

## 2. LBP

### Opioid use problems

#### **Utilization of pain medications and its effect on quality of life, health care utilization and associated costs in individuals with chronic back pain**

**Authors** Desai R, Hong YR, Huo J

**Published** 1 February 2019 Volume 2019:12 Pages 557—569

**DOI** <https://doi.org/10.2147/JPR.S187144>

**Purpose:** Pain medications are widely prescribed to treat chronic back pain (CBP). However, the effect of using pain medications on individuals with CBP has received very little attention.

**Objective:** The aim of this study was to determine the patterns of pharmacological treatment in the population with CBP and assess its impact on quality of life, health care utilization and associated costs in USA.

**Patients and methods:** Retrospective, cross-sectional data obtained from the Medical Expenditure Panel Survey (MEPS), from 2011 to 2015, were utilized for this study.

Pharmacological treatment for CBP was categorized into three mutually exclusive categories: 1) opioids only, 2) nonsteroidal anti-inflammatory drugs (NSAIDs) only, 3) opioids and NSAIDs (combination). The effect of the use of these treatments was also evaluated.

**Results:** A total of 5,203 individuals with CBP were identified. Of these, 2,568 (49.4%) utilized opioids only, 1,448 (27.8%) utilized NSAIDs only and 1,187 (22.8%) utilized both pain medications. Lower health-related quality-of-life scores on both the Short Form Health Survey-12 version 2 (SF-12v2) components (mental component summary score: 44.42 vs 46.67,  $P<0.001$ ; physical component summary score: 35.34 vs 40.11,  $P<0.001$ ) were observed for the opioid-only group compared to the NSAID-only group. In addition, individuals utilizing opioids only had greater utilization of inpatient services, office-based services, outpatient services and emergency room visits along with higher related health care costs.

**Conclusion:** Future researchers need to investigate the long-term risks and benefits of opioids, and policy makers should evaluate the prescribing guidelines to aim for a more patient-centered care.

**Altered perception**

Musculoskelet Sci Pract. 2019 Feb;39:136-143. doi: 10.1016/j.msksp.2018.12.006. Epub 2018 Dec 21.

**Clinical assessments can discriminate altered body perception in patients with unilateral chronic low back pain, but not differences between affected and unaffected side.**

Meier R<sup>1</sup>, Iten P<sup>2</sup>, Luomajoki H<sup>3</sup>.

Chronic pain disorders appear to be associated with altered body perception. The clinical tools of two-point discrimination (TPD), left/right judgment task (LRJ) and body image drawing (BID) can all be used to assess altered body perception in people with chronic low back pain (CLBP).

The aim of this observational study was to examine whether values from TPD, LRJ and BID can determine altered body perception between unilateral CLBP patients' painful and pain-free trunk sides, through the evaluation of some of the underlying mechanisms of body perception. Twenty-seven eligible participants completed all tasks. Inclusion criteria were: unilateral CLBP with duration of over 12 weeks; pain level higher than two out of ten on the numeric rating scale; a minimum score of four points on the Roland Morris Disability Questionnaire (RMDQ).

Findings from TPD and BID tests showed an alteration in body awareness. However, no significant interaction effects were found between the affected sides and their measurements (TPD  $p = 0.310$ , LRJ response time  $p = 0.571$ , LRJ accuracy  $p = 0.190$ , BID  $p = 0.751$ ). The profiling of people with high levels of distorted body perception for other factors known to contribute to CLBP may be a useful direction for further investigation.

## 5. SPINAL SURGERY

### Spondylo

Spine (Phila Pa 1976). 2019 Feb 15;44(4):E245-E251. doi: 10.1097/BRS.0000000000002798.

#### **Reoperation Rate After Microsurgical Uni- or Bilateral Laminotomy for Lumbar Spinal Stenosis With and Without Low-grade Spondylolisthesis: What do Preoperative Radiographic Parameters Tell Us?**

Schär RT<sup>1,2</sup>, Kiebach S<sup>1</sup>, Raabe A<sup>1</sup>, Ulrich CT<sup>1</sup>.

##### *STUDY DESIGN:*

Retrospective single-center cohort study.

##### *OBJECTIVE:*

The aim of this study was to analyze the influence of preoperative radiographic parameters on reoperation rates after microsurgical laminotomy for lumbar spinal stenosis (LSS).

##### *SUMMARY OF BACKGROUND DATA:*

Decompression for symptomatic LSS has shown to be effective. However, the optimal surgical strategy remains a matter of debate, especially with underlying spondylolisthesis.

##### *METHODS:*

Adult patients with LSS who underwent primary laminotomy without fusion between January 2012 and September 2013 at our institution were included for analysis. Disc height (in mm), facet joint (FJ) orientation (degrees), and grade of spondylolisthesis of all surgical index levels (SILs) were analyzed from preoperative magnetic resonance imaging. Patients were contacted in January 2017 by follow-up phone call (mean follow-up 49 months) regarding lumbar reoperation.

##### *RESULTS:*

A total of 161 patients (mean age 68.5 yrs,  $\pm 11.3$ ) and 236 SILs were analyzed. Fifty-six patients (34.8%) had low-grade spondylolisthesis involving 60 SILs (25.4%). Twenty-four patients (14.9%) underwent reoperation involving 32 levels. Of latter, 23 SILs (9.7%) had recurrent stenosis (RS) and 9 (3.8%) had adjacent level stenosis. Five patients in total (3.1%) required secondary fusion; all had preexisting spondylolisthesis. SILs with spondylolisthesis had a significantly higher rate of RS requiring reoperation compared with SILs without spondylolisthesis [18.3% (11/60) vs. 6.8% (12/176),  $P=0.013$ ]. Disc height and FJ orientation showed no significant difference between patients with and without reoperation, or with and without spondylolisthesis.

##### *CONCLUSION:*

Decompression alone is reasonable for most patients with LSS and stable low-grade spondylolisthesis. The overall reoperation rate and need for secondary fusion were low in our series. However, patients with spondylolisthesis had a higher rate of reoperation for RS after laminotomy without fusion. This must be taken into account for preoperative risk-benefit analysis, tailored surgical decision making and patient counseling.

### 7. PELVIC ORGANS/WOMAN'S HEALTH

#### Fetal growth and mental health

##### **Association of fetal growth with general and specific mental health conditions**

JAMA — Pettersson E, et al. | February 08, 2019

In this register-based study conducted in Sweden, researchers analyzed 546,894 pairs of full siblings born between January 1, 1973, and December 31, 1998, to investigate the relation of fetal growth with general and specific mental health conditions, controlling for familial factors. They found a significant association of 9 outcomes with birth weight: depression, anxiety, posttraumatic stress disorder, bipolar disorder, alcohol abuse, drug use, violent crimes, attention-deficit/hyperactivity disorder, and autism. They noticed that only depression, obsessive-compulsive disorder, attention-deficit/hyperactivity disorder, and autism were significantly associated with sibling pairs.

Overall, they reported a correlation between retarded fetal growth and a small but significant inclined general factor of psychopathology and a moderate increase in a specific neurodevelopmental factor.

## 8. VISCERA

### IBS and arterial stiffness

#### **Inflammation and Aortic Pulse Wave Velocity: A Multicenter Longitudinal Study in Patients With Inflammatory Bowel Disease**

**Luca Zanolli Kadir Ozturk**

**Originally published** 2 Feb 2019 <https://doi.org/10.1161/JAHA.118.010942> Journal of the American Heart Association. 2019;8

#### Abstract

#### Background

Inflammatory bowel disease (IBD) is characterized by a low prevalence of traditional risk factors, an increased aortic pulse-wave velocity (aPWV), and an excess of cardiovascular events. We have previously hypothesized that the cardiovascular risk excess reported in these patients could be explained by chronic inflammation. Here, we tested the hypothesis that chronic inflammation is responsible for the increased aPWV previously reported in IBD patients and that anti-TNF $\alpha$  (anti-tumor necrosis factor- $\alpha$ ) therapy reduce aPWV in these patients.

