

MUSCULOSKELETAL

IN REVIEW

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Volume 3, Number 1

Published by Physicians Specializing In
Musculoskeletal Medicine

January 5, 2016

ADOLESCENT PHYSICAL ACTIVITY AND BONE HEALTH

Research indicates that the optimization of bone accrual in the first few decades of life can reduce the later risk of osteoporosis. This study explored the relationships between physical activity and bone mineral density (BMD) and bone mineral content (BMC) levels.

In the Fit Futures study, all first-year, upper-secondary school students in a defined municipality were invited to participate. Included were 508 girls and 530 boys who underwent height and weight measurements and provided information regarding lifestyle factors. Physical activity frequencies were determined, ranging from never to almost every day. Perceived intensity of activity was categorized into five groups from "a bit hard" to "extremely hard". Bone parameters, including BMC and BMD, were measured at the total hip, the femoral neck, and for the total body by dual x-ray absorptiometry.

The mean BMD in girls who reported themselves as active outside of school hours was significantly higher at all sites as compared to their inactive counterparts ($p < 0.001$). Active girls also had a higher BMC of the femoral neck and total hip ($p < 0.001$) as compared to their inactive counterparts. In boys, those reporting to be active had higher BMC and BMD levels at all anatomical sites than their inactive counterparts.

Conclusion: This Norwegian study of children 15 to 18 years of age found self-reported physical activity to be positively associated with bone mass accrual, with a linear trend among activity categories.

Christoffersen, T., et al. Does the Frequency and Intensity of Physical Activity in Adolescents Have an Impact on Bone? The Tromso Study,

Fit Futures. *BMC Sports Sci Med Rehab.* 2015; 7: 26.

AMSSM ON VISCOSUPPLEMENTATION FOR KNEE OSTEOARTHRITIS

Osteoarthritis (OA) is one of the leading causes of disability in the United States, with knee OA ranked within the top 10, non-communicable diseases for global disability-adjusted life years. This meta-analysis and position statement was completed by the American Medical Society for Sports Medicine (AMSSM), culminating in recommendations for the use of viscosupplementation patients with knee OA.

A systematic literature search was completed for relevant articles between 1960 and August of 2014. Eligible studies were randomized, controlled trials of patients with OA of the knee, comparing treatments including intra-articular steroids (IAS) or intra-articular hyaluronic acid (IHA) with intra-articular placebo (IAP). Outcome measures included WOMAC pain, stiffness and function subscale scores. The treatment effect was determined by examining the number of subjects within a treatment arm who met the Outcome Measures in Rheumatoid Arthritis Clinical Trials- Osteoarthritis Research Society International (OMERACT-OARSI) criteria.

On meta-analysis, those receiving IHA were 15% and 11% more likely to respond to treatment by the OMERACT-OARSI criteria than those receiving IAS or IAP, respectively ($p < 0.05$ for both comparisons). Patients treated with IHA trended toward improving in WOMAC stiffness scores as compared with control and IAS, although statistical significance was not achieved.

Conclusion: This meta-analysis of studies involving patients with osteoarthritis of the knee resulted in

a recommendation by the AMSSM for the use of IHA for appropriate patients with knee osteoarthritis. The recommendation was strongest for those over 60 years of age.

Trojan, T., et al. AMSSM Scientific Statement Concerning Viscosupplementation Injections for Knee Osteoarthritis: Importance for Individual Patient Outcomes. *Clin J Sport Med.* 2016, January; 26(1): 1-11.

BOTULINUM TOXIN A FOR CEREBRAL PALSY SCOLIOSIS

The most common neurologic disease in children is cerebral palsy (CP). For years, botulinum toxin A (BTX) injections have been used, off label, for the treatment of spastic CP, to improve motor dysfunction and reduce spasticity. This study was designed to determine the effectiveness of BTX treatment for patients with scoliosis related to CP.

This prospective study included patients with a history of CP, all between the ages of two and 18 years, who were undergoing brace treatment. The subjects were randomized to either an active BTX group or a normal saline placebo group. Both groups received intramuscular injections, at the concave side of the scoliosis in the iliopsoas, quadratus lumborum, and erector spinae, with the treatment group receiving a maximum dose of 100 units BTX for each muscle.

Radiological measurements were obtained before treatment and six weeks after treatment. The primary outcome measures were the change in the Cobb angle and the rotation by Nash and Moe classification. The clinical effect was measured by the Pediatric Quality of Life Score and open questions to the parents concerning the child's well-being.

Subjects were 10 patients with CP, maintained in a brace throughout the study. The primary measures

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improved in two subjects and worsened in four after BTX, while improving in two and worsening in two after normal saline ($p=0.3$).

Conclusion: This study of children with cerebral palsy did not find that BTX injections were helpful in the treatment of scoliosis.

