Foot and Ankle Surgery 18 (2012) 124–127

Contents lists available at ScienceDirect

Foot and Ankle Surgery

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

Achilles tendinoscopy and plantaris tendon release and division in the treatment of non-insertional Achilles tendinopathy

Christopher J. Pearce FRCS(Tr&Orth), MFSEM(UK)[a,*], James Carmichael FRCS(Tr&Orth)[b], James D. Calder MD, FRCS(Tr&Orth), FFSEM(UK)[b]

[a] Department of Trauma and Orthopaedic Surgery, Egerton Road, Guildford, Surrey, GU2 7XX, UK
[b] Department of Trauma & Orthopaedic Surgery, Chelsea & Westminster Hospital, 369 Fulham Road, London, SW10 9NH, UK

ARTICLE INFO

Article history:
Received 1 December 2010
Received in revised form 14 April 2011
Accepted 28 April 2011

Keywords:
Non-insertional
Achilles
Tendinopathy
Endoscopic
Tendinoscopy

ABSTRACT

Background: The mainstay of treatment for non-insertional Achilles tendinopathy is non-operative, however a proportion of patients will fail conservative measures. We describe the results of Achilles tendinoscopy with plantaris tendon release in patients who have failed first line conservative treatment for at least 6 months.
Methods: A consecutive series of 11 patients with a minimum of 2 years follow up.
Results: The mean AOFAS scores significantly improved from 68 pre-op to 92 post op ($p = 0.0002$) as did the AOS scores for both pain (28% pre-op to 8% post op ($p = 0.0004$)) and disability (38% pre-op to 10% post op ($p = 0.0005$). The mean SF-36 scores also improved but were not statistically significant (pre-op 76, post op 87 ($p = 0.059$). There were no complications. 8 of the 11 patients were satisfied, the other 3 somewhat satisfied.
Conclusions: The results of Achilles tendinoscopy and division of the plantaris tendon are encouraging but further studies are required to compare it to other treatments. It is minimally invasive and low risk so should not affect the ability to perform a formal open procedure if unsuccessful.

1. Introduction

Non-insertional Achilles tendinopathy is a degenerative condition that affects athletes and the general population. Extrinsic factors such as a sudden increase in training intensity or duration and intrinsic factors such as abnormalities in lower limb biomechanics and tendon vascularity may contribute to the development of this condition. The area of degeneration usually occurs between 2 and 6 cm from the insertion of the Achilles tendon into the calcaneus and this coincides with the area of the tendon which has the poorest blood supply [1]. It is probably most accurate to describe the degenerative process as a failed healing response.

The major symptom in non-insertional Achilles tendinopathy is pain, which can significantly interfere with function and especially athletic activity. The exact source of this pain has been the subject of several research papers and much discussion but it seems to be related to areas of neovascularisation [2–4]. It has been shown that new nerve endings grow with the new vessels and those treatment modalities which reduce the amount of neovascularisation can lead to a reduction in symptoms [5–9]. Equally, treatments that have proven to be clinically effective have subsequently been shown to reduce neovascularisation within the tendon [10]. The new nerves and vessels which grow into the tendinopathic region appear to originate mainly from the paratenon, especially from the ventral aspect [2,3]. The tendinoscopic technique described aims to denervate the painful area by releasing the paratenon from the Achilles tendon.

It has also been noted that patients most often present with symptoms and swelling on the medial side of the tendon which lead to the postulation that the plantaris insertion or its association with the TA plays a role in the symptomatology and/or development of the condition and that releasing it may be an important part of the treatment [11].

2. Method

We report a consecutive series of 11 patients who underwent Achilles tendinoscopy with stripping of the paratenon and division of the plantaris tendon. All patients had a clinical diagnosis of non-insertional Achilles tendinopathy with either MRI or ultrasound conformation of intra-tendinous disease as well as paratendinopathy. All had failed conservative treatment

* Corresponding author at: 20 Topiary Square, Stanmore Road, Richmond, Surrey, TW9 2DB, UK. Tel.: +44 07976356076.
E-mail address: chris.pearce@doctors.net.uk (C.J. Pearce).

