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ANTI-INFLAMMATORY TREATMENT FOR IMPROVED OLFACTION AFTER HEAD INJURY

Head trauma is one of the major causes of olfactory dysfunction. Previous reports have demonstrated that the rate of recovery from olfactory dysfunction after head trauma is only 10-38%. As prior studies have suggested that olfactory dysfunction might be amenable to treatment with anti-inflammatory medications, this animal study explored the importance of the timing of such an intervention.

Using adult mice, a surgical transection of the olfactory nerve was performed. For behavioral and electrophysiological studies, the transection was performed bilaterally, and for histologic studies only the left nerve was transected, leaving the right for an internal control. Dexamethasone sodium phosphate was administered as an anti-inflammatory drug for five consecutive days, starting at days seven, 14, 28 and 42 after the surgery. For control animals, only the vehicle was injected. After surgery, the animals were assessed for olfactory function. On days five through 42 after the steroid treatment, the olfactory bulbs were removed for histological assessment.

The histologic studies revealed that the olfactory nerves degenerated until day 14, with evidence of regeneration at day 42. During olfactory testing, among the animals in the early (seven-day) interval series, 67% of the steroid group achieved 100% success on the olfactory function test, compared to only 11% of the control mice. Among the 14, 28 and 42-day interval series, the level of nerve recovery in the steroid treated animals did not differ significantly from that of the controls.

Conclusion: This animal study demonstrated that anti-inflammatory treatment was effective in preserving

olfactory function after a surgical lesion, but only when started within seven days.

Kobayashi, M., et al. A Time Limit for Initiating Anti-Inflammatory Treatment for Improved Olfactory Function after Head Injury. *J Neurotrauma*. 2018, February 15; 35 (4): 652-660.

CAFFEINE AND MUSCLE TORQUE COMPLEXITY

Neuromuscular fatigue during exercise decreases muscle torque output, a measure of the complexity of musculoskeletal physiology. This study evaluated the effect of pre-exercise caffeine ingestion on the rate of decrease in torque during isometric knee extension, and explored the contributions of peripherally and centrally related mechanisms.

This randomized, double-blind, controlled study involved 11 healthy participants who were asked to perform repeated isometric knee extensions with maximum voluntary contraction (MVC) until task failure. Failure was defined as a reduction to 50% of the baseline MVC. Torque and EMG output during contraction were measured continuously, beginning before and continuing until one hour after caffeine or placebo ingestion. Complexity and fractal scaling of torque were quantified using approximate entropy (ApEn) and the detrended fluctuation analysis (DFA) α scaling exponent. Global, central, and peripheral fatigue were quantified using MVCs with femoral nerve stimulation.

Caffeine ingestion increased the time to task failure (endurance) by 30% ($p=0.019$). Both conditions resulted in significant reductions in potentiated doublet torque ($p<0.001$), indicating the presence of peripheral fatigue. Voluntary activation significantly declined in

both conditions indicating the presence of central fatigue. At the time point in the caffeine condition equivalent to task failure in the placebo condition (isotime), MVC torque was significantly higher in the caffeine group, indicating that subjects still had a significant reserve of maximal torque. Furthermore, the rate of decrease in MVC torque was significantly attenuated in the caffeine condition. The rate of decrease in torque complexity was significantly lower in the caffeine group than in the placebo group ($p<0.05$).

Conclusion: This study found that caffeine ingestion slowed the fatigue-induced loss of torque during isometric knee extension through predominantly central mechanisms.

Pethick, J., et al. Caffeine Ingestion Attenuates Fatigue-Induced Loss of Muscle Torque Complexity. *Med Sci Sports Exerc*. 2018, Feb; 50(2): 236-245.

DETERMINANTS OF PATIENT SATISFACTION IN AN OUTPATIENT SPINE CLINIC

As healthcare increasingly shifts towards a consumer model of care, patient satisfaction scores have become an important measure of healthcare quality. This study was designed to identify factors related to higher patient satisfaction in an outpatient spine clinic.

Subjects were 200 patients of an outpatient spine center who were contacted by phone within three weeks of a new patient encounter. All answered a 25-question satisfaction survey using a one-to-ten scale. A linear regression analysis was performed to determine whether these factors were related to provider satisfaction, overall clinical satisfaction, and quality of care.

