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Achilles tendon-splitting approach and double-row suture anchor repair for Haglund syndrome

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ABSTRACT

Background: Haglund syndrom is characterized as a painful posterosuperior deformity of the heel with possible causes as tight Achilles tendon, high-arched foot and tendency to walk on the outside of the heel. Surgical treatment may be recommended in cases where of insufficient response to nonoperative treatment. This study aims to evaluate the clinical and radiographic results of central Achilles tendon splitting and double-row suture anchor technique in the surgical treatment of patients with Haglund syndrome.

Methods: 27 patients with Haglund syndrome who underwent central Achilles tendon splitting and double-row suture anchor were retrospectively evaluated. The results were evaluated by the pre- and post-operative American Orthopedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Scale and visual analogue scale (VAS). All patients were evaluated radiographically to assess lateral talus-first metatarsal angle (TMTA), Calcaneal pitch angle (CPA), and the Fowler-Philip angle (FPA) preoperatively and postoperatively.

Results: The mean preoperative AOFAS score was 47 ± 7 points; at the end of the follow-up period, it increased to 92 ± 4 points ($p < 0.001$). The mean preoperative VAS score was 9 ± 0.9 points; at the end of the follow-up period, it was 2 ± 0.6 points ($p < 0.001$). The lateral TMTA (preoperative: 5° ± 2°; follow-up: 4° ± 2°; $p < 0.001$), CPA (preoperative: 21° ± 5°; follow-up: 20° ± 5°; $p = 0.005$) and FPA (preoperative: 55° ± 6°; follow-up: 32° ± 3°; $p < 0.001$) values decreased at the end of the follow-up period.

Conclusion: In the absence of an improvement to nonoperative treatment methods, central Achilles tendon-splitting approach appears to be an effective and safe treatment option.

Level of evidence: Level IV, retrospective case series.

1. Introduction

Haglund syndrome, described by Patrick Haglund in 1928, is a painful posterosuperior deformity of the heel of uncertain etiology. However, tight Achilles tendon, high-arched foot, and tendency to walk on the outside of the heel have been suggested as possible causes. It most commonly occurs bilaterally in middle-aged women and is characterized by posterior heel pain. Clinical evaluation and ankle lateral radiography are usually sufficient for diagnosis [1,2].

Haglund syndrome is a deformity that can cause posterior pain in the heel. This protrusion leads to a predisposition to the development of retrocalcaneal bursitis [3]. The increased pressure between the heel and the heel contour of the shoe causes symptoms of Haglund syndrome [1].

Repetitive pressure of the protrusion on the superior side of the posterior calcaneus causes retrocalcaneal bursitis, which appears as inflammation and swelling between the calcaneus and the Achilles tendon [4]. This anomaly is frequently defined radiographically based on measurement of the Fowler-Philip angle (FPA) and calcaneal pitch angle (CPA) [5,6]. However, the relationships between symptomatic Haglund syndrome and measurement methods, especially determination of FPA and CPA, remain poorly understood [7,8]. Initial treatment mostly consists of nonoperative methods [9], including shoe modification, heel elevation, stretching of the gastro-soleus complex, anti-inflammatory drugs, steroid injection, and shockwave therapy [10–12].

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Table 1
Patient demographics, clinical and operative details.

	n (%)	Mean ± SD	Min–max
Age (in years)		47 ± 8	31–61
Gender			
Male	13 (48)		
Female	14 (52)		
Side			
Left	13 (48)		
Right	14 (52)		
Complications			
None	24 (89)		
Superficial wound site infection	3 (11)		
Follow up period (in months)		31 ± 5	21–39

n: number of cases, SD: standard deviation, min: minimum, max: maximum N: 27 total patients.

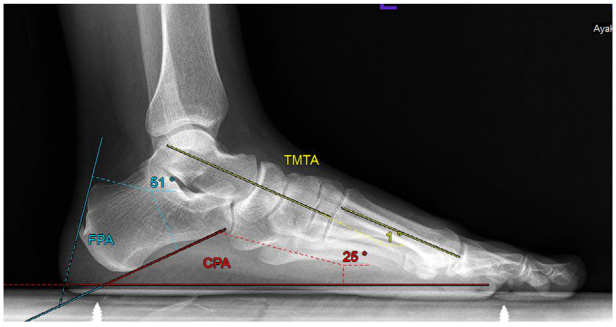

Fig. 1. Fowler and Philip angle (FPA), was measured between an inferior line which was tangent to the inferior margin of the calcaneocuboid joint and the plantar tuberosity of the calcaneus and a superior line which was tangent to the posterior prominence at the insertion of the Achilles tendon. Calcaneal pitch angle (CPA), is between the calcaneal inclination axis and the supporting horizontal surface. The lateral talo-first metatarsal angle (TMTA) is the angle formed between the long axis of the talus and the first metatarsal.

