical Prediction Rule for spinal manipulation were administered an exercise program based on their direction of preference. The Oswestry Disability Questionnaire (OSW), Fear-Avoidance Beliefs Questionnaire (FABQ), and the Numerical Pain Rating Scale (NPRS) were administered at the initial examination and at a 2-week follow-up. Sample *t*-Tests and the Pearson Product-Moment Coefficient of Correlation were used in the analysis. **RESULTS:** A significant correlation was observed between NPRS and RMSS ($r = .88, p < .05$). The patients also demonstrated significant improvement in OSW from pre-test to post-test ($p < .05$). **DISCUSSION-CONCLUSION:** The results suggest that a score based on the responses to repeated end-

range lumbar spinal movements when used in combination with a neurological examination may assist in establishing a prognosis for patients with acute LBP.

A COMPREHENSIVE APPROACH OF MANUAL THERAPY AND EXERCISE FOR LATERAL EPICONDYLALGIA: A CASE SERIES

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BACKGROUND: Treatment for lateral epicondylalgia (LE) varies greatly between therapists and may include manual therapy, exercise, and modalities. The purpose of this case series was to examine a comprehensive approach of regionally applied manual therapy in combination with exercise in patients with LE. **METHODS:** Patients were evaluated and provided impairment-based treatment including: joint mobilization (Grades I–IV) to the cervical and thoracic spine and upper extremity directed specifically toward areas of capsular tightness; high velocity, low amplitude manipulation of the cervical and thoracic spine directed at areas of restriction; mobilization with motion to the elbow; general stretching; eccentric wrist extensor strengthening; scapular stabilization/strengthening; and upper extremity strengthening. Outcomes included maximum grip strength, Numeric Pain Rating Scale (NPRS), and the Disabilities of the Shoulder, Arm and Hand Questionnaire (DASH). **RESULTS:** Two males and 2 females, ages ranging from 41 to 58 years, and symptom duration of 5 to 24 months participated in this case series. The average number of physical therapy sessions attended was 14 (range, 10–17). The median increase in maximal grip strength 32.3 PSI (range, 23–70 PSI) with the median decrease in NPRS during grip equal to 5.5/10 (range, 3–6). The median improvement on the DASH was 20.8 points (range, 11.5–40 points). **DISCUSSION-CONCLUSION:** A comprehensive, upper quarter, impairment-based approach resulted in increased grip strength and decreased pain as well as clinically mean-

ingful improvements in function. While cause and effect relationships cannot be inferred from this case series, the outcomes with these patients are similar to others reported in the literature.

AN IMPAIRMENT BASED MANUAL PHYSICAL THERAPY APPROACH IN THE TREATMENT OF BACK AND NECK PAIN IN A PATIENT WITH A T2-L3 SPINAL FUSION: A CASE REPORT

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BACKGROUND: Little high quality evidence exists to guide decision making regarding management of low back pain (LBP) with history of spinal fusion. This case report is designed to describe the management of a patient whose pain complaint lies structurally beyond the fusion. **METHODS:** A 20-year old male was referred to physical therapy with a 3-month insidious onset of non-radicular neck and back pain. He had a previous 6-year, uncomplicated history of T2-L3 spinal fusion. His complaints were NPRS of 8/10 with activities of standing, pushing, and bending forward and 2/10 at rest. PSFS was 7/10 for work and 5/10 for “picking things off the floor”, 0 being performing normally and 10 being cannot perform. ODI was 16%. Physical examination revealed LBP reproduction with A/PROM hip flexion. He also demonstrated CNS sensitivity both during seated slump testing and supine SLR, recreating both low back and neck pain, respectively. **RESULTS:** Five visits over 17 days resulted in a complete resolution of function and near resolution of pain. A 6-month follow-up confirmed continued function resolution. **DISCUSSION-CONCLUSION:** This patient experienced a rapid and clinically meaningful improvement with function and pain from hip and neurodynamic mobilizations. This case report is the first to describe the usage of hip mobility exercises and manual therapy combined with neurodynamic techniques in the management of low back and neck pain with a history of spinal fusion. Future research

should investigate this management strategy in larger sample size and compare it to standard care.

IMPROVEMENT IN TWO POINT DISCRIMINATION FOLLOWING SUCCESSFUL MANAGEMENT OF CHRONIC LOW BACK PAIN: A CASE REPORT

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BACKGROUND: Patients with long standing low back pain (LBP) commonly exhibit sensory perceptual deficits and heightened pain responses as well as altered motor control. These changes may signal central sensitization of nociceptive pathways and a shift towards chronicity of the condition. Quantitative sensory testing (QST) in addition to motor control assessment may assist in the identification of patients that fit into this subgroup. The purpose of this case report was to investigate QST changes in a patient with chronic LBP following physical therapy intervention. **CASE DESCRIPTION:** A 33 year-old female with 2-year history of non-specific R>L LBP was evaluated. L4/5 and L5/S1 segmental hypomobility was demonstrated, yet treatments of thrust and non-thrust manipulation were ineffective following 7 sessions over 6 weeks. Further specific evaluation revealed vibratory sensation loss and increased two-point discrimination on the right vs left (10.5 vs 7.5cm) at the L5 segment. Altered motor control of transverse abdominus (TrA) and multifidus was also noted. **OUTCOMES:** Following 4 weeks of progressive stabilization, the patient demonstrated improvement in TrA and multifidus motor control, two-point discrimination improved to 3cm (right) and 1.5cm (left), pain diminished to 0-2/10, and Global Rating of Change was rated as moderately better (+4). **DISCUSSION-CONCLUSION:** While this patient did not meet the clinical prediction rule for success with stabilization, progressive motor control exercises were effective in symptom resolution and normalization of

tactile acuity. The neurobiological mechanisms behind such changes are unclear. Further investigation for use of QST and the relationship to motor control issues is warranted.

