

# REHAB IN REVIEW

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## YOGA AND DISC DEGENERATION

It is been estimated that, in the United States, 20 to 30 million people practice some form of yoga. Yoga has been used to improve physical and emotional well-being, as well as to alleviate chronic pain, stress and anxiety. This preliminary study used MRI to assess the extent of spine degeneration among those who teach yoga compared to a non-yoga practicing control group.

Eighteen yoga instructors, each with teaching experience of more than 10 years' duration, were invited to participate in this study. All underwent an MRI evaluation of the cervical and lumbar spine. A matched control group included 18, non-yoga practicing, asymptomatic individuals, randomly selected from a health check-up database. The MRIs of the two groups were scored for degenerative disease processes and were compared to one another.

The scores for the cervical and lumbar discs revealed significantly less degenerative disc disease in the yoga group than in the control group ( $p < 0.001$ ). In the cervical spine, the yoga group had significantly better scores than did the control group ( $p < 0.001$ ). Similar comparison of the lumbar spines failed to reach statistical significance ( $p = 0.55$ ).

**Conclusion:** This pilot study, comparing long-time yoga practitioners with matched controls, found less degenerative disc disease in the yoga group, most notably in the cervical spine.

Jeng, C., et al. Yoga and Disc Degenerative Disease in Cervical and Lumbar Spine: An MR Imaging Based Case Control. *Eur Spine J.* 2011, March; 20: 408-413.

## PHYSICAL ACTIVITY AND KNEE JOINT HEALTH

While the promotion of physical activity is a major public health

initiative in Western countries, the influence of physical activity on the development and progression of osteoarthritis (OA), particularly on weight bearing joints such as the knee, remains unclear. While many epidemiological studies have examined the relationship between physical activity and knee OA, the results are conflicting. This systematic review examined the effect of physical activity on the health of specific structures within the knee joint.

Relevant studies were identified through electronic searches of Medline, Embase and CINAHL up to November of 2008. Studies were classified according to the study design, with the prospective cohort study considered to be the preferred design. From among those identified, 22 radiological and six magnetic resonance imaging (MRI) studies were found examining the relationship between physical activity and knee OA.

In those studies, strong evidence was seen for a positive association between physical activity and tibiofemoral osteophytes. However, there was also strong evidence for a lack of relationship between physical activity and joint space narrowing. In addition, limited evidence was found of MRI demonstrations of relationships between physical activity and cartilage volume loss. An inverse relationship was noted between physical activity and cartilage defects.

**Conclusion:** This systematic review of the literature did not find that increased physical activity increases the risk of osteoarthritis of the knee.

Urquhart, D., et al. What is the Effect of Physical Activity on the Knee Joint? A Systematic Review. *Med Sci Sports Exer.* 2011, March; 43(3): 432-442.

## POLIDOCANOL INJECTIONS OR ARTHROSCOPIC SHAVING FOR JUMPER'S KNEE

Chronic patella tendinopathy, also known as jumper's knee, is often quite difficult to treat. Given recent findings of high blood flow and nerves on the dorsal side of the proximal patellar tendon, new treatment methods have been introduced, including sclerosing polidocanol injections and ultrasound (US) guided arthroscopic shaving outside the dorsal patellar tendon. This study compared these two treatments.

Forty-five patients were recruited, with 52 tendons diagnosed with proximal patellar tendinopathy/jumper's knee, confirmed with US and color Doppler. All participants had a long duration of pain symptoms during patellar tendon loading activity. The subjects were randomized to receive either injections of sclerosing polidocanol or arthroscopy, performed under local anesthesia. Shaving was completed, with the aim to destroy only the region with high blood flow (neovessels), and nerves adjacent to the tendinosis changes on the dorsal side of the tendon. Patients in both groups were allowed full weight bearing immediately after treatment. The subjects scored the level of patellar tendon pain during sporting activity and at rest using a visual analogue scale. In addition self-reported patient satisfaction was documented.

At an average of one year after treatment, patients in the arthroscopic shaving group had significantly lower pain scores at rest and during patellar loading activity. The surgery group was more satisfied with treatment results than was the injection group. In addition, the surgery group demonstrated more improvement in time returned to sporting activity than did the injection group.

**Conclusion:** This study of patients with proximal patellar

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tendinopathy/jumper's knee found that arthroscopic shaving results in less pain, better patient satisfaction and quicker return to sporting activity than does polidocanol injection.

