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## LUMBAR SPINE

### Spinal positions in 24 hours

Eur Spine J. 2014 Sep 20

#### **Measurement of the number of lumbar spinal movements in the sagittal plane in a 24-hour period.**

Rohlmann A<sup>1</sup>, Consmüller T, Dreischarf M, Bashkuev M, Disch A, Pries E, Duda GN, Schmidt H.

#### **Abstract**

##### **PURPOSE:**

Little is known about the number of spinal movements in the sagittal plane in daily life, mainly due to the lack of adequate techniques to assess these movements. Our aim was to measure these movements in asymptomatic volunteers.

##### **METHODS:**

Two sensor strips based on strain gauge technology (Epionics SPINE system) were fixed on the skin surface of the back parallel to the spine on a total of 208 volunteers without back pain. First, the lordosis angle was determined during relaxed standing. The volunteers were then released to daily life. The increases and decreases in the back lumbar lordosis angle over a period of 24 h were determined and classified into 5° increments. Changes in the lordosis angle greater than 5° were considered.

##### **RESULTS:**

The median number of spinal movements performed within 24 h was approximately 4,400. Of these movements, 66 % were between 5° and 10°. The proportions of higher-magnitude lordosis angle changes were much lower (e.g., 3 % for the 20-25° movement bin). Surprisingly, the median total number of movements was significantly higher (29 %) in women than in men. Large inter-individual differences were observed in the number of movements performed. The volunteers spent a median of 4.9 h with the lumbar spine flexed between 20° and 30° and only 24 min with the spine extended relative to the reference standing position. A median of 50 movements reached or exceeded full-flexion angle and zero movements full-extension angle.

##### **CONCLUSIONS:**

These data illustrate the predominantly small range of movement of the spine during daily activities and the small amount of time spent in extension. These unique data strongly contribute to the understanding of patients' everyday behavior, which might affect the development and testing of spinal implants and the evaluation of surgical and nonsurgical treatments.

PMID: 2523879

**LBP****Use of lumbar belts**

BMC Musculoskelet Disord. 2014 Sep 19

**The effect of different lumbar belt designs on the lumbopelvic rhythm in healthy subjects.**

Larivière C, Caron JM, Preuss R, Mecheri H.

**Abstract****BACKGROUND:**

Research suggests that in some patients with low back pain, lumbar belts (LB) may derive secondary prophylactic benefits. It remains to be determined, however, which patients are most likely to benefit from prophylactic LB use, and which LB design is optimal for this purpose. The objective of this study was to determine the effect of different lumbar belts designs on range of motion and lumbopelvic rhythm.

**METHODS:**

Healthy subjects (10 males; 10 females) performed five standing lumbar flexion/extension cycles, with knees straight, during a control (no belt) and four lumbar belt experimental conditions (extensible, with and without dorsal and ventral panels; non-extensible). Motion of the pelvis and lumbar spine was measured with 3D angular inertial sensors.

**RESULTS:**

The results suggest that adding dorsal and ventral panels to an extensible LB produces the largest lumbar spine restrictions among the four tested lumbar belt designs, which in turn also altered the lumbopelvic rhythm. On a more exploratory basis, some sex differences were seen and the sex x experimental condition interaction just failed to reach significance.

**CONCLUSIONS:**

LB may provide some biomechanical benefit for patients with low back disorders, based on the protection that may be provided against soft tissue creep-based injury mechanisms. More comprehensive assessment of different LB designs, with additional psychological and neuromuscular measurement outcomes, however, must first be conducted in order to produce sound recommendations for LB use. Future research should also take sex into account, with sufficient statistical power to clearly refute or confirm the observed trends.

PMID: 25234136

**LBP/opioids vs. PT**

**Opioids versus physical therapy for management of chronic back pain**

The Journal for Nurse Practitioners , 09/26/2014 Clinical Article

Gladkowski CA, et al.

**Abstract**

The purpose of this article was to review the literature and critique the evidence to determine if opioid analgesics improved patient outcomes compared with physical therapy. More research involving the efficacy of opioid analgesic in treating CLBP is needed.

- No research was found that directly compared the efficacy of opioid analgesics with physical therapy.
- Although the evidence supports the use of physical therapy in chronic back pain, the study results are conflicting regarding the usefulness of opioid analgesics in CLBP management.

## Central sensitization and radicular symptoms

Pain. 2014 Sep 18.

### **Tactile allodynia in patients with lumbar radicular pain (sciatica).**

Defrin R<sup>1</sup>, Devor M<sup>2</sup>, Brill S<sup>3</sup>.

#### **Abstract**

**Purpose:** We report a novel symptom in many patients with low back pain (LBP) which sheds new light on the underlying pain mechanism.

**Methods:** Using quantitative sensory testing we compared patients with radicular LBP ("sciatica"), axial LBP (LBP without radiation into the leg) and healthy controls, searching for cutaneous allodynia in response to weak tactile and cooling stimuli on the leg and low back.

**Results:** Most radicular pain patients (60%) reported static and dynamic tactile allodynia, and cooling allodynia, on the leg, often extending into the foot. Some also reported allodynia on the low back. In axial LBP, allodynia was almost exclusively on the back. The degree of dynamic tactile allodynia correlated with the degree of background pain. The presence of allodynia suggests that the peripheral nerve generators of background leg and back pain have also induced central sensitization. The distal (foot) location of the allodynia in patients who have it indicates that the nociceptive drive that maintains the central sensitization arises para-spinally (ectopically) in injured ventral ramus afferents; this is not an instance of somatic referred pain. The presence of central sensitization also provides the first cogent account of "shooting pain" in sciatica as a wave of activity sweeping vectorially across the width of the sensitized dorsal horn. Finally, the results endorse leg allodynia as a pain biomarker in animal research on LBP, commonly used, but not previously validated.

**Conclusions:** In addition to informing the underlying mechanism of LBP, bedside mapping of allodynia might have practical implications for prognosis and treatment.

#### **KEYWORDS:**

Central sensitization; Radicular pain; Sciatica; Shooting pain; Tactile allodynia

PMID: 25242568

**DISC****Ligamentum flavum**

J Spinal Disord Tech. 2014 Oct

**Herniated Intervertebral Disk Induces Hypertrophy and Ossification of Ligamentum Flavum.**

Kang YM<sup>1</sup>, Suk KS, Lee BH, Kim HS, Lee KI, Park SY, Lee HM, Moon SH.

**Abstract****STUDY DESIGN::**

In vitro experiment using degenerated human ligamentum flavum (LF) and herniated intervertebral disk (IVD).

**OBJECTIVES::**

To investigate the role and effect of degenerated and herniated IVDs on LF hypertrophy and ossification.

**SUMMARY OF BACKGROUND DATA::**

Spinal stenosis is caused, in part, by hypertrophy and ossification of the LF, which are induced by aging and degenerative process. It is well known that degenerated IVDs spontaneously produce inflammatory cytokines. Therefore, we hypothesized that degenerated IVD may affect adjacent LF through secreted inflammatory cytokines.

**METHODS::**

LF and herniated lumbar IVD tissues were obtained during surgical spinal procedures. LF fibroblasts were isolated by enzymatic digestion of LF tissue. LF cell cultures were treated with disk supernatant from herniated IVDs. Secreted cytokines from IVD tissue culture were detected by enzyme-linked immunosorbent assay. After analysis of cytotoxicity, DNA synthesis was measured. Reverse transcription-polymerase chain reaction for mRNA expressions of types I, II, III, V, and XI collagen and osteocalcin, and histochemical stains were performed.

**RESULTS::**

Supernatant from tissue culture of herniated IVD showed increased production of interleukin-1 $\alpha$ , interleukin-6, tumor necrosis factor- $\alpha$ , prostaglandin E2, and nitric oxide compared with disk tissue culture from traumatic condition. There was no cytotoxicity in LF cells treated with disk supernatant from herniated IVDs. There was significant increase in DNA synthesis, upregulation in mRNA expression of types III, XI collagen and osteocalcin, whereas variable expression pattern of type I and V, and strong positive stains for Von Kossa and alkaline phosphatase in LF cultures with disk supernatant.

**CONCLUSIONS::**

Degenerated and herniated IVDs provide an important pathomechanism in hypertrophy and ossification of the LF through inflammatory cytokines.

PMID: 25250946

**SURGERY/LBP****Stenosis and fusion**

J Spinal Disord Tech. 2014 Oct;27

**Long-term Outcomes After Revision Neural Decompression and Fusion for Same-level Recurrent Lumbar Stenosis: Defining the Effectiveness of Surgery.**

Mendenhall SK<sup>1</sup>, Parker SL, Adogwa O, Shau DN, Cheng J, Aaronson O, Devin CJ, McGirt MJ.

**Abstract****STUDY DESIGN:**

Single-cohort study of patients undergoing revision neural decompression and fusion for same-level recurrent lumbar stenosis.

**OBJECTIVE:**

To assess the long-term outcomes of revision surgery using validated patient-reported outcomes measures.

