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COST AND OUTCOMES OF POSTACUTE CARE AFTER PRIMARY HIP AND KNEE ARTHROPLASTY

With the aging of the population of the United States, significant increases are expected in cases of total hip arthroplasty (THA) and total knee arthroplasty (TKA). Joint arthroplasty is now the largest Medicare procedural cost, at 6.3%. This study examined the duration of care, charges and readmission rates after primary THA or TKA.

Data were obtained from the Medicare Provider Analysis and Review (medPAR) database for individuals undergoing primary TKA (n=136,842) or THA (n=329,233) in 2008. Data collected included subsequent inpatient rehabilitation, extended-care facility stays, home healthcare and outpatient encounters, costs and readmissions within 90 days of discharge.

Those discharged to post-acute care facilities had longer hospitalizations and higher charges than those discharged to home, with or without home health care. Admission to inpatient rehabilitation was associated with a 30% increase in total charges for patients with THA and a 26% increase for patients with TKA. Mortality and readmission within 90 days were both significantly higher for patients discharged to extended care facilities and inpatient rehabilitation, than for those discharged to home ($p<0.001$ for both). The number of comorbidities was associated with increased cost and length of stay.

Conclusion: This study of patients undergoing elective total knee or total hip arthroplasty found that inpatient post-acute care results in increased costs and an increased risk of 90-day readmission and mortality.

Karthikeyan, P., et al. Post-Discharge Care Duration, Charges and Outcomes among Medicare Patients after Primary Total Hip and Knee Arthroplasty. **J Bone Joint Surg.** 2017, June; 99(11): e55.

EARLY VERTEBROPLASTY IN ELDERLY PATIENTS

For patients with painful vertebral compression fractures, vertebroplasty (VP) is often considered after the failure of conservative treatment. As previous studies have suggested better functional outcomes in elderly patients who undergo early VP, this study was designed to better understand the benefits of early VP in patients with a painful vertebral compression fracture (PVCF).

Data were harvested from the Taiwan National Health Insurance Research Database, which includes nearly 99% of the residents of Taiwan. From this database, patients 70 years of age and older were included if they had a PVCF admission between 2000 and 2013. Those who received a VP within three months of symptom onset were compared to those who received later procedures. The primary outcome measures were mortality and hospitalization due to pneumonia or respiratory failure.

Subjects were 1,773 patients with early VP and 5,324 non-VP patients with similar baseline characteristics. Death at one year occurred more frequently in the non-VP group than in the VP group ($p=0.008$). Benefits in the VP group compared to the non - VP group were seen in reduced respiratory failure ($p=0.028$), but not pneumonia.

Conclusion: This study of patients 70 years of age or older found that early vertebroplasty (within three months of symptom onset) resulted in improved mortality and a decreased risk of respiratory failure.

Lin, J., et al. Early Vertebroplasty Associated with a Lower Risk of Mortality and Respiratory Failure in Aged Patients with Painful Vertebral Compression Fractures: A Population-Based Cohort Study in Taiwan. **Spine J**. 2017. doi.org/10.1016/ j.spinee.2017.05.001.

EXERCISE-INDUCED HYPOALGESIA

Evidence suggests that physical activity may improve pain related symptoms in patients with chronic pain conditions. A single bout of exercise has been shown to activate endogenous inhibitory pain mechanisms and reduce the sensitivity to noxious stimuli. This has been termed exercise-induced hypoalgesia (EIH). This study was designed to determine whether physical activity type and or intensity correlates with EIH.

Subjects were 50 women who met the American College of Sports Medicine's aerobic activity recommendations (n=11) or the aerobic and resistance training recommendations (n=16), had insufficient aerobic activity, but participated in two days or more of resistance training per week (n=8) or were insufficiently active (n=15). At baseline, the subjects were assessed for mood, anxiety and pain perception. Daily physical activity (PA) was measured with a wearable device. All subjects were asked to perform isometric handgrip exercises to exhaustion. The primary outcome measure was the Pain Pressure Threshold (PPT), assessed before and after exercise, both in the exercised (right) and the contralateral arm.

The PPT increased by 7.7% in the right, and by 7.0% in the left forearm after exercise. The EIH did not differ between activity groups. The PPT values were found to be inversely related to vigorous-intensity PA.

Conclusion: This study found an inverse relationship between levels and types of vigorous-intensity physical activity and sensitivity to pressure stimuli, with no significant difference found between groups

with differing routine exercise schedules.

