

## TENDINOPATHY RESEARCH UPDATE - NOVEMBER 2012

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## **AETIOLOGY**

Med Sci Sports Exerc. 2012 Oct 10. [Epub ahead of print]

**A lower limb assessment tool for athletes at risk of developing patellar tendinopathy.**

Mann KJ, Edwards S, Drinkwater EJ, Bird SP.

### **Abstract**

#### **PURPOSE:**

Patellar tendon abnormality (PTA) on diagnostic imaging is part of the diagnostic criteria for patellar tendinopathy. A PTA in addition to altered landing strategies are primary risk factors that increase the likelihood of asymptomatic athletes developing patellar tendinopathy. Therefore, the aim of this study was to examine risk factors that are predictors of the presence and severity of a PTA in junior pre-elite athletes.

#### **METHODS:**

Ten junior pre-elite male basketball athletes with a PTA were matched with ten athletes with normal patellar tendons. Participants had patellar tendon morphology, Victorian Institute of Sport Assessment score (VISA), body composition, lower limb flexibility and maximum vertical jump height measured prior to performing five successful stop-jump tasks. During each stop-jump task, both two- and threedimensional kinematics and ground reaction forces were recorded. Multiple regression analyses were used to identify factors for estimating PTA presence and severity, and discriminant analysis used to classify PTA presence.

#### **RESULTS:**

Sixty-eight percent of variance for presence of a PTA was accounted for by hip joint range of motion (ROM), knee joint angle at initial foot-ground contact (IC) during stop-jump and quadriceps flexibility, whereas hip joint ROM and VISA accounted for 62% of variance for PTA severity. Prediction of the presence of a PTA was achieved with 95% accuracy and 95% cross-validation.

#### **CONCLUSIONS:**

An easily implemented, reliable and valid movement screening tool comprising of three criterion enables coaches and/or clinicians to predict for the presence and severity of a PTA in asymptomatic athletes. This enables identification of asymptomatic athletes at higher risk of developing patellar tendinopathy, which

allows the development of effective preventative measures to aid in the reduction of patellar tendinopathy injury prevalence.

*J Electromyogr Kinesiol.* 2012 Nov 8. pii: S1050-6411(12)00146-0. doi: 10.1016/j.jelekin.2012.08.010

**Triceps surae activation is altered in male runners with Achilles tendinopathy.**

Wyndow N, Cowan SM, Wrigley TV, Crossley KM.

**Abstract**

Achilles tendinopathy is a common injury in running sports however the exact etiology of Achilles injury is still unclear. In recent years, altered neuromotor recruitment patterns of the triceps surae have been hypothesized to create differential intra-tendinous loads leading to pathology; however, this hypothesis has not been investigated. Further, the effect foot orthoses may have on neuromotor recruitment of the triceps surae in Achilles tendinopathy has not been investigated. Methods: The electromyographic activity of the triceps surae was recorded during an over-ground running task. Fifteen Achilles injured participants and 19 asymptomatic controls were assessed in a footwear only condition. The Achilles injured participants were also assessed running in a pre-fabricated foot orthoses. Results: In Achilles injured participants, there was a significant difference between soleus and lateral gastrocnemius offset times during running compared to the asymptomatic controls ( $p < 0.05$ ). There were no significant differences in triceps surae muscle activity between the footwear only and footwear and orthoses condition in the Achilles injured participants. Conclusions: The finding that triceps surae activity is altered in participants with Achilles tendinopathy may have clinical importance as it suggests that intra-tendinous loads are altered which may contribute to pathological changes. Further, foot orthoses have no immediate effect on the neuromotor control of the triceps surae.

## MANAGEMENT

*Knee Surg Sports Traumatol Arthrosc.* 2012 Oct 6. [Epub ahead of print]

**Treatment for insertional Achilles tendinopathy: a systematic review.**

Wiegerinck JI, Kerkhoffs GM, van Sterkenburg MN, Sierevelt IN, van Dijk CN.

**Abstract**

**PURPOSE:**

Systematically search and analyse the results of surgical and non-surgical treatments for insertional Achilles tendinopathy.

