# MUSCULOSKELETAL

## IN REVIEW

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### SYSTEMIC INFLAMMATION DURING MIDLIFE AND COGNITIVE CHANGE

A growing body of evidence has implicated immune function in the pathophysiology of Alzheimer'sdisease (AD) and related dementia. In addition, a number of studies have associated cognitive decline with levels of circulating inflammatory markers. This study assessed the long-term effects of midlife systemic inflammation on progressive cognitive decline.

The atherosclerosis risk in communities (ARIC) study enrolled 15,792 adults, 45 to 65 years of age, between 1987 and 1989. Inflammatory biomarkers were measured in blood samples collected at visits one and two, including fibrinogen, von Willebrand factor, factor VIII, and white blood cell count. The inflammatory markers were converted to standardized Z scores. In addition, C-reactive protein (CRP) levels were also collected in 2011 to 2013 at visit two. Cognition was measured at visits two, four and five using standardized neuropsychological measures. After adjusting for demographic and cardiovascular risk factors, those with a higher inflammation composite score at visit one had steeper twenty - year declines in cognitive scores. Compared to the lowest quartile, those with inflammation composite scores in the second, third and fourth quartiles had cognitive declines that were 7.5%, 7.7% and 8.9% steeper, respectively. Elevated CRP was associated with a steeper cognitive decline after adjusting for demographic and cardiovascular risk factors. Compared to a CRP in the top quartile (lowest level of inflammation), a CRP in the second, third and fourth quartiles was associated with a 9.7%, 8.5% and 12.3% steeper cognitive decline, respectively, as compared to the first quartile.

**Conclusion:** This study found that elevated inflammatory markers in the blood are associated with a decline in cognitive status.

Walker, K., et al. Systemic Inflammation during Midlife and Cognitive Change over 20 Years.

### DYNAMIC BALANCE AND RISK OF CONCUSSION

Evidence suggests that, after a concussion, athletes are at a higher risk of sustaining a repeat concussion. This study investigated the association between dynamic balance performance and the risk of future concussion.

Subjects were 109, elite, male rugby union players from four senior Irish teams. All subjects underwent baseline testing sessions, and were fitted with a single inertial sensor, mounted at the level of the fourth lumbar vertebrae to match the body's center of mass. While wearing the sensor, the participants completed four practice trials and three recorded trials of the pre-defined directions of the Star Excursion Balance Test (YBT).

Reach distances were normalized to each individual according to leg length. The subjects were followed during the ensuing rugby season, with the incidence of training or match related concussion recorded. Independent variables included self-reported concussion history, playing position, age group, dynamic balance variables and gyroscope magnitude signal during each YBT excursion.

Of the 109 players, 44 had a history of concussion with 21 sustaining a concussion in the follow - up season. Those with suboptimal YBT performance at baseline were 2.81 times more likely to sustain a concussion during the following season, even after controlling for concussion history.

**Conclusion:** This study of professional rugby players found that those with suboptimal balance at baseline had a significantly increased risk of concussion during the following season.

Johnston, W., et al. Association of Dynamic Balance with Sports-Related Concussion: A Prospective Cohort Study. **Am J Sport Med.** 2019; 47 (1): 197-205. The ARIC Study. **Neurol**: 2019, March; 92 (11): e1256-e1267.

### TRANSCRANIAL MAGNETIC STIMULATION AND THETA BURST STIMULATION FOR SPASTICITY IN MULTIPLE SCLEROSIS

Spasticity has been reported in 50 to 70% of patients with multiple sclerosis (MS). Previous studies have demonstrated that high-frequency repetitive transcranial magnetic stimulation (HF-rTMS) or intermittent theta burst stimulation (iTBS) of the primary motor cortex can reduce spasticity among patients with central nervous system insults. This study assessed the effect of these interventions on patients with spasticity secondary to MS.

Patients with spastic secondary progressive MS (SPMS) were randomized to receive HF-rTMS, iTBS or sham stimulation, once per day for five days/week for two weeks. The HF□rTMS was delivered at 20 Hz with a total of 1600 stimuli per session. The iTBS was delivered with a total of 1200 stimuli per session. Outcomes were measured for subjective and objective spasticity as well as pain and fatigue at baseline, at the end of treatment (T1) and at two (T2) and 12 (T3) weeks after the last treatment.

Significant improvements in Modified Ashworth Scale (MAS) scores were noted at T1 for the HF-rTMS ($p<0.001$) and iTBS ($p<0.001$) groups with no such improvement seen in the sham control group. Scores on the Subjective Evaluating Spasticity Scale (SESS) were significantly improved in both treatment groups, persisting at 12 weeks in iTBS group but returning to baseline in the HF-rTMS group. Pain improved in the HF□rTMS group, persisting at two weeks and returning to baseline at 12 weeks, with no significant changes in the other two groups. Scores on the Modified Fatigue Impact Scale improved in the HF-rTMS group at T1, and gradually worsened at two

and 12 weeks, with no improvement in the iTBS group.

**Conclusion:** This study of patients with multiple sclerosis found that treatment with HF-rTMS or iTBS could reduce spasticity, pain and fatigue, with some evidence suggesting a longer lasting effect in those treated with iTBS.

