

REHAB IN REVIEW

TM

WWW.REHABINREVIEW.COM

Volume 24 Number 6

Published by Physicians
In Physical Medicine and Rehabilitation

June 5, 2016

RUNNING INJURIES WITH BARE VERSUS SHOD FEET

Advocates of barefoot running (BR) suggest that this form is more natural, and may reduce injury and promote foot strength. Opponents believe that the lack of cushion and support may lead to an increased risk of injury. This study reviewed the incidence and rate of injuries, comparing BR with Shod Running (SR).

Runners were solicited from online runners favoring running either BR or SR. Each participant provided information regarding running history, mileage history, injury history and monthly mileage. Injury data were recorded over one year, with an emphasis on injury location, diagnosis, medical attention received, footwear worn and activity during injury. The relative number of runners injured and the number of injuries reported between the two groups were analyzed.

A total of 226 runners were recruited, including 108 in the SR group and 118 in the BR group. Of all the musculoskeletal injuries, the foot was the most commonly injured body part in both groups. No significant differences were seen between the two groups in the relative number of runners reporting a musculoskeletal injury. When normalized for mileage, there was no difference in injury rates between the groups. The SR group comprised 21 diagnosed injuries to the hip and knee, as compared to only five in the BR group. This trend was reversed among lower leg injuries, with the BR group sustaining 27 lower leg injuries, as compared to 12 in the SR group.

Conclusion: This prospective study suggests that the rate of injury is similar between those who run barefoot and those who run wearing shoes, though the location of injury may differ.

Altman, A., et al. Prospective Comparison of Running Injuries between Shod and Barefoot Runners. **Br J Sports Med.** 2016, April; 50(8): 476-480.

ARTHROSCOPIC PARTIAL MENISCECTOMY

Arthroscopic surgery for the treatment of degenerative meniscal tears is commonly performed, despite recent evidence questioning its efficacy. Some have suggested that a subgroup of patients with mechanical symptoms such as knee locking may benefit from such procedures. This study was designed to determine whether arthroscopic partial meniscectomy improves mechanical knee symptoms, as compared with a sham procedure.

This study was performed as a secondary, *post hoc* analysis of recently published literature from the randomized, double-blind, sham surgery, controlled trial, the Finnish Degenerative Meniscal Lesion Study (FIDELITY). The study included 146 patients, ages 35 to 65 years, all with refractory knee pain of greater than three months, and with a medial meniscal tear confirmed by MRI. The subjects were randomized to receive either arthroscopic partial meniscectomy (APM) or a sham procedure, with outcome measures including a modified version of the locking domain of the Lysholm score on the day of surgery, and at two, six and 12 months after surgery.

Preoperative mechanical symptoms were reported in 46% of patients in the APM group and 49% in the sham group. At 12 months, 49% in the APM group and 43% in the sham group continued to have mechanical symptoms. Comparative analysis of this subgroup showed that the difference in risk for mechanical symptoms did not differ between the two groups at follow-up.

Conclusion: This randomized, controlled study found no evidence that, among patients with a torn meniscus and mechanical symptoms, meniscal surgery provides more relief than conservative treatment.

Sihvonen, R., et al. Mechanical Symptoms and Arthroscopic Partial Meniscectomy in Patients with Degenerative Meniscal Tear. **Ann Intern Med.** 2016, April 5; 164(7): 449-455.

KNEE REPLACEMENT REVISION AND BODY MASS INDEX

Obesity has been recognized as a main risk factor for osteoarthritis (OA), with some literature suggesting that obese patients may have poorer outcomes. This study was designed to identify a body mass index (BMI) cutoff value above which the revision rate after total knee arthroplasty (TKA) increases.

This prospective study involved all patients undergoing TKA at one institution beginning in 1998. Information concerning baseline characteristics and surgical intervention was documented, as was information concerning comorbidities and major complications. The BMI at the time of surgery was recorded and classified into one of five categories according to the World Health Organization's classification system. The primary outcome variable was all-cause revision after TKA.

Data were included from 2,442 primary TKAs in 2,035 patients. The mean age was 72 years, with a mean follow-up duration of 93 months. Revision rates did not differ between those who were normal weight (3.2 cases per 1,000 person-years), overweight (3.4 cases per 1,000 person-years), or obese class I (3.0 cases per 1,000 person-years), but increased to 6.7 cases per 1,000 person-years in obese class II and 5.7 cases per 1,000 person-years

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

*Ogoegbunam Agubuzu, M.D.

*Emily Boyd, M.B.B.S

Maria Beran, M.D.

David Bradberry, D.O.

Michael Bush-Arnold, M.D.

Zachary Chaz Fausel, M.D.

Anna McCrate, M.D.