Wong, C., et al. The Effect of Botulinum Toxin A Injections in the Spine Muscles for Cerebral Palsy Scoliosis, Examined in a Prospective, Randomized, Triple-Blind Study. **Spine**. 2015, December; 40(23):1205-1211.

EFFECT OF HYPOTHERMIA AFTER TRAUMATIC BRAIN INJURY

Among patients hospitalized with traumatic brain injury (TBI) with intracranial hypertension, standard care includes reducing intracranial pressure using mannitol, hypertonic saline, inotropes and therapeutic hypothermia. This study evaluated the effect on functional outcome of therapeutic hypothermia initiated after TBI.

This randomized study included patients with TBI with intracranial pressure of above 20 mmHg, assigned to receive standard care or standard care plus hypothermia. The primary outcome measure was the Extended Glasgow Outcome Scale (GOS-E), as measured at six months. Subjects were 387 patients seen between 2009 and 2014. Of those, 195 were randomized to hypothermia plus standard care, and 192 to a

standard care group without hypothermia. Six months after injury, the distribution of GOS-E shifted in an unfavorable direction in the hypothermia group ($p=0.04$). Favorable outcomes, defined as a GOS-E scores five to eight, were seen in 25.7% of the hypothermia group and 36.5% of the standard care group ($p=0.03$). The risk of death favored the standard care group ($p=0.047$).

Conclusion: This study of patients with traumatic brain injury and an intracranial pressure of over 20 mmHg found that, while therapeutic hypothermia reduced intracranial pressure, it did not improve functional recovery more than standard care alone.

Andrews, P., et al. Hypothermia for Intracranial Hypertension after Traumatic Brain Injury. **N Engl J Med**. 2015, December 17; 373(25): 2403-2412.

COMPLIANCE WITH REHABILITATION IMPROVES OUTCOME AFTER ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

Supervised physical therapy is routinely prescribed after anterior cruciate ligament (ACL) reconstruction. While previous studies have assessed the effects of supervised rehabilitation on quality-of-life and functional outcomes, none have looked at its effect on return to sport. This study examined the effect of compliance with rehabilitation on an athlete's ability to return to sport.

Subjects were 93 recreational athletes with acute ACL tears, referred for surgical reconstruction. After surgery, all patients were referred to physical therapy (PT). All participants were advised to attend 20 PT outpatient appointments, over nine months. At the end of six months, the patients were allowed to return to sport. The number of PT outpatient sessions attended in the first nine months after surgery was determined from the subjects' records.

Follow-up evaluations included Lysholm knee scores, Knee injury and Osteoarthritis Outcome Scores (KOOS) and Short Form-36 Health Survey (SF-36) physical component summary (PCS) and mental component summary (MCS) scores. The patient's ability to return to sport was also documented through self-report. Subjects were considered fully compliant if they attended 15 or more

sessions, and noncompliant if they attended fewer than six sessions.

Patients in the fully compliant group earned better scores on the Lysholm ($p<0.001$), KOOS sport/rec ($p=0.021$), KOOS Symptoms subscale ($p=0.040$) and SF-36 PCS ($p=0.012$) ADL subset than did the noncompliant group. Further, subjects in the fully compliant group had significantly greater odds of return to sport (odds ratio 18.5) than did those in the noncompliant group ($p=0.013$).

Conclusion: This study of recreational athletes undergoing anterior cruciate ligament reconstruction found that compliance with a well-designed, progressive, supervised physical therapy program is correlated with improved knee function and a greater chance of return to sport.

Han, F., et al. Increased Compliance with Supervised Rehabilitation Improves Functional Outcome and Return to Sport after Anterior Cruciate Ligament Reconstruction in Recreational Athletes. **Ortho J Sports Med**. 2015, December; 3: 12.

ELECTRICAL STIMULATION AND STRETCHING FOR FLEXIBILITY

The practice of some sports is associated with an increased prevalence of the short hamstring syndrome (SHS). Several studies have examined different techniques for increasing hamstring flexibility. This study compared the effectiveness of active stretching (AS) alone with that of AS plus electrical stimulation (TENS) in young soccer players.

This randomized, controlled, single-blind study included boys ages

10 to 16 years registered with the local soccer federation. Those eligible had a straight leg raise (SLR) test result of less than 70° and/or a passive knee extension (PKE) test result of more than 15°. The participants were randomized to one of three groups: AS plus TENS, AS, or a control group. In the AS plus TENS group, the subjects underwent AS combined with low-frequency stimulation with a TENS unit at 15 Hz with pulse trains of 1 second. All participants underwent one session weekly for eight weeks, with evaluations occurring after the final session.

The AS plus TENS group demonstrated significantly better improvement on the SLR than did the

AS group ($p < 0.001$ for both legs). In addition, the AS plus TENS group had superior improvement in the PKE test than did the AS only group ($p < 0.002$, $p < 0.001$).