Korzhova, J., et al. High-Frequency Repetitive Transcranial Magnetic Stimulation and Intermittent Theta Burst Stimulation for Spasticity Management in Secondary Progressive Multiple Sclerosis. **Eur J Neurol.** 2019 Apr; 26(4): 680-687.

## SPECIALIST VERSUS NON-SPECIALIST

Over the 10 years of the study, compared to patients admitted to non-SRUs, those admitted to SRUs had a longer onset from injury/illness to rehabilitation admission and lower admission FIM scores, as compared to those in non- SRUs. Patients in both the brain injury and spinal cord injury groups had higher absolute functional gains when treated in SRUs, though with lower FIM score gain per day.

**Conclusion:** This Australian study of patients hospitalized for brain injury or spinal cord injury found that those treated in specialized rehabilitation units had a lower relative functional efficiency per day in rehabilitation, but a higher percentage of gain on the Functional Independence Measure.

McKechnie, D., et al. A Comparison of Patients Managed in Specialist versus Non-Specialist Inpatient Rehabilitation Units in Australia. **Disabil Rehab**. 2019; Feb. 14: 1-8.

## PSYCHIATRIC ILLNESS AND ELDERLY FRACTURE PATIENTS

As the population ages, the number of elderly with trauma is expected to grow. Given the emotional burden of trauma, this study investigated the association between traumatic fractures requiring surgery and psychiatric illness among patients 70 years of age or older.

Data from a level I trauma center were reviewed for records of patients 70 years of age or older who underwent surgery for traumatic fractures between 2012 and 2017. The medical record was reviewed to identify patients with ICD codes for psychiatric illness. A multivariable logistic regression analysis was conducted to identify independent associations between hypothesis driven medical characteristics and unplanned readmissions. These variables included age, gender, the Charleston Comorbidity Index, Injury Severity Scale score, fracture location, surgical procedures, number of fractures, nicotine use, substance abuse, dementia, delirium or psychiatric disorders. Data were compared to those of individuals less than 70 years of age.

During the study, data were collected for 1,186 patients. Of these, 44.6% had baseline psychiatric comorbidities, significantly higher than those below 70 years of age ($p=0.007$). In descending order of prevalence, the comorbidities were anxiety disorder (22.9%), sleep disorder (16%), major depressive disorder (12.9%) and alcohol abuse (8.5%). A higher rate of readmission was noted among those with psychiatric diagnoses, as compared to those without ($p<0.001$). A multivariate regression analysis demonstrated an independent association between psychiatric illness and unplanned readmission (odds ratio 1.54; $p=0.003$).

**Conclusion:** This study of patients 70 years of age or older, admitted for surgical treatment of fractures, found that 44% had a psychiatric comorbidity, with the risk of readmission higher among those with psychiatric diagnoses.

Gitajn, I., et al. Psychiatric Illness is Common in Elderly Fracture Patients. **J Orthop Trauma.** 2019, March; 33 (3): 149-154.

## SENSORIMOTOR CONTROL IN CHRONIC ANKLE INSTABILITY

After a lateral ankle sprain, up to 70% experience instability and recurrent ankle sprain. Previous studies have shown that those with chronic ankle instability (CAI) have increased postural sway, prolonged peroneal reaction time and reduced eversion strength. As these factors are dependent on the central nervous system and reflect impaired sensorimotor integration, this study assessed the spinal reflex excitability, presymptomatic and recurrent inhibition in patients with CAI.

Subjects were 12 individuals with a history of at least one significant, lateral ankle sprain resulting in CAI. Controls were patients with no ankle sprain or with an ankle sprain without feelings of instability. Electromyographic data were taken at the soleus, tibialis anterior and peroneus longus muscles. Soleus H reflex pathway activity was measured during static double and single leg stance. Perception of pain and perceived instability were assessed,

with a regression analysis completed. Compared to that of healthy controls, H2 reflexes for the CAI group were 3.3 times greater during double-leg ($p<0.001$) and 1.6 times greater during single-leg stance conditions ($p<0.001$). Presynaptic inhibition was significantly less in patients with CAI as compared to healthy controls. The soleus spinal reflex excitability was greater in the CAI group ($p<0.001$) than in the controls.

**Conclusion:** This study of patients with ankle sprains found that those with chronic ankle instability exhibit disinhibition of presynaptic mechanisms, that was not evident among those with ankle sprains that did not develop into CAI.

Thompson, C., et al. Altered Spinal-Level Sensorimotor Control Related to Pain and Perceived Instability in People with Chronic Ankle Instability. **J Sci Med Sport.** 2019, April; 22 (4): 425-429.

## SUPRASCAPULAR NERVE BLOCK VERSUS SUBACROMIAL INJECTION FOR ROTATOR CUFF TEAR

Rotator cuff tear is among the most common musculoskeletal disorders. Most are treated conservatively, with treatments including nonsteroidal anti-inflammatory drugs, physical/ occupational therapy and subacromial injections. This study compared the effect of suprascapular nerve block to that of subacromial injection among patients with acute rotator cuff tears.

Subjects were 45 years of age or older, all with symptomatic, partial and full-thickness rotator cuff tears. The patients were randomized to treatment with suprascapular nerve block (SSNB) or subacromial injection (SA), with both injections including nine mL of one percent ropivacaine and one mL of betamethasone. All were assessed with a modified Constant-Murley (CM) score, with a secondary outcome of pain, as measured by visual analog scale (VAS) at two, six and 12 weeks after the injection.