INTEGRATING A PROPOSED PATHO-MECHANISM CLASSIFICATION APPROACH IN THE MANAGEMENT OF A WHIPLASH PATIENT: A CASE REPORT

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BACKGROUND: Recently, a proposed patho-mechanism-based approach for classifying low back related leg pain was introduced that identified four subgroups of referred pain to assist in diagnosis and selection of appropriate interventions. The purpose of this study was to describe the usefulness of incorporating this classification in the evaluation and treatment of a whiplash patient. **METHODS:** A 48 year-old male with complaints of neck, shoulder and arm pain and weakness following a motor vehicle accident participated. Two out of the four diagnostic subgroups (peripheral nerve sensitization and musculoskeletal) were identified. Interventions of high velocity low amplitude manipulation to the C-T junction and upper thoracic spine, cervical traction and neural tissue mobilizations were used. Outcome measures were the numerical pain rating scale (NPRS), elbow extension strength, response to a neural tissue provocation test and the neck disability index (NDI). **RESULTS:** After eight visits patient arm and shoulder pain decreased from 4/10 to 1/10 and his scapula pain from 5/10 to 1-2/10 on a NPRS. Cervical rotation increased from 65 degrees to 85 degrees and elbow extension strength improved from 4-/5 to 5/5. Response to an upper limb neural tissue provocation test improved by 60 degrees of elbow extension and the NDI decreased from 32% to 10%. **DISCUSSION-CONCLUSION:** The patho-mechanism approach was a

useful tool in further classifying this patient's referred neck pain. The patients C6-7 weakness also met the diagnostic subgroup of denervation. There may be overlap between the four groups with muscle weakness secondary to neural impingement as one example.

EFFECTS OF A LUMBOPELVIC JOINT MANIPULATION ON GAIT MECHANICS OF INDIVIDUALS WITH PATELLOFEMORAL JOINT PAIN

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BACKGROUND: Lumbopelvic joint manipulation can decrease pain and improve quadriceps activation in individuals with patellofemoral pain (PFP), but effects on gait are unknown. The purpose of this study was to examine changes in knee kinematics and kinetics following lumbopelvic joint manipulation. **METHODS:** Thirty-two subjects (age=25.1±9.7 y, height=173.6±10.6 cm, mass=77.3±15.6 kg) with PFP participated in this single-blind randomized control trial. Subjects ran at a self selected pace while three 15-second trials were obtained before and after intervention. Kinetic data were normalized and reported in Nm/kgm. Next, individuals were randomized to one of three intervention groups (lumbopelvic joint manipulation, lumbar passive range of motion (PROM), prone extension on elbows). A mixed-model ANOVA was used to compare changes in peak knee flexion angle and peak external knee flexion moments. **RESULTS:** There were no significant differences ($F_{2,29} = .44, P = .65$) in peak knee flexion angle (degrees) between groups, Manipulation Pre=43.97±5.62, Post=44.45±6.02; PROM 38.83±9.16, Post= 39.04±9.08; Prone on Elbows Pre=43.17 ±4.38, Post=42.59±5.00. There were no significant differences ($F_{2,29} = 1.39, P = .27$) in peak external knee flexion moments (Nm/kgm) between groups, Manipulation

Pre=0.78±0.27, Post=0.69±0.24; PROM Pre=0.64±0.31, Post=0.66±0.39; Prone on Elbows Pre=0.83±0.23, Post=0.79±0.28. **DISCUSSION-CONCLUSIONS:** Interventions directed at the lumbopelvic region do not seem to have an acute effect on knee joint running mechanics in individuals with PFP. Future studies should determine if changes occur at other joints, such as the hip, or if there is a subset of individuals with PFP likely to demonstrate changes in gait following lumbopelvic joint manipulation.

DIAGNOSIS OF A BONE TUMOR PRESENTING AS HIP PAIN: EOSINOPHILIC GRANULOMA—A CASE REPORT

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BACKGROUND: The differential diagnosis of hip pain includes non-musculoskeletal pathology. **CASE DESCRIPTION:** A 33-year-old male was referred to physical therapy 3 weeks after a right ankle sprain. At follow-up, he reported a new onset dull ache in the right anterior hip. A thorough examination of the lumbopelvic region revealed that the pain was not increased with palpation, range of motion, resisted tests or compressive hip loading, but was relieved with long axis manual distraction. Radiographs of the right hip were read as normal by the radiologist. For further screening, the physical therapist (PT) ordered an erythrocyte sedimentation rate, which was normal and a bone scan that revealed increased metabolic activity in the lesser trochanteric region of the right hip. This finding prompted the radiologist to perform a computed axial tomography scan. A lytic lesion was identified in the proximal hip with a differential diagnosis of osteoid osteoma or osteochondroma. The patient was placed on crutches to reduce the chance of pathologic fracture and was referred by the PT to orthopaedic surgery. **OUTCOME:** The patient underwent needle biopsy and was diagnosed with eosinophilic granuloma by orthopaedic oncology. The patient con-

tinued physical therapy to maintain hip range of motion and strength. The patient progressed from pool therapy to normal daily activities except for running and sports. **DISCUSSION-CONCLUSION:** This case of non-musculoskeletal hip pain was identified through a collaborative effort facilitated by the PT. To prevent pathological fracture in this active patient, early recognition of the atypical presentation was essential.

