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ORIGINAL ARTICLE

Haglund's deformity: Clinical outcomes of endoscopic calcaneoplasty

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ABSTRACT

Objective: Haglund's deformity is characterized by a bony prominence of the calcaneus, leads to posterior heel pain, swelling, and morning stiffness. Endoscopic calcaneoplasty is becoming increasingly popular due to its numerous advantages over conventional surgical methods. This study aims to evaluate the clinical and radiological results of patients who underwent endoscopic calcaneoplasty.

Materials and Methods: A total of 17 patients were diagnosed with Haglund's deformity and underwent endoscopic calcaneoplasty surgery in our clinic between June 2019 and January 2023 were included in this retrospective study. Pre-operative and post-operative parameters of patients with 6 months or more of follow-up were compared. The VAS was used for pain assessment, the AOFAS score for functional outcomes, and the length of bone deformity for radiological assessment.

Results: Significant pain resolution was observed at the final follow-up compared to the preoperative period. The mean VAS score decreased from 6.77±1.3 pre-operatively to 1.62±1.12 post-operatively ($p<0.001$). The AOFAS score showed a significant increase from 61.23±7.7 preoperatively to 92.46±6.04 postoperatively ($p<0.001$). Bony hump length decreased significantly from 4.12±1.14 preoperatively to -2.29±1.56 postoperatively ($p<0.001$).

Conclusion: Endoscopic calcaneoplasty is a reliable method in Haglund's deformity, that provides rapid recovery, early return to daily activities and sports, and a low complication rate.

Keywords: AOFAS score, endoscopic calcaneoplasty, Haglund's Deformity.

INTRODUCTION

Haglund's deformity, first described by Haglund in 1928. It is characterized by a bony prominence of the calcaneus, specifically at the posterosuperior aspect, which leads to posterior heel pain, swelling, and morning stiffness. Especially in progressed cases, the condition can reduce an individual's quality of life [1]. Haglund's deformity can frequently occur alongside retrocalcaneal bursitis or insertional Achilles tendinitis [2].

Conservative therapies are the primary choice of treatment, however, several studies reported that conservative treatment could fail and surgery may be necessary, especially in patients with symptoms lasting more than 6 months [3-6]. The surgery aims to remove the posterosuperior bony hump and remove the inflamed tendon and retrocalcaneal bursa [7]. Currently, there are many surgical approaches used for open surgery, including lateral paratendinous, medial paratendinous, central tendon splitting (with or without Achilles tendon detachment), and transverse Cincinnati incision [8-10,7,11-13]. Regrettably, present surgical methods may yield complications and adverse consequences, including wound dehiscence, Achilles tendon rupture, scar tenderness, prolonged posterior heel pain, altered sensation, nerve injury (sural nerve), incisional neuroma, and prolonged immobilisation and convalescence [14-17]. Hence, there is no consensus on the optimal surgical approach, and research on this subject is still ongoing.

Van Dijk's initial description of an endoscopic approach is perceived to alleviate the limitations of traditional approaches [18]. Endoscopic calcaneoplasty has become increasingly popular for its numerous benefits including reduced post-operative pain, lower incidences of post-operative complications, early mobilisation and rapid recovery when compared to open surgery [19-21]. In our study, we aimed to evaluate the clinical and radiological results of patients who underwent endoscopic calcaneoplasty.

MATERIALS and METHODS

We retrospectively reviewed the data of 17 patients who were diagnosed with Haglund's deformity (Figure 1-A) and underwent endoscopic calcaneoplasty surgery in our clinic between June 2019 and January 2023. We included patients who had symptoms for at least 6 months and whose complaints did not improve with conservative treatment. Patients with a previous fracture or surgery of the foot or ankle (one patient in our study), patients with rheumatological diseases (one patient in our study), and patients with a follow-up of less than 6 months, were excluded from the study. Moreover, we could not complete the surgery endoscopically in two patients, due to technical reasons, these patients' surgery was completed as open calcaneoplasty and they were excluded from the study.