Black, C., et al. Exercise-Induced Hypoalgesia Is Not Influenced by Physical Activity Type and Amount. Med Sci Sports Exer. 2017, May; 49 (5): 975-982.

FUNCTIONAL ELECTRICAL STIMULATION FOR WRIST AND FINGER SPASTICITY

Functional electrical stimulation (FES) has been used to treat patients with central nervous system dysfunctions and intact peripheral innervation. This study investigated the efficacy of FES for patients with stroke-related hemiplegia and spasticity.

Subjects were 30 patients with at least a three-month history of stroke and spasticity, assessed with the Modified Ashworth Scale (MAS). Those randomized to the treatment group underwent FES, applied to the motor points of the extensor carpi radialis longus, extensor carpi radialis brevis, extensor carpi ulnaris and extensor digitorum communis. The FES was applied 30 minutes per day for five days per week for total of 20 sessions. Both the study group and the conventional treatment group underwent range of motion exercises, stretching and wrist-hand static splint use. Assessments of wrist tone were made with the Modified Ashworth Scale (MAS). Motor function was assessed by the Rivermead Motor Assessment (RMA), Brunnstrom (BS) hand neurophysiological staging, with functional status evaluated with the Barthel Index (BI) and Upper Extremity Function Test (UEFT).

The patients in the FES group experienced significantly greater improvement in BI scores ($p<0.05$) passive range of motion ($p<0.05$), active range of motion ($p<0.05$), and RMA scores ($p<0.05$) as compared with the control group.

Conclusion: This study of patients with chronic stroke found that functional electrical stimulation can be an effective method to reduce spasticity and improve range of motion in patients with wrist and finger flexor spasticity.

Yuzer, G., et al. A Randomized, Controlled Study: Effectiveness of Functional Electrical Stimulation on Wrist and Finger Flexor Spasticity in Hemiplegia**. J Stroke Cerebrovasc Dis.** 2017, July; 26 (7): 1467-1471.

HIP FRACTURE MORTALITY IN EASTERN EUROPE

Data describing excess mortality after hip fracture is well established in developed countries in Western Europe and North America. However, estimates of hip fracture mortality in Eastern Europe are scarce. This study estimated the impact of hip fracture on 10-year, all-cause mortality among the Estonians 50 years of age or older.

This population-based, retrospective, cohort study used data from the Estonian Health Insurance Fund, which contains a complete record of inpatient and outpatient healthcare services. This record was reviewed for all patients hospitalized with incident hip fractures between January 1, 2005, and December 31, 2013. The patients were followed until the study's closure in 2016 or the date of death. The hip fracture patients were compared with matched controls.

During follow-up, the cumulative risks of death at three months were 17.5% for the hip fracture group and 2.0% for the control group. At one, five and 10 years' follow-up, the crude cumulative risks of death in the hip fracture group, as compared with the control group, were 28.3%, and 7.8%, 54.4% and 29.8% and 78.2% and 55.6%, respectively. The adjusted, cumulative, ten-year risks of all-cause death were 77.6% in the fracture group and 56.5% in the control group. At 10 years from fracture, one of four deaths in the hip fracture group was attributable to the patient's hip fracture.

Conclusion: This Eastern Europe study found that, 10 years after hip fracture, adjusted all-cause mortality was 77.6%, as compared with 56.5% for the general population.

Jurisson, M., et al. The Impact of Hip Fracture on Mortality in Estonia: A Retrospective, Population–Based, Cohort Study. **BMC Musculoskelet Disord**. 2017; 18: 243.

INCIDENCE OF SECOND ANTERIOR CRUCIATE LIGAMENT TEAR

The risk of anterior cruciate ligament (ACL) injury after an ACL reconstruction has been reported to be as high as one third. This study was designed to better understand the incidence of second ACL injuries in a population-based cohort, and to determined risk factors associated with these injuries.

Data were obtained through the Rochester Epidemiology Project, a medical record linkage system with access to complete medical records for all residents of Olmsted County, Minnesota. This database was reviewed for all occurrences of ACL tears between January, 1990, and December, 2000. Second ACL tears were defined as any that occurred after the primary injury, and until December 2015.

Between 1990 and 2000, of the 1,107 acute tears, six percent were second tears. Of these, 33.3% involved the ipsilateral graft and 66.7% involved the contralateral ACL. Among individuals less than 20 years of age, the graft failure rate was 5.9%, while the failure rate for those under 16 years of age was 1.8%. Of the failures, the allograft had the highest rate of second tears, accounting for 26.9%, followed by hamstring autografts at 11.4%, and patella autografts at 6.3%. Multivariate regression analysis revealed that use of an allograft was the single significant independent variable predicting second ACL injuries ($p<0.001$). The probability of a second ACL injury was highest among those 17 to 25 years of age, followed by those 26 to 35 years of age.

