

Original Article

Functional evaluation of patients undergoing endoscopic calcaneoplasty for Haglund deformity

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Abstract

Objective: To analyze the functional outcomes of patients undergoing endoscopic calcaneoplasty for the treatment of Haglund deformity.

Methods: This study consists of a case series of patients undergoing endoscopic calcaneoplasty. The American Orthopaedic Foot and Ankle Society ankle-hindfoot scale, was used to evaluate patients before and 12 months after the procedure, providing preoperative and postoperative scores.

Results: Nineteen patients were evaluated for a total of 24 endoscopic calcaneoplasties. The American Orthopaedic Foot and Ankle Society scale provided a mean preoperative score of 31.4 and a mean postoperative score of 93.3, which shows a significantly increased score after surgery. The mean patient age was 52 years, and the youngest patient was 25 years old and the oldest patient was 73 years old. However, no significant relationship was found between age and change in the American Orthopaedic Foot and Ankle Society score. No complications were observed in the immediate or late postoperative periods.

Conclusion: Arthroscopic resection is efficient in the treatment of Haglund deformity given the significant improvement in the American Orthopaedic Foot and Ankle Society score observed after the procedure. Also, no postoperative complications were seen in patients who underwent endoscopic calcaneoplasty.

Level of Evidence: IV; Therapeutic Studies; Case series.

Keywords: Calcaneus/surgery; Exostoses; Endoscopy; Bursitis; Arthroscopy.

Introduction

Haglund syndrome refers to a triad formed by an increased posterolateral calcaneal prominence (Haglund deformity), retrocalcaneal bursitis, and insertional Achilles tendinopathy. The typical clinical presentation consists of pain, edema, and hyperemia in the posterior region of the calcaneus, close to the calcaneal tendon insertion⁽¹⁾.

The retrocalcaneal bursa provides a gliding surface for the Achilles tendon during dorsiflexion and plantar flexion movements⁽²⁾. Retrocalcaneal bursitis is caused by impingement of the retrocalcaneal bursa between the posterolateral process of the calcaneus and the anterior aspect of the Achilles tendon⁽³⁾.

Achilles tendinopathy is caused by friction of the anterior Achilles tendon insertion against the bony prominence, especially when combined with a shortened triceps surae muscle. This results in local damage to the tendon and can lead to the appearance of partial longitudinal intratendinous tears⁽⁴⁾.

The condition usually affects middle-aged individuals, preferably women, and is often bilateral. Differential diagnoses include traumas, such as calcaneal stress fracture or pseudoarthrosis from tongue-type calcaneal fractures; infections, such as calcaneal tuberculosis; neoplasms, such as calcaneal osteochondroma; and inflammations, such as seronegative spondyloarthropathies⁽⁵⁻⁷⁾.

Study performed at the Hospital Vera Cruz, Campinas, SP, Brazil.

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The etiology in most patients is idiopathic. However, several contributing factors have been associated with the onset of the condition, such as excessive exercise performed by runners, tight shoe wear, or altered subtalar joint biomechanics⁽⁸⁾.

Diagnosis is based on clinical and imaging findings. Physical examination demonstrates increased volume and sensitivity to palpation over the bursa, which intensifies with passive dorsiflexion and plantar flexion of the ankle against resistance, in addition to pain, edema, and redness⁽⁹⁾. Lateral radiographs show a bony prominence (Haglund deformity) on the posterosuperior part of the calcaneal tuberosity, calcaneal edema, and increased density in bursae situated anteriorly to the calcaneal tendon⁽¹⁰⁾. Magnetic resonance imaging (MRI) is reserved for doubtful cases and allows an accurate assessment of soft tissues, calcaneal edema, local synovitis, and changes in the calcaneal tendon, if present⁽¹¹⁾.

