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LOW DOSE NALTREXONE AND QUALITY OF LIFE IN MULTIPLE SCLEROSIS

Naltrexone is a mu opiate receptor antagonist, approved for the treatment of opiate addiction. Low-dose naltrexone (LDN) is proposed to normalize endogenous endorphin levels. Some have suggested that this effect on endorphins might be beneficial in treating autoimmune disease. An open label study of 40, primary progressive multiple sclerosis (MS) patients found that spasticity was significantly reduced after six months of treatment with LDN. This study further evaluated the impact of LDN on patients with MS.

This randomized, double-masked, placebo-controlled, crossover study included 80 patients between the ages of 18 and 75 years. All had clinically definite MS. The subjects were randomized to receive either a placebo or similar capsules containing 4.5 mg of naltrexone once per day. All were assessed for quality of life with the MS Quality of Life Inventory (MSQLI), composed of eleven rating scales. Each subject completed eight weeks of treatment, and then a washout period, followed by the alternate treatment capsule.

Seventy subjects completed both treatment periods. No serious adverse effects were noted among those taking LDN. Those treated with LDN demonstrated significant improvements on mental health quality of life measures, including the SF-36 ($p=0.04$), as well as improvements on the Mental Health Inventory ($p=0.04$), the Pain Effects Scale ($p=0.04$) and the Perceived Deficits Questionnaire ($p=0.05$).

Conclusion: This study of patients with multiple sclerosis found that eight weeks of treatment with low-dose naltrexone is associated with improvement on self-report mental health outcome measures.

Cree, B., et al. Pilot Trial of Low-Dose Naltrexone and Quality of Life in Multiple Sclerosis. *Ann Neur.* 2010, August; 68: 145-150.

VITAMIN D AND RELAPSE RISK IN MULTIPLE SCLEROSIS

Multiple sclerosis (MS) is a chronic central nervous system disorder, characterized in the majority of cases by relapsing-remitting inflammatory demyelination. One of the striking features of MS epidemiology is that increasing latitude correlates with increasing prevalence and incidence. A growing body of work now indicates that sunlight and vitamin D may be involved in the etiology of MS. This study examined whether increasing levels of serum 25-hydroxy vitamin D (25 OH-D) are associated with a lower relapse risk in MS.

The Southern Tasmanian Multiple Sclerosis Longitudinal Study is a prospective, longitudinal cohort study addressing the role of ultraviolet radiation (UVR) exposure and 25 OH-D on the clinical course of MS. This study followed 203 persons with clinically definite MS living in southern Tasmania, Australia, from 2002 to 2005. Of those, 146 had relapsing-remitting MS. At each biannual review, participants answered questions concerning physical activity, tobacco abuse, use of immunomodulatory therapy, vitamin D supplements and pregnancy. In addition, the participants were asked to estimate how much time they spent in the sun during weekends and holidays. Polysulfone badges were used to measure personal UVR objectively. The hazard of a relapse was assessed using a survival analysis.

A total of 122 confirmed relapses occurred in 70 participants. Physical activity was a strong predictor of 25 OH-D, even after adjusting for time spent outdoors. Increasing levels of

25 OH-D were associated with younger age and the gender adjusted hazard ratio of relapse ($p=0.006$). The association between 25 OH-D and the hazard of relapse was linear, with no evidence of a threshold effect. This association was not significantly altered by adjustments for immunomodulatory therapy, smoking, physical activity, melanin density, pregnancy or acute infection. The beneficial effect of a higher 25 OH-D level was evident during both winter and summer.

Conclusion: This prospective, population based, cohort study found that higher levels of 25 OH-D are associated with a reduced risk of relapse in patients with relapsing remitting multiple sclerosis.

Simpson, S., et al. Higher 25 Hydroxy Vitamin D Is Associated with Lower Relapse Risk in Multiple Sclerosis. *Ann Neur.* 2010, August; 68(2):193-203.

CORTEX SPARING INFARCTIONS WITH OCCLUSION OF THE MIDDLE CEREBRAL ARTERY

Occlusions of the middle cerebral artery (MCA) often develop into large territory infarctions. However, many patients with MCA occlusion have small, subcortical infarctions, or may even lack an ischemic lesion. The extent of cortical involvement may reflect the degree to which the leptomeningeal collateral circulation can supply the cerebral cortex. This study investigated the presence and function of pre-existing connections of the cerebral arteries on the leptomeningeal surface by categorizing infarction patterns among patients with MCA occlusion.

