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Haglund's Triad Treatment Using a Central Tendon-Splitting Approach: Patient Satisfaction and Surgical Outcomes

Léčba Haglundovy trias z přístupu s využitím centrálního protnutí šlachy: spokojenost pacienta a chirurgické výsledky

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ABSTRACT

PURPOSE OF THE STUDY
To evaluate the mid-term clinical results of patients with Haglund's deformity treated with the central tendon-splitting procedure, and to determine the factors related to patient satisfaction. A retrospective evaluation was made of 20 patients treated with the central tendon-splitting procedure for Haglund's deformity by a single surgeon over a 5-year period.

MATERIAL AND METHODS
The patients were evaluated preoperatively and in the postoperative follow-up examinations with the American Orthopedic Foot and Ankle Society (AOFAS) scores and visual analog pain scale scores (VAS). Satisfaction with the surgical results was assessed at 3, 6, 12 months and the final follow-up visit, and the factors affecting patient satisfaction were examined.

RESULTS
Evaluation was made of 13 (65%) females and 7 (35%) males with a mean age of 45.8±8.1 years (range, 37–53 years). The AOFAS values were mean 44.4±8.4 preoperatively, and increased statistically significantly to 89.2±3.2 at the final follow-up examination ($p<0.001$). At 3 months postoperatively, 65% of the patients evaluated the results as good or excellent and this rate was 100% at the final follow-up examination. According to the correlation analysis, the main determinant of patient satisfaction was pain (r:-0.749, $p<0.001$), and a strong positive relationship was determined between the AOFAS score and satisfaction (r: 0.892, $p<0.001$).

DISCUSSION
The results of this study showed that the central tendon-splitting approach can be used in the treatment of Haglund's triad, with low complication rates, and high success and patient satisfaction rates.

CONCLUSIONS
In addition, the two components underlying patient satisfaction with Haglund's surgery were found to be the elimination of pain and the ability to return to normal daily activities.

Key words: Haglund's triad, patient satisfaction, central tendon-splitting approach.

INTRODUCTION

Haglund deformity was first described in 1928 by Patrick Haglund as a painful, bony prominence over the postero/superolateral Achilles tendon, associated with "cultured people" wearing rigid low-back shoes (5). In the following years, it was understood to be a part of a disease complex which included posterocalcaneal heel pain, retrocalcaneal bursitis, Achilles tendinopathy, and calcaneal posterior exostosis, and the disease was named Haglund's triad. Patients generally present with the complaint of posterior heel pain (1, 2, 13).

Although physical therapy and various medical methods, including the selection of appropriate shoes, walking techniques, analgesic anti-inflammatory drugs, corticosteroid injections under ultrasound guidance, and a program of stretching and eccentric exercises, are the first step in treatment, when symptoms cannot be eliminated with conservative treatment approaches, surgical treatment is generally indicated (4, 6, 11).

There are different treatment modalities in the literature (4, 6 ,12, 14). Each of these modalities has advantages and disadvantages (3, 15). The central Achilles tendon-splitting approach in the treatment of Haglund's disease, which was first described by McGarvey et al., allows rapid and comprehensive debridement because optimal visualization of the surgical area is provided at all stages of the operation (7). This results in rapid patient recovery and high patient satisfaction. Although the disease has a history of nearly a century in literature, there are limited data in literature related to treatment approaches, especially surgical treatment modalities (7, 11).

The sharing of experience of the treatment of cases with these types of characteristics would contribute to

the development of treatment modalities and could be of guidance to clinicians in the selection of treatment. No study could be found in literature that has evaluated the factors affecting patient satisfaction after surgery, so this could be the most important contribution of this study to literature.

The aim of this study was to evaluate the mid-term clinical results of patients with Haglund's deformity treated with the central tendon-splitting procedure, and to determine the factors related to patient satisfaction.