Conclusion: This observational cohort study of citizens of Olmsted County, Minnesota, found that six percent of ACL repairs were second repairs, with 66.7% of these occurring on the side contralateral to the initial surgery.

Schilaty, N., et al. Incidence of Second Anterior Cruciate Ligament Tears (1990 to 2000) and Associated Factors in a Specific Geographic Locale. **Am J Sport Med.** 2017, July; 45(7): 1567-1573.

KINESIOLOGY TAPE IMMEDIATELY AFTER ACL SURGERY

Despite a lack of clinical evidence to support its use, kinesiology taping (KT) is becoming increasingly popular. This study examined the efficacy of this taping technique after arthroscopic knee surgery.

This randomized, controlled trial included 68 patients with elective, primary, anterior cruciate ligament (ACL) repair. Two groups underwent standardized physical therapy, with the groups randomized to receive no taping or KT, applied at the first and second weekly postoperative physiotherapy sessions. Subjects were asked to remove the KT on the fifth day. All participants were assessed with a pain visual analog scale (VAS), the Lysholm-Tegner scale, measures of mid-patellar girth and for knee range of motion.

Changes in pain levels were better in the KT group than in the control group between the first and second weeks post-surgery. No significant difference in changes in pain scores were noted between groups after the second week. In addition, no significant differences were noted between the two groups in Lysholm-Tegner scores, mid- patella girth or knee range of motion.

Conclusion: This study found that kinesiology taping after anterior cruciate ligament repair reduced pain intensity early after surgery, with no effect on swelling, range of motion or knee function.

Chan, M., et al. Does Kinesiology Taping Improve the Early Postoperative Outcomes in Anterior Cruciate Ligament Reconstruction? A Randomized, Controlled Study. **Clin J Sport Med.** 2017, May; 27(3): 260-265.

LIGHT THERAPY AND SLEEPINESS IN PARKINSON'S DISEASE

Among patients with Parkinson's disease (PD), excessive daytime sleepiness and nocturnal sleep fragmentation affect up to 90%. As supplementary exposure to bright light has shown benefits in the treatment of sleep quality and daytime vigilance in healthy, older adults, this study assessed the effect of light therapy on patients with PD.

This randomized, placebo controlled, clinical intervention included 31 patients with PD and excessive daytime sleepiness. Those with an Epworth Sleepiness Scale (ESS) score of 12 or greater were randomized to receive two weeks of light therapy, twice per day, at 10,000 lux (bright light) or at less than 300 lux (dim-red light). During the study, all subjects wore an actigraphy monitor 24 hours per day and completed a daily sleep log. All completed a visual analog score (VAS) for daytime sleepiness every two hours.

Patients in the bright light group experienced significant improvement on the Excessive Daytime Sleepiness Scale of the ESS as compared to baseline ($p<0.001$), as well as daytime total physical activity ($p<0.001$). Both bright light and dim- red light were associated with improvements in sleep quality as measured by the Pittsburgh Sleep Quality Index ($p=0.006$). Overnight awakenings, sleep quality and ease of falling asleep were significantly improved in those treated with bright light, while all participants improved in sleep latency, total sleep time, and wake time after sleep onset. All participants reported being morerefreshed in the morning during light therapy.

Conclusion: This study of patients with Parkinson's disease and excessive daytime sleepiness revealed that light therapy, administered twice daily for two weeks, significantly improved excessive daytime sleepiness and sleep wake cycles.

Videnovic, A., et al. Timed Light Therapy for Sleep and Daytime Sleepiness Associated with Parkinson's Disease. A Randomized, Clinical Trial. JAMA Neurol. 2017, April; 74 (4): 411-418.

LONG-TERM EFFECTS OF VERTEBROPLASTY

Vertebral perforation (VP) is a treatment for vertebral compression fractures (VCFs), aimed at improving analgesia. This study compared the long-term analgesic effects of percutaneous vertebroplasty (PVP) with those of VP.

This retrospective study included patients seen between January of 2003 and April of 2011 with osteoporotic vertebral compression fractures. All had long-term pain, despite conservative treatment. In the first half of the study, PVP was performed for 64 patients. In the second half of the study, VP was provided to 67 patients. Pain was evaluated by a visual analog scale (VAS) for pain before, and at days two and seven, at three months and at greater than 15 months post- surgery.