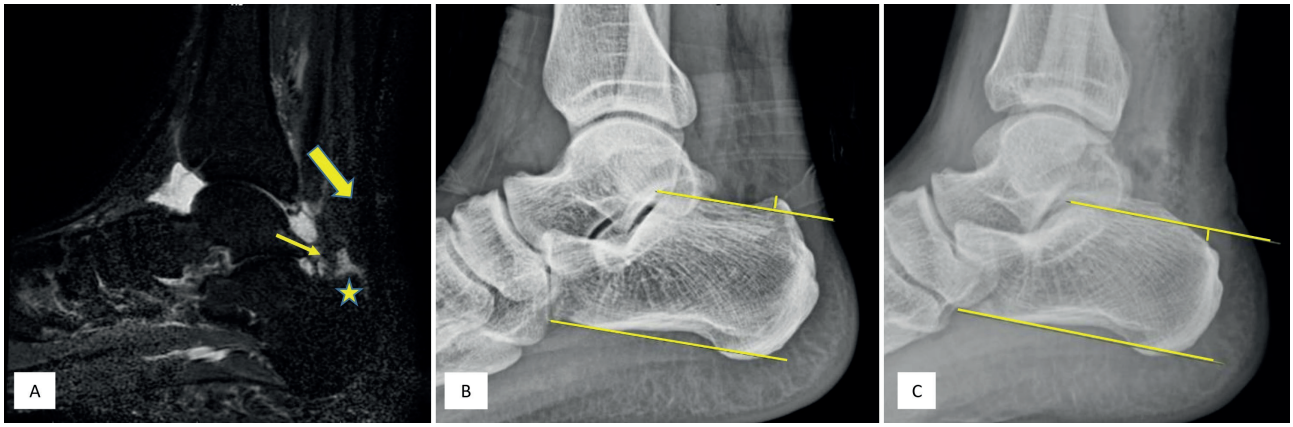

Figure 1. (A) MRI image of a Haglund deformity. The star indicates a bony prominence, the thin arrow indicates retrocalcaneal bursitis, and the thick arrow indicates the Achilles tendon. (B) and (C) The parallel pitch line consists of two parallel lines (yellow lines), the lower line running from the inferior calcaneal tuberosity to the anterior calcaneal tubercle and the upper line running parallel to the lower line from the posterior lip of the talocalcaneal articular facet. The length of the perpendicular line drawn from the highest point of the bony prominence to the upper line was measured as the "length of the bony prominence". The measurements are shown in (B) pre-operatively and (C) post-operative.

Pre-operative and post-operative parameters of patients with 6 months or more of follow-up were compared. The VAS was used for pain assessment, the AOFAS score for functional outcomes, and the length of bone deformity for radiological assessment. A lateral ankle radiograph was used to measure the height of the bone deformity. First, parallel pitch lines were determined; the inferior line from the inferior margin of the calcaneocuboid joint to the plantar tuberosity of the calcaneus was drawn parallel to the inferior line, starting from the posterior margin of the subtalar joint. Then a line perpendicular to the superior pitch line was drawn from the point where the bone deformity was greatest. The amount remaining above the superior line was measured in mm and recorded as the height of the bony deformity (Figure 1-B, 1-C). All patients were assessed by an experienced orthopedic surgeon with a specialist interest in ankle surgery, and the outcomes were recorded by the same person. This study was conducted in accordance with the principles of the Declaration of Helsinki.