**CERVICAL SPINE
MANIPULATION FOR
THE TREATMENT OF
CERVICOGENIC HEADACHE:
A MODIFIED EXTENSIVE
LITERATURE REVIEW.**

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BACKGROUND: Approximately 50 million people in the U.S. have headaches, losing 150 million workdays and costing \$57 billion dollars annually. The purpose of this study was to determine the efficacy of spinal manipulation on quality of life, intensity and frequency of headache, and articular mobility (ROM) in patients with cervicogenic headache. **METHODS:** An inductive analysis of literature addressing manipulative therapy of the cervical spine as treatment of cervicogenic headache. **RESULTS:** Mobilization is the current treatment of choice. Intraexaminer passive segmental mobility was supported. Inter-examiner mobility is still under debate. Intraexaminer assessment was a reliable method for cervicogenic headache differential diagnosis. There is a lack of quality studies on the efficacy of cervical spine manipulation. Research supports the use of cervical mobilizations and manipulations with exercise for optimal short- and long-term outcomes. **DISCUSSION-CONCLUSION:** The best outcomes for long-term benefit for cervicogenic headache resulted from mobilization and/or manipulation with exercise. The primary treatment region was from occipito-atlantal to C3 segments and secondary regions included T1 to T4. Exercise to the deep neck flexors, scapular musculature, and mobilizing exercises for the cervical

and thoracic spine were included as well. This comprehensive literature review provided legitimacy and clear definition for the diagnosis of cervicogenic headache. The study compiled the current evidence-based knowledge for spinal manipulation to the cervical spine, specifically for those suffering from cervicogenic headache. It exposed the importance of rigorous training for practitioners of spinal manipulation, especially to the upper cervical spine, in physical therapy education.

**CLINICAL REASONING FOR
UPPER CERVICAL SPINE
MANIPULATION:
A MODIFIED EXTENSIVE
LITERATURE REVIEW**

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BACKGROUND: Upper cervical spine manipulation as a treatment is a controversial topic. No Clinical Prediction Rules (CPRs) exist for upper cervical spine manipulation procedures. The purpose was to investigate the clinical decision-making process and assessments involved in determining the appropriateness of performing upper cervical spine manipulation through a review of literature. **METHODS:** An inductive analysis of literature addressing vertebral artery assessment, clinical decision-making algorithm, and clinical prediction rules implementation in the decision process for when and when not to perform manipulative therapy of the upper cervical spine. **RESULTS:** Higher risk for spontaneous arterial dissection is associated with atherosclerosis, hypertension, diabetes mellitus, and a history of smoking. A genetic defect can lead to increased levels of amino acid homocysteine creating fragility of the arterial wall. The examination options are to auscultate for bruits, blood pressure, cranial nerve examination, general eye examination, and laboratory testing for elevated amino acid homocysteine levels. Assess mechanical arterial dissection using cervical rotation, deKleyn's test, pre-manipulative hold, and a hand held Doppler velocimeter. If symptoms are associated with a spontaneous event, then

mechanical tests have little value. Fifty percent of patients, typically females 30 to 39 years old, will experience adverse event within four to eight hours most commonly resulting in mild to moderately severe local discomfort, headache, and stiffness/soreness. Symptoms usually dissipate within 24-hours. **DISCUSSION-CONCLUSION:** This study offers an evidence based compilation of literature providing a set of various subjective and objective testing which can assist the manual therapist in the clinical reasoning process.

**MANUAL THERAPY IN THE
TREATMENT OF CALCIFIC
SUPRASPINATUS TENDON:
A CASE STUDY**

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BACKGROUND: Calcification of the supraspinatus tendon is a common condition, which may require medical intervention, including corticosteroid injections and physical modalities. This study provides preliminary evidence that manual therapy (MT) treatment can lead to reduced calcification in the supraspinatus tendon. **METHODS:** A 46 year-old woman with an 18-month history of gradually increasing right shoulder pain participated. Raymond Sohler MT techniques were used to correct the alignment of the glenohumeral joint (GHJ). These techniques involved assessment of the passive range of motion (ROM) of flexion and abduction, followed by the application of gentle sustained posterior and inferior glides of the humeral head. The patient received 12 treatment sessions over a period of 3 months. **RESULTS:** Baseline measures were: (1) shoulder pain on a visual analogue scale (VAS) =2/10 at worst; (2) GHJ flexion ROM =100° and abduction =95°; (3) external and internal rotation of the shoulder were painful at end ROM; (4) baseline X-rays revealed calcification in the distal portion of the supraspinatus tendon; and (5) Activities of Daily Living at home and work were all painful. Following the intervention, repeated X-

rays revealed reduction of calcification. All shoulder ROM movements were full and pain-free. **DISCUSSION-CONCLUSION:** This case study provides preliminary evidence that MT can lead to reduction of calcification of the supraspinatus tendon and improvements in shoulder impairments and function. These techniques may cause relaxation of soft tissue structures of the GHJ, leading to correct alignment of the humeral head relative to the glenoid resulting in appropriate joint arthrokinematics.

DETECTION OF OS ODONTOIDEUM IN A PATIENT WITH POSITIVE ALAR LIGAMENT TEST

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BACKGROUND: Os odontoideum is the incomplete fusion of odontoid process with the body of second cervical vertebra or axis. The etiology is debatable between congenital failure of fusion and an old fracture of odontoid synchondrosis before ossification. It is diagnosed with a plain open mouth cervical radiograph. **METHODS:** This case report describes a 66-year-old female referred to physical therapy for neck pain with a history of motor vehicle accident five weeks earlier. She did not go to emergency room. Patient's chief complaints of pain were in lower cervical and upper thoracic spine. She denied neurological symptoms. Examination revealed positive alar ligament test. A positive test constituted an initial delay followed by quick movement of the spinous process of axis. Her physician was immediately notified. Cervical radiographs were obtained, that confirmed os odontoideum. Stress radiographs and magnetic resonance imaging were then ordered in consultation with the neurosurgeon. He concluded the os odontoideum to be stable, and referred her back to physical therapy. Clinical decision was made not to perform manual therapy techniques at C3 and above. Treatment procedures included manual therapy to the upper thoracic spine, cervico-scapular stabilization exercises, and

education. **RESULTS:** Patient completed four weeks of therapy with greater than 90% resolution of her symptoms. Prior to her discharge, patient was educated regarding os odontoideum and was advised to report any future neck trauma immediately to the emergency room. **DISCUSSION-CONCLUSION:** Os odontoideum may be present in an asymptomatic individual. It may be possible to suspect an os odontoideum with alar ligament test.