MATERIAL AND METHODS

The study was a retrospective cohort study. All procedures were applied in compliance with the Helsinki Declaration. Approval for this study was granted by the Local Ethics Committee (decision no: 2020-15/111 dated:20/10/20). Written informed consent was obtained from all the patients for the surgical procedure, imaging during surgery, and the sharing of personal information for scientific purposes only. From a scan of the patient files, computer records, anamneses, and anaesthesia monitoring forms for the period January 2014 – December 2019, a total of 22 patients were identified who were applied with the central tendon-splitting procedure by a single surgeon because of Haglund's triad. Two patients were excluded from the study; one with incomplete data, and one who refused consent for the data to be used in a scientific study. Therefore, evaluation was made of 20 patients. Evaluation was made of 20 patients, comprising 13 (65%) females and 7 (35%) males, with a mean age of 45.8±8.1 years (range, 37–53 years). The mean follow-up period was 36.3±11.6 months (range, 24.3–57.9 months).

All the patients included in the study had undergone 6 months of conservative treatment before surgery, in the physical examination had posterocalcaneal heel pain, retrocalcaneal bursitis, Achilles tendinopathy, and calcaneal posterior exostosis (Fig. 1), had radiographic findings consistent with the disease (the visualization of calcification within the Achilles tendon and retrocalcaneal bursitis as findings (Fig. 2) associated with Haglund's deformity on ultrasonography (USG) and magnetic resonance imaging (MRI)), and gave permission preoperatively for the use of their data. All patients

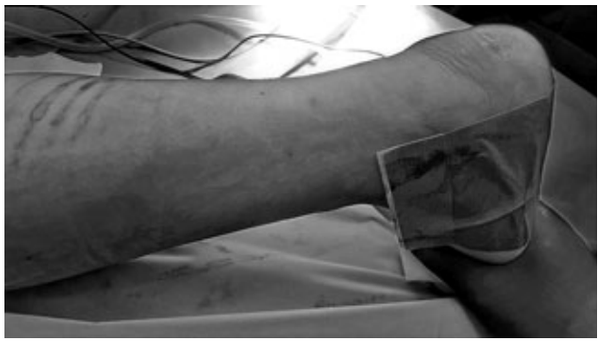

Fig. 1. The appearance of the deformity in a patient planned to undergo surgery because of Haglund's triad.

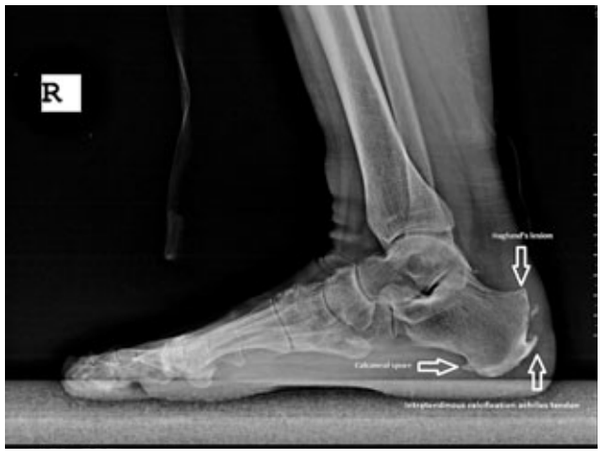

Fig. 2. Radiographic image of Haglund's deformity.

were assessed pre- and postoperatively by a trained physiotherapist from the Orthopaedic Diagnostic Center at our hospital, independently of the surgical team. Patients were excluded if they had experienced previous Achilles tendon rupture or had undergone any previous surgery over the same heel, or if they had undergone surgical correction of Haglund's triad with complete detachment of the Achilles tendon and if conservative treatment had not been applied, if consent was not given for the use of data, or the data were incomplete. Nonsteroid anti-inflammatory drugs, a removable ankle orthosis, heel support, and physiotherapy methods were applied alone or in combination to the patients as conservative treatment.

The patients were evaluated preoperatively and at postoperative 3, 6, 12, and 24 months or later with the American Orthopedic Foot and Ankle Society (AOFAS) scores and visual analog pain scale (VAS) values.

For evaluation of the success of the surgical technique and its appropriacy for use on other patients in our clinic, patient satisfaction with the surgical results was evaluated at postoperative 3, 6, and 12 months or later. The modified Morselli et al. scale evaluating patient satisfaction was used (8). In this method, patients first indicate their level of satisfaction with the surgical results on a 10 cm line marked in cm from 0 to 10, where 0 represents a minimum level of satisfaction and 10, the maximum. The point indicated is multiplied by 100 and evaluated as 0–25 = very bad, 26–50 = bad, 51-75 = good, and 76–100 = excellent. In the statistical evaluations, the patients were separated into two groups of dissatisfied with points ≤50 and satisfied with points >50.