1268-7731/$ – see front matter © 2011 European Foot and Ankle Society. Published by Elsevier Ltd. All rights reserved.
doi:10.1016/j.fas.2011.04.008

including a physiotherapist supervised eccentric exercise programme for at least 6 month and had opted for surgical intervention. They were given the choice of having a formal open procedure or to try this, relatively new, minimally invasive technique. Our usual open procedure consists of a midline tendon splitting approach and excision of all of the diseased tissue with or without a flexor hallucis longus (FHL) transfer depending on what percentage width of the tendon has had to be excised [12,13]. We counselled the patients that, as this was a new procedure for us with few published results, we could not guarantee that it would be successful but the rationale behind it (as set out in the introduction) was explained. We also informed them that 'key-hole' surgery in general has a low complication rate and that if it were not successful we would not be precluded from carrying out the usual open surgery at a later date. Informed consent was duly given for the surgery and for inclusion in the study. Local IRB approval for the study was granted.

The patients were scored with the American Orthopedic Foot and Ankle Society (AOFAS) hindfoot scale [14], the Ankle Osteoarthritis Scale (AOS) which consists of a series of visual analogue scores for pain and disability [15] and SF-36 scores [16] pre-operatively and at a minimum of 2 years post operatively. They also recorded their level of satisfaction with the treatment and outcome at final follow up using a three item scale: (1) satisfied, (2) somewhat dissatisfied and (3) dissatisfied [17].

2.1. Surgical technique

Under general anaesthesia and with a thigh tourniquet, the patient is placed prone on the operating table. Care is taken to protect pressure areas and a sand bag may be required under the patient's hip in order to keep the leg that is to be operated on in neutral rotation.

The borders of the Achilles tendon, the level of the malleoli and superior aspect of the calcaneus are marked with a sterile pen. There have been some variations in the description of portal placement for this procedure [11,18,19]; the ones that we use were described by Steenstra and van Dijk [11]. The portals are made with the distal portal just lateral to the midline and just above the level of the superior border of the calcaneus. The proximal portal is made just medial to the midline and just below the musculo-tendinous junction. Blunt dissection is continued with a 'nick and spread' technique using a haemostat down to the tendon. The main structure at risk in this procedure, apart from the Achilles tendon itself, is the sural nerve and this should be avoided using this technique.

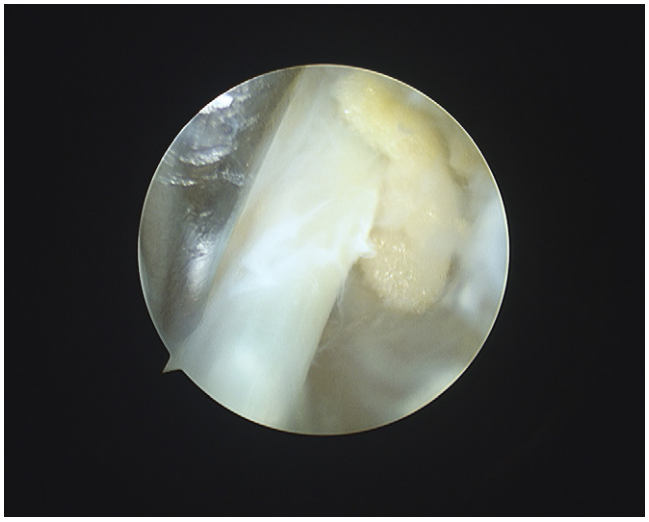

Fig. 2. Debridement between TA and plantaris.

A 4.5 mm, 30° angled arthroscope (Dyonics, Smith and Nephew, Andover, Massachusetts) with blunt trochar is inserted into the inferior portal aiming to enter the space between the paratenon and Achilles tendon. The arthroscope may be swept from side to side around the tendon to develop this space. The superior portal is made under direct vision. The paratenon is then formally released with a hook probe and a soft tissue shaver may be used to debride the paratenon further. Particular attention should be paid to releasing the anterior aspect of the tendon (Fig. 1).