CLINICAL DECISION MAKING IN THE IDENTIFICATION AND PHYSICAL THERAPY MANAGEMENT OF CERVICOGENIC DIZZINESS: A CASE SERIES

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PURPOSE: This study provides clinical decision making in the management of cervicogenic dizziness. **SUBJECTS:** Two patients were referred to Physical Therapy for dizziness and light-headedness. Examination reproduced familiar symptoms with vestibulocular reflex (VOR), dynamic visual acuity and motion sensitivity test. No noticeable abnormalities were found in balance and gait. Musculoskeletal findings presented poor posture with muscular tenderness, hypomobility and pain provocation in the upper cervical spine assessment. **METHODS:** Outcome measures included the Activities-specific Balance Confidence (ABC) Scale, Tinetti's Confidence Index (TCI), Dizziness Handicap Inventory (DHI) and a re-test of baseline abnormal physical variables. Global Rating of Change Scale (GROC) was completed at discharge and 4-week follow-up. Patients attended 3 or 8 sessions managed by upper cervical manual therapy and VOR retraining. **RESULTS:** Initial to discharge score change for 31-year-old patient were 71 to 96% (ABC), 75 to 100% (TCI), 44 to 16 scores (DHI) with GROC of +7 at discharge and follow-up. Score changes for the 67-year-old patient were 70 to 78 % (ABC), 78 to 85 % (TCI), 30 to 20 scores (DHI) with

GROC of +4 at discharge and +5 at follow-up. The 31-year-old patient returned to normal activity without dizziness. The 67-year-old patient reported only mild light-headedness upon waking up and full recovery after exercises. Age, severity and duration of symptoms may be contributing factors to outcome. **DISCUSSION-CONCLUSION:** This study demonstrates successful management to incorporate treatment based diagnostic decision making and an impairment-based approach utilizing both cervical manual physical therapy and vestibular rehabilitation for cervicogenic dizziness.

MERALGIA PARESTHETICA TREATED BY MANUAL PHYSICAL THERAPY INCLUDING THORACIC SPINE MANIPULATION, INGUINAL REGION SOFT TISSUE MOBILIZATION AND EXERCISE: A CASE REPORT

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BACKGROUND: Meralgia Paresthetica (MP) is a neuropathy of the lateral femoral cutaneous nerve (LFCN) characterized by dysesthesia and pain along the antero-lateral thigh. MP is diagnosed by clinical examination and nerve conduction study. Published treatments include altering LFCN compression, medication, injection, and surgery. The effect of manual physical therapy in patients with MP has not been reported. The purpose of this report is to describe MP treatment with manual therapy and exercise directed at the thoracic spine and inguinal region. **CASE DESCRIPTION:** Patient was a 55-year-old male with a one year onset of right antero-lateral thigh pain and dysesthesia. Numeric pain rating scale (NPRS) was 4/10, aggravated to 10/10 by rapid position changes. Lower Extremity Functional Scale (LEFS) was 33%. Surgical history included right laparoscopic inguinal hernia repair two years earlier. Neurological examination was normal. Antero-lateral thigh sensation decreased. Palpation to hernia repair site was thickened, lo-

cally painful and reproduced thigh pain. Right LFCN sensory distal latency was prolonged. The patient was treated for seven sessions over five weeks, initially with thoracic manipulation and spine exercises. Soft tissue mobilization and exercise to the right inguinal region followed. **OUTCOME:** The patient significantly improved. There were no exacerbations and reduced dysesthesia area; NPRS 0/10; LEFS 98%. Full function was sustained one month later. **DISCUSSION-CONCLUSION:** Both NPRS and LEFS exceeded their minimal clinical important differences. Specific manual techniques of thoracic spine manipulation and inguinal soft tissue mobilization appeared to yield significant benefit. Manual therapy and exercise improved pain and function in a patient with MP.

HIP FLEXION PASSIVE RANGE OF MOTION WITH AND WITHOUT PELVIC MOTION IN HEALTHY ADULTS

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BACKGROUND: Traditional methods for examining hip flexion passive range of motion (PROM) do not distinguish femoral-acetabular motion from pelvic motion. Similar to the scapulohumeral complex, the contributions of each component must be examined in order to accurately identify and treat limitations. The purpose of our study was to establish hip flexion PROM with and without pelvic motion in healthy adults using a method with clinical utility. **METHODS:** Hip flexion PROM was measured with and without pelvic motion three times bilaterally on 35 subjects (14 males 26.6±3.1 years; 21 females 25.8±7 years). A universal goniometer was used to measure the angle of motion and an inclinometer was placed at the pubic symphysis to monitor pelvic motion. **RESULTS:** There were significant differences between hip flexion PROM with pelvic motion (130.1°±7.4°) and without pelvic motion (78.6°±13.9°) with $P<.0001$. There were significant dif-

ferences ($P=.003$) in hip flexion PROM between males (125.2°±7.1°) and females (133.4°±7.7°) only when pelvic motion was allowed. **DISCUSSION-CONCLUSION:** Current literature suggests pure hip flexion ROM to be 85°–94°, but the method of controlling for pelvic motion varies widely with little reliability or clinical utility shown. Our findings show isolated hip flexion to be 75° in healthy males and 81° in healthy females. Further studies are indicated to examine hip flexion ROM in persons with lumbopelvic and hip dysfunction as well as to identify the best intervention to treat limitations involving both components pelvi-femoral complex.