Treatment is based on conservative and surgical approaches. Conservative approaches include adjustments to high heels, reassessment of the patient's shoe wear, and use of heel lifts to elevate the hindfoot⁽¹²⁾. Nonsteroidal anti-inflammatory drugs (oral or topical), bag of ice, stretching exercises and physiotherapy, rest, and immobilization can reduce the tension in the calcaneal tendon^(12,13). However, 50% to 65% of patients do not respond to conservative treatment after 6 months, and surgical treatment is then indicated⁽¹³⁾.

Open surgical treatment consists of an extensive posterior longitudinal incision for release of the calcaneal tendon, combined with a wedge osteotomy of the posterosuperior region of the calcaneus^(14,15). Complications of open surgical treatment include skin breakdown, Achilles tendon avulsion, possible weakening of the bone structure when the entire posterosuperior aspect of the calcaneus is removed, recurrent pain caused by inadequate amounts of bone being resected, hypersensitivity around the operative wound, and stiffness of the Achilles tendon resulting in decreased dorsiflexion^(12,14).

Arthroscopic techniques have become an important tool for diagnosing and treating intra-articular ankle abnormalities, such as anterior and posterior impingement syndromes, synovitis, and osteochondral lesions, for evaluating and removing free bodies, and for treating arthrosis. These techniques are effective and have lower complication rates than open techniques, as they are less aggressive to the skin, avoid complications arising from the surgical route, cause less postoperative pain, accelerate functional rehabilitation, and allow early discharge⁽¹²⁾.

Van Dijk et al.⁽¹⁴⁾ first described in 2001 a technique that is indicated for cases of pain, hypersensitivity, and hyperemia related to a posterosuperior calcaneal prominence with retrocalcaneal bursitis and imaging findings showing retrocalcaneal bursitis and mechanical impingement of Haglund deformity close to the tendon – thus consistent with Haglund syndrome –, after failed conservative treatment^(9,16). The procedure was named “endoscopic calcaneoplasty” and, since then, several studies have explored different arthroscopic portals, most of which presented good results and few complications⁽¹²⁾. Endoscopic calcaneoplasty is contraindicated

for cases of insertional calcific tendinosis, vascular insufficiency, and local infection⁽¹⁶⁾.

This study aimed to evaluate the functional outcome of patients undergoing endoscopic calcaneoplasty for the treatment of Haglund deformity.

Methods

The study was conducted at our institution between February and July 2021, after Research Ethics Committee approval (opinion no. 4.450.41, CAAE no. 39077820.5.0000.5412).

This is an evaluation of a case series with retrospective data collected from patients undergoing endoscopic calcaneoplasty to correct Haglund deformity. The following variables were evaluated: patient's age at the time of surgery, gender, and laterality of the condition. Clinical examination, radiography, and nuclear MRI were used for diagnostic purposes. Patients aged 18 years or over, clinically and radiologically diagnosed with Haglund syndrome, and surgically treated with endoscopic calcaneoplasty were included in the study. Patients with previous calcaneal fractures, with previous surgeries to treat Haglund syndrome, or patients already treated for Achilles tendon rupture were excluded.

The American Orthopaedic Foot and Ankle Society (AOFAS) has developed a standardized system for clinical and functional assessment of different parts of the foot, providing a better tool for analysis of foot conditions and proposal of therapeutic plans. The specific rating scale for the ankle and hindfoot consists of nine items, divided into three categories: pain (40 points), function (50 points), and alignment (10 points), with 100 possible points (Appendix). During preoperative outpatient follow-up, the AOFAS questionnaire was administered to the selected patients by a trained team member (BAM). Twelve months after the surgical procedure (endoscopic calcaneoplasty to treat Haglund deformity), the AOFAS questionnaire was administered for a second time by the same team member, and then the results were compared by statistical methods⁽¹⁷⁾.

A descriptive analysis included measures of location and dispersion (mean, standard deviation, median, minimum and maximum values) for continuous variables and frequency tables (absolute and relative values) for categorical variables. For the study of the AOFAS scores obtained by the same participant over time, generalized estimating equations (GEEs) were used. Estimates were calculated by maximum likelihood to control for not assuming independence between the participants and the difference in measurements for each participant. Data were transformed into ranks because they were not normally distributed. Significance level for statistical tests was set at 5%.

