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CHRONIC TRAMADOL AFTER ACUTE PAIN PERSCRIPTION

With an increased focus on opioids, prescriptions of tramadol have increased, with the widespread assumption that this medication is safer than other short acting opioids. Data to support this assumption are lacking. This study assessed the risk of transitioning from acute to prolonged use among those prescribed tramadol for postoperative pain.

This retrospective analysis included medical claims recorded in the OptumLabs Warehouse, representing a diverse mixture of ages, ethnicities and geographic regions across the U.S. The records were reviewed for those undergoing twenty commonly performed surgical procedures. Discharge opioid prescriptions were placed into five, mutually exclusive categories; short acting opioids only (SAO), excluding tramadol (reference); tramadol only (T); tramadol and any other short acting opioids (no long acting) (T+SA); any long acting opioids (LA) or no opioids (NO).

Of the 357,884 with a prescription for one or more opioids, the *additional use* of *opioids* (one or more opioid fills 90-180 days after surgery) was found in 7.1% of the sample. One per cent of the sample met the criteria for *persistent opioid use* after surgery, (opioid use lasting 90 or more days). The most stringent criterion—the *CONSORT definition of chronic opioid use* (opioid use episode lasting at least 90 calendar days and including either 10 or more opioid fills or supply of 120 days or more) was present in 0.46%. The receipt of tramadol alone was associated with a 6% increase in the risk of *additional use of opioids* relative to those receiving other short acting opioids (p=0.049), a 47% increase in the adjusted risk of *persistent opioid* use p<0.001), and a 41% increase in the adjusted risk of a *CONSORT definition of chronic opioid use* episode (p=0.013).

Conclusion: This study of surgical patients receiving prescription pain medications after surgery found that those prescribed tramadol had similar to somewhat higher risks of prolonged opioid use as compared with those receiving other short acting opioids.

Thiels, C., et al. Chronic Use of Tramadol after Acute Pain Episode: Cohort Study. **BMJ** 2019; 365: l1849

CENTRALLY DRIVEN OSTEOARTHRITIS PAIN

Many patients with osteoarthritis (OA) develop referred pain at sites distant to the initial joint damage and suffer from chronic pain resulting from a discordance between nociceptor activation and the resulting pain. Tapentadol is a centrally acting analgesic that activates descending opioidergic controls and increases the synaptic availability of noradrenaline producing analgesia through the activation of α2-adrenoceptors. This animal study investigated the effects of tapentadol and pregabalin on centrally mediated pain by using Diffuse Noxious Inhibitory Controls (DNIC) as a marker of changes in descending controls.

Male Sprague Dawley rats were randomized to receive knee injections of an OA producing chemical, monoiodoacetate (MIA), or a similar volume of saline. A laminectomy exposed the L4-L5 segments of the spinal cord, with extracellular single- unit recordings made from deep dorsal horn wide dynamic range (WDR) neurons during a variety of stimuli. Tapentadol injections included 1, 2 and 5 mg/kg. Pregabalin was injected at 10 mg/kg. After each individual drug dose as well as combinations of the two, neuronal responses to noxious stimuli were recorded.

After tapentadol injections, DNIC-induced neuronal inhibition was restored. Injections of gabapentin inhibited pre-conditioned mechanically evoked neuronal responses but did not restore DNIC. Given in combination, tapentadol and pregabalin restored DNIC expression and also inhibited spinal neuronal responses.

Conclusion: This animal study found that tapentadol and pregabalin target different mechanisms of centrally driven chronic pain associated with OA. The combination of the two may provide superior analgesia.

Lockwood, S., et al. A Combination Pharmacotherapy of Tapentadol and Pregabalin to Tackle Centrally Driven Osteoarthritis Pain. **Euro J Pain.** 2019;23(6): 1185-1196.

MORTALITY FROM FALLS IN THE ELDERLY

In the United States, 28.7% of adults ages 65 years or older fell in the year 2014. This study evaluated trends in mortality due to falls in the U.S. population, 75 years of age or older, between 2000 and 2016.

Data were extracted from the US National Vital Statistics System mortality files. Unintentional deaths from falls for persons ages 75 years or older were documented and compared between the years 2000 and 2016.

The absolute number of deaths from falls among those 75 years of age or older increased from 8,613 in the year 2000 to 25,989 in the year 2016. Mortality due to falls increased in those 75 years of age or older from 51.6 per 100,000 in 2000 to 122 per 100,000 persons in 2016. Age-adjusted mortality rates among adults aged 75 years or older increased from 60.7 per 100 000 men in 2000 to 116.4 per 100 000 men in 2016 and from 46.3 per 100 000 women in 2000 to 105.9 per 100 000 women in 2016. Mortality from falls was dramatically higher among those 95 years of age or older (590.7/100,000) than among those 75 to 79 years of age (42.1/100,000).

Conclusion: This nationally representative study of individuals 75 years of age or older found an increase in the number of, and mortality due to, falls between the years 2000 and 2016.

Hartholt, K., et al. Mortality from Falls among U.S. Adults Aged 75 Years or Older, 200-2016. **JAMA.** 2019, June

4; 321(21): 2131-2133.