Will Berg, L., et al. Sclerosing Polidocanol Injections or Arthroscopic Shaving to Treat Patellar Tendinopathy/Jumpers Knee? A Randomized, Controlled Study. **Br J Sport Med.** 2011, April; 45(5): 411-415.

### **DEEP VEIN THROMBOSIS PROPHYLAXIS AND INTRACRANIAL HEMATOMA EXPANSION**

Patients with intracerebral hemorrhage are at higher risk for the development of venous thromboembolism. This risk is greater than that among those with ischemic stroke. The American Heart Association/American Stroke Association guidelines for hemorrhagic stroke state that subcutaneous anticoagulants may be considered at 3 to 4 days from onset after documentation of cessation of bleeding. No consensus has been reached concerning how and when to start deep vein thrombosis prophylaxis in patients with intracranial hemorrhage (ICH) or intraventricular hemorrhage (IVH). This study assessed the safety of subcutaneous anticoagulants in patients with ICH or IVH.

This retrospective study included patients registered from June of 2003 to December of 2007 with a diagnosis of ICH or IVH. All participants had received either low molecular weight heparin (LMWH) or unfractionated heparin subcutaneously within seven days of admission, and all underwent a subsequent CT scan within four days after starting the prophylaxis. Hematoma volume and intraventricular hemorrhage change were calculated for each patient. The primary outcome measure was the absolute growth in hematoma.

Seventy-three patients met the study criteria. Fifty received LMWH, 20 received unfractionated heparin and three received dalteparin. Two of the subjects showed significant hematoma growth, one who had received LMWH and one who had received unfractionated heparin. No significant relationship was seen between the timing of the

anticoagulants and hematoma growth.

**Conclusion:** This retrospective study did not find that pharmacologic deep venous thrombosis prophylaxis, given to patients with intracranial hemorrhage or intraventricular hemorrhage, is associated with hematoma growth.

Wu, T., et al. Pharmacological Deep Vein Thrombosis Prophylaxis Does Not Lead to Hematoma Expansion in Intracranial Hemorrhage with Intraventricular Extension. **Stroke.** 2001, March; 42(3): 705-709.

### **ALTERED NEURAL ACTIVITY AND EMOTIONS FOLLOWING RIGHT MIDDLE CEREBRAL ARTERY STROKE**

The middle cerebral artery (MCA) is the vessel most commonly affected by cerebrovascular accidents (CVAs). Because the damaged area may include the striate/lenticular nuclei and frontal/temporal cortices, it is no surprise that the clinical picture following MCA stroke often includes emotional changes. As the mechanisms of reduced emotional awareness and expression after a right MCA CVA are poorly understood, this study sought to determine whether a stroke in the MCA territory results in blunting of both positive and negative emotions, or merely unpleasant emotions, and to clarify the mechanisms of such a change.

All subjects presented with stable stroke lesions and were recruited based upon the results of clinical and magnetic resonance imaging (MRI) findings demonstrating right MCA stroke with involvement of the lenticulostriate beds. Six subjects with stroke and 12, healthy, age matched subjects were recruited. All received MRI and PET imaging. Each underwent neurologic, psychiatric and neuropsychological assessments examining general intelligence, attention, language, visuospatial skills, visual and verbal memory and executive function. Emotions were induced using previously vetted databases of emotionally evocative pictures. The subjects were asked to rate the intensity of their feelings with the aid of a visual Likert scale ranging from 0 to 10. The responses to the images were compared between injured subjects and controls.

Compared to the control subjects, the stroke subjects showed lower levels of happiness and amusement in response to neutral stimuli and essentially no emotional changes in response to pleasant stimuli. Significant between-group differences were found for the experience of amusement in response to pleasant stimuli and happiness in response to neutral stimuli with both being greater in the comparison group. Unpleasant stimuli resulted in no significant between-group differences. Those with MCA stroke exhibited lower brain activity in the ipsilateral anterior cingulate cortex as well as thalamus, dorsal and medial prefrontal cortex in response to positive emotional stimuli. Dorsal and medial prefrontal cortex, association visual cortex and cerebellum showed reduced activity contralaterally. Experience from the unpleasant stimuli was not altered and was associated with decreased activity only in the left midbrain.

**Conclusion:** This study of patients with middle cerebral artery territory cerebrovascular accidents found a reduced response to positive emotional experiences that is associated with reduced activity in the ipsilateral anterior cingulate cortex.

