

# REHAB IN REVIEW

WWW.REHABINREVIEW.COM

TM

Volume 23 Number 7

Published by Physicians  
In Physical Medicine and Rehabilitation

July 5, 2015

## SPINAL CORD INJURY IN THE UNITED STATES OVER 20 YEARS

Calculations of the trends in the incidence, etiology and medical care of patients with acute traumatic spinal cord injury (SCI) in the United States are often based on regional estimates. This study assessed trends in the national incidence and mortality in acute SCI from 1993 to 2012.

This investigation used the Nationwide Inpatient Sample (NIS) database for the years 1993 through 2012. This database is the largest all-payer inpatient database available in the United States. The NIS survey uses sampling techniques to ensure national representation and provides sampling weights to allow for the calculation of national rates of SCI. Using these data, the authors calculated trends in etiology, in-hospital mortality, complications and procedures of patients hospitalized with SCI.

The sample consisted of 63,109 patients with acute SCI in 1990 through 2012. The annual incidence in 1993 was 53/million persons, and in 2012 was 54/million persons. The stratified rates showed a decreasing trend in younger age groups among males, from 144/million cases in 1993 to 87/million in 2012 for the 16 to 24 year olds and from 96 to 71 /million in the 25 to 44 year age group. In contrast for both males and females, the rates rose for those in the 65 to 74 year age group, from 84 to 131/million over the same time span. The rate of injury from falls rose from 19.3% in 1997 to 40.4% in 2012. Acute inpatient mortality was 6.6% in 1993 through 1996 and 7.5% in 2010 through 2012 ( $p < 0.001$ ).

**Conclusion:** This study demonstrates that, between 1993 and 2012, the incidence of traumatic spinal cord injury remained stable, although the rates among the young decreased and among the elderly increased.

Jain, N, et al. Traumatic Spinal Cord Injury in the United States, 1993 to 2012. *JAMA*. 2015, June 9; 313 (22): 2236-2243.

## DECREASED DEMENTIA WITH STATINS

Dementia is a neurodegenerative disorder, characterized by progressive cognitive and functional decline. Previous studies have demonstrated an association between statin use and dementia. As little data is available regarding non-Caucasian ethnicities, this Taiwanese study further evaluated the potential of statins to prevent dementia.

This retrospective cohort study employed data from the Longitudinal Health Insurance Database, a claims data set consisting of one million randomly selected people from among all insured patients in Taiwan. Patients with hyperlipidemia were identified, 20 years of age or older, including those who did and those who did not receive treatment with statins. The rates of dementia, myalgia and myositis were obtained and were compared between groups.

Subjects were 61,650 patients with and 61,650 matched controls without statin treatment. After adjusting for comorbidities and sociodemographic factors, those using statins were found to have a lower risk of dementia, with a hazard ratio (HR) of 0.92. A higher beneficial effect was noted for women than for men, with an adjusted HR of 0.91, and with increased age (For those  $\geq 75$  years of age; HR 0.79). The use of statins was associated with an increased risk of myalgia and myositis, with an adjusted HR of 1.05.

**Conclusion:** This Taiwanese cohort study found that the use of statins is associated with a decreased risk of dementia, with this association stronger in women, older adults and patients with low income.

Chuang, C., et al. Decreased Prevalence of Dementia Associated with Statins: A National, Population-Based Study. *Euro J Neurol*. 2015, June; 22 (6): 912-919.

## KINESIOTAPE AND KNEE EXTENSOR PEAK TORQUE

Kinesio taping (KT) has recently gained popularity among athletes for use in injury prevention and performance enhancement. This study investigated the effect of KT on the neuromuscular performance of the knee after isometric fatigue.

Twenty-six healthy volunteers were randomized to either a KT intervention group or a sham taping group. The intervention group received standardized KT application for vastus medialis oblique muscle activation. The control group received sham KT application in the same region, with non-stretchable tape. Musculoskeletal performance of the knee extensors was evaluated using an isometric fatigue protocol before and after taping.

Both groups demonstrated significant reductions in peak torque with the fatiguing protocol. After the fatigue protocol, both groups made significant recovery at five and 10 minutes after cessation of the protocol, with greater recovery of the rate of peak torque development in the KT group at both time intervals ( $p < 0.04$  and  $p < 0.027$ , respectively).

**Conclusion:** This study found that kinesio tape shortens the time required to generate peak torque during isometric knee extension after exhaustive isometric exercise.

Yeung, S., et al. Acute Effects of Kinesio Taping on Knee Extensor Peak Torque and Electromyographic Activity after Exhaustive Isometric Knee Extension in Healthy, Young Adults. *Clin J Sports Med*. 2015, May; 25(3): 284-290.