**SUMMARY OF BACKGROUND DATA:**

Recurrent lumbar stenosis may occur after lumbar spine surgery, leading to significant discomfort and radicular pain. Although numerous studies have reported clinical outcomes after primary lumbar surgery, there remains a paucity of data on the outcomes after revision surgery for recurrent same-level stenosis.

**METHODS:**

Fifty-three patients undergoing revision neural decompression and instrumented fusion for same-level recurrent stenosis-associated back and leg pain were included in this study. Baseline and 2-year visual analog scale for leg pain (LP-VAS), visual analog scale for low back pain (BP-VAS), Oswestry Disability Index (ODI), Zung self-reported depression score (ZDS), time to narcotic independence, time to return to work, health-state utility [EuroQol (EQ-5D)], and physical and mental quality of life [SF-12 physical and mental component scores (PCS and MCS)] were assessed.

**RESULTS:**

Mean±SD duration of time between index surgery and revision surgery was 4.00±4.19 years. A significant improvement from baseline was observed in BP-VAS (9.28±1.01 vs. 5.00±2.94, P=0.001), LP-VAS (9.55±0.93 vs. 3.45±2.95, P=0.001), and ODI (36.02±6.01 vs. 21.75±12.08, P=0.001). Mean±SD SF-12 PCS (7.17±11.22, P=0.001), SF-12 MCS (12.57±13.03, P=0.001), ZDS (12.37±16.80, P=0.001), and EQ-5D (0.42±0.34, P=0.001) were also significantly improved. The mean cumulative 2-year gain in health-utility state was 0.84 QALY. Median (interquartile range) duration of postoperative narcotic use was 6 (1.4-12.2) months and time of missed work was 6 (4.0-10.0) months.

**CONCLUSIONS:**

Our study suggests that revision neural decompression and instrumented fusion for recurrent same-level stenosis provides significant improvement in all patient-assessed outcome metrics and should be offered as a viable treatment option.

PMID: 25247253

## **Foot drop and surgery**

J Spinal Disord Tech. 2014 Oct;27

### **Surgical outcomes for painless drop foot due to degenerative lumbar disorders.**

Aono H<sup>1</sup>, Nagamoto Y, Tobimatsu H, Takenaka S, Iwasaki M.

#### **Abstract**

##### **STUDY DESIGN:**

Twenty patients presenting with painless drop foot who had undergone lumbar spine surgery for degenerative lumbar diseases were included in this retrospective study.

##### **OBJECTIVE:**

This study aims to investigate which causative factors and patient symptoms significantly affected surgical outcome.

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

Drop foot is a neuromuscular condition that results in dorsiflexion palsy of the ankle. Patients with drop foot often complain of leg pain. Rarely, patients experience painless drop foot due to lumbar degenerative disease. For these patients, the only purpose of surgery is to improve the palsy; this makes it difficult to determine whether surgical intervention is indicated. No studies have focused on the results of surgical treatment for painless drop foot caused by degenerative lumbar diseases.

##### **METHODS:**

Preoperative strength of the tibialis anterior and duration of palsy were recorded and considered with surgical outcome.

##### **RESULTS:**

Sixty-five percent of patients recovered from drop foot after surgery. Drop foot was caused mainly by impairment of the L5 nerve root. Patients with a longer duration of palsy had poorer results.

##### **CONCLUSIONS:**

Duration of palsy had the greatest effect on recovery. As the only goal of this surgery is improvement in the strength of the tibialis anterior, caution must be exercised when considering surgery for patients with longstanding palsy.

PMID: 24905505

## PELVIC GIRDLE

### Pelvic pain

Pain. 2014 Sep 18.

#### **Preliminary structural MRI based brain classification of chronic pelvic pain: A MAPP Network Study.**

Bagarinao E<sup>1</sup>, Johnson KA<sup>1</sup>, Martucci KT<sup>1</sup>, Ichesco E<sup>2</sup>, Farmer MA<sup>3</sup>, Labus J<sup>4</sup>, Ness TJ<sup>5</sup>, Harris R<sup>2</sup>, Deutsch G<sup>5</sup>, Vania Apkarian A<sup>3</sup>, Mayer EA<sup>4</sup>, Clauw DJ<sup>2</sup>, Mackey S<sup>6</sup>.

#### **Abstract**

**Purpose:** Neuroimaging studies have shown that changes in brain morphology often accompany chronic pain conditions. However, brain biomarkers that are sensitive and specific to chronic pelvic pain (CPP) have not yet been adequately identified.

**Methods:** Using data from the Trans-MAPP Research Network, we examined the changes in brain morphology associated with CPP. We used a multivariate pattern classification approach to detect these changes and to identify patterns that could be used to distinguish participants with CPP from age-matched healthy controls. In particular, we used a linear support vector machine (SVM) algorithm to differentiate gray matter images from the two groups.

**Results:** Regions of positive SVM weight included several regions within the primary somatosensory cortex, pre-supplementary motor area, hippocampus, and amygdala were identified as important drivers of the classification with 73% overall accuracy. Thus, we have identified a preliminary classifier based on brain structure that is able to predict the presence of CPP with a good degree of predictive power.

**Conclusions:** Our regional findings suggest that in individuals with CPP, greater gray matter density may be found in the identified distributed brain regions, which are consistent with some previous investigations in visceral pain syndromes. Future studies are needed to improve upon our identified preliminary classifier with integration of additional variables and to assess whether the observed differences in brain structure are unique to CPP or generalizable to other chronic pain conditions.

#### **KEYWORDS:**

Gray matter density; Machine learning; SVM; Support vector machine; UCPPS

PMID: 25242566

## HEADACHES

### Medication overuse

BMC Neurol. 2014 Sep 19

#### **Dependency-like behaviors and pain coping styles in subjects with chronic migraine and medication overuse: results from a 1-year follow-up study.**

Biagianti B, Grazzi L, Usai S, Gambini O.

##### **Abstract**

**Background:** Even after successful detoxification, 20-40% of subjects presenting chronic migraine with symptomatic medication overuse (CMwMO) relapse into medication overuse within one year. In this retrospective analysis on subjects referred to our center for detoxification, we investigated whether personality traits, dependency-like behaviors and pain coping styles predicted those who relapsed into medication overuse within the 12 months following the detoxification and those who did not.

**Methods:** 63 patients with CMwMO were assessed for personality traits, mood and anxiety, pain coping styles and dependency-like behaviors prior-to and one year after a detoxification program.

**Results:** Of the 42 subjects who attended 1-year follow-up interviews, 11 relapsed into medication overuse despite a temporary benefit from detoxification and did not show clinical or psychological improvement, instead reporting increased anxiety and unmodified perpetuation of severe dependency-like behaviors. In contrast, subjects who did not relapse into medication overuse had clinical improvements that generalized to untreated domains, including decreased depressive symptoms and dependency-like behaviors, although showing unmodified low internal control over pain.

**Conclusions:** Subjects who did not fall into medication overuse throughout the 12 months following the detoxification showed improved clinical, affective and dependence-related outcomes, but not pain coping strategies. Conversely, subjects who relapsed within one year into CMwMO continued to experience significant disability, pain intensity, and dependency-like behaviors. We believe that the persistence of maladaptive pain coping strategies and residual symptomatology increase the risk for recurrent relapses, against which pharmacological interventions are only partially effective. Further studies investigating predictors of relapse are needed to inform multi-disciplinary interventions for CMwMO.

PMID: 25234249

## Sensory changes

### **Migraine is associated with altered processing of sensory stimuli**

Current Pain and Headache Reports, 09/23/2014 Clinical Article

Harriott AM, et al

#### **Abstract**

**Background:** Migraine is associated with derangements in perception of multiple sensory modalities including vision, hearing, smell, and somatosensation. Compared to people without migraine, migraineurs have lower discomfort thresholds in response to special sensory stimuli as well as to mechanical and thermal noxious stimuli. Likewise, the environmental triggers of migraine attacks, such as odors and flashing lights, highlight basal abnormalities in sensory processing and integration. These alterations in sensory processing and perception in migraineurs have been investigated via physiological studies and functional brain imaging studies. Investigations have demonstrated that migraineurs during and between migraine attacks have atypical stimulus-induced activations of brainstem, subcortical, and cortical regions that participate in sensory processing.

**Conclusions:** A lack of normal habituation to repetitive stimuli during the interictal state and a tendency towards development of sensitization likely contribute to migraine-related alterations in sensory processing.

## Heat thresholds

### Low heat pain thresholds in migraineurs between attacks

Cephalalgia, 09/23/2014 Clinical Article

Schwedt TJ, et al. – The objective of this study was to investigate hypersensitivity to pain in migraineurs between attacks. This study provides evidence that migraineurs have low heat pain thresholds between migraine attacks. Mechanisms underlying these lower pain thresholds could also predispose migraineurs to their next migraine attack, a hypothesis supported by finding positive correlations between pain thresholds and time to next migraine attack.