Dynamic lumbar radiographs, MRI and CT were performed before the surgery to assess the presence or absence of vertebral mobility. New vertebral fractures after surgery were compared between groups.

The changes on the VAS at three months post-surgery were significantly larger in the PVP group than in the VP group. At 15 months post-surgery, the differences in VAS scores did not differ significantly. New VCFs were found in 52% of the PVP group, and in 23.9% of the VP group. New VCFs during the first three months post-surgery were seen in 38% of the PVP group and three percent of the VP group ($p<0.0001$).

Conclusion: This study of patients with painful vertebral compression fractures found that vertebroplasty is more effective than vertebral perforation for pain relief over the first three months, with a higher incidence of subsequent compression fractures in the vertebroplasty group.

Yokoyama, K., et al. Long-Term Therapeutic Effects of Vertebroplasty for Painful Vertebral Compression Fracture: A Retrospective, Comparative Study. Br J Neurosurg. 2017; 31(2): 184-188.

METHYLPHENIDATE, GRIP FORCE AND BRAIN CONNECTIVITY

The central fatigue theory proposes that force output during fatiguing exercise is limited in order to maintaining homeostasis in advance of tissue damage. As methylphenidate (MPH) has been shown to enhance physical performance, it has been proposed that this medication alters the central fatigue mechanisms of the motor cortex. This study evaluated the neural underpinnings related to the ergogenic effects of MPH.

This double-blind, crossover study involved 15 right-handed subjects, randomized to receive 20 mg of MPH or placebo. The participants were asked to perform 40 grip trials with a visual display of their grip strength. The subjects began the task at a target force of 70% of their maximum voluntary contraction. Test failure was defined as falling below the target force by more than 10% after having reached the target. All sessions were conducted with concurrent functional

magnetic resonance imaging (fMRI). Aso assessed were a measurement of task-dependent change in neural coupling (PPI), and a key region implicated in mental fatigue (OFC).

The mean forces achieved in all trials were significantly higher in the MPH group than in the placebo group (p=0.032). The MPH condition resulted in an increase in left IC-left hand motor cortex coupling (PPI) and a decrease in bilateral OFC-left IC coupling during grip.

Conclusion: This study found that methylphenidate improved force production and brain connectivity during a fatiguing handgrip task.

King, M., et al. Methylphenidate Enhances Grip Force and Alters Brain Connectivity. **Med Sci Sports Exer.** 2017, July; 49(7): 1443-1451.

MINOCYCLINE AND MULTIPLE SCLEROSIS

Studies have shown that, after a first, focal, clinical demyelinating event (clinically isolated syndrome (CIS), the risk of conversion to multiple sclerosis (MS) is high. In previous trials, minocycline therapy reduced the number of lesions detected on MRI. This study explored the effect of minocycline on the risk of conversion from CIS to MS.

Eligible subjects were patients with a first demyelinating symptom between January, 2009, and July, 2013. The subjects were randomized to receive either 100 mg of minocycline twice per day or a matching placebo for up to 24 months. The subjects were assessed by a physician held blind to the condition, and underwent blood testing and clinical assessments, including the Expanded Disability Status Scale (EDSS), at screening, baseline and months one through 24. Relapses and adverse events were recorded. MRIs were obtained at baseline and months three, six, 12, and 24. The primary outcome measure was conversion to MS.

The intention to treat analysis included 142 participants. Of these, 23 in the minocycline group and 41 in the placebo group were diagnosed with MS within six months (p=0.001). A post-hoc analysis revealed that the differences remained significant at 12 months, but not at 24 months. Adverse events occurred in 86.1% of the minocycline and 61.4% of the placebo group (p=0.001), including rash, dental discoloration and dizziness.

Conclusion: This study found that 100 mg of minocycline twice a day may delay the conversion of clinically isolated syndrome to multiple sclerosis.

Metz, L., et al. Trial of Minocycline in a Clinically Isolated Syndrome of Multiple Sclerosis. **N Eng J Med**. 2017, June; 376(22): 2122-2133.

OSTEOPOROSIS AND COW'S MILK

The consumption of cow's milk has been long thought to have a positive effect on bone growth and bone strength. However, a recent study found that calcium consumption is associated with excess mortality, osteoporosis and fractures. This literature review was designed to better understand the health effects of cow's milk on human bones.

