Endoscopic Treatment for Chronic Achilles Tendinopathy: A Mini-Invasive Technique


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Abstract

Introduction: The chronic midportion Achilles tendinopathy is a common pathology affecting either physically active people and general population. The first treatment approach should be conservative, but if there is no progress after 6 months, operative treatment should be considered.

Methods: We evaluated thirteen endoscopic procedures in twelve patients with chronic midportion Achilles tendinopathy with a mean age of 50.8 years.

Results: The mean AOFAS scores significantly had improved from 49.5 preoperatively to 88.5 postoperatively (p = 0.0001). The mean VISA-A also significantly improved from 37.3 preoperatively to 89.9 postoperatively (p = 0.0001). The VAS score averaged 0.63 postoperatively. The Nelen scale in the 2 physically active patients at the end of follow-up was good and fair respectively. In terms of global satisfaction, the median score was 93.3%. There were complications in 2 patients: a sural nerve irritation and a skin ulcer.

Conclusion: The endoscopic treatment for chronic Achilles tendinopathy has satisfactory results in the mid-term and is a safe procedure when performing it carefully. However, there are few studies that compare it to the open procedures, so further research is required.

Keywords: Endoscopic Treatment; Chronic Achilles Tendinopathy; Tendon

Introduction

Achilles mid-portion chronic tendinopathy is a common injury that occurs close to the tendon insertion. It arises from overuse and affects both athletes and the general population [1-3]. Elite athletes however can experience a lifetime cumulative incidence up to 52% [4]. Multiple factors have been implicated to this pathology such as mal-alignment, poor training technique, gastrocnemius-soleus dysfunction, strength imbalance, compression and friction of the tendon, shoe related factors, or endocrine disorders [4-6]. The affected area is between 2 - 6 cm proximal to the calcaneal insertion of the Achilles tendon where it has the poorest blood supply. The etiology of tendinopathy remains unclear; but it is believed that ischemia occurs during maximal tensile load of the tendon. During reperfusion (relaxation phase) oxygen free radicals are generated resulting in histological changes of the tendon as collagen degeneration, fiber disorientation and thickening [7]. It is also hypothesized that neovascularisation occurs as an attempt of healing the damaged tendon. The apparition of small neovessels can be detected with Doppler-US exam and it is correlated with achillodynia [8,9].

The common symptoms are pain, swelling, stiffness and impaired performance during daily activities and sport. The treatment should start with conservative methods such as non-steroidal anti-inflammatory drugs, activity and shoe modifications and eccentric stretching. Other proposed treatments include extracorporeal wave therapy, platelet-rich plasma injections (PRP) or corticosteroid injection [5,10]. Surgery is indicated if the patient’s condition does not improve after six months of conservative treatment [2,4,5,11].

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The aim of operative treatment is to remove adhesions, debride areas of failed healing, restore vascularity, and stimulate cells to promote healing [1,10,11]. Standard open surgeries involving tendon debridement and has been associated with wound complications, scarring and prolonged recovery [4,5]. On the other hand, endoscopic treatment has been successfully applied to the same objectives as open surgery with minimal complications [5,12]. Several clinical studies regarding Achilles tendon endoscopy have been reported with good outcomes and many investigators have considered endoscopy as a valid treatment alternative for Achilles tendinopathy [1,3,5,10-13].

The aim of the present study was to evaluate the mid-term clinical outcome of endoscopic surgery in a group of patients diagnosed with midportion Achilles tendinopathy.

Materials and Methods

From 2014 to 2016, thirteen cases of chronic mid-portion Achilles tendinopathies in twelve patients who had undergone an endoscopy surgery were retrospectively evaluated. The tendinopathy was diagnosed during the physical examination and the inclusion criteria findings were: achillodynia during activity, morning stiffness, tenderness, and decreased sports performance lasting at least 12 months.

The group of patients included 4 men and 8 women with a mean age of 50.8 years old. The left Achilles tendon was affected in eight cases and the right in the others. Only two patients were smokers and three suffered from systemic disorders such as obesity, dyslipidemia, Diabetes Mellitus or Multiple Sclerosis. Two patients had participated in sports regularly, however, due to their injury, were unable to continue their sports activity.

