

# MUSCULOSKELETAL

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## ACHILLES TENDON RUPTURE TREATED WITH AND WITHOUT SURGERY

After Achilles tendon rupture, the optimal management remains unclear. Studies comparing operative and nonoperative treatment have failed to show a clinically significant difference in outcome. This study was designed to better understand these treatment options.

This cohort study included 200 patients presenting for treatment of an Achilles tendon rupture. The treatment decisions were individualized based upon patient factors including age, activity level, comorbidities and surgeon's preference. Of those presenting, 99 were treated surgically, and 101 nonsurgically. Both groups were kept nonweightbearing in a cast for four weeks, and then placed in a controlled ankle movement walker boot at 20° equinus. Physical therapy was initiated, with the equinus progressively decreased to neutral by weeks six to eight. Weightbearing progressed from partial to full as patient tolerance and range of motion allowed. The orthotic was removed at week eight, with therapy continuing until week 12. The primary outcome variable was patient reported functional outcome, assessed with the Achilles Tendon Total Rupture Score (ATRS).

No significant difference was found between the groups in the rate of rerupture. There was also no significant difference between the groups in ATRS functional scores ( $p=0.55$ ). A logistic regression analysis did not reveal significant effects of age at rupture, gender or mode of treatment on ATRS scores.

**Conclusion:** This non-randomized study of patients with Achilles tendon rupture failed to demonstrate a better outcome for those treated surgically compared to those treated nonsurgically.

Lim, C., et al. Functional Outcome of Acute Achilles Tendon Rupture with

and without Operative Treatment Using Identical Functional Bracing Protocol. *Foot Ankle Int.* 2017, Dec; 38(12): 1331-1336.

## AEROBIC EXERCISE AND COGNITIVE CONTROL IN CHRONIC STROKE

Cognitive control/executive dysfunction is particularly associated with reduced functional capacity among patients with a chronic stroke. This study examined the immediate effect of a single session of aerobic exercise on cognitive control and attention among patients with chronic stroke.

Subjects were adults with a history of ischemic or hemorrhagic stroke at least six months prior, and full use of at least one arm and one hand. The participants completed baseline assessment in two experimental sessions. During an exercise session, two minutes of self-paced warm-up was followed by 20 minutes of exercise, corresponding to 45% to 55% of the individual's heart rate reserve. An EEG was recorded throughout the procedure. The subjects were assessed before and after exercise with a modified Eriksen Flanker task.

The data revealed improvements in EEG measures after exercise. P300 amplitude at Fz was greater 40 minutes after exercise as compared with after rest ( $p=0.007$ ). P300 latency was also shorter at 20 minutes after exercise as compared with after rest for both congruent ( $p=0.02$ ) and incongruent ( $p=0.003$ ) conditions at the central electrode on the lesional side.

Analyses of performance variables revealed no significant difference between the exercise and control groups.

**Conclusion:** This study suggests that cognitive control may be augmented 20 to 40 minutes after aerobic exercise among people with chronic stroke.

Swatridge, K., et al. The Acute Effects of Aerobic Exercise on Cognitive Control among People with Chronic Stroke. *J Stroke*

*Cerebrovasc Dis.* 2017, Dec; 26 (12): 2742-2748.

## EVALUATION OF CINNAMON IN HEALTHY ADULTS

In traditional Indian medicine, cinnamon is advocated for many ailments. Cinnamon comes in two main varieties, *Cinnamomum cassia* (*Cinnamomum aromaticum*) and *Cinnamomum zeylanicum* (CZ). As coumarin levels in cassia are higher than in CZ, the regular use of cassia cinnamon has not been advocated. This study evaluated the pharmacodynamic properties and safety of CZ in healthy adults.

Subjects were healthy adults between the ages of 18 and 60. Each subject was given a daily capsule containing refined CZ at 85 mg the first month, 250 mg the second month and 500 mg the third month. The participants were assessed at baseline, and at each of three monthly follow-ups. Assessments included anthropometrics and lab tests.

Compared with baseline, no significant changes were noted in weight, body mass index, waist circumference or waist to hip ratio. A significant increase in pulse rate was noted between visits two and three ( $p<0.05$ ). Both systolic and diastolic blood pressure readings were significantly reduced during the first month, with this reduction sustained at three months. In addition, significant reductions were noted in total cholesterol ( $p<0.05$ ) and LDL cholesterol ( $p<0.001$ ) at the end of three months. No serious side effects were noted.

**Conclusion:** This study of healthy adults found that daily ingestion of cinnamon may reduce blood pressure, total cholesterol and LDL cholesterol, with no significant side effects noted.

Ranasinghe, P., et al. Evaluation of Pharmacodynamic Properties and Safety of *Cinnamomum Zeylanicum* (Ceylon Cinnamon) in Healthy Adults: A Phase I Clinical Trial. *BMC*

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**Complement Altern Med.** 2017;  
17:550.

### **FREMANEZUMAB FOR PREVENTING CHRONIC MIGRAINE**

The global prevalence of migraine has been estimated at 15 to 18%. Chronic migraine, affecting two percent of the population, is defined as the occurrence of migraine headaches at least 15 days per month. Fremanezumab is a humanized, monoclonal antibody which selectively binds to calcitonin gene related peptide, involved in central and peripheral pathophysiological events of migraine. This study assessed the efficacy of this medication for the treatment of chronic migraine.