#### Methods

- Cutaneous heat pain thresholds were measured in 112 migraineurs, migraine free for  $\geq 48$  hours, and 75 healthy controls.
- Pain thresholds at the head and at the arm were compared between migraineurs and controls using two-tailed t-tests.
- Among migraineurs, correlations between heat pain thresholds and headache frequency, allodynia symptom severity, and time interval until next headache were calculated.

#### Results

- Migraineurs had lower pain thresholds than controls at the head ( $43.9^{\circ}\text{C} \pm 3.2^{\circ}\text{C}$  vs.  $45.1^{\circ}\text{C} \pm 3.0^{\circ}\text{C}$ ,  $p=0.015$ ) and arm ( $43.2^{\circ}\text{C} \pm 3.4^{\circ}\text{C}$  vs.  $44.8^{\circ}\text{C} \pm 3.3^{\circ}\text{C}$ ,  $p<0.001$ ).
- There were not significant correlations between pain thresholds and headache frequency or allodynia symptom severity.
- For the 41 migraineurs for whom time to next headache was known, there were positive correlations between time to next headache and pain thresholds at the head ( $r=0.352$ ,  $p=0.024$ ) and arm ( $r=0.312$ ,  $p=0.047$ ).

## Tension headaches

J Headache Pain. 2014 Sep 5.

### **Pericranial tenderness in chronic tension-type headache: the Akershus population-based study of chronic headache.**

Aaseth K<sup>1</sup>, Grande RB, Lundqvist C, Russell MB.

#### **Abstract**

##### **BACKGROUND:**

Most knowledge on chronic tension-type headache (CTTH) is based on data from selected clinic populations, while data from the general population is sparse. Since pericranial tenderness is found to be the most prominent finding in CTTH, we wanted to explore the relationship between CTTH and pericranial muscle tenderness in a population-based sample.

##### **METHODS:**

An age- and gender-stratified random sample of 30,000 persons aged 30-44 years from the general population received a mailed questionnaire. Those with a self-reported chronic headache were interviewed and examined by neurological residents. The questionnaire response rate was 71% and the interview participation rate was 74%. The International Classification of Headache Disorders II was used. Pericranial muscle tenderness was assessed by a total tenderness score (TTS) involving 8 pairs of muscles and tendon insertions. Cross-sectional data from the Danish general population using the same scoring system were used for comparison.

##### **RESULTS:**

The tenderness scores were significantly higher in women than men in all muscle groups. The TTS was significantly higher in those with co-occurrence of migraine compared with those without; 19.3 vs. 16.8,  $p = 0.02$ . Those with bilateral CTTH had a significantly higher TTS than those with unilateral CTTH. The TTS decreased significantly with age. People with CTTH had a significantly higher TTS compared to the general population.

##### **CONCLUSIONS:**

People with CTTH have increased pericranial tenderness. Elevated tenderness scores are associated with co-occurrence of migraine, bilateral headache and low age. Whether the increased muscle tenderness is primary or secondary to the headache should be addressed by future studies.

PMID: 2519340

## SHOULDER GIRDLE

### Scapular movement

Man Ther. 2014 Jul 3.

#### **A new description of scapulothoracic motion during arm movements in healthy subjects.**

Roren A<sup>1</sup>, Lefevre-Colau MM<sup>1</sup>, Poiraudeau S<sup>2</sup>, Fayad F<sup>3</sup>, Pasqui V<sup>4</sup>, Roby-Brami A<sup>5</sup>.

#### **Abstract**

**Purpose:** The participation of scapula motion in arm movement is clinically well known and recent three dimensional (3D) analyses using kinematic techniques have confirmed its importance. Scapular motion relative to the thorax has a theoretical maximum of 6 degrees of freedom (DoF), resulting from rotations at both clavicular joints (3 rotational DoF each). However, most recent kinematic studies have only analysed the 3D rotations of the scapula relative to the thorax. In the present study, the 3D translations of the barycentre of the scapula were considered in order to complete the description of movement at the shoulder complex.

**Methods:** Eight healthy subjects performed arm elevation in the sagittal and frontal planes, simulated activities of daily living (hair combing and back washing) and maximum voluntary scapula movement (forward and backward rolling). Measurements were recorded using a 6 DoF electromagnetic device and the acromial method of analysis was used.

**Results:** The results showed that 3D scapular rotations and translation of its barycentre were functionally consistent for all tasks. A principal component analysis (PCA) yielded three factors, explaining 97.6% of the variance. The first two factors (protraction and shrug, according to clinical descriptions) combined rotations and translations, consistent with the hypothesis that the scapula rolls over the curved thoracic surface. The third factor related to lateral-medial rotation, thus representing rotation in the plane tangential to the thorax.

**Conclusions:** The PCA suggested that scapular motion can be described using these 3 DoF. This should be studied in a larger group of individuals, including patients with pathological conditions.

#### **KEYWORDS:**

Clavicle; Kinematics; Protraction; Scapula rotation

PMID: 25034959

**GLENOHUMERAL/SHOULDER****Immobilization inhibition**

J Shoulder Elbow Surg. 2014 Sep 10.

**The effect of shoulder immobilization on driving performance.**

Hasan S<sup>1</sup>, Chay E<sup>1</sup>, Atanda A<sup>1</sup>, McGee AW Jr<sup>1</sup>, Jazrawi LM<sup>2</sup>, Zuckerman JD<sup>1</sup>.

**Abstract****BACKGROUND:**

The purpose of this study was to evaluate the effect of sling immobilization on driving performance with use of a driving simulator.

**METHODS:**

This is a prospective trial with a cohort of 21 healthy volunteers comparing their driving ability with and without sling immobilization on their dominant (driving) extremity. Multiple variables, including number of collisions, off-road excursions, and centerline crossings, were measured with a validated driving simulator. Trials were separated by 2 weeks to control for "adaptations" to the simulator. Statistical significance was found in collisions between sling and no-sling tests.

**RESULTS:**

The total number of collisions for trial 1 (no sling) was 36 (mean,  $1.7 \pm 1.2$ ) compared with 73 ( $3.7 \pm 1.6$ ) ( $P < .01$ ) for trial 2 (sling immobilization). Approximately 70% of participants with upper extremity immobilization were involved in  $\geq 3$  collisions; approximately 70% of no-sling participants were involved in  $\leq 2$  collisions. There was no statistically significant difference between groups with respect to overall vehicle road position and control.

**CONCLUSION:**

Sling immobilization of the dominant driving arm results in a decrease in driving performance and safety with respect to the number of collisions in a simulated driving circuit ( $P < .01$ ). There were no significant differences in driving parameters that are indicative of overall vehicle position and control. The decrease in driving performance with respect to the number of collisions is likely to be related to the effect the immobilized arm has on effectively performing evasive maneuvers during hazardous driving conditions.

**KEYWORDS:**

Driving; driving guidelines; driving safety; driving simulator; guidelines; shoulder immobilization; sling; upper extremity

PMID: 25217988

## ROTATOR CUFF

### Early vs late mobilization

J Shoulder Elbow Surg. 2014 Aug 12.

#### **Delayed versus early motion after arthroscopic rotator cuff repair: a meta-analysis.**

Chan K<sup>1</sup>, MacDermid JC<sup>2</sup>, Hoppe DJ<sup>1</sup>, Ayeni OR<sup>1</sup>, Bhandari M<sup>1</sup>, Foote CJ<sup>1</sup>, Athwal GS<sup>3</sup>.

#### **Abstract**

##### **BACKGROUND:**

We conducted a meta-analysis of randomized trials to compare delayed vs early motion therapy on function after arthroscopic rotator cuff repair.

##### **METHODS:**

We searched 4 electronic databases (Medline, Embase, Cochrane, and Physiotherapy Evidence Database [PEDro]). The methodologic quality of the included studies was assessed, and the relevant data were extracted. Data were pooled for functional outcomes, rotator cuff tear recurrence, and shoulder range of motion. Complications were reported descriptively.

##### **RESULTS:**

Three level I and 1 level II randomized trials were eligible and included. Pooled analysis revealed no statistically significant differences in American Shoulder and Elbow Surgeons scores between delayed vs early motion rehabilitation (mean difference [MD], 1.4; 95% confidence interval [CI], -1.8 to 4.7;  $P = .38$ ,  $I^2 = 34\%$ ). The risk of retears after surgery did not differ statistically between treatment groups (risk ratio, 1.01; 95% CI, 0.63-1.64;  $P = .95$ ). Early passive motion led to a statistically significant, although clinically unimportant, improvement in forward elevation between groups (MD,  $-1^\circ$ ; 95% CI,  $-2^\circ$  to  $0^\circ$ ;  $P = 0.04$ ,  $I^2 = 0\%$ ). There was no difference in external rotation between treatment groups (MD,  $1^\circ$ ; 95% CI,  $-2^\circ$  to  $4^\circ$ ;  $P = 0.63$ ,  $I^2 = 0\%$ ). None of the included studies identified any cases of postoperative shoulder stiffness.