This retrospective study included 3,321 patients with acute infarction, admitted to a neurological department and listed in the Yonsei Stroke Registry between January of 2000 and October of 2008. Included in the

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study were patients who had sustained an acute infarction in the MCA territory and an occlusion of the M1 segment. Infarction patterns were categorized based upon the extent of cortical surface involvement, and included total cortex (TC) involvement, partial cortex (PC) involvement or no cortex (NC) involvement.

Of the 3,321 patients studied, 6.4% had ischemic lesions in the MCA territory, with occlusion of the M1 segment. Of those, 73 were eligible for the study. Of the 73 patients with symptomatic MCA occlusions, the most common pattern of DWA lesions was NC (54%), followed by TC (27%) and PC (19%). The proportion of patients with complete cortical sparing was similar between those with cardioembolic and large artery atherosclerotic strokes.

Conclusion: In this study of patients with a complete MCA occlusion, only 27% had total cortex involvement, supporting the hypothesis that the cerebral arteries are very often functionally interconnected by leptomeningeal anastomoses.

Cho, H., et al. Cortex Sparing Infarctions in Patients with Occlusion of the Middle Cerebral Artery. *J Neur Neurosurg Psych.*2010, August; 81: 859-863.

BETAINE SUPPLEMENTATION FOR STRENGTH AND POWER

Betaine is involved in diverse cytoprotective and metabolically beneficial pathways in plants and animals. Recent human research has examined the ergogenic potential of betaine in endurance and resistance exercise. This study investigated the ergogenic effects of betaine supplementation on strength and power performance.

Twelve healthy, recreationally active men participated in this study. All had had least three months of resistance training and experience, with no history of musculoskeletal disorders. All subjects performed an exercise protocol providing data concerning physical performance. During this protocol, power and force were measured using a force plate.

After baseline testing, the subjects underwent 14 days of betaine or placebo supplementation, again

followed by exercise testing on two consecutive days (D1 and D2). The betaine supplement was administered at 1.25 g in 300 mL of Gatorade twice daily. Additionally, on each testing day, the subjects received a morning dose of the betaine supplement or placebo. Blood samples were collected before and immediately following exercise, as well as 15 minutes after cessation.

After 14 days of betaine supplementation, plasma concentrations were significantly greater than corresponding baseline and placebo levels. Following supplementation, significant increases were seen in power output for two of four vertical jumps performed on D1 and D2, as compared to placebo. In addition, D1 and D2 bench throw power and isometric bench press forces had increased in the betaine group ($p < 0.05$), as compared to pre-supplementation values.

Conclusion: This study demonstrates that betaine supplementation can increase power and force on selected performance measures.

Lee, C., et al. Ergogenic Effects of Betaine Supplementation on Strength and Power Performance. *Int Soc Sp Nut.* 2010; 7: 27.

CAFFEINE AND EXERCISE PERFORMANCE IN SEDENTARY FEMALES

Caffeine is thought to improve both mental and physical performance. This belief has led to its widespread use among athletes. This study examined the effect of caffeine ingestion on measures of performance in a sedentary female sample.

Ten, healthy females who did not drink caffeine on a regular basis were enrolled in this double-blind, randomized, crossover trial. After fasting overnight, a caffeine capsule or a placebo was taken in the morning. The participants then arrived at the exercise physiology laboratory at 7:15 a.m. The subjects exercised on a stationary bicycle at a standardized power output equal to 65% of heart rate maximum for 15 minutes (phase A), followed by 10 minutes of cycling as fast as possible (phase B). The average results were calculated for total work, overall mean

power output, and total energy expenditure recorded between trials during both phases. Results were compared between those who did and those who did not consume caffeine.

No significant differences were seen between the groups in mean power output and total amount of work performed during phase A. Caffeine ingestion did, however, significantly affect total energy expenditure during Phase A ($p=0.01$). Post-hoc analysis revealed a significant increase in energy expenditure and changes in VO_2 Max at the 15 min mark of the exercise trial after caffeine ingestion, as compared to placebo ($p=0.007$ and $p=0.008$, respectively). In phase B, no significant differences were found between the groups in the total amount of work performed, overall mean power, total energy expenditure, rate of perceived exertion, or VO_2 .

Conclusion: This study demonstrated that ingestion of caffeine by sedentary females can increase energy expenditure and oxygen consumption without increasing heart rate, perceived exertion, work or power while performing submaximal exercise.