### **Editor-in-Chief**

David T. Burke, M.D., M.A.  
Emory University, Atlanta, GA

### **Executive Editor**

Randolph L. Roig, M.D.  
Emory University, Atlanta, GA

### **Copy Editor**

Roberta Alysoun Bell, Ph.D.  
Emory University, Atlanta, GA

### **Contributing Editors**

\*Saiyun Hou, M.D., PhD  
Robert A. Lugo, D.O., MBS  
Baylor Coll. of Medicine, Houston, TX

\*Mitchel Leavitt, M.D.  
Benjamin Abramoff, M.D.  
Ogoegbunam Agubuzu, M.D.  
Robert Bowers, D.O., PhD  
Emily Boyd, M.B.B.S.  
Christine Krull, M.D.  
Casey Leong, M.D.  
Erin McCarty, M.D.  
Emory University, Atlanta, GA

\*Alexander Drakh, D.O.  
Casey Murphy, M.D.  
Eric Sterne, M.D.  
LSU Medical Center, New Orleans, LA

\*Bryndon Hatch, M.D.  
\*Katie Nanos, M.D.  
Mayo Clinic, Rochester, MN

\*Ashley Zakhary, M.D.  
Archana Bhatt, D.O.  
Bo Cui, M.D.  
Stella Ferker, M.D.  
Trishla Kanthala, D.O.  
Anup Patel, D.O.  
Eric Yuan, D.O.  
Nassau U. Med Cen., E. Meadow, NY

\*Christina Marciniak, M.D.  
Mary Dubon, M.D.  
Heather Ma, M.D.  
Mithra Maneyapanda, M.D.  
Abby Stephens, M.D.  
Craig Ziegler, M.D.  
N.W.U./R.I.C., Chicago, IL

\*Ondrea McKay, M.D.  
Rutgers-NJMS/Kessler, W. Orange, NJ

\*Zainab A. Najj, M.D.  
Lauren Kremm, D.O.  
Annie Layno-Moses, M.D.  
Joshua Minori, D.O.  
Schwab Rehab/U. of Chicago Hosp., IL

\*Arpit Arora, M.D.  
Rodion Erenberg, M.D.  
Jameel Khan, M.D.  
SUNY Downstate M. C., Brooklyn, NY

\*Ilya Igolnikov, M.D., M.S.  
Alexander Feng, M.D.  
James Wilson, M.D.  
Temple Univ./UPenn., Philadelphia, PA

## **KINESIOTAPE AND MUSCULAR IMBALANCE AMONG INFANTS**

Congenital muscular torticollis (CMT) is a shortening or contracture of the sternocleidomastoid as a result of positioning *in utero*. This condition leads to a very high risk of plagiocephaly. Kinesio taping (KT) has been used to either facilitate a weak muscle or to relax an overused muscle. This study investigated the utility of KT as a tool to help normalize muscle function in infants with CMT.

The study included 29 infants with congenital CMT, each of whom had a measurable imbalance in muscle function in the lateral flexors of the neck on a muscle function scale (MFS). Infants were randomly allocated to either a KT group or a control group. The intervention group had KT applied using the relaxing technique, which crosses over the sternocleidomastoid muscle on the affected side. A scarf was used to disguise the presence of the tape, and the infants were assessed by an evaluator held blind to condition, assessing changes on the MFS.

The 29 infants who completed the study were between the ages of 2.5 and 12 months. At baseline, both groups had a mean difference of 2.3 between the strong and weak sides, as measured by the MFS. At the second assessment, the intervention group had a mean difference of 0.5, with the control group remaining at 2.3 ( $p=0.0001$ ).

**Conclusion:** This study of infants with congenital muscular torticollis found that kinesio taping can immediately improve the imbalance in neck musculature.

Ohman, A., et al. The Immediate Effect of Kinesiology Taping on Muscular Imbalance in the Lateral Flexors of the Neck in Infants: A Randomized Masked Study. **PM&R**. 2015, May; 7(5): 494-498.

## **CEREBRAL BLOOD FLOW AFTER SPORTS CONCUSSION**

Reduced cerebral blood flow, one of the most enduring markers of concussion in animal models, is clearly present in studies of moderate to severe traumatic brain injury (TBI). This study assessed the recovery of cerebral blood flow (CBF) in collegiate athletes, comparing the

time course of CBF recovery with that of cognitive recovery.

Subjects were 44 male student-athletes, recruited from a National Collegiate Athletic Association Division I football team. Seventeen concussed athletes were assessed at a mean of 1.41 days (T-1) after concussion, with 15 returning for a second visit at a mean of 8.73 days (T-2), and 13 completing a final assessment at 31.46 days (T-3). The subjects were evaluated with the Hamilton Depression and Anxiety rating scales, and the Automated Neuropsychological Assessment Metrics for Sports Medicine Battery. Behavioral scores were collected at the initial visit and used to operationalize postconcussive severity. Arterial spin labeling magnetic resonance imaging was used to collect voxel-wise relative CBF at each visit. The concussed patients were compared with healthy athletes.

A significant main effect of time in a cluster was found in the right superior temporal sulcus (STS), and the right dorsal midinsular cortex (dmIC), with significant differences as compared with the control athletes at T1 ( $p=0.046$ ) and T2 ( $p=0.04$ ). Concussed athletes with poor outcomes had significantly lower dmIC CBFs at T-3 relative to those with good outcomes ( $p=0.005$ ). The dmIC CBF was inversely related to the magnitude of initial psychiatric symptoms (Hamilton Depression Scale:  $p=0.02$ ; Hamilton Anxiety Scale:  $p=0.046$ ).

