

## 5. SURGERY

### Decompression as good as discectomy

#### World Neurosurgery

#### Original article

#### Clinical outcome of minimally invasive decompression without discectomy in contained foraminal disc herniation: A single-center study

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<https://doi.org/10.1016/j.wneu.2018.06.192>Get rights and content

#### Highlights

- In contained foraminal disc herniation, most symptoms are due to nerve compression.
- Discectomy is the usual approach if conservative treatment fails.
- We report good outcomes of decompression without discectomy in all patients.
- Improvement in VAS and ODI scores with no radiation leg pain was noted at 12 months.
- Excellent and good outcomes were observed in 13 and 4 patients, respectively.

#### Abstract

#### Background

Foraminal disc herniation is rare. If conservative treatment fails, it is often treated with discectomy via a paraspinal or Wiltse approach. In contained foraminal disc herniation, more symptoms arise from the foraminal compression of the exiting nerve root, including the dorsal root ganglion, than from the herniation itself. We aimed to evaluate the benefits of stand-alone decompression without discectomy for patients with contained foraminal disc herniation.

#### Methods

This study included 17 patients with unilateral single-level foraminal disc herniation (14 women, 3 men; mean age:  $62.8 \pm 14.6$  years, range: 37–86 years). Disc herniation was confirmed to be contained by preoperative magnetic resonance imaging and/or computed tomography and by intraoperative exploration. All patients underwent thorough decompression without discectomy, via a paraspinal approach. Pain was evaluated preoperatively and at 3 and 12 months postoperatively using a visual analog scale (VAS). The Oswestry disability index (ODI) and Macnab criteria were used to evaluate the final outcome.

#### Results

The level that was most commonly affected was L5–S1. All 17 patients showed significant improvements in VAS and ODI scores at 3 and 12 months postoperatively. According to the Macnab criteria, outcome results were excellent in 13 patients and good in 4. The mean follow-up period was  $18.4 \pm 2.4$  months, with no recurrences or lumbar instability at the final follow-up.

#### Conclusions

Stand-alone decompression without discectomy is an effective method for relieving symptoms and preserving the disc in contained foraminal disc herniation. A minimally invasive approach with thorough decompression techniques yields good results.

## 8. VISCERA

### Sex and IBD

Gastroenterology. 2018 Jun 26. pii: S0016-5085(18)34685-7. doi: 10.1053/j.gastro.2018.06.043.

#### **Sex-based Differences in Incidence of Inflammatory Bowel Diseases-Pooled Analysis of Population-based Studies from Western Countries.**

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#### *BACKGROUND & AIMS:*

Although the incidence of inflammatory bowel diseases (IBD) varies with age, few studies have examined variations between the sexes. We hypothesize that sex hormones are implicated in IBD pathogenesis. We therefore used population data from established cohorts to analyze sex differences in IBD incidence according to age of diagnosis.

#### *METHODS:*

We identified population-based cohorts of patients with IBD for which incidence and age data were available (17 distinct cohorts from 16 regions of Europe, North America, Australia, and New Zealand). We collected data through December 2016 on 95,605 incident cases of CD (42,831 male and 52,774 female) and 112,004 incident cases of UC (61,672 male and 50,332 female). We pooled incidence rate ratios of Crohn's disease (CD) and ulcerative colitis (UC) for the combined cohort and compared differences according to sex using random-effects meta-analysis.

#### *RESULTS:*

Female patients had a lower risk of CD during childhood, until the age range of 10-14 years (incidence rate ratio, 0.70; 95% CI, 0.53-0.93), but they had a higher risk of CD thereafter, which was statistically significant for the age groups of 25-29 years and older than 35 years. The incidence of UC did not differ significantly for female vs male patients (except for the age group of 5-9 years) until age 45 years; thereafter, men had a significantly higher incidence of UC than women.

#### *CONCLUSIONS:*

In a pooled analysis of population-based studies, we found age of IBD onset to vary with sex. Sex hormones might affect pathogenesis of IBD in patients with epigenetic and genetic risk factors. Further studies are needed to investigate mechanisms of sex differences in IBD incidence.

**13 C. AIRWAYS/SWALLOWING/SPEECH****Scoring insomnia****ORIGINAL RESEARCH****The relationship between sleep disturbance and health status in patients with COPD**

**Authors** Ban WH, Joo H, Lim JU, Kang HH, Moon HS, Lee SH

**Published** 28 June 2018 Volume 2018:13 Pages 2049—2055

**DOI** <https://doi.org/10.2147/COPD.S167678>

**Introduction:** The detection of insomnia in patients with COPD is assumed to be significantly lower than the actual prevalence. In this study, we investigated the prevalence of insomnia and the relationship between insomnia and health status in patients with COPD using two fairly simple and straightforward questionnaires: COPD assessment test (CAT) and insomnia severity index (ISI).

**Patients and methods:** A cross-sectional study was conducted using data from patients undergoing treatment for COPD at St Paul's Hospital, The Catholic University of Korea, between December 2015 and August 2016. Patients were classified into three groups according to the ISI score: a “clinical insomnia” group ( $ISI \geq 15$ ), a “subthreshold insomnia” group ( $ISI 8-15$ ), and a “non-insomnia” group ( $ISI < 8$ ). Clinical parameters including past medical history, pulmonary function tests, and questionnaire data were collected and analyzed.

**Results:** A total of 192 patients were recruited, of which 25.0% were found to have clinical insomnia ( $ISI \geq 8$ ). Insomnia severity was related to all CAT component items except for cough, and patients with higher CAT scores generally had more severe insomnia. Logistic regression analysis revealed that CAT score was significantly associated with insomnia in these patients (odds ratio, 1.23; 95% CI, 1.13–1.34;  $p < 0.0001$ ). CAT score was also a significant predictor of insomnia (area under receiver operating characteristic curve, 0.779;  $p < 0.001$ ). The optimal predictive cutoff value was a CAT score  $> 14$ , giving a sensitivity and specificity of 66.7% and 71.5%, respectively.

