Clinical Biomechanics 29 (2014) 283–288

Contents lists available at ScienceDirect

Clinical Biomechanics

journal homepage: www.elsevier.com/locate/clinbiomech

Retrocalcaneal bursitis but not Achilles tendinopathy is characterized by increased pressure in the retrocalcaneal bursa

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ARTICLE INFO

Article history:
Received 19 July 2013
Accepted 3 December 2013

Keywords:
Achilles tendon insertion
Haglund's disease
Retrocalcaneal bursitis
Achilles tendinopathy
Heel pain

ABSTRACT

Background: We questioned whether different forms of Achilles tendon overuse injuries can be differentiated by retrocalcaneal bursa pressure measurement.
Methods: Retrocalcaneal bursa pressure was determined by using invasive pressure measurement in patients suffering from retrocalcaneal bursitis (n = 13) or Achilles tendinopathy (n = 15), respectively. Standardized measurements were taken with the subject lying prone. Initially, the foot and ankle was in a spontaneous, unsupported position. Then passive dorsiflexion was induced by an increasing pressure which was applied in five defined steps against the plantar forefoot.
Findings: Mean pressures found in unloaded position were 30.5 (SD 28.9) mmHg in retrocalcaneal bursitis and −9.9 (SD 17.2) mmHg in Achilles tendinopathy ($p < 0.001$). A stepwise increase in passive ankle dorsiflexion was associated with increasing pressure values in both groups. The differences were $p = 0.009$ to 0.035 when dorsiflexion was initiated with 10, 20, 30, and 40 N, respectively. Dorsiflexion induced by 50 N load resulted in a mean pressure of 113.7 (SD 124.9) mmHg for retrocalcaneal bursitis and 32.5 (SD 48.9) mmHg for Achilles tendinopathy ($p = 0{,}051$).
Interpretation: Higher retrocalcaneal bursa pressure values were found in patients suffering from chronic retrocalcaneal bursitis. This result supports the hypothesis that retrocalcaneal bursa hypertension leads to an impingement lesion of the corresponding anterior Achilles tendon.

1. Introduction

Historically the term “Achilles tendinitis” has extensively been used to characterize any acute or chronic pain syndrome of the Achilles tendon and its surrounding structures (Leach et al., 1981; Schepsis et al., 1994). Later the suffix “-itis” was abandoned as inflammation was rarely found in histologic sections from specimens with Achilles tendon overuse injuries (Jozsa and Kannus, 1997; Khan and Cook, 2000). Further classifications were proposed with respect to specific clinical and histological findings. “Achilles tendinopathy” meanwhile has been adopted to describe the clinical findings of pain, swelling, and altered performance with respect to the noninsertional Achilles tendon area (Maffulli et al, 1998; van Dijk et al., 2011). Insertional and noninsertional tendinopathy have been differentiated, but the term “insertional” still remains unclear and some authors include Haglund's disease (DeOrio and Easley, 2008; Nicholson et al., 2007). Derived from different etiologic and surgical implications most authors differentiate retrocalcaneal bursitis (which is synonymous to Haglund's syndrome) from insertional Achilles tendinopathy which is anatomically located more distally and is frequently associated with a calcified posterior heel spur (Heckman et al., 2009; Jerosch and Nasef, 2003; Lohrer and Arentz, 2003; McGarvey et al., 2002; Puddu et al., 1976; Schepsis et al., 1994, 2002; van Dijk et al, 2011). We propose to adopt this classification. It clearly differentiates between lesions originating from the Achilles tendon itself (midportion Achilles tendinopathy and insertional Achilles tendinopathy) and from adjacent structures (retrocalcaneal bursitis, Haglund's syndrome). Additionally, a third entity of Achilles tendinopathy exists anatomically corresponding with retrocalcaneal bursitis. This lesion is most probably induced by an “impingement” resulting from direct pressure of the chronically inflamed retrocalcaneal bursa against the anterior Achilles tendon (Lohrer, 2010; Lohrer and Arentz, 2003; van Dijk et al., 2011). The resulting Achilles tendon pathology (tendinosis and/or degenerative partial tears) may be clinically relevant in more advanced stages of retrocalcaneal bursitis (Heckman et al., 2009). We therefore propose to keep these lesions in mind when dealing with retrocalcaneal bursitis (Sella et al., 1998).

About 15–50% of the patients suffering from chronic (more than 3 months) retrocalcaneal bursitis do not profit from conservative treatment and consequently undergo operation later on (Lohrer, 2010; Nicholson et al., 2007; Sammarco and Taylor, 1998). Resection of the retrocalcaneal bursa and Haglund's tuberosity is the main focus of operative treatment for retrocalcaneal bursitis (Lohrer et al., 2008) but

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0268-0033/$ – see front matter
http://dx.doi.org/10.1016/j.clinbiomech.2013.12.002

impingement lesions of the anterior Achilles tendon column may require additional tendon repair (Leitze et al., 2003; Lohrer, 2010; Lohrer and Arentz, 2003). Authors agree that retrocalcaneal bursitis is the main feature in the pathogenic chain in Haglund's disease (Heckman et al., 2009; Jerosch and Nasef, 2003; Leitze et al., 2003; Lohrer and Arentz, 2003; Ortmann and McBryde, 2007; Sella et al., 1998; van Dijk et al., 2001).

To confirm clinical suspicion and indicate operation of acute and chronic compartment syndromes intracompartmental pressure measurement is generally recommended (Styf, 2004). Analog to muscular compartments bursae are also closed compartments and pressure measurement in the retrocalcaneal bursa has been shown to be feasible in a pilot study (Lohrer et al., 2011).