Wallman, K., et al. Effects of Caffeine on Exercise Performance in Sedentary Females. *J Sp Sci Med*. 2010; 9(2): 183-189.

BALANCE TRAINING TO PREVENT ANTERIOR CRUCIATE LIGAMENT INJURY

Knee injuries account for almost 50% of all sports injuries. Injuries to the anterior cruciate ligament (ACL) are relatively common, often occurring during noncontact cutting and landing maneuvers. Strength training to improve performance and to lessen the potential for injury has long been adapted by many sports, and has been found to increase the coordination of synergistic muscles. In addition, balance training has become an important component of sports preparation. However, the effect of balance training on knee loading and kinematics during the execution of sport specific maneuvers remains unknown. This study investigated the effect of strength training and balance training on knee joint loading and lower limb

kinematics during sporting maneuvers of running and cutting.

Fifty, healthy, Australian rules football players, all with no history of lower limb pain or injury, were studied. The subjects were randomized to either a control group or one of four training regimens. These conditions included strength training with machines, strength training with free weights, balance training and combined balance training and machine strength training. Pretesting was completed using extensive video analysis of sidestepping and running motions. The angles of the joints, particularly of the knees, were used to perform a three-dimensional kinetics analysis at different phases of gait. Training was then completed using 30-minute sessions, three times per week, for 12 weeks. A control group completed normal team training. Post-training measurements were then recorded.

All resistance training groups had significantly increased in three-repetition maximum strength after the intervention ($P < 0.001$). At completion of the study, it was concluded that balance training alone had induced positive changes in joint loading that could reduce the risk of ACL injury. Specifically, the balance training group had decreased their peak valgus and peak internal rotation moments during weight acceptance in all maneuvers. This group also lowered their flexion moments during the sidestep to 60° maneuver. Exclusive strength training produced variable results, depending upon the phase of the stance.

Conclusion: This study found that balance training can reduce the risk of anterior cruciate ligament injury, and suggested that the necessary strength training for sports should be performed in conjunction with balance training in order to reduce this injury potential.

Cochrane, J., et al. Training Affects Kinematics and Kinetics in Cutting Maneuvers in Sport. *Med Sci Sp Exer*. 2010, August; 42(8): 1535-1544.

PRE-WORKOUT SUPPLEMENT CONTAINING CAFFEINE, CREATINE AND AMINO ACIDS

Several studies support the use of high-intensity interval training (HIIT) strategies to improve athletic

performance. As HIIT may cause several physiological adaptations within a relatively brief training period, this technique may be an appropriate tool for examining training and supplement induced changes in performance. This study examined the effects of a pre-workout supplement, combined with three weeks of HIIT, on aerobic and anaerobic running performance, training volume and body composition.

Twenty-four, moderately trained men and women volunteered for this study. Using a randomized, single-blind, placebo controlled, parallel design, each subject visited the laboratory on 18 separate occasions. All patients were assessed for body composition, and were randomized to either an active supplement group or a placebo group. The active supplement (Game Time) includes a proprietary blend including whey protein, Cordyceps sinensis, creatine, Citrulline, ginseng and caffeine.

Thirty minutes prior to testing and training sessions, the participants consumed either the active or the placebo supplement, mixed in eight ounces of water. All subjects performed a maximal graded exercise test to volitional exhaustion on a treadmill, in order to determine VO_2 max. Four treadmill runs to exhaustion were performed. The time to exhaustion and distance achieved were recorded for each run. After baseline testing, the participants completed three weeks of HIIT. The training intensity began at 90% of the VO_2 max test velocity, and progressed to reach a maximum of 110% by the end of the three-week training period.

Both the supplement and the control groups demonstrated a significant ($p = 0.028$) increase in VO_2 max, resulting in 10.3% and 2.9% improvements, respectively. Aerobic work capacity increased ($p = 0.036$) for the supplement group by 2.9%, while the placebo group did not change ($p = 0.256$). Anaerobic running capacity increased by 22.9% for the placebo group and by 10.6% for the supplement group. The percent of body fat decreased from 19.3% to 16.1% for the supplement group, and from 18.0% to 16.8% for the placebo group ($p = 0.178$). Lean body mass increased from 54.2 kg to 55.4 kg ($p = 0.035$) for the supplement group, and decreased from 52.9 kg to 52.4 kg for the placebo group ($p = 0.694$).