Kunj G. Patel, M.D., MSc

Emory University, Atlanta, GA

*Eric Sterne, M.D.

Marc Raj, D.O.

Mike Retzer, D.O.

LSU Medical Center, New Orleans, LA

*Alexander Sheng, M.D.

Humaira Ashraf, M.D.

Stacey Bennis, M.D.

Sam Clanton, M.D., Ph.D.

Megan Flanigan, M.D.

Daniel Goodman, M.D., M.S.

Brendon S. Ross, D.O., M.S.

N.W.U./R.I.C., Chicago, IL

*Idris Amin, M.D.

NYU/Rusk Inst. of Rehab Med, NY, NY

*Cara Thomas, M.D.

Lauren Kremm, D.O.

Schwab Rehab/U. of Chicago Hosp., IL

*Nick Kinback, M.D.

Brian Nguyen, M.D.

Rakhi Vyas, D.O.

Temple Univ./UPenn., Philadelphia, PA

*Justin L. Weppner, D.O.

Austin L. Albright, M.D.

Sara Raiser, M.D.

UVA, Charlottesville, VA

*Jennifer Soo Hoo, M.D.

Alicia Fuhman, M.D.

University of Washington, Seattle, WA

among those in obese class III. The adjusted hazard ratio of those with a BMI of 35kg/m² or greater was 2.1, as compared to those with a lesser BMI (p=0.0008).

Conclusion: This study of patients undergoing total knee arthroplasty found that, while revision rates more than doubled among those with a BMI of 35 kg/m² or greater, those below this cutoff had similar risk of replacement.

Zingg, M., et al. Influence of Body Mass Index on Revision Rates after Primary Total Knee Arthroplasty. **Intern Ortho.** 2016, April; 40(4): 723-729.

SURVIVAL AFTER DIABETIC LOWER EXTREMITY AMPUTATION

Type II diabetes affects approximately 370,000,000 people worldwide, with complications including those involving the lower extremities. While the majority of diabetic foot ulcers heal, five to 24% require limb amputation within a period of six to 18 months. This study assessed the mortality rates following major amputations of those with diabetic wounds.

This retrospective study included records of patients admitted to a hospital with a diabetic foot amputation between January 1, 2001, and January 1, 2011. Clinical follow-up and results of patients with major lower limb amputations were assessed. The indications for major lower limb amputation were failure of wound healing, an overwhelming infection or associated severe systemic comorbidities that impeded treatments.

A total of 223 patients were identified, all of whom had diabetic lower limb amputations. Of these, 62.8% had major amputations, of whom 27.8% had undergone a previous minor amputation of the same extremity. Postoperative wound complications were observed in 38.5%. The mortality rate of the group was 32.8% at one year and 70% at five years. A subgroup analysis revealed that, for those with below the knee amputations, one-year mortality was 24.6%, and five-year mortality was 66.3%. Among those with above the knee amputations, one year mortality was 43.3%, and five-year mortality 83.3%.

Conclusion: This study of patients with diabetes related amputations of the lower extremity found that mortality was 32.8% at one year and 70.5% at five years, with higher mortality in those with above the knee, as compared with below the knee, amputations.

Gok, U., et al. Survival Evaluation of the Patients with Diabetic Major Lower Extremity Amputations. **Musculoskel Surg.** 2016 DOI. 10.1007/S12306-016-0399-y.

OSTEOARTHRITIS AND HEART DISEASE

Previous studies have suggested that osteoarthritis (OA) is associated with an increased risk of hospitalization, institutionalization and early death. As some data suggest that OA may also be associated with an increased risk of cardiovascular disease (CVD), this study was designed to further clarify the association between OA and the onset of CVD.

In this cohort study, 3,099 elderly subjects were identified between 1995 and 1997. Data collected included anthropometric, demographic and clinical characteristics. Standardized questionnaires, medical history, self-reported symptoms, medical and hospital records, laboratory results and physical examination findings were all recorded. Potential confounders considered included diabetes, hypertension, chronic obstructive pulmonary disease, atrial fibrillation and cancer. Physical activity was measured using the Short Physical Performance Battery. The presence of OA of the hand, hip or knee was identified on the basis of medical history and clinical records. Cardiovascular events were identified, including coronary artery disease, stroke, transient ischemic attack, heart failure, CVD related hospitalization or CVD related death.

During follow-up, 47.8% of those with OA developed new CVD, as compared with 41.3% of those without OA. A regression analysis adjusting for potential confounders revealed that the presence of OA significantly increased the risk of CVD (p=0.04). This was true of those with hip or knee OA, but not hand OA, with the association stronger in women than men.

Conclusion: This study of elderly individuals found that osteoarthritis, especially of the lower limbs, is associated with the onset of cardiovascular disease, particularly among women.