EFFECTS OF PLYOMETRICS

Plyometric training (PLY) is most often performed as unloaded jumping exercises with high-speed execution. This literature review was designed to better understand the effect of lower body plyometric training on jumping, sprint performance and lower body muscle strength in healthy adults.

A systematic literature review and meta-analysis included studies of healthy, adult subjects. Studies were included with training of four or more weeks, that utilized a control group to compare changes in jump height, sprint performance and lower body muscle strength.

The literature review identified 25 studies including 751 subjects. In the meta-analysis, as compared to the control group, significantly better improvement was noted in the plyometric group for jump performance, with increases ranging from 3.4% to 26.3% (as compared to -6 to 8% in the control group). In addition, compared to the control group, improvements were superior in sprint performance and lower body muscle strength ($p<0.05$ for all comparisons).

Conclusion: This meta-analysis found that plyometric training is an effective modality for improving jumping, sprint performance and lower body muscle strength.

Oxfekdt, M., et al. Effects of Plyometric Training on Jumping, Sprint Performance and Lower Body Muscle Strength in Healthy Adults: A Systematic Review and Meta-analysis. **Scand J Med Sci Sports**. 2019:1-14.

PLATELET RICH PLASMA FOR PATELLAR TENDINOPATHY

Patellar tendinopathy is common among sports involving jumping and can result in substantial pain and reduced performance. This study addressed the effect of injections with platelet rich plasma (PRP) as a treatment for patellar tendinopathy. This parallel, randomized, single blind, controlled study was conducted at three sports centers in separate countries, involving patients between 18 and 50 years of age. All were diagnosed with patellar tendinopathy, with symptoms present for at least six months. The participants were randomized to receive injections, placed adjacent to the patella tendon defect, of 3.5 mL of leukocyte poor PRP (LP–PRP), leukocyte rich PRP (LR–PRP) or normal saline. The primary outcome measure was the change in the Victorian Institute of Sports Assessment Patellar Score (VISA-P) at 12 weeks, with pain scores measured with a 10-point numeric pain rating scale.

At 12 weeks, 58% of the patients experienced improvement in VISA-P scores, with no significant difference noted between treatment groups. At six weeks, participants who rated themselves as worse included five from the LP-PRP group, three from the LR-PRP group and none from the saline group.

Conclusion: This study of patients with patellar tendinopathy found that exercise, combined with platelet rich plasma injections, does not provide superior relief than exercise combined with saline injections.

Scott, A., et al. Platelet Rich Plasma for Patellar Tendinopathy. A Randomized, Controlled Trial of Leukocyte Rich PRP or Leukocyte Poor PRP versus Saline. **Am J Sports Med.** 2019; 47 (7): 1654-1661.

PATIENT SUBGROUPS AND BENEFITS FROM MENISCAL SURGERY

Research has shown that arthroscopic partial meniscectomy for painful meniscal tears is often not beneficial. Some have argued that, despite these data, subgroups of patients may benefit from this surgical intervention. This study was designed to determine the veracity of this argument.

Data were obtained from the Knee Arthroscopic Cohort Southern Denmark (KACS) prospective cohort study of patients undergoing knee arthroscopy for a meniscal tear. Subjects were consecutive adult patients recruited from one of 14 hospitals in Southern Denmark. All underwent arthroscopic surgery for a repair of a suspected meniscal tear. The outcome variable was change in the Knee Injury and Osteoarthritis Outcome Score (KOOS) from baseline to 52 weeks after surgery. To develop a prognostic model, 26 factors in the KACS were considered. Subjects included 641 patients, of whom 600 received a resection and 33 underwent a repair, with the remaining receiving a combination of the two procedures. The average improvements in KOOS scores from before surgery to 52 weeks post-surgery were 18.6 for the entire cohort, 16.2 for those younger and 19.2 for those older than 40 years of age. The strongest prognostic factors were previous meniscal surgery, level of education and knee-related symptoms such as difficulty twisting/ pivoting and inability to straighten the

knee fully.

Conclusion: This study of patients undergoing meniscal repair does not support the existence of subgroups who have favorable outcomes after surgery.

Pihl, K., et al. Wild Goose Chase, No Predictable Patient Subgroups Who Benefit from MeniscalSurgery: Patient Reported Outcomes of 641 Patients One Year after Surgery. **Br J Sports Med**. 2019. doi.org/10.1136/ bjsports-2018- 100321.

FEMOROACETABULAR IMPINGEMENT AND NERVE INJURY AFTER SURGERY

Hip Arthroscopy (HA) is thought to be safe and less invasive than open surgery. This study was designed to determine the rate of nerve injury after hip arthroscopic surgery for femoroacetabular impingement (FAI). Subjects were consecutive patients at a single institution, each treated by HA for FAI between January of 2016 and January of 2018. During surgery, pincer and labral lesions were treated by acetabuloplasty and refixation of the labrum with suture anchors. All participants were queried about sensation at 24 hours, three and six weeks and then at three- and six-months post-surgery.

Data were collected for 110 patients with a mean age of 36 years. At four hours post-surgery, 60% to 77% reported abnormal sensation in at least one area. At three weeks, 39% still reported abnormal sensations in the perineal area, with 3.6% reporting such a disturbance in the lateral thigh. At six months, only one patient reported continued symptoms.