A literature review was completed, with studies reviewed that focused on the association between cow's milk and bone mineral density, fractures and bone turnover.

The literature review demonstrated that a high consumption of milk suppresses the secretion of parathyroid hormone, decreases the levels of bone resorption markers and is associated with a slower pace of bone remodeling and a higher bone mass. Studies of osteoporotic fractures have produced conflicting results. In large cohort studies, the risk of any fracture and hip fracture were higher in women consuming at least three glasses of milk per day, as compared to those consuming less than one glass. This has not been shown to be true in men.

Conclusion: This literature review of the effect of cow's milk on health found no conclusive evidence to suggest a modification of current consumption levels.

Fardellone, P., et al Osteoporosis: Is Milk a Kindness or a Curse? Joint Bone Spine. 2017, May; 84(3): 275-281.

STEM CELLS FOR MULTIPLE SCLEROSIS

Various studies have demonstrated that the transplantation of autologous hematopoietic stem cells (AHSCT) induces bone marrow recovery and promotes immune reconstitution. Early studies in multiple sclerosis (MS) have suggested that this treatment might be effective in suppressing disease reactivation. This study evaluated the long-term outcomes of patients who underwent AHSCT for the treatment of MS.

This multicentered, observational, retrospective, cohort study reviewed data collected at transplant centers worldwide between January of 1995 and December of 2006. Eligible subjects had MS, a baseline Expanded Disability Status Scale (EDSS) score and at least one follow- up visit or report after AHSCT. The study endpoint was progression-free survival.

Subjects were 281 patients in 13 countries with 66.2% undergoing AHSCT during the second half (2001- 2006) of the study. At five years, the overall progression-free survival after AHSCT was 46%, while for those with relapsing MS, progression-free survival was 73% and for those with secondary progressive MS was 33%. The overall survival rate was 93% at five years and 84% at 10 years after transplant.

Conclusion: This study of patients with multiple sclerosis who received autologous hematopoietic stem cell transplantation found that nearly half were free from neurologic progression for five years after transplantation.

Muraro, P., et al. Long-Term Outcomes after Autologous Hematopoietic Stem Cell Transplantation for Multiple Sclerosis. JAMA Neurol. 2017, April 1; 74(4):459-469.

STEROID VERSUS SALINE FOR KNEE OSTEOARTHRITIS

Symptomatic knee osteoarthritis (OA) affected more than nine million individuals in the United States in 2005. As evidence suggests that OA is an inflammatory condition, treatments to suppress inflammation in these patients have included intra - articular corticosteroids. This study further tested the benefits of intra-articular corticosteroids for the treatment of knee OA.

This two-year, double-blind study included 140 patients, 45 years or older, with symptomatic knee OA. The subjects were randomized to receive injections every three months for two years, with either

one mL of triamcinolone 40 mg/mL or one mL of 0.9% sodium chloride. In each case, synovial fluid was aspirated prior to the injection. All underwent MRI scans at months zero, 12 and 24 to assess cartilage volume, bone marrow lesion volume, effusion volume and cartilage damage.

The rate of cartilage loss was greater in the treatment group for cartilage thickness (p=0.01) and as assessed by the Secondary Cartilage Damage Index (p=0.048) than in the saline group. There were no significant differences between the two groups in the progression of cartilage denudation, bone marrow lesion, effusion volume, or trabecular morphology. Improvements in WOMAC scores of pain, function and stiffness, as well as VAS pain scores, did not differ significantly between the two groups.

Conclusion: This study of patients with osteoarthritis of the knee did not find that intraarticular triamcinolone is superior to placebo for the treatment of pain or the suppression of cartilage damage.

McAlindon, T., et al. Effect of Intra-Articular Triamcinolone versus Saline on Knee Cartilage Volume and Pain in Patients with Knee Osteoarthritis. A Randomized Clinical Trial. **JAMA**. 2017, May 16; 317(19): 1967-1975.

TAI CHI FOR KNEE OSTEOARTHRITIS IN THE ELDERLY

Knee osteoarthritis (OA) is the most common joint disorder, and is a leading cause of pain, functional limitations and physical disability. Sleep disturbances have been found to occur in more than two thirds of patients with OA. Tai chi is a traditional Chinese exercise, found to be effective in improving sleep quality and as an exercise regimen among the elderly. This study assessed the effects of tai chi on sleep quality and physical function among patients with OA.