Subjects were adults with chronic migraine, who received abdominal subcutaneous injections at baseline, and at weeks four and eight. Those randomized to a fremanezumab-quarterly group received 675 mg of fremanezumab at baseline. Those in a fremanezumab-monthly group received 675 mg of fremanezumab at baseline, and 225 mg at weeks four and eight, while those in the placebo group received placebo injections at all time periods. The primary endpoint was the mean change in the average number of headache days per month.

The mean number of headache days per month was reduced by 4.3 days in the quarterly group, by 4.6 days in the monthly group and by 2.5 days in the placebo group ( $p < 0.001$  for both, compared to placebo). Significantly more patients treated in the fremanezumab groups reported a reduction of at least 50% in the average number of headache days

per month as compared with placebo. There was no elevation in adverse or serious adverse events in the treatment groups as compared with the control group.

**Conclusion:** This study of patients with chronic migraine found that the monoclonal antibody, fremanezumab, when administered subcutaneously, monthly or quarterly, is effective for the preventive treatment of migraine.

Silberstein, S., et al. Fremanezumab for the Preventive Treatment of Chronic Migraine. **N Eng J Med.** 2017, Nov 30; 377(22): 2113-2122.

### **MULTIPLE VERSUS SINGLE HYALURONIC ACID INJECTIONS**

For patients with osteoarthritis (OA) of the knee, common, nonoperative therapies include nonsteroidal anti-inflammatory drugs, physical therapy, analgesics and intra-articular injections.

Recommendations of the major medical societies, including the American Academy of Orthopedic Surgeons, the American College of Rheumatology and the American Medical Society for Sports Medicine, differ in their recommendations for the use of intra-articular hyaluronic acid. This meta-analysis was designed to better understand the effect of single versus multiple injections of hyaluronic acid for the treatment of OA of the knee.

A comprehensive literature search was conducted for articles assessing the efficacy of hyaluronic acid injections for patients with OA of the knee, with outcomes including pain, function and adverse events. Relevant articles were reviewed and included in the meta-analysis.

Studies included were 26, double-blind, randomized, controlled trials and four, single-blind, randomized, controlled trials involving a total of 5,848 patients. Low molecular weight hyaluronic acid was the most frequently used treatment (47%), followed by high molecular weight hyaluronic acid (43%) and moderate weight hyaluronic acid (10%). Compared with intra-articular saline, two to four injections of HA produced the largest reduction in pain at three ( $p < 0.00001$ ) and six ( $p = 0.008$ ) months. Treatments involving five or more injections were correlated with significant improvement in pain at six months.

**Conclusion:** This meta-analysis of randomized, controlled trials involving hyaluronic acid for the treatment of osteoarthritis of the knee found that a series of two to four injections resulted in better outcomes than did single injections, or placebo.

Concoff, A., et al. Efficacy of Multiple versus Single Hyaluronic Acid Injections: A Systematic Review and Meta-analysis. **BMC Musculoskel Dis.** 2017; 18: 542.

### **GALCANEZUMAB FOR EPISODIC MIGRAINE PREVENTION**

Currently, five medications are approved by the United States Food and Drug Administration for the prevention of migraines, all of which have less than ideal treatment and side effect profiles. As calcitonin gene related peptide (CGRP) has been found to be a promising target for the treatment of migraine, this study assessed the efficacy of a humanized monoclonal antibody (galcanezumab), which selectively binds to CGRP.

This prospective, multicenter study included adult patients with a history of migraine, with or without aura. The participants were randomized to receive a placebo or subcutaneous galcanezumab, at doses of five mg, 50 mg, 120 mg, or 300 mg, administered monthly for three months. The primary outcome variable was the number of migraine days per month (MHD).

Compared with the placebo group, all groups receiving galcanezumab had a significant reduction in MHDs at month one. The overall change from baseline to month three in the number of MHDs was significant for both the 120 mg and 300 mg dose groups, as compared with placebo. The frequencies of adverse events were 51.1% in the placebo group and 53.1% in the treatment group.

**Conclusion:** This study of patients with migraine headaches found that, compared with placebo, monthly subcutaneous injections of galcanezumab are efficacious and well-tolerated for the prevention of episodic migraines.

Skljarevski, V., et al. Effect of Different Doses of Galcanezumab versus Placebo for Episodic Migraine Prevention. A Randomized, Clinical Trial. **JAMA Neurol.** doi:10.1001/jamaneurol.2017.3859.

### **CONCUSSION AND FUNCTIONAL BRAIN PROCESSES**

While routine MRI cannot adequately identify micro-structural injury after concussion, improvements have been made with the use of functional MRI (fMRI) or event-related potentials (ERP) and magnetoencephalography (MEG). This study used MEG to assess patients during visual working memory tasks.

Eighteen patients with a recent, first ever concussion were compared to 19 controls. Both groups were tested using the Sport Concussion Assessment Tool-Two (SCAT2), as well as an assessment battery including the Wechsler Abbreviated Scale of Intelligence (WASI) for IQ, the Alcohol Use Disorders Identification Test (AUDIT), the Conners, Attention-Deficit Hyper-activity Disorder (ADHD) Test, the Generalized Anxiety Disorder -7 test (GAD-7) and the Patient Health Questionnaire (PHQ-9) to assess depression. For both groups, MEG data were collected during a visual One-Back task with complex scenes as a test of visual working memory. MEG responses were compared between the groups.