Satisfaction with the provider was significantly related to appointment scheduling, parking, office staff teamwork, wait time, radiology,

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provider interactions and behavior, and treatment and follow-up communication ($p < 0.0001$). These were also true of the patients' perceptions of overall quality of care. A multivariate analysis revealed that explanation of the medical condition ($p = 0.002$) and provider empathy ($p = 0.04$) were significantly associated with provider satisfaction scores, while the amount of time spent with the provider was not. For 25% of the patients, some pre-provider aspect of the visit was rated as the most important element in their visit satisfaction.

Conclusion: This study of patients seen in an outpatient spine center found that satisfaction with their provider was significantly linked to many pre-visit services and team interactions.

Bible, J., et al. Are Low Patient Satisfaction Scores Always Due to the Provider?: Determinants of Patient Satisfaction Scores During Spine Clinic Visits. *Spine*. 2018, January. 43; (1): 58-64.

GENDER DIFFERENCES IN PLATELET RICH PLASMA

The benefits of platelet rich plasma (PRP) are thought to derive from growth factors released by platelets, as well as anti-inflammatory effects that help tissue heal. This study was designed to determine whether the composition of PRP differs by age and by gender.

Subjects were 39, healthy patients with a body mass index of less than 25 kg/m², including a young group, 18

to 30 years of age, and an older group, 45 to 60 years of age. All underwent blood draws, with PRP samples isolated. From the samples, a cytokine and growth factor composition analysis was completed.

Platelet counts did not differ by age or gender. Differences between female and male patients were observed for proinflammatory cytokines, including IL-1 β ($p = 0.008$) and TNF- α ($p = 0.048$), for the anti-inflammatory IL-1 receptor antagonist protein (IRAP) ($p = 0.001$) and for growth factors, including platelet-derived growth factor (PDGF-BB) ($p = 0.01$) and TGF- β 1 ($p = 0.002$). No significant differences were noted between the young and older age groups for any of these cytokines or growth factors except IGF-1 (97.6 versus 53.8 ng/mL, respectively; $p = 0.001$). The percent difference of the biomarkers that showed significant differences between sexes were IRAP (40.3%), VEGF (33.8%), IL-1 β (30.6%), FGF-basic (24.7%), PDGF-BB (24.3%), TNF- α (23.1%) and TGF- β 1 (21.9%).

Conclusion: This study of healthy patients found that males have higher cytokine and growth factor levels in their platelet rich plasma than do females.

Xiong, G., et al. Men and Women Differ in the Biochemical Composition of Platelet-Rich Plasma. *Am J Sports Med*. 2018, February; 46 (2):409-419.

MORTALITY AMONG FORMER PROFESSIONAL FOOTBALL PLAYERS

In 1994, the National Institute for Occupational Safety and Health found that professional football players who played between 1959 and 1988 had a lower mortality rate compared to the reference population. There was however a great variability in mortality rates based on body habitus and position. This study was designed to determine the most common causes of death among a recent cohort of former National Football League (NFL) players.

Subjects were 9778 NFL players with at least one year in the NFL, playing between 1986 and 2012. Player records from the NFL Player Information Office were matched with the National Death Index to determine vital status, date of death, and cause of death. Player positions were categorized as specialists (quarterbacks, kickers, punters), speed (wide receivers, defensive backs, tight ends, running backs,

linebackers), and power (linemen).

Of the 9778 players in the study, 227 were deceased at a median age of 38 years. Causes of death were heart disease (21%), violence (17%) and transportation injuries (15%). Former NFL players had a significantly lower standardized mortality rate (SMR) as compared to the US general population (SMR 0.46; $p < 0.01$). This was true across all categories of race, player positions, and years in the NFL. Players with a body mass index of greater than 30 kg/m² had higher mortality rates than players with a lesser body mass index.

Conclusion: Despite media reports to the contrary, NFL players have a significantly reduced mortality as compared to the general population.

Lincoln, A., et al. Risk and Causes of Death among Former National Football League Players (1986–2012). *Med Sci Sports Exerc*. 2018; 50(3): 486–493.

SCLEROTHERAPY AND PROLOTHERAPY FOR CHRONIC ACHILLES TENDINOPATHY

Of the treatments for chronic Achilles tendinopathy, heavy tendon loading seems most effective. Among alternative treatments, prolotherapy and sclerotherapy have been investigated, though the utility of these remains unclear. This literature search was designed to better understand the effects of these two interventions for the treatment of Achilles tendinopathy.