The foot and ankle radiographs showed no significant results. The magnetic resonance imaging (MRI) showed chronic degenerative intra-tendinous lesions and thickening 2-7 cm proximal to the tendon insertion with no intra-tendinous ruptures (Figure 1).

None of the patients were previously treated with local injections of steroids, PRP or glycosamines solutions.

The patients had been symptomatic preoperatively for an average of 2.7 years and had conservative treatment of physiotherapy, activity modification, strengthening and stretching for at least 12 months prior to surgery however conservative treatment was unsuccessful.

The patients had undergone surgery between the dates of June 2014 and February 2016 and received follow up for a minimum of 14 months’ post-surgery. The interval between the symptoms onset and surgery was at least 12 months (ranged from 1 to 8 years).

Figure 1: Sagittal T2-Weighted MR image shows markedly thickened Achilles tendon (arrow).
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All patients were evaluated preoperatively and postoperatively using a Visual Analog Scale (VAS), the AOFAS scale and the Victorian Institute Sport Assessment-Achilles Questionnaire (VISA-A). The VISA-A provides a 0 to 100 point scale. It is a validated instrument for assessing patients with Achilles tendinopathy and it was also used to evaluate endoscopic surgery outcomes [14]. The clinical outcome for patients that practiced sports was assessed with the Nelen Scale. The Nelen Scale is subjective and classifies the results according to limitations in the patient’s sports activity.

The global patient satisfaction to treatment was evaluated using a 0 to 100 scale level.

Surgical Technique

All patients received general anaesthesia and all the procedures were done by the same surgeon. The patients were placed in the prone position with both feet protruding beyond the operating table edge.

The anatomical references were marked on the skin (Figure 2). Two medial portals were used at distances 2.5 and 7 cm proximal to the Achilles calcaneal insertion. A slotted canula was introduced first from the distal portal and was irrigated with saline solution to create a virtual space. The 3.5 mm endoscope was inserted through the canula and the Achilles was inspected posteriorly (Figure 3). After a full evaluation, the proximal portal was made for instrumentation. The tendon adhesions were released and a debridement of the paratenon was done from the posterior side of the tendon using a blunt palpator (Figure 4) and an ablation blade. Finally with a retrograde knife blade two longitudinal tenotomies were performed and the skin incisions were closed with a 3-0 nylon suture.

Figure 2: Two medial portals at 2.5 cm and 7 cm approximately.

Figure 3: Endoscopic inspection of the posterior aspect of the Achilles tendon from the proximal portal.

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**Postoperative cares**

Post-operative oral anti-inflammatory drugs were administered for 5 days for pain control and heparin for 10 days. Patients were allowed to weight bear from the 3rd day using crutches if they experienced pain. They were encouraged to start actively moving their ankles in planar and dorsiflexion without weight bearing the day after surgery. By the second week, tendon stretching exercises, isometric calf muscle contractions and balance exercises were introduced. After 6 weeks, patients were allowed to do non-weight bearing sports like swimming or cycling. At 3 months, gradual resumption of sport activity was permitted.

**Statistical analysis**

Statistical analysis was performed using SPSS software for Windows, version. The Pearson test was used to assess the normal distribution of the data and a paired Wilcoxon test was used to evaluate differences between pre and post-operative scores in VISA-A, AOFAS and Wilcoxon test for VAS. The p < 0.05 was considered significant.

**Results**

The mean follow up was 22.18 months (14 - 32 months).

The three scoring systems showed significant improvement in all clinical outcomes after the last follow-up visit (Table 1). The VAS score decreased from 7.36 +/- 0.67 to 0.64 +/- 0.51 (p = 0.003), the AOFAS score had improved from 49.45 +/- 4.82 to 88.45 +/- 4.41 (p = 0.003), and the VISA-A had improved from 37.27 +/- 3.90 to 89.91 +/- 3.30 (p = 0.003) (Table 2). Three months' post-surgery, all patients had resumed their normal daily activity.