**Conclusion:** CAT score was closely related to insomnia severity in patients with COPD. The use of CAT scores to assess for the presence and severity of insomnia in these patients may allow for better detection and management and improve clinical practice.

**Measuring SA**

Sleep Breath. 2018 Jun 26. doi: 10.1007/s11325-018-1677-8.

**Serum levels of NGAL and cystatin C as markers of early kidney dysfunction in patients with obstructive sleep apnea syndrome.**

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**PURPOSE:**

Obstructive sleep apnea syndrome (OSAS) has been recently proposed as an independent risk factor for chronic kidney disease. Cystatin C (Cyst C) and neutrophil gelatinase-associated lipocalin (NGAL) are novel biomarkers for the earlier detection of latent kidney disease. The aim of the study was to assess serum Cyst C and NGAL levels in otherwise healthy OSAS patients and to explore possible associations with sleep parameters.

**METHODS:**

Consecutive subjects (n = 96, 79.2% males), without known comorbidities, with symptoms suggestive of OSAS were included. All of them underwent polysomnography (PSG) and blood examination for the measurement of serum Cyst C and NGAL levels.

**RESULTS:**

Based on apnea-hypopnea index (AHI), subjects were classified into two groups: 32 controls and 64 OSAS patients, with no significant differences in terms of age ( $50.1 \pm 11.7$  vs  $51 \pm 12.2$  years,  $p = 0.747$ ) and BMI ( $33.9 \pm 8.8$  vs  $35.9 \pm 13.1$  kg/m<sup>2</sup>,  $p = 0.449$ ). Serum Cyst C and NGAL mean levels were higher in OSAS patients compared to those in controls ( $1155.2 \pm 319.3$  vs  $966.8 \pm 173$  ng/ml,  $p = 0.001$ , and  $43.7 \pm 23.2$  vs  $35.6 \pm 13.8$  ng/ml,  $p = 0.035$ , respectively). After adjustment for age and BMI in OSAS patients, serum NGAL levels were associated with AHI ( $\beta = 0.341$ ,  $p = 0.015$ ) and minimum oxyhemoglobin saturation during sleep ( $\beta = -0.275$ ,  $p = 0.032$ ), while serum Cyst C levels were associated with percentage of time with oxyhemoglobin saturation < 90% ( $\beta = 0.270$ ,  $p = 0.043$ ), average ( $\beta = -0.308$ ,  $p = 0.018$ ), and minimum ( $\beta = -0.410$ ,  $p = 0.001$ ) oxyhemoglobin saturation during sleep.

**CONCLUSIONS:**

Higher risk for latent kidney disease in otherwise healthy OSAS patients is indicated. Sleep hypoxia seems to be a significant contributor in the pathogenetic process of renal dysfunction in OSAS.

**Cognitive impairment**

Sleep Breath. 2018 Jul 2. doi: 10.1007/s11325-018-1693-8.

**Proteomic biomarkers of cognitive impairment in obstructive sleep apnea syndrome.**

Lal C<sup>1</sup>, Hardiman G<sup>2</sup>, Kumbhare S<sup>3,4</sup>, Strange C<sup>3</sup>.

*PURPOSE:*

There are currently no biomarkers that are associated with cognitive impairment (CI) in patients with obstructive sleep apnea syndrome (OSAS). This pilot study performed an exploratory plasma proteomic analysis to discover potential biomarkers and explore proteomic pathways that differentiate OSAS subjects with and without CI.

*METHODS:*

Participants were selected from a cohort of women within 5 years of menopause not on hormone replacement therapy between the ages of 45-60 years. The Berlin questionnaire was used to select OSAS participants who then completed the MCFSI (Mail-In Cognitive Function Screening Instrument) to measure cognition. Six subjects with the highest MCFSI scores ( $\geq 5$  denoting CI) were compared to six with normal scores. Proteomic analysis was done by Myriad RBM using a targeted ELISA for 254 serum proteins. Pathway analysis of differentially expressed proteins was performed using STRING (Search Tool for the Retrieval of Interacting Genes/Proteins) software.

*RESULTS:*

Distinct proteomic signatures were seen in OSAS subjects with CI as compared to those without CI. Proteins including insulin, prostatic acid phosphatase, angiopoietin-1, plasminogen activator inhibitor 1, and interleukin-1 beta were overexpressed in OSAS subjects with CI. Proteins underexpressed in CI participants included cathepsin B, ceruloplasmin, and adiponectin. Pathway analysis revealed prominence of insulin-regulated vascular disease biomarkers.

*CONCLUSIONS:*

Proteomic biomarkers in participants with cognitive impairment suggest roles for insulin, and vascular signaling pathways, some of which are similar to findings in Alzheimer's disease. A better understanding of the pathogenic mechanisms of CI in OSAS will help focus clinical trials needed in this patient population.

**Gallstones and SA**

Sleep and Breathing pp 1–8|

**Risk of gallstones in patients with obstructive sleep apnea: a nationwide observational cohort study**

Chien-Hua Chen Cheng-Li Lin Chung-Y. Hsu Chia-Hung Kao

**Purpose**

To assess the association between obstructive sleep apnea (OSA) and gallstones.

**Methods**

We identified 3827 patients aged  $\geq 20$  years with OSA between 2000 and 2010 from the Longitudinal Health Insurance Research Database 2000 (LHID2000) as the study cohort. The beneficiaries without OSA were randomly selected and propensity-matched with the study cohort in a 1:1 ratio according to age; sex; occupation; urbanization; comorbidities of hypothyroidism, hyperlipidemia, diabetes, liver cirrhosis, alcohol-related illness, hypertension, chronic obstructive pulmonary disease (COPD), obesity, inflammatory bowel disease, stroke, coronary artery disease (CAD), hepatitis B virus, and hepatitis C virus; and the index year. All patients were followed until the end of 2011 or withdrawal from the National Health Insurance program to determine the incidence of gallstones.