#### Methods and Results

This was a multicenter longitudinal study. We enrolled 334 patients: 82 patients with ulcerative colitis, 85 patients with Crohn disease, and 167 healthy control subjects matched for age, sex, and mean blood pressure, from 3 centers in Europe, and followed them for 4 years (range, 2.5–5.7 years). At baseline, IBD patients had higher aPWV than controls. IBD patients in remission and those treated with anti-TNF $\alpha$  during follow-up experienced an aortic destiffening, whereas aPWV increased in those with active disease and those treated with salicylates ( $P=0.01$ ). Disease duration ( $P=0.02$ ) was associated with aortic stiffening as was, in patients with ulcerative colitis, high-sensitivity C-reactive protein during follow-up ( $P=0.02$ ). All these results were confirmed after adjustment for major confounders. Finally, the duration of anti-TNF $\alpha$  therapy was not associated with the magnitude of the reduction in aPWV at the end of follow-up ( $P=0.85$ ).

#### Conclusions

Long-term anti-TNF $\alpha$  therapy reduces aPWV, an established surrogate measure of cardiovascular risk, in patients with IBD. This suggests that effective control of inflammation may reduce cardiovascular risk in these patients.

## Manual treatment of AF

**October 2018** Volume 22, Issue 4, Page 858**Results of osteopathic treatment of patients with paroxysmal atrial fibrillation**

Anastasia Tabina Ekaterina Leleka Dr. Kirill Mazalskiy

DOI: <https://doi.org/10.1016/j.jbmt.2018.09.036>

**Introduction:** Atrial fibrillation (AF) is one of the most widespread arrhythmias in the world. The main cause of AF is structural heart disease and hypertension, which lead to the structural remodeling of atrial tissue. However, the symptom burden of AF does not correlate with degree of atrial remodeling. The initiation of AF starts from a source in the pulmonary veins (Haissaguerre et al 1998). The ablation of this source can suppress recurrent AF (Kirchhof et al 2016). This region of the pulmonary veins is the point of tight attachment of the connective tissue of the pericardium. The pericardium is fixed in the thorax with ligaments that can spread the tension from different organs to the pericardium (Barralle 1991). We suggest that dysfunctions of other organs can affect the pulmonary veins due to the tension in the connective tissues of ligaments and the pericardium, triggering the activation of arrhythmia. We expect that osteopathic treatment can reduce the symptoms of AF.

**Methods:** The study included 30 patients (mean age  $54,37 \pm 12,29$  years) with non-valvular paroxysmal AF. All of them were on suitable antiarrhythmic therapy. Patients were randomized into 2 groups. The first group (15 patients) received osteopathic treatment while the 2nd group received only standard treatment. Osteopathic treatment included structural, visceral, and cranial techniques and was based on the patient's individual somatic dysfunctions (SD). All patients had undergone osteopathic examination to assess the structure of SD according to Russian standard protocol. The examinations also included assessment of quality of life by SF-36, a questionnaire for patients with arrhythmia, 24-hour-ECG monitoring, and echocardiography. The assessments were made before and 3 months after commencing treatment.

**Results:** All patients with AF had somatic dysfunctions of the thorax. In the first group the number of SD of thorax region decreased from  $5,45 \pm 1,63$  to  $3,00 \pm 2,16$  ( $p=0,0336$ ) after treatment. Osteopathic treatment led to improvement of quality of life ( $p=0,0019$ ), reduction of paroxysms of AF, and number of atrial extrasystoles ( $p=0,01$ ). Patients with AF without hypertension ( $p=0,024$ ) and with abdominal SD benefited more from osteopathic treatment.

**Conclusion:** Osteopathic treatment is a good additional support for patients with paroxysmal AF, which can be helpful for prevention of paroxysms of AF, decreasing symptoms, and improvement in quality of life.

## Mediterranean diet and CV disease

**Mediterranean Diet and the Association Between Air Pollution and Cardiovascular Disease Mortality Risk****Chris C. Lim Richard B. Hayes Jiyoung Ahn Yongzhao Shao Debra T. Silverman Rena R. Jones and George D. Thurston**2019<https://doi.org/10.1161/CIRCULATIONAHA.118.035742>Circulation. 2019;0

## Abstract

**Background:** Recent experimental evidence suggests that nutritional supplementation can blunt adverse cardiopulmonary effects induced by acute air pollution exposure. However, whether usual individual dietary patterns can modify the association between long-term air pollution exposure and health outcomes have not been previously investigated. We assessed, in a large cohort with detailed diet information at the individual level, whether a Mediterranean diet modifies the association between long-term exposure to ambient air pollution and cardiovascular disease mortality risk.

**Methods:** The NIH-AARP Diet and Health Study, a prospective cohort (N=548,845) across 6 states and 2 cities in the United States and with a follow-up period of 17 years (1995-2011), was linked to estimates of annual average exposures to PM<sub>2.5</sub> and NO<sub>2</sub> air pollution at the residential census-tract level. The alternative Mediterranean Diet Index (aMED), which uses a 9-point scale to assess conformity with a Mediterranean-style diet, was constructed for each participant from information in cohort baseline dietary questionnaires. We evaluated mortality risks for cardiovascular disease (CVD), ischemic heart disease (IHD), cerebrovascular disease (CER), or cardiac arrest (CAR) associated with long-term air pollution exposure. Effect modification of the associations between exposure and the mortality outcomes by aMED was examined via interaction terms.

**Results:** For PM<sub>2.5</sub>, we observed elevated and significant associations with CVD (HR=1.13; 95% CI: 1.08-1.18), IHD (HR=1.16; 95% CI: 1.10-1.23), and CER (HR=1.15; 95% CI: 1.03-1.28). For NO<sub>2</sub>, we found significant associations with CVD (HR=1.06; 95% CI: 1.04-1.08), and IHD (HR=1.08; 95% CI: 1.05-1.11). Analyses indicated that Mediterranean diet modified these relationships, as those with a higher aMED score had significantly lower rates of air pollution related mortality (*p interaction*<0.05).

**Conclusions:** Mediterranean diet reduced cardiovascular disease mortality risk related to longterm exposure to air pollutants in a large prospective U.S cohort. Increased consumption of foods rich in antioxidant compounds may aid in reducing the considerable disease burden associated with ambient air pollution.

## 12 B. CERVICAL SURGERIES

### Skipping levels

#### **Biomechanics following skip-level cervical disc arthroplasty versus skip-level cervical discectomy and fusion: a finite element-based study**

Tingkui Wu<sup>†</sup>, ang Meng<sup>†</sup>, Beiu Wang, Xin Rong, Ying Hong, Chen Ding, Hua Chen and Hao Liu

*BMC Musculoskeletal Disorders* 2019 **20**:49  
<https://doi.org/10.1186/s12891-019-2425-3>

#### Background

Moderately increased motion at the intermediate segment (IS) after skip-level fusion may accelerate disc degeneration. However, limited biomechanical data are available that examine the effects on the IS following cervical disc arthroplasty (CDA). The purpose of this study is to investigate the biomechanical changes in the IS of the cervical spine after skip-level fusion or skip-level arthroplasty.

#### Methods

A finite element model of a healthy cervical spine (C2-C7) was constructed. Two surgical models were developed: (1) skip-level fusion at C3/4 and C5/6 and (2) skip-level arthroplasty at C3/4 and C5/6. A 75-N follower load and 1.0-N·m moments were applied to the top of the C2 vertebra to produce flexion, extension, lateral bending and axial rotation in the intact model. The end-points in each direction corresponding to the intact model were applied to the surgical models under displacement-control protocols.

#### Results

The ranges of motion (ROMs) of the fusion model were markedly decreased at the operated levels, while the corresponding ROMs of the arthroplasty model were similar to those of the intact spine in all directions. In the fusion model, the ROMs of the IS (C4/5) were markedly increased in all directions. The ROMs in the arthroplasty model were similar to those in the intact spine, and the ROMs of untreated segments were evenly increased. In the fusion model, the intradiscal pressure and facet contact force at were C4/5 remarkably increased and unevenly distributed among the unfused segments. In the arthroplasty model, the IS did not experience additive stress.

#### Conclusion

The IS does not experience additive ROM or stress in the intervertebral disc or facet joints after skip-level arthroplasty, which has fewer biomechanical effects on the IS than does skip-level fusion. This study provides a biomechanical rationale for arthroplasty in treating patients with skip-level cervical degenerative disc disease.