Paradiso, S., et al. Altered Neural Activity and Emotions following Right Middle Cerebral Artery Stroke. **J Stroke Cerebr Vas Dis.** 2011, March-April; 20(2): 95-104.

### **CEREBRAL MICROBLEEDS AND MORTALITY IN THE ELDERLY**

Cerebral microbleeds (CMBs) result from minimal blood leakage from damaged small vessels, and are regarded as markers of pathological vascular changes. The prevalence of CMBs in the general population increases from about 20% in those 60 to 69 years of age to approximately 40% in those 80 years or older. This study investigated the prognostic value of CMBs for overall, cardiovascular and stroke related mortality in a population at high risk for cardiovascular disease.

Participants included a subset of the Prospective Study of Pravastatin in the Elderly at Risk (PROSPER). Subjects were men and women, 70 to 82 years of age, all with total cholesterol levels of 4.0 to 9.0 mmol/L. In addition all had a history of either ischemic or hemorrhagic

stroke, transient ischemic attack, myocardial infarction, arterial surgery or amputation for vascular disease, or had risk factors for vascular disease. Each subject underwent MRI scanning of the brain, with the scans assessed for microbleeds, white matter lesions, atrophy and cerebral infarction.

A total of 435 subjects were included, with a mean follow-up of seven years. During that time, 34.9% died, 37% of cardiovascular causes. A history of hypertension was significantly associated with the diagnosis of CMB, independent of other risk factors ( $p=0.005$ ). Subjects with more than one microbleed were at increased risk of overall death, as compared to those without, although that finding did not reach statistical significance. Those participants with more than one microbleed had a six-fold increased risk of stroke related death, as compared to those without ( $p=0.01$ ). Subjects with non-lobar microbleeds had a greater than two-fold risk of cardiovascular death, as compared to those without ( $p=0.01$ ). Finally, those with a probable cerebral amyloid angiopathy type microbleed had a greater than seven-fold risk of stroke related death, as compared to those without ( $p=0.02$ ).

**Conclusion:** This study of elderly individuals with cerebral microbleeds found that non-lobar microbleeds are significantly and independently associated with cardiovascular mortality, while cerebral amyloid angiopathy-type microbleeds were associated with a significantly increased risk of stroke related mortality.

Altmann-Schneider, I., et al. Cerebral Microbleeds Are Predictive of Mortality in the Elderly. **Stroke.** 2011, March; 42(3): 638-644.

### **MANNITOL, BRAIN METABOLISM AND TISSUE OXYGENATION IN HEMORRHAGIC STROKE**

After a severe brain injury, episodes of increased intracranial pressure (ICP), accompanied by low cerebral perfusion pressure (CPP), are associated with increased morbidity and mortality. Mannitol reduces ICP and improves CPP, although its effect on brain metabolism has not previously been well studied. This study examined the effects of mannitol on metabolism

and oxygenation among patients with severe hemorrhagic stroke.

This retrospective review included patients admitted between June of 2006 and December of 2008 with non-traumatic, severe, acute hemorrhagic stroke. Study participants included those with intracranial hypertension of greater than 20 mmHg for more than 10 minutes, requiring osmotherapy. At the discretion of the attending physician, a 20% mannitol solution was administered to each patient. All subjects underwent intracranial monitoring, including assessment of ICP, microdialysis and PbtO<sub>2</sub>. Patient care conformed to guidelines established by the American Heart Association. Hemodynamic and fluid management was targeted to maintain CPP at 60 mmHg or more and ICP at less than 20 mmHg. Data were compared for the three hours preceding, and the four hours after mannitol therapy.

Following mannitol infusion, the lactate-pyruvate ratio decreased by 20% over two hours. Mannitol infusion was also associated with a significant, mean ICP reduction at 30 minutes to 17 mmHg, lasting for 240 minutes ( $p<0.001$  for all time points). CPP increased at the time of infusion, and remained elevated for 180 minutes ( $p<0.03$ ).

**Conclusion:** This study of patients with hemorrhagic stroke and elevated intracranial pressure found that a 20% mannitol solution reduces intracranial pressure and improves brain metabolism, as measured by the lactate-pyruvate ratio.

Helbok, R., et al. Effect of Mannitol on Brain Metabolism and Tissue Oxygenation in Severe Hemorrhagic Stroke. **J Neurol Neurosurg Psychiatry.** 2011, April; 82: 378-383.