**Results**

The prevalence of OSA was higher in men (67.3%) and in patients younger than 49 years (57.0%; mean age  $47.8 \pm 15.1$  years). The cumulative incidence of gallstones was higher in the OSA cohort than in the non-OSA cohort (log-rank test,  $P < 0.001$ ). Compared with patients without OSA, those with OSA had an increased risk of gallstones (adjusted hazard ratio = 1.53, 95% confidence interval = 1.16–2.03) after adjustment for age, sex, hyperlipidemia, diabetes, hypertension, COPD, stroke, and CAD.

**Conclusion**

The study shows a strong association between OSA and gallstones. Moreover, our findings suggest the requirement for survey and health education for gallstones in OSA and further studies to verify whether the treatment of OSA can reduce the risk of gallstones.

## Sleep apnea

## ORIGINAL ARTICLE

**Renal Denervation in Resistant Hypertension and Obstructive Sleep Apnea  
Randomized Proof-of-Concept Phase II Trial**

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**Abstract**

It has been postulated that catheter-based renal denervation (RDN) may lower blood pressure (BP) and improve severity of obstructive sleep apnea (OSA) in resistant hypertensive patients.

The aim of our study (NCT01366625) was to investigate in a prospective randomized trial the effect of RDN on BP and clinical course of OSA. Sixty patients with true resistant hypertension coexisting with moderate-to-severe OSA (apnea/hypopnea index,  $\geq 15$ ) were randomly allocated to RDN group (30 patients) and to control group (30 patients). The primary end point was reduction in office systolic BP at 3 months. Secondary end points included reduction in diastolic office and ambulatory BP, change in apnea/hypopnea index and biochemical measurements at 3 months, and change in echocardiographic measurements at 6 months.

There were no differences in clinical characteristics between the groups. At 3 months in the RDN group, both office and ambulatory BP were significantly reduced, and a significant decrease in OSA severity (apnea/hypopnea index, 39.4 versus 31.2 events per hour;  $P=0.015$ ) was observed. Between-group difference in apnea/hypopnea index change was significant at 0.05. At 6 months in the RDN group, reductions in office and ambulatory BP were sustained and were accompanied by significant improvement in echocardiographic measures of global longitudinal strain.

There were no differences in metabolic variables in follow-up in both groups. In a randomized controlled trial, RDN lowered both office and ambulatory BP in patients with resistant hypertension and OSA. This was accompanied by improvement of the clinical severity of OSA.

## 14. HEADACHES

### Food triggers

#### ORIGINAL RESEARCH

#### **Dietary trigger factors of migraine and tension-type headache in a South East Asian country**

**Authors** Tai MLS, Yap JF, Goh CB

**Published** 28 June 2018 Volume 2018:11 Pages 1255—1261

**DOI** <https://doi.org/10.2147/JPR.S158151>

**Background:** The literature on the dietary trigger factors of headache among the South East Asians is limited.

**Objective:** The objective of the study was to examine the dietary trigger factors of migraine and tension-type headache (TTH) in Malaysian patients, consisting of Malays, Chinese and Indians.

**Methods:** In this prospective cross-sectional study, patients presenting with migraine and TTH to a neurology clinic between April 2010 and June 2017 were recruited. The patients were given a comprehensive dietary list consisting of 25 specified types of food and drink items as well as other unspecified types of food and drink items which were possible dietary triggers. The data on these dietary triggers and missing meals were collected.

**Results:** A total of 684 patients with headache (319 migraine and 365 TTH patients) were recruited. One hundred and fifty-eight (23.1%) patients had missing meals as trigger. Two hundred and fifty-five (37.3%) patients had dietary triggers; 141 (44.2%) patients with migraine and 114 (31.2%) patients with TTH had dietary triggers. Eighty-four (52.8%) Malay, 28 (41.8%) Chinese, 25 (32.5%) Indian migraine patients and five (38.5%) migraine patients from other ethnic groups, had dietary triggers. Some 58 (40.0%) Malay, 27 (25.2%) Chinese, 22 (23.9%) Indian patients and 7 (29.2%) patients from other ethnic groups with TTH had dietary triggers. The most common dietary trigger factors were coffee (19.9%), chocolate (7.5%) and food rich in monosodium glutamate (5.6%). Logistic regression showed that chocolate (OR 2.16, 95% CI 1.06–4.41,  $p = 0.035$ ) and coffee (OR 1.73, 95% CI 1.12–2.68,  $p = 0.014$ ) were significantly associated with migraine compared to TTH.

**Conclusion:** Chocolate and coffee significantly triggered migraine compared to TTH. Inter-ethnic differences were observed for dietary trigger factors.

## 26. CARPAL TUNNEL SYNDROME

### Carpal mobilization

#### **Dimensional changes of the carpal tunnel and the median nerve during manual mobilization of the carpal bones**

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DOI: <https://doi.org/10.1016/j.msksp.2018.04.002>

#### **Highlights**

- Cross-sectional area of the carpal tunnel increased during the manual mobilization of the carpal bones.
- The mobilization increased the anterior-posterior diameter of the carpal tunnel.
- Both the carpal tunnel and the median nerve became rounder during the technique.
- Differences in the median nerve dimensions were considered as irrelevant.

#### **Abstract**

##### **Introduction**

The carpal tunnel is a clinically important fibro-osseous conduit for the median nerve and associated tendons. It is mechanically dynamic, such that the dimensions of the tunnel and median nerve change with position, movement and application of externally applied force with mechanical devices. Therapeutic manual techniques that appear to move and change tunnel shape are part of clinical practice. The aim of this study was therefore to measure changes in dimensions of the carpal tunnel and median nerve with manual mobilization of the carpal bones.