## 26. CARPAL TUNNEL SYNDROME

### Fascial role

October 2018 Volume 22, Issue 4, Pages 846–847

#### **Role of fasciae around the median nerve in pathogenesis of carpal tunnel syndrome: microscopic and ultrasound study**

Chenglei Fan Caterina Fede Federico Giordani Nathaly Gaudreault Carlo Biz  
Veronica Macchi Raffaele De Caro Carla Stecco

DOI: <https://doi.org/10.1016/j.jbmt.2018.09.007>

**Introduction:** Carpal Tunnel Syndrome (CTS) is the most common hand problem affecting 1-3% of the population (Atroshi et al 1999), while recurrence of CTS following surgery is reported to be between 7-20% (Jones et al 2012). However, the relationship between the fasciae around the median nerve (MN) and pathogenesis is unknown. The aim of this study was to investigate the connection between myofascial structure, epineurium, and paraneural sheath of MN to evaluate a possible role of fascia in the pathogenesis of CTS.

**Methods:** An anatomic study (approved by the local ethical committee) was carried out on 9 unembalmed upper limbs managed by the 'Body Donation Program' at the Institute of Anatomy, University of Padova. 4 samples of MN and surrounding tissue were excised from arm at 4 different levels for microscopic analysis. Ultrasound images of MN were analyzed in 11 healthy and 8 CTS subjects to evaluate the MN transversal displacement during the 3rd finger and all fingers' motion at carpal tunnel (CT) and forearm levels.

**Results:** Anatomical continuity between the epimysium and paraneural sheath of MN was found and the reduction of paraneural fat tissue from proximal to distal was demonstrated in all samples (Fig. 1). The MN displacement in both levels were significantly different between healthy and CTS subjects, while it was significantly decreased in CTS subjects [forearm: 3th -1.76 (-2.33; -1.26); all -1.65 (-2.21; -0.91); CT: 3th -0.60 (-0.82; -0.41); all -1.14 (-1.56; -0.50);  $p < 0.001$ ].

**Conclusion:** This study has clearly demonstrated the link between the epineurium, paraneural sheath of MN, and myofascial structure. Therefore, it is possible to argue that an unbalanced condition of epimysial fasciae must be considered in the pathogenesis of CTS. The CT segment will be more sensitive to pressure because the reduced fat component reveals a decreased ability in cushioning to protect the nerve. The ultrasound study has confirmed the previous studies about reduction of displacement in CT, but has also shown the reduction of displacement in the forearm for the first time. The present study suggests CTS is not only a nerve compression within the CT, but also suggests a global problem that can affect nerve movement along the whole upper limb.

## 27. HIP

### Increased incidence of hip fx in antidepressant usage

#### **Association between antidepressant drug use and hip fracture in older people before and after treatment initiation**

JAMA — Brännström J, et al. | February 08, 2019

Researchers conducted a nationwide cohort study to examine the association between antidepressant drug treatment and hip fracture starting 1 year before the initiation of treatment. Outcomes support the association between antidepressant drug use and hip fracture in the year before and year after the initiation of treatment. All studied antidepressants and subgroups displayed the pattern consistently.

#### **Methods**

- From the Prescribed Drugs Register of Sweden's National Board of Health and Welfare, researchers matched 204,072 individuals, aged 65 years or older, who had a prescription of antidepressants filled between July 1, 2006, and December 31, 2011, by birth year and sex to 1 control participant who was not prescribed antidepressants (for a total of 408 144 people in the register).
- Collection of outcome data was done from 1 year before to 1 year after the index date (date of prescription being filled).
- From July 1, 2005, to December 31, 2012, they performed data analysis.
- They determined the incident hip fractures occurring in the year before and year after initiation of antidepressant therapy, and investigated the associations using multivariable conditional logistic regression models and flexible parametric models.

#### **Results**

- This study included 408,144 people; 257,486 (63.1%) women; mean (SD) age 80.1 (7.2) years.
- Researchers observed more than twice as many hip fractures among antidepressant users as that observed among nonusers in the year before and year after the initiation of therapy (2.8% vs 1.1% and 3.5% vs 1.3%, respectively, per actual incidence figures).
- In adjusted analyses, they noted highest odds ratios for the associations between antidepressant use and hip fracture 16 to 30 days before the prescription was filled (odds ratio, 5.76; 95% CI, 4.73-7.01).
- In all separate analyses of age groups, of men and women, and of individual antidepressants, the odds ratios were highest 16 to 30 days before initiation of treatment, and there was no clear dose-response relationship.

**34. PATELLA****Vibrations in joint in weight bearing****Analysis of patellofemoral arthrokinematic motion quality in open and closed kinetic chains using vibroarthrography**

- Dawid Bączkowiec rzysztof Kręcisz and Zbigniew Borysiuk

*BMC Musculoskeletal Disorders* 2019;20:48

<https://doi.org/10.1186/s12891-019-2429-z>

Knee movements performed in open (OKC) and closed (CKC) kinetic chains generate various patterns of muscle activities and especially distinct contact stresses in the patellofemoral joint (PFJ). In contrast to these features, the arthrokinematic motion quality (AMQ) of the PFJ has not been compared between mentioned conditions. In this study we performed vibroarthrographic analysis of AMQ in movements performed in OKC and CKC, in healthy subjects and individuals with chondromalacia patellae, to assess which of the test conditions is more efficient in differentiation between healthy and deteriorated joints. Moreover, our analysis will broaden the knowledge related to behavior of normal and pathological synovial joints during motion with and without weight bearing. It is an essential issue, due to the recently observed significant interest in comparing potential benefits and limitations of CKC and OKC exercises as they relate to lower extremity rehabilitation.

**Methods**

100 subjects (62 healthy controls and 38 subjects with PFJ chondromalacia) were enrolled. During repeated knee flexion/extension motions performed in OKC (in a sitting position) and CKC (sit-to-stand movements), the vibroarthrographic signals were collected using an accelerometer and described by variability (VMS), amplitude (R4), and spectral power in 50–250 Hz (P1) and 250–450 Hz (P2) bands.

**Results**

Significant differences in VMS [V], R4 [V], P1 [ $V^2/Hz$ ] and P2 [ $V^2/Hz$ ] between OKC and CKC were found (0.0001, 0.969, 0.800, 0.041 vs 0.013, 3.973, 6.790, 0.768, respectively,  $P < 0.001$ ). Moreover, in both analyzed load-related conditions the subjects with chondromalacia were characterized by significantly higher values of all parameters, when compared to controls ( $P < 0.001$ ), with effect size values over 0.6.

**Conclusions**

We showed that motion of the physiological, unloaded PFJ articular surfaces in OKC is nearly vibrationless, which corresponds with optimal AMQ of PFJ, while loaded movements in CKC are characterized by a higher vibroacoustic emission level. Moreover, chondral lesions should be considered as an increased friction-related, aggravating factor of AMQ, which is critical in CKC movements under load. Nonetheless, OKC and CKC conditions are characterized by large effect sizes, and provide an efficient test frame for differentiating physiological knees and joints with chondral lesions.

**Weakness in males with PF pain****January 2019** Volume 23, Issue 1, Pages 54–58**Electromyographic activity of the hip and knee muscles during functional tasks in males with and without patellofemoral pain**Gholam Hassan Mirzaie Abbas Rahimi Mehrnaz Kajbafvala Farideh Dehghan Manshadi ,  
Khosro Khademi Kalantari Ahmad SaideeDOI: <https://doi.org/10.1016/j.jbmt.2018.11.001>**Background**

Patellofemoral pain (PFP) is a common overuse injury in physically active individuals. It is characterized by anterior knee, retropatellar, or prepatellar pain associated with activities that increase patellofemoral joint stress such as squatting, stair ascending and descending, running, jumping, prolonged sitting, and kneeling. The etiology of PFP is believed to be multifactorial. Recently, proximal factors have been shown to influence the biomechanics of patellofemoral joint.

**Objective**

The aim of the study was to assess hip and knee muscle activity during single leg stance and single leg squat in males with PFP and a control group without PFP.

**Methods**

Eighteen males with PFP (age  $24.2 \pm 4.4$  years) and 18 healthy subjects as controls (age  $23.5 \pm 3.8$  years) were included. We evaluated gluteus medius, gluteus maximus, vastus medialis oblique (VMO), and vastus lateralis (VL) electromyographic (EMG) activity. The muscle activity and reaction time of the proposed muscles were assessed during single leg stance and single leg squat tasks. Independent *t*-test was used to identify significant differences between PFP and control groups.

**Results**

No difference in activity of the gluteus maximus muscle was found in either task ( $p > 0.5$ ). Significant differences were found in activity of gluteus medius and VMO in both tasks ( $p < 0.05$ ). VL muscle activity had significant difference in single leg stance ( $p = 0.01$ ), however, had no significant difference in single leg squat ( $p = 0.1$ ). No significant differences were found in reaction time of the four studied muscles during both single leg stance and single leg squat ( $p > 0.5$ ).