**Conclusion:** This small study of concussed collegiate athletes found that cerebral blood flow in the dmIC at 1 month was inversely associated with both concussion severity and independent assessments of outcome.

Meier, T., et al. Recovery of Cerebral Blood Flow following Sports-Related Concussion. **JAMA Neurol**. 2015, May; 72 (5): 530-538.

## **POLYUNSATURATED FATTY ACIDS AND C REACTIVE PROTEIN**

Dietary guidelines have suggested high consumption of polyunsaturated fatty acids (PUFAs), n-3 and n-6, as a replacement for other fatty acids. However, concerns have been raised that high amounts of n-6 PUFAs may contribute to

increased inflammation. This prospective study investigated the association between intakes of total and individual PUFAs and serum C-reactive protein (CRP).

This study was performed within the framework of the Rotterdam study, a population based, cohort investigation including persons 55 years of age or older. The baseline examination took place from 1989 through 1993, with follow-up visits every three to five years. At baseline, participants indicated the foods and beverages that they had consumed at least twice a month during the preceding year. These data were converted into daily intakes of total energy and fatty acids. High sensitivity CRP was measured in non-fasting frozen serum samples, collected at baseline and at the third visit in 1997 through 1999.

An inverse association was found between total PUFA intake and serum CRP after adjusting for age and gender ( $p=0.003$ ). Also, higher intake of n-6 PUFAs was associated with lower levels of CRP ( $p=0.033$ ), while higher intake of n-3 PUFAs was associated with an increase in serum CRP ( $p=0.006$ ), although this finding occurred primarily among participants with lower fish intake and higher butter consumption.

**Conclusion:** This study found that high intakes of PUFAs, primarily n-6 PUFAs, were associated with lower levels of C-reactive protein.

Muka, T., et al. Polyunsaturated Fatty Acids and Serum C Reactive Protein. The Rotterdam Study. *Am J Epidemiol.* 2015, June; 181(11): 846-856.

#### CERULOPLASMIN AND CHELATION IN PARKINSON'S DISEASE

A growing body of evidence suggests that Parkinson's disease (PD) is associated with oxidative damage in the substantia nigra (SN) via iron accumulation. Iron accumulation appears to be modulated by ceruloplasmin, which facilitates the incorporation of plasma iron into circulating apotransferrin. In addition, a D544E polymorphism has been found to be associated with PD and iron overload. This study evaluated the effect of iron chelation treatment and genetic polymorphism genotype in patients with PD.

This randomized, controlled trial included 40 patients with PD. In an early start group, patients were administered moderate chelation with deferiprone at 30 mg/kg/day in two daily doses, while a control group received a placebo for the first six months. In a late start group, after receiving placebo for six months, patients then received deferiprone. CP-ferroxidase activity was assessed in blood and cerebral spinal fluid at six, 12 and 18 months. Iron levels were evaluated, and the United Parkinson's Disease Rating Scale (UPDRS) motor score was used to evaluate motor disability. In addition, genetic testing was completed to determine the D544E polymorphism.

After six to 12 months of treatment, relatively greater reductions in SN iron levels and UPDRS motor scores were obtained by patients with higher serum and CSF levels of CP-ferroxidase activity. An increase in CP-ferroxidase activity in the CSF was correlated with better UPDRS scores. In addition, the treated patients with the AT genotype displayed a greater reduction in iron levels in the substantia nigra than did those with the AA genotype.

**Conclusion:** This study of patients with Parkinson's disease demonstrated that iron chelation, through the use of deferiprone, can reduce iron levels in the substantia nigra and decrease motor dysfunction.

Grolez, G., et al. Ceruloplasmin Activity and Iron Chelation Treatment of Patients with Parkinson's Disease. *BMC Neurol.* 2015, May; 15: 74.

#### TAI CHI AND CELL FUNCTION IN PATIENTS WITH LUNG CANCER

Approximately 80% of cases of lung cancer in the world are non-small cell (NSCLC). The five-year survival rate is estimated to be in the range of five to 20%. Recent data have shown that Tai Chi Chuan (TCC) can improve immune system function in breast cancer survivors as well as NSCLC survivors. This study reported the physiologic effects of TCC on alterations in peripheral blood mononuclear cell (PBMCs) proliferation and cytolytic activity.

This study included patients with lung cancer, randomized to a control group or a TCC group. Both groups received hospital care as routinely

scheduled. The TCC protocol was designed to regulate consciousness, train breathing and improve physical fitness. Subjects completed 60 minute sessions, three times per week. The control group received no exercise training. Peripheral blood was collected from all participants for PBMC proliferation and cytotoxicity analysis, as well as immune cell analysis.

Significant changes in PBMC proliferation capacity were observed in the TCC group at 16 weeks, with increases noted in cell proliferation ( $p<0.05$ ), but none seen in the control group. The TCC group also demonstrated enhanced cytolytic/oncolytic activity against A549 cancer cells, as compared to controls ( $p<0.05$ ). Significant differences were also found in the natural killer cell percentage at 16 weeks ( $p<0.05$ ), post-pre changes of NKT ( $p<0.05$ ) and DC11c ( $p<0.01$ ) between groups.