##### **Material and methods**

An analytical descriptive study with 18 volunteer subjects and a total of 33 records was designed. Ultrasound measurements of the cross-sectional area (CSA), anteroposterior diameter (APD), transverse diameter (TD), perimeter, flattening ratio and circularity of the carpal tunnel and of the median nerve, were measured, both in the anatomical position of the wrist and during mobilization techniques of the carpal bones.

##### **Results**

During the mobilization technique, the tunnel ( $p = 0.003$ ) CSA significantly increased. APD also increased significantly for the tunnel ( $<0.001$ ) while TD decreased. The median nerve showed similar and significant ( $p < 0.001$ ) changes than the tunnel. However, because several of the obtained differences were smaller than the SDD obtained in a previous study, these differences were considered as irrelevant.

##### **Conclusions**

Manual mobilization of the carpal bones produced significant changes in the dimensions of the carpal tunnel.

**32 A. KNEE/ACL****Knee hyperextension**

Knee Surgery, Sports Traumatology, Arthroscopy  
pp 1–9 | Cite as

**Contralateral knee hyperextension is associated with increased anterior tibial translation and fewer meniscal injuries in the anterior cruciate ligament-injured knee**

- David Sundemo Christina Mikkelsen Riccardo Cristiani Magnus Forssblad Eric Hamrin Senorski Eleonor Svantesson Kristian Samuelsson Anders Stålmán

**Purpose**

To investigate the influence of hyperextension of the contralateral healthy knee on anterior tibial translation (ATT) and the presence of associated injuries in the anterior cruciate ligament (ACL)-injured knee.

**Methods**

A local patient data register containing the surgical and clinical data of patients undergoing ACL reconstruction was analyzed. Patients were divided into groups according to the degree of hyperextension of the contralateral knee: normal (Group A  $\leq 0^\circ$ ), mild (Group B  $1^\circ\text{--}5^\circ$ ), moderate (Group C  $6^\circ\text{--}10^\circ$ ), and severe (Group D  $> 10^\circ$ ). The ATT was measured in both knees preoperatively and 6 months postoperatively using the KT-1000 arthrometer. The presence of associated meniscal and cartilage injuries was noted. Using multivariate analysis, Groups B, C, and D were compared with Group A, using this group as a reference.

**Results**

A total of 10,957 patients were available in the register and 8502 (Group A  $n = 4335$ , Group B  $n = 3331$ , Group C  $n = 771$ , Group D  $n = 65$ ) were included in the final analysis. Groups B (10.3 mm; 95% CI 0.06–0.042,  $p < 0.0001$ ) and C (10.6 mm; 95% CI 0.23–0.89,  $p = 0.006$ ) showed significantly greater preoperative ATT in the injured knee compared with the control group (10.1 mm). Moreover, at the 6-month follow-up, greater ATT was observed for Groups B (8.5 mm; 95% CI 0.13–0.45,  $p < 0.0001$ ), C (8.5 mm; 95% CI 0.02–0.60,  $p = 0.035$ ), and D (9.1 mm; 95% CI – 0.08–1.77,  $p = 0.082$ ) compared with Group A (8.2 mm). Meniscal injuries were less frequent in patients with contralateral hyperextension [Group B 903 (27.1%)  $p < 0.0001$ , Group C 208 (27.0%)  $p = 0.0003$ , and Group D 12 (18.5%), 0.012] compared with the control group [Group A 1479 (34.1%)].

**Conclusion**

Contralateral knee hyperextension is associated with greater pre- and postoperative ATT in the ACL-injured knee. In patients with contralateral knee hyperextension, concomitant injuries to the menisci are less frequent. Surgeons should consider grafts with superior properties regarding postoperative anteroposterior laxity to patients with contralateral knee hyperextension.

**Level of evidence**

Retrospective cohort study, Level IV

**Comparison of repairs**

Knee Surg Sports Traumatol Arthrosc. 2018 Jul 4. doi: 10.1007/s00167-018-5042-z

**No difference between full thickness and partial thickness quadriceps tendon autografts in anterior cruciate ligament reconstruction: a systematic review.**

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**PURPOSE:**

The purpose of this review was to compare outcomes and complication profiles of anterior cruciate ligament reconstruction (ACL-R) between full thickness (FT-Q) and partial thickness (PT-Q) quadriceps tendon (QT) autografts.

**METHODS:**

As per PRISMA guidelines, PubMed, EMBASE, and MEDLINE were searched in September 2017 for English language, human studies of all levels of evidence on patients undergoing primary ACL-R with FT-Q or PT-Q. This search was repeated in March 2018 to capture additional articles. Data regarding postoperative outcomes and complications were abstracted. Due to heterogeneous reporting, data were not combined in meta-analysis and were summarized descriptively.

**RESULTS:**

Upon screening 3670 titles, 18 studies satisfied inclusion/exclusion criteria. The second search identified an additional two studies for a total of 20 studies (50% case-control, 50% case series). These studies examined 1212 patients (1219 knees) of mean age 29.8 years (range 15-59) followed a mean of 42.2 months (range 12-120). FT-Q and PT-Q autografts were used in eight studies (50.5% of knees), and thirteen studies (49.5% of knees), respectively. Only one study directly compared FT-Q to PT-Q. Instrumented laxity was less than 3 mm in 74.8 and 72.4% of the FT-Q and PT-Q groups, respectively. Postoperative IKDC Subjective Knee Form scores were similar between the FT-Q (82.5) and PT-Q (82.1) groups. Postoperative quadriceps strength, measured as a percentage of the contralateral side, were similar in the FT-Q (89.5%) and PT-Q (85.1%) groups. Graft failure rates for the FT-Q and PT-Q groups were 3.7 and 3.0%, respectively.