Data were collected for 43 patients with a mean age of 65.2 years. At two weeks, there was no difference in CM scores between the two cohorts. At six and twelve weeks, the mean change from baseline CM was significantly greater in the SSNB group than in the subacromial group ($p=0.048$ and $p=0.014$ respectively). A 12 weeks, the SSNB group demonstrated a significantly higher mean CM score than did the SA group ($p=0.014$).

**Conclusion:** This study of patients with symptomatic rotator cuff tears found that, compared with subacromial injections, those treated with suprascapular nerve blocks enjoyed greater improvements in pain and function at six and 12 weeks.

Coory, J., et al. Efficacy of Suprascapular Nerve Block Compared with Subacromial Injection: A Randomized, Controlled Trial in Patients with Rotator Cuff Tears. **J Shoulder Elbow Surg.** 2019, March; 28(3): 430-436.

## ORAL CURCUMIN BEFORE OR AFTER ECCENTRIC EXERCISE

Curcumin is a natural polyphenolic substance extracted from turmeric. Studies have shown various physiological effects of this spice, including membrane protective, anti-inflammatory and antioxidant properties. This study examined the effect of curcumin on muscle damage and inflammatory markers after eccentric exercise.

Two, parallel experiments were conducted. Ten, healthy men ingested either 180 mg per day of oral curcumin or placebo for seven days before exercise or for seven days after exercise. Each subject performed 30 maximal isokinetic ($120°s^{-1}$) eccentric contractions of the elbow flexors, with the contralateral arm performing the same exercises after at least four weeks. Muscle strength, range of motion soreness and serum CK activity were measured before and one to seven days after exercise. In addition, plasma IL□8 and TNF□α concentrations, serum concentrations of derivatives of reactive oxygen metabolites (d□ROMs), and the biological antioxidant potential (BAP) were measured before, immediately after, 12 hours after, and one, three, five and seven days after exercise.

When curcumin was ingested before exercise, no significant differences in any muscle damage markers were found between the curcumin and placebo trials. However, IL8 was lower at 12 hours after exercise in this group ($p=0.003$). When ingested after exercise, compared to the control group the curcumin group demonstrated superior torque ($p<0.05$), range of motion ($p<0.05$), muscle soreness ($p<0.05$) and CK activity ($p=0.02$).

**Conclusion:** This study of eccentric exercise found that 180 mg of curcumin, when taken before exercise, can reduce inflammation, and when taken after exercise, can reduce soreness and markers of muscle damage.

Tanabe, Y., et al. Effects of Oral Curcumin Ingested before or after Eccentric Exercise on Markers of Muscle Damage and Inflammation. **Scand J Med Sci Sports**. 2019, April; 29(4): 524-534.

## HYALURONIC ACID FOR GLENOHUMERALOSTEOARTHRITS

Hyaluronic acid has been studied for the treatment of osteoarthritis of the knee while such use in the shoulder is less clear. This systematic review and meta-analysis was designed to better understand theefficacy of HA for patients with shoulderOA.A systematic review of the medical literature wascompleted hrough January 16, 2018.Fromthis review, 15 were chosenforinclusion,include;ing five randomized controlledtrials, six prospectivecohortstudies,71 retrospective cohort studies and three case series. This meta-analysis found that the administratpon of HA resulted in a significant decrease in VAS pain scores, both at three and six months' follow-ups. In studies either found no difference or sightlyfavorered the HA group. Studies found similar improvements between the treatment and control groups.

**Conclusion:** This meta-analysis of studies involving patients with osteoarthritis of the glenohumera; joint found that hyaluronic acid can reduce pain at three and six months, although similar improvement was found in control groups.

Zhang, B., et al. Outcomes of Hyaluronic Acid Injections for Glenohumeral Osteoarthritis: A Systematic Review and Meta Analysis. J Shoulder Elbow Surg. 2019, March; 28(3): 596-606.

## METHOD TO STANDARDIZE BLOOD FLOW RESTRICTION

Blood flow restriction (BFR), in combination with low-load resistance exercise, can allow for strengthening with much lower weights. To restrict blood flow, two common cuffs are employed, including elastic and the traditional pressurized nylon cuff. This study compared the efficacy of these two methods.

Subjects were adults, 18 to 35 years of age, including 16 men and 19 women. The circumference of the mid-upper arm was determined, with the arms randomized to receive compression with either the pressurized or the elastic cuff. Resting arterial blood pressure was measured in both arms for all subjects.

In the pressurized cuff condition, the cuff was inflated to 40% of the resting arterial occlusion pressure for one minute. Blood flow was then measured, followed by inflation to 80%. In the elastic cuff condition, the cuff was applied after reducing its

length by 10%, and then 20%, with blood flow measurements made after one minute. In both conditions, blood flow in the brachial artery, distal to the cuff, was quantified using a Logiq E ultrasound apparatus with a high- resolution probe.

The mean differences in blood flow between cuffs were -5.9% for low-pressure and -4% for high pressure (p=0.5). When the relative changes in pressures for each cuff were separated by sex, there were no differences in the changes (p=0.5).

**Conclusion:** This study of blood flow restriction exercise techniques found that an elastic cuff can be used as a simple means to apply blood flow restriction at 40% or 80% of the systolic blood pressure.