Scores on tests of ADHD, anxiety and depression were worse in the concussion group than in the controls ( $p=0.035$ ,  $p=0.035$ , and  $p=0.004$ , respectively). The mean accuracy on the One-Back test was similar between the two groups. Despite this, MEG demonstrated abnormal hypo- and hyperactivation patterns in brain areas involving frontoparietal, ventral occipitotemporal, temporal, and subcortical areas in concussed patients as compared with controls. Hyperactivation in the right hippocampus and orbital frontal areas during encoding and/or recognition was found, suggesting inefficient, compensatory activity.

**Conclusion:** This study of patients with recent concussion found that, during tests of visual working memory, abnormal activity was present in the frontoparietal, ventral occipitotemporal, medial temporal and orbitofrontal areas.

Shah-Basak, P., et al. Concussion Alters the Functional Brain Processes of Visual Attention and Working Memory. *J Neurotrauma*. 2018, January 15; 35: 267-277.

### **PAIN CATASTROPHIZING AND POSTOPERATIVE PAIN AFTER TOTAL JOINT ARTHROPLASTY**

Between 1997 and 2010, the rate of total knee arthroplasties (TKA) has doubled, while the rate of total hip arthroplasties (THA) has increased from 11 to 15 per 10,000 population. While these procedures have been effective in reducing pain, a small portion of patients continue to experience chronic, postoperative pain, and to report poor functional outcomes. This study examined the relationship between pain catastrophizing and postoperative pain intensity among patients undergoing joint replacement surgery. This prospective study included all

patients undergoing primary TKA or THA in August of 2013 and March of 2014. All were administered the Pain Catastrophizing Scale (PCS) at their final presurgical visit.

From these scores, the patients were divided into catastrophizing and non-catastrophizing cohorts. The primary outcome measure was patient reported postoperative pain at three months post-surgery, as measured on a visual analog scale (VAS).

Of the 123 patients in the analysis, 87 scored  $<30$  (non-catastrophizers) and 36 scored  $\geq 30$  (catastrophizers) on the PCS. At three months, the average VAS pain score was significantly higher in the catastrophizer group than in the non-catastrophizer group ( $p=0.000$ ), although this level did not meet the pre-established clinically important difference of two points on the VAS. In addition, there were no significant differences between the two groups in the morphine equivalent doses consumed during hospitalization.

**Conclusion:** This prospective study of patients undergoing total knee or total hip arthroplasty found a statistically, but not clinically, significant difference in pain scores three months after surgery between pain catastrophizers and non-catastrophizers.

Wright, D., et al. Pain Catastrophizing as a Predictor for Postoperative Pain and Opiate Consumption in Total Joint Arthroplasty Patients. *Arch Ortho Trauma Surg*. 2017, Dec; 137 (12): 1623-1629.

### **SURGERY FOR CLINICALLY POSITIVE AND ELECTRODIAGNOSTICALLY NEGATIVE CARPAL TUNNEL SYNDROME**

Treatment for carpal tunnel syndrome (CTS) may include splinting, corticosteroid injections and/or surgery. Electrodiagnostic (EDX) tests to confirm this diagnosis can be negative in up to 15% of patients. This study was designed to determine whether surgical decompression can effectively treat those with clinically positive, but EDX negative CTS.

Subjects were adult patients referred with symptoms of CTS, with normal EDX results. The patients were randomly assigned to surgical decompression or nonsurgical treatment, with the latter including nocturnal wrist splinting or local corticoid injections. Outcomes were measured with a six-point scale for perceived improvement, as well as the Boston Carpal Tunnel Questionnaire, completed at baseline and at six-month follow-up.

At six-month follow-up, more patients in the surgery group (70%) than in the non-surgery group (35.3%) reported important improvement ( $p=0.02$ ). In addition, complete symptom relief was reported by 39.4% of the surgery group and zero percent of the non-surgery group ( $p=0.003$ ).

**Conclusion:** This study provides evidence that most patients with clinically defined carpal tunnel syndrome and normal electrodiagnostic study results can benefit from carpal tunnel release surgery.

De Kleermakeeker, F., et al. Treatment Outcome in Patients with Clinically Defined Carpal Tunnel Syndrome but Normal Electrodiagnostic Test Results: A Randomized, Controlled Trial. *J Neuro*. 2017, Dec; 264(12): 2394-2400.

### **TISSUE FLOSSING, JUMP AND SPRINT PERFORMANCE**

Previous studies have demonstrated that tissue flossing can be useful in improvement of ankle range of motion and single leg jump performance. This study investigated the effect of tissue flossing at different time points following the application of the bands.

Subjects were 69, healthy, recreational athletes. The participants were randomized to either a FLOSS group or a control group (CON). Following a standardized warmup, both groups were asked to perform several athletic maneuvers, including a weight-bearing lunge test (WBLT), a counter movement jump and a 15-meter sprint test. Those in the FLOSS group had a band attached to each ankle before beginning warmup exercises, while the CON group had none.

A significant intervention-time interaction was found for the WBLT in favor of FLOSS as compared to CON ( $p<0.05$ ). These results were associated with trivial to small effect sizes at all time points. As compared to CON, better, but non-significant, improvement in CMJ force and sprint times were seen in the FLOSS group ( $p>0.05$ ) at up to 45 minutes after the bands were removed.