**CONCLUSION:**

Across the 20 studies included in this review, there appeared to be no difference in outcomes or complications between either FT-Q or PT-Q in primary ACL-R. Moreover, primary ACL-R using QT autografts appears to have successful outcomes with a low rate of graft failure, irrespective of tendon thickness. While further comparative studies are needed to better delineate the optimal thickness of quadriceps tendon for primary ACL-R, these data suggest that, in primary ACL-R, either FT-Q or PT-Q is efficacious and, in the clinical setting, surgeons may be justified in using either graft thickness.

## Ratings

**Self-reported outcomes are associated with knee strength and functional symmetry in individuals who have undergone anterior cruciate ligament reconstruction with hamstring tendon autograft**

Gulcan Harput Hamza Ozer Gul Baltaci Jim Richards

DOI: <https://doi.org/10.1016/j.knee.2018.06.007>**Background**

The aim of this study was to investigate the relationship between self-reported knee outcomes and limb symmetry indices (LSIs) for hip and knee strength, postural control and single-leg hop distance in individuals who had undergone an anterior cruciate ligament (ACL) reconstruction via hamstring tendon autograft (HTG).

**Methods**

A total of 72 participants with a history of unilateral ACL reconstruction via HTG (mean  $\pm$  standard deviation (SD) age:  $28.0 \pm 7.6$  years; height:  $178.4 \pm 6.7$  cm; mass  $76.9 \pm 14.9$  kg) were included. International Knee Documentation Committee 2000 Subjective Knee Form (IKDC), Lysholm, Knee Osteoarthritis Outcomes Scores (KOOS) and Tampa scores were used to evaluate self-reported outcomes. Concentric and eccentric knee extensor and flexor, and hip strength, postural control and single leg hop distance were evaluated for performance-based outcomes. The relationships between the LSI scores and the performance measures were explored using the Pearson correlation coefficient.

**Results**

The IKDC, Lysholm and KOOS scores were positively correlated with knee extensor and flexor strength LSIs ( $P < 0.05$ ,  $r = 0.34$  to  $r = 0.50$ ), and the Tampa score was negatively correlated with eccentric extensor LSI ( $P = 0.02$ ,  $r = -0.34$ ). Single-leg hop distance LSI was correlated with IKDC and Lysholm scores ( $P = 0.003$ ,  $r = 0.50$ ;  $P = 0.04$ ,  $r = 0.29$ ) respectively, while postural control was only correlated with the KOOS scores ( $P < 0.001$ ,  $r = 0.51$  to  $r = 0.52$ ).

**Conclusions**

Compared to Lysholm and Tampa scores, KOOS and IKDC scores were more likely to be correlated with performance-based outcomes. Therefore, KOOS and IKDC scores may help clinicians in return to sport decision making when there is a limited time to perform extensive evaluations or access equipment.

**32 B. KNEE/PCL****PCL laxity****Posterior Laxity Significantly Increases Over Time after Successful PCL Reconstruction**

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Imke Schatka, MD, GERMANY Andreas Weiler, MD, PhD, GERMANY  
DOI: <https://doi.org/10.1016/j.arthro.2017.08.194>

**Summary**

Restoration of the posterior cruciate ligament (PCL) is crucial to preserve physiological knee kinematics. We found that posterior laxity significantly increased after PCL reconstruction from postoperative values to the final follow-up of at least five years. Thus the direct postoperative result cannot be equated with the final outcome.

**Background**

Restoration of the posterior cruciate ligament (PCL) is deemed necessary to preserve physiological knee kinematics, but initial results of successful PCL reconstruction appear to deteriorate in the long term.

We hypothesized that postoperative posterior tibial translation (PTT) increases over time after PCL reconstruction and is significantly influenced by patient-specific factors, such as tibial slope, age, gender and body weight or the number of operated ligaments.

**Methods**

The study comprised 46 patients (10 female, 36 male;  $30 \pm 9$  years), which underwent PCL reconstruction in a single surgeon series. Patients were evaluated preoperatively, at three, six, 12, 24 months and at a final follow-up (FFU) of at least five years by bilateral stress radiographs using a Telos device. Anthropometric and demographic measures included age (years), gender, BMI ( $\text{kg}/\text{m}^2$ ), tibial slope and the number of operated ligaments.

Mean side-to-side difference of the PTT significantly improved from pre-operative to the three months postoperative values ( $10.9 \pm 3.1$  vs.  $3.6 \pm 3.8$  mm;  $P < .0001$ ). The PTT increased to  $4.6 \pm 3.7$  mm at six, to  $4.8 \pm 3.3$  mm at twelve months, to  $4.8 \pm 3.2$  mm at 24 months, to  $5.4 \pm 3.4$  mm at FFU, respectively. Consequently, there is a significantly increment of the PTT between the onset of weight bearing at three month and the final follow-up ( $3.6 \pm 3.8$  vs.  $5.4 \pm 3.4$  mm;  $P = .02$ ). Flattening of the tibial slope resulted in a significantly higher PTT in comparison with a high tibial slope at 24 months and final FU. BMI, age, gender and the number of operated ligaments failed reach statistical significance.

**Conclusions**

Posterior laxity significantly increased from postoperative values to the final follow-up of at least five years. Thus the direct postoperative result cannot be equated with the final outcome. Additionally, this increment was significantly higher in patients with a flattening of the tibial slope.

## 45 A. MANUAL THERAPY LUMBAR & GENERAL

### PA mobilizations of lumbar spine

August 2018 Volume 36, Pages 25–31

#### **Spinal PA movements behave ‘as if’ there are limitations of local segmental mobility and are large enough to be perceivable by manual palpation: A synthesis of the literature**

Neil Tuttle Charles Hazle

DOI: <https://doi.org/10.1016/j.msksp.2018.04.005>

#### **Highlights**

- Spinal PA movements, while non-specific, emphasize single vertebral level motion.
- Differences in PA motions of the spine are perceptible by manual examination.
- Application of less force in examination may enhance discriminatory ability.
- Students and novice clinicians may benefit from a tiered manual exam methodology.