Factors statistically related to patient satisfaction were selected from criteria in the AOFAS score which could be associated with patient satisfaction. The parameters evaluated were pain (ref: moderate and severe), activity limitations, support requirements (ref: limited daily and recreational activities - severe limitation of daily and recreational activities), maximum walking distance, blocks (ref: ≤three), walking surfaces (ref: severe difficulty on uneven terrain, stairs, inclines, ladders), gait abnormality (ref: obvious and marked), sagit-

tal motion (ref: moderate and severe restriction), hindfoot motion (ref: moderate and marked restriction).

The VAS and AOFAS scores were also included in the evaluations of patient satisfaction.

Surgical technique

Surgery was preceded by preoperative planning and X-ray templating. Posterior incisions were marked referencing the evidence on lateral radiographs, and the posterior superior prominence and other landmarks apparent on plantar radiographs. The angle, orientation and width of the wedge to be removed must be predefined to obtain proper correction. Each patient was positioned prone and fluoroscopy-guided skin incisions were made with Kirschner wires used to locate landmarks, i.e., the calcaneus and the positions of deeper posterior incisions (Fig. 3). Similar to the procedure followed for repair of Achilles tendon rupture, a full-thickness skin incision was made, and the Achilles tendon was separated posterior to the bone surface using a sagittal saw fitted with either a large or small blade, as required. The ankle joint was plantar flexed, and using sharp and blunt dissection, the Achilles tendon central zone was divided while protecting the lateral zone. The calcaneal exostectomy was applied starting just superior to the insertion of the Achilles fibers on the calcaneus and was continued at an approximately 45° angle to the long axis of the tendon as far as the posterior-superior surface of the calcaneus. This was resected and the edges were smoothed with a rongeur and rasp. Tendon deformation was minimal. After calcaneal exostectomy and decompression, the Achilles tendon central zone was repaired with anchor sutures. All patients were forbidden to use the bandaged foot for 6 weeks; all were walking by one month postoperatively. Sutures were removed after two weeks, but the non-weight-bearing cast remained for four weeks. Then a removable weight-bearing cast boot was applied, and active plantar flexion and dorsiflexion exercises were initiated.

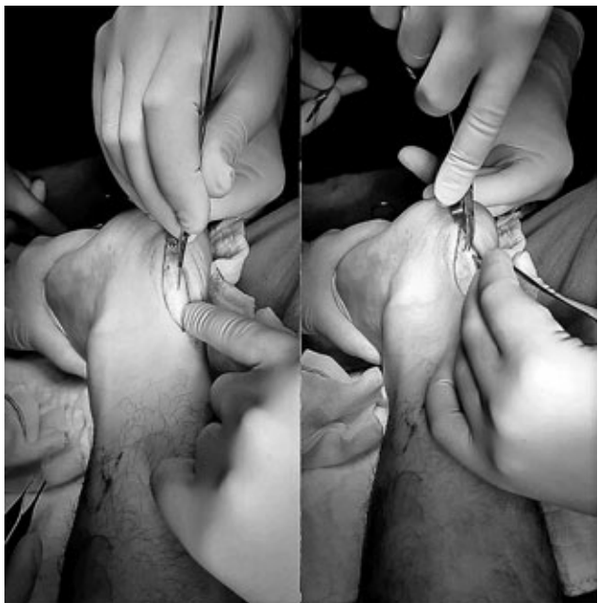

Fig. 3. Application of the central tendon-splitting method in a male patient.