Conclusion: This study of soccer players, 10 to 16 years of age, with short hamstring syndrome found that active stretching plus low-frequency electrical stimulation achieved greater improvement in range of motion than did active stretching alone.

Piqueras-Rodriguez, F., et al. Effectiveness Analysis of Active Stretching versus Active Stretching Plus Low-Frequency Electrical Stimulation in Children Who Play Soccer and Who Have the Short Hamstring Syndrome. *Clin J Sports Med.* 2016, Jan; 26(1): 59-68.

EXERCISE PREVENTS LOW BACK PAIN

The global point prevalence of low back pain (LBP) is 12%, and is thought likely to increase. While there have been several reviews of strategies to prevent LBP, most have major limitations. This systematic review was completed to evaluate the evidence for the effectiveness of interventions for the prevention of episodes of LBP.

Several databases were reviewed through November 22, 2014, searching for randomized, controlled trials assessing the effectiveness of prevention strategies for nonspecific LBP. Studies were reviewed for the quality of the trials and overall quality of the evidence, with the primary outcome being episodes of LBP and the secondary outcome being sick leave associated with LBP.

Of the studies reviewed, 23 published reports, including 30,850 participants, were included. The studies reviewed six prevention strategies, including exercise, education, back belts, shoe insoles and other techniques.

The pooled results provided moderate quality evidence that exercise and education can reduce the risk of LBP at short-term follow-up, and low-quality evidence of a protective effect at long-term follow-up. There was also low-quality evidence of a protective effect against sick leave due to LBP at short-term follow-up. There was no evidence of protective effects of back belts or shoe insoles against episodes of LBP.

Conclusion: This literature review suggests that exercise, combined with

education, may be effective in preventing low back pain.

Steffens, D., et al. Prevention of Low Back Pain: A Systematic Review and Meta-Analysis. *JAMA Intern Med.* 2016, February; 176(2): 199-208.

KNEE OSTEOARTHRITIS: ONE OR TWO X-RAYS?

The standard method of radiographic assessment of the femoro-tibial joint has been the weight-bearing, extended knee AP x-ray, plus a semi-flexed posterioranterior (schuss) x-ray. As there is insufficient data to determine the utility of using both, this study evaluated the use of both versus the schuss view alone as a diagnostic screening tool.

This study included 350 individuals ranging in age from 45 to 70 years, with various stages of knee osteoarthritis. All subjects underwent weight-bearing, extended AP, a schuss and an axial/skyline view of both knees. Joint space measurements were scored with a five-point system. Radiographic knee osteoarthritis was defined as a K-L score of two or more. X-ray comparisons were made between the different views for K-L stages, osteophyte detection and localization, as well as joint space narrowing (JSN).

When combining the two views, a higher proportion of patients were ranked with K-L scores of two or greater, as compared with either of the views alone. The schuss X-ray alone was significantly better at detecting JSN than the standing AP view alone ($p = 0.003$ and $p = 0.009$ for the right and left knees, respectively). No significant difference was found in detecting JSN and osteophytes when using the schuss view alone as compared with combining the two.

Conclusion: This radiographic study of patients with osteoarthritis of the knee found that the schuss view is sufficient for detecting osteophytes and joint space narrowing.

Roux, C., et al. Femoro-tibial Knee Osteoarthritis: One or Two X-Rays? Results from a Population-Based Study. *Joint Bone Spine.* 2016, January; 83(1): 37-42.

LENGTH OF HOSPITAL STAY FOLLOWING HIP FRACTURE

Hip fracture among elderly adults is associated with high mortality, despite

advances in healthcare. This study was designed to identify whether a shorter hospital length of stay corresponds with a decrease in mortality within 30 days of discharge from acute care hospitalization.

Subjects were 180,208 patients over the age of 50 years, who were admitted to one of 233 New York State hospitals with a hip fracture between 2000 and 2011. Of these, 169,258 were treated surgically and 18,950 nonsurgically. Those who died during hospitalization were excluded.

During the 30 days post-discharge, 5.1% of the patients died. During the study, the average length of stay decreased from 12.9 days in 2000 to 5.6 days in 2011. A shorter hospital stay was associated with a decreased 30-day mortality. A multivariate regression analysis revealed that discharge to a hospice facility and age over 90 years were the largest risk factors for 30-day mortality. The mortality rate for surgically treated patients was 4.5%, while that for nonsurgically treated patients was 10.7%. Patients with a stay longer than 14 days had similar mortality rates to those of patients treated nonsurgically.

Conclusion: This study of patients with a hip fracture found that hospital length of stay has decreased significantly since the year 2000, and that shorter hospital length of stay and surgical treatment are associated with decreased mortality within 30 days after discharge from acute care. The authors suggest that longer length of hospitalization likely represents a surrogate for medical comorbidities or complications.