**Conclusion**

Males with PFP demonstrated altered gluteus medius, VMO, and VL muscle activity during single leg stance and single leg squat compared to healthy subjects. Gluteus maximus activity did not show any changes between groups. Moreover, muscle recruitment patterns were different between PFP and healthy groups.

**45 C. MANUAL THERAPY THORACIC****Myofascial release helps****January 2019** Volume 23, Issue 1, Pages 74–81**Immediate biomechanical, systemic, and interoceptive effects of myofascial release on the thoracic spine: A randomised controlled trial**

Ellie Cathcart Terence McSweeney Ross Johnston Hayley Young Darren J. Edwards

DOI: <https://doi.org/10.1016/j.jbmt.2018.10.006>**Background**

Myofascial release (MFR) is used to restore tissue extensibility of the fascia tissue and is considered to be useful in a number of clinical settings such as low back pain, ankle injuries, fibromyalgia, and headaches. There is, however, despite the popularity of MFR in manual therapy, little consensus on whether it leads to biomechanical, systemic or interoceptive outcomes.

**Aims**

This study aimed to explore the immediate biomechanical (increased elasticity for increased range of motion), systemic (local vs. distal areas of pain threshold) and bodily awareness effects (interoception) of a myofascial release technique on the thoracic spine.

**Method**

Twelve healthy participants took part in this triple-blind, repeated measures, cross-over design study, and were randomised into counterbalanced sequences of three conditions; a control, a sham, and the MFR condition. The outcome measures used were; range of motion (ROM), pain pressure thresholds (PPT), and interoceptive sensitivity (IS) to assess biomechanical, systemic, and interoceptive effects of MFR.

**Results**

There were significant increases in ROM and PPT (both local and distal) post MFR intervention. There was also a positive correlation between baseline interoceptive sensitivity and post-MFR ROM and a negative correlation for baseline interoceptive sensitivity and post-MRF PPT. Interoceptive sensitivity did increase post-MFR but this was non-significant.

**Conclusions**

The increase in ROM suggests that the MFR may have caused a biomechanical change in tissue elasticity creating an increase in tissue flexibility. The increase in both local and distal sites of the PPT suggest an overall systemic response to the therapy. The correlation between baseline IS and post-MFR ROM and PPT suggest that IS may be usefully applied as a predictor for ROM and PPT post-MFR.

**46 B. LOWER LIMB NEUROMOILIZATION****Lumbar stenosis****October 2018** Volume 22, Issue 4, Page 846**Ligamental compartments and their relation to the passing spinal nerves are detectable with MRI inside the lumbar neural foramina**

Dina Wiersbicki nna Völker Christoph-eckhard Heyde Hanno Steinke

DOI: <https://doi.org/10.1016/j.jbmt.2018.09.005>

**Introduction:** Low back pain (LBP) is one of the most frequently occurring symptoms in clinical practice. A person has a 50-70% lifetime probability of developing LBP. Therefore, precise knowledge of this anatomical region is indispensable. The lumbar spinal nerves (SN) course next to the intraforaminal ligaments (IFL) in the intervertebral foramina. Previous studies used manual dissection to examine the IFL.

**Methods:** We present a new method for exposing IFL in lumbar neural foramina (NF). 15 lumbar spines were used to produce Giemsa- and PAS-stained, plastinated body slices to show the anatomy of 92 NF. Correlating scans of magnetic resonance imaging (MRI) and computed tomography from the same specimens were generated and compared. Medially in the NF, we saw very thin IFL directly touching the SN. As a second compartment, vertical IFL were seen ventrally and dorsally in the NF without direct contact with the SN. A third compartment, again without a direct connection to the SN, was formed by thick, horizontal IFL lying cranially and caudally. This IFL compartment is located more laterally than the vertical ligaments. From medial to lateral, the IFL thickens. All three IFL compartments can be found using T2-MRI near to the SN in healthy individuals. A 3D-reconstruction shows their anatomical structure.

**Results:** We have dissected one lumbar spine to compare our results with previous literature in which dissection was used to analyze the IFL. In our findings, most of the IFL have no direct connection to the SN in slices, while this has been noticed in previous dissection. Therefore, manual dissection seems to be inappropriate for detailed study of the IFL.

**Conclusion:** The thick lateral IFL compartments may play a role in power transmission and in protecting the SN under physiological conditions, while the thin medial IFL may lead the SN through the NF. From the revealed topography we conclude that the IFL are relevant in any case of foraminal stenosis. Any herniation in the NF presses the IFL to the SN. Possibly IFL themselves can cause low back pain in case of their turnover during aging even without visible stenosis. In this case, the IFL could partially explain “occult” stenosis.

**Internal oblique fascia****October 2018** Volume 22, Issue 4, Pages 847–848**Distinct viscoelastic behavior of internal and external rectus abdominis fascia, consequences for our notion of abdominal wall function.**

Jan-paul van Wingerden Inge Ronchetti Gert-Jan Kleinrensink

DOI: <https://doi.org/10.1016/j.jbmt.2018.09.009>

**Introduction:** In recent decades fascia has gained scientific interest, underpinning its unique role in physical function. Several studies consider the abdominal fascia as a stabilizer of the spine (Hodges et al 2003; Stokes et al 2010). From an evolutionary perspective, this is peculiar because bone developed much later than fascia (Perry et al 2010). Should it not be the other way around: the spine as subordinate to fascia? To explore this notion we need a better understanding of the function of fascia. This study explores the viscoelastic behavior of internal and external rectus abdominis fascia, as significant components of the abdominal fascial system (Deeken & Lake, 2017).

**Methods:** 7 embalmed human bodies were dissected. Samples (4 x 4 cm) were bilaterally taken from both internal and external rectus abdominis fascia 2cm lateral to the umbilicus. Viscoelastic behavior was examined by means of a displacement sensor (Microstrain®) attached to the fascial sample. Force (20 grams) was applied in longitudinal and transverse directions to the samples. Mean elongation was calculated over three repetitions in each direction. Data were analyzed by using the Wilcoxon signed rank test.

**Results:** There is a significant difference in the viscoelastic behavior of the internal and external rectus abdominis fascia. More surprisingly in the internal fascia there is a significant difference in viscoelastic behavior in longitudinal and transversal directions. Longitudinally the internal fascia allows far more stretch than in the transverse direction where the fascia is very stiff. This particular viscoelastic behavior is far less outspoken in the external fascia.

**Conclusion:** Internal rectus abdominis fascia displays very characteristic viscoelastic behavior, apparently corresponding to its specific purpose. It allows stiffening of the trunk in the coronary plane, while longitudinal elasticity is maintained. This raises the question of whether balanced control of trunk stiffness is not more important than spinal control. Considering trunk function from this perspective may enhance our understanding of coherence between back and pelvic pain, urinary incontinence, breathing disorders, diastasis recti, and even exorbitant bellies. (Smith et al 2014).

## TL fascia

October 2018 Volume 22, Issue 4, Page 846

**Anatomical and functional relationships between external abdominal oblique muscle and posterior layer of thoracolumbar fascia**

Chenglei Fan, Federina Fede, Nathaly Gaudreault, Andrea Porzionato, Veronica Macchi, Raffaele De Caro, Carla Stecco

DOI: <https://doi.org/10.1016/j.jbmt.2018.09.006>

**Introduction:** The abdominal muscles are important for the stability of the lumbar region through the thoracolumbar fascia (TLF). However, the mechanisms of transmission of tension through the abdominal muscles contributing to vertebral stability are unclear. In particular, there is not full agreement regarding the posterior transversal continuity of the external abdominal oblique muscle (EO) with the TLF (Barker et al 2004; Schuenke et al 2012).

**Methods:** 10 cadavers (approved by the local ethical committee) managed by the 'Body Donation Program' at the Institute of Anatomy, University of Padova, and 27 CT images of subjects were used to evaluate the transversal continuity of the TLF with the abdominal muscles. The width of the fascial continuity of EO with posterior layer of TLF along the posterior border of EO was also measured.

**Results:** The epimysial fascia of the EO was in direct continuity with the posterior layer of the TLF in eight cadavers and 23 CT images, whereas in two cadavers and four CT images the epimysial fascia of the EO fused first with the fascia covering the latissimus dorsi and then both fasciae were in continuity with the posterior layer of the TLF. The width of the fascial continuity of the EO with the posterior layer of TLF along the posterior border of the EO was  $40.70 \pm 3.92$  mm.