**Conclusion:** This study of patients with lung cancer found that tai chi exercises can significantly enhance PBMC proliferation and cytolytic activities.

Liu, J., et al. Effect of Tai Chi on Mononuclear Cell Functions in Patients with Non-Small Cell Lung Cancer. *BMC Complementary Alternative Med.* 2015; 15: 3.

#### BRACE FOR PATELLOFEMORAL OSTEOARTHRITIS

Symptomatic knee osteoarthritis (OA) affects approximately 12.5% of individuals 60 years of age or older in the United States and United Kingdom. Among the structural features of OA are bone marrow lesions (BML), which are thought to be caused by excess focal stress across a localized area of the joint. This study was designed to determine the efficacy of patellofemoral bracing on pain and BML activity of patients with patellofemoral OA.

Subject with painful patellofemoral OA were recruited, all with knee radiographs demonstrating Kellgren and Lawrence scores of grade II or III in the patellofemoral joint. All participants were assessed for joint symptoms and by physical examination. The patients were randomized either to a bracing group, receiving a Bioskin Patellar Tracking Q Brace, or to a control group. At baseline and follow-up visits, the

subjects completed a 10 cm visual analogue pain scale rating concerning pain during aggravating activities. Each also completed a Knee Osteoarthritis Outcome Score (KOOS). At baseline, subjects underwent contrast enhanced MRI, repeated after six weeks.

Subjects included 126 patients with a mean age of 55.5 years and a mean baseline pain score of 6.5 cm. Treatment subjects wore the brace for a mean of 7.4 hours per day. Compared to the no brace group, the brace group showed a significant improvement in activity pain and KOOS subscale scores. At MRI follow-up, the patellofemoral BML was 18% smaller in the brace group than in the non-brace group.

**Conclusion:** This study of patients with patellofemoral osteoarthritis found that daily use of a brace can reduce knee pain and bone marrow lesion volume.

Callaghan, M., et al. A Randomized Trial of a Brace for Patellofemoral Osteoarthritis Targeting Knee Pain and Bone Marrow Lesions. **Ann Rheum Dis.** 2015, June; 74(6): 1164-1170.

#### DEPRESSION AND LUMBAR FUSION OUTCOME

Many studies have suggested that United States Workers' Compensation (WC) recipients have worse clinical outcomes after lumbar fusion than do the general population. This study was designed to determine how psychosocial factors, including depression, impact lumbar fusion outcomes among patients in a WC setting.

This retrospective cohort study included 2,799 WC subjects undergoing lumbar fusion between 1993 and 2013, including 123 who had been diagnosed with depression before the fusion. The outcomes of patients with depression were compared with those of patients without depression for return to work status.

Preoperative depression was found to be a negative predictor of return to work within two years, with only 10.6% of the depressed workers returning to work, as compared to 33% of controls ( $p < 0.001$ ). Return to work was negatively related to age greater than 50 years, chronic opioid use before surgery, repeat lumbar

surgery and legal representation. Of note, 16.1% of controls were diagnosed with depression within three years after fusion.

**Conclusion:** This study of Workers' Compensation patients with a preoperative diagnosis of depression found that return to work rates after lumbar fusion surgery were significantly less than those of matched workers without depression.

Anderson, J., et al. Clinical Depression Is a Strong Predictor of Poor Lumbar Fusion Outcomes among Workers' Compensation Subjects. **Spine.** 2015, May 14; 40(10): 748-756.

#### MORTALITY AFTER UPPER EXTREMITY FRACTURE

Hip fractures are known to be associated with increased mortality in both men and women. Although upper extremity fractures are more common, the mortality rate after these injuries is unknown. This study investigated mortality in adults with upper extremity fractures who receive inpatient care in a trauma unit.

Subjects were patients 16 years of age or older admitted to a trauma ward of the Central Finland Hospital between 2002 and 2008. These patients were hospitalized for planned surgical procedures. Data collected included diagnostic code, procedural code and other medical and sociodemographic characteristics. The subjects were followed after discharge until the end of 2012, with mortality data obtained from the Statistics Finland. The expected number of deaths was calculated on the basis of age and gender in the Finnish population.

The sample included 929 women and 753 men with upper extremity fracture. At a mean follow-up of six years, 179 women and 105 men had died. The standardized mortality ratio (SMR) was calculated as a ratio between the number of deaths observed and the number of deaths expected. The SMR for all patients with UE fracture was 1.5, with 1.34 for women and 2.1 for men.

In both sexes, fractures of the humerus were associated with higher mortality than the other fracture types. For humerus fractures, the SMR was 2.0. For proximal humerus fractures, the SMR was 2.2. For wrist fractures, the SMR was 0.96. In all

cases, the SMR was greater for men than for women. Cardiovascular diseases were the leading primary cause of death among those who died after these fractures.

**Conclusion:** This Finnish, population-based study of patients hospitalized with upper extremity fractures found an increased mortality rate as compared to a matched population.