##### **CONCLUSIONS:**

The current meta-analysis did not identify any significant differences in functional outcomes and relative risks of recurrent tears between delayed and early motion in patients undergoing arthroscopic rotator cuff repairs. A statistically significant difference in forward elevation range of motion was identified; however, this difference is likely clinically unimportant.

##### **KEYWORDS:**

Rotator cuff; motion; rehabilitation; shoulder; therapy

PMID: 25127908

**Force production of torn RC muscles**

J Shoulder Elbow Surg. 2014 Sep 3.

**Reduced muscle fiber force production and disrupted myofibril architecture in patients with chronic rotator cuff tears.**

Mendias CL<sup>1</sup>, Roche SM<sup>2</sup>, Harning JA<sup>2</sup>, Davis ME<sup>2</sup>, Lynch EB<sup>3</sup>, Sibilsky Enselman ER<sup>2</sup>, Jacobson JA<sup>4</sup>, Claflin DR<sup>5</sup>, Calve S<sup>6</sup>, Bedi A<sup>2</sup>.

**Abstract****BACKGROUND:**

A persistent atrophy of muscle fibers and an accumulation of fat, collectively referred to as fatty degeneration, commonly occur in patients with chronic rotator cuff tears. The etiology of fatty degeneration and function of the residual rotator cuff musculature have not been well characterized in humans. We hypothesized that muscles from patients with chronic rotator cuff tears have reduced muscle fiber force production, disordered myofibrils, and an accumulation of fat vacuoles.

**METHODS:**

The contractility of muscle fibers from biopsy specimens of supraspinatus muscles of 13 patients with chronic full-thickness posterosuperior rotator cuff tears was measured and compared with data from healthy vastus lateralis muscle fibers. Correlations between muscle fiber contractility, American Shoulder and Elbow Surgeons (ASES) scores, and tear size were analyzed. Histology and electron microscopy were also performed.

**RESULTS:**

Torn supraspinatus muscles had a 30% reduction in maximum isometric force production and a 29% reduction in normalized force compared with controls. Normalized supraspinatus fiber force positively correlated with ASES score and negatively correlated with tear size. Disordered sarcomeres were noted, along with an accumulation of lipid-laden macrophages in the extracellular matrix surrounding supraspinatus muscle fibers.

**CONCLUSIONS:**

Patients with chronic supraspinatus tears have significant reductions in muscle fiber force production. Force production also correlates with ASES scores and tear size. The structural and functional muscle dysfunction of the residual muscle fibers is independent of the additional area taken up by fibrotic tissue. This work may help establish future therapies to restore muscle function after the repair of chronically torn rotator cuff muscles.

**KEYWORDS:**

Rotator cuff; fatty degeneration; macrophages; myosteatosis; permeabilized muscle fibers; sarcomeres

PMID: 25193488

## ADHESIVE CAPSULITIS

### Grades

Man Ther. 2014 Jul 18.

### **Frozen shoulder contracture syndrome - Aetiology, diagnosis and management.**

Lewis J.

#### **Abstract**

**Background:** Frozen shoulder is a poorly understood condition that typically involves substantial pain, movement restriction, and considerable morbidity. Although function improves overtime, full and pain free range, may not be restored in everyone. Frozen shoulder is also known as adhesive capsulitis, however the evidence for capsular adhesions is refuted and arguably, this term should be abandoned.

**Purpose:** The aim of this Masterclass is to synthesise evidence to provide a framework for assessment and management for Frozen Shoulder.

**Results:** Although used in the treatment of this condition, manipulation under anaesthetic has been associated with joint damage and may be no more effective than physiotherapy. Capsular release is another surgical procedure that is supported by expert opinion and published case series, but currently high quality research is not available. Recommendations that supervised neglect is preferable to physiotherapy have been based on a quasi-experimental study associated with a high risk of bias. Physiotherapists in the United Kingdom have developed dedicated care pathways that provide; assessment, referral for imaging, education, health screening, ultrasound guided corticosteroid and hydro-distension injections, embedded within physiotherapy rehabilitation. The entire pathway is provided by physiotherapists and evidence exists to support each stage of the pathway.

**Conclusions:** Substantial on-going research is required to better understand; epidemiology, patho-aetiology, assessment, best management, health economics, patient satisfaction and if possible prevention.

#### **KEYWORDS:**

Assessment; Frozen shoulder; Management

PMID: 25107826

**HIP****Fracture of hip and vertebral bodies**

Osteoporos Int. 2014 Sep 19.

**Distribution of vertebral fractures varies among patients according to hip fracture type.**

Watt J<sup>1</sup>, Cox L, Crilly RG.

**Abstract**

This study explored the distribution of vertebral fractures in hip fracture patients. Unlike patients with intertrochanteric fractures, those with subcapital fractures were less likely to have vertebral fractures in the T4-T10 region of the spine. The dissimilar distribution of vertebral fractures among patients with intertrochanteric and subcapital fractures may indicate different underlying etiologies.

**INTRODUCTION:**

There are two main types of hip fractures: intertrochanteric and subcapital. Both types can have associated vertebral fractures. In this study, we explored the distribution of vertebral fractures in the two hip fracture populations.

**METHODS:**

This was a retrospective analysis of a convenience sample of 120 patients: 40 with subcapital fractures and vertebral fractures, 40 with intertrochanteric fractures and vertebral fractures, and 40 with vertebral fractures only. Based on Genant's semiquantitative assessment method of radiographic images, the distribution and severity of each patient's vertebral fractures were explored [1].

**RESULTS:**

Patients with subcapital fractures had significantly fewer total vertebral fractures (93 vs. 144,  $p = 0.005$ ; 93 vs. 127,  $p = 0.019$ ), vertebral fractures from T4 to T10 (41 vs. 81,  $p = 0.005$ ; 41 vs. 64,  $p = 0.042$ ), and vertebral fractures at the T7-T8 peak (11 vs. 31,  $p = 0.002$ ; 11 vs. 30,  $p = 0.003$ ) than patients with intertrochanteric fractures and those with vertebral fractures alone, respectively, and they were more likely to have only one vertebral fracture (15 vs. 3,  $p < 0.001$ ; 15 vs. 2,  $p < 0.001$ ). The number of vertebral fractures from T11 to L4 and at the T12-L1 peak did not differ among the groups. The numbers of fractures at each vertebral level was significantly correlated only between those with intertrochanteric fractures and those with vertebral fractures alone ( $r = 0.65$ ,  $p = 0.009$ ).

**CONCLUSION:**

The distribution of vertebral fractures among patients with subcapital fractures differed from the other fracture groups, which may indicate that subcapital fractures and some lumbar fractures have a different underlying etiology than intertrochanteric fractures and thoracic (T4-T10) fractures.

PMID: 25236878

## IMPINGEMENT

### Hip flexor strength

Man Ther. 2014 Oct;19.

#### **Hip flexor muscle size, strength and recruitment pattern in patients with acetabular labral tears compared to healthy controls.**

Mendis MD<sup>1</sup>, Wilson SJ<sup>2</sup>, Hayes DA<sup>3</sup>, Watts MC<sup>3</sup>, Hides JA<sup>4</sup>.

#### **Abstract**

**Purpose:** Acetabular labral tears are a source of hip pain and are considered to be a precursor to hip osteoarthritis. Hip flexor muscles contribute to hip joint stability and function but it is unknown if their size and function is altered in the presence of labral pathology. This study aimed to investigate hip flexor muscle size, strength and recruitment pattern in patients with hip labral pathology compared to control subjects.

**Methods:** 12 subjects diagnosed with an unilateral acetabular labral tear were compared to 12 control subjects matched for age and gender. All subjects underwent magnetic resonance imaging (MRI) of their lumbo-pelvic region. Average muscle cross-sectional area (CSA) of the iliacus, psoas, iliopsoas, sartorius, tensor fascia latae and rectus femoris muscles were measured. Hip flexion strength was measured by an externally fixed dynamometer. Individual muscle recruitment pattern during a resisted hip flexion exercise task was measured by muscle functional MRI.

**Results:** Hip flexor muscle strength was found to be decreased in patients with labral pathology compared to control subjects ( $p < 0.01$ ). No difference between groups or sides was found for hip flexor muscle size (all  $p > 0.17$ ) and recruitment pattern (all  $p > 0.53$ ).

**Conclusions:** Decreased hip flexor muscle strength may affect physical function in patients with hip labral pathology by contributing to altered gait patterns and functional tasks. Clinical rehabilitation of these patients may need to include strengthening exercises for the hip flexor muscles.

#### **KEYWORDS:**

Hip injuries; Magnetic resonance imaging; Muscle strength; Osteoarthritis

PMID: 2464666

## **KNEE/ACL**

### **Testing**

Arch Orthop Trauma Surg. 2014 Oct

#### **Can physical examination predict the intraarticular tear pattern of the anterior cruciate ligament?**

Yoon KH<sup>1</sup>, Lee SH, Park SY, Kang DG, Chung KY.