#### **Background**

Posterior-anterior (PA) movements are one type of passive intervertebral movement used to assess and treat perceived deficits in localized segmental mobility.

#### **Objectives**

To describe: 1) The specific effects that reductions in segmental mobility would be expected to have on PA movements; 2) How differences in PA movements in clinical situations compare to what would be expected with reduced segmental mobility; and 3) Whether such differences in PA movements are likely to be perceivable by manual palpation.

#### **Methods**

Multiple modelling studies and *in vivo* measurements of PA movements are described.

#### **Results**

The findings indicate the differences in PA movements present in clinical conditions corresponds with the differences that would be expected with decreased segmental mobility. The differences both predicted from the modelling and found in clinical conditions were greatest at low levels of force. Additionally, the differences are large enough that individuals with training are likely to be capable of 1) consistently producing controlled movements with sufficiently small magnitudes of force to assess the movements, and 2) detecting the differences in stiffness expected from modelling and found in clinical situations.

#### **Conclusions**

Implications for clinical practice and teaching include the need to attend to the stiffness of PA movements at lower levels of force than those typically described. The authors recommend a three tiered approach to assessment of PA movements which may assist in both clinical practice and teaching manual therapy skills.

**45 D. MANUAL THERAPY EXTREMITIES****Hip OA**

August 2018 Volume 36, Pages 81–86

**Comparison of high, medium and low mobilization forces for increasing range of motion in patients with hip osteoarthritis: A randomized controlled trial☆☆☆**

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DOI: <https://doi.org/10.1016/j.msksp.2018.05.004>

**Highlights**

- A high force LADM increased hip ROM in all planes of motion in patients with hip OA.
- A specific intensity of force mobilization is necessary to increase ROM in hip OA.
- A high force LADM is based on the maximum resistance of the tissues to the movement.

**Background**

Manual therapy has been shown to increase range of motion (ROM) in hip osteoarthritis (OA). However, the optimal intensity of force during joint mobilization is not known.

**Objective**

To compare the effectiveness of high, medium and low mobilization forces for increasing range of motion (ROM) in patients with hip OA and to analyze the effect size of the mobilization.

**Design**

Randomized controlled trial.

**Methods**

Sixty patients with unilateral hip OA were randomized to three groups: low, medium or high force mobilization group. Participants received three treatment sessions of long-axis distraction mobilization (LADM) in open packed position and distraction forces were measured at each treatment. Primary outcomes: passive hip ROM assessed before and after each session. Secondary outcomes: pain recorded with Western Ontario and McMaster Universities (WOMAC) pain subscale before and after the three treatment sessions.

**Results**

Hip ROM increased significantly ( $p < 0.05$ ) in the high-force mobilization group (flexion: 10.6°, extension: 8.0°, abduction: 6.4°, adduction: 3.3°, external rotation: 5.6°, internal rotation: 7.6°). These improvements in hip ROM were statistically significant ( $p < 0.05$ ) compared to the low-force group. There were no significant changes in the low-force and medium-force groups for hip ROM. No significant differences in hip pain were found between treatment groups.

**Conclusion**

A high force LADM in open packed position significantly increased hip ROM in all planes of motion compared to a medium or low force mobilization in patients with hip OA. A specific intensity of force mobilization appears to be necessary for increasing ROM in hip OA.

**Carpel bones****Dimensional changes of the carpal tunnel and the median nerve during manual mobilization of the carpal bones**

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DOI: <https://doi.org/10.1016/j.msksp.2018.04.002>

**Highlights**

- Cross-sectional area of the carpal tunnel increased during the manual mobilization of the carpal bones.
- The mobilization increased the anterior-posterior diameter of the carpal tunnel.
- Both the carpal tunnel and the median nerve became rounder during the technique.
- Differences in the median nerve dimensions were considered as irrelevant.

**Abstract****Introduction**

The carpal tunnel is a clinically important fibro-osseous conduit for the median nerve and associated tendons. It is mechanically dynamic, such that the dimensions of the tunnel and median nerve change with position, movement and application of externally applied force with mechanical devices. Therapeutic manual techniques that appear to move and change tunnel shape are part of clinical practice. The aim of this study was therefore to measure changes in dimensions of the carpal tunnel and median nerve with manual mobilization of the carpal bones.

**Material and methods**

An analytical descriptive study with 18 volunteer subjects and a total of 33 records was designed. Ultrasound measurements of the cross-sectional area (CSA), anteroposterior diameter (APD), transverse diameter (TD), perimeter, flattening ratio and circularity of the carpal tunnel and of the median nerve, were measured, both in the anatomical position of the wrist and during mobilization techniques of the carpal bones.

**Results**

During the mobilization technique, the tunnel ( $p = 0.003$ ) CSA significantly increased. APD also increased significantly for the tunnel ( $<0.001$ ) while TD decreased. The median nerve showed similar and significant ( $p < 0.001$ ) changes than the tunnel. However, because several of the obtained differences were smaller than the SDD obtained in a previous study, these differences were considered as irrelevant.

**Conclusions**

Manual mobilization of the carpal bones produced significant changes in the dimensions of the carpal tunnel.

**50 A. MOTOR CONTROL****LBP training helps**

August 2018 Volume 36, Pages 1–11 MSP DOI: <https://doi.org/10.1016/j.msksp.2018.03.008>

**Effectiveness of movement control exercise on patients with non-specific low back pain and movement control impairment: A systematic review and meta-analysis**

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Christoph Michael Bauer

**Highlights**

- This is a meta-analysis on the effectivity of movement control exercises by LBP.
- These exercises improve disability significantly better than other interventions.
- Pain is reduced in short term better than with other interventions.
- Results were better if patients were subgrouped to MCI group.