Surgical treatment may be recommended in cases of an insufficient response to nonoperative treatment for 3–6 months [12]. Retrocalcaneal bursa excision, calcaneal osteotomy, and excision of some or all of the posterosuperior calcaneal tuberosities have been used as surgical treatments in patients with recalcitrant symptoms [13–15].

Although there is as yet no consensus on ideal surgical treatment, it has been suggested that the central Achilles tendon-splitting approach provides a good intervention for Achilles tendon insertion tendinopathy [16,17].

This study was performed to evaluate the clinical and radiographical results of central Achilles tendon splitting and the double-row suture anchor technique in the surgical treatment of patients with Haglund syndrome.

2. Materials and methods

2.1. Study population and design

This retrospective evaluation was performed in 27 feet of 27 consecutive patients (13 [48%] male, 14 [51.9%] female; mean age 47 ± 8 years) with Haglund syndrome treated with central Achilles tendon splitting and the double-row suture anchor technique between August 2013 and March 2015. The study population included 13 (48%) patients with symptoms on the left foot and 14 (52%) with symptoms on the right foot, who were treated using calcaneal protrusion excision, retrocalcaneal bursectomy, Achilles tendon debridement, and the double-row suture anchor technique (Table 1). Patients were included in the study if they had pain and tension in the posterosuperior calcaneal prominence, were diagnosed with Haglund syndrome, did not respond to nonoperative treatments for at least 3 months, and underwent central Achilles tendon splitting and the double-row suture anchor technique. Patients were excluded if they had inflammatory arthritis or other pathological findings around the foot and ankle. All patients were evaluated preoperatively and postoperatively according to The American Orthopedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Scale and visual analog scale (VAS) (where 0 describes no pain, 10 describes the most pain imaginable) [18]. All patients were evaluated radiographically to assess TMTA, CPA, and the FPA preoperatively and postoperatively (Fig. 1).

2.2. Surgical technique

All surgical procedures were performed under regional anesthesia after a tourniquet had been applied to the thigh (Fig. 2). Patients also received prophylactic antibiotic therapy with a first-generation cephalosporin at a dose of 2 mg/kg. They were placed in the prone position on the operating room table, and a central tendon-splitting approach, as described in literature [19], was performed after making a midline skin incision proximal to the Achilles tendon insertion, extending distally by about 7 cm. The paratenon was centrally incised and marked with 2–0 sutures (Vicryl, Ethicon; Johnson & Johnson Medical Ltd., Berkshire, UK) for later repair. After exploring the Achilles tendon, the tendon was split centrally to the most inferior attachment of the tendon onto the bone. 50% of the Achilles tendon was detached from its center bilaterally (to %25 medial and %25 lateral), so the distal Haglund's prominence could be visualized (Fig. 3). The lateral and medial tendon insertions were left intact. The degenerative portion of the tendon and retrocalcaneal bursal tissue was excised. In all patients, the excised degenerative portion was <50% of the entire tendon. Next, the bony prominence was completely excised using a sagittal saw in a direction from posterodistal to antero-proximal (Figs. 4 and 5). The calcaneus was shaped with a rasp guided by fluoroscopy. The bilaterally reflected tendons were anchored to

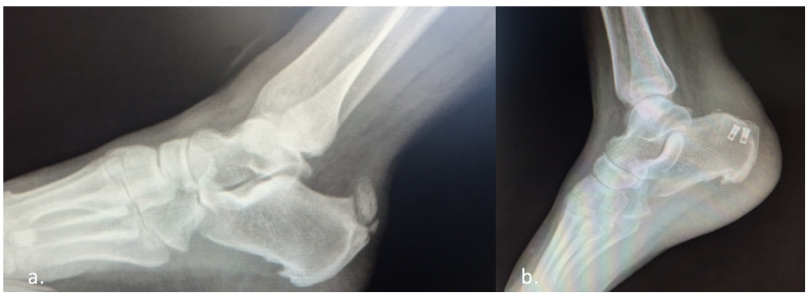

Fig. 2. a and b: Resection of Haglund deformity. (a) Pre-operative lateral radiograph of a 49-years old patient with posterosuperior calcaneal bony prominence. (b) Postoperative radiograph after resection.