##### **Abstract**

##### **PURPOSE:**

We evaluated the correlation between physical examinations and the tear patterns of the anterior cruciate ligament (ACL).

##### **MATERIALS AND METHODS:**

From January 2003 to May 2007, we reviewed 201 cases of ACL rupture, diagnosed by MRI. Two orthopaedic surgeons (a fellow and a senior surgeon) evaluated the instability of the knee under anaesthesia: physical examinations were the anterior draw test (AD), Lachman test (LT), and pivot shift test (PT). By describing the rupture pattern and the site of the anteromedial (AMB) and posterolateral bundle (PLB) during arthroscopic examination, we analysed the correlation between the physical examination under anaesthesia and arthroscopic findings.

##### **RESULTS:**

In terms of the arthroscopic findings, rupture of the PLB was seen in 83 cases (41.3 %), of the AMB in 24 cases (11.9 %), and of both bundles in 94 cases (46.8 %). The kappa values for the physical examinations between the examiners were 0.963 (AD), 0.92 (LT), and 0.865 (PT). AD and LT above grade 2 did not differ significantly according to the pattern of rupture, but a PT above grade 2 was significantly different in ruptured PLB versus complete rupture.

##### **CONCLUSIONS:**

A PT of more than grade 2 is a reliable physical examination for prediction of ruptured PLB or complete rupture.

PMID: 25064508

## MENISCUS

### Root tears

Knee Surg Sports Traumatol Arthrosc. 2014 Sep 13.

#### **Traumatic posterior root tear of the medial meniscus in patients with severe medial instability of the knee.**

Ra HJ<sup>1</sup>, Ha JK, Jang HS, Kim JG.

#### **Abstract**

##### **PURPOSE:**

To examine the incidence and diagnostic rate of traumatic medial meniscus posterior root tear associated with severe medial instability and to evaluate the effectiveness of pullout repair.

##### **METHODS:**

From 2007 to 2011, 51 patients who underwent operation due to multiple ligament injuries including medial collateral ligament rupture were reviewed retrospectively. The International Knee Documentation Committee (IKDC) subjective and Lysholm score were evaluated pre- and postoperatively. Postoperative magnetic resonance imaging (MRI) was performed, and if indicated, a second-look arthroscopic examination was conducted.

##### **RESULTS:**

Fourteen out of 51 patients were associated with severe medial instability. Seven patients were diagnosed with traumatic medial meniscus posterior root tear and underwent arthroscopic pullout repair. Five of them were missed at initial diagnosis using MRI. In seven patients, the mean Lysholm and IKDC subjective scores improved from  $74.6 \pm 10.3$  and  $47.6 \pm 7.3$  to  $93.0 \pm 3.7$  and  $91.6 \pm 2.6$ , respectively. All showed complete healing of meniscus root on follow-up MRI and second-look arthroscopy.

##### **CONCLUSION:**

Medial meniscus posterior root tear may occur in severe medial instability from trauma. It is a common mistake that surgeons may not notice on the diagnosis of those injuries using MRI. Therefore, a high index of suspicion is required for the diagnosis of medial meniscus posterior root tear in this type of injuries. The traumatic medial meniscus posterior root tear could be healed successfully using arthroscopic pullout repair technique.

##### **CLINICAL RELEVANCE:**

The possibility of the medial meniscus posterior root tear should be considered in severe medial instability and arthroscopic pullout repair can be an effective option for treatment.

##### **LEVEL OF EVIDENCE:**

Case series with no comparison group, Level IV.

PMID: 25217312

**ACL and meniscus**

Knee Surg Sports Traumatol Arthrosc. 2014 Sep 13.

**Meniscal integrity predicts laxity of anterior cruciate ligament reconstruction.**

Robb C<sup>1</sup>, Kempshall P, Getgood A, Standell H, Sprowson A, Thompson P, Spalding T.

**Abstract****PURPOSE:**

The aim of this study was to evaluate the incidence of failure of anterior cruciate ligament (ACL) reconstruction and to assess the prognostic factors for such an outcome.

**METHODS:**

A prospective inception cohort of patients undergoing ACL reconstruction was analysed for failure (patient reported symptoms of rotational instability, a clinically positive pivot shift, MRI or arthroscopy showing ACL graft rupture). Risk factors evaluated included medial and lateral meniscal deficiency, medial and lateral meniscal repair, age, gender, BMI, graft size and time to surgery. Survival analysis was performed using the Kaplan-Meier method. Prognostic factors were assessed using the Cox proportional hazard model to investigate whether covariate risk factors influenced graft survival.

**RESULTS:**

One hundred and twenty-three patients were available for final analysis at a follow-up of 2 years. Eighteen patients satisfied the criteria of failure (15.4 %). Risk factors for failure were medial meniscal deficiency (hazard ratio 4.5; 95 % CI 1.8-11.5;  $p = 0.002$ ), or lateral meniscal deficiency (hazard ratio 3.5; 95 % CI 1.3-9.3;  $p = 0.01$ ). At 2-year follow-up, ACL survival was 94.5 % (95 % CI 89-100) for patients with intact menisci and 69 % (95 % CI 56-86) for those with deficiency of the medial or lateral meniscus (log-rank test  $p = 0.017$ ). Patients were 4.9 times more likely to fail if they had a deficient medial or lateral meniscus. Those patients who underwent meniscal repair did not demonstrate any increased risk of failure.

**CONCLUSION:**

Medial and lateral meniscal tears are important prognostic factors that influence the survival of ACL reconstruction. Surgeons should endeavour to repair all meniscal tears associated with ACL reconstruction.

PMID: 25217313

**PATELLA****Anatomical factors for dislocations**

Knee Surg Sports Traumatol Arthrosc. 2014 Oct;22

**Anatomical factors influencing patellar tracking in the unstable patellofemoral joint.**

Biyani R<sup>1</sup>, Elias JJ, Saranathan A, Feng H, Guseila LM, Morscher MA, Jones KC.

**Abstract****PURPOSE:**

The current study was performed to relate anatomical parameters to in vivo patellar tracking for pediatric patients with recurrent patellar instability.

**METHODS:**

Seven pediatric patients with recurrent patellar instability that failed conservative treatment were evaluated using computational reconstruction of in vivo patellofemoral function. Computational models were created from high-resolution MRI scans of the unloaded knee and lower-resolution scans during isometric knee extension at multiple flexion angles. Shape matching techniques were applied to replace the low-resolution models of the loaded knee with the high-resolution models. Patellar tracking was characterized by the bisect offset index (lateral shift) and lateral tilt. Anatomical parameters were characterized by the inclination of the lateral ridge of the trochlear groove, the tibial tuberosity-trochlear groove distance, the Insall-Salvati index and the Caton-Deschamps index. Stepwise multivariable linear regression analysis was used to relate patellar tracking to the anatomical parameters.

**RESULTS:**

The bisect offset index and lateral tilt were significantly correlated with the lateral trochlear inclination ( $p \leq 0.002$ ) and TT-TG distance ( $p < 0.05$ ), but not the Insall-Salvati index or the Caton-Deschamps index. For both the bisect offset index and lateral tilt, the standardized beta coefficient, used to identify the best anatomical predictors of tracking, was larger for the lateral trochlear inclination than the TT-TG distance.

**CONCLUSION:**

For this population, the strongest predictor of lateral maltracking that could lead to patellar instability was lateral trochlear inclination.

**LEVEL OF EVIDENCE:**

Diagnostic study, Level II.

PMID: 25063490

**Medial patella femoral ligament**

Knee Surg Sports Traumatol Arthrosc. 2014 Oct;22. Epub 2014 Jul 25.

**Medial patellofemoral ligament avulsion injury at the patella: classification and clinical outcome.**

Sillanpää PJ<sup>1</sup>, Salonen E, Pihlajamäki H, Mäenpää HM.

**Abstract****PURPOSE:**

To define medial patellofemoral ligament (MPFL) injury characteristics at the patellar attachment and clinical outcome in patients with primary traumatic patellar dislocation and MPFL avulsion injury at the patella.

**METHODS:**

Magnetic resonance imaging (MRI) was used to assess patients with primary (first-time) patellar dislocation and MPFL injury at the medial margin of the patella. Fifty-six patients with patellar attachment MPFL injury were enrolled in the study. Thirteen patients underwent surgical fixation of the avulsed MPFL and patellar medial margin osteochondral fracture, and the remaining patellar MPFL injuries were treated nonoperatively. Forty-four patients were evaluated clinically at median four (range 1-10) years after patellar dislocation. The follow-up included evaluation of recurrent patellar instability, subjective symptoms, and functional limitations.