**Background**

Patients with low back pain (LBP) and movement control impairment (MVCI) show altered spinal movement patterns. Treatment that aims to change movement behaviour could benefit these patients.

**Objective**

To assess the effectiveness of movement control exercise (MVCE) in terms of clinically relevant measures (disability and pain) on patients with NSLBP.

**Methods**

A systematic review and meta-analysis were conducted. CINAHL, MEDLINE, PUBMED and PEDro databases were searched for RCT's evaluating MVCE treatment in patients with NSLBP from review inception to April 2017. Authors were contacted to obtain missing data and outcomes. PEDro was used to assess methodological quality of the studies and the GRADE approach was used to assess the overall quality of evidence Data were combined using a random effects meta-analysis and reported as standardized mean differences (SMD).

**Results**

Eleven eligible RCT's including a total of 781 patients were found. Results show 'very low to moderate quality' evidence of a positive effect of MVCE on disability, both at the end of treatment and after 12 months (SMD -0.38 95%CI -0.68, -0.09 respectively 0.37 95%CI -0.61, -0.04). Pain intensity was significantly reduced after MVCE at the end of treatment (SMD -0.39 95%CI -0.69, -0.04), but not after 12 months (SMD -0.27, 95%CI -0.62, 0.09).

**Conclusions**

MVCE intervention for people with NSLBP and MVCI appears to be more effective in improving disability compared to other interventions, both over the short and long term. Pain was reduced only in the short term. An important factor is the initial identification of patients with MVCI.

**54. POSTURE****Impact of hip dysplasia**

Archives of Orthopaedic and Trauma Surgery  
pp 1–5 | Cite as

**Relationship between spinal sagittal alignment and acetabular coverage: a patient-matched control study**

- Kensuke Fukushima Masayuki Miyagi Gen Inoue iki Shirasawaatsufumi Uchiyama Naonobu Takahira Masashi Takaso

**Introduction**

The significance of the relationship between the spine and hip joints has been frequently discussed. However, the relationship between acetabular coverage and spinal sagittal alignment has not been fully elucidated as previous studies did not adequately control for factors that might affect the spinopelvic alignment. The aim of this study was to elucidate the impact of acetabular coverage on spinal sagittal alignment by comparing patient groups matched on sex, age, and the presence of hip and anterior impingement pain.

**Materials and methods**

We prospectively enrolled 30 women undergoing periacetabular osteotomy (PAO) for developmental dysplasia of the hip (DDH) and 30 women undergoing hip arthroscopic surgery (HAS) for labral tears. The lateral centre edge angle was measured on hip radiographs. In addition, the sagittal vertical axis, pelvic tilt, pelvic incidence, sacral slope (SS), and lumbar lordosis (LL) were measured on preoperative plain radiographs of the whole spine to assess the sagittal spinal alignment. Clinical and radiologic data were compared between the two groups (PAO vs. HAS).

**Results**

The patient groups did not differ in age and body mass index. The mean SS was significantly greater in the PAO group ( $41.6^\circ \pm 1.6^\circ$ ) than in the HAS group ( $35.3^\circ \pm 1.5^\circ$ ;  $P = 0.0039$ ). Additionally, the mean LL was significantly greater in the PAO group ( $54.5^\circ \pm 2.0^\circ$ ) than in the HAS group ( $45.1^\circ \pm 1.9^\circ$ ;  $P = 0.0015$ ).

**Conclusions**

The SS and LL were greater in patients with DDH than in patients with hip pain, but without DDH. Patients with DDH might show lumbar hyperlordosis to rotate the pelvis anteriorly, increasing the anterosuperior acetabular coverage.

**58. RUNNING****Runners and pain**

J Pain. 2018 Jun 29. pii: S1526-5900(18)30312-2. doi: 10.1016/j.jpain.2018.06.003.

**Psychological factors associated with ultra-marathon runners' supra-normal pain tolerance: a pilot study.**

Athletes appear to have higher pain tolerance than the normally active population. It is unknown whether psychological factors contribute to their supra-normal pain tolerance. The aim of this pilot study was to examine pain-related psychological processes in ultra-marathon runners ('ultra-runners') and to explore whether psychological factors mediate the elevated pain tolerance displayed by ultra-runners.

Forty participants took part in the study: 20 ultra-runners and 20 age- and gender-matched controls. Participants underwent the cold pressor test (CPT) using water cooled to 0.1–0.5°C and completed the Pain Catastrophizing Scale, Pain Anxiety Symptoms Scale-20 (PASS-20), Pain Vigilance and Awareness Questionnaire and Pain Resilience Scale. Immersion time on the CPT was significantly longer for the ultra-runners ( $p = 0.007$ ) and they also had lower scores on all PASS-20 subscales ( $p \leq 0.030$ ).

The two groups did not differ significantly on the other questionnaires. Mediation analysis revealed that reduced pain-related escape and avoidance behaviors accounted for 40% of the difference in immersion time between the groups ( $p = 0.020$ ).

Our results suggest that ultra-runners have lower levels of pain-related anxiety than the general population and that their supra-normal pain tolerance is partially mediated by reduced pain-related escape and avoidance behaviors.

**Causes of running injuries**

August 2018 Volume 36, Pages 48–53

**Risk models for lower extremity injuries among short- and long distance runners: A prospective cohort study**

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Bart W. Koes Arianne P. Verhagen

DOI: <https://doi.org/10.1016/j.msksp.2018.04.007>

**Highlights**

- Risk models for short- and long distance runners did not differ much.
- Previous injuries, training volume and age are important in prevention of RRI's.
- There might be an optimum weekly training volume.