Nikkel, L., et al. Length of Hospital Stay after Hip Fracture and Risk of Early Mortality after Discharge in New York State: Retrospective Cohort Study. *Br Med J.* 2015; 351: H6246.

LEUKOCYTE – REDUCED PLATELET RICH PLASMA FOR SUPRASPINATOUS TENDINOPATHY

Without intervention, the prognosis for patients with symptomatic rotator cuff tears remains poor. Among the current treatment options, platelet rich plasma (PRP) has been suggested, as this substance contains growth factors of interest for tendon regeneration. This study compared the effects of low versus high leukocyte concentrated PRP on mediators of matrix metabolism in diseased supraspinatus tendons.

This laboratory controlled study included tendon biopsy specimens taken from 20, chronically torn supraspinatus tendons of patients ages 60 to 80 years, who were scheduled for rotator cuff surgical repair. Venous blood was taken from healthy, human volunteers distinct from the rotator cuff donor patients. This blood was used to generate low leukocyte platelet rich plasma or high leukocyte platelet rich plasma.

Tendons were categorized into two groups, group 1, with moderate tendinopathy, and group 2 with severe tendinopathy. After four days of culture with the diseased tendon, specific growth factors and cytokine concentrations within the PRP media were measured. Additionally, gene expression of anabolic markers, catabolic markers and interleukin-one beta were measured.

In group 1, tendon cultures with low leukocyte PRP had lower concentrations of interleukin one beta ($p < 0.01$), as well as increased ratios of interleukin one receptor antagonists to interleukin one beta ($p < 0.01$) and collagen type I to collagen type III gene expression than did high leukocyte PRP ($p = 0.04$). In group 2 tendons, neither PRP preparation displayed an enhanced matrix synthesis.

Conclusion: This study of patients with degenerative supraspinatus tendinopathy found that, among those with moderately degenerative rotator cuff tendons, low leukocyte PRP supports normal generation of collagen matrix while decreasing pro-inflammatory cytokines more than does high leukocyte PRP.

Cross, J., et al. Leukocyte Reduced Platelet Rich Plasma Normalizes Matrix Metabolism in Torn Human Rotator Cuff Tendons. *Am J Sports Med.* 2015, December; 43(12): 2898-2906.

LUMBAR TOTAL DISC REPLACEMENT

Traditionally, management of lumbar degenerative disease is limited to either nonsurgical treatment or fusion of the affected level. Research has focused on the development of total disc replacement (TDR) as a motion preserving alternative to fusion. This study evaluated the safety and efficacy of a novel lumbar TDR,

compared with currently FDA-approved TDRs.

This prospective, randomized, controlled, noninferiority trial included patients with degenerative disc disease at L4 through S1, which remained painful despite six months of nonsurgical management. The subjects were randomized to receive either the activeL artificial disc modular prosthesis or one of two FDA approved devices (prodisc-L or Charity). The primary outcome measure was a composite success outcome at two-year follow-up, including ≥ 15 point improvement in Oswestry Disability Index (ODI), maintenance or improvement in neurological status, maintenance or improvement in range of motion, freedom from revision, reoperation, removal, or supplemental fixation, and freedom from serious device-related adverse events

A total of 324 patients were randomized at 14 sites between January of 2007 and December of 2009. At two-year follow-up, the activeL was not inferior to controls ($p < 0.001$). In addition, patients treated with the activeL demonstrated higher rates of radiographic success ($p < 0.01$) and also trended toward better ODI scores ($p = 0.09$). Patient satisfaction with the treatment was over 90% in each of the groups at two years, with over 90% saying that they would definitely/probably have the surgery again.

Conclusion: This study of patients with low back pain, comparing a new disc replacement device with two currently approved by the FDA, demonstrates that the new, activeL, is a safe and effective treatment, with non-inferior performance as compared to other total disc replacements.

Garcia, R., et al. Lumbar Total Disc Replacement for Discogenic Low Back Pain: Two-Year Outcomes of the ActiveL Multicenter Randomized Controlled IDE Clinical Trial. *Spine.* 2015, December; 40(24): 1873-1881.

MATERNAL PHYSICAL ACTIVITY AND UMBILICAL STEM CELLS

Fetal stem cells have been associated with postnatal health outcomes in cases such as cardiovascular disease and breast cancer. This study explored the effect of exercise before and during

pregnancy on fetal stem cell populations.

Subjects were recruited from the Tufts Medical Center. All had a singleton full-term pregnancy with no blood-borne diseases or pregnancy complications. Exercise information was documented during the 12 weeks prior to pregnancy, as well as during the first and second trimesters. Exercise was categorized as vigorous, moderate or light. Fetal stem cell samples were obtained from the umbilical cord at delivery, with flow cytometry used to assess cell subpopulations. Stem cells were identified as hemopoietic stem cells, endothelial precursor cells, or breast putative progenitor cells.