Veronese, N., et al. Association of Osteoarthritis with an Increased Risk of Cardiovascular Diseases in the Elderly. *Arthritis Rheumatol.* 2016, May; 68(5): 1136-1144.

ONE-YEAR RISK OF STROKE AFTER TIA OR MINOR STROKE

The TIAregistry.org project was created to describe the contemporary profile, etiologic factors as well as the short- and long-term outcomes of patients with TIA or minor ischemic stroke. This manuscript describes the one-year follow-up of this project, reviewing its utility in predicting the risk of stroke.

The TIAregistry.org project is a prospective, international registry of patients with a recent TIA or minor stroke involving five years of follow-up. A stroke specialist collected patient data prospectively, using a standardized web-based case report form during face-to-face interviews, conducted at baseline and at one, three and 12 months after baseline, and every 12 months thereafter for five years. The primary outcome measure was a composite outcome, including death from cardiovascular causes, nonfatal stroke and nonfatal acute coronary syndrome. Secondary outcomes included individual components of the primary outcome.

From June of 2009 through December of 2011, 4,583 patients were included in the analysis, among whom 4,013 sought medical attention within 24 hours. At a median of 27.2 months' follow-up, 274 primary outcome events (6.2%) occurred. Strokes occurred in 1.5% within two days of symptom onset, 2.1% within seven days, 2.8% within 30 days, 3.7% within 90 days, 5.1% within one year and 6.2% within five years. Factors associated with increased risk of stroke at one year were multiple acute cerebral infarctions on brain imaging, an ABCD² score of six or seven, as compared with a score of zero to three, and large artery atherosclerosis, each associated with over a doubling of the risk.

Conclusion: This multinational, prospective study found that the one-

year risk of stroke after a TIA or mild stroke was 5.1% at one year, and 6.2% at five years, with risk factors including increased ABCD² scores, multiple infarctions seen on brain imaging, and large artery atherosclerosis.

Amarenco, P. et al. One Year Risk of Stroke after Transient Ischemic Attack or Minor Stroke. *N Eng J Med.* 2016, April 21; 374(16): 1533-1542.

NEUROIMAGING IN PATIENTS WITH ZIKA VIRUS

Microcephaly is a principal characteristic of children of patients with severe congenital infection during the early stages of pregnancy. The connection between the Zika virus infection and microcephaly was confirmed in November of 2015, although the neuroimaging of such cases has been poorly characterized to date. This case series was designed to report the radiologic findings of Zika cases resulting in microcephaly.

This retrospective review included 23 cases of children with microcephaly and a presumed diagnosis of Zika virus during the Brazilian epidemic of 2015 to 2016. All 23 children underwent neuroimaging studies, with 22 undergoing CT scans, and eight undergoing magnetic resonance imaging. The scans were reviewed, with findings reported.

Of the 22 patients who underwent CT imaging, all had calcifications in the cortical and subcortical white matter junctions. In addition, 95% had malformation of cortical development, with 91% demonstrating decreased brain volume, 86% demonstrating ventriculomegaly and 50% demonstrating hypoplasia of the cerebellum/brainstem. Of those who underwent MRI, 100% had calcifications in the cortical and subcortical white matter junction, 100% had malformation of cortical development, decreased brain volume and ventriculomegaly, 88% had an enlarged cisterna magna, 88% had delayed myelination and 75% had moderately to severely decreased brain volume.

Conclusion: This retrospective case series of patients with microcephaly due to a Zika virus infection found that the most commonly observed CT findings were

calcifications in the cortical and subcortical white matter junctions, with associated malformations of cortical development.

Aragao, M., et al. Clinical Features and Neuroimaging (CT and MRI) Findings in Presumed Zika Virus Related Congenital Infections and Microcephaly: Retrospective Case Series. *Brit Med J.* 2016; 353: DOI: 10. 1136/BMJ. i1901

PREDICTING EARLY RETURN AFTER ISCHEMIC STROKE

For patients with ischemic stroke, recurrence is highest during the 90 days following the initial event. This study was designed to determine whether a web-based instrument, the recurrent risk estimator (RRE), can predict 90-day stroke recurrence in patients with ischemic stroke.

This retrospective study included a cohort of patients in the United States, one in South Korea and one in Brazil. Clinical and imaging predictors were collected by participating neurologists. From these, the RRE score was calculated for each patient by an investigator held blind to the patients' recurrence status. The RRE is a seven-point score wherein one point is received for each of the following predictors: a) a prior transient ischemic attack or stroke within the preceding month, b) a Causative Classification Symptom subtype, with one point added if the cause of the stroke was large artery atherosclerosis or uncommon cause, c) the presence of multiple infarcts of different ages, d) simultaneous acute infarcts in both hemispheres or in both the anterior and posterior circulations e) multiple acute infarcts or f) isolated cortical location.