Results

Nineteen patients were evaluated and 5 of them underwent the bilateral procedure, which resulted in 24 endoscopic calcaneoplasties to correct Haglund deformity. Eleven procedures were performed on the right side (45.83%) and 13 on the left side (54.17%), as shown in table 1.

Table 1. General descriptive analysis

| Preoperative AOFAS score | | | | | |
|--------------------------|-----------|------------|----------------------|--------|---------|
| Age | | | | | |
| N | Mean | SD | Minimum | Median | Maximum |
| 19 | 52.0 | 13.9 | 25.0 | 53.0 | 73.0 |
| Operated side | | | | | |
| SIDE | Frequency | Percentage | Cumulative frequency | | |
| Right | 11 | 45.83 | 11 | | |
| Left | 13 | 54.17 | 24 | | |
| Pain | | Frequency | Percentage | | |
| 0 | | 21 | 87.50 | | |
| 20 | | 3 | 12.50 | | |
| Function | | Frequency | Percentage | | |
| 0 | | 2 | 8.33 | | |
| 4 | | 4 | 16.67 | | |
| 7 | | 18 | 75.00 | | |
| Distance | | Frequency | Percentage | | |
| 0 | | 5 | 20.83 | | |
| 2 | | 7 | 29.17 | | |
| 4 | | 4 | 16.67 | | |
| 5 | | 8 | 33.33 | | |
| Surface | | Frequency | Percentage | | |
| 0 | | 10 | 41.67 | | |
| 3 | | 7 | 29.17 | | |
| 5 | | 7 | 29.17 | | |
| Gait | | Frequency | Percentage | | |
| 0 | | 8 | 33.33 | | |
| 4 | | 10 | 41.67 | | |
| 8 | | 6 | 25.00 | | |
| SAGITTAL | | | | | |
| MOTION | | Frequency | Percentage | | |
| 0 | | 8 | 33.33 | | |
| 4 | | 9 | 37.50 | | |
| 8 | | 7 | 29.17 | | |
| HINDFOOT | | | | | |
| MOTION | | Frequency | Percentage | | |
| 0 | | 7 | 29.17 | | |
| 3 | | 9 | 37.50 | | |
| 6 | | 8 | 33.33 | | |
| ANKLE | | | | | |
| STABILITY | | Frequency | Percentage | | |
| 0 | | 18 | 75.00 | | |
| 8 | | 6 | 25.00 | | |

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...Continuation

Table 1. General descriptive analysis

| ALIGNMENT | Frequency | Percentage | |
|---------------------------|-----------|------------|------------|
| 0 | 5 | 20.83 | |
| 5 | 13 | 54.17 | |
| 10 | 6 | 25.00 | |
| Postoperative AOFAS score | | | |
| PAIN | | Frequency | Percentage |
| 20 | | 1 | 4.17 |
| 30 | | 7 | 29.17 |
| 40 | | 16 | 66.67 |
| FUNCTION | | Frequency | Percentage |
| 7 | | 1 | 4.17 |
| 10 | | 23 | 95.83 |
| DISTANCE | | Frequency | Percentage |
| 2 | | 1 | 4.17 |
| 5 | | 23 | 95.83 |
| SURFACE | | Frequency | Percentage |
| 3 | | 5 | 20.83 |
| 5 | | 19 | 79.17 |
| GAIT | | Frequency | Percentage |
| 4 | | 1 | 4.17 |
| 8 | | 23 | 95.83 |
| SAGITTAL | | | |
| MOTION | | Frequency | Percentage |
| 4 | | 8 | 33.33 |
| 8 | | 16 | 66.67 |
| HINDFOOT | | | |
| MOTION | | Frequency | Percentage |
| 3 | | 1 | 4.17 |
| 6 | | 23 | 95.83 |
| ANKLE | | | |
| STABILITY | | Frequency | Percentage |
| 6 | | 1 | 4.17 |
| 8 | | 23 | 95.83 |
| ALIGNMENT | | Frequency | Percentage |
| 10 | | 24 | 100.00 |

Note: AOFAS: American Orthopaedic Foot and Ankle Society; SD: standard deviation; N: number.