Surgical procedure and post-operative care

The entire surgical procedure was performed under pneumatic tourniquet control and regional anesthesia and sedation with the patient in the prone position. Firstly, 50 cc of physiological saline was injected into the posterior ankle (Figure 2-A), deep into the Achilles tendon, and a space was formed to assist portal entrance. Two portals are approximately 2.5 cm proximal to the calcaneal tuberosity medial and lateral adjacent to the Achilles tendon (Figure 2-B). The 4.5 mm 30° arthroscope and a 4 mm motorized shaver were introduced from lateral and medial portals, respectively. Portal change was performed frequently to expand the viewing and working areas (Figure 2-C). The motorized shaver was used to remove the retrocalcaneal bursa and degenerated parts of the tendon. A radiofrequency ablation device was used to remove the soft tissue on the bony deformity and expose the bone (Figure 2-D). A 4.5 mm motorized burr was used for resection of the bony deformity (Figure 2-E). Intra-operative C-arm fluoroscopy control was performed to ensure adequate and

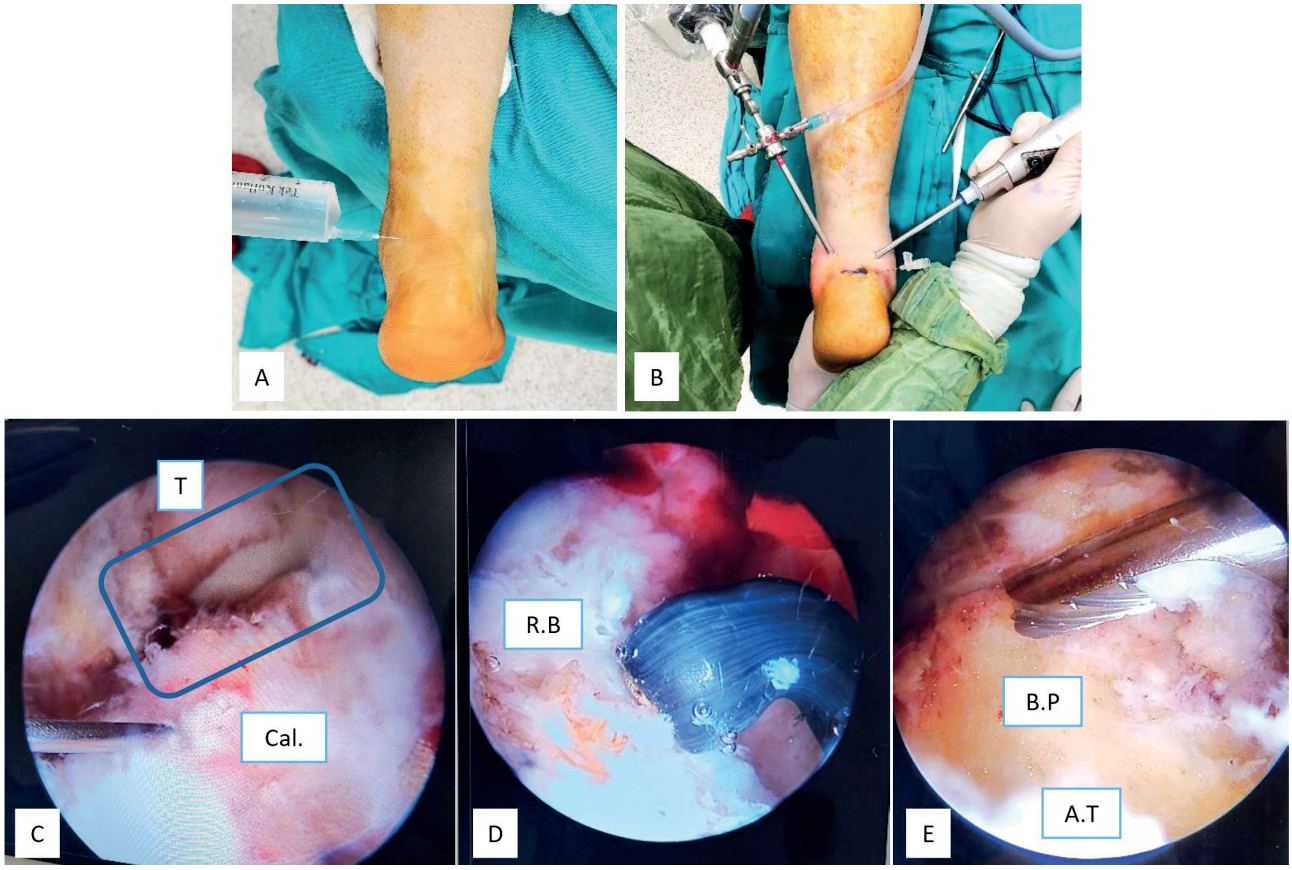

Figure 2. (A) Saline was administered to the posterior ankle, deep to the Achilles tendon to facilitate portal access. (B) The procedure was performed using postero-medial and postero-lateral portals with the patient in the prone position. (C) Endoscopic view of the surgical field, with the talus (T) and calcaneus (Cal) bones visible and the subtalar joint highlighted in the rectangle. (D) Retrocalcaneal bursa (R.B) was debrided with a radiofrequency ablation device. (E) The bony prominence (B.P) was resected using a motorised burr, taking care to protect the Achilles tendon (A.T).

appropriate bone resection was performed. Finally the portals were sutured and the operation was terminated.

All patients were discharged the day after operation. The patients were allowed perform partial weight bearing during the first 2 weeks and then full weight-bearing was allowed at the 3. post-operative week. Patients were encouraged for all active and passive ankle movements on the first post-operative day and returned to daily activities 4-6 weeks after the surgery. VAS and AOFAS scores and the length of bone deformity were recorded at the final follow-up.