CERVICOTHORACIC MANUAL PHYSICAL THERAPY AND EXERCISE IN LATERAL EPICONDYLALGIA

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BACKGROUND: Lateral epicondylalgia (LE) is a complex condition thought to have many potential causative factors. Evidence indicates improved outcomes when cervical and cervicothoracic intervention is coupled with local management strategies. While isolated local management strategies have been described, clinical details and outcomes of cervicothoracic specific management in LE is lacking. The purpose of this case series is to describe the initial recovery and 6-month outcomes of cervicothoracic manual physical therapy and exercise in LE. **METHODS:** Two individuals with LE were treated with cervicothoracic manual therapy and exercise interventions following LE symptom provocation or relief with cervicothoracic examination. Case 1 exclusively received cervicothoracic treatment (2 visits), yet case 2 received elbow mobilization and forearm stretching initially that was removed after the 3rd of 6 visits. Patient outcomes up to 6 months were detailed using the Global Rating of Change Scale (GROC) and Numeric Pain Rating Scale (NPRS). **RESULTS:** Both patients report-

ed 0/10 NPRS and +7/+7 on the GROC at the end of treatment and 6 months after treatment. Case 2 demonstrated dramatic changes when cervicothoracic treatment was added to local treatment and further progress when local treatment was removed. **DISCUSSION-CONCLUSION:** While no cause/effect conclusions can be drawn from these two cases, it highlights the clinical importance of cervicothoracic examination and treatment in individuals with LE. Additional investigation is warranted to further assess the effect of cervicothoracic specific treatment in LE and characterize any potential subgroup of LE patients that may respond to cervicothoracic treatment.

RESOLUTION OF AGUESIA (TASTE LOSS) IN A PATIENT RECEIVING MANUAL PHYSICAL THERAPY INTERVENTIONS POST CERVICAL LYMPH BUNDLE EXCISION: A CASE REPORT

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BACKGROUND: Aguesia (taste loss) has been reported as occurring infrequently after cervical tonsillectomy, radiation therapy and with accidental nerve damage intra-operatively. This case report describes the resolution of aguesia in a patient examined post cervical lymph node resection after receiving manual physical therapy (MPT) interventions. **SUBJECT:** 53 year-old female, thyroidectomy with radiation but no aguesia or significant pain; four weeks subsequent lymph bundle excision with immediate right brachialgia, facial paresthesia and aguesia. **METHODS:** Baseline measures 24 days post-op included a near complete loss of taste excluding a minimal retention of posterior tongue bitter/salt perception. Pain level 6-10/10. Neck disability index (NDI) 52%. Sensory testing noted numbness and intermittent pain right side of the face and extending down to the mid-humeral level. Six treatment sessions included upper cervical, scapula and rib mobilizations, soft tissue interventions and nerve slid-

ing techniques. **RESULTS:** Following the first session, the patient was pain free at rest. Taste sensation was reported as partially restored within 24 hours, and fully resolved within 72 hours. No aguesia present five weeks post the first treatment with pain levels 0-6/10. A progressive return of facial/right upper extremity sensation was reported. NDI at 5 weeks was 42% with treatment ongoing. **DISCUSSION-CONCLUSION:** This case report provides the first clinical evidence of beneficial effects from MPT in the treatment of aguesia. Aguesia resolution usually follows a slow course, but the dramatic return of taste in this case suggests that manual interventions may provide a means to accelerate return of taste in a traumatic presentation.

**IMMEDIATE EFFECTS OF
ADDING A SCIATIC NERVE
SLIDER TECHNIQUE ON LUMBAR
AND LOWER QUADRANT
MOBILITY IN SOCCER PLAYERS:
A PILOT STUDY**

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BACKGROUND: To assess the immediate effect of a sciatic nerve slider technique added to sustained hamstring stretching on lumbar and lower quadrant flexibility. **METHODS:** Eight healthy male soccer players (21±3 years) were randomly assigned to 2 groups. Group A received 5 minutes of bilateral sustained hamstring stretching. Group B additionally performed 60 seconds of a sciatic nerve slider technique. Pre- and post-intervention, an assessor blinded to group assignment measured metric distance on finger-floor, sit and reach, and modified Schöber tests and goniometric range of each hip for the straight leg raise and each knee for the seated slump test. Baseline between-

group differences were examined with an independent t-test; a two-way repeated measures Analysis of Variance (ANOVA) with P<0.05 analyzed effects of the interventions. **RESULTS:** There were no significant between-group baseline differences. There was a significant effect for time on all outcome measures other than the sit and reach test. A significant interaction between group*time with greater improvements in group B was found for the modified Schöber test (F = 5.5; P < 0.05), left straight leg raise (F = 6.1; P < 0.05) and slump test in either leg (left F = 28.7; P = 0.002; right F = 4.9; P < 0.05). **DISCUSSION-CONCLUSION:** Adding a sciatic nerve slider technique to sustained hamstring stretching led to greater immediate increases in lumbar and lower quadrant flexibility in young healthy soccer players as measured by 4 of the 7 outcome measures used.