A total of 373 pregnant women were recruited for the study. The amount of pre-pregnancy vigorous exercise was significantly related to levels of endothelial (CD34+CD133+, CD34+CD133+VEGFR2+, CD34+VEGFR2+, and CD133+VEGFR2+) progenitor cell populations ($p = 0.02$, $p = 0.01$, $p = 0.001$, and $p = 0.003$, respectively). No significant associations were observed between the amount of pre-pregnancy vigorous exercise and levels of hemopoietic stem cell populations.

Light exercise during the first trimester was not associated with any cell population, although light exercise during the second trimester was associated with endothelial CD34+VEGFR2+ progenitor levels ($p = 0.03$). Levels of EpCAM+CD49f+ and CD49f+CD24+ breast stem cell subpopulations were significantly lower among pregnant women who engaged in vigorous/moderate exercise during pregnancy than among those who did not exercise ($p = 0.05$ and $p = 0.02$, respectively).

Conclusion: This study found that the amount of vigorous exercise before pregnancy is strongly associated with levels of endothelial progenitor cells, suggesting a potential for improving cardiovascular fitness in offspring. Vigorous/moderate exercise during pregnancy had a negative association with putative breast stem cells.

Onoyama, S., et al. Prenatal Maternal Physical Activity and Stem Cells in Umbilical Cord Blood. *Med Sci Sports Exerc.* 2016, January; 48(1):82-89.

MEDICATION OVERUSE HEADACHE AND PRIMARY CARE

Chronic headache affects two to five percent of the population worldwide, with approximately 50% of those with chronic headache having medication-overuse headaches (MOHs). This paper presents data for headache disability, anxiety and depression of MOH patients versus controls, from a study of a brief intervention (BI) for MOH in primary care (the BIMOH study).

This double-blind, pragmatic, cluster, randomized, controlled trial included patients seen by 50 general practitioners in Norway. Subjects were 18 to 50 years of age, with self-reported, chronic headache, all fulfilling the international classification of headache disorders for MOH. Those in the treatment group received a BI, including information on severity of dependence scales and personal risk for MOH, the need to cut down on medication use, the expected gains and the difficulties to be overcome. The general practitioners, in collaboration with their patients, could determine the point where rescue medications and short term sick leave were necessary. The primary outcome variables were numbers of headaches and medication days/month.

Subjects included 60 patients with MOH and 40 controls. Among those with MOH, patients were divided into a BI group or a business as usual (BAU) group. Those in the BI group experienced significantly fewer headaches and medication days per month at three months than those in the control group. At follow-up, 67% in the BI group were without medication overuse, with chronic headache resolved in 50%, as compared with three percent and six percent, respectively, in the BAU group.

Conclusion: This study of patients with medication-overuse headaches revealed that those individuals had high levels of disability, with anxiety and depression. Treatment by detoxification by a primary care provider was effective in reducing the number of headaches and degree of medication overuse.

Kristoffersen, E., et al. Disability, Anxiety and Depression in Patients with Medication-Overuse Headache

in Primary Care-The BIMOH Study. *Eur J Neurol.* 2016, January; 23 Suppl 1: 28-35.

OUTCOME AFTER KNEE REPLACEMENT IN RHEUMATOID ARTHRITIS

Historically, over 50% of patients with rheumatoid arthritis (RA) have undergone orthopedic surgery over the course of the illness. This study evaluated pain, function, and quality of life after primary total knee replacement (TKR) in a cohort of patients with RA, as compared with those with osteoarthritis (OA).

All primary TKR patients in a prospective joint replacement registry between 2007 and 2010 were eligible for enrollment. From that database, 268 patients with RA were identified. Data gathered included RA specific information concerning medication use, use of RA related medications, assessments of pain function and quality of life data, using the WOMAC and SF-12 questionnaires. Results were compared with those of patients undergoing surgery due to OA.

Data were gathered for 4,020 patients with OA and 136 patients with RA. Pain, as measured by the WOMAC, was significantly worse at baseline for patients with RA undergoing TKR ($p < 0.0001$), as compared to those with OA. However, at two years, almost all patients with RA and OA had achieved clinically meaningful improvement in pain, with no significant difference in WOMAC pain scores at two years (13.3 versus 12.7, $p = 0.65$).

Preoperative SF-12 PCF scores were significantly worse for patients with RA at baseline and remained so at two years. Satisfaction with surgery was high for both patients with RA and those OA, with most reporting that they were very satisfied with the pain relief (81% versus 71%, $p = 0.89$).

Conclusion: This study found that patients with rheumatoid arthritis achieve excellent pain and functional outcomes after primary knee replacement, with improvement consistent with that achieved by patients with osteoarthritis.