Abe, T., et al. A Method to Standardize the Blood Flow Restriction Pressure by an Elastic Cuff. **Scand J Med Sci Sports**. 2019, March; 29(3): 329-335.

## INPATIENT REHABILITATION

Previous studies have demonstrated that, for patients with spinal cord injury (SCI), cerebrovascular attack (CVA) and traumatic brain injury (TBI) properly timed treatment in a post-acute rehabilitation specialty unit can improve outcome. This population-based study examined differences in outcomes among patients admitted to special units (SRUs) versus those who were not.

This retrospective, cohort study examined aggregated data from patients hospitalized for TBI, and SCI recorded by the Australasian Rehabilitation Outcomes Centre Registry Database at four discrete time points, 2007, 2010, 2013 and 2016. These prospectively collected data included length of stay and Functional Independence Measure (FIM) scores. A case mixed adjustment was made, and outcomes were compared between those who were treated in SRUs and those who were treated in non-specialized units. Over the 10 years of the study, compared to patients admitted to non-SRUs, those admitted to SRUs had a longer onset from injury/illness to rehabilitation admission and lower admission FIM scores, as compared to those in non- SRUs. Patients in both the brain injury and spinal cord injury groups had higher absolute functional gains when treated in SRUs, though with lower FIM score gain per day.

**Conclusion:** This Australian study of patients hospitalized for brain injury or spinal cord injury found that those treated in specialized rehabilitation units had a lower relative functional efficiency per day in rehabilitation, but a higher percentage of gain on the Functional Independence Measure.

McKechnie, D., et al. A Comparison of Patients Managed in Specialist versus Non-Specialist Inpatient Rehabilitation Units in Australia. **Disabil Rehab**. 2019; Feb. 14: 1-8.

## DURATION OF SYMPTOMS AND OUTCOME AFTER LUMBAR DECOMPRESSIVE SURGERY

While data support the efficacy of decompression for lumbar spinal stenosis, the point at which conservative treatment should be discontinued and surgical intervention initiated is unclear. This study assessed the association between the duration of symptoms and clinical outcomes in patients undergoing lumbar decompression procedures.

Subjects were consecutive patients undergoing primary lumbar decompression for spinal stenosis between January of 2008 and December of 2015. The patients' average age was 54.1 years and the average duration of symptoms was 19.4 months. All participants had undergone the same conservative protocol, including activity modification, anti-inflammatory medications, physical therapy and injections, for a minimum of three months. All underwent a laminectomy at the symptomatic level.

Repeat surgery occurred in 7.5% of those with pain for less than one year and 7.9% of those with symptoms more than one year. No significant difference on any clinical outcome measure was noted between those with less than one year and those with a longer symptom duration. In addition, there was no difference between groups in reoperation rates.

**Conclusion:** This study of patients undergoing primary lumbar laminectomy found that the length of the symptoms did not affect the surgical outcome or rate of hospital readmission.

Movassaghi, K., et al. The Duration of Symptoms Does Not Impact Clinical Outcomes Following Lumbar Decompression Surgery. **Spine**. 2019; 44(5): 305-308.

## DONEPEZIL FOR FALLS AND MILD COGNITIVE IMPAIRMENT

Older adults with mild cognitive impairment (MCI) have a higher prevalence of gait disorders and an increased risk of falls compared to their cognitively normal counterparts. These patients also have a higher dual-task gait cost (DTC), defined as a reduction in gait speed while performing a cognitively demanding task. This study assessed the effect of donepezil on gait speed in patients with MCI.

After a baseline gait assessment, the patients were randomized to receive either donepezil (n=31), titrated up to 10mg/day, or a matching placebo (n=29). Follow-up gait assessments, including gait speed, gait variability and reduction of DTC, were completed at one and six months. Secondary outcomes included the Digit Span subtest, the Trail Making Test, Forms A and B, Letter–Number Sequencing scores and the number of falls.

At six months, the treatment group demonstrated improved dual task gait speed, although this finding was not significant. The treatment group also demonstrated a reduction in DTC compared with placebo, with significant improvement while counting backwards (p=0.037). In the six months after intervention, the treatment group reported 13 falls, while the placebo group reported 21. The percentages of patients who fell during that time were 23% in the treatment group and 41% in the placebo group. Neither comparison was statistically significant. No major adverse events were reported.

**Conclusion:** This randomized, controlled study of patients with mild cognitive impairment found that Aricept, 10 mg per day, may reduce the risk of falls.

Montero-Odasso, M., et al. Donepezil for Gait and Falls in Mild Cognitive Impairment: A Randomized, Controlled Trial. **Euro J Neurol.** 2019, April; 26(4): 651-659.

## CEREBELLAR STIMULATION AND GAIT RECOVERY AFTER HEMIPARETIC STROKE

Gait and balance impairments after stroke are associated with poor functional recovery. Studies using magnetic resonance imaging (MRI) have found that activity in the contralesional cerebellum positively correlate with gait recovery in patients with stroke. This study assessed whether cerebellar

intermittent theta burst stimulation (CRB-iTBS), a novel form of repetitive transcranial magnetic stimulation (rTMS) could improve gait and balance recovery in patients with stroke.