The plantaris tendon is released from the Achilles (Fig. 2), where it is (often) found to be adherent using the hook probe and divided above the level of the tendinopathic changes in the Achilles (Figs. 3 and 4).

The portals are formally sutured closed at the end of the procedure and a compressive dressing is applied initially. Early motion of the ankle is undertaken and the patients are allowed to weight bear as tolerated but elevation is encouraged until the portal sites have healed.

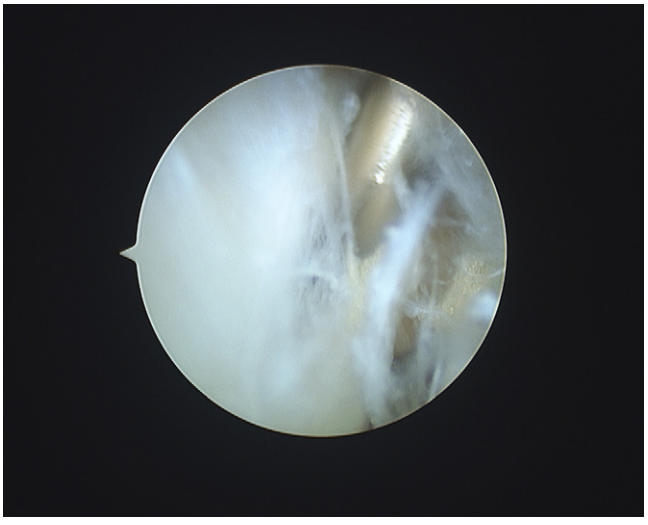

Fig. 1. Debridement of adhesions surrounding Achilles tendon – ventral aspect.

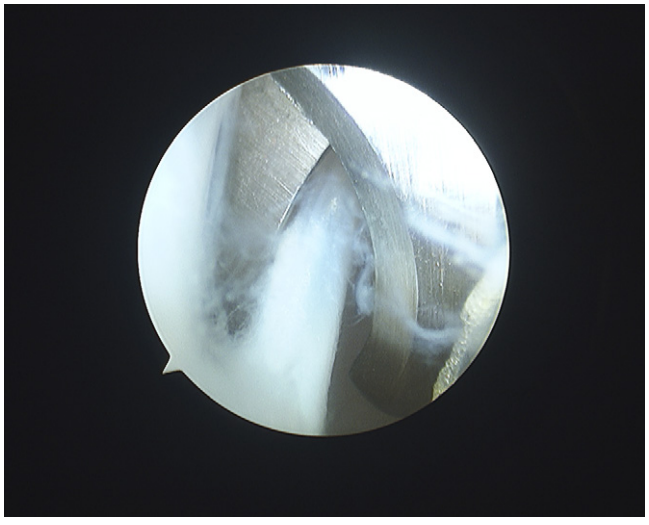

Fig. 3. Sectioning of plantaris.

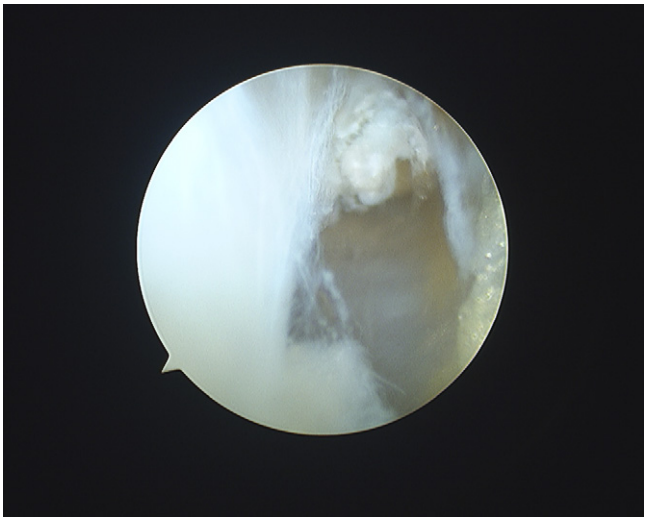

Fig. 4. After sectioning.