Fig. 3. Intraoperative calcaneal bony prominence visualization. The distal insertion of the Achilles tendon is released and reflected medially and laterally.

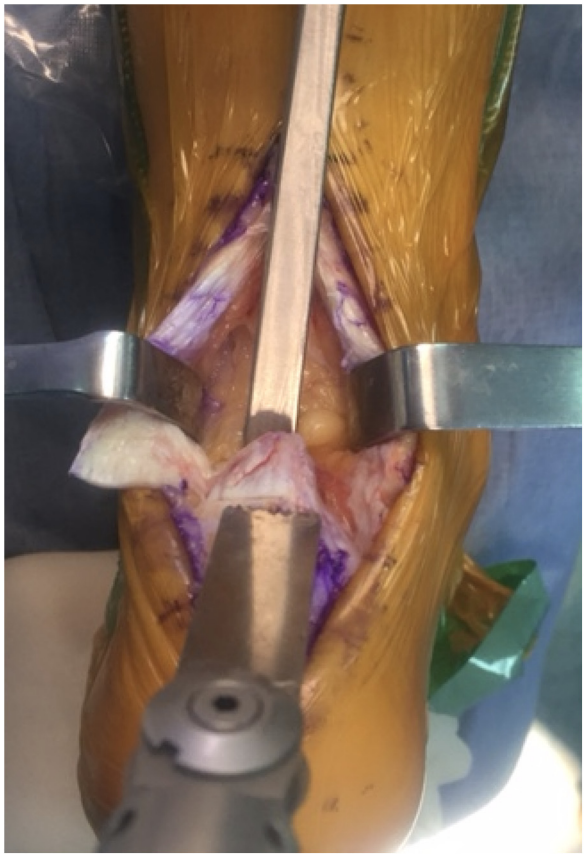

Fig. 4. Resection of bony prominence. The bony prominence was completely excised using a sagittal saw in a direction from posterodistal to antero-proximal.

the newly formed cancellous surface. First, two 5.5-mm anchors (Healix Advance Anchors; DePuy Synthes Mitek) were placed in the antero-proximal row (Fig. 6). After passing the sutures from the detached portion of the Achilles tendon, repair was completed by placing two knotless anchors (VERSALOK® Suture Anchors; DePuy Synthes Mitek, Raynham, MA) to the distal row to achieve a crossing configuration (hourglass) (Fig. 7a and b). The split tendon was then repaired with 3–0 absorbable sutures using a running stitch (Fig. 8). The paratenon was also repaired with 3–0 absorbable sutures, and the skin was closed with 3–0 nonabsorbable sutures.

2.3. Postoperative management

The skin sutures were removed at 2 weeks after surgery. Postoperatively, the patients were given a removable foot and ankle brace with 10° of ankle plantar flexion, and partial weight bearing (%50 of his/her weight) was maintained for the initial 4 weeks. At 4 weeks postoperatively, the removable foot and ankle brace was reapplied with the ankle in neutral dorsiflexion, and weight bearing was allowed. At 6 weeks postoperatively, the patients started range of motion exercises after removal of the brace. Passive dorsiflexion and active resistive plantar flexion ankle exercises were started at this time. At 8 weeks postoperatively, the double heel raise exercise was started. The single heel raise exercise was started at 10–12 weeks postoperatively.

2.4. Statistical analysis

Data analysis was performed using statistical software (SPSS Statistics version 17.0 software; IBM Corp., Armonk, NY, USA). Whether or not continuous variables were normally distributed was determined by the Shapiro–Wilk test. Continuous variables are shown as means ± standard deviation, and the numbers of

Fig. 5. Intraoperative Achilles tendon appearance after central-splitting approach and calcaneal bony prominence excision.

Fig. 6. Appearance during the insertion of anchors before the repair of double-row anchors. Antero-proximal row:two 5.5-mm anchors (Healix Advance Anchors; DePuy Synthes Mitek); postero-distal row: knotless anchors (VERSALOK® Suture Anchors; DePuy Synthes Mitek, Raynham, MA).

cases and percentages are shown for categorical data. Whether or not the differences between pre- and postoperative clinical measurements were statistically significant was evaluated by the paired sample *t*-test or the Wilcoxon signed-rank test where appropriate. In all analyses, $p < 0.05$ was taken to indicate statistical significance.