Goodman, S., et al. Patients with Rheumatoid Arthritis Have Similar, Excellent Outcomes after Total

Knee Replacement Compared with Patients with Osteoarthritis. *J Rheumatol.* 2016, January; 42(1): 46-52.

PLANTARIS EXCISION FOR ACHILLES TENDINOPATHY

Achilles tendinopathy can be debilitating. Recent studies have reported encouraging results after the release of adhesions surrounding the Achilles tendon and sectioning of the plantaris tendon. This study evaluated the clinical results and time to return to sport following Achilles tendon release, with plantaris excision among athletes with focal medial Achilles tendon pain.

This prospective, consecutive case series included elite athletes who presented with focal, Achilles tendon pain and swelling along the medial edge of the Achilles tendon. All underwent MRI examination confirming paratendinitis. All athletes had initially failed conservative intervention, and then underwent surgical release of adhesions between the Achilles tendon and the paratendon. The plantaris tendon was identified, released from the medial aspect of the Achilles tendon and transected. Outcomes were assessed with a visual analog scale (VAS) score and the foot and ankle outcome score (FAOS).

Subjects were 32 athletes with a mean age of 27.2 years and a mean follow-up of 22.1 months. Visual analog scale scores for pain improved from 5.8 to 0.8 ($p < 0.001$). Significant improvement was also noted in FAOS scores, from a mean of 333 to 449 ($p = 0.007$). Following surgery, 69% of the patients were very satisfied, and 22% partially satisfied, with 94% returning to sport at a mean of 10.3 weeks.

Conclusion: This study of elite athletes with noninsertional Achilles tendinopathy found that excision of the plantaris tendon and debridement of the ventral aspect of the Achilles tendon can significantly improve symptoms and return to sport participation.

Calder, J., et al. Plantaris Excision in the Treatment of Noninsertional Achilles Tendinopathy in Elite Athletes. *Br J Sports Med.* 2015, December; 49(23): 1532-1534.

MUSCLE POWER VERSUS PAIN AND QUALITY-OF-LIFE IN OSTEOARTHRITIS

Knee osteoarthritis (OA) is a highly prevalent condition that often leads to disability and decreases in quality of life. Studies which have evaluated the relationship between muscle strength at the knee and the progression of OA have produced inconsistent results. This study investigated the relationships between leg muscle strength, muscle power and perceived disease severity in patients with established knee OA.

This single center, cross-sectional study investigated 190 patients with radiographically diagnosed knee OA. The subjects were assessed with the WOMAC pain subscale and the SF - 36 health questionnaire with muscle strength assessed using a one repetition maximum in the leg press. Muscle power and peak contraction velocity measurements were made after a five-minute rest.

A multivariate analysis revealed that leg strength, power and contraction velocity in patients with OA were decreased compared to those of the reference population. Power was found to be inversely associated with OA ($p < 0.02$). While muscle power was a significant, independent predictor of pain ($p < 0.02$) and PCS scores ($p < 0.05$), muscle strength was not an independent determinant of pain or quality-of-life.

Conclusion: This study found that, among patients with osteoarthritis of the knee, leg power is independently predictive of pain and function.

Reid, K., et al. Muscle Power Is an Independent Determinant of Pain and Quality-Of-Life in Knee Osteoarthritis. *Arthritis Rheum.* 2015, December; 67(12): 3166-3173.

OUTCOME AFTER PLANTAR FASCIA RELEASE

Plantar fasciitis is a common condition, with a lifetime incidence of up to 10%. When conservative measures fail to provide sufficient relief, open plantar fascia release may be considered. This study evaluated the long-term effect of open plantar fascia release.

This retrospective study included 37 patients identified with

recalcitrant plantar fasciitis, undergoing plantar fascia release surgery. Data gathered included preoperative function, work status, sleep disturbance and ability to exercise. The subjects were contacted at an average of 80 months post-surgery, and invited to complete two, patient-reported outcome questionnaires, the Manchester Oxford Foot Questionnaire (MOXFQ) and the Visual Analog Scale-Foot and Ankle (VAS-FA).

After surgery, the mean MOXFQ total score was 33.6. The mean VAS- FA score was 57.8. The authors also found worse outcomes among those with preoperative steroid injections, and better outcomes in older patients. A negative correlation was noted between the duration of follow-up and outcome, with patients continuing to improve for many years after surgery.

Conclusion: This study of patients with recalcitrant plantar fasciitis found that those patients improved after surgery, although that improvement was rather poor.

Macinnes, A., et al. Long-Term Outcome of Open Plantar Fascia Release. *Foot Ankle Intern.* 2016, January; 37:17 – 23.

POSITIVE PRESSURE WALKING FOR KNEE OSTEOARTHRITIS

Osteoarthritis (OA) is a major cause of disability. While exercise is considered important for improving function among patients with OA, data are lacking regarding which types of exercises are best. As lower body positive pressure (LBPP) reduces weight-bearing loads, distributes pressure evenly and allows normal muscle activation patterns, this study was designed to determine whether exercises with body weight support might be better tolerated and more effective than conventional exercise among patients with symptomatic OA.