This literature review included athletes and non-athletes with chronic, painful Achilles tendinopathy, as well as animal studies. From this review, 18 articles were available for qualitative synthesis, with six included in the meta-analysis.

All four of the randomized, controlled trials demonstrated positive effects of the treatment. In addition, eight of the nine nonrandomized studies investigating sclerotherapy or prolotherapy in humans confirmed these favorable outcomes. The meta-analysis found a significant improvement in pain with activity as compared with placebo ($p < 0.001$).

Conclusion: This literature review and meta-analysis suggests that sclerotherapy and prolotherapy may be effective and safe as a treatment for chronic Achilles tendinopathy.

Morath, O., et al. Effect of Sclerotherapy and Prolotherapy on Chronic, Painful Achilles Tendinopathy: A Systematic Review

Including Meta-analysis. **Scan J Med Science Sports.** 2018, January; 28 (1):88-95.

TIMING OF VENOUS THROMBOEMBOLIC EVENTS AFTER SPINE SURGERY

Patients undergoing major surgery, including spine surgery, are at increased risk for venous thromboembolic events. The timing of venous thromboembolisms (VTEs) and the effect of chemoprophylaxis after spine surgery remain unclear. This prospective study examined the occurrence and timing of VTEs after spine surgery.

The authors followed all patients who underwent spine surgery at a single institution between 2009 and 2015. For each surgery included in the study, data were collected including, procedure and postoperative management. Chemoprophylaxis was defined as anticoagulation given from one day prior, to three days post surgery. The rates of VTEs and spinal epidural hematomas were compared between those receiving versus those not receiving anticoagulation.

Data were collected for 6,869 procedures. Of these, 4,965 did not receive chemoprophylaxis and 1,904 did. A multivariable analysis determined that age, length of surgery, history of DVT, and fusion surgery were all significantly related to the use of chemoprophylaxis. The median time to initiate chemoprophylaxis was postoperative day 1.46. The rates of epidural hematoma development did not differ significantly between the two groups ($p=0.619$). The cumulative incidence of VTE was significantly related to the postoperative day in both groups ($p<0.0001$ for both comparisons). The cumulative incidence increased in both groups in the first two weeks postoperatively and then plateaued.

Conclusion: This study found that chemical anticoagulation reduces the cumulative incidence of venous thromboembolism, and that the cumulative risk of venous thromboembolism rises until two weeks postoperatively, and then plateaus.

Cloney, M., et al. The Timing of Venous Thromboembolic Events after Spine Surgery: A Single-Center Experience with 6,869 Consecutive Patients. **J Neurosurg Spine.** 2018, January; 28(1): 88-95.

CONCUSSION DURING ULTIMATE FRISBEE

It has been estimated that over four million individuals play Ultimate Frisbee (Ultimate) in the United States. Despite these numbers, relatively little data exist concerning the risk of concussion among the participants. This study was designed to determine the lifetime prevalence and mechanisms of injury among patients who play competitive Ultimate.

An anonymous, web-based survey was created and was distributed to an estimated 3,500 adult Ultimate players. The questionnaire asked the players to self-report whether they had sustained a concussion while playing Ultimate. Concussion was defined in the questionnaire as "Disruption in brain function, caused by a bump or blow to the head or body. It may or may not be accompanied by temporary loss of consciousness, and symptom presentation may include changes in realms of physiology, cognition, emotion and/or sleep."

A total of 790 players responded to the questionnaires. The mean periods of Ultimate involvement were 8.9 years for men and 7.2 years for women. Of the respondents, 26.6% of the men and 24.8% of the women reported at least one concussion during play. Of those, 45.6% of the men and 43.1% of the women reported a history of multiple concussions. After a concussion, 46% of the men and 37.6% of the women reported having returned to play in the same game or practice.

Conclusion: This survey of competitive Ultimate Frisbee players found that approximately one fourth of the participants experience at least one concussion while playing, with over one third of these reporting that they returned to play within the same game.