**MANAGEMENT OF SUSPECTED
CERVICAL RADICULOPATHY
IN A PATIENT WITH
RHEUMATOID ARTHRITIS**

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BACKGROUND: Differential diagnosis of cervical dysfunction with radiating arm symptoms is often challenging due to variable neurological signs and symptoms, and is complicated in the presence of a systemic inflammatory condition like rheumatoid arthritis. Recent evidence suggests that radiculopathy and pseudoradiculopathy may represent a continuum of altered somatosensation rather than separate disease entities. **CASE DESCRIPTION:** A 55 year-old male, diagnosed with 20 year history of rheumatoid arthritis, was referred to physical therapy with a diagnosis of cervical radiculopathy. He presented with cervical pain and intermittent pain and paresthesia in the medial forearm radiating into 4th/5th digits. Neurological screen showed non-dermatomal sensory loss distally without myotomal weakness. Left elbow flexion was limited and painful. Grip strength was also sig-

nificantly compromised (5kg vs 25kg uninvolved side). Neural provocation testing reproduced distal symptoms. One of 4 cluster item tests implicating cervical radiculopathy was positive. Initial treatment at cervicothoracic spine abolished cervical pain but had no effect on distal symptoms. Oscillatory neural glides resulted in only transient reduction in symptoms. The addition of a non-thrust manipulation technique at the humeroulnar joint produced a significant reduction in forearm and hand symptoms along with improvement in painfree elbow flexion (151°) and an increase in grip strength to 34kg. **DISCUSSION-CONCLUSION:** Presence of rheumatoid disease increases the chance of neurogenic inflammation and clinical signs of neurologic dysfunction. Careful differentiation particularly in patients with inflammatory diseases is critical for successful management.

**A MANUAL PHYSICAL THERAPY
APPROACH FOR NON-
OPERATIVE MANAGEMENT OF
FULL-THICKNESS ROTATOR
CUFF TEARS: A CASE SERIES**

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BACKGROUND: Full thickness rotator cuff tears can be debilitating and are often managed surgically despite the incidence of tears in the asymptomatic population and evidence for satisfactory outcomes with conservative interventions. Two patients were managed with an impairment-based manual physical therapy program. The purpose of this study was to describe the evaluation, intervention, and outcomes of two patients with confirmed full-thickness rotator cuff tears that had been offered surgical repair but instead chose a conservative manual physical therapy intervention. **METHODS:** A 59 year-old female with a full-thickness tear of the left supraspinatus tendon and a 62 year-old male with full-thickness tears of the left supraspinatus and infraspinatus tendons were followed for 6 months.

Prior symptom duration was three and four weeks respectively. Intervention consisted of joint mobilizations, stretches, and strengthening exercises. **RESULTS:** Although full range of motion was not restored, the Shoulder Pain and Disability (SPADI) scores were improved from baseline scores of 76% to 1% for the female and from 39% down to 10% for the male by respective discharge (6 months). Both patients reported Global Rating of Change (GRC) scores of +7 at discharge. The female patient returned to playing golf. **CONCLUSION:** Two patients managed with orthopaedic manual physical therapy demonstrated improvements in functional outcomes that were no worse than those reported with surgery. This nonsurgical intervention should be considered in the management of this patient population.

CLINICAL DECISION MAKING ASSOCIATED WITH ATLANTOAXIAL INSTABILITY IN A PATIENT DIAGNOSED WITH ANKYLOSING SPONDYLITIS

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BACKGROUND: This report describes the clinical decision-making process for a patient referred to physical therapy for the treatment of neck pain with underlying atlantoaxial instability. **CASE DESCRIPTION:** The patient was a 31 year-old man (military pilot for an aerial refueling tanker aircraft) diagnosed with ankylosing spondylitis who had a complaint of chronic neck pain without a history of injury. All active cervical spine movements were moderately limited and his neurological examination was unremarkable. The Sharp-Purser test was positive for excessive motion. Cervical spine radiographs (including flexion-extension views) were then ordered, which revealed evidence of atlantoaxial instability (the atlantodens interval increased to 6 mm with the lateral flexion radiograph). After discussion with the patient's physician, it was determined that no further immediate medical

evaluation was necessary and a course of physical therapy was indicated. This decision was based upon a normal neurological examination, an atlantodens interval that was less than typically required for surgical intervention, and the patient's desire to avoid surgical intervention. At 1 year following his initial physical therapy evaluation, the patient successfully deployed and continued working as a pilot. **DISCUSSION-CONCLUSION:** Physical therapists should understand the clinical findings associated with atlantoaxial instability, as these findings provide guidance for diagnostic imaging and medical referral prior to initiating physical therapy.

VERTEBROBASILAR ARTERY INSUFFICIENCY SCREENING: A THREE CASE SERIES.

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BACKGROUND: Vertebrobasilar artery insufficiency (VBI) is a rare but potentially fatal condition that is a contraindication to cervical manipulation. Controversy surrounds which screening methods should be used. The Australian Physiotherapy Association (APA) provides widely cited guidelines but no studies have determined their effectiveness. The purpose of this case series is to demonstrate the utility of these guidelines. **METHODS:** Subjects were 3 patients referred for cervical spine dysfunction. Evaluation included questions regarding symptoms, medical history, and medications. Following APA guidelines, symptoms were monitored during bilateral ten second holds at end range cervical rotation. Subjective and objective reassessment was contiguous throughout treatment. Vestibular differentiation was accomplished via trunk rotation under a fixed head. **RESULTS:** Case one was a false positive with dizziness, nystagmus, and an "odd" sensation subsequently attributed to sinus congestion. Follow up screening was negative on the second visit after resolution of the sinus congestion. Case two was a true negative with dizziness reported during end range rotation test-

ing and during vestibular differentiation. Clinical reasoning led to the conclusion that cervicogenic dizziness was likely and symptoms resolved with cervical mobilization. Case three was a true positive with tremors, nausea, and visual disturbances. Findings of VBI were verified by magnetic resonance angiogram and compared to earlier study. **DISCUSSION/CONCLUSION:** The APA may provide the best current guidelines for screening patients with VBI. Further differential diagnostic testing should be included to gain a more comprehensive clinical picture and guide decision-making in the cervical spine patient when VBI is suspected.