Table 1. Demographic variables and surgical results of the patients

Variables	Mean ± SD (range) (n=20)
Age (year)	45.8 ± 8.1 (37–53)
Gender (female, n,%)	13 (65%)
BMI (kg/m²)	28.3 (27.2–30.9)
Side of operated heel **right (n,%)** **left**	 8 (40%) 12 (60%)
Follow-up duration (month)	36.3 ± 11.6 (24.3–57.9)
Postoperative early complications **superficial infection** **hyperesthesia** **scar development** **Achilles tendon rupture**	 1 (5%) 2 (10%) 1 (5%) 0 (0%)
Preoperative VAS score	8.4 ± 0.9 (5–9)
Preoperative AOFAS score	44.4 ± 8.4 (33–62)
Return to normal function (months)	3.9 ± 2.7 (2–10)
Return to sporting activity (months)	4.8 ± 4.2 (4-19)
AOFAS –American Orthopaedic Foot and Ankle Society, BMI – Body mass index., VAS – Visual analog scale.	

Statistical analysis

All statistical analyses were performed using SPSS software (ver. 18.0; IBM Corp., Armonk, NY, USA). Conformity of the data to normal distribution was assessed using the Kolmogorov Smirnov and Shapiro Wilk tests. Variables showing normal distribution were stated as mean ± standard deviation (SD), and those not showing normal distribution as median and interquartile range. As the VAS and AOFAS results did not meet parametric assumptions, the statistical significance of the change over time for these parameters was examined using the Friedman test. When paired comparisons were necessary, the Wilcoxon test with Bonferroni correction was used. Total type-1 error level of 5% was used for statistical significance. The factors related to patient satisfaction were examined using Pearson and Spearman correlation analysis. A value of $p<0.05$ was accepted as statistically significant.

RESULTS

The demographic data of the patients are shown in Table 1. The AOFAS values were mean 44.4±8.4 preoperatively, and increased statistically significantly to 89.2±3.2 at the final follow-up examination ($p<0.001$) (Fig. 4). The VAS scores were determined to have statistically significantly decreased over time from 8.4±0.9 preoperatively to 1.8±0.7 at the final follow-up examination ($p<0.001$). The VAS values are shown in Figure 5,

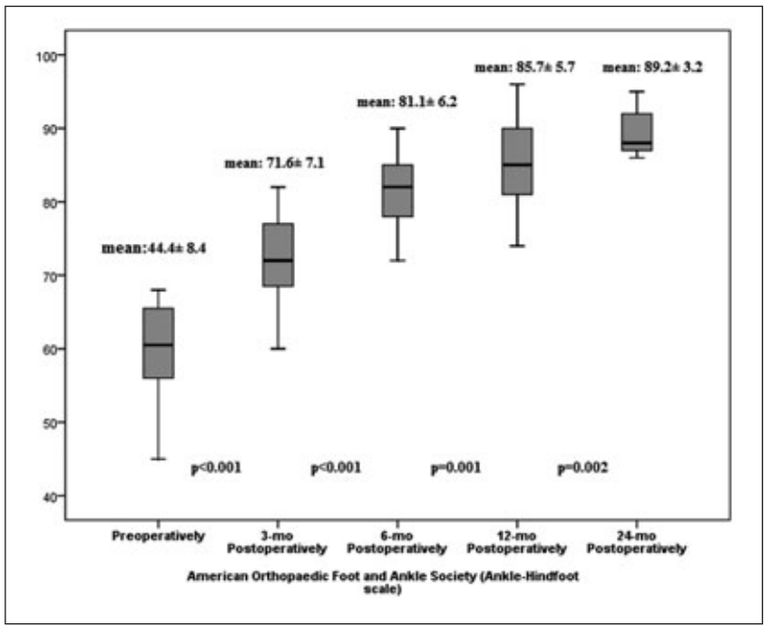

Fig. 4. The change in AOFAS scores from the preoperative to postoperative periods.