**Abstract****Background**

Running injuries are very common. Risk factors for running injuries are not consistently described across studies and do not differentiate between runners of long- and short distances within one cohort.

**Objectives** The aim of this study is to determine risk factors for running injuries in recreational long- and short distance runners separately.

**Design** A prospective cohort study.

**Methods**

Recreational runners from four different running events are invited to participate. They filled in a baseline questionnaire assessing possible risk factors about 4 weeks before the run and one a week after the run assessing running injuries. Using logistic regression we developed an overall risk model and separate risk models based on the running distance.

**Results**

In total 3768 runners participated in this study. The overall risk model contained 4 risk factors: previous injuries (OR 3.7) and running distance during the event (OR 1.3) increased the risk of a running injury whereas older age (OR 0.99) and more training kilometers per week (OR 0.99) showed a decrease. Models between short- and long distance runners did not differ significantly. Previous injuries increased the risk of a running injury in all models, while more training kilometers per week decreased this risk.

**Conclusions**

We found that risk factors for running injuries were not related to running distances. Previous injury is a generic risk factor for running injuries, as is weekly training distance. Prevention of running injuries is important and a higher weekly training volume seems to prevent injuries to a certain extent.

**59. PAIN****Ultramarathons and pain anxiety**

J Pain. 2018 Jun 29. pii: S1526-5900(18)30312-2. doi: 10.1016/j.jpain.2018.06.003.

**Psychological factors associated with ultra-marathon runners' supra-normal pain tolerance: a pilot study.**

Athletes appear to have higher pain tolerance than the normally active population. It is unknown whether psychological factors contribute to their supra-normal pain tolerance. The aim of this pilot study was to examine pain-related psychological processes in ultra-marathon runners ('ultra-runners') and to explore whether psychological factors mediate the elevated pain tolerance displayed by ultra-runners.

Forty participants took part in the study: 20 ultra-runners and 20 age- and gender-matched controls. Participants underwent the cold pressor test (CPT) using water cooled to 0.1–0.5°C and completed the Pain Catastrophizing Scale, Pain Anxiety Symptoms Scale-20 (PASS-20), Pain Vigilance and Awareness Questionnaire and Pain Resilience Scale. Immersion time on the CPT was significantly longer for the ultra-runners ( $p = 0.007$ ) and they also had lower scores on all PASS-20 subscales ( $p \leq 0.030$ ).

The two groups did not differ significantly on the other questionnaires. Mediation analysis revealed that reduced pain-related escape and avoidance behaviors accounted for 40% of the difference in immersion time between the groups ( $p = 0.020$ ).

Our results suggest that ultra-runners have lower levels of pain-related anxiety than the general population and that their supra-normal pain tolerance is partially mediated by reduced pain-related escape and avoidance behaviors.

**61. FIBROMYALGIA****Tai chi**

BMJ. 2018 Mar 21;360:k851. doi: 10.1136/bmj.k851.

**Effect of tai chi versus aerobic exercise for fibromyalgia: comparative effectiveness randomized controlled trial.**

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**OBJECTIVES:** To determine the effectiveness of tai chi interventions compared with aerobic exercise, a current core standard treatment in patients with fibromyalgia, and to test whether the effectiveness of tai chi depends on its dosage or duration.

**DESIGN:** Prospective, randomized, 52 week, single blind comparative effectiveness trial.

**SETTING:** Urban tertiary care academic hospital in the United States between March 2012 and September 2016.

**PARTICIPANTS:** 226 adults with fibromyalgia (as defined by the American College of Rheumatology 1990 and 2010 criteria) were included in the intention to treat analyses: 151 were assigned to one of four tai chi groups and 75 to an aerobic exercise group.

**INTERVENTIONS:** Participants were randomly assigned to either supervised aerobic exercise (24 weeks, twice weekly) or one of four classic Yang style supervised tai chi interventions (12 or 24 weeks, once or twice weekly). Participants were followed for 52 weeks. Adherence was rigorously encouraged in person and by telephone.

**MAIN OUTCOME MEASURES:** The primary outcome was change in the revised fibromyalgia impact questionnaire (FIQR) scores at 24 weeks compared with baseline. Secondary outcomes included changes of scores in patient's global assessment, anxiety, depression, self-efficacy, coping strategies, physical functional performance, functional limitation, sleep, and health related quality of life.

**RESULTS:**

FIQR scores improved in all five treatment groups, but the combined tai chi groups improved statistically significantly more than the aerobic exercise group in FIQR scores at 24 weeks (difference between groups=5.5 points, 95% confidence interval 0.6 to 10.4, P=0.03) and several secondary outcomes (patient's global assessment=0.9 points, 0.3 to 1.4, P=0.005; anxiety=1.2 points, 0.3 to 2.1, P=0.006; self efficacy=1.0 points, 0.5 to 1.6, P=0.0004; and coping strategies, 2.6 points, 0.8 to 4.3, P=0.005). Tai chi treatment compared with aerobic exercise administered with the same intensity and duration (24 weeks, twice weekly) had greater benefit (between group difference in FIQR scores=16.2 points, 8.7 to 23.6, P<0.001). The groups who received tai chi for 24 weeks showed greater improvements than those who received it for 12 weeks (difference in FIQR scores=9.6 points, 2.6 to 16.6, P=0.007). There was no significant increase in benefit for groups who received tai chi twice weekly compared with once weekly. Participants attended the tai chi training sessions more often than participants attended aerobic exercise. The effects of tai chi were consistent across all instructors. No serious adverse events related to the interventions were reported.

**CONCLUSION:**

Tai chi mind-body treatment results in similar or greater improvement in symptoms than aerobic exercise, the current most commonly prescribed non-drug treatment, for a variety of outcomes for patients with fibromyalgia. Longer duration of tai chi showed greater improvement. This mind-body approach may be considered a therapeutic option in the multidisciplinary management of fibromyalgia.