### **HYPERTENSION, ORTHOSTATIC HYPOTENSION AND THE RISK OF FALLS**

Falls are a leading cause of disability in the older population. Orthostatic hypotension is thought to increase the risk of falls, especially in nursing home residents. This study investigated the relationship between controlled and uncontrolled hypertension, orthostatic hypotension and falls in participants of the Maintenance of Balance, Independent Living, Intellect and Zest

in the Elderly of Boston Study (MOBILIZE).

The MOBILIZE study is a prospective, population based study, designed to examine novel risk factors for falls in older adults. Adults 70 years of age or older, all living within a five-mile radius of the study headquarters, were identified using random sampling of town lists. All subjects were able to understand and communicate in English and walk 20 feet without personal assistance, with sufficient vision to read written material.

Blood pressure was measured at baseline, with the subjects classified into one of three groups. These included: not hypertensive (blood pressure of less than 140/90 mmHg and no history of hypertension), controlled hypertensive (blood pressure of less than 140/90 mmHg and a history of hypertension) or uncontrolled hypertensive (blood pressure of greater than 140/90 mmHg). Fall data were prospectively collected using monthly calendars, with fallers defined as those with at least two falls within one year.

Of the 765 participants enrolled, 722 completed at least six months of follow-up. After adjusting for covariates, orthostatic hypotension was found to be highest among participants with uncontrolled hypertension. The prevalence of systolic orthostatic hypotension at one minute after standing was 19% in participants with uncontrolled hypertension, five percent in those with controlled hypertension and two percent in those without hypertension ( $p < 0.0001$ ). Participants with systolic hypotension at one minute and uncontrolled hypertension were at a greater risk of falls than were those without orthostatic hypotension with uncontrolled hypertension. The hazard ratio for recurrent falls in participants with uncontrolled hypertension with orthostatic hypotension was 2.5. In contrast, orthostatic hypotension was not associated with recurrent fall risk among those with controlled hypertension.

**Conclusion:** This study of elderly individuals found that those with uncontrolled hypertension and systolic orthostatic hypotension at one minute after standing are at a greater risk for falling within one year than are those with controlled hypertension.

Gangavati, A., et al. Hypertension, Orthostatic Hypotension and the Risk of Falls in a Community Dwelling, Elderly Population: The Maintenance of Balance, Independent Living, Intellect and Zest in the Elderly of Boston Study. *J Am Geriatr Soc.* 2011, March; 59: 383-389.

### HIGHER EDUCATION SHORTENS COGNITIVE IMPAIRMENT

Cognitive impairment is a major cause of dementia and associated disability, as well as care dependence, among aging societies. The age-specific prevalence of dementia doubles with every five years of age, from approximately 1.5% in persons 60 to 69 years of age to 40% among nonagenarians. This study assessed the duration of cognitive impairment and the effects of risk factors on its duration.

Using data collected in the Health and Retirement Study (HRS) and the Asset and Health Dynamics Among The Oldest Old (AHEAD) study, cognitive impairment was measured by a modified version of the Telephone Interview Cognitive Screen (TICS) a telephone interview adapted from the Mini Mental State Examination. As behavioral risk factors, self-reported body mass index (BMI), smoking status and level of education were recorded. Using life expectancy tables, a multistate model was used for the analysis of transition rates to cognitive impairment comparing subjects by race, BMI, smoking status and level of education.

The risk of cognitive impairment was twice as high for blacks and Hispanics than for whites. Highly educated men and women lived longer, as well as 1.6 and 1.9 years less with cognitive impairment than did lowly educated men and women. Higher education delayed the incidence of cognitive decline in both males and females. The average lifespan with cognitive impairment differed by group. In the white population, 55-year-old white males and females spent 1.7 and 2.7 years with cognitive impairment, respectively. Male and female black subjects lived on average 3.7 years longer with cognitive impairment than did whites. Hispanic men and women lived 3.2 and 5.8 years longer with cognitive impairment than non-Hispanic white men and women.

Smoking decreased the duration of cognitive impairment through higher mortality.

**Conclusion:** This study found that white race, male gender, smoking and higher education were correlated with a reduced duration of life with cognitive impairment.

Reuser, M., et al. Higher Education Delays and Shortens Cognitive Impairment. A Multi-State Life Table Analysis of the U.S. Health and Retirement Study. *Eur J Epidemiol.* 2011, Feb 20: 10.1007/s10654-011-9553-x.