Conclusion: This study of patients with femoral acetabular impingement who underwent arthroscopic surgery found that over 60% reported symptoms of nerve dysfunction at 24 hours post-surgery, with nearly all resolved in six months.

Martinez, J., et al. Femoroacetabular Impingement: Prospective Study of Rate and Factors Related for Nerve Injury after Hip Arthroscopy. **J Orthop**. 2019, Sept-Oct; 16(5): 350-353.

CORTICOSTEROID INJECTIONS AFTER ROTATOR CUFF REPAIR

After rotator cuff repair, most patients have pain and pain related difficulty during rehabilitation. While one treatment option is an intra- articular triamcinolone injection, some have expressed concern that corticosteroid injections may hamper tissue growth, particularly after surgery. This study was designed to better understand the efficacy and safety of intra-articular corticosteroid injections after arthroscopic rotator cuff repair.

Subjects were patients undergoing arthroscopic rotator cuff repair, with a standardized postoperative rehabilitation protocol. Eight weeks after surgery, patients were randomized to receive a glenohumeral joint injection with either a placebo (normal saline) or a corticosteroid (one ml of triamcinolone 40 mg/mL, combined with 1.5 mL of 2% lidocaine). Before surgery the clinical status of each patient was assessed, including measures of pain, ROM, and function, measured by the American Shoulder and Elbow Surgeons (ASES) and the Constant at three, six and 12 months.

At one-month post injection (three months post-surgery), the treatment group had significantly lower pain scores (p=0.02) and improved ASES scores (p=0.02) as compared to the control group. In addition, at three months, the treatment group was superior to the control group in measures of forward flexion (p=0.05), external rotation at the side (p=0.04) and external rotation at abduction (p=0.05). No such differences were noted at six months. At 12 months, the rate of re-tear, as determined by MRI, did not differ between groups.

Conclusion: This study of patients undergoing repair of a rotator cuff tear found that intra-articular corticosteroid injections after surgery can help improve short-term pain and function, without increasing the risk of damage to the rotator cuff.

Kim, Y., et al. Is It Safe to Inject Corticosteroids into the Glenohumeral Joint after Arthroscopic Rotator Cuff Repair? **Am J Sports Med.** 2019, June; 47 (11): 1694-1700.

ONE-STAGE CARTILAGE REPAIR OF THE KNEE

For patients with cartilage damage of the knee, there are limited treatment options to restore the knee with durable tissue. This study investigated the long-term clinical outcomes of a one-stage, cell-based cartilage repair of the knee with a hyaluronic acid-based scaffold embedded with bone marrow aspirate concentrate (HA-BMAC).

Patients with a full-thickness chondral injury of the knee (>1cm^2) who were treated with HA-BMAC between April of 2007 and January of 2012 were followed prospectively for a median of eight years. All had received a scaffold composed of an HA-based material (Hyalofast) size matched to the cartilage lesion. The activated BMAC clot was implanted into the cartilage defect, with the scaffold secured by polydioxanone suture and/ or fibrin glue. Clinical outcomes were examined with the patient-reported scoring instruments the Tegner Activity Scale, the International Knee Documentation Committee (IKDC) subjective score, a visual analog scale and the Knee Injury and Osteoarthritis Outcome Score (KOOS).

Subjects were 23 patients with a mean age of 48.5 years. The median cartilage lesion size was 6.5 cm^2. The median Tegner score before surgery was two, improving to four at a final follow-up (p<0.001). The median visual analog pain score at final follow-up was 0.3, significantly improved from a median score five at baseline (p<0.001). No significant difference was found in outcome between those older than, and those younger than, 45 years of age.

Conclusion: This study of 25 patients undergoing a single stage repair of a knee cartilage defect found a good to excellent outcome at eight-year follow-up.

Gobbi, A., et al. Long-Term Clinical Outcomes of One Stage Cartilage Repair in the Knee with Hyaluronic Acid-Based Scaffold, Embedded with Mesenchymal Stem Cells Sourced from Bone Marrow Aspirate Concentrate. **Am J Sport Med**. 2019, July; 47(7): 1621-1628.

HEAD INJURIES IN MALE SOCCER AFTER A RULE CHANGE

A unique feature of football (soccer) is the intentional use of the head to strike the ball. Based on an analysis of head injuries during World Cup play, the International Football Association Board altered the rules in 2006 such that direct and deliberate elbows to the head were punished with a red card (eviction from the match). This study assessed the effects of this rule change on the incidence of head injuries.

This retrospective analysis was made of head injuries recorded in the first German Male Bundesliga during the seasons 2000/01–2012/13. Injuries were recorded and published in the German football magazine *Kicker Sportmagazin* which is published twice weekly with one journalist being responsible for one club and having daily contact with the club. The severity of injuries was determined by the time lost from practice or competition.

During the observation periods, 356 head injuries were recorded, with an incidence rate of 2.22 per 1000 match hours. Compared to the rate of head injuries before the rule change, the rate of head injuries was reduced by 29%, including a 29% reduction in concussions and a 16% reduction in facial fractures.

Conclusion: This study of German male soccer players found that, after a rule change calling for the ejection of players who inflicted direct and deliberate elbows to the opponent's head, there was a 29% reduction in head injuries during match play.

Beaudouin, F., et al. Head Injuries in Professional Male Football (Soccer) Over 13 Years: 29% Lower Incidence Rates after a Rule Change (Red Card). **Br J Sports Med**. 2019, August; 53:948–952.