This randomized, controlled trial included women, 60 to 70 years of age, diagnosed with OA of the knee. The subjects were randomized to either a tai chi training group or a health education control group. The tai chi group received 60-minute sessions, three times a week for 24 weeks. The primary outcome measure was the Pittsburgh Sleep Quality Index (PSQI), Chinese version. In addition, the patients were assessed with the Berg Balance Scale (BBS) and The Timed Up and Go Test (TUG).

At 24-week follow-up, the tai chi group had better scores than did the control group in the global PSQI (p=0.006), with better improvements in sleep latency (p=0.031), sleep duration (p=0.043) and total sleep time (p=0.033). Scores on the SF-36 PCS were also more improved in the tai chi group (p=0.006). The tai chi group had significant improvement in the BBS (p=0.001) and the TUG (p=0.006), while the control group did not, although the differences between the groups were not significant.

Conclusion: This study of elderly Chinese women found that tai chi training over 24 weeks could improve sleep quality and quality of life.

Lu, J., et al. Effect of Tai Chi Training on Self-Reported Sleep Quality in Elderly Chinese Women with Knee Osteoarthritis: A Randomized, Controlled Trial. Sleep Med. 2017, May: 33; 70-75.

TISSUE FLOSSING FOR ANKLE RANGE OF MOTION AND JUMP PERFORMANCE

The partial occlusion of blood flow during range of motion activities (tissue flossing) has become a popular strategy to increase joint range of motion and improve athletic performance. This study analyzed the effect of floss band use on range of motion and jump height.

Subjects were 52 recreational athletes with a mean age of 20 years, who reported regular physical exercise. At baseline, all participants were assessed by the Weight- Bearing Lunge test (WBLT), dorsiflexion and plantarflexion range of motion, and the Single-Leg Vertical Jump Test (JUMP) with wrap pressures measured with the Kikuhime pressure monitor. Those randomized to an active treatment group had a floss band applied using a standard ankle bandaging technique, with a mean pressure of 182 mmHg. With the band applied, the subjects performed both plantarflexion and dorsiflexion to their extreme ranges of motion, and completed the mobility exercises. After two minutes, the band was removed. The control group underwent the same procedure with no band applied.

Compared to baseline, significant improvements were found in all test measures in the treatment group (WBLT, PF, DF JUMPH, JUMPv

($p < 0.01$ for all comparisons). The differences in gains between the treatment and the control group were all in favor of the treatment group but failed to reach statistical significance.

Conclusion: This study of floss bands applied to recreational athletics found that ankle range of motion and jump performance could be enhanced with this blood restriction technique.

Driller, M., et al. Effects of Tissue Flossing on Ankle Range of Motion and Jump Performance. Phys Ther Sport. 2017, May; 25: 20-24.

TRAINING LOAD-INJURY PARADOX

Traditionally, workload-injury investigations have found that higher workloads were associated with greater rates of injury. However, high training loads are necessary for physiological adaptation, and increased performance. This study investigated the relationship between participation in preseason training and injuries during the following season.

Subject were 30 elite rugby players followed through a 17-week preseason and 26-round competitive season. Data collected included participation in preseason sessions, in-season training loads and injury status throughout the year. An injury was included only if it resulted in a loss of match time.

A total of 40 injuries were sustained during the competitive season. A significant inverse relationship was noted between the number of preseason training sessions and the percentage of games that were missed due to injury ($p<0.05$). When controlling for training load, increased preseason participation was associated with a reduced odds of injury in the current week (OR 0.85), and the subsequent week (OR 0.83). Ten additional preseason training sessions reduced the odds of injury by at least 17% in the current and subsequent week.

Conclusion: This study of rugby players found that greater preseason participation was

associated with a reduced risk of injury during the competitive season.

Windt, J., et al. Training Load-Injury Paradox: Is Greater Preseason Participation Associated with Lower In-Season Injury Risk in Elite Rugby League Players? Br J Sports Med. 2017, April; 51(8): 645-650.

VITAMIN D DEFICIENCY AND SPINAL CORD INJURY

Previous studies have suggested that vitamin D deficiency might be related to a number of health issues including neuromuscular function. This literature review was designed to clarify the vitamin D status of patients with spinal cord injury (SCI).

A literature review was completed for studies published through June of 2016 which included patients with SCI and an assessment of vitamin D status. From the review, 16 studies met the inclusion criteria, with 14 of these investigating individuals with chronic SCI. Vitamin D deficiency was identified in 32-93% of the subjects, and was predominant among those with chronic SCI. Significantly higher parathyroid hormone levels were found in those with low vitamin D status as compared to those with normal vitamin D status. Vitamin D supplementation was found to normalize vitamin D and decrease parathyroid hormone concentrations. There was no link between calcium concentration and vitamin D deficiency. The relationship between vitamin D deficiency and testosterone levels was equivocal.