<table>
<thead>
<tr>
<th></th>
<th>Before Surgery</th>
<th>Post Surgery</th>
<th>Statistical Significance (Wilcoxon Test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAS</td>
<td>7.36</td>
<td>0.64</td>
<td>p = 0.0001</td>
</tr>
<tr>
<td>AOFAS</td>
<td>49.45</td>
<td>88.45</td>
<td>p = 0.0001</td>
</tr>
<tr>
<td>VISA-A</td>
<td>37.27</td>
<td>89.91</td>
<td>p = 0.0001</td>
</tr>
</tbody>
</table>

*Table 1: Variables Correlation.*

The Wilcoxon test was used to compare the score differences pre-operatively and post-operatively. The difference was statistically significant in all the scores.

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<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>VAS pre</th>
<th>VAS post</th>
<th>AOFAS pre</th>
<th>AOFAS post</th>
<th>VISA-A pre</th>
<th>VISA-A post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Value</td>
<td>33</td>
<td>7</td>
<td>0</td>
<td>44</td>
<td>81</td>
<td>31</td>
<td>82</td>
</tr>
<tr>
<td>Maximum Value</td>
<td>71</td>
<td>9</td>
<td>1</td>
<td>59</td>
<td>95</td>
<td>42</td>
<td>95</td>
</tr>
<tr>
<td>Mean Value</td>
<td>51,82</td>
<td>7,36</td>
<td>0,64</td>
<td>49,45</td>
<td>88,45</td>
<td>37,27</td>
<td>89,91</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>13,16</td>
<td>0,67</td>
<td>0,51</td>
<td>4,82</td>
<td>4,41</td>
<td>3,90</td>
<td>3,30</td>
</tr>
<tr>
<td>Error Estándar Media</td>
<td>3,97</td>
<td>0,20</td>
<td>0,15</td>
<td>1,46</td>
<td>1,33</td>
<td>1,18</td>
<td>0,99</td>
</tr>
<tr>
<td>Variance</td>
<td>173,16</td>
<td>0,45</td>
<td>0,26</td>
<td>23,27</td>
<td>19,47</td>
<td>15,22</td>
<td>10,89</td>
</tr>
</tbody>
</table>

Confidence Interval (95%) (Maximum Value)

|                      | 60,66 | 7,82  | 0,98     | 52,70     | 91,42      | 39,89      | 92,13       |

Confidence Interval (95%) (Minimum Value)

|                      | 42,98 | 6,91  | 0,30     | 46,21     | 85,49      | 34,65      | 87,69       |

Table 2: Numeric Variables (Descriptive Statistics).

Statistical values of age, VAS, AOFAS and VISA-A pre-op and post-op scores

Four months’ post-surgery the two athletes were able to return to sports activity. The Nelen clinical outcome score was evaluated with one of the patients receiving a “good” outcome and the other a “fair” outcome. The good outcome indicated a full return to sport activities with a possibility of posterior Achilles tendon discomfort. The fair outcome signified clinical improvement with a high likelihood of discomfort during sport related activities.

Finally, the patient satisfaction score of the study was 93.3% and all patients agreed that they would undergo the same procedure again.

Two patients developed postoperative complications related to surgery. A 40-years-old woman developed a growing skin ulcer 1 week after surgery as a result of the debridement procedure of the superficial layers of the tendon with the ablation blade (Figure 5). By the second month the decision was made by the plastic surgeon to cover the defect with an autologous skin graft as the ulcer had grown beyond the tendon edges with a lack of skin coverage. By the third month the patient had a VISA-A score of 91 and AOFAS score of 89 and was able to resume her daily activities. The second female patient of 52 years of age presented with neuroapraxia in the 4th and 5th toes in the immediate post-operatory. She was treated conservatively and showed partial improvement in the first 4 months. She developed a permanent sensitive deficit in the sural nerve area, though her global satisfaction scale showed 100 points and she reported an excellent clinical outcome at the final follow up (VAS score 0 points, VISA-A 89 points, AOFAS 92).

Figure 5: Ulcer formation on the skin over the posterior part of the Achilles tendon. The lesion appeared immediately one week after the surgery.

Discussion

The main conclusion of the present study was that the novel technique of tendoscopy of the Achilles provides good mid-long term results in patients with chronic midportion Achilles tendinopathies as well as a reliable and safe treatment method for this entity.

Presently, the incidence of chronic painful midportion Achilles tendinopathy has increased among professional athletes due to increasing training intensity. However, the non-athletic population is also affected, most frequently the middle-aged between 45 - 55 years and those who are overweight. Moreover, systemic illnesses such as diabetes mellitus, dyslipidemia, and obesity are also most likely implicated in the Achilles tendinopathy [5,12].