REPETITVE HEAD IMPACTS IN SOCCER

Repetitive head impacts (RHI) are defined as mild impacts that do not result in a known or diagnosed concussion. While the long-term effects of RHIs have been studied, the short- to medium-term effects have been less often studied and less well understood. This study was designed to determine the effect of RHI on clinical assessments across one season.

Subjects were collegiate football (FB) and women soccer (WSOC) players. All were tested two weeks before the start of the competitive season, and within one week after the end of the season. The ImPACT and several other functional and cognitive evaluations were completed. Exposure to RHI was quantified using the head impact telemetry system for FB players and the Smart Impact Monitor for WSOC players. Forces were measured by an accelerometer, inserted into individual helmets. Data were transmitted wirelessly to determine real-time head impact kinematics. Data from the accelerometers were compared with changes in cognitive and functional scores.

In the WSOC cohort, associations were found between increased RHI exposure and impaired eye movements and saccades and poorer visual memory (p=0.002) and tandem gait (TG) (p=0.029). In the FB cohort, greater RHI was associated with poorer performance on the King- Devick (KD) measurement of speed for rapid number naming and reading (p=0.013). The number of impacts greater than 98 g made significant and unique contributions to the reduction of scores on visual memory, TG and KD. Overall, however, RHIs did not produce clinically meaningful changes in scores on a concussion assessment battery.

Conclusion: This study of high-level soccer players does not provide evidence that repetitive head impacts result in clinically meaningful changes in neurologic health.

Caccese, J., et al. Effects of Repetitive Head Impacts on a Concussion Assessment Battery. **Med Sci Sports Exerc.** 2019, July; 51(7): 1355-1361.

SOCCER HEADGEAR AND CONCUSSION IN ADOLESCENCE

Concussion injuries comprise eight to 13 percent of all sports injuries sustained in high school. This study was designed to determine whether players wearing headgear have a lower number of concussions than do those not wearing headgear.

High school soccer teams were invited, with participant schools randomized to a headgear (HG) group or a no-headgear (NoHG) group. Injuries and exposures were recorded for each player over a single season. Those in the HG group were allowed to individually choose a headgear model from those meeting the ASTM testing standards. Licensed trainers working with these teams were responsible for in-season data collection and determining the onset mechanism injury characteristics and diagnosis of all sports-related injuries.

Data were collected for 2,766 participants. Over the season, 130 sports-related concussions were recorded. The rate of sports-related concussions did not differ significantly between the HG group (4.4%) and the NoHG group (4.1%). In addition, no significant difference between the two groups was noted in the number of days with concussion symptoms.

Conclusion: This study of adolescent soccer players did not find that headgear can reduce the risk of concussion.

McGuine, T., et al. Does Soccer Headgear Reduce the Incidence of Sport Related Concussion? A Cluster, Randomized, Controlled Trial of Adolescent Athletes. **Br J Sports Med**. 2019; 0: 1-6.

ANTERIOR CRUCIATE LIGAMENT AND MENISCUS REPAIRS AND RISK OF KNEE REPLACEMENT

Previous studies have suggested that injuries to the anterior cruciate ligament (ACL) as well as injuries to the meniscus, increase the risk of developing osteoarthritis (OA) of the knee. This study was designed to quantify the risk of undergoing a total knee replacement (TKR) among patients with a history of ACL repair or meniscal injury repair.

Within the United Kingdom Clinical Practice Research Datalink (CPRD), ACL, meniscal injury and joint replacement are coded and recorded. A matched case-control study was undertaken of all primary TKRs in the United Kingdom, recorded in the CPRD, performed between 1991 and 2011. Each primary TKR was matched with two controls who had no history of ACL repair.

Subjects included 49,723 individuals with TKR and 104,353 controls. Compared to those without a history of ACL repair, the adjusted risk of undergoing a TKR within 20 years was significantly greater among those with an ACL repair (odds ratio (OR) 6.96). Further, compared to those without a history of meniscal injury repair, the adjusted risk of TKR within 20 years was significantly greater among those with a meniscal repair (OR 15.24). The adjusted OR for TKR in individuals with both a recorded ACL repair and meniscal injury repair compared with those with only an ACL repair was 4.19.

Conclusion: This matched case–control study of all TKRs performed in the UK between 1990 and 2011 found that those with a history of ACL injury have a sevenfold increased odds of a subsequent TKR.

Khan, T., et al. ACL and Meniscal Injuries Increase the Risk of Primary Total Knee Replacement for Osteoarthritis: A Matched Case–Control Study Using the Clinical Practice Research Datalink (CPRD). **Br J Sports Med**. 2019, August; 53 (15):965-968.

PRIOR ACL SURGERY AND OUTCOME OF KNEE REPLACEMENT

Studies have suggested that anterior cruciate ligament (ACL) injury and surgery may accelerate osteoarthritis (OA), particularly when associated with meniscal damage. Patients with a history of ACL repair undergo total knee arthroplasty (TKA) at a higher rate than do patients without such a history. Therefore, this study compared the clinical outcomes of patients with a TKA with a history of ACL repair to those without previous ACL repair.