This prospective study enrolled patients with symptomatic OA and with a body mass index of 25 kg/m² or greater. All had radiographic evidence of mild to moderate OA. Treadmill exercise was performed for 25 minutes at 3.1 m/h, twice weekly. Body weight support was gradually increased until pain reduction was maximized or 40%

support was provided. Assessments were made at baseline and at week 12, including Knee Injury and Osteoarthritis Outcome Scores (KOOS), visual analogue scale (VAS) scores of pain and percentage of LBPP support.

Subjects were 31 patients, ages 50 to 75 years. Compared to baseline, overall pain scores improved from 3.2 to 1.8, with eight participants walking pain-free during follow-up walking sessions ($p = 0.0001$). In addition KOOS scores improved significantly in subscales of pain, symptoms, ADLs, Sport/Rec and quality of life ($p = 0.02$, $p = 0.001$, $p = 0.007$, $p = 0.003$ and $p = 0.0002$, respectively).

Conclusion: This study of patients with osteoarthritis of the knee found that lower body positive pressure exercise may result in both functional and pain symptom improvement when treating patients who are overweight or obese.

Peeler, J., et al. Effects of Bodyweight Supported Physical Activity and Joint Pain, Function and Muscle Strength. *Clin J Sports Med.* 2015, November; 25: 518-523.

RECOVERY TIME FOR SPORTS RELATED CONCUSSIONS

While symptom resolution after sports related concussion has been reported in some detail among high school athletes, data remain limited concerning the epidemiology of these concussions in college student-athletes. This study was designed to describe the epidemiology of sports related concussions sustained during participation in National Collegiate Athletic Association (NCAA) sports.

Data were obtained from the NCAA injury surveillance program from 2009 to 2014, utilizing a convenience sample of varsity teams from 25 sports, with certified athletic trainers reporting injury data. Types of symptoms, symptom resolution and return play timing were categorized.

During the study period, a total of 1,670 sports related concussions were reported, with 888 occurring during competition and 782 during practice. Football contributed to the greatest number of sports related concussions, followed by men's ice hockey and women's soccer. The most commonly reported symptoms were headache 92.2%, dizziness

60.9% and difficulty with concentration 58.3%.

Symptoms resolved within one week in 60.1%, while 6.2% had symptom resolution in more than four weeks. Over the five academic years of the study, the proportion of sports related concussions with long symptom resolution time increased from 3.7% in 2009 to 8.3% in 2013 ($p=0.03$). The proportion of concussions that required at least one week before return to play increased from 42.7% in 2009 to 70.2% in 2013 ($p<0.01$).

Conclusion: This study of NCAA athletes found that return to play taking more than one week increased of the study, likely reflecting changes in the management of concussions.

Wasserman, E., et al. Epidemiology of Sports Related Concussions in National Collegiate Athletic Association Athletes from 2009-2010 to 2013-2014: Symptom Prevalence, Symptom Resolution Time, and Return-to-Play Time. *Am J Sports Med.* 2016, January; 44 (1): 226-233.

RETURN TO WORK AFTER HIP AND KNEE REPLACEMENT

The number of total hip arthroplasty (THA) and total knee arthroplasty (TKA) surgeries is between 70 and 112 per 100,000 in northern Europe and the United States. Studies have shown that 15 - 45% of these patients are of working age, with plans to return to work after surgery. This study quantified the work status and return to work in both THA and TKA.

Data from patients 18 to 65 years of age who underwent TKA or THA were gathered from the Department of Orthopedics at Alrijne hospital in the Netherlands. This prospective, cohort study gave all patients a preoperative and a one-year post-operative questionnaire, gathering data on demographics, work status and quality of life, as well as functional outcome information. Preoperative and postoperative data were analyzed from 71 patients with THA (average age 57.7) and 64 with TKA (average age 57.4). The primary outcome measures were work status and time to return one year after surgery.

The mean times to return to work were 12.5 weeks for patients with THA, and 12.9 weeks for patients

with TKA. At one year, 64 of 71 patients with THA, and 56 of 64 those with TKA had returned to work. At one year, 14% of the patients with THA and 19% of those with TKA reported working fewer hours per week than before surgery.

Conclusion: This study of adult patients undergoing knee or hip joint replacement found that a large majority returned to work at an average of 12 weeks after surgery.

Tilbury, C., et al. Return to Work after Total Hip and Knee Arthroplasty: Results from a Clinical Study. *Rheum Intern.* 2015, Dec; 35 (12): 2059-2067.