Lazar, D., et al. Concussion Prevalence in Competitive Ultimate Frisbee Players. **Ortho J Sports Med.** 2018. DOI: 10.1177/2325967118759051

PROPHYLAXIS AFTER TOTAL HIP OR TOTAL KNEE ARTHROPLASTY

Perioperative prophylactic administration of anticoagulants is associated with reduced rates of death and complications associated with venous thromboembolism (VTE). Evidence-based guidelines recommend anticoagulant prophylaxis

for a minimum of 14 days, and suggest that this treatment continue for up to 35 days post-surgery. This study was designed to determine whether aspirin may be an effective option after a short course of a factor Xa inhibitor.

This double-blind, multicenter study included patients undergoing elective total hip arthroplasty (THA) or total knee arthroplasty (TKA). Beginning on the day of surgery, all patients received five days of rivaroxaban at 10 mg daily. The participants were then randomly assigned to receive extended prophylactic treatment with either rivaroxaban or aspirin, 81 mg per day, for nine additional days after TKA or 30 additional days after THA. The primary efficacy outcome was symptomatic VTE or pulmonary embolism (PE) within 90 days of surgery. The primary safety outcome was major or clinically relevant, non-major bleeding.

Symptomatic, proximal deep-vein thrombosis or PE developed in 11 of 1,707 patients (0.64%) in the aspirin group, and in 12 of 1,717 patients (0.70%) in the rivaroxaban group ($p=0.84$). Six PEs occurred in the rivaroxaban group, and five in the aspirin group. Major bleeding occurred in five patients in the rivaroxaban group and eight in the aspirin group ($p=0.42$). A combination of major bleeding and clinically relevant, non-major bleeding occurred in 22 patients (1.29%) in the aspirin group, and in 17 (0.99%) in the rivaroxaban group.

Conclusion: This study of patients undergoing elective total hip or total knee arthroplasty found that, after five days of rivaroxaban, extended prophylaxis with aspirin was as effective as extended treatment with rivaroxaban for the prevention of venous thromboembolism.

Anderson, D., et al. Aspirin or Rivaroxaban for VTE Prophylaxis after Hip or Knee Arthroplasty. **N Engl J Med.** 2018, February 22; 378:699-707.

CONCUSSION HISTORY AND VISUAL-MOTOR FORCE COMPLEXITY

In United States, an estimated 1.6 to 3.8 million sports-related concussions occur each year. Previous studies have shown that a significant number of individuals with a history of concussion exhibit subtle, but persistent, increases in postural sway irregularity. This study was designed to determine whether individuals a history of concussion have impaired

performance in tasks requiring integration of proprioceptive and visual systems.

Subjects were 50 adults with self-reported concussion history who were asymptomatic. All

individuals performed an isometric, visual-motor tracking task. During this task, index finger force was measured, using a straight red line as the target, with the subjects asked to maintain a constant force. From these data calculations were made of the subjects' isometric visual-motor tracking force multi-scale complexity. Males were found to have greater complexity than females ($p < 0.001$). Complexity decreased significantly for each concussion ($p = 0.031$). The average power decreased by approximately 11% per diagnosed concussion for those with no history of loss of consciousness ($p = 0.355$), but by 41.5% for those with a history of a loss of consciousness ($p = 0.014$).

Conclusion: This study found that, among asymptomatic individuals with a history of concussion, visual-motor tracking force complexity is degraded, suggesting cumulative reductions in the ways in which previously concussed individuals process and integrate visual information.

Raikes, A., et al. Concussion History Is Negatively Associated with Visual - Motor Force Complexity: Evidence for Persistent Effects on Visual-Motor Integration. *Brain Inj.* 2018. DOI:10.1080/02699052.2018.1444204

CRACKING SOUNDS DURING MANIPULATION

In 400 B.C., Hippocrates described combinations of spinal traction and manipulation. Spinal manipulation remains widely used today, with many patients with low back pain seeking this treatment. During this manipulation, a cracking sound is heard, which is now ascribed to cavitation, which is the formation of bubbles in a fluid when exposed to a drop in pressure. However, the origin of this sound remains enigmatic to the general population. This study evaluated beliefs regarding this sound.

Subjects were 60 individuals with, and 40 without, a history of spinal manipulation. All were interviewed during a face-to-face meeting. Data collected included demographics and medical history, including experience with spinal manipulation

and beliefs regarding the cracking sounds heard during these procedures.