**Conclusion:** The transversal fascial continuity of EO may explain the transmission of tension from the EO to the posterior layer of TLF and its important role in the maintaining the stability of the lumbar spine through the hydraulic effect. In regards to fascial continuity in the trunk and also taking the EO into consideration, the TLF is formed by the fascia of all the abdominal muscles as the rectus sheath. In this manner, myofascial continuity between the TLF and the abdominal muscles is achieved through the aponeurosis and fascia, which ensures synchronization between the erector spinae and the rectus abdominis.



## Lateral femoral cutaneous tunnel

October 2018 Volume 22, Issue 4, Page 845

**Is there a fascial canal for the lateral femoral cutaneous nerve?**

Ming Zhang Zhaoyang Xu anyan Zheng Lili Tu Xiaohui Ma

DOI: <https://doi.org/10.1016/j.jbmt.2018.09.003>

**Introduction:** Meralgia paresthetica (MP) is characterized by symptoms of pain, numbness, or itching at the anterolateral thigh, commonly caused by mechanical entrapment of the lateral femoral cutaneous nerve (LFCN) and associated with various sports and physical activities. The mechanical entrapment site is believed to be at the point where the nerve exits the pelvis around the anterior superior iliac spine (ASIS). The aim of this study was to reveal the fascial configuration around the LFCN in the inguinal and upper thigh region.

**Methods:** Thirty-six cadavers (18 females, 18 males; age range, 38-97 years) and 11 living subjects (7 females, 4 males; age range, 22-62 years) were studied. Thirty cadavers were used for microdissection and measurements. Six cadavers were prepared as the transverse (2 sets) and sagittal (4 sets) plastinated slices that were examined under a confocal laser scanning microscope. Ultrasound examination was performed in 11 healthy volunteers. This study was performed in accordance with our institutional ethical guidelines and approved by the institutional ethics committees.

**Results:** (1) The LFCN coursed medially and inferiorly to the ASIS and pieced three tendinous or ligamental fibrous septa. It ran from the iliac fascial compartment to a tendinous canal bordered by the internal and external oblique abdominis, then to a compartment between the fascia lata and sartorius, and finally to a ligamental canal formed by 2-3 curtain strip-like ligaments that attached to the ASIS and were termed “the iliolata ligament” in this study. (2) The distances from the ASIS to the tendinous and ligamental canals were  $2.15 \pm 0.94$  cm and  $5.07 \pm 1.59$  cm, respectively, and the angle between the two canals was  $40 \pm 23^\circ$ . (3) The LFCN was visualized as a small mesh-like structure embedded in rigid tendinous/ligamental structures under ultrasound scanning medially and inferiorly to the ASIS.

**Conclusion:** The tendinous and ligamental canals may make the LFCN susceptible to mechanical entrapment. Their nature, configuration, and location suggest that (1) any conservative management that can reduce the tension of the abdominal muscles and iliolata ligaments on the ASIS may alleviate the entrapment and (2) different approaches may be required to surgically expose the LFCN.

## 48 A. STM

## Myofascial decompression

October 2018 Volume 22, Issue 4, Page 863

**The immediate and long-term effects of negative pressure soft tissue mobilization on the iliotibial bands of runners using magnetic resonance imaging**

Christopher DaPrato Roland Krug Richard Souza Daria Motamedi

DOI: <https://doi.org/10.1016/j.jbmt.2018.09.050>

**Introduction:** Myofascial decompression (MFD) is a soft tissue mobilization technique in which negative pressure is applied to soft tissues through active range of motion (ROM). Overuse injuries, such as iliotibial band syndrome (ITBS), result in compression and irritation of lateral knee structures commonly seen in runners (Nemeth & Sanders 1996). The purpose of this study is to quantify the effects of MFD using MR imaging (MRI) to compare tissue changes with clinical measures for addressing ITBS. We hypothesize that immediately and 72 hours after application the space between the tissue layers will increase with MFD. Clinically, subjective pain, hip adduction ROM, and functional single leg squat (SLS) will be improved.

**Methods:** This single-group pretest-posttest study evaluated the effects of MFD in 8 knees on pain, hip adduction ROM with Ober's testing, paired with radiologic tissue findings at baseline, immediately after intervention, and post 72 hours. MFD was applied using a pneumatic pump and 2.5-in. diameter concave plastic cup on the ITB at the lateral femoral condyle (LFC) of the knee. After two minutes of static application in side-lying, hip extension/adduction ROM and active knee flexion occurred for one minute each. Changes in tissue thickness was measured on T1 weighted MRI using OsiriXTM software, observing the millimeter difference from the periosteum to the medial border of the ITB and from the lateral border of the ITB to the epidermis.

**Results:** Results show increased space of the ITB to LFC with a mean change of 15% increase in the symptomatic side immediately post-treatment and maintained a 13% change 72 hours after treatment. Pain began and stayed at zero, and SLS was normal throughout. Ober's showed a 7 degree mean improvement in horizontal adduction.

**Conclusion:** The results of this study support our hypothesis that MFD is beneficial in treating ITBS via increasing space between tissue layers around the ITB/LFC, both in the immediate effects and 72hrs later. Increased space theoretically allows these tissues to glide more readily when performing repetitive ROM activities such as running (Pavan et al 2014). An intervention that efficiently reduces compressive forces of the ITB to the deep osseous structures could improve rehabilitation outcomes for runners with ITBS.

**Quadratus induction helps posture****October 2018** Volume 22, Issue 4, Page 856**Immediate effects of myofascial induction of quadratus lumborum in postural orientation of standing asymptomatic subjects**

Ana Rita Pinheiro hristine Cunha Ana Rita Fernandes Tiago Pastilha Vanessa Catarino Nuno, Carlos Crasto Cláudia Silva Rubim Santos Paulo Carvalho

DOI: <https://doi.org/10.1016/j.jbmt.2018.09.031>

**Introduction:** Standing represents a challenging posture that requires upright orientation of body segments (Winter 1995). The thoracolumbar fascia (TLF), a complex network of fascial layers that establishes a direct relationship with several trunk muscles (Willard et al 2012), might be a privileged structure to influence standing posture, either by the direct transmission of forces to the muscle fibers (Turrina et al 2013; Willard et al 2012), influencing its tension, or by the inputs to the central nervous system, ultimately influencing body schema and motor control. Therefore, this study aimed at analyzing the immediate effects of a myofascial induction technique over TLF on the postural orientation of asymptomatic standing subjects.

**Methods:** Participants aged between 30 and 60 years old were randomly assigned to a placebo (PG) or an intervention (MIG) group using covariate adaptive randomization; all consented to participate, according to the Declaration of Helsinki. MIG intervention consisted of myofascial induction of quadratus lumborum II described by Pilat (Pilat 2003), whereas PG intervention consisted of a placebo handling similar to MIG intervention but without pressure. Upright orientation was assessed before and after intervention using infrared motion capture (6 Oqus cameras, Qualisys Motion Capture Systems) and was analyzed in the sagittal plane, including angles of the cervical, thoracic, and lumbar spine; pelvis alignment; and the verticality of tragus and acromion in relation to the lateral malleolus. Data extraction and analysis were performed using Qualisys Track Manager software.

**Results:** Sixteen participants, 6 males (M) and 10 females (F), were divided into PG (3M, 4F; 35±11.00 years old) and MIG (3M, 6F, 35±18.0 years old). Statistically significant differences ( $p=0.01$ ) were found for the thoracic alignment, for which participants from MIG showed a gain of a few degrees of extension ( $3.2\pm3.09^\circ$ ), whereas PG showed lesser variation ( $-0.6\pm1.18^\circ$ ). Despite no statistically significant differences for the remaining analyzed variables, their overall descriptive analysis was suggestive of a tendency for a greater vertical orientation of MIG participants.

**Conclusion:** Myofascial induction of quadratus lumborum II may have an immediate influence in postural orientation of asymptomatic standing subjects by increasing body verticality; nevertheless, the results found deserve further research. This finding highlights for the possibility of including fascial system-related approaches in the intervention of individuals with altered postural control.