**RESULTS:**

Three types of patellar MPFL injuries were found; type P0 with ligamentous disruption at the patellar attachment, type P1 with bony avulsion fracture from the medial margin of the patella, and type P2 with bony avulsion involving articular cartilage from the medial facet of the patella. Of the patellar MPFL avulsion injuries that underwent initial surgical fixation, two patients (2/13) reported an unstable patella at follow-up. Fifty-five per cent (17/31) of patellar MPFL avulsion injuries that were treated nonoperatively had recurrent patellar instability (n.s.). The median Kujala score was 90 for patellar avulsion with surgical fixation and 86 for patellar avulsion without surgical fixation (n.s.).

**CONCLUSION:**

Patellar attachment MPFL injury showed three different patterns, classified as types P0, P1, and P2. MRI can be used to assess the injury pattern. Patellar MPFL avulsion injuries do not benefit from acute surgical repair compared with nonsurgical treatment. Type P2 patellar MPFL avulsion includes an osteochondral fracture that may require surgical fixation.

PMID: 25059336

## **Foot and patella pain**

Knee Surg Sports Traumatol Arthrosc. 2014 Mar 22.

### **Increased medial foot loading during drop jump in subjects with patellofemoral pain.**

Rathleff MS<sup>1</sup>, Richter C, Brushøj C, Bencke J, Bandholm T, Hölmich P, Thorborg K.

#### **Abstract**

##### **PURPOSE:**

To compare medial-to-lateral plantar forces during drop jump and single leg squat in individuals with and without patellofemoral pain.

##### **METHODS:**

This cross-sectional study compared 23 young adults with patellofemoral pain to 20 age- and sex-matched controls without knee pain. The plantar pressure distribution was collected during drop jump and single leg squat using pressure-sensitive Pedar insoles, inserted into a standard flat shoe. The primary outcome was the medial-to-lateral force, quantified as the peak force under the medial forefoot as the percentage of force under the total forefoot during drop jump. Secondary outcomes included peak medial-to-lateral force during single leg squat and mean forces during drop jump and single leg squat.

##### **RESULTS:**

The primary outcome showed that individuals with patellofemoral pain had a 22 % higher medial-to-lateral peak force during drop jump, ( $p = 0.03$ ). Secondary outcomes showed 32 % higher medial-to-lateral peak force during single leg squat ( $p = 0.01$ ) and 19-23 % higher medial-to-lateral mean force during drop jump and single leg squat ( $p = 0.02-0.04$ ).

##### **CONCLUSION:**

These findings indicate that individuals with patellofemoral pain display a more medially oriented loading pattern of the forefoot compared to individuals without knee pain. This loading pattern may be associated with the distribution of forces acting on the patellofemoral joint and suggest treatment of PFP should consider interventions that target normalisation of foot loading. LEVEL OF EVIDENCE: III.

PMID: 24658150

## OSTEOARTHRITIS/KNEE

### Muscle activation

Exp Brain Res. 2014 Sep 3.

#### **Corticospinal and intracortical excitability of the quadriceps in patients with knee osteoarthritis.**

Kittelson AJ<sup>1</sup>, Thomas AC, Kluger BM, Stevens-Lapsley JE.

##### **Abstract**

**Purpose:** Deficits in voluntary activation of the quadriceps muscle are characteristic of knee osteoarthritis (OA), contributing to the quadriceps weakness that is also a hallmark of the disease. The mechanisms underlying this central activation deficit (CAD) are unknown, although cortical mechanisms may be involved. Here, we utilize transcranial magnetic stimulation (TMS) to assess corticospinal and intracortical excitability in patients with knee OA and in a comparably aged group of healthy older adults, to quantify group differences, and to examine associations between TMS measures and pain, quadriceps strength, and CAD.

**Methods:** Seventeen patients with knee OA and 20 healthy controls completed testing. Motor evoked potentials were measured at the quadriceps by superficial electromyographic recordings. Corticospinal excitability was assessed by measuring resting motor threshold (RMT) to TMS stimulation of the quadriceps representation at primary motor cortex, and intracortical excitability was assessed via paired-pulse paradigms for short-interval intracortical inhibition (SICI) and intracortical facilitation (ICF).

**Results:** No statistically significant differences between patients with knee OA and healthy controls were found for RMT, SICI or ICF measures ( $p > 0.05$ ). For patients with knee OA, there were significant associations observed between pain and RMT, as well as between pain and ICF. No associations were observed between CAD and measures of corticospinal or intracortical excitability.

**Conclusions:** These data suggest against direct involvement of corticospinal or intracortical pathways within primary motor cortex in the mechanisms of CAD. However, pain is implicated in the neural mechanisms of quadriceps motor control in patients with knee OA.

PMID: 25183161

## FOOT AND ANKLE

### Forefoot varus and hip dysfunction

Man Ther. 2014 Jul 12.

#### **The effects of forefoot varus on hip and knee kinematics during single-leg squat.**

Scattone Silva R<sup>1</sup>, Maciel CD<sup>2</sup>, Serrão FV<sup>3</sup>.

#### **Abstract**

**Purpose:** Foot misalignments, such as forefoot varus (FV), have been associated with musculoskeletal injuries in the proximal joints of the lower limb. Previous theories suggested that this association occurs because FV influences knee and hip kinematics during closed kinetic chain activities. However, research on the effects of FV in the kinematics of the lower limb is very scarce. Therefore, the purpose of this study was to compare the knee and hip kinematics between subjects with and without FV during a functional weight-bearing activity.

**Methods:** Forty-six healthy adolescents were divided into two groups: group of subjects with FV (VG, n = 23) and group of subjects with aligned forefoot (CG, n = 23). A kinematic evaluation was conducted while the subjects performed a single-leg squat task. The variables of interest were hip internal rotation and adduction and knee abduction excursions at 15°, 30°, 45° and 60° of knee flexion. Between-group comparisons were performed with multivariate analysis of variance.

**Results:** The VG presented greater hip internal rotation when compared with the CG across all evaluated knee flexion angles ( $P = 0.02-0.0001$ ). No differences between groups were observed in hip adduction or knee abduction ( $P > 0.05$ ).

**Conclusions:** These results indicate that FV influences the transverse plane hip movement patterns during a functional weight-bearing activity. Considering that excessive hip internal rotation has been associated with knee injuries, these findings might contribute for a better understanding of the link between FV and injuries of the proximal joints of the lower limb.

#### **KEYWORDS:**

Biomechanics; Patellofemoral pain; Subtalar hyperpronation

PMID: 2508121

## ORTHOTICS/SHOES

### Shoes and OA

BMC Musculoskelet Disord. 2014 Sep 20

#### **Self-reported adult footwear and the risks of lower limb osteoarthritis: the GOAL case control study.**

McWilliams DF, Muthuri S, Muir KR, Maciewicz RA, Zhang W, Doherty M.

##### **Abstract**

##### **BACKGROUND:**

Biomechanical factors may play a role in osteoarthritis (OA) development and progression. Previous biomechanical studies have indicated that types of footwear may modulate forces across the knee joint, and high heeled womens' shoes in particular are hypothesised to be detrimental to lower limb joint health. This analysis of data from a case control study investigated persistent users of different adult footwear for risks of knee and hip OA. Our underlying hypotheses were that high heeled, narrow heeled, and hard soled shoe types were putative risk factors for lower limb OA.

##### **METHODS:**

Data on footwear were initially obtained from participants during the Genetics of Osteoarthritis and Lifestyle (GOAL) hospital-based, case control study using standardised interview-delivered questionnaires. An additional questionnaire was later sent to GOAL study participants to verify findings and to further investigate specific shoe use per decade of life. Persistent users of footwear types (high or narrow heel; sole thickness or hardness) were identified from early adulthood. Participants were grouped into single sex knee OA, hip OA or control groups. Adjusted odds ratios (aOR) and 95% confidence interval (CI) were calculated.

##### **RESULTS:**

Univariate analysis of persistent users of women's high heeled and narrow heeled shoes during early adulthood showed negative associations with knee OA and hip OA. After logistic regression, persistent narrow heel users were associated with less risk of OA (knee OA aOR 0.59, 95% CI 0.35 - 1.00 and hip aOR: 0.50, 95% CI 0.30 - 0.85), and other analyses were not statistically significant. Further analysis suggested that women with hip OA may have stopped wearing high and narrow heeled footwear to attenuate hip pain in early adulthood. Consistent associations between shoe soles and OA were not found.

##### **CONCLUSIONS:**

In general, persistent users of high and narrow heeled shoes during early adulthood had a negative association with knee or hip OA. This does not necessarily imply a causal relationship, as changing footwear during early adulthood to modulate index joint pain may provide a possible explanation. Despite the findings of previous biomechanical studies of high heels, we did not find a positive association between women's shoes and lower limb osteoarthritis.

PMID: 25240981

## ACHILLES TENDON

### Hypertrophy with demand

Foot Ankle Int. 2014 Sep 11.

#### **Achilles Tendons Hypertrophy in Response to High Loading Training.**

Milgrom Y<sup>1</sup>, Milgrom C<sup>2</sup>, Altaras T<sup>3</sup>, Globus O<sup>4</sup>, Zeltzer E<sup>3</sup>, Finestone AS<sup>5</sup>.