A systematic review of the medical literature was completed of studies published through November 2018. Eligible studies compared outcomes of patients undergoing TKA with and without a history of ACL repair. The review identified five studies including 318 patients with a history

of ACL repair and 455 matched controls. The mean time between the ACL repair and TKA was 21.8 years. Postoperative subjective outcome scores, as measured by the Knee Society Score, did not differ significantly between the two groups. In addition, no significant difference was noted between groups in pain and function as measured by the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scores. The risk of repeat surgery was slightly higher for the ACL group.

Conclusion: This literature review of patients with total knee replacement found that those with a history of ACL repair had outcomes similar to those without such a history.

Chaudhry, Z., et al. Does Prior Anterior Cruciate Ligament Reconstruction affect Outcomes of Subsequent Total Knee Arthroplasty? A Systematic Review. **Orthop J Sports Med.** 2019, July; 7 (7).

SLEEP DISTURBANCE AND CHRONIC PAIN

Chronic pain is often associated with a poor quality of life, negative affect and functional impairment. Many patients with chronic pain also report a sleep disturbance. This study examined direct and indirect pathways by which sleep disturbance may affect chronic pain intensity and functional status.

Subjects were 87 adults with chronic low back pain (CLBP) of at least three months' duration, without daily opioid analgesics. Sleep disturbance was assessed using the PROMIS sleep disturbance-short form 8a, assessing sleep quality, sleep depth and restoration associated with sleep. Subjects were also assessed using chronic pain intensity measures (the McGill Pain Questionnaire (MPQ)-Short Form, including a visual analogue scale (VAS) of pain intensity, and assessments of sensory (MPQ-sensory) and affective (MPQ-affective) quality of pain, psychosocial measures, and functional measures. Assessments were made of the direct effects of sleep disturbance, as well as the indirect effects of sleep disturbance, on the measures of pain. Worse sleep disturbance scores were associated with greater depression, anxiety and catastrophizing, lower global positive affect, and worse functioning. The effect of sleep disturbance on the measures of CLBP were both direct (independent of other measures), as well as indirect, mediated by elevated emotional distress, lower positive affect and greater catastrophizing.

Conclusion: This study of patients with chronic low back pain found that greater sleep disturbance is associated with greater pain intensity and pain related symptoms, both through sleep disturbance itself and through the effect of sleep disturbance on psychosocial factors.

Burgess, H., et al. Associations between Sleep Disturbance and Chronic Pain Intensity and Function: A Test of Direct and Indirect Pathways. **Clin J Pain.** 2019, March; 35(7): 569-576.

FORCES OF ACUTE VS CHRONIC BAREFOOT RUNNING

Previous studies have shown that changing from shod to barefoot running can induce several acute changes in running biomechanics. This study assessed the biomechanics of those who have habituated to barefoot running.

Healthy, physically active adults, between 18 and 35 years of age, were recruited. None had experience with barefoot running. The subjects were randomized to a barefoot intervention group, a shod intervention group or passive control group. The subjects participated in seven sessions, separated by one week. For running habituation, the subjects ran in the intervention footwear (barefoot or shod) for 15 minutes on the treadmill at 70% of their VO2 max. The shod group wore a commercially available cushioned running shoe. Before and after the intervention, a running gait analysis was conducted on an instrument treadmill. The primary outcome measure was the foot strike index, calculated as the distance from the heel to the center of pressure at ground contact, divided by the foot/ shoe length. Secondary outcome variables were the angle of the ankle, foot and knee at foot strike.

Of the sixty participants, those in the barefoot group experienced improvement in the foot strike index and ankle, foot, and knee angles at ground contact ($p<0.001$), as well as vertical average loading rate ($p=0.003$), peak force ($p<0.001$) and acute reduction in loading rates. After habituation, however, the force and average loading rates increased towards baseline.

Conclusion: This study found that, while moving from shod to barefoot running will initially decrease forces, after habituation to this running condition, the forces will again increase.

Hollander, K., et al. Adaptation of Running Biomechanics to Repeated Barefoot Running: A Randomized Controlled Study. **Am J Sport Med.** 2019, July; 47(8): 1975-1983.

CAFFEINE AND EXERCISE INDUCED HYPOGLYCEMIA

Caffeine is an ergogenic substance used by athletes during sports practice.Despite its widespread use, mechanisms of action of caffeine remain incompletely understood. This study reviewed the effects of caffeine on blood sugar levels among runners.

Subjects were competitive long-distance runners, ages 18 to 40 years, with a body mass index averaging 22.3 kg/m². The athletes were randomized to receive a placebo or a tablet containing caffeine (6mg/kg) ingested 30 minutes prior to each stress test. Before and after each maximum stress test, heart rate (HR), blood pressure (BP), and subjective perception of effort (SPE), and labs (glucose, lactate [LAC], and triglyceride [TG]) were assessed. At the following appointment, the subjects were then tested after ingesting the alternate capsule.

Glycemic levels were significantly higher in the caffeine group than in the placebo group beginning at 11 minutes and continuing through the end of the thirty-minute protocol ($p<0.05$). In addition, triglyceride levels were higher in the caffeine group than in the placebo group before and after the stress test ($p<0.05$). Lactate levels however were lower after exercise in the caffeine group than in the placebo group ($p<0.05$).