RULING OUT CANDIDACY FOR PHYSICAL THERAPY WITH MECHANICAL EVALUATION

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BACKGROUND: Implementation of evidence-based practice is necessary to expedite the transition of orthopaedic manual physical therapists (PTs) toward autonomous practice. This case demonstrates that specifically-skilled therapists can identify a patient who is not appropriate for PT intervention based on mechanical (MDT) evaluation. **CASE DESCRIPTION:** 21 year-old male employed teacher reported worsening, intermittent back pain with pain/numbness to posterior right leg and left thigh that occurred for no apparent reason. Symptoms were aggravated with bending, sitting, rising from sitting; alleviated by walking for short periods of time and while lying supine. Initial Oswestry Low Back Disability Index was 32% (moderate disability). Comprehensive MDT assessment showed: slouched posture; positive slump and straight leg raise tests; no myotomal or dermatomal deficits; minimal lumbar sagittal or left side-glide movement loss; no right side-glide loss. In loaded and unloaded positions, repeated lumbar testing in extension worsened symptoms, while it had no effect in flexion. Mechanical testing in sustained prone on elbows position with hips offset worsened symptoms and

supine trunk rotation had no effect. Patient's home program was repeated flexion in lying every 2 hours. Patient returned and was reassessed, adding traction in flexed and extended recumbent postures. No evidence of centralization or directional preference to MDT occurred over a total of 3 visits. **DISCUSSION-CONCLUSION:** Patient was a non-responder to MDT testing; physician was contacted. Diagnostic imaging confirmed at the L5-S1 segment a large central disc extrusion with stenosis to the central canal. Patient was referred for surgery consult. This case supports the effectiveness of specifically-trained PTs in ruling out candidacy for physical therapy intervention

USE OF THE MULTIFIDUS ISOMETRIC CONTRACTION TECHNIQUE IN PATIENTS WITH ACUTE NECK PAIN: A CASE SERIES

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BACKGROUND: Acute facet capsular entrapment is a syndrome that is thought to occur suddenly during motion of the cervical spine or after sleeping in an awkward position. The patient reports a sudden "catch" unilaterally, which typically results in markedly reduced motions of side bending and rotation to the painful side and reduced backward bending. The Multifidus isometric technique is hypothesized to pull the entrapped facet capsule from the facet joint resulting in increased range and decreased pain levels. **METHODS:** Three patients were treated with complaints of sudden onset of acute left sided neck pain and limitation in range of motion of left rotation, left side bending and backward bending. The multifidus isometric technique was performed to facilitate contraction of the left multifidus (4 sets of 4 repetitions [5 seconds holds]) for three to four consecutive visits. All range of motion measurements were taken with a standard goniometer. **RESULTS:** At discharge, 2 patients exhibited full pain free cervical AROM and 1 patient

had full AROM with mild pain (1/10) at end range. The most dramatic increases in AROM occurred during visits 1 and 2. The mean increase in AROM from initial examination to completion of the second treatment session was 49 degrees for left rotation, 45 degrees for backward bending, and 28 degrees for left side bending. **DISCUSSION-CONCLUSION:** The Multifidus Isometric technique was useful in restoring AROM in 3 patients with acute neck pain. Further research is warranted to investigate outcomes in larger populations and compare outcomes to interventions such as manipulation and exercise.

TRANSVERSUS ABDOMINIS MUSCLE ACTIVATION DURING FUNCTIONAL TASKS: IMPLICATIONS FOR THE PRACTITIONER DEALING WITH SPINAL STABILIZATION

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BACKGROUND: This longitudinal study examined the impact of Abdominal Hollowing Exercise (AHE) training with USI (Ultrasound Imaging) in healthy adults as an injury prevention technique during lifting and handling maneuvers typically encountered at work, examining the ability to retain Transverse Abdominis (TrA) muscle activation over time as a result of a quick bout of AHE training using USI. **METHODS:** Healthy adults (N=16) participated in 3 experimental sessions. Visual and verbal feedback regarding success of Transverse Abdominis (TrA) contraction was provided by a physical therapist on all trials during all tasks; each adult was instructed to relax (no AHE prior to task) and engage in AHE on the same 5 tasks, respectively. Tasks were standing, reaching (loaded vs. unloaded), lifting (proper vs. improper) under various instructional sets. One week and 12-week retention sessions required participants to perform the same tasks under the same instructions, yet without feedback. Dependent variables included TrA measures of thick-

ness and percentage of change in thickness. **RESULTS:** A doubly RM ANOVA (5 tasks x 2 training and 1-wk sessions) was not significant for any effects, indicating adults retained their ability to contract the TrA. A paired *t*-test on TrA thickness scores during proper and improper lifts with AHE indicated a higher mean TrA contraction for proper lifts. **CONCLUSIONS:** USI feedback during AHE training enhanced participants' ability to regulate TrA contraction at 12-week when performing reaching and lifting tasks with loads. Improper lifting mechanics inhibited the magnitude of TrA contraction, even after recruitment training sessions.

PHYSICAL EXAMINATION COMBINED WITH ELECTRODIAGNOSTIC TESTING TO DIAGNOSE & TREAT INFRASPINATUS MYOFASCIAL TRIGGER POINTS AND SUPERFICIAL RADIAL SENSORY NERVE MYELINOPATHY WITH MANUAL THERAPY: A CASE REPORT WITH A FOUR MONTH FOLLOW-UP

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BACKGROUND/METHODS: A 33 year-old male presented with referral from his physician to evaluate/treat right C7 radiculopathy. The patient reported insidious onset of right posterior shoulder, arm, forearm, and dorsal hand pain eleven days prior. He was unable to differentiate which fingers were involved, but neither his distal phalanges nor his neck was symptomatic. Symptoms increased and peripheralized with increased use of his right (dominant) arm. DASH was 25%, NPRS was 4/4/6/2 and seated VAS scores for the shoulder, arm, forearm and hand were recorded. Physical examination revealed hypomobile cervicothoracic PA mobilizations, positive ULTT (Radial) and Myofascial Trigger Points (MTrP) at the infraspinaus. Clinical Prediction Rule for cervical radiculopathy was negative (0 of 4 items positive). Electrodiagnostic testing by the physical therapist demonstrated isolated myelinopathy of the right Superficial