**Conclusion:** This study revealed that applying FLOSS bands to the ankle (talocrural) joint for two minutes may improve ROM, jump and sprint performance for up to 45 minutes after removing the bands.

Driller, M., et al. Tissue Flossing on Ankle Range of Motion, Jump and Sprint Performance: A Follow-Up Study. *Phys Ther Sport*. 2017, Nov; 28: 29-33.

## VITAMIN D SUPPLEMENTATION FOR CHRONIC, WIDESPREAD PAIN

Chronic widespread pain (CWP), including fibromyalgia (FM), is prevalent in the general population, with estimates ranging from 10-18%. As vitamin D has been proposed to be an associated factor in CWP, this meta-analysis was designed to better understand this relationship.

Medical databases were reviewed for randomized, controlled trials involving patients with CWP, FM and vitamin D supplementation. From those studies were extracted diagnoses, serum vitamin D levels, vitamin D dosing and the results of clinical outcome measures. The primary outcome variables of the meta-analysis were differences in VAS pain scores, Fibromyalgia Impact Questionnaire (FIQ) scores or Discomfort Behavior Scale (DBS) scores between the intervention and the placebo groups.

From the literature review, six randomized, controlled trials were identified and were included in this analysis. The pooled results revealed that patients with CWP who received vitamin D treatment had significantly lower pain scores than those who received a placebo. No significant relationship was found between changes in blood levels of vitamin D and pain scores.

**Conclusion:** This study of patients with chronic, widespread pain found that vitamin D supplementation can decrease pain scores, independent of changes in blood levels of vitamin D.

Yong, W., et al. Effect of Vitamin D Supplementation in Chronic Widespread Pain: A Systematic Review and Meta-analysis. *Clin Rheum.* 2017, Dec; 36 (12): 2825-2833.

## ARTHROSCOPIC VERSUS PLACEBO MENISCUS SURGERY

Arthroscopic partial meniscectomy is a common orthopedic procedure, with its incidence increasing steadily. Despite studies suggesting a lack of clinical efficacy, most guidelines advocate meniscal surgery after failed conservative treatments. This prospective study, the Finnish Degenerative Meniscal Lesion Study (Fidelity), was designed to better understand the effect of meniscal surgery.

This multicenter, randomized, placebo-controlled trial included adults, 35 to 65 years of age, each with chronic knee symptoms. All were scheduled for knee arthroscopic surgery, and were

randomized to receive a partial meniscectomy (PM) or a placebo surgery. All patients were assessed with the Western Ontario Meniscal Evaluation Tool (WOMET), the Lysholm knee score and for pain after exercise from baseline to 24 months after surgery.

Intraoperatively, tear morphology was defined as unstable in 34 of the surgery and in 41 of the placebo group. Both groups demonstrated marked improvement in all primary outcomes, with no significant difference in WOMET, Lysholm or pain after exercise scores. Most were satisfied, and reported improvements, with no significant difference between the two groups. Further, no significant difference was found between the groups on follow-up meniscal tests during clinical examination.

**Conclusion:** This prospective, blinded study of patients with degenerative meniscal pathology found no significant difference in outcome between those receiving surgical intervention and those receiving placebo intervention, as measured for up to two year follow-up.

Sihvonen, R., et al. Arthroscopic Partial Meniscectomy versus Placebo Surgery for a Degenerative Meniscus Tear: A Two-Year Follow-Up of the Randomised Controlled Trial. *Ann Rheum Dis.* 2018; 77: 188-195.

## BRACING AFTER SPINAL FUSION

A recent survey found that 56% of surgeons prescribe some type of brace after spine surgery. This prospective study was designed to better understand the effect of early bracing of patients undergoing posterior spinal instrumented fusion (PSIF).

This prospective trial included all patients with lumbar degenerative conditions admitted for PSIF. The subjects were randomized to a brace (n=25) or no brace (n=18) group. After PSIF surgery, those in the brace group were instructed to wear a rigid, molded, lumbosacral orthosis (LSO) full-time for eight weeks, except during hygiene and wound care. This was followed by daytime wear for another four weeks. The control group underwent the same postoperative rehabilitation, without the use of a brace. Participants were assessed with the Oswestry Disability Index (ODI) questionnaire, the Short Form (SF)-12 General Health Survey and a visual analog scale (VAS) for back pain at baseline, and then at six weeks and three months.

Scores on the ODI improved in both groups, with similar outcomes noted at six weeks, but with greater gains in the control group at three months (p=0.01). Improvements in SF-12 scores were similar between the groups at six weeks, but significant only for the control group at three months (p=0.01). Significantly better VAS scores were seen in the control group at three months (p=0.001). No instrumentation failure was noted in either group.

**Conclusion:** This prospective, randomized study of patients undergoing posterior spinal instrumented fusion found that those who did not have postoperative bracing performed better than those who did.

Soliman, H., et al. Early Impact of Postoperative Bracing on Pain and Quality of Life after Posterior Instrumented Fusion for Lumbar Degenerative Conditions: A Randomized Trial. *Spine.* 2018, February 1; 43 (3): 155-160.

## CONCUSSION NONDISCLOSURE IN THE NATIONAL FOOTBALL LEAGUE

Studies of retired national football league (NFL) players have found associations between recurrent concussions and adverse health outcomes. Despite the institution of a concussion protocol in the 2009 season, assessment of concussion remains dependent to some extent upon the willingness of the athletes to disclose symptoms. This study of retired NFL players was designed to determine the extent of nondisclosure of concussion events.