Conclusion: This study of trained runners found that a supplemental dose of caffeine can increase glucose and triglyceride availability and reduce blood lactate concentration in athletes participating in a maximal stress test.

Weber, V., et al. Caffeine Prevents Exercise Induced Hypoglycemia in Trained Runners. **J Human Sport Exerc.** 2019; 14 (2): 335-347.

SELF-REPORTED HEALTH AMONG OLDER CHINESE VERSUS AMERICANS

Many factors have been shown to influence self-rated health in the older population. However, most studies have been conducted in one country. This study compared the

self-rated health of older adults in China with those of their American counterparts.

Data were retrieved from the 2014 Health and Retirement Study (HRS) and the China Health and Retirement Longitudinal Study (CHARLS), conducted from 2014 to 2015. Data were analyzed for 8,905 older adults in the USA and 4,442 in China. Information was obtained concerning self-rated health, sociodemographics and family structure, functional limitations, cognition, mental health and health-related behaviors. The responses were reviewed by age category, including those 65 to 74 years, 75 to 84 years and eighty-five years of age and older.

Older Chinese subjects reported more instrumental activities of daily living limitations relative to older Americans; however, the difference in ADLs limitations was small. Older Chinese participants further reported a lower proportion of chronic conditions than did older Americans. In addition, older Chinese had poorer mental health and worse cognition, including self-reported memory and total recall scores than did older Americans. Approximately 78% of older Chinese reported fair or poor health status, while 74% of older Americans reported excellent, very good, or good health status. An ordered logistic regression model revealed that the odds of having better versus poorer health was almost five times greater in American older adults than in those in China (Odds Ratio 4.88).

Conclusion: This nationally representative sample of older populations in China and the United States found that, relative to their American counterparts, Chinese elders were much more likely to report bad health.

OSTEOARTHRITIS AND THE RISK OF CARDIOVASCULAR DISEASE

Nonsteroidal anti-inflammatory drugs (NSAIDs) are associated with cardiovascular side effects. As NSAIDs are commonly used in the treatment of osteoarthritis (OA), this study evaluated the mediating role of NSAID use in the relationship between OA and cardiovascular disease (CVD).

This longitudinal study analyzed a cohort of 720,055 British Columbia adults registered in the national health database from April 1991 to December 2013. Data were available for health information including health-related consultations, hospital admissions, diagnoses and deaths. In addition, community dispensed prescriptions were monitored. A group of non-OA individuals was compared to those with OA. The primary outcome measure was the composite of CVD events, with the secondary outcomes including ischemic heart disease, congestive heart failure and stroke.

Data were analyzed for 7,743 patients with OA, and 23,229 non-OA controls. The mean age of study participants was 64.5 years. At a mean follow-up of 9.7 years, the crude incidence rate of CVD per 1000 person years was 38.07 among patients with OA and 29.05 among non-OA controls. Adjusting for risk factors, the risk of CVD was significantly higher among those with OA as compared to controls (Hazard Ratio 1.23). Among the secondary risk factors, the risk was highest for CHF (Hazard Ratio 1.42). Approximately 41% of the total effect of OA on the increased risk of CVD was mediated through NSAID use. For the secondary outcomes, NSAID use mediated 23%, 56%, and 64% of the risk for congestive heart disease, ischemic heart disease, and stroke, respectively.

Conclusion: This study demonstrates that patients with osteoarthritis have an increased risk of cardiovascular disease, with much of this risk related to the use of nonsteroidal anti-inflammatory drugs.

Atiquzzaman, M et al. Role of Nonsteroidal Anti-Inflammatory Drugs (NSAIDs) in the Association between Osteoarthritis and Cardiovascular Disease: A Longitudinal Study. **Arthritis Rheumatol.** DOI: 10. 1002/ ART.41027

ELECTRICAL STIMULATION FOLLOWING PERIPHERAL NERVE INJURY

Previous studies of nerve injuries have shown that electrical stimulation can promote axon elongation across a surgical repair site. This animal study assessed the efficacy of repeated applications of a brief electrical stimulation on the recovery of an injured peripheral nerve.

In a well-established peripheral nerve injury model, a transection and surgical repair of a murine sciatic nerve was completed. Electrodes and recording hardware were implanted near the repair site. In the repeat condition (R), electrical stimulation was applied for one hour at 20 Hz on the day of the surgery and every third day for two weeks. In the controls, the injured mice were either untreated (U) or treated with a single ES (S). Stimulus evoked EMG data were then collected for up to 12 weeks post-injury. The animals were then euthanized for histologic evaluation of the nerves.

The amplitudes of the muscle responses increased progressively over time, with the rate of progression increased significantly in animals treated once with ES. The H-reflex recovered in all groups but reached more than twice the baseline level in the R group. In the anatomical study, both excitatory and inhibitory synaptic contacts in the injured cell bodies were sustained in the R group, but not in the others.

Conclusion: This animal study of a peripheral nerve injury suggests that repeated electrical stimulation does not enhance the rate of restoration of functional muscle denervation, and, in fact, may result in a retention of exaggerated reflexes.

Park, S., et al. Effects of Repeated 20 Hz Electrical Stimulation on Functional Recovery following Peripheral Nerve Injury. **Neurorehab Neural Repair**. 2019, September; 39 (9): 775-784.