Of the respondents, 50% of those treated with spinal manipulation, and 48.3% of those who had not received that treatment, believed the sound was the result of the repositioning of the vertebrae. The second most common belief was that the sound was caused by friction between vertebrae. Only nine percent indicated that the sound was produced by a gas bubble within the joint. Overall 40% believed that the cracking sound was proof of a successful spinal manipulation.

Conclusion: This study found that most people have erroneous beliefs about the cracking sound heard during spinal manipulation.

Demoulin, C., et al. Beliefs in the Population about Cracking Sounds Produced During Spinal Manipulation. *Joint Bone Spine.* 2018, Mar; 85(2):239-242.

GABAPENTINOID USE IN THE UNITED STATES

Gabapentin and pregabalin are widely used in the United States, often for off-label indications. This study was designed to understand the change in gabapentinoid use from 2002 through 2015.

Data for the study were obtained from the 2002-2015 Medical Expenditure Panel Survey, consisting of two, overlapping, noninstitutionalized, adult cohorts who self-reported medical conditions and health indicators. Medications recorded included gabapentinoids, benzodiazepines and opioids. Medical conditions were identified by self-report. Trends over time were calculated.

Subjects were 346,177 adults. The percentage of individuals who used gabapentinoids increased from 1.2% in 2002 to 3.9% in 2015 ($p < 0.001$). Of the gabapentinoids, gabapentin was used 82.6% of the time. A subgroup analysis revealed increases among individuals older than 64 years and among those with diabetes.

Conclusion: This study found that the use of gabapentinoids in the United States more than tripled between 2002 and 2015.

Johansen, M. Gabapentinoid Use in the United States 2002 through 2015. *JAMA Intern Med.* February, 2018; 178(2): 292-294.

POSTSURGICAL OPIOID PRESCRIPTION REFILLS AND MISUSE

Opioid overdose now ranks as the leading cause of death related to unintentional injury. As surgical patients are nearly four times more likely to receive post-discharge opioid prescriptions than are their nonsurgical counterparts, this study was designed to quantify the association between post-surgical opioid prescribing patterns and dependence, overdose and abuse.

This retrospective study used the data from a commercial healthcare database. The sample included members who underwent surgery and had medical insurance, including pharmacy coverage, before and after surgery. Patients were considered opioid naïve if they had a history of seven days or less of opioid use in the 60 days prior to surgery. Postsurgical opioid use was documented. The primary outcome measure was an ICD-9 diagnosis code of opioid dependence, abuse and/or overdose.

From the database, 1,015,116 met the inclusion criteria and were followed for a mean of 2.67 years. Postoperatively, 56% filled a prescription for a postsurgical opioid. Compared to those with no refills, rates of misuse more than doubled among those with one refill, with each additional refill increasing the rate of misuse by 44% ($p < 0.001$). Each additional week of opioid use resulted in a 19.9% increase in the rate of misuse ($p < 0.001$). Compared with the duration of use, the dosage prescribed was a weaker predictor of misuse.

Conclusion: This retrospective study of opioid use after surgery found that the risk of opioid misuse significantly increases for every prescription refill.

Brat, G., et al. Postsurgical Prescriptions for Opioid Naive Patients and Association with Overdose and Misuse: Retrospective Cohort Study. *BMJ.* 2018; 360: J5790.

MESNA FOR FAILED BACK SURGERY

Among patients with decompressive spinal surgery, including laminectomy, a fibrotic reaction occurs, which may result in

persistent pain and poor results. As epidural and radicular fibrosis is one of the determinants of failed back surgery syndrome (FBSS), addressing this fibrosis has been the focus of interventional trials. MESNA (sodium 2-mercaptoethanesulfonate) has been patented for the dissection of pathologic tissue from the healthy tissue in cases of local adhesions. This study was designed to determine the efficacy of MESNA in reducing fibrosis related complications of back surgery.

The authors identified patients diagnosed with FBSS with the presence of epidural fibrosis who were thought not suitable for revision surgery. The subjects underwent one peridural injection of MESNA per week for three weeks. All were assessed before and after using the Oswestry Disability Index (ODI), the Numeric Rating Scale (NRS) and Odoms criteria.

From September of 2011 to November of 2013, six patients were enrolled, with a mean age of 65 years. Improvements in scores on the NRS of pain from baseline to three months after the final injection ranged from 26.5% to 34%. ODI score improvement averaged 20%, and the average reduction in morphine equivalence use per day was 20.5.

