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Chapter 7

Good outcome after stripping the plantaris tendon in patients with chronic midportion Achilles tendinopathy

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ABSTRACT

Purpose

Achilles tendinopathy is a problem that is generally difficult to treat. The pain is frequently most prominent on the medial side of the midportion of the tendon, where the plantaris tendon is running parallel to the Achilles tendon. The purpose of this study was to assess if excision of the plantaris tendon would relieve symptoms.

Methods

Three patients with pain and stiffness at the midportion of the Achilles tendon were treated by excision of the plantaris tendon. Pre-operatively these patients experienced recognisable tenderness on palpation of the medial side of the midportion of the Achilles tendon with localized nodular thickening at 4-7 cm proximal to the insertion. MRI indicated Achilles tendinopathy with involvement of the plantaris tendon.

Results

The plantaris tendon was bluntly retrieved and excised with a tendon stripper through a 3 cm incision in the proximal calf. We report a good to excellent outcome of this novel procedure in 3 patients with chronic midportion Achilles tendinopathy.

Conclusion

The medial pain might be based on involvement of the plantaris tendon in the process.

INTRODUCTION

Midportion Achilles tendinopathy is generally difficult to treat. The source of pain and the background to the pain mechanisms associated with it have not been scientifically clarified¹⁵. Isolated symptomatic tendinopathy is rare, most often the paratenon is involved²⁸. A wide range of conservative and surgical treatments is available. The role of surgery is still not fully understood²². Most operative procedures are directed at the Achilles tendon itself. The intratendinous degenerative changes are incised or excised. It is questionable however if degeneration of the tendon itself is the main cause of the pain in midportion tendinopathy. Morphologic and degenerative changes in the Achilles tendon seem to be a part of aging and in many cases there is no correlation with symptoms^{25,29}. Several studies have reported intratendinous changes in up to 34% of cadaver specimens, ultrasound- and MRI images of patients without complaints^{6,7,9,10,30}. Recently a long-term follow-up study was published by Alfredson et al. revealing persistent structural abnormalities and thickening of the tendon 13 years after intratendinous surgery for Achilles tendinopathy, whereas all patients were satisfied with the results and went back to Achilles tendon loading activities without restrictions¹.

In patients with a painful nodular thickening in the Achilles tendon, the pain is often most prominent on the medial side of the midportion Achilles tendon²⁴. At this level the plantaris tendon runs closely with- and parallel to the Achilles tendon. An inflammatory response of the paratenon (located around the Achilles- and plantaris tendon) at the level of the painful nodule may result in adhesions between plantaris- and Achilles tendon. We hypothesize that the medial pain may be caused by these adhesions. If this hypothesis were to be correct, isolated stripping or release of the plantaris tendon would be sufficient to relieve complaints. This paper reports on a novel technique of isolated stripping of the plantaris tendon in 3 patients with chronic midportion Achilles tendinopathy.

METHODS

Three consecutive patients with midportion tendinopathy of the Achilles tendon were included (2 female, 1 male). Mean age was 47 years (43, 48, and 50). Patients had complaints of pain and stiffness of the Achilles tendon for a mean of 32 months (11, 37 and 48), with a palpable painful nodule 4, 6, and 7 centimetres proximal of the insertion of the Achilles tendon onto the calcaneus. In all 3 patients pain on palpation was predominantly on the medial side. Conservative treatment had failed and none had had previous hindfoot surgery. Magnetic Resonance Imaging (MRI) confirmed the clinical diagnosis of Achilles tendinopathy with involvement of the plantaris tendon in this process.

Visual Analogue Scales (VAS) for pain and function¹⁹ and Victorian Institute of Sports Assessment –Achilles (VISA-A) questionnaires²⁰ were filled out by all three patients pre-operatively,

6 weeks and 1 year postoperatively. Additionally time to- and level of sport resumption, as well as 4 point scales for satisfaction (bad, poor, good, excellent) and complaints (more, same, less, none) were documented.