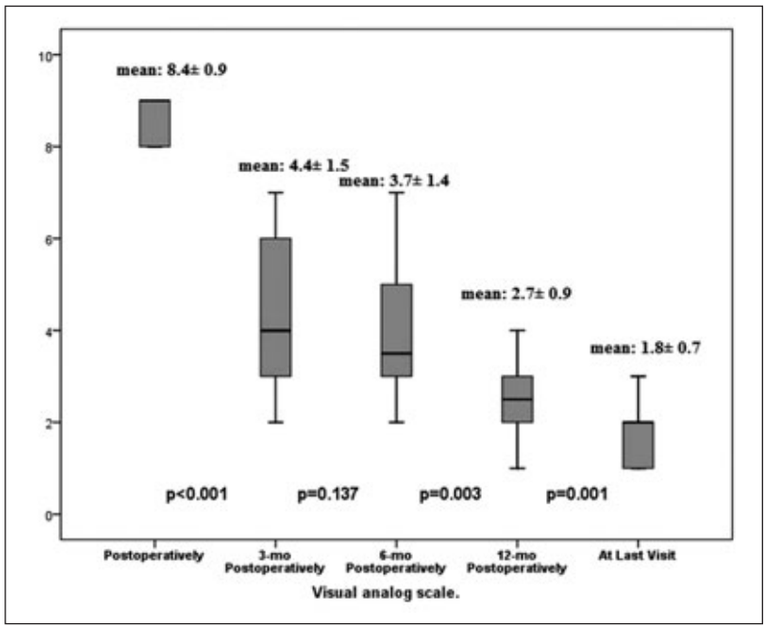

Fig. 5. The change in VAS scores from the preoperative to postoperative periods. The p-values show the difference between each value and the preceding value.

with the p values showing the difference between each value and the preceding value.

In the evaluation of the postoperative satisfaction of the patients, 65% of the patients evaluated the results as good or excellent at 3 months postoperatively, and this rate was 100% at the final follow-up examination (Table 2). The parameters related to patient satisfaction and the changes over time are shown in Table 3. According to the correlation analysis, the main determinant of patient satisfaction was pain (r: -0.749, $p<0.001$), and a strong positive relationship was determined between the AOFAS score and satisfaction (r: 0.892, $p<0.001$).

When the parameters within the AOFAS score were evaluated according to the contributions to patient satisfaction, the two most effective factors at the 3-month follow-up visit were determined to be pain (r: -0.681, $p = 0.001$), and activity restriction (r: -0.659, $p = 0.002$). At the subsequent follow-up examinations, although the above parameters were associated with patient satisfaction, the level of significance was seen to have decreased together with the decrease in the number of patients dissatisfied with the surgical results due to the decrease in pain as the patients recovered and the elimination of limited movement. This is clearly reflected in the table as there were no dissatisfied patients at the final follow-up visit.

Evaluation was made of postoperative complications related to the surgical results. In one patient, surface wound infection was seen to develop in the operation area. Before starting empirical antibiotherapy, the skin was opened in this patient and samples were taken for culture and gram staining. The complaints recovered with open wound care and antibiotic treatment, then secondary

Table 2. Patient satisfaction with the surgical results at the postoperative follow-up examinations

	Patient satisfied 3-m postoperatively	Patient satisfied 6-m postoperatively	Patient satisfied 12-m postoperatively	Patient satisfied at last visit
Likert scale				
very bad (0–25 points)	2 (10%)	1 (5%)	0 (0%)	0 (%)
bad (26–50 points)	5 (25%)	3 (15%)	1 (5%)	0 (%)
good (51–75 points)	10 (50%)	10 (50%)	10 (50%)	8 (40%)
excellent (76–100 points)	3 (15%)	5 (25%)	9 (45%)	12 (60%)

Table 3. Evaluations of the factors affecting patient satisfaction

	patient satisfied 3-m postoperatively		Patient satisfied 6-m postoperatively		Patient satisfied 12-m postoperatively		Patient satisfied at last visit	
	r	p	r	p	R	p	R	p
VAS score	-0.749*	***<0.001***	-0.500**	***0.025***	-0.480*	***0.032***	-	-
AOFAS	0.892**	***<0.001***	0.688**	***0.001***	0.553*	***0.011***	-	-
Pain (ref: moderate and severe)	-0.681**	***0.001***	-0.491*	***0.028***	-0.459*	***0.042***	-	-
Activity limitations, support requirements (ref: limited daily and recreational activities – severe limitation of daily and recreational activities	-0.659**	***0.002***	-0.649**	***0.002***	-0.480**	***0.039***	-	-
Maximum walking distance, blocks (ref:≤ three)	-0.471*	***0.036***	-0.455*	***0.044***	-0.324	0.214	-	-
Walking surfaces (ref: severe difficulty on uneven terrain, stairs, inclines, ladders)	-0.314	0.177	-0.375	0.103	-0.228	0.319	-	-
Gait abnormality (ref: obvious and marked)	-0.228	0.234	-0.214	0.306	-0.189	0.660	-	-
Sagittal motion (ref: moderate and severe restriction)	-0.479*	***0.031***	-0.441	***0.047***	-0.274	0.162	-	-
Hindfoot motion (ref: moderate and marked restriction)	-0.411*	***0.046***	-0.38	0.094	-0.226	0.322	-	-