## TLF and intraabdominal pressure

October 2018 Volume 22, Issue 4, Pages 854–855

**Mechanical evaluation of the role of intra-abdominal pressure within the thoracolumbar fascia in postural asymmetry: A finite element study**

Khaled El-Monajjed M.Eng Mark Driscoll Eng., PhD

DOI: <https://doi.org/10.1016/j.jbmt.2018.09.027>

**Introduction:** The mechanism of Intra-Abdominal Pressure (IAP) variation remains enigmatic and has been previously proposed to perform spinal unloading, a backward bending moment, and/or a preparatory role (Marras & Mirka 1996). This study invests a 2D Finite Element Model that works towards a better understanding of the IAP role when an asymmetric posture is induced.

**Methods:** A model was extracted from a transverse plane situated at a 19° angle positioned at the L2-L3 spinal level from the sagittal plane. A two-layered Thoracolumbar Fascia (TLF) model was subsequently created (Fig. 1). Material properties of the soft tissues were based on previously published ex-vivo data and assumed to be linear and uniform. Boundary conditions designate a fixed support of the L3 vertebra and the compartment pressures were designated as the input values based on previously established in-vivo data. A symmetric case (PL = PR = 24.2 mmHg), defining the control, with equal Paraspinal Muscle Compartmental (PMC) pressure was compared to imposed asymmetric cases (PR = 24.2mmHg, PL = 11.8 mmHg) using a finite element platform (ANSYS v18.1). For each case, the intra-abdominal pressure (PA) was varied between 3.4 and 20.4 mmHg. The reaction force outputs were then validated with an analogous in-vitro experiment using load cells (Vleeming et al 2014).

**RESULTS** Simulation results displayed similar decreasing trends for the posterior force on the spinous process (TPLF) in both cases. Moreover, the contact forces between the abdominal muscles and the TLF (TCL and TCR) identically increased in both cases. The symmetric case portrayed equal reaction forces at the transverse processes (TALFL and TALFR). However, asymmetric pressures in the PMC resulted with a shift to the TALFL curve to, consequently, intersect with the TALFR curve at a single point of equal tension.

**Conclusion:** Increasing IAP tended to decrease the reaction force on the spinous process, which may allude towards a relieving role. Moreover, the elevation of IAP resulted in a point of equal tension between the TALFL and TALFR. This suggests that one role the IAP may possess is a neutralizing effect in asymmetric postures by compensating for the higher-pressure difference between the left and right PMC.

## Fasciae and muscles

October 2018 Volume 22, Issue 4, Pages 852–853

**The role of intra- and epimuscular fasciae beyond being passive structural elements: MRI analyses indicate that they interfere with and affect muscle's active mechanics**

Omer Batin Gozubuyuk Agah Karakuzu Uluc Pamuk Can A. Yucesoy

DOI: <https://doi.org/10.1016/j.jbmt.2018.09.023>

**Introduction:** Contractile properties are central to skeletal muscles' contribution to joint range of movement (JROM) and force production. However, the contractile apparatus is integral to intramuscular fasciae, which are continuous with epimuscular fasciae. Altered properties of these due to pathological changes also affect activated muscles' mechanics (Yucesoy & Huijing 2007). This is not simply because the force developed in passive fasciae is added to muscle force. Instead, mechanics of intra- and epimuscular fasciae also affect sarcomeres (Yucesoy 2010). Diffusion tensor (DT) imaging measures local anisotropy of muscle tissue, describing local fiber architecture via tractography. Magnetic Resonance (MR) images compared with Demon's non-rigid registration provide local strains. In human medial gastrocnemius (GM), in vivo, we assessed strains within intra- and epimuscular fasciae, and along muscle fibers: i.e., force transmission via passive connective tissues and consequent effects on sarcomere lengths, respectively.

**Methods:** Healthy volunteers (n=5, age=27±1 years) were positioned prone and relaxed within an MR scanner with ankle fixed at 90° and knee flexed (140.8±3.0°) (undeformed-state). Sets of 3D high-resolution MR and DT images were acquired. This was repeated after extending the knee (177.0±1.0°) (deformed-state-1) and subsequent submaximal plantar flexion activity at 15% MVC (deformed-state-2).

**Results:** Local shortening and lengthening (maximally 23.3% & 116.7%, respectively) occurred simultaneously along individual fascicles despite imposed GM lengthening. Shearing between fascicles (maximally 63.0%) confirmed load bearing in the endomysium. Deep aponeurosis strains (22.4±13.5% & 17.2±7.9% peak local lengthening & shortening, respectively) were unhomogeneous. Deformed-state-2 (Karakazu et al 2017): Fascicle strain distributions indicated shortened proximal track segments, while distal ones lengthened (e.g., by 13% & 29%, respectively). Mean fiber direction strains of different fascicles showed heterogeneity (57.5% of fascicles). Large stretches calculated for epimuscular fasciae and neurovascular-tracts at their intersection sites with muscle belly (maximally 60%) do indicate presence of myofascial loads (Fig. 1).

**Conclusion:** Forces transmitted via fasciae change sarcomere lengths along and across muscle fibers: a key determinant of the muscles' force production and contribution to JROM. Therefore, passive intra- and epimuscular fasciae interfere with and affect muscles' active mechanics substantially. DT and MR resolutions are orders of magnitude coarser than sarcomere lengths: strains over a voxel are averaged, yielding underestimated heterogeneity. Demon's algorithm showed small strain errors towards underestimated strain, localized at discontinuities (Yaman et al 2013).

## Foam rolling works

October 2018 Volume 22, Issue 4, Page 851

**Acute effects of foam rolling on passive stiffness, stretch sensation, and fascial sliding: a randomized controlled trial**

Frieder Krause Jan Wilke Daniel Niederer Lutz Vogt Winfried Banzer

DOI: <https://doi.org/10.1016/j.jbmt.2018.09.019>

**Introduction:** Foam Rolling (FR), an intensive self-massage treatment, aims to mimic the effects of manual therapy and tackle dysfunctions of the skeletal muscle and connective tissue. It has been shown to induce improvements in flexibility, but the underlying mechanisms are poorly understood. The aim of the present study was to further elucidate the acute, systemic, and tissue-specific responses evoked by FR.

**Methods:** In a crossover study, 16 (34±6y, 6f) participants received all the following interventions in a permutated random order: a) 2x60 seconds of FR at the anterior thigh, b) 2x60 seconds of passive static stretching of the anterior thigh (STR), and c) no intervention (CON). Maximal active and passive knee flexion range of motion (ROM), passive stiffness, sliding of fascial layers, as well as knee flexion angle of first subjectively perceived stretch sensation (FSS) were evaluated before and directly after each intervention.

**Results:** Flexibility increased only after FR (active (+1.8±1.9%) and passive ROM (+3.4±2.7%), p=.006, respectively) and STR (passive ROM (+3.2±3.5%), p=.002). Angle of FSS was altered following FR (+4.3° (95% CI: 1.4°-7.2°)) and STR (+6.7° (3.7°-9.6°)), while tissue stiffness remained unchanged after any intervention compared to baseline. Movement of the deepest layer (-5.7mm (-11.3mm – -0.1mm)) as well as intrafascial mobility between deep and superficial layer (-4.9mm (-9.9mm – -0.7mm)) decreased only after FR.

**Conclusion:** FR improved knee flexion ROM without altering passive stiffness but modified the perception of stretch as well as the mobility of the deep layer of the fascia lata. The mechanisms leading to altered fascial sliding merit further investigation.

## Cupping helps mobility

October 2018 Volume 22, Issue 4, Page 851

**The effects of dry cupping therapy on muscle thickness and elasticity of upper back muscles**

Omer Batin Gozubuyuk Sergen Devran Mahsum Akikol

DOI: <https://doi.org/10.1016/j.jbmt.2018.09.018>

**Introduction:** Cupping is an ancient method used for various diseases in different cultures. In recent years, the use of cupping therapy has increased. Mechanically, cupping increases local blood flow (Wei et al 2013), stimulates mechanosensitive receptors, and provides pain relief (Rozenfeld & Kalichman 2016). Although the receiver of cupping therapy feels relaxed, no detailed studies have assessed how the therapy affects elastic properties of the muscles. We aimed in this study to evaluate how 10 minutes of cupping affects the thickness and stiffness of the upper back muscles (middle trapezius and paraspinals) of healthy volunteers. Ultrasound imaging (B-mode and shear wave elastography [SWE]) were used to measure the physical properties (Ryu & Jeong 2017).