**METHODS:**

A structured systematic review of the literature was performed to identify surgical and non-surgical therapeutic studies reporting on ten or more adults with insertional Achilles tendinopathy. MEDLINE, CINAHL, EMBASE (Classic) and the Cochrane database of controlled trials (1945-March 2011) were searched. The Coleman methodology score was used to assess the quality of included articles, and these were analysed with an emphasis on change in pain score, patient satisfaction and complication rate.

**RESULTS:**

Of 451 reviewed abstracts, 14 trials met our inclusion criteria evaluating 452 procedures in 433 patients. Five surgical techniques were evaluated; all had a good patient satisfaction (avg. 89%). The complication ratio differed substantially between techniques. Two studies analysed injections showing significant decrease in visual analogue scale (VAS). Eccentric exercises showed a significant decrease in VAS, but a large group of patients was unsatisfied. Extracorporeal shockwave therapy (ESWT) was superior to both wait-and-see and an eccentric training regime. One study evaluated laser CO(2), TECAR and cryoultrasound, all with significant decrease in VAS.

**CONCLUSIONS:**

Despite differences in outcome and complication ratio, the patient satisfaction is high in all surgical studies. It is not possible to draw conclusions regarding the best surgical treatment for insertional Achilles tendinopathy. ESWT seems effective in patients with non-calcified insertional Achilles tendinopathy. Although both eccentric exercises resulted in a decrease in VAS score, full range of motion eccentric exercises shows a low patient satisfaction compared to floor level exercises and other conservative treatment modalities.

LEVEL OF EVIDENCE: III

## REHABILITATION & LOADING

Am J Phys Med Rehabil. 2012 Oct 5. [Epub ahead of print]

### **Effect of Eccentric Strengthening on Pain, Muscle Strength, Endurance, and Functional Fitness Factors in Male Patients with Achilles Tendinopathy.**

Yu J, Park D, Lee G.

#### **Abstract**

##### **OBJECTIVE:**

The aim of this study was to investigate the effect of eccentric strengthening on pain, muscle strength, endurance, and functional fitness factors in Achilles tendinopathy patients.

##### **DESIGN:**

Thirty-two male patients with Achilles tendinopathy were assigned to either the experimental group that performed eccentric strengthening or the control group that performed concentric strengthening (n = 16, both groups) for 8 wks (50 mins per day, three times per week). A visual analog scale, an isokinetic muscle testing equipment, the side-step test, and the Sargent jump test were used to assess pain, muscle strength, endurance, and functional fitness factors before and after the intervention.

##### **RESULTS:**

In comparison with the control group, the experimental group showed significant improvement in pain, ankle dorsiflexion endurance, total balance index, and agility after the intervention (P < 0.05). However, there was no significant difference in dexterity between the two groups.

##### **CONCLUSIONS:**

Eccentric strengthening was more effective than concentric strengthening in reducing pain and improving function in patients with Achilles tendinopathy; therefore, regular eccentric strengthening is important for patients in a clinical setting.

Med Sci Sports Exerc. 2012 Oct 15. [Epub ahead of print]

### **Achilles Tendinopathy Modulates Force Frequency Characteristics of Eccentric Exercise.**

Grigg NL, Wearing SC, O'Toole JM, Smeathers JE.

#### **Abstract**

##### **INTRODUCTION:**

Previous research has demonstrated that ground reaction force (GRF) recorded during eccentric ankle exercise is characterised by greater power in the 8-12Hz bandwidth when compared to that recorded during concentric ankle exercise. Subsequently, it was suggested that vibrations in this bandwidth may underpin the beneficial effect of eccentric loading in tendon repair. However, this observation has been made only in individuals without Achilles tendinopathy. This research compared the force frequency characteristics of eccentric and concentric exercises in individuals with and without Achilles tendinopathy.

##### **METHODS:**

Eleven male adults with unilateral mid-portion Achilles tendinopathy and nine control male adults without tendinopathy participated in the research. Kinematics and GRF were recorded while the participants performed a common eccentric rehabilitation exercise protocol and a concentric equivalent. Ankle joint kinematics and the frequency power spectrum of the resultant GRF were calculated.