Surgical procedure

The procedure was performed under general or spinal anaesthesia. The patients were placed in the prone position. A tourniquet was applied. A 4 cm posteromedial incision was made in the proximal third of the calf. The plane dividing the medial belly of the gastrocnemius muscle and the soleus muscle was retrieved by blunt dissection. This is where the plantaris tendon runs in this plane from the posterolateral femoral condyle to the medial calcaneus. The plantaris tendon was identified, released, and pulled medially for visualization through the incision. After placing holding sutures, the tendon was transected and threaded through a tendon stripper. The stripper was advanced slowly with the leg fully extended, until it passed the palpable nodule (Figure 1). Then the plantaris tendon was cut distally and removed

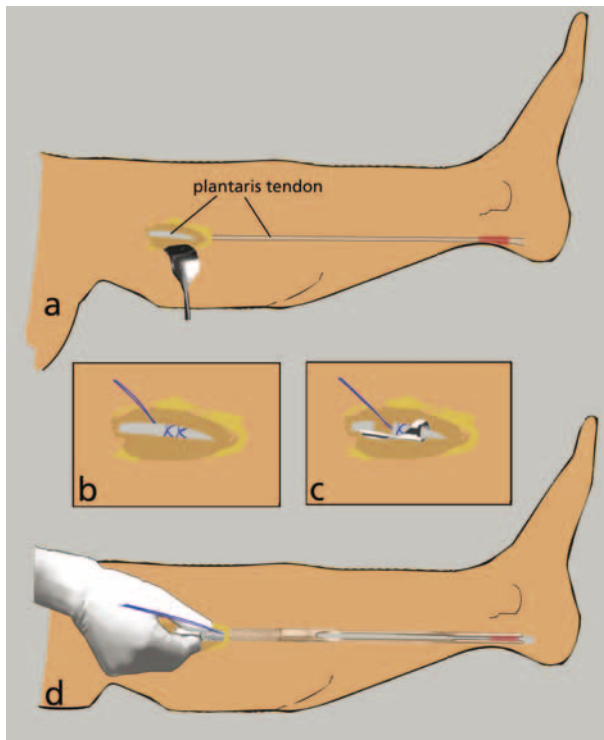


Figure 1. Surgical technique. **(A)** A 4-5 cm incision is made. The plantaris tendon is bluntly identified, and pulled medially for visualization through the incision. **(B)** A holding suture is placed. **(C)** The tendon is transected and threaded through a tendon stripper. **(D)** The stripper is advanced slowly with the leg fully extended. When the calcaneus is reached the tendon is cut



Figure 2. Result; right is the distal portion of the Achilles tendon removed past the adhesions, left (with holding suture) the proximal portion

through the proximal incision (Figure 2). The superficial fascia, subcutaneous tissues and skin were closed. Aftertreatment consisted of a compression bandage for 2 days. Weight-bearing was allowed as tolerated.

RESULTS

All three patients were scheduled for the surgical procedure as explained above. Pre-operatively VAS for pain was 69, 58 and 59 (mm) respectively. VAS for function was only taken from case 2 and 3, being 16 and 24 (mm). Pre-operative VISA-A-NL scores were 19, 25 and 45 points.

The first case had a large lower leg for which the stripper was too short, so it was decided to convert. At the level of the nodule a 3 cm medial longitudinal incision was made and the superficial fascia was opened. The paratenon was longitudinally dissected. The plantaris tendon could not be identified at this level because of extensive adhesions. After lengthening the incision 3 cm to proximal the plantaris tendon came into view. It was cut proximally, bluntly released distal from the process and resected. Six weeks after the procedure VAS for pain was 13 (mm), - for function 64 (mm), the VISA-A-NL score measured 64 points. There were less complaints and a good outcome. After 4 weeks he had resumed sporting activities, but still on a lower level. At one year follow-up, VAS for pain was 3 (mm), VAS for function 92 (mm) and VISA-A-NL 97. There were no complaints and excellent outcome playing sports after 6 weeks at a higher level than pre-operatively.

The second case went without technical problems. The plantaris tendon was histologically examined and showed signs of chronic inflammation. Six weeks postoperatively she had less complaints and an excellent subjective outcome. VAS for pain was 17 (mm), - for function 78 (mm) and VISA-A-NL measured 55 points. After one year she reported less complaints and excellent outcome, with VAS for pain of 4 (mm), for function 95 (mm) and VISA-A-NL 55. As the VISA-A accredits 45 out of 100 points to sports, this patient could not score higher than 55 points as she was not sports active.

In the third case, the connection between Achilles- and plantaris tendon was so tight that the stripper could not pass the process and the plantaris tendon ruptured proximal to this process. It was decided to end the procedure. Histology obviously showed no signs of pathology. On 6 weeks follow-up she had less complaints and was moderately satisfied with

the surgery. VAS for pain measured 0 (mm), for function 98 (mm), and VISA-A-NL scored 77 points. She resumed her sporting activities after 6 weeks at the same level as before complaints. After one year she reported no complaints and a good outcome with VAS for pain of 0 points (mm), - for function 100 (mm) and VISA-A-NL outcome of 91 points.