#### **Abstract**

##### **BACKGROUND:**

Whether the human Achilles tendon undergoes hypertrophic changes as measured by an increase in cross-sectional area, in response to endurance training exercise remains in question. We investigated the hypothesis that transition from civilian life through 6 months of elite infantry training would induce adaptive Achilles tendon hypertrophy.

##### **METHODS:**

Seventy-two new elite infantry recruits had the cross-sectional area of their Achilles tendons measured at a point 2.5 cm proximal to the Achilles insertion by ultrasound before beginning elite infantry training. Measurements were repeated by the same ultrasonographer for those recruits who were still in the training program at 6 months. Prior to beginning the study the intraobserver reliability of the ultrasonographer's Achilles tendon measurements was calculated (intraclass correlation coefficient = .96). Fifty-five recruits completed 6 months of training.

##### **RESULTS:**

The mean cross-sectional area of their right Achilles tendon increased from  $47.0 \pm 11.2$  to  $50.2 \pm 9.6$  mm<sup>2</sup> (P = .037) and the left Achilles tendon from  $47.2 \pm 8.9$  to  $51.1 \pm 8.3$  mm<sup>2</sup> (P = .013). The change in cross-sectional area did not correlate with subject height, weight, prior sport history, or jumping and running abilities.

##### **CONCLUSIONS:**

An abrupt stimulus of 6 months of elite infantry training was adequate to induce hypertrophic changes in the Achilles tendon. This is the first human prospective study showing an increase in the Achilles tendon cross-sectional area in response to rigorous endurance type training. The finding supports the hypothesis that the Achilles tendon in response to sufficiently high and sustained loading can remodel its morphological properties and thereby strengthen itself.

##### **LEVEL OF EVIDENCE:**

Level II, etiology study.

##### **KEYWORDS:**

Achilles tendon; adaptation; hypertrophy; ultrasound

PMID: 25212862

**STM/STRETCHING/MUSCLES****Scar tissue**

Pain Physician, 09/26/2014 Clinical Article

**2014;17;465-474. New Insights from Immunohistochemistry for the Characterization of Epidural Scar Tissue****Laboratory Study**

Paulo Pereira, MD, Antonio Avelino, PhD, Pedro Monteiro, MD, Rui Vaz, MD, PhD, and Jose Manuel Castro-Lopes, MD, PhD

**BACKGROUND:** The association between epidural fibrosis and recurrent symptoms after lumbar spine surgery remains a matter of debate in scientific literature and the underlying pathophysiological mechanism has not been clearly elucidated.

**OBJECTIVE:** To investigate the presence of nerve fibers and the expression of osteopontin in epidural fibrous tissue after lumbar surgery in humans.

**STUDY DESIGN:** Laboratory study of human tissue samples.

**METHODS:** Twenty-four patients with persistent or recurrent low back and/or leg pain after lumbar spine surgery, in whom no relevant findings were present on magnetic resonance imaging (MRI) besides epidural scar tissue, were submitted to epiduroscopy. Biopsy samples of epidural scar tissue resting in the posterior epidural and periradicular space were obtained from 15 patients, using an endoscopic grasping forceps, in locations where the stimulation with the tip of a Fogarty consistently reproduced pain. Biopsy samples were processed for examination under optical and transmission electron microscopes and under a fluorescence microscope after incubation in primary antibodies against beta3-tubulin or against osteopontin.

**RESULTS:** Optical and transmission electron microscopy revealed a homogeneous fibrous tissue rich in collagen and lacking nerve fibers. No immunofluorescence was present in any of the samples immunoreacted against beta3-tubulin. In the samples immunoreacted against osteopontin, a punctate signal was detected around the collagen fibers.

**LIMITATIONS:** Being a human study, there was no control group, so it is not possible to determine the contribution of osteopontin in the formation of epidural fibrosis and its relation to the patients' symptoms. Additional animal studies are needed to investigate these issues.

**CONCLUSION:** Rather than direct stimulation of nociceptors in the epidural scar tissue, other factors should relate epidural fibrosis and recurrent symptoms after lumbar spine surgery. Osteopontin seems to play a role in the formation of epidural fibrosis.



## **SCOLIOSIS**

### **Shoulder ROM**

J Spinal Disord Tech. 2014 Oct;27.

#### **Patterns of shoulder imbalance in adolescent idiopathic scoliosis: a retrospective observational study.**

Menon KV<sup>1</sup>, Tahasildar N, Pillay HM, Anbuselvam M, Jayachandran RK.

##### **Abstract**

##### **STUDY DESIGN:**

Retrospective cohort study.

##### **OBJECTIVE:**

To study the relationship between the proximal spine and shoulder levels in adolescent idiopathic scoliosis (AIS).

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

It has been frequently observed that the shoulder levels do not correspond to the spinal curve direction in AIS.

##### **MATERIALS AND METHODS:**

Eighty-five operated cases of AIS were analyzed retrospectively of which 69 were Lenke type I and II curves. Preoperative anteroposterior standing x-rays of the spine and clinical photographs were studied. T1 tilt and intercoracoid line (ICL) tilt and their mutual relationship were documented. The curve type (Lenke), magnitude, and direction of the proximal and main thoracic (PT and MT) curves were also noted.

##### **RESULTS:**

The shoulder level as depicted by the ICL showed 3 patterns-horizontal, left side elevated, or right side elevated. The T1-ICL relationship was either concordant or discordant. In the concordant case the T1 was tilted to the same side as the ICL; and vice versa in the discordant. The shoulder level was dependent on the MT curve if the ICL tilted to the same side as the MT curve and it was dependent on the PT curve if it tilted to the same side as the PT curve. This relationship appeared unrelated to curve type.

##### **CONCLUSIONS:**

Preoperative shoulder levels in AIS may be concordant with the T1 or discordant-each can have left or right shoulder elevation or balanced shoulders. Further, the shoulder might be MT dependent or PT dependent. Theoretically therefore, surgical balancing of the shoulder and upper instrumented vertebra placement should not depend only on the magnitude and stiffness of the PT curve.

PMID: 25144206

## ATHLETICS

### Minor league pitchers

J Shoulder Elbow Surg. 2014 Aug 26.

#### Shoulder functional performance status of Minor League professional baseball pitchers.

Fronek J<sup>1</sup>, Yang JG<sup>2</sup>, Osbahr DC<sup>3</sup>, Pollack KM<sup>4</sup>, EIAttrache NS<sup>5</sup>, Noonan TJ<sup>6</sup>, Conte SA<sup>7</sup>, Yocum LA<sup>5</sup>.

#### Abstract

##### BACKGROUND AND HYPOTHESIS:

The Overhead Shoulder and Elbow Score (Kerlan-Jobe Orthopaedic Clinic [KJOC] score) among healthy or uninjured professional baseball pitchers is lacking. We hypothesized that shoulder function and performance status measured by the KJOC score among active Minor League professional baseball pitchers were high at pre-participation and that the pitchers who had not been previously treated for a shoulder injury and were playing without arm trouble had significantly higher KJOC scores than their counterparts.

##### METHODS:

In this cross-sectional survey, data on pre-participation KJOC scores, along with other study measures, were collected from a cohort of Minor League professional baseball pitchers. Generalized estimating equations with a Poisson distribution were used for analysis.

##### RESULTS:

A total of 366 Minor League professional pitchers were included, with a mean KJOC score of 92.8 points (SD, 12.1 points), suggesting that participating pitchers' shoulder function and performance were high. Participating pitchers who had not received treatment for a shoulder injury had significantly higher KJOC scores than those who had received treatment, either surgical or nonsurgical ( $\beta = 0.0238$ ,  $P = .0495$ ). In addition, pitchers who were not currently injured, were playing without arm trouble, or had not missed games in the past 12 months because of a shoulder injury also had statistically significantly higher KJOC scores than their counterparts.

##### CONCLUSION:

This study provides an empirical profile of the KJOC score for a large sample of active Minor League professional baseball pitchers and identifies risk factors associated with decreased KJOC scores.

##### KEYWORDS:

Baseball; KJOC score; professional pitchers; shoulder

PMID: 25168348

**Pitchers elbow**

J Shoulder Elbow Surg. 2014 Aug 30.

**The effects of medial ulnar collateral ligament reconstruction on Major League pitching performance.**

Keller RA<sup>1</sup>, Steffes MJ<sup>2</sup>, Zhuo D<sup>2</sup>, Bey MJ<sup>3</sup>, Moutzouros V<sup>2</sup>.

**Abstract****BACKGROUND:**

Medial ulnar collateral ligament (MUCL) reconstruction is commonly performed on Major League Baseball (MLB) pitchers. Previous studies have reported that most pitchers return to presurgical statistical performance levels after MUCL reconstruction.

**METHODS:**

Pitching performance data-specifically, earned run average (ERA), walks and hits per inning pitched (WHIP), winning percentage, and innings pitched-were acquired for 168 MLB pitchers who had undergone MUCL reconstruction. These data were averaged over the 3 years before surgery and the 3 years after surgery and also acquired from 178 age-matched, uninjured MLB pitchers.