Conclusion: This pilot study of patients with chronic, disabling pain found that the use of MESNA to lyse the branches of fibrosis resulted in improvements in pain and disability scores.

Carassiti, M., et al. Failed Back Surgery Syndrome: A New Strategy by the Epidural Injection of MESNA. *Musculoskel Surg*. DOI 10.1007/s12306-017-0520

PROGNOSIS OF PLANTAR FASCIITIS

Plantar fasciitis (PF) is one of the most frequent causes of heel pain. This study was designed to determine the long-term prognosis of PF, and to evaluate whether baseline characteristics might help predict the outcome.

Subjects were 174 patients with PF presenting for clinical evaluation. The patients were given instructions for rehabilitation and were then provided a variety of treatments as recommended by their physicians. At follow-up, the patients were interviewed and underwent a clinical

evaluation and ultrasound examination of the plantar fascia of both feet. Symptoms were rated on a 10-point, Numerical Rating Scale (NRS).

Of the 269 patients diagnosed with PF, 174 were eligible and agreed to participate. The mean follow-up was 9.7 years from the onset of symptoms. At follow-up, the subjects reported having tried an average of 3.8 different treatments. At that time, 54% were asymptomatic and 46% symptomatic. Of those who were asymptomatic at follow-up, 31.9% had experience at least one relapse before reporting permanent relief. Ultrasound evaluation revealed no significant difference in plantar fascial thickness between the symptomatic and asymptomatic groups. Of those with resolution, the mean time with symptoms prior to resolution was 725 days.

Conclusion: This study found that, of patients presenting for treatment of plantar fasciitis, 45.6% still had symptoms at ten years.

Hansen, L., et al. Long-Term Prognosis of Plantar Fasciitis: A 5 to 15-Year Follow-Up Study of 174 Patients With Ultrasound Examination. *Ortho J Sports Med*. 2018; 6 (3):DOI:10.1177/2325967118757983

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.

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.

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.

PLATELET RICH PLASMA FOR GLUTEAL 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 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

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 (acetonide), 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.

Attakomol, 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.

CITRUS FLAVONOIDS AND EXERCISE PERFORMANCE

Exhaustive exercise increases reactive oxygen species (ROS), leading to muscle fiber damage, eventually creating muscle fatigue. Polyphenols including flavonoids, derived primarily from fruits, have been shown to reduce muscle soreness and improve muscle strength and endurance. Some flavonoids have also been found to stimulate nitric oxide production, causing vasodilation and improving blood flow. This study was designed to determine whether citrus flavonoid (CF) can improve performance in trained athletes.

Subjects were 39 males, ages 18 to 25, all engaged in moderate to high physical activity for a minimum of 30 minutes, three or more times per week. Each participant was tested on a cycle ergometer for maximal power, oxygen consumption and maximal oxygen consumption. The subjects were then randomized to receive a daily dose of 500 mg of CF or a placebo.

After four weeks, both the absolute and relative power outputs were significantly increased in the CF group, with no such gain in the placebo group. The VO_2 consumption/power ratio significantly improved ($p=0.001$) by 5.1% in the CF group, compared to 0.6% in the placebo group ($p=0.54$).

Conclusion: This study found that citrus flavonoid extract for four weeks significantly increased absolute power as compared with placebo.

Overdeest, E., et al. Citrus Flavonoid Supplementation Improves Exercise Performance in Trained Athletes. *J Sports Sci Med.* 2018; 17 (1): 24-30.

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 ($BMI < 30 \text{ kg/m}^2$), 35.4% were obese ($BMI 30$ to 39 kg/m^2) and 3.2% were extremely obese ($>40 \text{ kg/m}^2$). Weight loss, as a percent of BMI, was 11.1% for a BMI of less than 30 kg/m^2 , 16.6% for a BMI of $30-39 \text{ kg/m}^2$ and 21.1% for a BMI of $>40 \text{ kg/m}^2$.

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 $BMI >40 \text{ kg/m}^2$ ($p < 0.0001$) and 1.42 for $BMI 30-39 \text{ kg/m}^2$ ($p = 0.0025$)).

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.

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. *J Bone Joint Surg.* 2018, January 17;100 (2):99-106.

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MUSCULOSKELETAL IN REVIEW

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