2.2. Statistical analysis

Statistical analysis was performed using MedCalc for Windows, version 9.6.4 (MedCalc software, Mariakerke, Belgium). The Dagostino–Pearson test was used to confirm a normal distribution of the data and a paired *t*-test was used thereafter. Statistical significance was accepted if $p < 0.05$.

3. Results

The mean age of the patients was 36.5 years (range 24–55) at the time of surgery. The patients had been symptomatic for between 6 and 36 months pre-operatively with an average duration of symptoms of 13 months. The mean length of follow up was 30 months with a minimum follow up of 2 years (range 24–39).

The mean AOFAS hindfoot score pre-operatively was 68 (range 51–82) and these significantly improved to a mean of 92 (range 74–100) at final follow up ($p = 0.0002$). The AOS scores for pain (28% pre-op to 8% post op ($p = 0.0004$)) and disability (38% pre-op to 10% post op) also significantly improved ($p = 0.0005$). The mean SF-36 scores also improved but were not statistically significant (pre-op 76, post op 87 ($p = 0.059$)).

There were no infections, nerve injuries or other complications. 8 of the 11 patients pronounced themselves satisfied with the other 3 somewhat dissatisfied. Despite incomplete relief of symptoms and only partial satisfaction with the treatment in 3 patients, none required further surgical intervention at a minimum of 2 years.

4. Discussion

The mainstay of treatment in Achilles tendinopathy is conservative with an eccentric exercise programme having the most evidence for effectiveness at present [20]. Between a quarter and a third of patients will, however fail conservative treatment and require or request surgical intervention [21]. Open surgery for non-insertional Achilles tendinopathy has shown varying success rates of between 50 and 96% [13,22–24] with surgery for intratendinous lesions and late presenting lesions showing significantly fewer good to excellent results [24,25]. The main concern with open surgery is the risk of complications. In a large series of 432 consecutive patients from a specialist centre there was an overall complication rate of 11%. These complications broke down as follows: wound edge necrosis (3%), superficial infection (2.5%) and sural nerve irritation (1%). Other complications included seroma, haematoma, fibrotic reactions and one incidence of thrombosis [26].

Minimally invasive therapies which aim to strip the paratenon from the tendon, either directly [27] or indirectly with high volume fluid injection [28] have shown promise in relieving the symptoms of non-insertional Achilles tendinopathy. Tendinoscopy allows this to be done under direct vision.

There have been some other small case series published reporting the results of various different techniques of Achilles tendinoscopy for non-insertional Achilles tendinopathy. Maquirriain et al. [18] reported the results of seven patients, 5 of whom underwent surgery under local anaesthesia, with a paratenon release in all patients and longitudinal tenotomy in patients with intratendinous lesions seen on MRI. There were no complications and 6 of the 7 patients achieved excellent clinical outcomes with an average post-operative score of between 90 and 100 out of 100. The 7th patient had presented with a chronic partial tendon rupture and although her Achilles tendinopathy score improved from 27 pre-operatively to 53 post operatively further surgery was being contemplated. With a similar technique (release alone for paratendinopathy and combined release and tenotomy for intratendinous lesions), Thermann et al. [19] reported on 8 patients with 100% satisfied with the outcome. The mean VAS scores in this series improved from 36 pre-operatively to 95 at a minimum of 6 months follow up with no complications. Steenstra and van Dijk [11] described the results of endoscopic paratenon release with release (but not division) of the plantaris tendon in 20 patients with combined paratendinopathy and intratendinous tendinopathic lesions. 16 patients were available for follow up at a mean of 6 years post op. There were no complications and most patients had been able to resume their sporting activities at 4–8 weeks after surgery. Another endoscopic technique where the pathological tissue was resected whilst performing multiple longitudinal tenotomies with a retrograde knife blade showed excellent results in 8 patients with all returning to their pre-injury levels of activity and no complications [29].