**RESULTS:**

Of the pitchers who had MUCL reconstruction surgery, 87% returned to MLB pitching. However, compared with presurgical data, pitching performance declined in terms of ERA (P = .001), WHIP (P = .011), and innings pitched (P = .026). Pitching performance also declined in the season before the surgery compared with previous years (ERA, P = .014; WHIP, P = .036; innings pitched, P < .001; winning percentage, P = .004). Compared with age-matched control pitchers, the MUCL reconstruction pitchers had significantly more major league experience at the same age (P < .001).

**CONCLUSION:**

MUCL reconstruction allows most players to return to pitching at the major league level. However, after MUCL reconstruction, there is a statistically significant decline in pitching performance. There appears to be a statistically significant decline in pitching performance the year before reconstructive surgery, and this decline is also a risk factor for requiring surgery. In addition, there is an increased risk of MUCL reconstruction for pitchers who enter the major leagues at a younger age.

**KEYWORDS:**

Elbow; baseball; injury; pitcher; ulnar collateral ligament

PMID: 25183663

**PAIN****Chronic pain and suicide**

Neuropsychiatr Dis Treat. 2014 Sep 2.

**Aggression, impulsivity, and suicide risk in benign chronic pain patients - a cross-sectional study.**

Margari F<sup>1</sup>, Lorusso M<sup>2</sup>, Matera E<sup>3</sup>, Pastore A<sup>1</sup>, Zagaria G<sup>3</sup>, Bruno F<sup>4</sup>, Puntillo F<sup>4</sup>, Margari L<sup>3</sup>.

**Abstract****OBJECTIVES:**

The objective of this study was to investigate the role that psychopathological dimensions as overt aggression and impulsivity play in determining suicide risk in benign chronic pain patients (CPPs). Furthermore we investigated the possible protective/risk factors which promote these negative feelings, analyzing the relationship between CPPs and their caregivers.

**METHODS:**

We enrolled a total of 208 patients, divided into CPPs and controls affected by internistic diseases. Assessment included collection of sociodemographic and health care data, pain characteristics, administration of visual analog scale (VAS), Modified Overt Aggression Scale (MOAS), Barratt Impulsiveness Scale Version 11 (BIS), Hamilton Depression Rating Scale (HDRS), and a caregiver self-administered questionnaire. All variables were statistically analyzed.

**RESULTS:**

A significant difference of VAS, MOAS-total/verbal/auto-aggression, HDRS-total/suicide mean scores between the groups were found. BIS mean score was higher in CPPs misusing analgesics. In CPPs a correlation between MOAS-total/verbal/auto-aggression with BIS mean score, MOAS with HDRS-suicide mean score and BIS with HDRS-suicide mean scores were found. The MOAS and BIS mean scores were significantly higher when caregivers were not supportive.

**CONCLUSION:**

In CPPs, aggression and impulsivity could increase the risk of suicide. Moreover, impulsivity, overt aggression and pain could be interrelated by a common biological core. Our study supports the importance of a multidisciplinary approach in the CPPs management and the necessity to supervise caregivers, which may become risk/protective factors for the development of feelings interfering with the treatment and rehabilitation of CPPs.

**KEYWORDS:**

chronic pain; impulsivity; overt aggression; suicide

PMID: 25214787

## **Ethyl chloride spray**

Am J Phys Med Rehabil. 2014 Oct.

### **Effects of ethyl chloride spray on pain and parameters of needle electromyography in the upper extremity.**

Moon YE<sup>1</sup>, Kim SH.

#### **Abstract**

##### **OBJECTIVE:**

The aim of this study was to compare the effects of ethyl chloride and placebo sprays for reducing pain induced by needle electromyography and changes in parameters of the motor unit action potential during needle electromyography of the upper extremity.

##### **DESIGN:**

Sixty patients were randomized into the ethyl chloride or placebo spray groups. In both groups, spray was applied just before needle electromyography of the flexor carpi radialis, and a visual analog scale to evaluate the pain of needle electromyography and a five-point Likert scale for patient satisfaction and preference for reexamination were compared between the two groups. Then, changes in the amplitude, phases, turns, and duration of the motor unit action potential during needle electromyography of the biceps brachii were compared before and after spraying in each group.

##### **RESULTS:**

The visual analog scale was significantly lower, and patient satisfaction and preference for reexamination were significantly higher in the ethyl chloride spray group. Among the parameters of the motor unit action potential, there were no significant changes except for an increased duration after spraying with ethyl chloride.

##### **CONCLUSIONS:**

Ethyl chloride spray can effectively reduce pain, but it must be used with caution because it may affect parameters of the motor unit action potential during needle electromyography.

PMID: 24879550

## NUTRITION/VITAMINS

### Vitamin D and pain

#### **Effect of vitamin D on musculoskeletal pain and headache: A randomized, double-blind, placebo-controlled trial among adult ethnic minorities in Norway**

Pain, 09/26/2014 Clinical Article

Knutsen KV, et al. – The aim of this study was to examine whether daily vitamin D3 (25 µg/d or 10 µg/d) supplementation for 16 weeks would improve musculoskeletal pain or headache compared to placebo. The use of vitamin D supplements, however, showed no significant effect on the occurrence, anatomical localization, and degree of pain or headache compared to placebo.

#### **Methods**

- This randomized, double-blind, placebo-controlled, parallel-group trial recruited 251 participants aged 18 to 50 years, and 215 (86%) attended the follow-up visit.
- The pain measures were occurrence, anatomical localization and degree of musculoskeletal pain, as measured by visual analogue scale score (VAS) during the past two weeks.
- Headache was measured with VAS and the Headache Impact Test (HIT-6) questionnaire.

#### **Results**

- It baseline, females reported more pain sites (4.7) than males (3.4), and only 7% reported no pain the past two weeks. During the past 4 weeks, 63% reported headache with a high mean HIT-6 score of 60 (SD 7).
- At follow-up, vitamin D level, measured as serum 25(OH)D3 increased from 27 nmol/l to 52 nmol/l and from 27 nmol/l to 43 nmol/l in the 25 µg and 10 µg supplementation groups, respectively, whereas serum 25(OH)D3 did not change in the placebo group.
- Pain scores and headache scores were improved at follow-up compared with baseline.

## Vitamin D and hip fracture

BMC Geriatr. 2014 Sep 9.

### **An initial loading-dose vitamin D versus placebo after hip fracture surgery: baseline characteristics of a randomized controlled trial (REVITAHIP).**

Mak JC<sup>1</sup>, Klein LA, Finnegan T, Mason RS, Cameron ID.

#### **Abstract**

##### **BACKGROUND:**

Hypovitaminosis D is particularly common among older people with a proximal femoral (hip) fracture. There are currently no agreed strategies for vitamin D replenishment after hip fracture surgery. The REVITAHIP Study is a multisite, double-blinded randomized-controlled trial investigating the effects of an oral vitamin D loading dose on gait velocity after hip fracture surgery. We describe the baseline characteristics of participants, aiming to document hypovitaminosis D and its associations after hip fracture.

##### **METHODS:**

Participants, over 65, recruited within 7 days following hip fracture surgery from 3 Australia hospitals, were randomly allocated to receive a loading dose of vitamin D<sub>3</sub> (250,000IU) or placebo, followed by oral maintenance vitamin D<sub>3</sub>/calcium (800 IU/500 mg) and the usual hip fracture rehabilitation pathway. Demographic and clinical data were collected, including surgical procedure, pre-fracture functional status, Mini Mental State Examination (MMSE) score, serum 25-hydroxyvitamin D (25-OHD), Verbal Rating Scale (VRS) for pain, grip strength and gait velocity. The associations of baseline 25-OHD levels with demographic and clinical data were assessed using Pearson's correlation, ANOVA and regression analyses.

##### **RESULTS:**

Two-hundred-and-eighteen people with hip fracture participated in the study. Mean age was 83.9+/-7.2 years, 77% were women and 82% lived in private homes. Fifty-six percent had a subcapital fracture. Mean comorbidity count was 3.13+/-2.0. Mean MMSE was 26.1+/-3.9. Forty-seven percent of participants had hypovitaminosis D (<50 nmol/L). Multivariate regression models demonstrated higher baseline vitamin D levels were significantly associated with higher premorbid Barthel index scores, lower post-operative VRS pain levels and use of vitamin D.

##### **CONCLUSION:**

This study cohort shared similar demographic characteristics and comorbidities with other cohorts of people with hip fracture, with the probable exception of less cognitive impairment. Hypovitaminosis D was not as prevalent as previously documented. Patients taking vitamin D supplements and with higher premorbid Barthel index, reflecting greater independence and activity, tended to have higher 25-OHD levels at baseline. Further, lower VRS pain ratings following surgery were associated with higher vitamin D levels. Such associations will need further investigation to determine causation. (ANZCTR number, ACTRN12610000392066).

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