The study's final sample were 1,468 patients, among whom 59 had sustained a recurrent stroke within 90 days. The cumulative rate of 90-day recurrence was 4.2%, with the risk of recurrence increased with a higher RRE score ($p < 0.001$). The RRE identified 710 patients as being at either high or low risk for recurrence. For identifying those at high risk, the RRE had 41% sensitivity and a 90% specificity. For identifying those at low risk the RRE had a 38% sensitivity and a 93% specificity.

Conclusion: This study of patients with acute ischemic stroke found that the Recurrence Risk

Estimator can be useful in identifying high versus low risk patients.

Arsava, E., et al. Prediction of Early Recurrence after Acute Ischemic Stroke. *J Amer Med Assoc Neurol*. 2016, April 16; 73(4): 396-401.

EYE POSITION AND HOSPITAL MORTALITY AFTER ACUTE INTRACEREBRAL HEMORRHAGE

In 1865, Jean Prevost first described ocular gaze deviation towards the side of damage cerebral hemisphere. This study reviewed the association of brain imaging assessed eye position with hospital mortality in patients with supratentorial intracerebral hemorrhage (ICH).

This retrospective analysis was performed in 316 adult patients with a supratentorial ICH. Eye position was measured on the first brain CT or MRI, usually performed at admission. Scans were reviewed, with eye position characterized by horizontal skew, as deviation or no deviation. Conjugate eye deviation (CED) was defined as deviation of both eyes in the same direction by at least 10°, with horizontal skew deviation (HSD) defined as deviation in the opposite direction. The primary outcome variable was the association between eye position and hospital mortality, as measured using a logistic regression analysis.

Among the 316 patients studied, CED was present in 30.4%, HSD in 13.9% and no deviation in 55.7%. Of those with CED, 81.3% deviated to the ipsilateral side of the hemorrhage. A univariable regression analysis revealed that HSD was associated with increased mortality, with an odds ratio of 3.1. Multivariable analysis, adjusted for age, ICH volume, intraventricular extension and a GCS score of eight or less, found that eye position was not independently associated with mortality.

Conclusion: This study found that horizontal skewing of the eyes, as measured during the initial CT scan or MRI, is an unfavorable prognostic factor, although not independent from other predictors of ICH mortality.

Frusch, K., et al. Association between Eye Position on Brain Scan and Hospital Mortality in Acute

Intracerebral Hemorrhage. *Euro J Neurol*. 2016, April; 23(4): 831-835.

ULTRASOUND TREATMENT APPLIED WITH EXERCISE FOR ANKYLOSING SPONDYLITIS

Ankylosing spondylitis (AS) is a chronic inflammatory disease that often leads to back pain. Treatment goals include pain reduction and postural correction. As ultrasound (US) is a physical modality commonly used to treat musculoskeletal disorders, this study assessed the efficacy of US combined with exercise in ameliorating pain.

This randomized, prospective, double-blind, placebo-controlled trial included 50 patients diagnosed with AS. The subjects were randomized to perform exercise and receive US (15 minutes per session) or placebo US in 10 sessions over two weeks. Both groups were given instructions for an exercise program comprising postural stretching and breathing exercises. Both groups were evaluated for pain and stiffness, and with patient global assessments (PGAs), doctor global assessments (DGAs), the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI), the Bath Ankylosing Spondylitis Metrology Index (BASMI), the Ankylosing Spondylitis Quality-Of-Life Questionnaire (ASQoL), and the Ankylosing Spondylitis Disease Activity Score (the ASDAS-ESR, and ASDAS-CRP).

While improvements were noted in both groups, significantly superior results were seen in the US group at week two for parameters of BASMI, tragus to wall distance, PGA and DGA, and at six weeks for daily pain and the PGA, VGA, BAS PAI, ASDAS -CRP, ASDAS-ESR, and lumbar side flexion, the modified Shober test and the ASQoL.

Conclusion: This study of patients with ankylosing spondylitis found that continuous ultrasound treatment with exercise therapy can reduce pain, stiffness and disease activity, as well as improve lumbar mobility and quality of life, better than exercise alone.

Karaamanlioglu, D., et al. Effectiveness of Ultrasound Treatment Applied with Exercise Therapy in Patients with Ankylosing Spondylitis: A Double-Blind, Randomized, Placebo-Controlled

Trial. *Rheum Intern*. 2016, May; 36 (5): 653-661.

SUPPRESSION OF ARTHRITIS BY A CALCIUM CHANNEL ANTAGONIST

Rheumatoid arthritis (RA) has a chronic relapsing course, often leading to the destruction of multiple joints. As osteoclastogenesis is dependent on calcium-release activated calcium current (CRAC) channels, suppression of these channels has been found to impair bone degrading osteoclasts. This study tested the effect of a CRAC antagonist, 3,4-dichloropropionaniline (DCPA) in an animal model of collagen-induced arthritis.