Subjects were patients with a first ever ischemic stroke in the territory of the middle cerebral artery. The patients were randomized to age-matched groups treated with either CRB-iTBS or sham CRB-iTBS, both coupled with physical therapy. The primary efficacy endpoint was the change from baseline in Berg Balance Scale (BBS) scores.

Patients in the treatment group, but not those in the sham group, showed improvement in gait and balance, with pronounced increases in mean BBS scores at three weeks ($p<0.001$). In addition, those in the treatment group, but not those in the sham group, showed a reduction of step width during gait ($p<0.05$). Non-significant differences were noted between the groups in Fugl- Meyer and Barthel index scores.

**Conclusion:** This study of patients with ischemic stroke found that intermittent theta burst stimulation directed at the cerebellum can promote gait and balance recovery.

Koch, G., et al. Effect of Cerebellar Stimulation on Gait and Balance Recovery in Patients with Hemiparetic Stroke. A Randomized, Clinical Trial. **JAMA Neurol.** 2019, February; 76(2): 170-178.

## CONCUSSION AND RISK OF SUICIDE

Concussion is a transient disturbance of neurologic function caused by trauma. For 80%, neurologic symptoms resolve within seven days of injury. Systematic reviews have demonstrated that severe traumatic brain injury (TBI) is associated with a higher risk of suicide. This study was designed to determine whether concussion and/ or mild TBI is also associated with an increased risk of suicide.

A systematic review and meta-analysis were performed using studies assessing the risk of suicide in patients with concussion or mild TBI. Studies published from 1963 through 2017, were reviewed with 17 chosen for inclusion in the analysis.

Data reviewed in the analysis included over 700,000 individuals diagnosed with concussion and or mild TBI and 6.2 million unaffected individuals. From the analysis, the risk of suicide was twofold higher for those diagnosed with at least one concussion and/or mild TBI compared to those without such a diagnosis ($p=0.001$). Comparing the risk between civilian and military populations, the risk was found to be higher in the civilian than in the military population ($p<0.01$).

**Conclusion:** This literature review and meta-analysis found that, compared to the general population, the risk of suicide doubles among those who have had a concussion or mild traumatic brain injury.

Fralick, M., et al. Association of Concussion with the Risk of Suicide: A Systematic Review and Meta-Analysis. **JAMA Neurol.** 2019, February; 76(2):144-151.

## BLOOD NEUROFILAMENT LIGHT CHAIN AS A BIOMARKER OF MULTIPLE SCLEROSIS DISEASE ACTIVITY

As a macroscopic reflection of neural axonal damage, elevated cerebral spinal fluid and blood concentrations of neurofilament light (NFL) chain have been found to correlate with an increased number of relapses in patients with multiple sclerosis (MS). This paper used data from two studies to assess the efficacy of NFL as a biomarker for treatment activity and treatment response in patients with relapsing remitting MS (RRMS).

Patients with RRMS were randomized to receive fingolimod or a placebo in a two-year placebo-controlled trial (FREEDOMS) and a one-yearactive control (TRANSFORMS) trial, with these data compared to normal controls. Blood samples were used to measure concentrations of NFL before and after treatment, with outcomes compared to NFL levels, clinical outcome and MRI changes.

At baseline, patients had significantly higher NFL concentrations than did healthy controls ($p<0.001$). High baseline NFL concentrations were associated with high T2 lesion volume and the presence of Gd+ lesions. The occurrence of new or enlarging T2 lesions was associated with higher baseline NFL ($p=0.0006$). Fingolimod treatment significantly reduced NFL levels ($p<0.001$). Irrespective of treatment, compared to those with

<30pg/ml, patients with NFL concentrations of >60pg/ml at baseline had 2.6 times more new or enlarging T2 lesions, 2.5 times more MS relapses and 2.9 times more brain volume loss ($p<0.001$ for all comparisons).

**Conclusion:** This study found that NFL levels are associated with clinical and MRI related measures of disease activity.

Kuhle, J., et al. Blood Neurofilament Light Chain as a Biomarker of MS Disease Activity and Treatment Response. **Neurol.** 2019, March 5;92(10): e1007-e1015.

## BOTOX VERSUS LOCAL INJECTION FOR MYOFASCIAL PAIN

Myofascial pain is a chronic pain disorder affecting a wide range of patient populations. Local injections are considered a first-line treatment for myofascial pain, with injectates including local anesthetics and botulinum toxin. This literature review and meta-analysis compared the efficacy of injections with botulinum toxin with that of local anesthetic in patients with myofascial pain disorder.

A literature review was conducted for studies of patients with myofascial pain, injected with either botulinum toxin A or local anesthetic, with follow-ups through 24 weeks. From this review were identified 33 studies. Outcome measures included a visual analog scale for pain and the Neck Pain and Disability Scale.

Data from 11 studies found that, one to four weeks after injections, local anesthetic, but not Botox, was effective for pain relief. For studies with follow-up at weeks seven to eight, the pain relief of those treated with local anesthetics was large, while that of botulinum toxin was significant, but small. With follow-up at 11 to 12 weeks, both injections were significantly better than placebo, although clinically small. At 16 weeks, only local anesthetic was significantly better than placebo. A 24 weeks' follow-up, both local anesthetic and botulinum toxin were significantly better than placebo.

**Conclusion:** This literature review and meta-analysis of patients with myofascial pain found that injections with local anesthetics result in a consistent, large improvement at one to 16 weeks' follow-up, while botulinum toxin injections result in negligible or small effects.