Conclusion: This literature review found that individuals with spinal cord injury are at an increased risk for vitamin D deficiency, with parathyroid hormone levels negatively correlated with Vitamin D status.

Flueck, J., et al. Vitamin D Deficiency in Individuals with a Spinal Cord Injury: A Literature Review. Spinal Cord. 2017, May; 55 (5): 428-434.

PREOPERATIVE OPIOID USE AND TOTAL KNEE ARTHROPLASTY

While total knee arthroplasty (TKA) is an effective treatment to relieve pain, patients are treated for an average of 13 years before undergoing a surgical procedure. This study explored whether the postoperative outcomes of patients are affected by their preoperative opioid use.

Subjects were patients undergoing primary, unilateral TKA, all of whom were at least 40 years of age. The participants completed questionnaires consisting of clinical outcomes, including the Western Ontario and McMaster universities osteoarthritis index (WOMAC), the Pain Catastrophizing Scale and questions about comorbidities. Records were reviewed to determine opioid utilization from two years before, to one year after, surgery. In addition, the authors conducted a literature search to identify published studies regarding the effect of preoperative opioids on postoperative orthopedic outcomes, to use as a comparison with this study.

Data were obtained for 156 patients with a mean age at the time of surgery of 65.7 years, and a mean body mass index of 31.1 kg/ m². Of these, 23% had had at least one opioid prescription within the two years prior to surgery, and 93.6% had multiple opioid prescriptions after surgery. In an adjusted analysis, those who had not used opioids before surgery were found to have a six-month WOMAC pain score of 10.5 points, compared to 17.1 points for those who had used opioids. A multivariate analysis revealed that the opioid group had a mean six-month WOMAC pain score reduction of 27.0 points, as compared with 33.6 points for the non-opioid use group.

Conclusion: This study of patients undergoing total knee arthroplasty found that those who used opioids before surgery had less pain relief after surgery than did those who had not used opioids.

Smith, S., et al. Impact of Preoperative Opioid Use on Total Knee Arthroplasty Outcomes. **J Bone Joint Surg.** 2017, May 17; 99 (10): 803-808.

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Jurisson, M., et al. The Impact of Hip Fracture on Mortality in Estonia: A Retrospective, Population–Based, Cohort Study. **BMC Musculoskelet Disord**. 2017; 18: 243.

METHYLPHENIDATE, GRIP FORCE AND BRAIN CONNECTIVITY

The central fatigue theory proposes that force output during fatiguing exercise is limited in order to maintaining homeostasis in advance of tissue damage. As methylphenidate (MPH) has been shown to enhance physical performance, it has been proposed that this medication alters the central fatigue mechanisms of the motor cortex. This study evaluated the neural underpinnings related to the ergogenic effects of MPH.

This double-blind, crossover study involved 15 right-handed subjects, randomized to receive 20 mg of MPH or placebo. The participants were asked to perform 40 grip trials with a visual display of their grip strength. The subjects began the task at a target force of 70% of their maximum voluntary contraction. Test failure was defined as falling below the target force by more than 10% after having reached the target. All sessions were conducted with concurrent functional magnetic resonance imaging (fMRI). Aso assessed were a measurement of task-dependent change in neural coupling (PPI), and a key region implicated in mental fatigue (OFC).

The mean forces achieved in all trials were significantly higher in the MPH group than in the placebo group (p=0.032). The MPH condition resulted in an increase in left IC-left hand motor cortex coupling (PPI) and a decrease in bilateral OFC-left IC coupling during grip.

Conclusion: This study found that methylphenidate improved force production and brain connectivity during a fatiguing handgrip task.

King, M., et al. Methylphenidate Enhances Grip Force and Alters Brain Connectivity. **Med Sci Sports Exer.** 2017, July; 49(7): 1443-1451.

EARLY VERTEBROPLASTY IN ELDERLY PATIENTS

For patients with painful vertebral compression fractures, vertebroplasty (VP) is often considered after the failure of conservative treatment. As previous studies have suggested better functional outcomes in elderly patients who undergo early VP, this study was designed to better understand the benefits of early VP in patients with a painful vertebral compression fracture (PVCF).