This retrospective survey used data from the retired NFL players General Health Survey (GHS), with responses from players ranging from those playing before World War II to those playing in the early 2000s. A baseline instrument was sent to all living members of the NFL Retired Players Association in 2001, with a follow-up GHS sent in 2010. The survey contained queries concerning sports related concussions during the players' career and whether any of these was unreported to the medical staff.

Of the respondents, 50.3%, reported that they had sustained at least one concussion that they did not disclose to the medical staff. The prevalence of at least one nondisclosure was higher among those with more professional career concussions, ranging from 35.5% in those with one or two concussions, to 75% among those with 10 or more concussions.

**Conclusion:** This study of retired National Football League players found that over half did not disclose to the medical team at least one concussion during their playing careers.

Kerr, Z et al. Concussion Nondisclosure during Professional Career among a Cohort of Former National Football League Athletes. *Am J Sports Med.* 2018, January; 46 (1): 22-29.

### REPEATED ISCHEMIC LEG PRE-CONDITIONING AND CYCLING PERFORMANCE

Ischemic preconditioning (IPC) involves repetitive, pressure induced, brief ischemia followed by reperfusion. While many studies have analyzed the effects of this technique on strengthening, little is known about its effect on athletic performance. This study investigated the effect of IPC on cycling performance.

Subjects were recreationally active sport science students who underwent baseline aerobic and anaerobic capacity testing prior to the IPC protocol. At baseline, and after the final IPC, all participants were tested with a simulated Keirin cycling event. The subjects were then randomized into an IPC or a sham IPC group to perform seven daily sessions. Participants received four, five-minute episodes of IPC (220 mm Hg) or sham treatment (20 mm Hg), separated by five minutes of rest for each leg. Urine samples were collected five minutes before each IPC session. Four Wingate tests were used to simulate the Keirin competition. VO<sub>2</sub>max testing was conducted 48 hours and seven days following the last IPC session.

Compared to baseline, performance increased in the IPC group in peak power by 11% ( $p < 0.001$ ), in average power by 4.3% ( $p = 0.02$ ) and improved in the Fatigue Index by 12.1% ( $p = 0.01$ ). No significant changes were observed for the sham group on any of these parameters. Maximal aerobic capacity increased in the treatment group by 9.5% at 48 hours post-treatment, with a further increase of 12.8% after an additional seven days ( $p < 0.01$ ). Urine studies indicated an increase in total biopterin, suggesting increased vasodilation and sympathetic activation, and lower levels of indirect markers of oxidative stress, during cycling.

**Conclusion:** This randomized, controlled study of repeated, ischemic preconditioning found that seven days of this treatment

significantly increased aerobic and anaerobic capacity.

Lindsey, A., et al. The Effect of one Week of Repeated Ischemic Leg Preconditioning on Simulated Keirin Cycling Performance: A Randomized Trial. *BMJ Open Sport Exer Med.* 2017; 3(1): e000229.

### PLATELET RICH PLASMA FOR GLEUTEAL TENDINOPATHY

Tendinopathy of the gluteus medius and/or minimus tendons is a major cause of lateral hip pain or greater trochanteric pain syndrome. This study compared the efficacy of injections with glucocorticoids, with and without platelet rich plasma (PRP), for the treatment of gluteal tendinopathy (GT).

Eligible subjects were 18 to 80 years of age, all with a history of GT of greater than four months' duration. The participants were randomized to a glucocorticoid or a PRP group, with both undergoing blood withdrawal of 55 mL. In the PRP group, six to seven mL of autologous PRP were injected into the affected area of the tendon using ultrasound guidance. In the corticosteroid group, a similar volume of corticosteroid was injected, using the same procedure. The primary outcome measures were pain and function, assessed with the modified Harris Hip score (mHHS), administered at two, six and 12 weeks. As the minimal clinically important difference (MCI) for the mHHS is been shown to be eight points, this cutoff was used to help estimate clinical efficacy.

At 12 weeks, the mean mHHS scores improved to 74.05 in the PRP group and 67.13 in the corticosteroid group ( $p = 0.048$ ). The proportions of subjects who achieved the predefined MCI change from baseline at 12 weeks were 56.7% in the corticosteroid group and 82% in the PRP group ( $p = 0.016$ ). There were no significant treatment related, adverse events in either group.

**Conclusion:** This study of patients with chronic gluteal tendinopathy found better clinical improvement with a single injection of PRP than with a single injection of corticosteroid.

Fitzpatrick, J., et al. The Effectiveness of Platelet Rich Plasma Injections in Gluteal Tendinopathy. A Randomized, Double-Blind, Controlled Trial Comparing a Single Platelet-Rich Plasma Injection with a Single Corticosteroid Injection. *Am J Sports*

*Med.* 2018, January.  
DOI:10.1177/0363546517745525

### DISCHARGE AFTER TOTAL JOINT ARTHROPLASTY FOR PATIENTS LIVING ALONE

Numerous studies have demonstrated that patients undergoing total joint arthroplasty (TJA) who are discharged to home have an equivalent recovery to those who are discharged to an inpatient rehabilitation facility (IRF). Despite these findings, concern has been expressed about those who are discharged to live alone. This study was designed to better understand the outcomes of these patients.