TREATMENT OF SUBACROMIAL BURSITIS

Among patients with subacromial bursitis, studies have demonstrated an increase in the expression of several cytokine genes (TNF, IL-1alpha, IL-1beta and IL-6). This study assessed the efficacy of treatment with a long-acting IL-1 blocking medication, as compared with that of a corticosteroid.

Subjects were 18 years of age or older, all reporting shoulder pain of a minimum of two weeks' duration, with a diagnosis of subacromial bursitis. The participants were randomized to receive either 160 mg of riloncept or a mixture of 2 mL of 1% lidocaine, 2 mL of 0.5% bupivacaine and 2 mL of triamcinolone acetonide (40 mg/mL). The primary outcome measure was the QuickDASH questionnaire (a shortened version of the Disabilities of the Arm, Shoulder, and Hand (DASH) Outcome Measure), administered four weeks post-injection.

Comparing QuickDASH scores between treatment arms, a significant difference was found between groups, favoring the triamcinolone group, at four weeks post-injection ($p=0.004$). At four weeks, the triamcinolone group also had superior pain scores compared with the riloncept group ($p=0.044$).

Conclusion: This study of patients with subacromial bursitis found that subjects injected with a long-acting interleukin one blocking medication had significant improvement in pain and function, although that improvement was inferior to that of those injected with triamcinolone.

Carroll, M., et al. Riloncept in the Treatment of Subacromial Bursitis: A Randomized, Noninferiority, Unblinded Study versus Triamcinolone Acetonide. *Joint Bone Spine.* 2015, December; 82(6): 446-450.

TOPICAL MANNITOL AND CAPSAICIN- INDUCED PAIN

Previous studies have demonstrated that topical and injected sugar and sugar-alcohols affect small, peptidergic polymodal nerve fibers, which are associated with neuropathic pain. Among the treatments for neuropathic pain, capsaicin is known to stimulate the transient receptor potential vanilloid type 1 (TRPV1) receptors, although topical application is often found to produce a painful burning sensation. This study investigated the utility of topical mannitol, a metabolically inert sugar-alcohol, to reduce capsaicin-induced pain.

This randomized, double-blind, placebo-controlled study evaluated

25 adult participants with intact sensation and pain free lips. A small amount of capsaicin 0.75% was applied to both halves of each subject's upper lip. After five minutes, or when the burning sensation reached a self-reported numeric value of eight of 10, the cream was removed. A cream containing mannitol or a placebo cream was then immediately applied to each side of the upper lip. Subjects self-reported a numeric rating scale pain after 10 minutes.

At five minutes after capsaicin application, subjects reported an average numeric rating scale score of 7.8, equivalent on both sides. The participants noted that the side treated with the mannitol cream had faster resolution and maintenance of pain relief than the control side at three to 10 minutes ($p<0.01$).

Conclusion: This study of subjects with capsaicin induced pain found that topical mannitol may be useful in reducing self-reported pain, suggesting that mannitol may affect the TRPV1 pain receptors.

Bertrand, H., et al. Topical Mannitol Reduces Capsaicin-Induced Pain: Results of the Pilot Level, Double-Blind, Randomized Controlled Trial. *PMR.* December, 2015; 7(11): 1111-1117.

TRANSCRANIAL MAGNETIC STIMULATION AND CERVICAL DYSTONIA

Studies have suggested that people with cervical dystonia (CD) may have impaired sensorimotor integration and plasticity, with overactivity of the primary motor cortex (M1) with reduced intracortical inhibition. This study examined whether the use of repetitive transcranial magnetic stimulation (rTMS) to inhibit the sensorimotor cortex can normalize evoked potential amplitudes and short latency afferent inhibition (SAI) in patients with CD.

Twelve patients with CD underwent one session of rTMS over the left primary sensory cortex as an active condition and a separate session at the left primary motor cortex, as a control condition. Eight, healthy, control patients underwent one session of rTMS over the left primary sensory cortex only. Motor evoked potential (MEP) amplitudes and short latency afferent inhibition (SAI) were measured before and after rTMS at

the right first dorsal interosseous muscle and the right index finger, respectively.

At baseline, MEP amplitudes did not differ between the groups. However, the SAI was relatively decreased in subjects with CD. After the inhibitory rTMS to the primary sensory cortex, MEP amplitudes increased. This was not true with stimulation to the primary motor cortex. In contrast, SAI normalized after rTMS to both the primary sensory and motor cortices.

Conclusion: This study of patients with cervical dystonia found that their impaired sensorimotor integration could be normalized by inhibitory stimulation to the primary sensory and motor cortices using rTMS.

Zittel, S., et al Normalization of Sensorimotor Integration by Repetitive Transcranial Magnetic Stimulation in Cervical Dystonia. *J Neur.* 2015, August; 262 (8): 1883-1889.

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MUSCULOSKELETAL IN REVIEW

Produced by the Department of
Rehabilitation Medicine, Emory
University School of Medicine

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