**Methods:** Twenty healthy volunteers participated in the study. The procedures of the study conformed to the Declaration of Helsinki. The cupping was applied to one side (suctioned) and the other side served as a control (no suction). The thickness and the stiffness of the middle trapezius and the paraspinals were measured before (PRE), right after (POST), and 30 minutes after (POST30) the application by the same examiner. Intraclass Correlation Coefficient (ICC), Mann-Whitney, and ANOVA tests were used as appropriate. Significance was set to  $p < 0.05$ .

**Results:** The groups did not differ significantly in terms of thickness and stiffness ( $p > 0.05$ ). Intra-session reliability of measurements was very high ( $r = 0.985$ ). There was a significant time main effect  $F(2,37) = 10.31$ ,  $p < 0.0001$ ,  $\eta^2 = 0.36$  and group interaction effect  $F(2,37) = 4.38$ ,  $p < 0.05$ ,  $\eta^2 = 0.19$  for trapezius muscle. For paraspinals, there was significant time main effect,  $F(2,37) = 4.661$ ,  $p < 0.05$ ,  $\eta^2 = 0.20$  but no interaction effect and no group main effect. POST stiffness values ( $12.84 \pm 3.01$ ) were significantly lower than PRE ( $16.11 \pm 3.72$ ) and POST30 values ( $14.27 \pm 3.03$ ) in trapezius. No metrics changed significantly on the control sides. Muscle thickness significantly increased after cupping in the trapezius muscle ( $4.22 \pm 1.21$  vs  $4.51 \pm 1.32$ ) but not in paraspinal muscles ( $14.77 \pm 2.43$  vs  $15.24 \pm 2.76$ ).

**Conclusion:** Stiffness in the upper back muscles significantly decreased after 10 minutes of a single cupping session, particularly in superficial muscles. Thickness increase was also prominent in the superficial muscles. Although the general application necessitates more than one cup, application of even a single cup affects the elastic properties of tissues underneath. Further studies may show the effects of multiple cups with different pressures on different body parts.



## Adhesions

October 2018 Volume 22, Issue 4, Page 845

**Influence of adhesion-related fascial gliding restrictions on dermal and articular movement**

Hidetaka Imagita Taiko Sukezane

DOI: <https://doi.org/10.1016/j.jbmt.2018.09.002>

**Introduction:** The fascia is a connective tissue that covers the tissue of the body. It maintains the relative positions of visceral organs and skeletal muscles, comprising the frame of the inner parts of the body. Under the skin, the superficial adipose tissue, superficial fascia, deep adipose tissue, and deep fascia are present. This structure plays a role in external mechanical force absorption, facilitating skeletal muscle contractions regardless of external forces (Nakajima et al 2004; Stecco 2015). The purpose of this study was to investigate the influence of adhesion-related destruction of the fascial structure on dermal and subcutaneous tissue movement.

**Methods:** Ten 9-week-old Wistar rats were divided into control (n=4) and adhesion (n=6) groups. In the adhesion group, the skin to middle layer of the anterior tibial muscle was longitudinally incised on the anterior surface of the lower thigh and sutured. After 4 weeks, dermal movement was photographed with a video camera under anesthesia. Subsequently, the movement of each subcutaneous tissue during dorsal and plantar flexion of the ankle joint was examined using ultrasonography. Then, the anterior surface of the lower thigh was extirpated and immunofluorescence staining of anti-CD68 and anti-collagen type I was performed, followed by microscopy.

**Results:** Dermal movement after 4 weeks was reduced; however, deep fascia showed excessive movement. Furthermore, anti-CD68-positive cells remained at the site of incision and anti-collagen type I-positive reaction disappeared somewhere along the line.

**Conclusion:** In this study, we prepared an adhesion model by incising the subcutaneous tissue to anterior tibial muscle and suturing it. After 4 weeks, adhesion was present, restricting dermal movement, and fascial gliding was increased below the site of adhesion during passive articular movement. Such an imbalance in fascial gliding may promote the release of algentic substances, inducing pain, immobility, and arthrogyposis.



## Friction massage

January 2019 Volume 23, Issue 1, Pages 89–93

**Dry needling versus friction massage to treat tension type headache: A randomized clinical trial**

Fahimeh Kamali Marzieh Mohamadi Leila Fakheri Fatemeh Mohammadnejad

DOI: <https://doi.org/10.1016/j.jbmt.2018.01.009>

Tension type headache (TTH), the most common type of headache, is known to be associated with myofascial pain syndrome and the existence of myofascial trigger points. There are several treatment options for myofascial trigger points. In this study we compared the effectiveness of dry needling and friction massage to treat patients with TTH.

A convenience sample of 44 patients with TTH participated in this randomized clinical trial. The frequency and intensity of headache, pressure pain threshold at the trigger point site, and cervical range of motion were recorded. Then the participants were randomly assigned to one of two treatment groups for dry needling or friction massage, delivered in 3 sessions during 1 week. The participants were evaluated 48 h after the last treatment session. Analysis of covariance, paired *t*-test and Wilcoxon's test were used for statistical analysis.

The results showed that both treatment methods significantly reduced headache frequency and intensity, and increased pain threshold at the trigger points. However, neither treatment had any effect on cervical range of motion except for extension, which increased in the dry needling group. Between-group comparisons showed that dry needling increased pain threshold significantly more than friction massage. There were no significant differences between groups in any other outcome variables.

Dry needling and friction massage were equally effective in improving symptoms in patients with TTH. The decreases in frequency and intensity of headache were similar after both dry needling and friction massage.

**50 B. PNF****Patterns and scapula****January 2019** Volume 23, Issue 1, Pages 59–64**Comparison of muscular activities between subjects with and without scapular downward rotation impairment during diagonal pattern of exercises**

Se-Yeon Park Du-Jin Park

DOI: <https://doi.org/10.1016/j.jbmt.2018.01.006>**Backgrounds**

One form of abnormal scapular alignment is scapular downward rotation (SDR). Changes in muscle function in SDR have not been clearly identified, and SDR exercises also require investigation. Although a diagonal pattern of exercise is commonly used as part of the exercise protocol, a direct comparison of shoulder and scapular diagonal exercises has not yet been conducted. The objectives of this study were to determine the altered activation of the scapular musculature in the SDR group and to investigate which diagonal pattern of exercise effectively activates the scapular musculature.

**Methods**

Thirty-two participants (18 in the control group and 14 in the SDR group) volunteered to participate in this study. Electromyographic signals were collected from four muscles, the upper trapezius (UT), lower trapezius (LT), serratus anterior (SA), and anterior deltoid (AD), during standing performance of diagonal shoulder and scapular exercises.

**Results**

The control group showed significantly lower UT activity, UT/LT ratio, and UT/SA values than the SDR group ( $p < .05$ ). Activation of the AD was significantly higher in the SDR than in the control group ( $p < .05$ ). SA and AD activation were significantly higher in shoulder diagonal pattern exercises than in scapular diagonal pattern exercises ( $p < .05$ ). The scapular posterior elevation pattern exercise showed significantly higher UT and LT activities than anterior elevation and shoulder diagonal pattern exercises ( $p < .05$ ).

**Conclusion**

Our findings suggest that reduced activation of the UT could lead to greater activation in the AD in SDR. Scapular posterior elevation exercise is advantageous as selectively activates the trapezius musculature, and shoulder diagonal pattern exercise is advantageous in activating the SA and AD.

**56. ATHLETICS****Total hips in athletes****Prognosis Following Hip Arthroscopy Varies in Professional Athletes Based on Sport**

Robert A. Christian, M.D. Ryan J. Lubbe, B.S. Danielle S. Chun, M.D. Ryan S. Selley, M.D. ,  
Michael A. Terry, M.D. Wellington K. Hsu, M.D.

DOI: <https://doi.org/10.1016/j.arthro.2018.10.113>

**Purpose**

To evaluate return to play (RTP) and performance-based outcomes in professional athletes across 4 major North American team sports following hip arthroscopy.

**Methods**

Professional athletes of the National Football League, Major League Baseball (MLB), National Basketball Association, and National Hockey League (NHL) who underwent hip arthroscopy were identified using an established protocol of public reports. Sport-specific statistics were collected before and after hip arthroscopy for each athlete, leading to a performance score. RTP was defined as the first regular or postseason game played following surgery.