Somersalo, A., et al. Increased Mortality after Upper Extremity Fracture Requiring Inpatient Care. **Acta Ortho.** 2015; 86(5). DOI: 10.3109/17453674.2014.908340

#### MRI VERSUS ULTRASOUND FOR ASSESSING ROTATOR CUFF SYNDROME

While magnetic resonance imaging (MRI) is a reference standard for the diagnosis of rotator cuff lesions, it is expensive, time-consuming and often not available. This study assessed the efficacy of ultrasound (US) as a substitute for MRI prior to rotator cuff surgery.

Patients scheduled for shoulder joint replacement were prospectively enrolled. Before surgery, all subjects underwent ultrasound and MRI examinations of the affected shoulder. Using the Snyder classification, the supraspinatus, infraspinatus, subscapularis and long head of the biceps were classified as having full thickness tears, partial thickness tears, or as intact. These criteria were applied both for the US and the MRI assessments. The findings were compared to intraoperative observations.

A high level of agreement was noted between the MRI results and the US results, with Kappa values for the various tendons of  $> 0.57$ . For the supraspinatus tendon, the accuracy of US when using operative findings as a reference was 91.1%, as compared to 86.7% for MRI. However, the partial thickness tears were not accurately assessed by US, with two classified as healthy and two as full thickness tears. The accuracy for any tear for the infraspinatus and subscapularis, were 91.1% and 75.6%, respectively, with similar difficulties in detecting partial tears. For the long head of the biceps, both MRI and US were similar in accuracy, with US demonstrating a sensitivity of 1.0 and a specificity of 0.87 for

detection of a rupture, 1 and 0.97 for detection of a dislocation and 0.58 and 0.63 for diagnosis of long head tendovaginitis.

**Conclusion:** This study found that ultrasound may be comparable to MRI for the presurgical detection of rotator cuff injuries.

Fisher, C., et al. Ultrasound versus MRI in the Assessment of Rotator Cuff Syndrome Prior to Shoulder Arthroplasty. *J Ortho.* 2015, March; 12(1): 23-30.

### **CAPSAICIN CUTANEOUS PATCH FOR NEUROPATHIC PAIN**

Capsaicin is a highly selective agonist for the transient receptor potential vanilloid 1 (TRPV1) receptor, known to be a key receptor involved in the transmission and modulation of pain signals. This case series reports on the effect of a capsaicin patch for patients with neuropathic facial and other head pain.

This case series included four patients, 21 to 75 years of age, with neuropathic pain due to surgical injury of the greater auricular nerve, intracerebral hemorrhage, trigeminal neuralgia or osteomyelitis of the mandible. All four patients had failed treatment with oral neuropathic pain medications, and underwent treatment with an eight percent capsaicin patch, after having been pretreated with a four percent lidocaine cream. Patients one and two realized marked pain relief, within 12 hours after application of the capsaicin patch, improving from Numeric Rating Scale (NRS) 8 to NRS 2, with that effect lasting for 12 weeks. Patient two realized a sustained reduction in pain after a single treatment, without the need for repetition. Patient three realized only mild pain reduction, but a marked reduction in pruritus. Patient four realized a sustained treatment response, with pain intensity reduced more than 50%. All patients demonstrated transient, mild erythema and burning pain during the few hours after capsaicin application.

**Conclusion:** This case series of patients with neuropathic pain of the head or face, refractory to systemic or topical medications, enjoyed marked symptom relief with the use of a capsaicin patch.

Gaul, C., Application of the Capsaicin 8% Cutaneous Patch and Neuropathic Pain in the Head and Face: A Case Series. *Cephalalgia.* 2015, May; 35(6): 545-550.

### **LIPID LOWERING DRUGS AND STROKE IN ELDERLY ADULTS**

In France, people over 85 years of age account for 43% of deaths from coronary artery disease and 49% of deaths from stroke. While new guidelines do not contain recommendations for statin treatment for patients over 75 years of age without clinical atherosclerotic disease, many individuals are nonetheless prescribed these medications. This study examined the association between lipid lowering drugs and the risk of stroke and coronary heart disease among individuals 65 years of age or older.

This prospective, population based, cohort study included a random selection of community dwelling individuals 65 years of age or older, recruited between 1999 and 2001. All underwent a history and physical examination every two years for total of five visits. At each examination, information was collected on all drugs used during the preceding month. In addition, information was obtained concerning the occurrence of severe medical events or hospital admissions since the last contact. Cardiac and cerebrovascular events were clarified through hospital records.

Among the 7,484 participants, with a mean age of 73.9 years, 27.4% reported using lipid lowering drugs at baseline. The risk of coronary heart disease was not found to be lower among lipid lowering drug users, as compared to nonusers, with a hazard ratio of 1.12. However, individuals taking lipid lowering drugs were found to have a 30% decreased risk of stroke as compared to nonusers, with a hazard ratio of 0.66. The reduction in stroke risk was similar for those using statins and fibrates.

**Conclusion:** This French study of individuals 65 years or older found that lipid lowering drug use results in a decreased risk of stroke as compared to nonusers. No significant association was found between these drugs and coronary heart disease.

Alperovitch, A., et al. Primary Prevention with Lipid Lowering Drugs

and Long-Term Risk of Vascular Events in Older People: A Population Based Cohort Study. *Br Med J.* 2015; 350: H2335.