The basis of treatment is conservative following an individualized rehabilitative program. The eccentric exercises [15], extracorporeal shockwave therapy [16] and PRP injections [2] have shown benefits. Other treatments including sclerosing agent injections, deproteinized hemodialysate and topical glyceryl nitrate application are useful but require further investigation [17]. Jonge., et al. [18] concluded in their study that in tendinopathic Achilles tendons the ultrasonography structure improved during non-operative treatment after 24 weeks to values of matched asymptomatic controls demonstrating that there was no association between the tendon structure and symptoms. Nevertheless, 25 - 45% of patients fail conservative treatment and request surgical intervention [3,12].

Open surgery procedures have shown satisfactory results for chronic tendinopathies however; the postoperative complication rates were high. Williams and Paavola et al reported in their studies 14% and 11% complications respectively regarding large series of open procedures [19,20]. The main complications were related with wound healing: infection, necrosis, seroma, hematoma, painful skin scar, sural nerve damage, and limb problems related to deep vein thrombosis [1]. Complications were also associated with longer postoperative rehabilitation periods and delayed patient recovery [12].

The present study showed postoperative complications in two patients (15%), both related to surgical technique defects that could have been avoided. The posterior skin ulcer was classified as a major complication and that resulted from the misuse of the ablation blade on the thin skin covering the tendon. We used two medial portals, owing to a greater risk to damage sensory branches of sural nerve when using distal lateral portals [20]. Despite of this fact, we had a case of sural neuroapraxia, considered a minor complication. It was likely provoked by traumatic damage from arthroscopic tools during the procedure.

There are only a few review studies reported in the literature concerning endoscopic treatment for chronic midportion Achilles tendinopathy. Vega., et al. [11] assessed endoscopic treatment results in a small group of 8 patients with chronic Achilles tendinopathy that practiced sports regularly. They had excellent outcomes with the resection of pathological tissues while performing longitudinal tenotomies using two distal portals. All patients returned to their previous activity level without limitations and complications. Therman., et al. [12] described the results of endoscopic visualisation and debridement of both the ventral and dorsal neovascularised areas, the paratenon, and the longitudinal tenotomies in 8 patients. One hundred percent of the patients were satisfied with the treatment, improving their mean VAS scores from 36 to 95 points at 6 months follow-up and were able to resume their previous activity level with no complications. Recently, Pearce., et al. [3], reported a group of 11 patients treated with endoscopic surgery paying particular attention to the release of the ventral aspect of the tendon. They advocated for the plantaris tendon to be implicated for the Achilles tendinopathy and therefore systematically released it. The mean hind foot AOFAS score improved from 62 to 92. There were no complications reported and 8 of the 11 patients were satisfied. Finally, Maquirrain., et al. [1] reported the longest series of patients to date, studying 27 endoscopic procedures in 24 patients with MRI image confirmations for chronic Achilles tendinopathy. With a dorsal approach to the tendon using two medial portals, a paratenon debridement and crural fascia along with longitudinal tenotomies was performed. They obtained excellent global assessment results in 85.1% of patients, with an improvement in the VISA score from 37.0 to 97.5 points and an ATSS score improvement from 32.6 to 97.2 points. Two patients developed postoperative complications related to the wound healing: a keloid lesion two months after surgery and a seroma 10 weeks after surgery with fistulisation.

The limitations of the study included a smaller patient population than we would have liked and the retrospective nature of the study may have posed a threat to the validity of results. In addition, not all the patients in our series had the same grade of intra-tendinous degeneration on MRI, though our inclusion criteria were not based on the grade but the symptoms of the tendinopathy condition.

In summary, endoscopic treatment for chronic midportion Achilles tendinopathy has satisfactory results in the mid-term and is a safe procedure when performing it carefully. Only a few studies have provided evidence of the effectiveness of endoscopic treatment and therefore more investigational studies are required. Nonetheless, we believe that endoscopic release of the paratenon and longitudinal tenotomies will become the gold standard treatment for non-insertional Achilles tendinopathies.

**Conflict of Interest**
The authors certify that they have no financial conflict of interest in connection with this article.

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**Bibliography**