Ahmed, S., et al. Effect of Local Anesthetic versus Botulinum Toxin-A Injections for Myofascial Pain Disorders: A Systematic Analysis. **Clin J Pain.** 2019, April; 35(4): 353-367.

## ULTRASOUND DIAGNOSIS OF PIRIFORMIS SYNDROME

Piriformis syndrome (PS) is a controversial, yet commonly seen,

diagnosis for hip and buttock pain. MRI has been the preferred imaging method for evaluation of the piriformis, although ultrasound (US) provides a potentially cheaper and quicker option. This study compared US and MRI for the examination of piriformis syndrome.

This cross-sectional study evaluated 33 patients with a clinical diagnosis of PS and 26 healthy controls. The subjects were assessed by clinicians held blind to the clinical diagnosis, using US and MRI. Evaluations were made of piriformis muscle thickness, cross-sectional area (CSA), echogenicity and signal intensity on T2-weighted images.

Comparative studies of both the MRI and US found that the piriformis muscle was thicker on the symptomatic than on the asymptomatic side in patients with PS, with no significant difference between sides in the controls. In addition, CSA and echogenicity were significantly different between the symptomatic and the asymptomatic piriformis muscles in the PS patients, with no significant difference in controls.

**Conclusion:** This study suggests that ultrasound may be an effective tool to assist with the diagnosis of the PS.

Zhang, W., et al. Ultrasound Appears to be a Reliable Technique for the Diagnosis of Piriformis Syndrome. **Musc Nerve**. 2019, April; 59 (4): 411-416.

## VIBRATION FOAM ROLLING AFTER EXERCISE-INDUCED MUSCLE DAMAGE

Foam Rolling (FR) is a self-administered therapeutic technique that requires that an individual lie on a round or tubular device, slowly rolling the affected body area over the roller. As vibration during exercise has shown some therapeutic benefit, this study compared the effects of FR with vibration (VFR) with non- vibrating FR (NVFR) on DOMS.

Thirty-eight adults, free from musculoskeletal disorders, were randomized to a VFR or a NVFR group. After baseline measurements, the subjects participated in 10 sets of 10 repetitions of parallel squats using a gravity-free training flywheel, with maximal effort at each repetition. At baseline, and at 48 hours post-exercise, measurements were made of pain, using a visual analog scale (VAS), pain pressure threshold, oxygen saturation, muscle performance and hip and knee range of motion. The treatment technique included three, 60-second bouts of roller massage, applied to each leg, with a 30- second rest between sets, using either VFR or NVFR vibration.

Compared to the NVFR group, resting VAS was reduced by 30.2% in the VFR group ($p<0.05$), with pain during exercise or stretching better in the VFR group, although this finding did not reach statistical significance. For measures of passive hip joint extension, compared to the NVFR, the ROM in the VFR group was 9.3% greater ($p<0.05$).

**Conclusion:** This study of exercise induced muscle soreness found that, when using the foam roller technique for recovery, adding vibration may enhance the results.

Romero-Moraleda, B., et al. Effects of Vibration and Non-Vibration Foam Rolling on Recovery after Exercise with Induced Muscle Damage. **J Sports Sci Med.** 2019; 18: 172-180.

## SPINAL MANIPULATION FOR CHRONIC LOW BACK PAIN

Spinal manipulative therapy (SMT) treatment of chronic low back pain (cLBP) is considered a first line treatment option in some countries, while others recommend it as a component of a broader treatment package. This literature review and meta-analysis was designed to better understand the effectiveness of SMT for pain relief and functional improvement among patients with chronic low back pain.

Data were reviewed for randomized controlled trials (RCTs) which included adults with cLBP, compared with a control group, allowing for the assessment of the isolated effect of SMT. Outcomes were assessed at one, three, six, and 12 months post-randomization, with data analyzed according to the time closest to these intervals. The primary outcomes were defined as short term (one month), intermediate term (six months), and long term (12 months).

From the studies reviewed, 47 RCTs were included in this analysis. Those trials which compared SMT to traditional therapies, demonstrated significantly better pain relief at six ($p=0.009$) but not at 12 months ($p=0.21$). In addition, compared to traditional therapies, improved function was noted at one ($p=0.003$) but not at six ($p=0.14$) or 12 months ($p=0.18$).

**Conclusion:** This literature review and meta-analysis suggests that, for patients with chronic low back pain, spinal manipulative therapy is more effective than traditional therapies at six months for pain relief, and at one month for functional improvement.

Rubenstein, S., et al. Benefits and Harms of Spinal Manipulative Therapy for the Treatment of Chronic Low Back Pain: Systematic Review and Meta-Analysis of Randomized, Controlled Trials. **Br Med J.** 2019; 364: 1689.

## SURVIVAL AFTER A NONTRAUMATIC SPINAL CORD INJURY

The prevalence of non-traumatic spinal cord injuries (NTSCI) is expected to rise with the aging of the population. This study was designed to better understand the long-term outcomes of patients with NTSCI.

Data were harvested from the Swiss Spinal Cord Injury Medical Record study, which covers all specialized rehabilitation centers for SCI in Switzerland. Data were obtained for patients 16 years of age or older, with NTSCI identified between 1990 and 2011. Diagnostic categories included degenerative disc disorders, infection, vascular disorders, benign tumors, malignant tumors, unspecified tumors and other. Other medical information, including level of injury, was documented.