### HOME EXERCISE PROGRAM AFTER HIP FRACTURE

Hip fractures affect more than 1.6 million persons worldwide, causing substantial changes in body composition, function and strength. By 2050, the number of hip fractures is expected to increase to almost four million worldwide. Among survivors, 50% need assistance to walk and 90% need assistance to climb stairs after one year. This study was designed to test the efficacy of an exercise program, administered after fracture by an exercise trainer in the home setting, following the cessation of usual care.

This randomized, controlled trial included 180, community dwelling female patients within 15 days of hip fracture. The subjects were 65 years of age or older, and were randomized to receive the study intervention or usual care. The exercise plus program was administered by an exercise trainer, and included supervised and independently performed aerobic and resistance exercise of increasing intensity. Follow-up assessments were conducted at two, six and 12 months post-fracture.

The primary outcome measure was bone mineral density of the contralateral femur. Secondary outcomes included time and kilocalories spent on physical activity during the Six-Minute Walk Test, the Lower Extremity Gain Scale, which evaluated performance on nine lower-extremity tasks, a single chair rise time, a timed walk, a measure of gait and global balance, grip strength, lower extremity physical activities of daily living, instrumental activities of daily living, the Geriatric Depression Scale and health-related quality of

life, assessed with the 36-Item Short Form Health Survey (SF-36).

The mean time to initiate exercise was 67.8 days post-fracture. The intervention group spent more time in exercise activity during follow-up. Small effect sizes of 0 to 0.2 standard deviations were seen for body composition measures, including femoral neck, trochanteric and total hip BMD and fat mass. No significant differences were found for physical performance outcomes, Lower Extremity Physical Activities of Daily Living or Instrumental Activities of Daily Living summary scores, SF-36 subscale scores or Geriatric Depression Scale scores ( $p>0.05$ ).

**Conclusion:** This feasibility study found that a year-long, in-home, exercise program can improve several body composition measures. However, the study did not find clinically significant improvements in bone mineral density, muscle mass or strength, fat mass, activities of daily living or physical or psychosocial function.

Orwig, D., et al. Delivery and Outcomes of a Year-Long Home Exercise Program after Hip Fracture. **Arch Intern Med.** 2011, February; 171(4): 323-331.

#### **FAMILY-MEDIATED EXERCISE AND STROKE RECOVERY**

Motor impairment after stroke is a common focus of rehabilitation. Recent data suggests that additional exercise therapy after stroke significantly impacts recovery. Recommendations have included the development of strategies to place the responsibility for additional therapy with patients and their caregivers. However, this strategy has not been studied in a randomized, controlled format. This study investigated the impact of family mediated exercise (FAME) therapy on stroke outcome.

Forty patients were randomized to either a control group or a FAME group. Inclusion criteria were, first unilateral stroke, as confirmed by MRI or CT scan, no impairment in cognition, participation in a physiotherapy program and family members who were willing to participate. A control group received routine therapy without input from their families. The FAME group received routine therapy plus an

individualized FAME program, conducted for 35 minutes daily with the assistance of the family member. The lower limb Fugl-Myer assessment served as the primary outcome measure. Secondary outcome measures included the Motor Assessment Scale, the Berg Balance Scale, a six-minute walk test, the 100-Point Barthel Index and measures of participation. Measurements were completed at baseline, post-intervention and at three-month follow-up.

At follow-up, scores on all outcome measures were significantly better in the FAME group than in the control group ( $p<0.05$ ). At three-month follow-up, a significant difference was seen in the change in scores post-intervention on the six-minute walk test, the Integration to Normal Living Index, and the Nottingham Extended Activities of Daily Living Index, favoring the FAME group ( $p<0.05$ ). At follow-up, family members in the intervention group reported a significant decrease in their levels of caregiver strain when compared with family members in the control group ( $p=0.01$ ).

**Conclusion:** This study demonstrates that family mediated exercise interventions are beneficial in acute stroke recovery, as well as for patient-community integration and family involvement.

Galvin, R., et al. Family-Mediated Exercise Intervention (FAME): Evaluation of a Novel Form of Exercise Delivery after Stroke. **Stroke.** 2011, March; 42(3): 681-686.

#### **TOPICAL GLYCERYL TRINITRATE FOR TREATMENT OF CHRONIC LATERAL EPICONDYLOSIS**

Lateral epicondylitis has a prevalence of one to three percent, with a peak incidence at 40 to 55 years of age. Local injections of corticosteroids are a common treatment, with beneficial short-term effects including diminished pain and increased grip strength. Topical glyceryl trinitrate (GTN) treatment has been found to have short-term efficacy in treating chronic lateral epicondylitis, although the exact mechanism of this treatment's efficacy is not well known. Despite short-term success with topical GTN, no long-term follow-up studies have been completed. This follow up study

investigated whether the improved patient outcomes noted in the initial study at six-months persist five years later.