CORTICOSTEROID INJECTION FOR PLANTAR HEEL PAIN

Corticosteroid injections are often used to treat plantar heel pain. This literature review was designed to better understand the data surrounding this intervention.

A literature review was completed of randomized trials which included a corticosteroid injection for plantar heel pain and at least one outcome measure of pain. From this review, 47 studies were chosen for qualitative analysis and 39 for meta-analysis.

The combined sample size for the final analysis was 2,989. The outcome measures were determined for a time-points categorized as short- term (zero to six weeks), medium- term (seven to 12 weeks) and long- term (13 to 52 weeks). For reducing pain in the short-term, corticosteroid injections were more effective than autologous blood and foot orthoses. In the long-term, corticosteroid injections were less effective than dry needling or platelet rich plasma injection. For physical function, corticosteroid injections were more effective than physical therapy in improving function.

Conclusion: This literature review and meta-analysis found that corticosteroid injections were more effective for short-term pain relief

than autologous blood injections or foot orthoses, but in the longer term, less effective than dry needling and platelet rich plasma.

Whittaker, G., et al. Corticosteroid Injection for Plantar Heel Pain: A Systematic Review and Meta-Analysis. **BMC Musculoskelet Disord**, 2019; 20: 378.

IONTOPHORESIS FOR LATERAL EPICONDYLITIS

Lateral epicondylitis is a prevalent disorder, thought to be caused by repetitive strain of the tendon of the extensor carpi radialis brevis. This study evaluated the effectiveness of iontophoresis, as compared with the galvanic current therapeutic approach.

This double-blind, randomized, clinical trial included 24 adult patients clinically diagnosed with lateral epicondylitis, all of whom had not received any treatment for the prior four weeks. Baseline data included a pain assessment, using a 10-point visual analog scale, muscle strength and hand grip strength, as well as a functional assessment, using the patient rated Tennis Elbow Evaluation Scale (TEES). Intervention occurred at 5 mA for 15 minutes, three times a week for four weeks. The prescription solution included 3 mL of 4 mg per mL of dexamethasone and four percent lidocaine gel applied at the negatively charged electrode. The positively charged electrode received the base gel solution. The galvanic current group received the same protocol, with a base gel solution used on both electrodes. Changes in pain scores were compared between the groups.

Significant pain reduction at rest was noted in both groups. At the end of the study, the iontophoresis group showed significantly lower pain levels at rest than did the galvanic current group (p=0.002). Pain on exertion decreased more in the iontophoresis group than in the galvanic current group (p= 0.000). No significant difference in muscle strength was noted between groups.

Conclusion: This study of patients with lateral epicondylitis found that iontophoresis was superior to galvanic current stimulation for reducing pain, both at rest and with exertion.

Luz, D., et al. Iontophoresis and Lateral Epicondylitis: A Randomized, Double-Blind, Clinical Trial. **J Should Elbow Surg.** 2019, September; 28 (9): 1743-1749.

TENS FOR ANKLE STRETCH IN THE ICU

Patients in the intensive care unit (ICU) are at risk for a number of complications, including joint contracture. As previous studies have shown that transcutaneous electrical nerve stimulation (TENS) can improve range of motion, spasticity and contracture in joints, this study investigated the effects of adding TENS to passive stretch.

This double-blind, controlled, clinical trial included patients with at least one week in the ICU. All were assessed for passive ankle range of motion, including plantarflexion and dorsiflexion. The subjects were randomized to receive standard care (S) or standard care with TENS(S+T). Standard care included stretching in dorsiflexion, applied to the patient's ankle with the knee in full extension, with five, two-minute sessions of stretch and a one-minute rest between. For the S+T group, before stretching TENS was applied for 30 minutes at a frequency 100 Hz, a duration of 0.2 ms and an intensity of 15 mA. The sessions were completed three times per week for two weeks. A therapist held blind to the treatment group measured range of motion at baseline and at follow- up.

Comparing baseline to final follow-up the range of motion was found to have improved in both groups, with significantly greater improvement noted in the S+T group than in the S group, for both plantarflexion (p= 0.001) and dorsiflexion (p=0.001).

Conclusion: This study of patients in the intensive care unit found that, compared to passive stretching alone, ankle range of motion can be enhanced by preceding passive stretching with TENS unit stimulation.

Shamsi, M., et al. The Effect of Adding TENS to Stretch on Improvement of Ankle Range of Motion in Inactive Patients in Intensive Care Units: A Pilot Trial. **BMC Sports Sci Med Rehab.** 2019; 11: 15.

PERONEAL TENDON SHEATH CORTICOSTEROID INJECTION

The treatment of symptomatic peroneal tendinopathy and tears typically begins with conservative intervention. This study assessed the efficacy of ultrasound-guided peroneal tendon sheath corticosteroid injections for the treatment of chronic tendinopathy or tears.

This retrospective study reviewed consecutive patients who had undergone ultrasound-guided peroneal tendon sheath corticosteroid injections for pain due to peroneal tendinopathy, tears or subluxation between the years 2012 and 2018. During that time, 96 patients received 109 injections. The medical records were reviewed for medical workup surrounding the procedure, treatment outcome, and socioeconomic and demographic data.