### **GREEN TEA CONSUMPTION AND MORTALITY**

While previous epidemiologic studies have suggested the health benefits of green tea, no study has comprehensively assess the effect of green tea on the leading causes of death. This Japanese study reviewed the effect of green tea consumption on the five leading causes of death in Japan.

The Japan Public Health Center-Based Prospective Study commenced in 1990 for cohort I and in 1993 for cohort II, covering 140,420 individuals in 11 public health center areas. The subjects completed self-administered questionnaires regarding demographics, height, weight, smoking, alcohol intake, physical exercise and dietary habits. The patients were followed from the baseline survey until the date of death or until December 31, 2011. Associations were determined between beverage intake and the risk of all-cause and cause-specific mortality.

During the study, 12,874 deaths were reported. After adjusting for potentially confounding factors, an inverse association was found between green tea consumption and all-cause mortality in both men and women ( $p<0.001$ ). Inverse associations were also found between deaths due to heart disease in both men and women ( $p<0.001$ ). Associations between green tea and cerebrovascular diseases and respiratory diseases were significant for men ( $p=0.017$  and  $p<0.001$ , respectively), but not women. In addition, an inverse trend was noted with deaths from injuries in women ( $p=0.014$ ), but not men.

**Conclusion:** This Japanese study found a negative correlation between green tea intake and the major leading causes of mortality in Japan, corroborating previous studies of the significant health benefits of this drink.

Saito, I.E., et al. Association of Green Tea Consumption with Mortality Due to All Causes and Major Causes of Death in a Japanese

Population: A Japan Public Health Centered-Based, Prospective Study (JPHC Study). **Annals of Epidem.** 2015, July; 25(7): 512-518.

### INCREASED PHYSICAL ACTIVITY AND TOTAL MORTALITY IN ELDERLY MEN

Relative mortality risk has been reported to be 30% to 60% lower in those physically active than in sedentary individuals. The Oslo I cardiovascular study took place in 1972 to 1973 when all men ages 40 to 49 years were invited to a screening examination. In 2000, these men were invited to an extended screening examination of cardiovascular health, named Oslo II. That study explored the relationship between exposure variables on 12-year cardiovascular, non-cardiovascular and all-cause mortality among elderly men in the study.

Invitees of the 1972 to 1973 screening included 25,915 men born in 1923 to 1932 for the initial screening examination, with 63% participating. Patients were assessed for conventional risk factors, as well as for level of physical activity. In the year 2000, 6,014 attended a follow-up. Analysis of cardiovascular, non-cardiovascular and all-cause mortality was completed from the year 2000 to the end of 2011. During that time, 2,154 deaths occurred among the 5,738 men who had participated.

Less than one hour of light activity per week did not result in a significant reduction in any outcome, while for vigorous activity, less than one hour per week was associated with a 23-37% risk reduction. Thirty minutes of physical activity, six days a week, resulted in a 40% mortality risk reduction. For those who were sedentary in Oslo I, and increased their activity in Oslo II, the mortality rate was 40% lower than for those who remained sedentary. Comparing physical activity increases with smoking reduction, the mortality risk reduction was found to be essentially equivalent.

**Conclusion:** This study of elderly individuals found that 30 minutes of light to moderate physical activity six days per week is associated with reduced mortality, equivalent to that of smoking cessation.

Holme, I., et al. Increases in Physical Activity Is As Important As Smoking

Cessation for Reduction in Total Mortality in Elderly Men: Twelve Years of Follow-Up of the Oslo II Study. **Br J Sports Med.** 2015; 49 (11): 743748.

### TOTAL SHOULDER ARTHROPLASTY IN OCTOGENARIANS

While shoulder arthroplasty has shown increasingly good outcomes over time, limited data exist concerning this surgery in elderly patients. This study reports on the outcomes of total shoulder arthroplasty (TSA) in a cohort of patients 80 years of age or older.

This retrospective analysis included 612 consecutive patients undergoing TSA between September of 1990 and October of 2004. The patients were divided into those over the age of 80 years and those ages 70 or younger, both with primary osteoarthritis. Outcome measures included the Subjective Shoulder Value (SSV), postoperative Constant Scores and postoperative radiographic findings.

In the older group, at a mean follow-up of 78 months, 24 of 32 patients reported being very satisfied, compared to 23 of 32 of the younger group at a mean follow-up of 84 months. Both groups had the same SSV of 81%. An increase in the postoperative Constant Score was reported in both groups. Preoperative range of motion was similar in both groups, with no significant difference noted between groups postoperatively.

**Conclusion:** This study of patients undergoing anatomic shoulder replacement for primary osteoarthritis found no difference in outcome when comparing patients over 80 years of age and those 70 years or younger.

Iriberry, I., et al. Anatomic Shoulder Replacement for Primary Osteoarthritis in Patients Over 80 Years: Outcome Is as Good as in Younger Patients. **Acta Orthopaedic.** 2015, June; 86(3): 298-302.

### DIABETES AND PAIN AFTER JOINT REPLACEMENT

Persistent pain has been reported in approximately five to 21% of hip

replacements and eight to 27% of knee replacements. These patients often describe their pain in a way that suggests persistent inflammation. As low grade inflammation is associated with the pathogenesis of diabetes, this study assessed the association of persistent pain with glucose metabolism, the metabolic syndrome and obesity.