This study was a follow-up of a randomized, double-blind, placebo controlled clinical trial, initially investigating the use of topical GTN for 86 patients with lateral epicondylitis. The subjects were randomly assigned to one of two equal groups, with one receiving active transdermal GTN and the other a placebo. Assessments included patient rated pain scores, patient rated elbow pain at rest, patient rated elbow pain with activity, patient rated elbow pain at night, local epicondylar and tendon tenderness and dynamometer measured strength.

Of the 74 patients who completed the initial trial, 52 were included in the five-year follow-up results. Data for all 74 patients demonstrated significant improvements compared with baseline on measures of patient rated pain, epicondyle tenderness and strength tests at six months. At five-year follow-up, further improvements in patient rated pain scores were noted for both groups, while strength scores remained similar to those recorded at six months. At five years, no significant difference was seen between the groups on community outcome measures.

**Conclusion:** This study of patients with lateral epicondylitis found that topical glyceryl trinitrate offers short-term benefits for up to six months. However, at five years, no significant difference was seen in outcome as compared with rehabilitation alone.

McCallum, S., et al. Five-Year, Prospective Comparison Study of Topical Glyceryl Trinitrate Treatment of Chronic Lateral Epicondylitis at the Elbow. **Br J Sports Med.** 2011, April; 45(5): 416-420.

#### **SPORTS FUNCTION SIX YEARS AFTER ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION**

Anterior cruciate ligament (ACL) reconstruction is a common surgical repair among athletes. Prognostic information is valuable to physicians who counsel patients regarding the likely results of this surgery. This study followed a population cohort in order to identify modifiable predictors

for both short and long-term outcomes of ACL repair.

A total of 448 patients were followed. At baseline, surgeons completed a questionnaire regarding the knee injury and surgery. Patients completed the International Knee Documentation Committee (IKDC) questionnaire, the Knee injury and Osteoarthritis Outcome Score (KOOS), and the Marx Activity Scale at baseline, two years and six years after surgery.

Scores on the IKDC and the KOOS improved at two years, and continue to improve at six years after baseline. A decrease occurred in physical activity level over time. Specific, negative outcome predictors identified included smoking tobacco, a high body mass index, revision surgery and use of an allograft. A positive outcome predictor was conservative treatment of a lateral meniscus injury.

**Conclusion:** This study of patients undergoing anterior cruciate ligament injury repair found that use of an allograft, tobacco abuse and excess body mass index were modifiable predictors of a poor outcome.

Spindler, K., et al. The Prognosis and Predictors of Sports Function and Activity at Minimum Six Years after Anterior Cruciate Ligament Reconstruction. *Am J Sport Med.* 2011, February; 39(2): 348-354.

### FUNCTIONAL ELBOW RANGE OF MOTION

Previous studies of functional range of motion of the elbow suggest that, for most activities of daily living, this angle varies from 30° to 130° of flexion and from 50° of pronation to 50° of supination. This study used new, three-dimensional, optical tracking technology to assess previously described positional and functional tasks, as well as several contemporary tasks.

Twenty-five healthy adult subjects (fourteen male and eleven female) participated. Light reflective spherical markers were attached to each subject's skin, as part of a 10-camera, optical, three-dimensional motion analyzer. All 25 subjects performed six positional and 11 functional tasks. The positional tasks included touching the vertex of the head, occiput, chest, neck, sacrum

and shoes. The participants were then asked to perform eight tasks described in previous research, as well as three contemporary tasks. These included pouring from a pitcher into a glass, drinking from a glass, eating with a fork, cutting with a knife, reading a magazine, picking up a telephone, sitting up from a desk, opening a door, using a standard computer mouse, typing on a computer keyboard and picking up and using a cellular telephone while standing. The motion arc for each task was recorded.

For the positional tasks, the minimum elbow flexion was 27° (to tie a shoe) with maximum flexion of 149° for activities of daily living required to reach the neck, maximum valgus positioning of 9° occurring when reaching for the vertex of the head, and maximum varus occurring at 2° when reaching for the sacrum. Forearm rotation ranged from 20° pronation to 104° supination when reaching for the occiput and the sacrum, respectively. The use of a cellular telephone required the greatest flexion arc of motion, at 130°. Maximum flexion also occurred for the cellular telephone task, at 147°. The largest pronation-supination arc of motion was found with the use of a fork. The maximum supination was found with opening a door, at 77°. Pronation was greatest for the keyboard task, at 65°.