This prospective, observational study included 910 consecutive patients undergoing primary, unilateral total hip arthroplasty (THA) or total knee arthroplasty (TKA). The investigational group was defined as patients who were discharged directly to home. A nurse navigator was assigned to each patient for post-operative surveillance. The primary outcome measures were ninety-day post-discharge complications and unplanned clinical events, including readmissions. Functional outcomes were assessed preoperatively at one and six months using the Hip Disability and Osteoarthritis Outcome Score (HOOS), the Knee Injury and Osteoarthritis Outcome Score (KOOS), as well as the Short-Form Health Survey (SF-12).

Data analysis was completed for 769 patients, including 443 undergoing THA and 326 undergoing TKA. Of those, 137 reported living alone, of whom 37.2% reported limited or no support at home. No significant difference was seen in the rates of unplanned clinical events, with at least one event occurring in 10.9% of those living alone and 9.5% of those with home support ( $p = 0.64$ ). Readmission occurred in 2.2% of those living alone and 3.2% of those living with others. At two weeks, 83.6% of those living alone reported being happy to have been discharged directly home.

**Conclusion:** This prospective study of 874 patients undergoing total joint arthroplasty found that those discharged directly to home alone did not differ significantly in medical or functional outcomes from those discharged to home with others.

Fleishman, A., et al. Patients Living Alone Can Be Safely Discharged Directly Home after Total Joint Arthroplasty: A Prospective Cohort.

### HIP AND KNEE ARTHRITIS IN MARATHON RUNNERS

While distance running has been associated with numerous health benefits, data regarding the impact of this behavior on hip and knee joint health remain inconclusive. This large, cross-sectional study was designed to better understand hip and knee health in active marathon runners.

An electronic survey was distributed to marathon clubs, with eligibility for inclusion restricted to active, adult marathoners. On a survey, 953 marathon runners provided information concerning running history, and current running status. Joint health questions inquired about hip or knee pain in the past year, doctor-diagnosed hip or knee arthritis, age of diagnosis, family history, and surgical history. The subjects were also asked whether they had been diagnosed with hip or knee arthritis by a doctor.

The mean age of the marathoners was 47.9 years, with a mean distance of 36.4 miles per week, and a mean training time of 18.8 years. Hip and/ or knee pain was reported by 47% of the marathoners, including 22% with knee pain, 11.1% with hip pain and 13.6% with hip and knee pain. The arthritis prevalence of the marathoners was 8.8% in the subgroup of U.S. marathoners, significantly lower than that of the age-matched U.S. population, estimated at 17.9% ( $p < 0.001$ ). A multi-variable analysis revealed no significant, positive relationship between pain or arthritis and running duration, intensity, weekly mileage or number of marathons.

**Conclusion:** This multi-national study of marathon runners found that the prevalence of self-reported arthritis in the United States was less than half of that reported in the U.S. general population.

Ponzio, D., et al. Low Prevalence of Hip and Knee Arthritis in Active Marathon Runners. *J Bone Joint Surg.* 2018, January 17; 100(2): 131-137.

### MEDICATION PHYSICAL THERAPY AND ACUPUNCTURE FOR SPINAL STENOSIS

Lumbar spinal stenosis (LSS) is associated with neurological symptoms and a reduced quality of life, particularly among the elderly. This study compared

acetaminophen, exercise and acupuncture as conservative treatments for patients with LSS.

Subjects were adults with L5 radiculopathy associated with LSS, treated between December of 2011 and January of 2014. The participants were randomized to receive; 1) 900 mg of acetaminophen, three times per day, 2) physical therapy, including six sets of 10 repetitions of back flexion exercises or 3) acupuncture. Interventions were provided twice in the first week and once each week from weeks two through four. The acupuncture sites included BL-23 (Shenshu), BL-25 (Dachangshu), BL-5 3(Hoko), BL-54 (Zhibian), BL-40 (Weizhong) and GB-34 (Yanglingquan). The primary outcome measure was the Zurich Medication Questionnaire (ZMQ), completed before, and four weeks after treatment.

A total of 119 patients were randomized into the three groups. Symptom severity scores improved in the acetaminophen group ( $p = 0.048$ ), the exercise group ( $p = 0.003$ ) and the acupuncture group ( $p = 0.04$ ), with no significant differences between the three groups. The mean improvements in physical function scores were significantly greater only after acupuncture, and were significantly greater in the acupuncture than in the exercise group. As compared to the acetaminophen group, satisfaction was better in the acupuncture group ( $p = 0.0004$ ), and trended toward being better than in the exercise group ( $p = 0.06$ ).

**Conclusion:** This Japanese study of patients with lumbar spinal stenosis found that pain and function can be better improved with acupuncture than with exercise or acetaminophen.

Oka, H., et al. A Comparative Study of Three, Conservative Treatments in Patients with Lumbar Spinal Stenosis: Lumbar Spinal Stenosis with Acupuncture and Physical Therapy Study (LAP Study). *BMC Complimentary Alt Med.* 2018; 18:19.

### KINESIOPHOBIA AND PHYSICAL THERAPY RELATED PAIN

Kinesiophobia describes avoidance and fear of movement. This seems to be important to the development of chronic musculoskeletal pain. This study examined the impact of kinesiophobia at the onset of physical therapy (PT), and the effect of analgesia on kinesiophobia.