Statistical analysis

Statistical analyses were performed using SPSS for Windows 25.0 software. For descriptive statistics, quantitative continuous variables were expressed as mean and standard deviation, and qualitative variables were expressed as frequencies and percentages. The normality of the distribution of continuous variables was tested by Kolmogorov-Smirnov / Shapiro-Wilk tests. In the Kolmogorov-Smirnov test, the distribution was considered normal if the p-value was greater than 0.05. Student t test was used to compare the means of two normally distributed dependent samples, $p<0.05$ indicates statistical significance.

RESULTS

A total of 13 patients met the inclusion criteria and were included in the study. Eight of the patients were male and 5 were female, with a mean age of 47.46 ± 6.63 (range, 38-60 years). The mean follow-up time was 15.92 ± 4.73 (range, 8-24 months) (Table 1). No patients were missed during the follow-up. The mean duration of the surgical procedure was 58.08 ± 9.1 (range, 45-75) minutes (Table 1).

Notable pain relief was observed in the final control of the patients compared to the pre-operative period. The mean VAS score decreased significantly from 6.77 ± 1.3 pre-operatively to 1.62 ± 1.12 post-operatively ($p<0.001$), (Figure 3-A). The mean AOFAS score increased significantly from 61.23 ± 7.7 pre-operatively to 92.46 ± 6.04 post-operatively ($p<0.001$), (Figure 3-B). According to post-operative AOFAS score, 9 patients had excellent (90–100 points), 3 good (80–89 points), and 1 fair (70–79 points) clinical results, respectively (Table 1). There was also significant post-operative radiological improvement. The mean length of bony hump decreased significantly from 4.12 ± 1.14 pre-operatively to -2.29 ± 1.56 post-operatively ($p<0.001$), (Table 1), (Figure 3-C). No complication was noted such as infection, irritating scars or neurovascular complication.