Conclusion: This study of moderately trained men and women indicate that the acute ingestion of a supplement containing caffeine, creatine, branch chain amino acids, protein, cordyceps sinensis, citrulline and rhodiola, taken prior to exercise can significantly improve aerobic capacity and total training volume.

Smith, A., et al. The Effects of a Pre-Workout Supplement Containing Caffeine, Creatine, and Amino Acids during Three Weeks of High-Intensity Exercise on Aerobic and Anaerobic Performance. *J Int Soc Sp Nut.* 2010, **7**: 10.

EARLY VERSUS DELAYED ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

Anterior cruciate ligament (ACL) ruptures primarily affect physically active young people. Surgical reconstruction has been regarded as critical for good outcome, and is commonly performed, particularly for those who wish to resume sport activities. This study sought to determine whether a strategy of structured rehabilitation with early ACL reconstruction is superior to one involving delayed ACL reconstruction.

Subjects 18 to 35 years of age who presented with recent knee trauma were screened for eligibility. Those with ACL injuries were randomized to either a structured rehabilitation plus early reconstruction (an early reconstruction group) or to structured rehabilitation with delayed reconstruction (a delayed reconstruction group). A baseline MRI verified ACL rupture and other knee injuries.

The subjects were evaluated with the Knee Injury and Osteoarthritis Outcome Score (KOOS), the Medical Outcomes Study 36 Short Form Health Survey (SF-36), and the Tegner Activity Scale (TAS). The primary outcome variables were changes from baseline to two years in the average scores on four of the five KOOS subscales, scores on the SF-36 physical and mental components, results on the TAS and the percentage of subjects with KOOS quality of life scores of below 44 (more than moderately decreased, knee-related quality of life).

Of the 59 subjects in the delayed-reconstruction group, 23 underwent ACL reconstruction at an average of

11.6 months after randomization. Those in the delayed reconstruction group had fewer rehabilitation visits than did those in the early intervention group ($p < 0.05$). At two years, no significant difference was seen between the two groups in KOOS scores. In addition, no significant differences occurred on subscales including pain, symptoms, function, activities of daily living and function in sports and recreation.

Conclusion: This study of patients undergoing anterior cruciate ligament reconstruction found that a delay in the surgery does not adversely affect long-term outcome.

Frobell, R., et al. A Randomized, Controlled Trial of Treatment for Acute Anterior Crucial Ligament Tears. *NEJM.* 2010, July 22; 363: 331-342.

DISTAL RADIAL FRACTURES IN THE ELDERLY

Previous studies of distal radial fractures in the elderly have demonstrated that malalignment does not necessarily correlate with poor functional outcome. Despite this finding, the rate of operative treatment of distal radial fractures in the elderly has increased in the past decade. This retrospective study compared two cohorts of elderly patients with distal radial fracture, who were managed either operatively or non-operatively, in order to determine the functional outcomes of these groups.

Between October of 2004 and October of 2008, 600 patients with distal radial fractures presented to the authors' institution and were enrolled into a database. Initially, all displaced fractures underwent closed reduction and splinting. Patients who met the criteria for closed treatment, on the basis of radiographic injury and demographic parameters, were discharged to follow-up in the outpatient setting within one week of presentation. At that time they were reexamined clinically and radiographically to assess maintenance of the reduction.

Surgical patients were treated with either plate and screw fixation or external fixation. Eighty-two of the total sample were treated surgically, and 74 were treated conservatively. Thirty-two of those in the operative group and 17 in the nonoperative

group missed their one-year follow-up appointments and were excluded from further analysis. Interviewers obtained baseline demographic data, injury information, and baseline functional scores on the Disabilities of the Arm Shoulder and Hand (DASH) questionnaire. Follow-up was conducted at two, six, 12, 24 and 52 weeks.

At three months, no significant differences were seen between the groups in wrist range of motion. At six months, those treated nonoperatively had better wrist extension ($p = 0.04$). While no significant differences in wrist flexion or ulnar or radial deviation were noted, at one year, those who had undergone surgical treatment had significantly better grip strength. No significant differences were seen between the two groups in pain at any time point. Further, no significant differences were noted in DASH scores at baseline or at three, six or 12 months' follow-up. Finally, radiographic outcomes favored the operative group at each follow-up interval.