Preoperative questionnaire data showed a mean AOFAS score of 31.4, with a standard deviation of 21, a median of 25, and minimum and maximum values of 0 and 77, respectively. Postoperative questionnaire data showed a mean AOFAS score of 93.3, with a standard deviation of 8, a median of 96, and minimum and maximum values of 68 and 100, respectively (Table 2).

Thus, the descriptive analysis and the AOFAS score comparison between pre- and postoperative time points had a p-value (GEE) <0.0001. In figure 1, pre- and postoperative AOFAS scores were compared; (a) shows the dispersion of the AOFAS score at each time point for each patient, and (b) features bars representing median and interquartile range. There was a significant difference between the evaluations, which indicates a significant overall increase in the score after surgery and, therefore, a significant improvement after the surgical procedure.

The relationship between patient's age and AOFAS score was also studied. The mean age of patients was 52 (25-73) years, and the median age was 53 years. The GEE for this relationship found a p-value = 0.3373, which indicates that there was no interaction between age and improvement in the total AOFAS score or in any of its components. That is, functional improvement is independent of patient's age.

Discussion

Once the diagnosis of Haglund syndrome is confirmed by the sum of history taking, clinical evaluation, and imaging tests (radiography and MRI), conservative outpatient treatment is initiated. If the clinical symptoms remain at six-month follow-up, surgery is indicated.

The patients evaluated in this study underwent endoscopic calcaneoplasty, which consists of a bone resection performed arthroscopically, with use of two distal calcaneal paratendinous approaches (medial and lateral). The procedure aims to decompress the Achilles tendon, the bursa, and other retrocalcaneal soft tissues⁽¹⁸⁾.

According to statistical data from this study, subjective aspects pointing to an improved AOFAS score were observed: the mean preoperative score was 31.4, while the mean postoperative score rose to 93.3. The results of this study are consistent with those of a systematic review published in November 2020 by the European Society for Sports Traumatology, Knee Surgery and Arthroscopy (ESSKA), which found that the correction of Haglund deformity provides a good clinical status and a low complication rate. The endoscopic approach ensures significantly better postoperative AOFAS scores and a faster return to daily activities when compared to open surgery⁽¹⁹⁾.

Table 2. Descriptive analysis and comparison of American Orthopaedic Foot and Ankle Society scores between time points

| Variable | N | Mean | SD | Minimum | Median | Maximum |
|------------------------------------|----|------|------|---------|--------|---------|
| Preop. total | 24 | 31.4 | 21.0 | 0.0 | 25.0 | 77.0 |
| Postop. total | 24 | 93.3 | 8.0 | 68.0 | 96.0 | 100.0 |
| P-value (GEE) <0.0001 ¹ | | | | | | |

Note: ¹Significantly increased score after surgery. SD: standard deviation; GEE: generalized estimated equation; N: number; preop.: preoperative; postop.: postoperative.