Data were completed for 1,450 patients, of whom 59% were male, 65.3% were paraplegic and 87.2% were diagnosed with incomplete cord lesions. Those with malignant and unspecified tumors had the steepest decline in five-year survival, compared with all other etiologic groups. Compared with degenerative disc disease, the mortality was significantly greater for those with malignant and unspecified tumors, (hazard ratio [HR] 6.32).

For those with malignant lesions, the one-year survival probability for those with complete paraplegia was 20.9%, dropping to 9.2% after five years. Those with a nonmalignant etiology had a survival probability of 69.9% after one year, diminishing to 45.6% after five years. Among males at least 60 years of age, malignant etiology was associated with 1.7 life years remaining, compared with 10.1 for those with nonmalignant etiologies and 12.9 for those with degenerative disc etiology.

**Conclusion:** This observational, cohort study of patients with spinal cord injury found that life

expectancy estimates were different among etiologic groups.

Buzzell, A., et al. Survival after non-Traumatic Spinal Cord Injury: Evidence from a Population-Based Rehabilitation Cohort in Switzerland. **Spinal Cord.** 2019: 57:267–275.

## REGAINING PREFRACTURE MOBILITY AND POST-DISCHARGE MORTALITY

Despite enhanced recovery programs, patients undergoing surgery for hip fractures (HFs) continue to have a high rate of morbidity and mortality. This population-based, cohort study assessed the association between the return to prefracture basic mobility status at the time of discharge and 30-day, post-discharge mortality and readmission.

Subjects were Danish patients, 65 years or older, all undergoing a first-time HF during the year 2015. The data were harvested from the Danish Multidisciplinary HF Database (DMHFD), a national database that monitors the early basic mobility status of patients with HF at the time of acute hospital discharge. During hospitalization, all patients were assessed with the Cumulative Ambulation Score (CAS). The primary outcome variables (mortality or any readmission within 30 days of discharge) was compared between those who had returned to baseline CAS (Baseline CAS) and those who had not (Impaired CAS).

Of the 5,147 patients, 2,050 (40%) regained the baseline CAS and 3,097 did not. An adjusted analysis revealed that 30-day mortality was 2.8 times higher in the Impaired CAS group than in the Baseline CAS group. In the adjusted analysis, compared with the Baseline CAS group, the hazard ratio for readmission within 30 days was 1.26 for the Impaired CAS group.

**Conclusion:** This study of patients hospitalized for hip fracture found that those who regained baseline mobility had a reduced mortality rate and risk of readmission within thirty days, as compared to those discharged with a reduced basic mobility.

Kristensen, M., et al. Regaining Pre-Fracture Basic Mobility Status after Hip Fracture and Association with Post-Discharge Mortality and Readmission—a Nationwide Register Study in Denmark**. Age Aging.** 2019; 48: 278-284.

## PROLONGED OPIOID USE AFTER SHOULDER ARTHROSCOPY

The United States consumes 80% of the global opioid supply. As long-term opioid dependence may be triggered by a period of opioid use for acute pain, this study assessed the risk of long-term use after rotator cuff surgery.

Health claims were reviewed from the Truvan Health Market Scan Research Databases (50 million employees and Medicare patients). Data from 2010 to 2015 were reviewed for shoulder arthroscopic procedures among opioid naïve adults. Data were recorded for demographics, comorbidities, and postoperative opioid use. The primary outcome measure was prolonged opioid use, defined as more than one opioid prescription within 90 -100 days after the surgical event.

During the study timeframe, 31,768 patients undergoing an arthroscopic procedure filled an opioid prescription within the 30 days of surgery. Of these 8,686 patients (8.3%) developed new prolonged opioid use, as defined in this study. The factors associated with the highest odds ratio of prolonged use included a total opioid dose during the perioperative period of over 743 oral morphine equivalents (>149 tablets of 5-mg hydrocodone), followed by a self-harm disorder, a history of alcohol dependence or abuse, mood disorder and an opioid prescription filled within 30 days before surgery, female gender, anxiety disorder or a history of a pain diagnosis.

**Conclusion:** This study of adults undergoing arthroscopic shoulder procedures found that, of opioid naïve patients, 8.3% developed new, prolonged opioid use (refilled the prescription).

Gil, J., et al. Risk of Prolonged Opioid Use among Opioid-Naïve Patients after Common Shoulder Arthroscopic Procedures. **Am J Sports Med.** 2019, April; 47(5): 1043-1050.

## PEDALING BASED REHABILITATION FOR TOTAL KNEE REPLACEMENT

While pedaling is often prescribed after total knee replacement (TKR), no prior trials have assessed the efficacy of this exercise in the acute, postoperative setting. This study compared a pedaling protocol with a non-pedaling protocol, commencing within 24 hours of surgery.

Subjects were adults with osteoarthritis, undergoing unilateral TKR. Beginning the day of surgery patients began therapy for 20 minutes, twice per day, randomized either to a pedaling group or a traditional exercise group. The pedaling group used a stationary pedaling protocol seated at a set of floor pedals. The standard care group engaged in a 10-exercise program, including seated knee bends, inner range quadriceps strengthening and functional exercises. The primary outcome measure was the six-minute walk test, with secondary outcomes including the timed up and go (TUG) test, the 10m-walk test (10MWT) and maximum knee flexion.