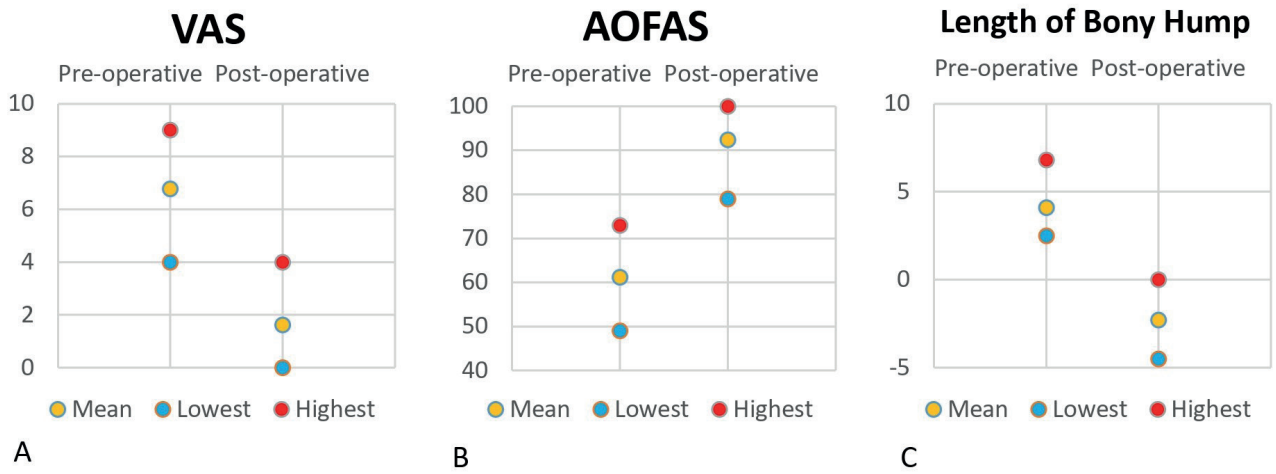

Figure 3. Comparison of pre- and post-operative results for (A) VAS, (B) AOFAS and (C) length of bone prominence.

Table 1. Demographic characteristics, pre-operative and post-operative clinical and radiological findings

Variable	Pre-operative Value	Post-operative Value	P
Sex: M (%) / F (%)	8 (61.5 %) / 5 (38.5 %)		
Age (Years)			
Mean ± SD (Range)	47.46 ± 6.63 (38-60)		
Operated Side			
Right: n (%)	7 (53.8 %)		
Left: n (%)	6 (46.2 %)		
Follow-up time (Months)			
Mean ± SD	15.92 ± 4.73		
(Range)	(8-24)		
Duration of Surgery (Minutes)			
Mean ± SD	58.08 ± 9.1		
(Range)	(45-75)		
VAS			
Mean ± SD	6.77 ± 1.3		<0.001
(Range)	(5-9)		
AOFAS Score			
Mean ± SD	61.23 ± 7.7		<0.001
(Range)	(49-73)		
AOFAS Class: n (%)			
Excellent	-	9 (69 %)	
Good	-	3 (23 %)	<0.001
Fair	3 (23 %)	1 (8 %)	
Poor	10 (77 %)	-	
Length of Bony Hump (mm)			
Mean ± SD	4.12 ± 1.14	-2.29 ± 1.56	<0.001
(Range)	(2.5-6.8)	(-4.5-0)	

M: Male, F: Female, SD: Standard Deviation, VAS: Visual Analogue Scale, AOFAS: American Orthopedic Foot and Ankle Society.

DISCUSSION

The main finding of the present study was that post-operative functional scores were improved and pain was relieved significantly, compared to the pre-operative period. According to the AOFAS scoring, 92.3% (12/13) of the patients had excellent and good results. Although our series had a small number of patients, we did not observe any post-operative complications, which is a promising aspect of this surgical method.

However, endoscopic heel surgery is gaining ground, many centers still perform open surgery. Whether it is conventional or endoscopic calcaneoplasty, complete removal of the bony prominence and debridement of the retrocalcaneal bursa without damage to the Achilles tendon insertion site is critical to surgical success [22]. Endoscopic calcaneoplasty enables excellent medial and lateral visualization, direct examination of the Achilles tendon, adequate removal removal of bone, and the inflamed bursa. It also offers smaller incisions, less morbidity and post-operative pain, earlier functional rehabilitation, and a quicker return to normal daily and sports activities [23,24]. The return to sports time is crucial for especially professional athletes. Open procedures can take up to 9 months, while endoscopic surgeries have an average recovery time of 12 weeks (range: 6 to 24) [25]. In a study by Kaynak et al. endoscopic calcaneoplasty was performed on 5 professional athletes. The athletes were allowed to return to training with the team in the 6th post-operative week and to full sports activities without restrictions in the 12th post-operative week [26].