Because of the postulation that the plantaris insertion or its association with the TA may play a role in the symptomatology of non-insertional Achilles tendinopathy [11], we released and divided this tendon in all cases as part of the procedure. A fair criticism of this study is that it is not possible to assess whether there is any added benefit to this extra step over simply releasing the paratenon and this may be the subject of future work.

It could be argued that the method used in our series does not address the pathology in terms of the degeneration in the tendon itself, however it is the symptoms of the condition that are debilitating rather than the degeneration per se. Symptomatic Non-insertional Achilles tendinopathy has not been shown to confer any increased risk of tendon rupture. Moreover two studies, one cadaveric [30] and one imaging based [31], have shown degenerative changes in the tendon proper in over 30% of asymptomatic individuals. This increased to 89% in asymptomatic diabetic patients in another ultrasound study. [32].

In summary, endoscopic release of the paratenon in non-insertional Achilles tendinopathy, with plantaris tendon release and division is a safe and effective treatment as evidenced by these small series. Most importantly it is another method of treatment available to the surgeon in this, sometimes difficult, condition which has a low complication rate and should not affect the ability to perform a formal open procedure if unsuccessful. Further studies are required to compare endoscopic surgery to other treatment modalities and to elucidate which of the slightly different endoscopic methods mentioned here is best.