Data were harvested from the Taiwan National Health Insurance Research Database, which includes nearly 99% of the residents of Taiwan. From this database, patients

70 years of age and older were included if they had a PVCF admission between 2000 and 2013. Those who received a VP within three months of symptom onset were compared to those who received later procedures. The primary outcome measures were mortality and hospitalization due to pneumonia or respiratory failure.

Subjects were 1,773 patients with early VP and 5,324 non-VP patients with similar baseline characteristics. Death at one year occurred more frequently in the non-VP group than in the VP group (p=0.008). Benefits in the VP group compared to the non - VP group were seen in reduced respiratory failure (p=0.028), but not pneumonia.

Conclusion: This study of patients 70 years of age or older found that early vertebroplasty (within three months of symptom onset) resulted in improved mortality and a decreased risk of respiratory failure.

Lin, J., et al. Early Vertebroplasty Associated with a Lower Risk of Mortality and Respiratory Failure in Aged Patients with Painful Vertebral Compression Fractures: A Population-Based Cohort Study in Taiwan. **Spine J**. 2017. doi.org/10.1016/ j.spinee.2017.05.001.

INCIDENCE OF SECOND ANTERIOR CRUCIATE LIGAMENT TEAR

The risk of anterior cruciate ligament (ACL) injury after an ACL reconstruction has been reported to be as high as one third. This study was designed to better understand the incidence of second ACL injuries in a population-based cohort, and to determined risk factors associated with these injuries.

Data were obtained through the Rochester Epidemiology Project, a medical record linkage system with access to complete medical records for all residents of Olmsted County, Minnesota. This database was reviewed for all occurrences of ACL tears between January, 1990, and December, 2000. Second ACL tears were defined as any that occurred after the primary injury, and until December 2015.

Between 1990 and 2000, of the 1,107 acute tears, six percent were second tears. Of these, 33.3% involved the ipsilateral graft and 66.7% involved the contralateral ACL. Among individuals less than 20 years of age, the graft failure rate was 5.9%, while the failure rate for those under 16 years of age was 1.8%. Of the failures, the allograft had the highest rate of second tears, accounting for 26.9%, followed by hamstring autografts at 11.4%, and patella autografts at 6.3%. Multivariate regression analysis revealed that use of an allograft was the single significant independent variable predicting second ACL injuries (p<0.001). The probability of a second ACL injury was highest among those 17 to 25 years of age, followed by those 26 to 35 years of age.

Conclusion: This observational cohort study of citizens of Olmsted County, Minnesota, found that six percent of ACL repairs were second repairs, with 66.7% of these occurring on the side contralateral to the initial surgery.

Schilaty, N., et al. Incidence of Second Anterior Cruciate Ligament Tears (1990 to 2000) and Associated Factors in a Specific

Geographic Locale. **Am J Sport Med.** 2017, July; 45(7): 1567-1573.

BRACING OF RECONSTRUCTED AND OSTEOARTHRITIC KNEES

Radiographic knee osteoarthritis (OA) is evident in more than 50% of people at 10-20 years after anterior cruciate ligament (ACL) reconstruction. This study compared the efficacy of an unloader brace, either with or without varus realignment for patients after ACL reconstruction.

Subjects were 19 patients with a primary ACL reconstruction 5-20 years prior to recruitment who demonstrated valgus malalignment as well as symptomatic and radiographic OA of the knee. Subjects performed hopping, stair ascent and stair descent tasks under three conditions including; no brace, unadjusted brace with a sagittal plane support and no varus alignment, and an adjusted brace with sagittal plane support and varus realignment. Quantitative motion analysis was performed during each examination, with kinematic and external joint movements computed.

There was no difference in pain during hopping or stair climbing between any of the three test conditions. Compared with no brace, the brace conditions increased the maximum knee flexion angle occurring at initial ground contact ($p<0.001$). The adjusted brace condition increased the maximum external knee flexion moment ($p=0.001$). There were no significant differences in kinetics or moments between the adjusted and unadjusted brace conditions.

Conclusion: This study of patients with ACL reconstruction and osteoarthritis of the knee found that, compared with no bracing, an unloader brace can positively modulate the kinematics and external joint moments during activity, with no additional positive effect found with the use of varus realignment.

Hart, H et al. Bracing of the Reconstructed and Osteoarthritic Knee during High Dynamic Load Tasks. **Med Sci Sports Exerc**. 2017, June; 49 (6):1086–1096.

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Expanding the frontier of medicine in research, teaching, and patient care