This French, multicenter study included consecutive, adult patients, referred to PT for the treatment of musculoskeletal pain. All were assessed for kinesiophobia using the Tampa Scale of Kinesiophobia (TSK). Data collected included medical history, demographic data, pain assessed at baseline and at the fifth PT session using the Numerical Rating Scale (NRS), medication use and patient view of pain. The subjects were asked about pain during PT sessions and of level of satisfaction.

Participants were 700 patients with a mean age of 50.3 years. The level of initial pain was significantly higher for those with kinesiophobia than for those without. Patients with kinesiophobia received a higher number of PT sessions. The proportion of subjects who received a prescription for pain medications was significantly greater ( $p < 0.001$ ) for those with as compared to those without kinesiophobia (95.4% versus 85.0%). A significant increase in PT satisfaction was observed in the 25.6% who had been given preventive analgesics before PT sessions.

**Conclusion:** This study of consecutive patients seen in a musculoskeletal clinic found that kinesiophobia is frequent among patients receiving physical therapy and is associated with higher levels of pain, with improved satisfaction in those given preventative analgesics before therapy.

Perrot, S., et al. Kinesiophobia and Physical Therapy-Related Pain and Musculoskeletal Pain: A National, Multicenter, Cohort Study on Patients and their General Physicians. *Joint Bone Spine.* 2018; 85: 101-107.

### OSTEOARTHRITIS, KNEE PAIN AND OMEGA-3

Studies have suggested that, in addition to joint specific inflammation, systemic inflammation is also involved in the pathogenesis of osteoarthritis (OA). As higher levels of Omega-3 polyunsaturated fatty acids, and lower levels of Omega-6, are associated with lower inflammation and pain in inflammatory conditions such as rheumatoid arthritis, this study investigated the association between these levels and symptoms among patients with OA of the knee.

Subjects were 45 to 85 years of age with symptomatic OA of the knee. All completed self-reported measures of clinical pain and functional limitations, including the Western Ontario and McMaster

Universities Index of Osteoarthritis (WOMAC), the Graded Chronic Pain Scale and the Short Physical Performance Battery (SPPB). In addition, all were assessed with several psychosocial measures. Blood samples were collected with Omega-6: Omega-3 ratios determined. Those with high ratios were compared to those with low ratios.

Subjects in the high ratio group obtained worse scores on the WOMAC ( $p=0.011$ ), and slightly lower physical function scores on the SPPB chair stand ( $p=0.001$ ) and total scores ( $p=0.008$ ) than did those in the low ratio group. The high ratio group reported greater pain intensity following 10 mechanical taps, had higher perceived stress and reported greater negative affect.

**Conclusion:** This study of adults with symptomatic osteoarthritis of the knee found that those with lower Omega-6:Omega-3 ratios have lower levels of knee pain, better physical function, and less psychosocial distress than do those with high Omega-6:Omega-3 ratios.

Sibille, K., et al. Omega-6: Omega-3 PUFA Ratio, Pain, Functioning and Distress in Adults with Knee Pain. *Clin J Pain*. 2018, Feb; 34(2): 182-189.

### REPEATED ISCHEMIC LEG PRECONDITIONING AND CYCLING PERFORMANCE

Ischemic preconditioning (IPC) involves repetitive, pressure induced, brief ischemia followed by reperfusion. While many studies have analyzed the effects of this technique on strengthening, little is known about its effect on athletic performance. This study investigated the effect of IPC on cycling performance.

Subjects were recreationally active sport science students who underwent baseline aerobic and anaerobic capacity testing prior to the IPC protocol. At baseline, and after the final IPC, all participants were tested with a simulated Kerin cycling event. The subjects were then randomized into an IPC or a sham IPC group to perform seven daily sessions. Participants received four, five-minute episodes of IPC (220 mm Hg) or sham treatment (20 mm Hg), separated by five minutes of rest for each leg. Urine samples were collected five minutes before each IPC session. Four Wingate tests were used to simulate the Kerin competition.  $VO_{2max}$  testing was conducted 48 hours and seven days following the last IPC session.

Compared to baseline, performance increased in the IPC group in peak power by 11% ( $p<0.001$ ), in average power by 4.3% ( $p=0.02$ ) and improved in the Fatigue Index by 12.1% ( $p=0.01$ ). No significant changes were observed for the sham group on any of these parameters.

Maximal aerobic capacity increased in the treatment group by 9.5% at 48 hours post-treatment, with a further increase of 12.8% after an additional seven days ( $p<0.01$ ). Urine studies indicated an increase in total biopterin, suggesting increased vasodilation and sympathetic activation, and lower levels of indirect markers of oxidative stress, during cycling.

**Conclusion:** This randomized, controlled study of repeated, ischemic preconditioning found that seven days of this treatment significantly increased aerobic and anaerobic capacity.

Lindsey, A., et al. The Effect of one Week of Repeated Ischemic Leg Preconditioning on Simulated Kerin Cycling Performance: A Randomized Trial. *BMJ Open Sport Exer Med*. 2017; 3(1): e000229.

### SHOCKWAVE AND CORTICOSTEROID INJECTION FOR CARPAL TUNNEL SYNDROME

Recent studies have suggested that radial extracorporeal shock wave therapy (rESWT) can reduce pain and improve function in patients with carpal tunnel syndrome (CTS). This study compared the effects of a single dose of rESWT versus local corticosteroid injection (LCsl). Adult patients presenting with CTS were randomly assigned to a group to receive a single dose of rESWT or a single LCsl. Those in the rESWT group received seven minutes of continuous shockwaves at 4 Bar, 15 Hz frequency, 5,000 shocks, BTL-6000 SWT, radial shockwave mode.