**Results**

A total of 151 arthroscopic hip procedures were performed on 131 professional athletes. The overall RTP rate after arthroscopic hip surgery was found to be 88.7% (134 of 151 arthroscopic hip surgeries), with no significant difference between sports. The median number of seasons played after hip arthroscopy were 2.7, 2.3, 1.1, and 0.9 for the National Football League, National Basketball Association, MLB, and NHL cohorts, respectively, with no significant difference between sports. MLB and NHL cohorts experienced a decrease in games played in the first season following hip arthroscopy ( $P = .04$ ,  $P = .01$ ), whereas NHL players also experienced a decrease in games played in seasons 2 and 3 postoperatively ( $P = .001$ ). Performance scores decreased in the NHL cohort for all seasons postoperatively ( $P < .001$ ,  $P = .003$ ). No other statistically significant differences were found when comparing players of different sports.

**Conclusions**

Although professional athletes demonstrate a high rate of RTP following hip arthroscopy across the 4 major North American team sports, hockey players demonstrate the worst prognosis following hip arthroscopy, with sustained decreases in games played and performance in the first 3 seasons postoperatively.

## 61. FIBROMYALGIA

### Cost of surgery

Spine (Phila Pa 1976). 2019 Feb 15;44(4):E233-E238. doi: 10.1097/BRS.0000000000002820.

### **Fibromyalgia as a Predictor of Increased Postoperative Complications, Readmission Rates, and Hospital Costs in Patients Undergoing Posterior Lumbar Spine Fusion.**

Donnally CJ 3rd<sup>1</sup>, Vakharia RM<sup>2</sup>, Rush AJ 3rd<sup>1</sup>, Damodar D<sup>1</sup>, Vakharia AJ<sup>3</sup>, Goz V<sup>4</sup>, Lebowitz NH<sup>1</sup>.

#### **STUDY DESIGN:**

Retrospective review.

#### **OBJECTIVE:**

The aim of this study was to identify whether a concomitant diagnosis of fibromyalgia (FM) influences postoperative complications, readmission rates or cost following primary 1 to 2 level lumbar fusions in an elective setting.

#### **SUMMARY OF BACKGROUND DATA:**

Patients with FM often are limited by chronic lower back pain, many of whom will seek operative treatment. No previous study has evaluated whether patients with a concomitant diagnosis of FM have more complications following spine surgery.

#### **METHODS:**

Medicare data (2005-2014) from a national database was queried for patients who underwent primary 1 to 2 level posterolateral lumbar spine fusion for degenerative lumbar pathology. Thirty- and 90-day postoperative complication rates, readmission rates, and treatment costs were queried. To reduce confounding, FM patients were matched with a control cohort of non-FM patients using patient demographics, treatment modality, and comorbid conditions, and then analyzed by multivariable logistic regression.

#### **RESULTS:**

Within the first 30-day postoperative, acute post hemorrhagic anemia (odds ratio [OR]: 2.58; P<0.001) and readmission rates were significantly higher in FM patients compared to controls. There was no significant difference in wound related complications within first 30-days (0.19% vs. 0.23%; P=0.520) or with length of stay (3.60 vs. 3.53 days; P=0.08). Within 90-day postoperative, FM patients had higher rates of pneumonia (OR: 3.73; P<0.001) and incurred 5.31% more in hospital charges reimbursed compared to the control cohort.

#### **CONCLUSION:**

Primary 1 to 2 level lumbar fusions performed on FM patients have higher rates of postoperative anemia, pneumonia, cost of care, and readmission compared to match controls. FM patients and surgeons should be aware of these increased risks in an effort to control hospital costs and potential complications.

**LEVEL OF EVIDENCE:** 3.

**62 A. NUTRITION/VITAMINS****Vegan and insulin****Nutrition, Metabolism and Cardiovascular Diseases****Vegetarians have a lower fasting insulin level and higher insulin sensitivity compared with matched omnivores: a cross-sectional study**B. Wang<sup>a</sup>Y. Wu<sup>a</sup>L. Xie<sup>a</sup>P. Xun<sup>b</sup>Q. Tang<sup>c</sup>W. Cai<sup>ac</sup>X. Shen<sup>ac</sup><https://doi.org/10.1016/j.numecd.2019.01.012>Get rights and content**Highlights**

- Vegetarians have a lower level of fasting insulin and insulin resistance index, which indicating higher insulin sensitivity in vegetarians.
- The association mentioned above is independent of body mass index.
- The association between vegetarian diet patterns and insulin sensitivity is more significant in vegans.

**Abstract****Background and Aims**

Potential associations between vegetarian diet patterns and fasting insulin and insulin sensitivity remain unclear. We aimed to investigate if vegetarian diets were associated with fasting insulin and insulin sensitivity in a cross-sectional study in Chinese vegetarians and matched omnivores, then to test if it is independent of body mass index (BMI).

**Methods and Results**

This study included 279 vegetarians (73 vegans, 206 lacto-ovo-vegetarians) and 279 age and sex matched omnivores. Fasting blood glucose (FG) and fasting insulin (FI) concentrations were measured, and  $\beta$ -cell function (HOMA- $\beta$ ) and insulin resistance index (HOMA-IR) were used to evaluate insulin sensitivity. All blood glucose and insulin sensitivity indices were naturally log-transformed and multiple-linear regression was used to determine the association between vegetarian diet patterns and insulin sensitivity after adjusting for confounders including BMI, visceral fat area, physical activity, sedentary time, income, alcohol consumption, and daily dietary intakes of macronutrients. Compared to omnivores, both vegan diet [ $\beta = -0.25$ , 95% CI: (-0.38, -0.14)] and lacto-ovo-vegetarian diet [ $\beta = -0.10$ , 95% CI: (-0.18, -0.01)] were negatively associated with HOMA-IR after adjusting for BMI. Vegan diet remained negatively associated with FI [ $\beta = -0.16$ , 95% CI: (-0.30, -0.01)] and HOMA-IR [ $\beta = -0.17$ , 95% CI: (-0.32, -0.03)] after adjusting for all confounders.

**Conclusion**

Vegetarian diet, especially vegan diet, is negatively associated with fasting insulin and insulin resistance index, independent of BMI.

**Vit D improves mental**

J Am Geriatr Soc. 2019 Feb 1. doi: 10.1111/jgs.15808

**Effect of Monthly High-Dose Vitamin D on Mental Health in Older Adults: Secondary Analysis of a RCT.**

Gugger A<sup>1,2</sup>, Marzel A<sup>1,2</sup>, Orav EJ<sup>3</sup>, Willett WC<sup>4</sup>, Dawson-Hughes B<sup>5</sup>, Theiler R<sup>1,2</sup>, Freystätter G<sup>1,2</sup>, Egli A<sup>1,2</sup>, Bischoff-Ferrari HA<sup>1,2,6</sup>.

**OBJECTIVES:**

To test the effect of monthly high-dose vitamin D supplementation on mental health in pre-frail older adults.

**DESIGN:**

Ancillary study of a 1-year double-blind randomized clinical trial conducted in Zurich, Switzerland.

**SETTING AND PARTICIPANTS:**

A total of 200 community-dwelling adults 70 years and older with a prior fall event in the last year. Participants were randomized to receive 24 000 IU vitamin D<sub>3</sub> (considered standard of care), 60 000 IU vitamin D<sub>3</sub>, or 24 000 IU vitamin D<sub>3</sub> plus 300 µg calcifediol per month.

**MEASURES:**

The primary end point was the Mental Component Summary (MCS) of the SF-36. Secondary end points were the SF-36 Mental Health (MH) subscale and the Geriatric Depression Scale (GDS-15).

**RESULTS:**

Participants' mean age was 78 years (67% women), and 58% were vitamin D deficient (<20 ng/mL). Over time, primary and secondary end points did not differ significantly among the three treatment groups or in subgroups by vitamin D status at baseline. Given the lack of a true placebo group, we explored in a predefined observational analysis the change in mental health scales by achieved 25(OH)D levels at 12 months. After adjusting for confounders, participants achieving the highest 25(OH)D quartile (Q) at 12 months (44.7-98.9 ng/mL) had the greatest improvements in MCS (Q4 = 0.79 vs Q1 = -2.9; p = .03) and MH scales (Q4 = 2.54 vs Q1 = -3.07; p = .03); these associations were strongest among participants who were vitamin D deficient at baseline. No association was found for GDS (p = .89).

**CONCLUSIONS:**

For mental health, our study suggests no benefit of higher monthly doses of vitamin D<sub>3</sub> compared with the standard monthly dose of 24 000 IU. However, irrespective of vitamin D treatment dose, achieving higher 25(OH)D levels at 12-month follow-up was associated with a small, clinically uncertain but statistically significant improvement in mental health scores.