**Conclusion:** This study found that the functional elbow range of motion needed for activities of daily living may be greater than previously reported, with modern tasks such as computer mouse and keyboard use requiring greater pronation than others, and the use of a cellular telephone requiring greater flexion than others.

Sardelli, M., et al. Functional Elbow Range of Motion for Contemporary Tasks. *J Bone Joint Surg.* 2011, March 2; 93(5): 471-477.

### LONG-TERM SURVIVAL OF ADULT TRAUMA PATIENTS

Previous studies of patients hospitalized for trauma have focused on outcomes at level one trauma centers. These studies have demonstrated that severely injured patients have higher cumulative mortality in the years following admission. However, a higher

proportion of severely injured young patients are treated at level one trauma centers, as compared with non-trauma centers. As age-related risk factors may be different for long-term mortality, this study was designed to better understand long-term mortality following trauma admission.

This retrospective investigation included 124,421 injured patients, treated at one of Washington State's 78 hospitals. All data were collected between January of 1995 and December of 2008, and included those 18 years of age or older. Excluded from the study were those with primary injuries involving burns of greater than 20% of the body, those who were younger than 18 years of age and those who had transferred from outside Washington State. Deaths among trauma patients were identified by linking the Washington State Trauma registry cohort with Washington State death certificates. The burden of trauma included mortality of both inpatients and those who died following discharge.

Of the patients included in the study, 5.8% died during the index hospitalization. This percentage declined during each year of the study, from 8% in 1995 to 4.9% in 2008. Of all admitted for trauma, 7.2% died within one year following discharge. Of those discharged, 24.7% were placed at a skilled nursing facility. However of those 65 years of age or older 54% were discharged to a skilled nursing facility. Cumulative mortality was significantly lower for those patients discharged home and patients discharged to rehabilitation facilities than for patients discharged to a skilled nursing facility, who had a 34% cumulative mortality by 3 years post discharge. Age was a strong predictor of the risk of death during the follow-up period. In addition, patients who had a systolic blood pressure of less than 90 mm Hg in the emergency department, those with a Glasgow Coma Scale score of less than nine, males, and those with an injury mechanism of fall or blunt trauma were at highest risk of death in the subsequent year (44%). Other significant predictors of mortality after discharge included a maximum score for head injury on the Abbreviated Injury Score Scale, performance on the Functional Independence Measure, the mechanism of injury

being a fall and having Medicare or other government insurance.

**Conclusion:** This retrospective study of adult patients admitted for trauma in Washington State found the three-year cumulative mortality to be 16%. Discharge to a nursing facility was associated with a higher risk of subsequent mortality.

Davidson, G., et al. Long-Term Survival of Adult Trauma Patients. *JAMA*. 2011, March 9; 305(10): 1001-1007.

### **EFFICACY OF ETANERCEPT FOR ANKYLOSING SPONDYLITIS**

Ankylosing spondylitis (AS) results in disability due to reduced spinal mobility and pulmonary function. Ankylosis is the consequence of ligament ossification in the vertebrocostal and sternocostal joints. Tumor necrosis factor (TNF) blockers have greatly improved the condition of patients with active inflammatory spinal disease, although related studies suffer from methodologic problems. This study evaluated the effects of a TNF blocker, etanercept on advanced AS.

This 12-week, randomized, double-blind, placebo-controlled trial included 21 centers in four European countries. Subjects were men and women, 18 to 70 years of age, each diagnosed with severe AS, refractory to treatment with nonsteroidal anti-inflammatory drugs. Each investigator evaluated the disease at the screening visit radiologically, using modified Stoke Ankylosing Spondylitis Spine Scores.

The patients were then randomized to receive either etanercept, 50 mg once weekly, or an identical placebo. All subjects were evaluated at screening, baseline and at weeks two, four, eight and 12. At each visit, the participant was assessed with the Patient Global Assessment, the Bath AS Disease Activity Index (BASDAI), the Bath Ankylosing Spondylitis Functional Index Metrology Index (BASMI), and the Bath Ankylosing Spondylitis Functional Index (BASFI), as well as for C reactive protein levels. At weeks zero and 12, pulmonary function tests were also performed. The primary endpoint was the difference in BASDAI scores between randomization and week 12.