DISCUSSION

The most important finding of our study was that all patients had a good outcome with stripping of the plantaris tendon only. A new surgical technique to relieve symptoms in patients with midportion Achilles tendinopathy with pain predominantly located on the medial side of the Achilles tendon is reported. Involvement of the plantaris tendon in the pathological process was confirmed on MRI.

How can removal of this possibly rudimentary plantaris tendon relieve the often recalcitrant complaints? The plantaris tendon lies posterior to the knee joint, originating from the inferior part of the lateral supracondylar line of the femur. Its tendon travels inferomedially, posterior to the soleus muscle and anterior to the medial gastrocnemius muscle. The tendon crosses the calf relatively proximal, running medial from, and parallel with the Achilles tendon from the midportion of the calf; in the majority of cases ultimately inserting medially onto the calcaneus^{5, 8}. The plantaris muscle-tendon complex is a weak ankle- and knee flexor and ankle invertor. Additionally, the medial portion of the Achilles tendon consists solely of the soleus tendon since at about the level where the soleus contributes fibers to the Achilles tendon, rotation of the tendon begins. Gastrocnemius fibers are therefore positioned lateral- and soleus fibers medial of the insertion. The soleus is biarticular (ankle- and subtalar joints). The plantaris tendon runs medial to it.

In a healthy situation the plantaris tendon can move freely in relation to the Achilles tendon, however an inflammatory response of the paratenon may cause adhesions between plantaris- and Achilles tendon. Adhesions cause the mechanical problem of obstruction as the plantaris muscle-tendon complex not only causes flexion but also inversion, whereas the triceps surae is a flexor only. Although the movement between the two is limited, traction onto the surrounding paratenon will take place with every step. Chronic painful tendons have been shown to exhibit new ingrowth of sensory nerve fibers from the paratenon^{12,23}. Repetitive traction onto this richly innervated area might explain the pain and stiffness during and after walking. On the basis of this theory, symptom relief in our 3 cases is probably caused by discontinuing the proximally directed drawing forces of the plantaris tendon from its distal adhesion onto the Achilles tendon.

Another explanation for the pain relief might be 'denervation'. As seen in studies on various species, it is shown that the nerves to the Achilles tendon have in part a cutaneous origin, including the sural nerve, and an origin from the associated muscles^{2,3,27}. The healthy Achilles

tendon proper is superficially innervated by the paratenon, but does not seem to have a rich nervous supply itself². The healthy tendon proper is normally aneuronal; conversely chronic painful tendons have been shown to exhibit new ingrowth of sensory nerve fibers from the paratenon into the tendon proper^{12,23}. Can pain yet originate from the Achilles tendon itself or is it caused by this nerve ingrowth from the paratenon²?

With many surgical procedures for recalcitrant Achilles tendinopathy of the tendon proper the paratenon is released or removed. In open surgical debridement of the tendon proper the paratenon has to be opened^{11,14,21}, and during minimally invasive tenotomy the paratenon is also addressed. Paratendinopathy and tendinopathy often co-exist, but in some procedures only the peritendinous structures are addressed, such as in open or minimally invasive paratenelectomy^{13,18} and Achilles tendoscopy^{17,26}. These procedures all render good to excellent results in 75-100% of patients. The pain relief can probably be explained by destruction of these sensory nerves running from the paratenon into the Achilles tendon proper. When *stripping* the plantaris tendon, the paratenon is also being released since plantaris- and Achilles tendon run together within one paratenon. If pain can be relieved which isolated release of the paratenon, surgery of the tendon proper and consequently major tendon reconstruction becomes redundant. The advantages of a minimal invasive approach are clear and consist of decreased peri- operative morbidity, decreased duration of hospital stay, and reduced costs^{4,13,16}.

There are two major limitations to our study. To advocate this technique for everyday practise more patients are needed. The technique also needs to be optimized, e.g. the plantaris tendon should be identified more distally (but still proximal from the nodular thickening in the Achilles tendon) or a longer tendon stripper is needed to avoid conversion of the technique as in case 1.

CONCLUSION

A good to excellent outcome of stripping tendon in 3 patients with chronic midportion Achilles tendinopathy is reported. The medial location of pain at physical examination might be based on involvement of the plantaris tendon in the process. More patients and optimization of the surgical procedure are needed to advocate this technique for everyday practise and to support this novel approach to the pathogenesis of chronic midportion Achilles tendinopathy.

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