Derived from this we hypothesized that increased pressure inside the retrocalcaneal bursa should be present in patients suffering from retrocalcaneal bursitis but not in midportion Achilles tendinopathy patients (controls). Besides this, we speculated, that pressure inside the retrocalcaneal bursa might be increased by passive dorsiflexion of the foot in both Achilles tendinopathy and retrocalcaneal bursitis patients.

2. Methods

The local ethics committee approved the study and the patients gave their written informed consent.

2.1. Patients

In our center the overall relation between Achilles tendinopathy and retrocalcaneal bursitis patients is 60% to 40%. The ratio of the patients to be operatively treated for recalcitrant symptoms following ineffective conservative therapy for more than 3 months is about 15% for both conditions (Lohrer, 2010). Between October 2009 and January 2013 nineteen patients underwent operative treatment for retrocalcaneal bursitis (19 measurements) and 17 patients had their Achilles tendinopathy treated operatively (18 measurements). The operative procedure for retrocalcaneal bursitis is described elsewhere (Lohrer, 2010). Achilles tendinopathy operations included paratenon resection, resection of anterior neovascularization, and scarification and/or longitudinal splitting with excision of degenerated tissue in the midportion of the Achilles tendon. Nine of the 37 measurements were excluded following the validation procedure. So, finally 13 retrocalcaneal bursitis (13 patients) and 15 Achilles tendinopathy measurements (15 patients) were considered eligible for further analyses (Fig. 1, Table 1).

Inclusion criteria for patients to be eligible for this study were age over 18 years, legal capacity, indication for midportion Achilles tendinopathy or retrocalcaneal bursitis operation, and willingness to take part in the study. Exclusion criteria were previous operation at the relevant lower leg, reduced ankle dorsiflexion when compared with the opposite side, and systemic disorders like rheumatism, diabetes mellitus, generalized hypermobility with a Beighton score of four and more (Beighton et al., 2012), and idiopathic or posttraumatic axial misalignment of the lower extremity.

2.2. Diagnostic procedure

In line with the current literature we diagnosed both midportion Achilles tendinopathy and retrocalcaneal bursitis based on the "anatomic location, symptoms, and clinical findings" (van Dijk et al., 2011).

All patients were preoperatively investigated with radiographs. However, we were unable to detect morphologic differences in posterior calcaneal anatomy or any kind of deformity between the retrocalcaneal bursitis group and Achilles tendinopathy group (Table 1).

2.3. Retrocalcaneal bursa pressure measurement

The retrocalcaneal bursa pressure measurements were performed in the operating room immediately prior to the operation for Achilles tendinopathy or retrocalcaneal bursitis. A commercially available single use pressure measurement system (Combitrans Monitoring-Set arteriell, B. Braun, Melsungen, Germany) was chosen. It is certified for monitoring arterial blood pressure and relies on a piezoresistive pressure transducer. The system is easy to use and has an accuracy of ± 1 to 3% in the expected pressure range. It has been validated in a previous pilot study and a nearly perfect relation was demonstrated between the inflated pressure and the registered values ($R^2 = 0.9992$). Precision of

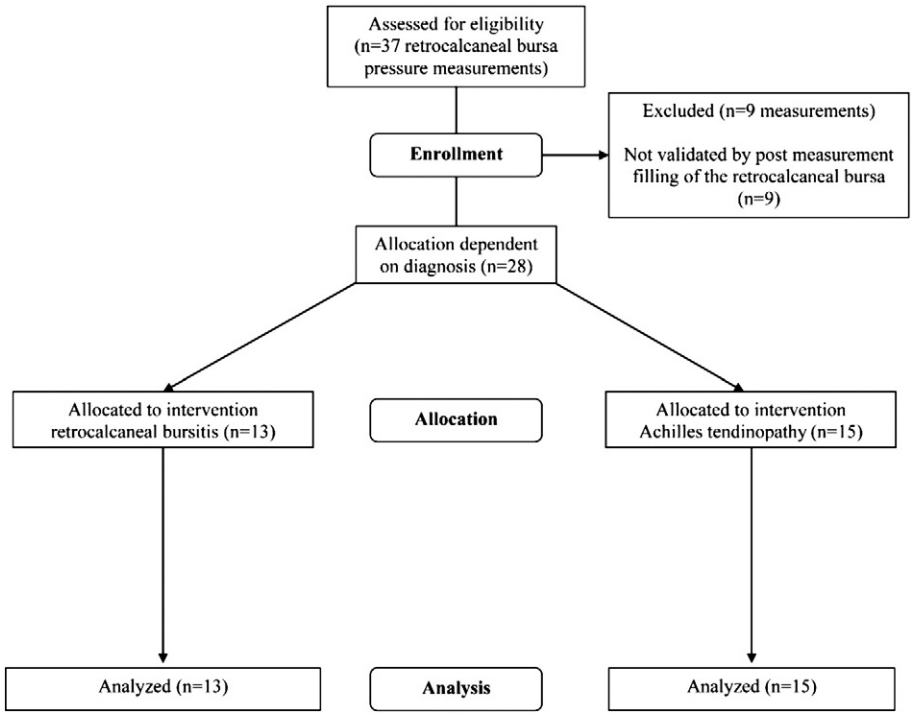

Fig. 1. CONSORT (Consolidated Standards of Reporting Trials) flow chart for the patients through the study.