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

closure of the skin was applied on the 12th day. In the subsequent period, scar development and hyperesthesis in the incision area were observed in this patient. Deep infection in the surgical area or Achilles tendon rupture did not develop in any patient in this series. All the patients were able to perform normal daily activities at mean 3.9±2.7 months, and activities requiring more effort, such as exercise and sports at approximately 5 months without pain. In one patient, the time to resuming normal functions (10th month postoperatively) and sports activities (19 months) was extremely delayed.

DISCUSSION

The results of this study will be discussed under two main headings. The first of these is the mid-term results of the surgical method used in treatment. Although the main aim was to evaluate patient satisfaction, it is necessary to present the surgical results as this disease is relatively little known and the procedure is relatively uncommon in orthopaedic surgical practice. The second heading is the evaluation of the factors affecting patient satisfaction with the surgical procedure used.

As a brief summary of the results of this study, 22 patients were operated on because of Haglund's deformity in a 5-year period, and 20 patients were included in the study. The central tendon-splitting approach was used as the surgical technique in all the patients. In the early postoperative period, 65% of the patients were satisfied because of factors such as pain and restricted joint movement, and at the final follow-up visit, patient satisfaction had reached 100%. In the correlation analyses applied, pain and activity restriction were seen to be the most important factors with a negative effect on satisfaction.

There are few relatively studies in literature on the surgical treatment of Haglund's deformity. In a literature scan of "PubMed" and "Google Scholar" performed on 23.08.2020, there were seen to be 87 articles evaluating surgical treatment of the disease. These were generally retrospective studies with a low number of patients, and there were very few studies which compared different surgical methods used in treatment. The number of studies related to the method used in the current study was seen to be even lower and were retrospective in design.

Although the disease has been known for many years, the low number of studies in literature may be due to insufficient knowledge of the disease, the patients not giving importance to the subject, the success of medical treatment methods or patients not wanting surgical treatment. However, there is a gap in the literature related to this, and there can be considered to be a need for multidisciplinary studies to clarify this issue.

Various treatment approaches have been described for treatment of Haglund's deformity, including a Cincinnati transverse incision, vertical J-shaped medial or lateral incision, a double incision and the central-splitting approach (6, 7). Although there are no studies in literature on which of these methods is more reliable, or which provides higher patient satisfaction, recent data have shown that by providing a better visual area, the tendon central-splitting approach allows optimal debridement of the diseased area, and minimal damage to the healthy tendon. This results in more rapid postoperative tissue healing, less pain, earlier patient mobilisation, and an earlier return to daily activities. Therefore patient satisfaction rates are high (15). In 2002, McGarvey et al. introduced the central-splittting approach in the treatment of Haglund's triad in a series of 22 cases, and reported that the results were comparable with those

of other approaches with 91% of patients returning to routine activities, and a patient satisfaction rate of 82% (12). In a study by Nunley et al. that evaluated the long-term (mean 7 years) results of the method, patient satisfaction was reported at the rate of 96% (9). One of the most interesting studies of this method was by Ahn et al., in which a different perspective was presented of the study design and results, although only 15 cases were included. The AOFAS scores were reported to improve from 62.1±7.5 to 92.5±3.5 and the Victorian Institute of Sport Assessment-Achilles score from 53.2±7.4 to 89.6±3.4. With a 3.5-year follow-up period, that study made a valuable contribution to literatüre (1). In another recent study of 22 patients followed up for mean 15.1±4.6 months, the AOFAS score was seen to have increased from preoperative 46.0±24.4 to 78.0±26.4 at the final follow-up examination (14). In the current study, the patients were followed up for 36.3±11.6 months, which was a similar period to that of the Ahn et al. study, and the AOFAS scores increased from mean 44.6±14.8 preoperatively to 89.2±3.2 at the final follow-up examination, which was seen to be similar to results in literature.