References

[1] Longo UG, Ronga M, Maffulli N. Achilles tendinopathy. Sports Med Arthrosc Rev 2009;17:112–26.
[2] Alfredson H, Ohberg L, Forsgren S. Is vasculo-neural ingrowth the cause of pain in chronic Achilles tendinosis? An investigation using ultrasonography and colour Doppler, immunohistochemistry, and diagnostic injections. Knee Surg Sports Traumatol Arthrosc 2003;11:334–8.
[3] Andersson G, Danielson P, Alfredson H, Forsgren S. Nerve-related characteristics of ventral paratendinous tissue in chronic Achilles tendinosis. Knee Surg Sports Traumatol Arthrosc 2007;15:1272–9.
[4] Ohberg L, Lorentzon R, Alfredson H. Neovascularisation in Achilles tendons with painful tendinosis but not in normal tendons: an ultrasonographic investigation. Knee Surg Sports Traumatol Arthrosc 2001;9:233–8.
[5] Alfredson H, Ohberg L. Sclerosing injections to areas of neo-vascularisation reduce pain in chronic Achilles tendinopathy: a double-blind randomised controlled trial. Knee Surg Sports Traumatol Arthrosc 2005;13:338–44.
[6] Alfredson H, Ohberg L, Zeisig E, Lorentzon R. Treatment of midportion Achilles tendinosis: similar clinical results with US and CD-guided surgery outside the tendon and sclerosing polidocanol injections. Knee Surg Sports Traumatol Arthrosc 2007;15:1504–9.
[7] Boesen MI, Torp-Pedersen S, Koenig MJ, Christensen R, Langberg H, Holmich P, et al. Ultrasound guided electrocoagulation in patients with chronic non-insertional Achilles tendinopathy: a pilot study. Br J Sports Med 2006; 40:761–6.
[8] Lind B, Ohberg L, Alfredson H. Sclerosing polidocanol injections in mid-portion Achilles tendinosis: remaining good clinical results and decreased tendon thickness at 2-year follow-up. Knee Surg Sports Traumatol Arthrosc 2006; 14:1327–32.
[9] Willberg L, Sunding K, Ohberg L, Forssblad M, Fahlstrom M, Alfredson H. Sclerosing injections to treat midportion Achilles tendinosis: a randomised controlled study evaluating two different concentrations of Polidocanol. Knee Surg Sports Traumatol Arthrosc 2008;16:859–64.
[10] Ohberg L, Alfredson H. Effects on neovascularisation behind the good results with eccentric training in chronic mid-portion Achilles tendinosis? Knee Surg Sports Traumatol Arthrosc 2004;12:465–70.
[11] Steenstra F, van Dijk CN. Achilles tendoscopy. Foot Ankle Clin 2006;11:429–38. viii.
[12] Den Hartog BD. Flexor hallucis longus transfer for chronic Achilles tendonosis. Foot Ankle Int 2003;24:233–7.
[13] Schepsis AA, Leach RE. Surgical management of Achilles tendinitis. Am J Sports Med 1987;15:308–15.
[14] Kitaoka HB, Alexander IJ, Adelaar RS, Nunley JA, Myerson MS, Sanders M. Clinical rating systems for the ankle-hindfoot, midfoot, hallux, and lesser toes. Foot Ankle Int 1994;15:349–53.
[15] Domsic RT, Saltzman CL. Ankle osteoarthritis scale. Foot Ankle Int 1998;19:466–71.
[16] Ware Jr JE, Gandek B. SF-36 health survey: manual & interpretation guide. Lincoln, RI: QualityMetric Incorporated (1993), 2000.
[17] Myles PS, Williams DL, Hendrata M, Anderson H, Weeks AM. Patient satisfaction after anaesthesia and surgery: results of a prospective survey of 10,811 patients. Br J Anaesth 2000;84:6–10.
[18] Maquirriain J, Ayerza M, Costa-Paz M, Muscolo DL. Endoscopic surgery in chronic Achilles tendinopathies: a preliminary report. Arthroscopy 2002; 18:298–303.
[19] Thermann H, Benetos IS, Panelli C, Gavriilidis I, Feil S. Endoscopic treatment of chronic mid-portion Achilles tendinopathy: novel technique with short-term results. Knee Surg Sports Traumatol Arthrosc 2009;17:1264–9.
[20] Magnussen RA, Dunn WR, Thomson AB. Nonoperative treatment of midportion Achilles tendinopathy: a systematic review. Clin J Sport Med 2009;19:54–64.
[21] Paavola M, Kannus P, Paakkala T, Pasanen M, Jarvinen M. Long-term prognosis of patients with achilles tendinopathy. An observational 8-year follow-up study. Am J Sports Med 2000;28:634–42.
[22] Kvist H, Kvist M. The operative treatment of chronic calcaneal paratenonitis. J Bone Joint Surg 1980;62:353–7.
[23] Snook GA. Achilles tendon tenosynovitis in long-distance runners. Med Sci Sports 1972;4:155–8.
[24] Paavola M, Kannus P, Orava S, Pasanen M, Jarvinen M. Surgical treatment for chronic Achilles tendinopathy: a prospective seven month follow up study. Br J Sports Med 2002;36:178–82.
[25] Maffulli N, Binfield PM, Moore D, King JB. Surgical decompression of chronic central core lesions of the Achilles tendon. Am J Sports Med 1999;27:747–52.
[26] Paavola M, Orava S, Leppilahti J, Kannus P, Jarvinen M. Chronic Achilles tendon overuse injury: complications after surgical treatment. An analysis of 432 consecutive patients. Am J Sports Med 2000;28:77–82.
[27] Longo UG, Ramamurthy C, Denaro V, Maffulli N. Minimally invasive stripping for chronic Achilles tendinopathy. Disabil Rehabil 2008;30:1709–13.
[28] Chan O, O'Dowd D, Padhiar N, Morrissey D, King J, Jalan R, et al. High volume image guided injections in chronic Achilles tendinopathy. Disabil Rehabil 2008;30:1697–708.
[29] Vega J, Cabestany JM, Golano P, Perez-Carro L. Endoscopic treatment for chronic Achilles tendinopathy. Foot Ankle Surg 2008;14:204–10.
[30] Kannus P, Jozsa L. Histopathological changes preceding spontaneous rupture of a tendon. A controlled study of 891 patients. J Bone Joint Surg Am 1991;73:1507–25.
[31] Khan KM, Forster BB, Robinson J, Cheong Y, Louis L, Maclean L, et al. Are ultrasound and magnetic resonance imaging of value in assessment of Achilles tendon disorders? A two year prospective study. Br J Sports Med 2003;37:149–53.
[32] Batista F, Nery C, Pinzur M, Monteiro AC, de Souza EF, Felippe FH, et al. Achilles tendinopathy in diabetes mellitus. Foot Ankle Int 2008;29:498–501.