Radial Sensory nerve (fingers 1–4). The patient was treated with HVLA to cervicothoracic spine and strain-counterstrain & HEP to infraspinatus MTrP's. Percent-Change Scores for regional VAS immediately after that treatment was: Shoulder 16%, Arm 60%, Forearm 0, and Hand 50%. Patient received six additional visits that combined manual therapy (elbow), myofascial direct technique (infraspinatus) and radial nerve mobilizations. **RESULTS:** Upon discharge 15 days later, the patient's DASH score was 0, NPRS 0, and GROC +7. Four months telephone follow-up revealed no recurrence of symptoms. **DISCUSSION-CONCLUSION:** Physical therapists are uniquely qualified to combine examination and electrodiagnostic results into a clear clinical picture and resulting plan of care. Referral to a different subspecialist may have resulted in additional diagnostic testing and delay in treatment.

APPLYING CLASSIFICATION AND DECISION RULE TO PREDICT OUTCOME OF WHIPLASH IN AN AMBULATORY PATIENT RECOVERING FROM INCOMPLETE SPINAL CORD TRAUMA

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BACKGROUND: It is not known whether a clinical prediction rule or a whiplash associated disorder (WAD) classification may be applied effectively in a second traumatic event to predict the outcome in a patient recovering from cord trauma. Therefore, the purpose of this case was to apply a decision rule and a whiplash classification to predict the outcome of a second traumatic event in a recovering incomplete spinal cord injured (SCI) patient who was ambulatory. **CASE DESCRIPTION:** A 47 year-old male sustained a C4/5 fracture with spinal cord edema at C5 following a boogie board accident. He received manual therapy and exercises for about 1 month after the removal of the cervicothoracic orthosis. Subsequently, he was rear ended in a motor vehicular ac-

cident (MVA). This patient was classified as having WAD type IIA with a favorable outcome. Initial American Spinal Injury Association (ASIA) score and Neck Disability Index (NDI) were measured and compared with the scores obtained three months following the second MVA. **RESULTS:** The ASIA score continued to improve 3 months after the MVA, which appears in line with the pattern of recovery seen in Central Cord SCI. More importantly, the final NDI was 6% compared to the initial 36% following cervical spinal fracture. **DISCUSSION-CONCLUSION:** Using the WAD classification and the decision rule were effective in predicting outcome in a recovering incomplete SCI patient who sustained a minor second traumatic event.

INITIAL EFFECT OF USING ANTERIOR-POSTERIOR PALPATION IN A PATIENT WITH NECK PAIN WHO MET THE CLINICAL PREDICTION RULE FOR CERVICAL RADICULOPATHY

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BACKGROUND: There is no primary literature report indicating the use of anterior-posterior palpation for the treatment of cervical pain. Therefore, the purpose of this case report was to present the initial effect of using this procedure in a patient diagnosed with neck pain. **CASE DESCRIPTION:** A 35 year-old female presented with reports of insidious onset left sided neck and scapular pain (P1). Her initial findings were: Numerical Pain Rating Scale 5/10, Neck Disability Index 36%, Shoulder Pain and Disability Index 54.6%, Fear-Avoidance Belief Questionnaire for Physical Activity 11 and for Work 10. Active Range of Motion (AROM) of the cervical spine and both shoulders were measured. The clinical measures of this patient met all 4 of the clinical prediction rule for cervical radiculopathy. Passive anterior-posterior palpation reproduced P1 at left C6. After the above examination procedures and prior to treatment, measure-

ments were made pre- and post- treatment that day. Manual therapy consisted only of anterior-posterior glides. **RESULTS:** P1 profile and ROM of cervical spine, shoulder, and upper limb neurodynamic test for median nerve (ULNT1) in tested planes improved following anterior-posterior mobilization. Global rating of change was 70% reduction of P1. **DISCUSSION-CONCLUSION:** The initial effect of using anterior-posterior palpation of the cervical spine resulted in dramatic reduction in pain and improved clinical parameters. The above preliminary results are intriguing but conclusions cannot be made regarding a cause and effect relationship.

VERTEBRAL OSTEOMYELITIS: PHYSICAL THERAPY PRIOR TO DIAGNOSIS WITH MR IMAGING: A CASE REPORT

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BACKGROUND: Screening for red flags when evaluating patients with low back pain (LBP) is essential to rule out serious pathology. Acute osteomyelitis may present as LBP with constitutional symptoms. However, chronic osteomyelitis may present without additional symptoms, complicating the diagnosis. The purpose of this case report is to describe the presentation of a patient with LBP due to chronic osteomyelitis. **CASE DESCRIPTION:** A 36 year-old Hispanic male presented to physical therapy with severe LBP and anterior thigh pain with signs and symptoms consistent with discal pathology three months after feeling a sharp pain while lifting at work. The patient denied history of cancer, infection, or fracture and attributed his LBP to a lifting incident. Physical therapy treatments included manual therapy, body weight supported treadmill walking and stabilization exercises. Therapy interventions were stopped when MRI revealed osteomyelitis at L2-L3. A biopsy confirmed methicillin-sensitive staphylococcus aureus (MSSA) as the infectious agent. This case was unique because of the lack of red flags pointing to infection

as a source of low back pain. **RESULTS:** The patient reported pain reduction from 8/10 to 1/10 following therapy, using a Numerical Pain rating scale. He reported decreased radicular pain and increased

functional ability. Intravenous antibiotic therapy brought the sedimentation rate and C-reactive protein (CRP) to normal levels. **DISCUSSION-CONCLUSION:** In patients with severe LBP, months after an

offending incident, a referral to a physician may be needed. MRI or CRP may be indicated to rule out infection.