Collagen-induced arthritis was created using bovine-2 collagen plus 20 mg of Mycobacterium tuberculosis H37RA. At day 20, mice were provided with subcutaneous injections of either DCPA at 10.5mg/kg/day, 21 mg/kg/day or a placebo. The animals were monitored for arthritis and scored on an arthritic index, with all euthanized on day 40. Serum was analyzed for antibodies and cytokines, with histologic evaluation of the osteoclast bone interface and T-cell density.

While the lower dose of the DCPA had no significant effect on the mice, the higher dose reduced the arthritic index strongly before day 37 and by 20-50% at days 38 to 40. Bone and cartilage damage in sections of animal feet was reduced by 50% among those treated with the higher dose of DCPA. Effects on bone density were reduced more among the DCPA treated animals than in those without treatment.

Conclusion: This animal study of induced arthritis found that a calcium-release activated calcium channel antagonist can suppress the development of arthritis by approximately 50%.

Blair, H., et al. Suppression of Arthritis-Induced Bone Erosion by a CRAC Channel Antagonist. *RMD Open*. 2016.DOI:10.1136/rmdopen-2015-000093.

ORAL PREDNISOLONE FOR THE TREATMENT OF GOUT

Acute gout flares are often treated with nonsteroidal anti-inflammatory

drugs (NSAIDs). This study evaluated the efficacy and safety of oral prednisolone, as compared with indomethacin, in patients presenting to the emergency department with acute gouty attacks.

This multicenter, double-blind, randomized, double dummy, controlled trial included 416 patients presenting to the emergency department with a clinical diagnosis of acute gout flare. Subjects were randomized to receive either prednisolone, 30 mg a day for five days, plus a placebo, or a placebo plus Indocin at 50 mg, three times a day for two days, followed by 25 mg three times a day for three days. The primary outcome measure was pain at rest and with activity, using a visual analogue scale, measured two hours after entering the emergency department, and then daily for 14 days.

Improvement in pain during the emergency department phase, and during the 14-day follow-up, was similar between the two groups. No major adverse events occurred during the study. A significantly greater number of patients in the indomethacin group had minor adverse events during the emergency department phase, as compared with the prednisolone group. During the 14-day follow-up, the rate of minor adverse events, approximately 37%, was comparable in both groups.

Conclusion: This study of patients with acute gouty attacks revealed that oral prednisolone and indomethacin have similar efficacy for the treatment of pain, as measured both acutely and at 14-day follow-up.

Rainer, T., et al. Oral Prednisolone in the Treatment of Acute Gout: A Pragmatic, Multicentered, Double-Blind, Randomized Trial: *Ann Intern Med.* 2016, April 5; 164(7): 464-471.

LAMINECTOMY WITH OR WITHOUT FUSION FOR SPONDYLOLISTHESIS

Spinal fusions are increasingly common in the United States, representing the highest aggregate hospital cost of any surgical procedure. This study compared the effectiveness of laminectomy alone versus a combination of laminectomy and lumbar spinal fusion.

This randomized, controlled trial included patients with stable

degenerative spondylolisthesis. The participants were randomly assigned to undergo either decompressive laminectomy or laminectomy with posterolateral fusion, at the single level of the spondylolisthesis. The primary outcome measure was the change in the SF-36 physical component summary score at two years. The secondary outcome measure was the change in the disease specific Oswestry disability index (ODI) score.

Subjects were 66 patients with a mean age of 67 years. At two years post-surgery, the fusion group had a significantly greater increase in the SF-36 physical-component summary score than did those in the decompression alone group (15.2 points versus 9.5 points). The magnitude of the difference in treatment effect was sustained over four years after surgery ($p=0.02$). The fusion group had a lower rate of reoperation over four years than did the decompression group ($p=0.05$). Disability related low back pain scores, as measured by the ODI, did not differ significantly at years two, three and four.

Conclusion: This study of patients undergoing lumbar laminectomy found that the addition of posterolateral fusion was associated with a slightly greater clinically meaningful improvement in physical health-related quality of life, as measured at two, three and four years post-surgery.

Ghogawala, Z., et al. Laminectomy plus Fusion versus Laminectomy Alone for Lumbar Spondylolisthesis. *N Eng J Med.* 2016, April 14; 374:1424-1434.

FUSION SURGERY FOR LUMBAR SPINAL STENOSIS

Lumbar spinal stenosis is caused by a narrowing of the spinal canal, with symptoms often including low back and leg pain. These are usually associated with walking. In recent years, half of the patients in the United States who received surgical treatment for lumbar spinal stenosis have undergone fusion surgery as well. This study investigated whether fusion surgery, as an adjunct to decompressive surgery, can produce better clinical outcomes.