The distance covered in the six-minute walk test was significantly greater in the pedaling group at two days postoperatively ($p<0.001$). Though statistically insignificant, further improvement was noted at two and four months. A similar pattern was found for the secondary outcomes of the 10MWT and TUG tests, in favor of the pedaling-based group at two days ($p=0.016$ and $p=0.020$, respectively), but not at two weeks or four months. The hospital length of stay was one half day shorter for the pedaling group ($p = 0.024$).

**Conclusion:** This randomized, controlled trial found that a pedaling-based physical therapy protocol after total knee replacement is superior to a multi-exercise protocol for mobility improvement, with a significantly shorter length of stay.

Sattler, L., et al. Pedaling-Based Protocol Superior to a 10- Exercise, Non-Pedaling Protocol for Postoperative Rehabilitation after Total Knee Replacement. **J Bone Joint Surg.** 2019, April 17; 101 (8):688-695.

## LEUKOCYTE ESTERASE TEST FOR PERIPROSTHETIC JOINT INFECTION

Periprosthetic joint infections are one of the more complex complications of total joint arthroplasty (TJA). As the diagnosis of such infections can be complicated by recent antibiotic administration, this study evaluated the diagnostic utility of the synovial leukocyte esterase strip test.

Records were reviewed of all patients who had undergone hip or knee arthroplasty at the authors' facility from October 2009 to 2014. Of those undergoing a revision surgery for suspected periprosthetic joint infection, 32% had taken antibiotics within two weeks of the diagnostic workup. Lab tests included the leukocyte esterase strip

*(Continued from page 2)*

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test, the serum erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP), synovial fluid white blood cells (WBC) and synovial effusion fluid polymorphonuclear neutrophil (PMN). The results of these laboratory tests were compared with the final diagnosis of infection.

The recent administration of antibiotics was found to significantly reduce the sensitivity of all laboratory tests except the leukocyte esterase strip test ($p<0.05$). With recent antibiotic treatment, the sensitivity of the most accurate lab tests, in descending order were: ESR 79.5%, leukocyte esterase 78%, and WBC 69.3%.

**Conclusion:** This study of patients undergoing joint replacement revision found that the administration of premature antibiotics can compromise the results of standard diagnostic tests for periprosthetic joint infection, with the leukocyte esterase test most able to maintain its diagnostic performance.

Shahi, A., et al. The Leukocyte Esterase Test for Periprosthetic Joint Infection is Not Affected by Prior Antibiotic Administration. **J Bone Joint Surg.** 2019, April 17;101 (8):739-744.

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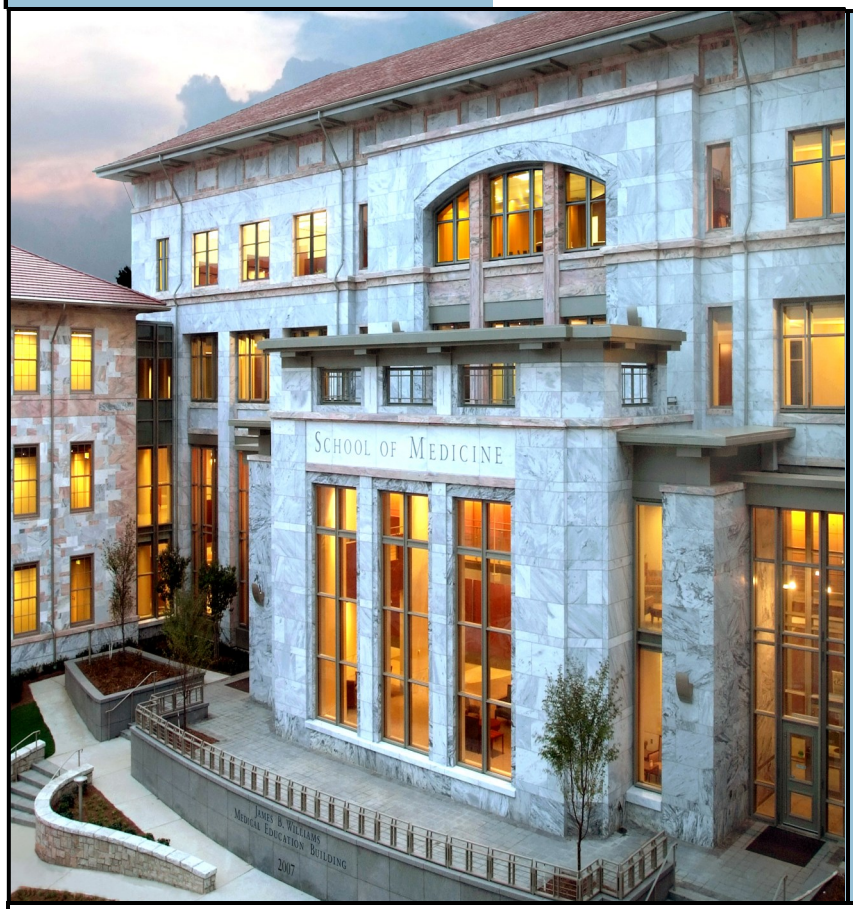


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