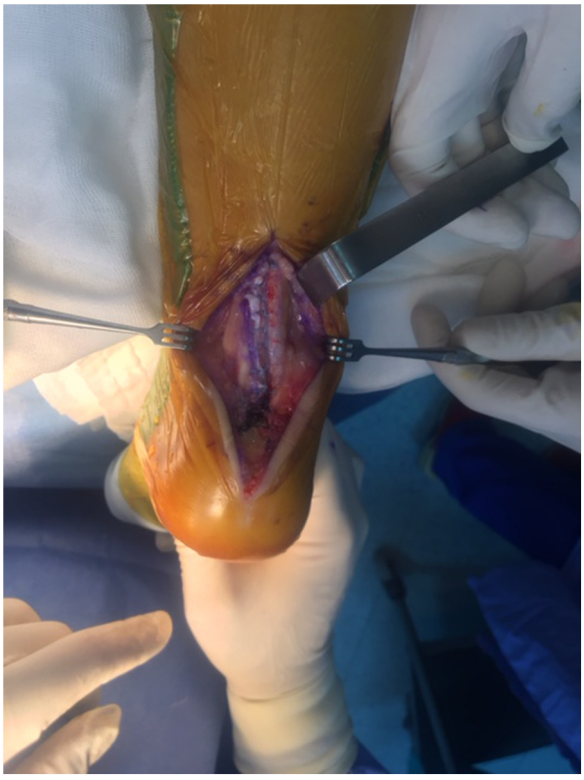

Fig. 8. Achilles tendon appearance after the double-row anchor repair.

3. Results

The mean follow-up period was 30 months (21–39 months). No surgical complications occurred in 24 feet. Three patients (11%) developed a superficial wound infection. The mean preoperative AOFAS Ankle-Hindfoot score was markedly increased at the end of the follow-up period ($p < 0.001$). Also the mean preoperative VAS score decreased at the end of the follow-up period ($p < 0.001$). In the preoperative radiographic measurements, the lateral TMTA ($p < 0.001$), FPA ($p < 0.001$) and the CPA ($p = 0.05$) decreased at the end of the follow-up period (Table 2).

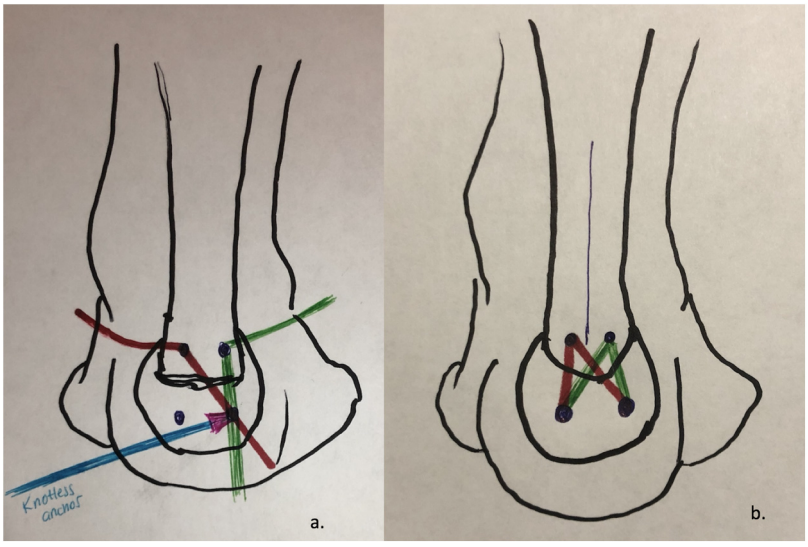

Fig. 7. a and b: Crossing Configuration. The sutures from the antero-proximal row were crossed and anchored to the posterodistal row.

Table 2
Patients pre- and post-op radiographical measurements.

	Pre-op	Post-op	p-Value	Difference
Ankle-hindfoot scale	47 ± 7	92 ± 4	<0.001*	46 ± 8
VAS score	9 ± 0.9	2. ± 0.59	<0.001**	−7 ± 1
Lateral talo-first metatarsal angle (°)	5 ± 2	4 ± 2	<0.001*	−0.35 ± 0.28
Calcaneal pitch angle (°)	21 ± 5	20 ± 5	0.005**	−0.48 ± 0.75
Fowler-Philip angle (°)	55 ± 6	32 ± 3	<0.001*	−23 ± 7

* Paired samples t-test.
** Wilcoxon sign rank test.