Jerosch reported a review in 2015, including the results of 164 patients (average follow-up 46.3 months) who underwent endoscopic calcaneoplasty. Good and excellent results were achieved in more than 90% of patients [19]. In our series, although the number of cases was lower (13 cases) and the average follow-up period was shorter (15.9 months), we obtained a similar result (92.3%) in terms of good and excellent outcomes. In 2022, Mahmoud et al published the results of 17 patients on whom they performed endoscopic calcaneopalsty. They reported an increase in AOFAS scores from 55.7 pre-operatively to 94.3 post-operatively, a decrease in VAS scores from 8.1 to 0.7, and excellent and good results in 94% (16/17) of patients [27]. In the study, bony hump length was also measured and recorded for radiological evaluation, and mean bony hump length decreased from 4.7 pre-operatively to -0.2 post-operatively. Similarly, in our study, we observed a decrease in the mean length of bone prominence from 4.1 to -2.2. Although the pre-operative bone protrusions in the study by Mahmoud et al. and our study were similar (4.7/4.1), more bone resections were performed in our series (-0.2/-2.2). In our cases, we aimed to perform extensive bone resection, with the hypothesis that would result in greater post-operative relief. On comparison of the mean post-operative AOFAS scores in the two studies, results were similar (94.3/92.5). It can be concluded that post-operative relief is not directly proportional to radiological parameters. Lu et al. reported that there is not a direct correlation between radiological parameters and complaints of the patients in their publication [1], as we noted in the current study. Therefore, when deciding on surgery for Haglund's deformity, radiological measurements alone should not be considered. These measurements should only be used as ancillary information.

Comparing the clinical outcomes of endoscopic and open calcaneoplasty have been the subject of comparisons by researchers. Lietze et al. conducted a study including 50 cases, with 33 cases in the endoscopic group and 17 cases in the open calcaneoplasty group. The post-operative outcomes in both groups were significantly better than the pre-operative outcomes, but there was no difference in the post-operative outcomes between the groups. However the endoscopic group had a lower rate of complications, including altered sensation, infection, and scar tenderness, compared to the open calcaneoplasty group (20% vs. 48%) [28]. Pi et al conducted a study comparing the clinical outcomes of endoscopic (27 patients) and open (20 patients) calcaneoplasty. There was no significant difference between the two groups in post-operative AOFAS scores, VAS and radiological parameters. No complications were observed in the endoscopic calcaneoplasty group, but two patients in the open group experienced local neurological complications, which were reported to have fully recovered spontaneously within six months [29]. It should be noted that some studies are reporting superior results for endoscopic calcaneoplasty compared to open surgeries. Bohu et al. Chimenti et al. and Cusumano et al. declared that the endoscopic technique was superior to open techniques in their studies in 2009, 2017, and 2021, respectively [30,15,7]. Although the number of centers performing endoscopic calcaneoplasty is increasing, the gold standard surgical procedure for Haglund's deformity has not yet been clarified.

The study has limitations such as the retrospective nature of the research, the small number of cases, the short follow-up period, and the lack of a comparison group.

CONCLUSION

Endoscopic calcaneoplasty is a reliable treatment method in patients with Haglund's deformity, that provides rapid recovery, early return to daily activities and sports, and a low complication rate. Trials with larger patient populations, longer follow-ups, and comparison groups may shed more light on this procedure.

Author contribution

Study conception and design: İHR, EÇ, and NG; data collection: İHR and NG; analysis and interpretation of results: İHR and EÇ; draft manuscript preparation: İHR and EÇ. All authors reviewed the results and approved the final version of the manuscript.

Ethical approval

Ethical approval for this study was obtained from Sanko University Clinical Studies Ethics Committee (Approval number: 202310-19).

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Conflict of interest

The authors declare that there is no conflict of interest.

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