Improvement on the BASDAI was significantly greater in the treatment group than in the placebo group (p=0.019). In addition, the treatment group realized better results for total back pain, BASFI and BASMI scores, CRP levels and forced vital capacity (FVC) than did the placebo group.

**Conclusion:** This study of patients with ankylosing spondylitis found that etanercept, a tumor necrosis factor blocker, can improve spinal and respiratory function in this group.

Dougados, M., et al. Efficacy of Etanercept on Rheumatic Signs and Pulmonary Function Tests in Advanced Ankylosing Spondylitis: Results of a Randomized, Double-Blind, Placebo-Controlled Study (SPINE). *Ann Rheumat Dis*. 2011. Doi:10.1136/ard.2010.139261.

### **AGE AND NONSURGICAL TREATMENT OF LUMBAR DISC HERNIATION**

Lower extremity pain in the setting of low back pain affects 12% of older men in the community and 21% of those in retirement communities. This study reviewed the outcomes of nonsurgical treatment of lumbar disc herniation, comparing those older than, with those younger than, 60 years of age.

Participants were recruited from a hospital-based outpatient spine center between January of 2008 and March of 2009. All patients underwent a comprehensive, standardized history and physical examination, with inclusion criteria involving recent onset of radicular pain in an L2, L3, L4, L5 or S1 dermatome, with or without neurological changes. Each subject also underwent MRI scanning. Each participant then underwent a customized intervention, including medications, physical therapy, acupuncture, chiropractic, massage therapy, epidural steroid injections and pain clinic management. The primary outcome measure of this study was patient-reported change in functional limitations and disability at six-month follow-up, as measured by the Oswestry Disability Index (ODI). Secondary outcomes were changes in leg pain and back pain at six-month follow-up.

A total of 133 consecutive patients were studied, 89 of whom were less

than 60 years of age and 44 of whom were 60 years of age or older. Older subjects had a higher comorbidity burden and a shorter duration of symptoms and clinical presentation than did younger patients (p<0.006). At six-month follow-up, the groups did not differ in disability as measured by the ODI or by pain intensity. The greatest total improvement in pain intensity was noted in the first month of follow-up among older adults.

**Conclusion:** This study of patients with lumbar disc herniation, treated conservatively, did not find worse outcomes among those who were 60 years of age or older as compared to those who were under 60 years of age.

Suri, P., et al. Nonsurgical Treatment of Lumbar Disc Herniation: Are Outcomes Different in Older Adults? *J Am Geriatr Soc*. 2011, March; 59 (3): 423-429.

### **PROLOTHERAPY AND ECCENTRIC LOADING FOR ACHILLES TENDINOSIS**

Tendinopathy of the Achilles tendon is a common overuse injury in sports. Mid-portion Achilles tendinosis has proven difficult to treat, with reported success rates between 0 % and 36% for conservative treatment, and between 70% and 85% with surgery. The current standard for conservative treatment includes intensive eccentric loading exercises involving 180 daily contractions for 12 weeks. This technique has a success rate of 60% to 100%. Given that prolotherapy injections require less time and patient effort than do eccentric loading exercises, this may be an attractive alternative. This study compared the effectiveness of eccentric loading exercises with that of prolotherapy for the treatment of painful Achilles tendinosis.

Patients in the sample were diagnosed with unilateral or bilateral mid-portion Achilles tendonosis, with pain located at between two and seven cm proximal to the calcaneal attachment. Participants in this 12-week program were randomized to a group performing eccentric leg exercises, a group receiving prolotherapy (with hypertonic glucose with lignocaine delivered alongside the affected tendon) or a group combining the two treatment methods. The main outcome

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measure was the Victorian Institute of Sports Assessment- Achilles (VISA-A), with treatment success defined as an improvement of at least 20 points. This criterion was considered to be the minimally clinically important change.

A total of 43 patients were identified for participation. At 12 months, the proportion of subjects achieving the minimally clinically important change included 73% of the exercise group, 79% of the prolotherapy group and 86% of the combined group. At both six weeks and 12 months, the increases were significantly greater for the combined treatment group than for the exercise only group.

**Conclusion:** This study of patients with painful Achilles tendinosis found that prolotherapy, when added to eccentric strengthening exercises, enhances the effectiveness of this treatment.

Yelland, M., et al. Prolotherapy Injections and Eccentric Loading Exercises for Painful Achilles Tendinosis: A Randomized Trial. **Br J Sports Med.** 2011, April; 45(5): 421-428.

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