Conclusion: This study, comparing operative with nonoperative treatment of distal radial fractures in the elderly, found that those treated nonoperatively have minor limitations in range of motion, as well as diminished grip strength, as compared to those treated operatively. However, these differences did not translate into differences in functional outcome at one year.

Egol, K., et al. Distal Radial Fractures in the Elderly: Operative Compared with Nonoperative Treatment. *J Bone Joint Surg (Am).* 2010, August 4; 92-A(9): 1851-1857.

EFFECTS OF WALKING DISTANCE ON DEPRESSION IN THE ELDERLY

Depressive symptoms have been identified in eight to 20% of older, community dwelling residents, and in up to 35% of older primary care patients. Depression is associated with greater morbidity and mortality, and with a greater risk of physical decline and onset of disability. Cross-sectional and longitudinal studies have shown the benefits of physical activity on depressive symptoms in older cohorts. This study reviewed the relationship between walking

distance and incident depressive symptoms.

Subjects were recruited from among participants of the Honolulu Heart Program. This program began in 1965 as a prospective, population based study of cardiovascular disease in 8,006 men of Japanese ancestry who were born between 1900 and 1919. During the fourth examination, in 1991 to 1993, the subjects were asked how many city blocks they walked each day. Those distances were then converted into miles. The participants were screened for depressive symptoms using the Centers for Epidemiologic Studies Depression Scale (CED-D 11). That screening was repeated during the seventh examination eight years later. Walking distances were compared to CED-D 11 scores.

After adjusting for age, education, marital status, cardiovascular risk factors, prevalent diseases and functional impairment, multivariate models demonstrated significantly lower odds of developing eight-year, incident depressive symptoms in the high (>1.5 miles/day) and intermediate (0.25-1.5 miles/day) walking distance groups ($p < 0.04$ and $p < 0.007$, respectively).

Conclusion: This study of Japanese-American men found that walking at least a quarter of a mile per day is significantly associated with a lower risk of developing depressive symptoms.

Smith, T., et al. Effect of Walking Distance on Eight-Year Incident Depressive Symptoms in Elderly Men with and without Chronic Disease: The Honolulu Asia Aging Study. **JAGS**. 2010, August; 58(8): 1447-1452.

FUNCTIONAL OUTCOME OF MAJOR LOWER LIMB AMPUTATION

Numerous studies have focused on the outcome of lower limb amputation in the contemporary literature. Often, however, the emphasis has been placed on comorbidities and mortality, rather than on functional outcome. This study sought to determine the functional outcomes of patients with lower limb amputation in Australia, where universal healthcare is available for all inpatient and outpatient care.

This retrospective cohort study included the medical records of all consecutive patients who underwent lower limb amputation at the Prince of Wales Hospital in Australia. During the 13-year period between 1994 and 2006, 226 major lower limb amputations were performed. A total of 97% subjects were mobile prior to amputation. The remaining three percent were able to perform transfers independently, but relied on a wheelchair for indoor mobility. Ninety-seven percent were admitted from home. Comorbid conditions were frequent, and included diabetes mellitus (43%) and cardiovascular disease (43%).

Of the 190 patients who survived acute admission, 71% were assessed as having rehabilitation potential. Of those admitted to rehabilitation, 79% were discharged to home, nine percent to a hostel and 12% to a nursing home. Forty-four percent achieved community ambulation with a prosthesis, 20% achieved household ambulation with a prosthesis and 12% used a prosthesis only for transfers or exercise. A total of 24% used a wheelchair only, and were unable to use a prosthesis.

Conclusion: This study of lower limb amputation demonstrates that the vast majority of those patients are able to go home, with most able to achieve community or household ambulation using a prosthesis.

Wu, J., et al. Functional Outcomes of Major Lower Limb Amputation 1994-2006: A Modern Series. **J Prosthet and Orthot**. 2010, July; 22(3): 152-156.

TAPING FOR PATELLOFEMORAL PAIN SYNDROME

Patellofemoral pain syndrome (PFPS) is characterized by diffuse pain over the anterior aspect of the knee, aggravated by activities such as ascending or descending stairs, squatting and prolonged sitting. Studies of taping have resulted in conflicting data concerning whether patellar taping affects the clinical outcome of this condition. This study investigated the effect and predictors of the effectiveness of taping for the treatment of PFPS.