##### **RESULTS:**

Eccentric exercise was characterised by a significantly greater proportion of spectral power between 4.5 and 11.5Hz when compared to concentric exercise. There were no significant differences between limbs in the force frequency characteristics of concentric exercise. Eccentric exercise, in contrast, was defined by a shift in the power spectrum of the symptomatic limb, resulting in a second spectral peak at 9Hz, rather than 10Hz in the control limb.

##### **CONCLUSIONS:**

Compared to healthy tendon, Achilles tendinopathy was characterised by lower frequency vibrations during eccentric rehabilitation exercises. This finding may be associated with changes in neuromuscular activation and tendon stiffness which have been shown to occur with tendinopathy and provides a possible rationale for the previous observation of a different biochemical response to eccentric exercise in healthy and injured Achilles tendons.

Br J Sports Med. 2012 Oct 31. [Epub ahead of print]

**Do structural changes (eg, collagen/matrix) explain the response to therapeutic exercises in tendinopathy: a systematic review.**

Drew BT, Smith TO, Littlewood C, Sturrock B.

**Abstract**

**BACKGROUND:**

Previous reviews have highlighted the benefit of loaded therapeutic exercise in the treatment of tendinopathy. Changes in observable structural outcomes have been suggested as a possible explanation for this response to therapeutic exercise. However, the mechanism for the efficacy of therapeutic exercise remains unclear.

**OBJECTIVE:**

To systematically review the relationship between the observable structural change and clinical outcomes following therapeutic exercise.

**DATA SOURCES:**

An electronic search of AMED, CINAHL, Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, PEDro and SPORTDiscus was undertaken from their inception to June 2012.

**STUDY ELIGIBILITY CRITERIA:**

Any study design that incorporated observable structural outcomes and clinical outcomes when assessing the effect of therapeutic exercise on participants with tendinopathy.

**STUDY APPRAISAL AND SYNTHESIS METHODS:**

Included studies were appraised for risk of bias using the tool developed by the Cochrane Back Review Group. Due to heterogeneity of studies, a qualitative synthesis was undertaken.

**RESULTS:**

Twenty articles describing 625 patients were included. Overall, there is a strong evidence to refute any observable structural change as an explanation for the response to therapeutic exercise when treated by eccentric exercise training. Moderate evidence does exist to support the response of heavy-slow resistance training (HSR).

**CONCLUSIONS AND IMPLICATIONS OF KEY FINDINGS:**

The available literature does not support observable structural change as an explanation for the response of therapeutic exercise except for some support from HSR. Future research should focus on identifying other explanations including neural, biochemical and myogenic changes.

## MEDICINES AND INJECTIONS

Phys Ther Sport. 2012 Nov 3. pii: S1466-853X(12)00078-8. doi: 10.1016/j.ptsp.2012.07.002. [Epub ahead of print]

**High volume image guided injections for the management of chronic tendinopathy of the main body of the Achilles tendon.**

Maffulli N, Spiezia F, Longo UG, Denaro V, Maffulli GD.

**Abstract**

**OBJECTIVES:**

Several substances are routinely injected in and around tendons. The present study evaluated the long term effects of high volume image guided injection (HVIGI) of normal saline, local anaesthetic and aprotinin in athletic patients with resistant tendinopathy of the main body of the Achilles tendon.

**DESIGN:**

Case series.

**METHODS:**

The study included a series of 94 athletes (69 men and 25 women; average age 37.5 years, range 22-63) with ultrasound confirmed tendinopathy of the main body of the Achilles tendon. All the patients had not improved after at least three months of conservative management. Patients were injected with 10 mL of 0.5% Bupivacaine Hydrochloride, 25 mg aprotinin, and up to 40 mL of injectable normal saline. We prospectively administered the Victorian Institute of Sport Assessment-Achilles tendon (VISA-A) to assess the short- and long-term pain and functional improvement.

**RESULTS:**

At baseline (n = 94), the VISA-A score was  $41.7 \pm 23.2$  (range 11-60), and had improved to  $74.6 \pm 21.4$  (range 71-100) by 12 months (n = 87) ( $p = 0.003$ ), with no significant difference between sexes.

**CONCLUSION:**

HVIGI with aprotinin significantly reduces pain and improves function in patients with chronic Achilles tendinopathy in the short- and long-term follow up.