Of the 86 patients followed after the injection, 44% reported pain relief lasting only one week, while 36.8% reported greater than 12 weeks of pain relief. The duration of symptoms before the injection was associated with the duration of pain after the injection (p=0.036). Twenty-four of 96 (25%) patients went on to have surgery involving their peroneal tendons following injection. None were found to have a tear or tendinopathy compared with preoperative MRI. One was found to have sural nerve irritation.

Conclusion: This study of patients with chronic peroneal pain found that of those injected, 44% had very short pain relief while 37% reported pain relief greater than three months.

Fran, B et al. Clinical Outcomes and Complications of Peroneal Tendon Sheath Ultrasound-Guided Corticosteroid Injection. **Foot Ankle Int**. 2019; https://doi.org/10.1177%2F1071100719847629.

TRANSCRANIAL DIRECT CURRENT STIMULATION IN WIDESPREAD PAIN

Fibromyalgia (FM) encompasses systems of central sensitization syndrome. Medications have been limited in their ability to adequately treat many of these patients. As transcranial direct current stimulation (tDCS) has been found to be effective in treating other pain conditions, this study assessed the efficacy of tDCS as a treatment for FM.

This study included 20 adult females, ages 18 to 65 years, all diagnosed with FM. The patients were randomly assigned to an active tDCS (a-tDCS) group or a placebo tDCS (p-tDCS) group. For both groups, the anode electrode was placed over the left dorsolateral prefrontal cortex (DLPFC) and the cathode over the right DLPFC. After training, the a-tDCS was self-delivered at home for 30 minutes per day at 2 mA, with 60 sessions completed over 12 weeks. The primary outcome variable was the change in pain, as measured across the 12 weeks of treatment. Baseline blood samples were collected and after the end of treatment to

(Continued from page 2)

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determine blood derived neurotrophic factor (BDNF) levels.

By the fourth week of treatment, visual analogue scale pain scores (VAS-P) improved by 45.7% in the a-tDCS group and 27.7% in the p-tDCS group (p=0.01). At 12 weeks, VAS-P scores were reduced by 62.06% in the a- tDCS group and 24.92% in the p-tDCS group (p<0.001). Those with greater BDNF levels at baseline had greater improvement in VAS-P scores with treatment (p=0.01).

Conclusion: This study of patients diagnosed with fibromyalgia found that transcranial direct current stimulation, applied over the dorsolateral prefrontal cortex, can significantly improve pain and disability.

Brietzke, A., et al. Large Treatment Effect with Extended, Home-Based Transcranial Direct Current Stimulation over Dorsolateral Prefrontal Cortex and Fibromyalgia: A Proof of Concept, Sham, Randomized, Clinical Study. **J Pain**. 2019. https://doi.org/10.1016/j.jpain.2019.06.013

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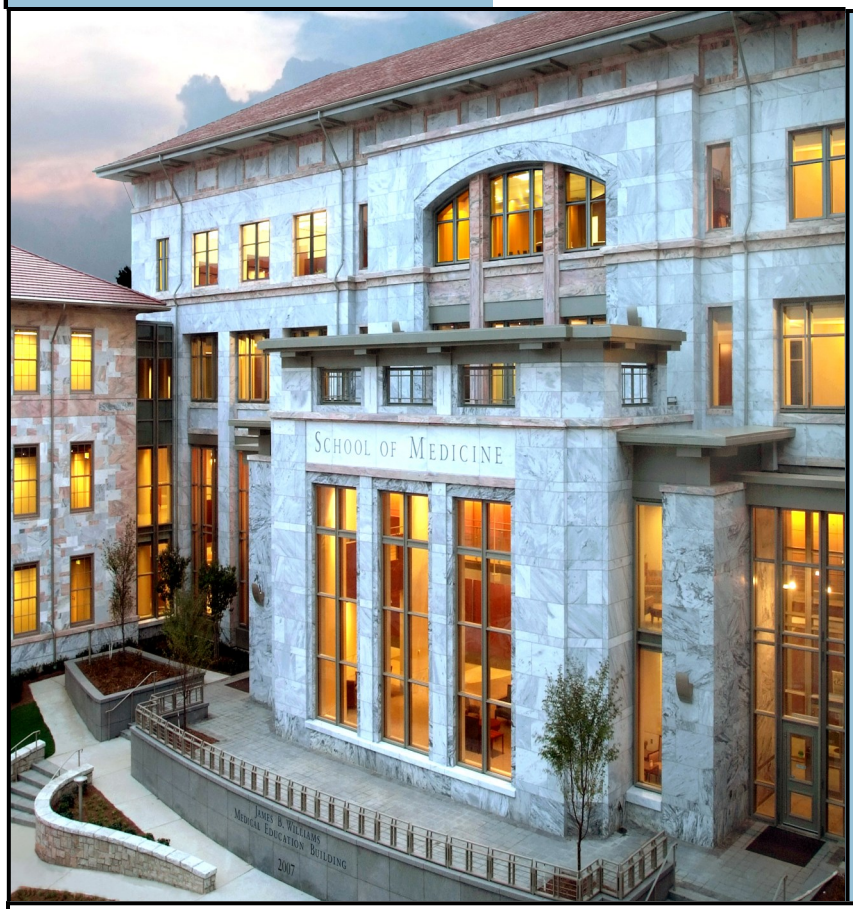

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