This prospective, cohort study included patients between the ages of 20 and 60 years, each diagnosed

with patellofemoral pain syndrome. A total of 66 women and 34 men, with an average age of 42 years, were recruited. The evaluations included gender, age, body mass index, Q angle, lateral patellar displacement and lateral patellofemoral angle (LPA). Each patient was taped according to the McConnell method, with all instructed to change the tape at home using the technique demonstrated in the clinic. Before taping, the subject was instructed to step down from an eight-inch platform, leading with the non-tested leg. Pain during this test was scored on a visual analogue scale. The procedure was repeated after taping.

The mean, overall VAS score prior to taping was 49 mm, decreasing to 29.3 mm after taping ($p < 0.001$). Among the participants, 66 were classified as responsive and 34 as non-responsive. Those in the responsive group had a smaller mean LPA, a larger mean Q angle and a larger mean pre-taping VAS score than did the nonresponsive patients. Logistic regression analysis revealed that body mass index, LPA and larger Q angle increased the likelihood of effectiveness of treatment.

Conclusion: This prospective study found that, among patients with patellofemoral pain syndrome, taping can significantly improve pain. This effect was less among those with high body mass index, larger lateral patellofemoral angle and/or smaller Q angle.

Lan, T., et al. Immediate Effect and Predictors of Effectiveness of Taping for Patellofemoral Pain Syndrome. **Am J Sp Med**. 2010, August; 38(8): 1626-1630.

WHOLE BODY VIBRATION FOR STRETCHING

Over the past few years, reports on the use of whole body vibration (WBV) have demonstrated positive effects for strength, blood flow, vertical jump and even balance. However, few have reported on the effect of vibration on flexibility. This study sought to determine whether WBV affects static stretching.

Thirty-four, college age, recreationally active students were studied. All had clinical examination findings of tight hamstrings, defined as the inability to touch the tops of their feet from a standing position

with the knees straight, and 70° or less on a straight leg raise. The subjects were randomly assigned to one of three groups, a control group, a static stretch group or a vibration plus static stretch group.

The subjects stretched for five days per week for four weeks, and were followed for three weeks after cessation of the stretching program. Subjects in the vibration group performed their stretches with the vibration platform running at 26 Hz. and 4 mm amplitude. After treatment, bilateral hamstring flexibility was measured by a physical therapist held blind to group assignment.

No significant change in flexibility occurred in the control group. Both the static stretch and the vibration groups demonstrated significantly greater flexibility than did the control groups after four weeks of stretching. The vibration group continued to show greater flexibility than the control group at two weeks and three weeks after treatment end. At three-week follow-up, the static stretch group had returned to baseline, with the vibration group remaining 6.4 degrees more flexible than at baseline.

Conclusion: This prospective study suggests that stretching on a whole body vibration platform may be a good adjunct to static stretching, with the potential to enhance the retention of flexibility gains.

Feland, J., et al. Whole Body Vibration as an Adjunct to Static Stretching. *Int J Sports Med.* 2010; 31: 584-589.

RISING INCIDENCE OF ACROMIOPLASTY

While Neer has suggested that extrinsic impingement of the acromium is the most common cause of chronic rotator cuff derangement, advances in magnetic resonance imaging have provided evidence for intrinsic tendon disease. Further, there is mounting evidence that acromioplasty may not offer significant benefits in the treatment of impingement syndrome, when compared with non-operative treatments. In light of this controversy, this study addressed how the frequency of acromioplasty has changed over time.

The New York Statewide Planning and Research Cooperative System

database was used to identify all acromioplasty procedures performed from 1996 through 2006. Demographic data were collected, including age, gender, payer ICD-9 primary diagnosis and procedure code, location of surgery site and procedure year. In a second phase of this study, the American Board of Orthopedic surgery database was used to compare the volumes of arthroscopic acromioplasties with those of other orthopaedic procedures reported by candidates taking Part II of the board certification.

In 1996, 5,571 acromioplasties were performed in New York State, representing a population incidence of 30 per 100,000. In 2006, 19,743 acromioplasties were performed, representing a population incidence of 101.9 per 100,000. Over 11 years, the volume of acromioplasties increased by 254.4%, while the volume of all orthopedic surgery ambulatory procedures increased by 78.3%. This increase was similar in hospital-based centers and freestanding ambulatory surgery centers.

Conclusion: This study found that acromioplasty has become one of the most frequently performed procedures in orthopedics. These increases are well above those observed for all other orthopedic procedures.

Vitale, M., et al. The Rising Incidence of Acromioplasty. *J Bone Joint Surg (Am).* 2010, August 4; 92(9): 1842-1850.