Between December of 2009 and May of 2011, 200 patients with primary osteoarthritis (OA) who were scheduled for primary hip or knee replacement were recruited. Preoperative laboratory tests, as well as measurements to diagnose the metabolic syndrome and diabetes, were obtained. Pain in the operated joint was surveyed one to two years post-surgery using a postal questionnaire. These results were compared with baseline measurements. The primary outcome measure was the occurrence of persistent pain in the operated joint.

The likelihood of persistent pain, but not of joint pain, was higher among patients who were diabetic than among those who were not (adjusted odds ratio 8.5). A higher ratio of patients with a body mass index (BMI) of over 35kg/m<sup>2</sup> had a painful joint than did those with a BMI of less than 30kg/m<sup>2</sup> (adjusted odds ratio 5.0). The metabolic syndrome was not associated with persistent pain.

**Conclusion:** This study found that previously diagnosed diabetes is a risk factor for persistent pain and that severe obesity is a risk factor for painful joints one to two years after primary hip or knee replacement.

Rajamaki, T., et al. Diabetes Is Associated with Persistent Pain after Hip and Knee Replacement. **Acta Orthopaedic.** 2015, June; 86 (4): 1-8.

### VITAMIN D AND COGNITIVE IMPAIRMENT/FUNCTIONAL IMPROVEMENT AFTER STROKE

The hormone vitamin D plays an important role in immune modulation, cell proliferation and regulation of cell growth. Low levels of vitamin D have been associated with cardiovascular disease and reported to be a predictive factor for stroke. This study investigated the association between functional outcomes after stroke and 25-hydroxyvitamin D [25(OH)D] levels.

This retrospective study included the medical records of stroke patients undergoing inpatient rehabilitation between 2012 and 2014, whose blood 25(OH)D levels were assessed. Demographic data and comorbidities were reported, with functional measures including Functional Independence Measurement (FIM) scores at admission and discharge.

Vitamin D deficiency, defined as 25(OH)D of <20ng/ml, was detected in 79.2% of the patients, including 77.1% of patients with ischemic stroke and 87.5% of patients with hemorrhagic stroke. High levels of 25 (OH)D were associated with greater FIM score gains during the rehabilitation program for both ischemic and hemorrhagic stroke patients. The Mini-Mental State Exam scores of patients in the ischemic stroke group were correlated with 25 (OH) D levels ( $p=0.001$ ). In patients who had sustained a stroke within six months previously, the number of stroke attacks was negatively correlated with 25(OH)D levels in all patients ( $p=0.021$ ), with significance in the ischemic ( $p=0.03$ ), but not the hemorrhagic, ( $p>0.05$ ) stroke group.

**Conclusion:** This study of patients in admitted to a stroke unit in a rehabilitation hospital found that individuals admitted with lower levels of 25(OH)D have poorer rehabilitation outcomes and worse cognitive function than do those with higher levels.

Yalbuздag, S., et al. Is 25(OH)D Associated With Cognitive Impairment and Functional Improvement in Stroke? A Retrospective, Clinical Study. *J Stroke Cerebrovasc Dis.* 2015, July; 24(7): 1479-1486.

### **CIGARETTE SMOKING AND EARLY ARTHRITIS**

Individuals who smoke cigarettes have a two to five times greater risk of developing rheumatoid arthritis (RA) than those who do not. This study analyzed the effects of cigarette smoking on disease activity, functional capacity and radiographic damage among patients with early RA.

The Argentine Consortium for Early Arthritis is a cross-sectional study that analyzed the effects of cigarette smoking on patients with RA and undifferentiated arthritis (UA).

Included were 1,305 patients, 729 with RA and 576 with UA with no more than two years of disease activity. Patients were assessed for functional capacity, disease activity by visual activity score (VAS), radiographic damage, serology and the presence of extra-articular manifestations.

Current smokers had more swollen joints, higher VAS scores for morning stiffness and higher RF titer scores than did than former smokers ( $p=0.017$ ) and never smokers ( $p=0.004$ ). The disease activity score of 28 joints (DAS-28) and simple erosion narrowing scores (SENS) were higher in current smokers than in former and never smokers ( $p=0.011$  and  $p=0.006$ , respectively). In addition, current and former smokers had higher SENS than never smokers. Among patients with undifferentiated arthritis, there was no association between smoking and parameters of activity and radiographic damage.

**Conclusion:** This study found that smoking resulted in greater disease activity and joint erosion among patients with RA, with no such findings among those with undifferentiated arthritis

Salinas, M., et al. Effects of Cigarette Smoking on Early Arthritis: A Cross-Sectional Study – Data From the Argentine Consortium for Early Arthritis (CONAART). *Rheum Intern.* 2015, May; 35(5): 855-859.

### **EPIDEMIOLOGY OF ELBOW TENDINOPATHY**

Studies of the incidence of lateral elbow tendinosis have often come from individual practices rather than population-based studies. This population-based study further assessed the incidence, characteristics and natural history of lateral elbow tendinitis over a 13-year time span.