This multicenter, open label, clinical superiority trial included

patients with lumbar spinal stenosis, with or without degenerative spondylolisthesis. The subjects were randomized to undergo either decompressive surgery plus fusion, or decompressive surgery alone. The primary outcome measure was the Oswestry disability index (ODI), with secondary outcome variables including scores on the European Quality Of Life-five dimensions (EQ-5D), visual analogue scales for back pain and leg pain, the ZCQ measure of disability, and the six-minute walk test.

Between October of 2006 and June of 2012, 228 patients were enrolled. At two years, there was no significant difference in the primary outcome, the ODI ($p=0.27$). In addition, there was no significant difference between groups in performance of the six-minute walk test at two years, with walking distance improving in both groups ($p=0.60$). Subjective assessments of improvement in walking ability did not differ between groups. Of those followed for five years, there were no significant differences on any of the patient reported outcome measures. The mean direct cost of the procedure was \$6,800 higher in the fusion group.

Conclusion: This study of patients with lumbar spinal stenosis found that decompression with fusion did not result in clinical outcomes that were superior to those of patients who underwent decompression surgery without fusion.

Forsth, P., et al. A Randomized, Controlled Trial of Fusion Surgery for Lumbar Spinal Stenosis. *N Eng J Med.* 2016, April, 14; 374(15): 1413-1423.

ONE-YEAR FOLLOW-UP OF RADIAL NERVE PALSY

Humeral shaft fractures are often associated with radial nerve palsy, representing the most common traumatic nerve injury. This study assessed the recovery time and clinical outcome of patients with primary or secondary radial nerve palsy after humeral shaft fracture.

This retrospective analysis of prospectively collected data included all patients treated at a level I Trauma Center with a humeral fracture with concurrent radial nerve palsy. Data were reviewed to determine primary

versus secondary injuries, with patients followed for one year for clinical outcome. Nerve conduction studies were routinely performed two weeks following the onset of radial nerve palsy, and again after four months in cases of delayed recovery. Functional assessment was performed at all follow-up visits.

Of the patients, 53 sustained a high-energy trauma and 49 a low energy trauma, leading to humeral shaft fractures. Among those with a primary radial nerve injury (group A), 35 were treated with open reduction internal fixation, with 41 undergoing a similar procedure among those with a secondary nerve injury (group B). The time to onset of recovery of the radial nerve palsy was 10.5 weeks. In 45 patients (81.8%), full motor recovery (M5) was achieved after 26.7 weeks. In six patients, full recovery (M4) was achieved within 52 weeks. At final follow-up, 82% could manage activities of daily living without difficulty, while 10.7% showed mild to moderate impairment of motor function, and 6.8% suffered from severe functional impairment.

Conclusion: This study of patients with humeral fractures resulting in radial nerve injuries found that full recovery occurred in 81.8% at an average of 26.7 weeks. Mild to severe impairment was noted in over 17% at final follow-up.

Lang, N., et al. Retrospective Case Series with One-Year Follow-Up after Radial Nerve Palsy Associated with Humeral Fractures. **International Ortho.** DOI: 10. 1007/s 00264-016-3186-3

DYSPORT TO TREAT LATERAL PATELLOFEMORAL OVERLOAD SYNDROME

Superiolateral fat pad impingement (SLFPI) occurs at the lateral aspect of the patellofemoral joint, resulting in pain in the anteriolateral region of the knee. Iliotibial band syndrome (ITBS) is typified by pain around the lateral knee during activity, thought to result from compression of the fat layer between the IT band and the lateral femoral condyle. This study assess the effect of botulinum toxin type A (Dysport) injections into the tensor fasciae latae (TFL), as an adjunct to treatment for patients with lateral patellofemoral overload syndrome

(PFOS), defined as having one or a combination of SLFPI and ITBS .

Subjects included patients presenting to a sports medicine clinic between the ages of 20 and 50 years with a diagnosis of PFOS, who had previously failed conservative treatment. Patients received an ultrasound-guided injection to the IT band of 75 units of Dysport in 0.75 cc of normal saline. Subjects then underwent a six-week course of physical therapy. The primary outcome measure was a change in self-reported knee pain using the Anterior Knee Pain Scale (AKPS) before and at one, 4, 12 and 72 weeks after intervention.

Among the 45 patients, 36 reported improvement in AKPS scores greater than the minimal detectable change (MDC). Significant improvement in AKPS scores were identified from before the injection (61 ± 15) compared with one (67 ± 15), four (70 ± 16), and 12 weeks (76 ± 16) after the injection ($p < 0.001$), as well as at five years (87.0 ± 12.5) after the injection ($p < 0.01$).