APOMORPHINE FOR VEGETATIVE AND MINIMALLY CONSCIOUS STATES

Patients who remain in a prolonged state of unconsciousness following a severe traumatic brain injury (TBI) usually evolve to a vegetative state or a minimally conscious state. The neurobiological basis of prolonged unconsciousness is not completely understood. Some have speculated that this phenomenon may include abnormalities of dopaminergic neurotransmission, such as reductions in the dopamine transporter and the expression of D2 receptors. Among dopamine agonists, apomorphine is a potent, direct acting agonist, acting at both the D1 and D2 classes of dopamine

receptors. This study sought to determine the feasibility, efficacy and safety of continuous subcutaneous administration of apomorphine to patients in a vegetative or minimally conscious state caused by a TBI.

All participants were between the ages of eight and 40 years and were clinically stable, but had remained in a vegetative or minimally conscious state for one to four months. Each had suffered a severe closed head injury. The patients were given subcutaneous apomorphine, starting at an infusion rate of two mg per hour, titrated up to eight mg per hour, for 12 to 16 hours per day. The treatment continued for 84 days, with provisions to extend the intervention for up to 180 days. Outcome measures included the Coma-Near Coma Scale (CNCS) and the Disability Rating Scale (DRS).

Prior to apomorphine administration, none of the eight patients had responded to commands. All responded to commands after commencing apomorphine treatment, with the onset of this response occurring from one to 62 days. Four of the patients responded within 10 days. All of the patients demonstrated improvement on the DRS. The improvements were maintained for at least one year, even after discontinuation of the medication.

Conclusion: This pilot study provides evidence that continuous, subcutaneous apomorphine infusion may promote consciousness in patients in a vegetative state or minimally conscious state resulting from a traumatic brain injury.

Fridman, E., et al. Continuous Subcutaneous Apomorphine for Severe Disorders of Consciousness after Traumatic Brain Injury. *Brain Inj.* 2010, April; 24(4): 636-641.

IN HOSPITAL MORTALITY AMONG PATIENTS WITH STROKE

Stroke is among the leading causes of death in the United States. However, recent data suggest that annual stroke death rates are steadily declining. This study assessed the proportion of stroke hospitalizations that result in death in the United States, and addressed predictors of in-hospital mortality after hospitalization.

Data were obtained from the United States Nationwide Inpatient Sample (NIS), developed as part of the Healthcare Cost and Utilization Project, a federal-state-industry partnership. All discharges from sampled hospitals for the calendar year were selected for inclusion into the NIS. To identify stroke hospitalizations, ICD-9 codes were determined for discharged patients. All subjects admitted to hospitals between 1997 and 2006 were included in the analysis. Time trends in the proportion of hospitalizations resulting in death after stroke were then calculated.

Stroke hospitalizations were reduced from 1,351,293 in 1997 to 1998, to 1,202,449 in 2005 to 2006. The overall percentage of stroke hospitalizations resulting in death decreased from 11.5% to 10.3% ($p < 0.0001$). Mortality rates significantly decreased across the study, regardless of stroke type. Multi-variable (multivariate) analysis revealed a higher odds of in-hospital mortality with older age, female gender, non-Medicare insurance and multiple comorbidities.

Conclusion: This study found that the percentage of stroke hospitalizations in the United States resulting in death has decreased over the past decade.

Ovbiagele, B., et al. Nationwide Trends in In-Hospital Mortality among Patients with Stroke. *Stroke*. 2010, August; 41: 1748-1754.

BOTOX SPREAD AFTER INTRAGASTRIC INJECTION

Botulinum toxin (BoNT) has been successfully used for the treatment of many skeletal and smooth muscle hyperactivity disorders. Recently, BoNT injections into the gastrointestinal system have been suggested for the treatment of conditions including obesity, gastroparesis and delayed gastric emptying. Some studies have revealed diffusion to adjacent muscles and, in some cases, distant sites, after BoNT treatment. This study investigated the possibility of subclinical BoNT diffusion after intragastric injections.

This double-blind, randomized, controlled trial included 23 obese patients with a body mass index (BMI) of at least 35 kg per meter²,

with two complications of obesity, or with a BMI of at least 40 kg per meter² without complications. Single fiber EMG of the extensor digitorum communis and repetitive stimulation of the abductor digiti minimi were completed before, and eight days after, multiple intragastric injections. The injections totalled 200 units of BoNT or a similar volume of normal saline. Muscle jitter and compound muscle action potentials were recorded and analyzed, in order to compare the baseline and post-treatment activity.