This population-based cohort study in Olmsted County, Minnesota, identified all patients who were residents of that county with a new diagnosis of lateral epicondylitis, medial epicondylitis, synovitis of the upper arm or synovitis of the forearm. Medical records of a random 10% sample of patients were reviewed to validate the diagnoses and to collect detailed information. The data were examined to describe trends in the

incidence of lateral elbow tendinosis, treatments and outcomes.

During the 13 years of the study, 5,867 individuals were identified with new onset lateral elbow tendinosis. The overall incidence was 3.4 per 1,000, with the highest incidence among individuals ages 40 to 49 years. The overall, annual incidence decreased significantly over time, from 4.5 per 1,000 in 2002 to three per 1,000 in 2006, to 2.4 per 1,000 in 2012. Among treatments, 82% received nonsteroidal anti-inflammatory drugs, 77% bracing, 35% physical therapy, 19% injections and two percent surgeries. Most patients (74%) no longer required care after three months. Approximately three percent of the cases diagnosed between 2009 and 2011 underwent surgery within two years of diagnosis, compared with one percent in the early years ( $p<0.0001$ ).

**Conclusion:** This population-based study of residents of Olmsted County, Minnesota, found that lateral epicondylitis is relatively common, particularly among individuals ages 40 to 49 years, with conservative management effective in most cases.

Sanders, T., et al. Epidemiology and Health Care Burden of Tennis Elbow. *Am J Sports Med.* 2015, May; 43(5): 1066-1071.

### **DAYS SINCE LAST CONCUSSION AND NUMBER OF CONCUSSIONS VS COGNITIVE FUNCTION**

Studies using neuropsychological assessments for baseline and immediate post-concussion measurements concur that cognitive function typically returns to baseline within five to 14 days. However, other studies have suggested that cognitive function may not return for six to eight months after injury. This study assessed whether the number of days since the athlete's most recent concussion and the total number of concussions affect cognitive functioning.

Participants were 87 Division I athletes, of whom 60 had no history of concussion and 27 had a history of concussion. The latter included nineteen with one concussion, six with two and two with three or more concussions. For those who experienced multiple concussions, the time since the most recent

(Continued from page 2)

\* Lindsey Beck, D.O.  
Kerri Chung, D.O.  
Diane Mortimer, M.D.  
Parisa Salehi, M.D.  
University of Minn., Minneapolis, MN

\*Ryan Solinsky, M.D.  
Jennifer Soo Hoo, M.D.  
University of Washington, Seattle, WA

\*Anne Eliason, M.D.  
\*Sean Stockhausen, D.O.  
Daniel Contract, M.D.  
Heather Martin, M.D.  
Brad Stovall, M.D.  
VCU, Richmond, VA

\*Jeremy Hartman, M.D.  
Jawad Bajwa, M.D.  
Prateek Grover, M.D., PhD  
Joey Malbrogh, M.D., MA  
Sri Patchala, M.D.  
Washington University, St. Louis, MO

**Executive Editor Emeritus**  
Donald F. Langenbeck, Jr., M.D.

**Subscription Manager**  
Michael P. Burke, M.S.

**\*Regional Managing Editors have attested that they have no financial conflict of interest when choosing articles that appear in Rehab in Review.**

concussion was determined. All athletes had been medically cleared to return to play. The Immediate Post-Concussion Assessment Test (ImPACT) was administered to all participants, with results compared to concussion history.

A significant, multivariate mean effect of days since last concussion suggested that more days since concussion predicted better overall cognitive function. Fewer days since the last concussion was associated with worse visual memory and slower reaction time. The total number of concussions had no independent effect on visual memory or reaction time.

**Conclusion:** This study of athletes with a history of concussion who had been returned to play found that cognitive scores were better among those with more time since the last concussion.

Thoma, R., et al. The Effect of Days since Last Concussion and Number of Concussions on Cognitive Functioning in Division I Athletes. *Brain Inj.* 2015, May; 29(5): 633-638.

*Rehab in Review (RIR)* is produced monthly by physicians in the field of Physical Medicine and Rehabilitation (PM&R), with the cooperation and assistance of Emory University School of Medicine, Department of Rehabilitation Medicine. The summaries appearing in this publication are intended as an aid in reviewing the broad base of literature relevant to this field. These summaries are not intended for use as the sole basis for clinical treatment, or as a substitute for the reading of the original research.

The Emory University School of Medicine designates this journal based activity for a maximum of 3 AMA PRA Category 1 Credits™. Physicians should only claim credit commensurate with the extent of their participation in the activity. The Emory University School of Medicine is accredited by the ACCME to provide continuing medical education for physicians.

*RIR* is affiliated with the Association of Academic Physiatrists, the World Health Organization, and the Chinese and Indian Societies of PM&R and endorsed by the International Society of Physical and Rehabilitation Medicine.

Private subscriptions are available by email at [rehabinreview@aol.com](mailto:rehabinreview@aol.com) or by fax or phone at (800) 850-7388.

ISSN # 1081-1303  
[www.rehabinreview.com](http://www.rehabinreview.com)



## REHAB IN REVIEW

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



Department of  
Rehabilitation  
Medicine

Expanding the frontier of rehabilitation sciences in research, teaching, and patient care