Conclusion: This uncontrolled trial of patients with lateral patellofemoral overload syndrome found that an injection botulinum toxin type A into the IT band combined with exercise could provide long-term pain relief.

Stephen, J., et al. The Use Of Sonographically Guided Botulinum Toxin Type A (Dysport) Injections Into The Tensor Fasciae Latae For The Treatment Of Bilateral Patellofemoral Overload Syndrome. **Am J Sport Med.** 2016, May;44:1196-1202

FINANCIAL INCENTIVES TO PROMOTE PHYSICAL ACTIVITY IN OVERWEIGHT ADULTS

Higher levels of regular physical activity are associated with a number of health benefits. Evidence suggests that, overall, most workplace physical activity interventions have not been effective. This study tested the effectiveness of three financial incentive designs to promote activity in overweight and obese adults.

This randomized, controlled trial included 281 adult employees of the University of Pennsylvania in Philadelphia, all of whom had a body mass index (BMI) of at least 27 kg/m². The participants were given the goal of achieving at least 7,000 steps

per day, with the steps tracked using the Moves smart phone application. The participants were randomized to one of four groups: a Gain Incentive Group, who received money for each day that they met the goal, a Loss Incentive Group, who had money withdrawn from a monthly incentive allotment each time the goal was not met, and a Lottery Incentive Group, who were eligible to receive money from a lottery, only if the goal had been achieved. A fourth group served as controls. The primary outcome variable was the mean proportion of participant days that the 7,000 step goal was achieved during the 13-week intervention.

Among the four groups, only the Loss Incentive group had a significantly greater mean proportion of participant-days during which they achieved the goal, as compared to the control group ($p = 0.001$). While this group had a greater mean daily steps than the control group, this difference did not achieve statistical significance ($p = 0.056$).

Conclusion: This study found that, among the financial incentives tested, a financial loss model was most effective in achieving physical activity goals among overweight and obese participants.

Patel, M., et al. Framing Financial Incentives to Increase Physical Activity among Overweight and Obese Adults. A Randomized, Controlled Trial. **Ann Intern Med.** 2016, March 15; 164(6): 385-394.

INTENSIVE REHABILITATION AND THE IMMUNE SYSTEM

Previous studies have demonstrated that some treatments which enhance cortical plasticity also up-regulate the brain derived neurotrophic factor (BDNF) – tyrosine receptor kinase B (TrkB) and increases N-methyl-d-aspartate receptor (NMDAR) association in both the cortex and peripheral lymphocytes. On binding of BDNF, TrkB facilitates mechanisms related to neuronal plasticity, including long-term potentiation (LTP) and synapse formation. Studies of patients with Parkinson's disease (PD) have revealed a decrease in LTP-like plasticity in the cortex. This study was designed to determine whether a multidisciplinary intensive rehabilitation treatment (MIRT),

previously demonstrated to improve motor and nonmotor functions of patients with PD, might also enhance BDNF-TrkB signaling in lymphocytes.

Participants were 16 patients with PD, hospitalized for a four-week MIRT, including three daily PT sessions five days per week for four weeks. Clinical progress was assessed with the Unified Parkinson's Disease Rating Scale-II (UPDRS), the six-Minute Walking Test, the Berg Balance Scale, the Timed Up and Go Test, the Parkinson's Disease Disability Scale, and the Freezing of Gait Questionnaire. Blood was collected at baseline and at two and four weeks.

The results indicated that MIRT improved BDNF-TrkB signaling and TrkB-NMDAR interaction. The TrkB interaction with NMDAR and BDNF-TrkB signaling increased in peripheral lymphocytes at receptor, intracellular mediator, and downstream levels. The increases in TrkB signaling and NMDAR interaction levels were significantly related to improvements in the UPDRSII and activities of daily living.

Conclusion: This study, involving patients with Parkinson's disease, demonstrates that an intensive rehabilitation program can enhance BDNF-TrkB signaling in lymphocytes, with parallel improvement in clinical scores.

Fontanesi, C., et al. Intensive Rehabilitation Enhances Lymphocyte BDNF-Trkb Signaling in Patients with Parkinson's Disease. **Nerorehab Neural Repair**. 2016, June; 30(5): 411-418.

TRAUMATIC BRAIN INJURY RELATED BRAIN LESIONS AND CAREGIVER BURDEN

Traumatic brain injury (TBI) often leads to serious health and socioeconomic issues that may have a long-term effect on quality of life. Previous studies have demonstrated that, while the caregivers play a crucial role in the rehabilitation process, high levels of caregiver burden increase the risk of caregiver morbidity. This study focused on the caregiver burden related to the dysexecutive syndrome, as well as the association between TBI-related lesions and caregiver burden.