No significant changes were noted in muscle jitter or compound muscle action potentials in either group when comparing results before and after BoNT injections. None of the patients developed signs or symptoms of abnormal neuromuscular transmission.

Conclusion: After intragastric botulinum toxin injection, no subclinical signs of distant toxin spread could be found using neurophysiologic techniques highly sensitive to end plate dysfunction.

Osio, M., et al. Botulinum Neurotoxin A Does Not Spread to Distant Muscles after Intragastric Injection: A Double-Blind, Single-Fiber Electromyography Study. *Muscle Nerve*. 2010, August; 42 (2): 165 - 169.

RADIOFREQUENCY LESIONS FOR SPASTICITY IN CEREBRAL PALSY

Cerebral palsy (CP) is a central nervous system deficit characterized by atypical muscle tone, posture and movement. The most common surgical procedures for addressing this tone are the continuous infusion of intrathecal baclofen and selective dorsal rhizotomy (SDR). An alternative to SDR is radiofrequency lesioning of the dorsal root ganglion. This study sought to determine whether radiofrequency total rhizotomy is effective for the relief of spasticity in pain in patients with CP.

Seventeen children were identified with CP and with severe hip spasticity accompanied by pain or difficulty with caregiving. All were treated with radiofrequency lesioning of the dorsal root ganglion. The children were assessed at baseline and then at one and six months, using the modified Ashworth Scale, a caregiver's questionnaire and a gross

motor function measure (the first six patients) and a visual analogue scale for spasticity, pain and ease of care (the last eleven patients).

Post-treatment assessments revealed small improvements in muscle power, as measured by the modified Ashworth Scale, but no effect on the gross motor function measure. Despite these findings, the caregivers of the first six treated children noted that those children's quality of life had improved. In the 11 children who were followed, improvement was seen on all visual analogue scale scores.

Conclusion: This study of patients with cerebral palsy with significant hip spasticity suggests that percutaneous radiofrequency lesions to the dorsal root ganglion may alleviate spasticity and improve quality of life.

Vles, G., et al. Percutaneous Radiofrequency Lesions Adjacent to the Dorsal Root Can Alleviate Spasticity and Pain in Children with Cerebral Palsy: Pilot Study in 17 Patients. *BMC Neuro*. 2010; 10:52 (June); doi:10.1186/1471-2377-10-52

GLUCOSAMINE FOR CHRONIC LOW BACK PAIN

Osteoarthritis (OA) currently affects more than 20 million people in United States, with its prevalence rising. The spine may demonstrate osteoarthritic and degenerative changes which can cause or contribute to low back pain (LBP). As glucosamine is widely used as a treatment for OA, this study assessed the effect of this medication on patients with chronic LBP and degenerative lumbar OA.

This double-blind, randomized, placebo-controlled trial included 250 patients with LBP and degenerative lumbar OA. The subjects were randomized to receive either glucosamine, at 1,500 mg per day, or a placebo. The primary outcome measure was the Roland Morris Disability Questionnaire (RMDQ), which measures pain related disability, wherein a three-point reduction in total score was considered to be a response to treatment. Secondary outcomes included scores on an 11-point Numeric Rating Scale (NRS), health related quality of life, as measured by

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the EuroQol-5 Dimensions Index (EQ-5D) and scores on the EuroQol-Visual Analogue Scale (EQ-VAS). At baseline, descriptive data, psychological status and fear avoidance behaviors were assessed.

At six months and one year, no significant differences were seen between the two groups in RMDQ scores ($p=0.72$ and $p=0.5$, respectively). In addition, at one year, no significant differences were found between the groups in back pain at rest, leg pain at rest, scores on the EQ-5D or scores on the EQ-VAS, ($p=0.85$, $p=0.93$, $p=0.07$ and $p=0.14$, respectively).

Conclusion: This study of patients with low back pain and degenerative lumbar osteoarthritis did not find that glucosamine has a positive effect on low back pain or quality-of-life.

Wilkins, P., et al. Effect of Glucosamine on Pain Related Disability in Patients with Chronic Low Back Pain and Degenerative Lumbar Osteoarthritis: A Randomized, Controlled Trial. *JAMA*. 2010, July 7; 304(1): 45-52.

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