4. Discussion

In high-arched feet, shoe modification and heel pads or heel-raising nonoperative methods are possible treatments [4]. Casting to reduce pain, and icing, may be useful for treating swelling. Topical or oral anti-inflammatory drugs, stretching exercises, and physiotherapy can reduce calcaneal tendon strain. Local steroid injections are also used in recalcitrant feet [20]. If nonoperative treatments are not effective, surgical treatment options, such as retrocalcaneal decompression and calcaneal osteotomy, are preferred [21].

There have been no controlled studies regarding the surgical treatment of Haglund syndrome [22]. Endoscopic techniques, open resections and calcaneal osteotomies has been described in the literature [13,23,24].

It is generally agreed that inadequate decompression of the Achilles tendon and bursa increases the risk of recurrent symptoms. Removal of a large amount of bone increases the risk of avulsion insertion of the Achilles tendon [25,26]. Failure of surgical treatment is correlated with posterior overhang after resection, and radiographical analysis provides advantages in open procedures [22,27].

Our results revealed that obtaining sufficient visualization with the central Achilles tendon-splitting approach may prevent inadequate resection with calcaneal spur excision, retrocalcaneal bursectomy, and Achilles tendon debridement, and avulsion risk can be avoided with the double-row suture anchor technique.

Other techniques have been described to provide retrocalcaneal decompression without dissection of the Achilles tendon from its insertion [23].

Since the first description of the central tendon-splitting approach, there have been a number of reports of successful treatment in cases of insertional Achilles tendinopathy [16,17,19]. While medial and lateral approaches result in limited exposure, excessive retraction, or ineffective debridement, the central tendon-splitting approach provides access to all pathological areas with a single incision. Another advantage of the central approach is the avoidance of sural nerve damage by lateral [21] and Cincinnati (transverse circumferential incision) [28] incision and reduction of damage to the blood supply of the Achilles tendon. We used two different types of anchor. The medially and laterally detached portion of the Achilles were hold by the sutures of antero-proximal row anchors and then fixed to its insertion on the calcaneus by the knotless anchor at the posterodistal row.

There have been insufficient reports regarding the central tendon-splitting approach, and the studies reported to date mostly did not compare preoperative and postoperative functional and radiographical data [29].

It was reported that the central split approach minimizes the complications of wound development and increases the likelihood of long-term success in terms of tendon strength, range of motion, and function [17].

No complications such as regeneration of the prominence, wound problems, infection, or Achilles tendon rupture was reported after 3.5 ± 1.5 years follow up in a study in which central tendon-splitting approach was performed [30]. We observed 3 cases (11%) of surgical wound infections, and these patients responded positively to wound care and medical treatment. Theoretically a single incision around hindfoot may cause less wound problems than multiple incision around foot.

Preoperative and postoperative AOFAS scores was compared and found a significant increase after surgery [16,17]. In a study, not only preoperative and postoperative AOFAS and VISA-A scores (The Victorian Institute of Sports Assessment – Achilles Questionnarie) [31] were measured to compare functional outcomes, but also lateral TMTA, CPA, and FPA preoperatively and postoperatively. As the CPA increases, the posterosuperior protrusion of the calcaneus will tighten the Achilles tendon [30]. The relationship of symptomatic Haglund syndrome with FPA and parallel pitch line (PPL) measurement methods were investigated back in the literature, and it was found that Haglund symptoms were associated with Achilles tendon calcification and posterior calcaneal bony prominence. Angles, such as FPA and PPL, were not correlated with the severity of the symptoms of Haglund syndrome, and the symptoms were due to calcification of the Achilles tendon. Therefore, surgical decision should be made according to clinical symptoms rather than angle measurements [8].

This study have some limitations. We do not have a control group which included patients with radiographical findings but no clinical symptoms. However, the patients were retrospectively evaluated and the sample size relatively small. Ideally, a multicenter randomized controlled trial should be planned.

In the present study, statistically relevant differences were found between the lateral TMTA and FPA in preoperative and postoperative radiographical measurements. An increased FPA indicates a large posterosuperior prominence of the calcaneus, which would result in compression of the Achilles tendon. A high TMTA may be related with high arch which can worsening the symptoms. In our study, after surgery FPA and TMTA values decreased significantly. The decrease in FPA and TMTA values may be associated with the decreased pain.

In the absence of an improvement to nonoperative treatment methods, surgical decisions should be made according to clinical and radiographical findings. Although repair with calcaneal spur excision, retrocalcaneal bursectomy, Achilles tendon debridement, and the double-row suture anchor technique with central Achilles tendon-splitting approach appears to be an effective and safe treatment option, randomized comparative studies would likely help optimize treatment strategies.

Conflict of interest

The author declares no conflicts of interest.

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