Subjects were 256 participants, including 105 combat veterans with

traumatic brain injury, 23 healthy control combat veterans and 128 caregivers. All were assessed by CT scan, with lesions identified and characterized. Caregivers were interviewed by phone four years post-injury. Combat veterans were assessed for executive function (EF) and symptoms of post-traumatic stress disorder. Caregiver burden was assessed with a 22-item version of the Zarit Burden Interview (ZBI).

The caregivers of those in the TBI group had a significantly higher ZBI scores than those caring for healthy veterans ($p < 0.05$). For the TBI group, significant relationships were found between all EF measures and ZBI scores. Caregivers of those with lesions affecting the left dorsolateral prefrontal cortex and dorsal anterior cingulate cortex had greater long-term burden than did caregivers of participants with lesions elsewhere in the brain.

Conclusion: This study of combat veterans found that, four years post-injury, caregivers had significant perceived burden, with an association between long term caregiver burden and both impaired executive function and lesion location.

Brioschi, G., et al. Association between Traumatic Brain Injury-Related Brain Lesions and Long-Term Caregiver Burden. **J Head Trauma Rehab**. 2016, March/April; 31(2): E48-E58.

TASTE DYSFUNCTION AND MULTIPLE SCLEROSIS

The impact of multiple sclerosis (MS) on taste perception has rarely been studied, despite the fact that malnutrition affects 10 to 15% of patients with MS in the community. This study attempted to better characterize taste dysfunction among patients with MS.

This case-control study included 73 patients with MS and 73 controls. All underwent a standardized taste test, including six trials of four different taste stimulants applied to four different regions of the tongue. All patients with MS also underwent an MRI of the brain on the same day of testing to characterize the number, size and location of lesions.

Taste identification scores were significantly lower in the MS patients than in the controls for sucrose, citric

acid, caffeine and sodium chloride in both the anterior and posterior tongue regions. The percentage of patients with MS whose taste identification scores fell below the fifth percentile of controls was 15.07% for bitter, 21.9% for sour, 24.6% for sweet and 31.5% for salty, all significant at the .05 level. Taste scores were negatively correlated with lesion volumes in the temporal, medial and superior frontal lobes, and with the number of lesions in the left and right superior frontal lobes, the right anterior cingulate gyrus, and the left parietal operculum. Women outperforming men in most taste tests.

Conclusion: This study of patients with multiple sclerosis found that this disease is associated with decrements in the ability to identify all four classic taste qualities.

Doty, R., et al. Taste Dysfunction in Multiple Sclerosis. **J Neurol**. 2016, April; 263(4): 677-688.

TAI CHI VERSUS PHYSICAL THERAPY FOR KNEE OSTEOARTHRITIS

Knee osteoarthritis (OA) is a major, age-related public health problem, with few effective medical treatments. While physical therapy is recommended as an element of care for patients with knee OA, there remains a need to identify new and effective treatments. This study compared the effectiveness of tai chi with that of physical therapy for patients with OA of the knee.

This single-blind, randomized, comparative study included symptomatic adult patients, at least 40 years of age, with radiographic knee OA. The subjects randomized to the tai chi group received 60-minute sessions occurring twice per week for 12 weeks. After completing these 24 sessions, the participants were instructed to continue tai chi for 52 weeks. Those in the physical therapy group underwent two, 30-minute sessions per week for six weeks, after which they were instructed to continue exercise in 30-minute sessions four times per week for six weeks. The primary outcome measure was the change in the pain subscale score of the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) between baseline and week 12.

(Continued from page 2)

*Bonnie Weigert, M.D.
Larry Kim, M.D.
University of Wisconsin, Madison, WI

*Chris Arbonies, M.D.
VCU, Richmond, VA

*Jeremy Hartman, M.D.
Jessica Justmann, M.D.
Rucha Kharod, 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.

Subjects included 204 adults, with a mean age of 60 years and a mean body mass index of 33 kg/m². At 12 weeks, both groups showed significant improvement in WOMAC pain scores, with no significant difference between the groups. In addition, both groups showed similar improvements in most of the secondary outcomes at 12 weeks, and in all outcomes as measured 24 and 52 weeks.

Conclusion: This study of patients with osteoarthritis of the knee found that both tai chi and physical therapy resulted in clinically significant improvements in pain and related health outcomes by 12 weeks, with the benefits maintained at 52 weeks.

Wang, C., et al. Comparative Effectiveness of Tai Chi versus Physical Therapy for Knee Osteoarthritis: A Randomized Trial. *Ann Int Med*: DOI. 7326/M 15-2143.

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 or by fax or phone at (800) 850-7388.

ISSN # 1081-1303
www.rehabinreview.com



REHAB IN REVIEW

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



EMORY
UNIVERSITY
SCHOOL OF
MEDICINE

Department of
Rehabilitation
Medicine

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