The injection group received 1 ml of triamcinolone (acetone), 10 mg, mixed with 1 ml of one percent lidocaine. The primary outcome measure was the Boston Self-Assessment Questionnaire (BQ). Compared with baseline a significant improvement in pain and function scores, was noted at weeks 12 and 24 compared to baseline in the rESWT group, with no significant change noted in the LCsl group. In addition, significant reductions in symptom severity and BQ scores were found at weeks four, 12 and 24 in the rESWT group,

with significant reductions noted in the injection group at weeks one and four. Electrodiagnostic studies revealed a significant decrease in peak sensory distal latency in both groups at week 12 as compared to baseline.

**Conclusion:** This study of patients with carpal tunnel syndrome found that a single session of radial extracorporeal shock wave therapy may provide greater symptom and functional improvement than steroid injections.

Atthakomol, P., et al. Comparison of Single-Dose Radial Extracorporeal Shockwave and Local Corticosteroid Injection for Treatment of Carpal Tunnel Syndrome, Including Mid-Term Efficacy: A Prospective Randomized Controlled Trial. *BMC Musculoskel Dis*. 2018; 19: 32.

### UPPER EXTREMITY STRENGTHENING FOR CHRONIC LOW BACK PAIN

For patients with chronic low back pain (LBP), the best combination of exercise type, frequency and duration remains uncertain. As no common exercise programs for chronic LBP incorporate the upper part of the spinal muscle chain, this study assessed the impact of a program for back pain that includes these exercises.

Twenty sedentary males with chronic LBP were randomized to receive conventional LBP exercises, with or without exercises for the upper back, neck and shoulders. At baseline, all were assessed for lumbar strength, shoulder abduction and horizontal abduction strength, isokinetic neck strength and isometric neck strength. The conventional exercise (CE) group underwent isometric back exercises, as well as back and abdominal concentrated strengthening exercises, three days per week for six weeks. For the supplemental exercise (SE) group, the back exercises were supplemented with neck and shoulder isotonic exercises. The participants were assessed for disability with the modified Oswestry Disability Questionnaire (MODQ), and for pain with a Visual Analog Scale (VAS).

Both groups improved significantly in fingertip to floor distance and VAS scores. In addition, compared to the CE group, greater improvements were noted at follow up in the SE group in VAS ( $p<0.001$ ) and MODQ scores ( $p<0.001$ ).

**Conclusion:** This study of patients with chronic low back pain found that a low back exercise program used in combination with neck, shoulder and upper back

exercises can reduce pain and disability more than conventional low back exercise alone.

Atalay, E., et al. Effect of Upper-Extremity Strengthening Exercises on the Lumbar Strength, Disability and Pain of Patients with Chronic Low Back Pain: A Randomized, Controlled Study. *J Sport Sci Med.* 2017, December 1; 16(4): 595-603.

### **WEIGHT LOSS AFTER SPINE FUSION SURGERY**

In the United States, over one third of adults are obese, with 6.3% classified as extremely obese. Data concerning the outcome of obese patients following lumbar spine surgery have suggested that these patients experience improvement in both back and leg pain. This study was designed to determine whether the increased activity after surgery results in weight loss.

Data were extracted from the health records of an integrated health care system (Kaiser Permanente) for patients with surgeries at lumbar discs 1-5. Body mass index (BMI) was recorded from one year before to one year

after the surgery. The outcome of interest was a weight loss of five percent at one year post-surgery.

Of the 7,303 patients included in the sample, 61% were non-obese (BMI<30 kg/m<sup>2</sup>), 35.4% were obese (BMI 30 to 39kg/m<sup>2</sup>) and 3.2% were extremely obese (>40kg/m<sup>2</sup>). Weight loss, as a percent of BMI, was 11.1% for a BMI of less than 30kg/m<sup>2</sup>, 16.6% for a BMI of 30-39kg/m<sup>2</sup> and 21.1% for a BMI of >40 kg/m<sup>2</sup>.

Compared with non-obese patients, obese and extremely obese patients were more likely to lose a clinically significant amount of weight during the first year post-surgery (ORs 1.73 for BMI >40kg/m<sup>2</sup> (p<0.0001) and 1.42 for BMI 30-39kg/m<sup>2</sup> (p=0.0025).

**Conclusion:** This study of patients undergoing lumbar spine fusion found that obese and extremely obese patients are more likely to lose weight and less likely to gain weight than are non-obese patients after that procedure.

Akins, P., et al. Do Obese and Extremely Obese Patients Lose Weight after Lumbar Spine Fusions? Analysis of a Cohort of 7,303 Patients from the Kaiser National Spine Registry. *Spine.* 2018, Feb 1; 43(3):22-27.

*Musculoskeletal in Review (MSK)* is produced by physicians specializing in musculoskeletal and neurological medicine, with the cooperation and assistance of Emory University School of Medicine. Summaries appearing in this publication are intended as an aid in reviewing the literature relevant to the practice of clinical musculoskeletal medicine. The summaries appearing in this publication are intended as an aid in reviewing the broad base of literature relevant to this field.

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## ***MUSCULOSKELETAL IN REVIEW***

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