Pain is known to be the most important component driving patients to seek treatment for Haglund's triad. Patients have complaints of pain and limited joint movement causing restrictions in normal life and inability to perform daily tasks (1, 14, 15). In studies of patients who require surgery, VAS scores have been reported to decrease independently of the surgical technique used (1, 4, 6, 10, 14). However, because of the essential exposure to stresses such as pain and movement applied to the area by the surgeon, pain may continue for months in most cases and this is reflected negatively in patient satisfaction (15). In a study by Xia et al., the VAS values were reported to have decreased in the 6th month postoperatively (from 7.8±2.0 to 4.1±3.0) and at the end of a mean follow-up period of 15.1±4.6 months, decreased as far as 1.8±2.7 (14). In another recent study by Gillis, the VAS values were shown to decrease from 7.25 to 1.81 (3). In the current study, the VAS values decreased over time to 1.8±0.7 at the final follow-up examination, and these results were seen to be consistent with data in literature.

Some complications were seen in our study. In one patient, the time to resuming normal functions (10^{th} month postoperatively) and sports activities (19 months) was extremely delayed. However, this can be attributed to the fact that this patient was the oldest in the study (53-year-old), was using drugs containing steroids because of chronic obstructive pulmonary disease, and had concomitant pathologies such as diabetes mellitus which negatively affected wound healing. That this was the patient who developed wound infection could also be a reason. While Ahn et al. reported no development of complications in their series (1), Xia et al. reported delayed wound healing in one patient and loss of sensation in the heel region in one patient (14).

In the current study, all the patients were seen to be satisfied with the results at the final follow-up examination. At the 3-month follow-up examination, this rate was 65%, and the level of satisfaction was determined to have increased over time. This suggested that evaluation of the factors affecting patient satisfaction coud be of guidance to surgeons in respect of increasing patient satisfaction. Therefore, in the current study, first evaluation was made of the AOFAS score as a whole, then the parameters in the AOFAS scale in respect of the effects on patient satisfaction. Despite a separate pain evaluation within the AOFAS score, the VAS value was evaluated separately to be able to observe patient consistency in the results. In the examination, the two factors with the greatest effect on patient satisfaction were determined to be pain and limited movement continuing postoperatively. Although significant correlations were eliminated because all patients were satisfied with the results at the final follow-up examination, pain and activity limitation were observed to be associated with satisfaction, even in 2 patients who were not satisfied at 12 months.

As stated in the complications section, the pain level and daily activities returned to normal in one patient at 10 months postoperatively. These were seen to be the main reasons determining patient dissatisfaction with the surgery, and the presentation of this in this study can be considered valuable. As there is no similar study in literature, there can be no detailed discussion, but these results can be of guidance to surgeons involved in this subject.

There were some limitations to this study, primarily the retrospective design and low number of patients. In comparison with other orthopaedic procedures, this is an uncommon procedure with strict selection criteria, which explains the low number of patients. However, the study can be considered of great value as evaluation was made of a subject that has not been studied before with Haglund's deformity and can be a guide for future similar studies. Another important limitation was that this was not a comparative study. Therefore, further studies comparing the central tendon-splitting approach with other surgical procedures would be important for the determination of the most appropriate surgical approach for this disease.

In conclusion, the results of this study showed that the central tendon-splitting approach can be used in the treatment of Haglund's triad, with low complication rates, and high success and patient satisfaction rates. In addition, the two components underlying patient satisfaction with Haglund's surgery were found to be the elimination of pain and the ability to return to normal daily activities. Therefore, in treatment of the disease, it can be considered that the use of surgical procedures causing minimal tendon damage and allowing optimal debridement by providing an optical visual area, will increase patient satisfaction.

Informed consent. *All participants were informed that their information was coded and would be kept confidential.*
Compliance with Ethical Requirements. *This manuscript has not been published elsewhere and is not under consideration by another journal.*
Conflicts of interest*. The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript. The authors report no involvement in the research by the sponsor that could have influenced the outcome of this work.*

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