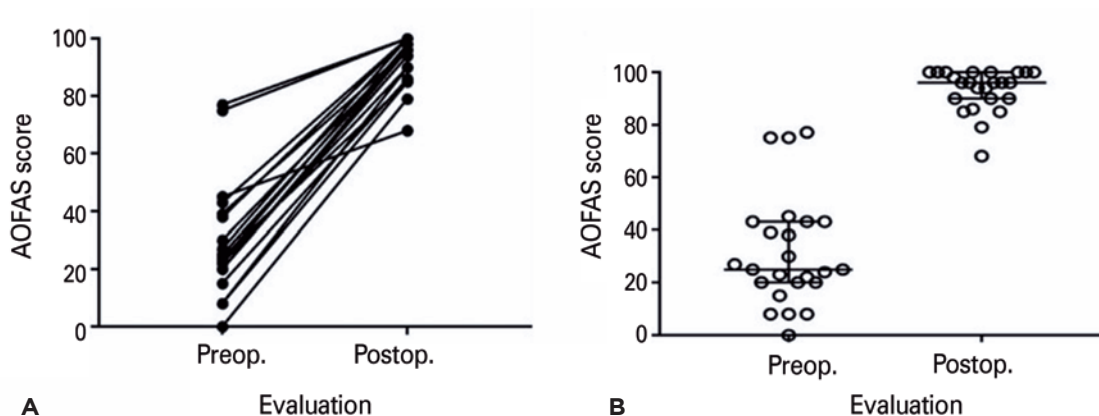



Figure 1. Comparison of AOFAS scores between time points.

Note: AOFAS: American Orthopaedic Foot and Ankle Society; preop.: preoperative; postop.: postoperative.

Finally, there were no postoperative complications in any of the 24 endoscopic surgeries performed: no Achilles tendon rupture, dehiscence, or sign of Achilles tendon infection were identified, either in the immediate postoperative period or in a period of 18 to 36 months after the procedure. These data are in line with findings described in the literature, as other studies have shown good outcomes in terms of improvement of both pain and function^(14,16,19).

Conclusion

Arthroscopic resection is efficient in the treatment of Haglund deformity, which is a conclusion based on the significant improvement observed in the AOFAS score after the procedure. Also, the patients who underwent endoscopic calcaneoplasty in this study had no complications after surgery.

Authors' contributions: Each author contributed individually and significantly to the development of this article: HDB *(<https://orcid.org/0000-0002-1901-3309>) Conceived and planned the activities that led to the study, wrote the paper, participated in the reviewing process, approved the final version; BAM *(<https://orcid.org/0000-0001-9610-6122>) Conceived and planned the activities that led to the study, wrote the paper, participated in the reviewing process, approved the final version; IFP *(<https://orcid.org/0000-0002-6476-2878>) Conceived and planned the activities that led to the study, wrote the paper, participated in the reviewing process, approved the final version; MSPC *(<https://orcid.org/0000-0002-0758-2547>) Participated in the reviewing process, approved the final version; CDCCF *(<https://orcid.org/0000-0003-3522-1076>) Participated in the reviewing process, approved the final version; RGH *(<https://orcid.org/0000-0003-3951-8408>) Participated in the reviewing process, approved the final version. All authors read and approved the final manuscript. *ORCID (Open Researcher and Contributor ID) 

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Appendix 1. AOFAS ankle-hindfoot scale

| AOFAS ANKLE-HINDFOOT SCALE (100 POINTS TOTAL) | |
|--|----|
| Pain (40 points) | |
| • No pain | 40 |
| • Mild, occasional | 30 |
| • Moderate, daily | 20 |
| • Severe, almost always present | 0 |
| Functional (50 points) | |
| • Restraints in activities, support required | 10 |
| • No restraints, no support | 7 |
| • No restraints in daily activities, restrained recreational activities, no support | 4 |
| • Restraints in daily and recreational activities, cane required | 0 |
| Strong restraints in daily and recreational activities; walker, crutches, wheelchair, orthosis (ankle restraint, ankle immobilizer) | |
| Maximum walking distance, in blocks | |
| • More than 6 | 5 |
| • 4 - 6 | 4 |
| • 1 - 3 | 2 |
| • Less than 1 | 0 |
| Walking surfaces | |
| • No difficulties in any surface | 5 |
| • Some difficulty on irregular floors, stairs, steeps and hills | 3 |
| • Strong difficulties on irregular floors, stairs, steeps and hills | 0 |
| Gait abnormality | |
| • No abnormality, mild | 8 |
| • Evident | 4 |
| • Strong | 0 |
| Sagittal mobility (flexion + extension) | |
| • Normal or slightly limited (30° or more) | 8 |
| • Moderate limitation (15° - 29°) | 4 |
| • Strong limitation (less than 15°) | 0 |
| Hindfoot mobility (inversion + eversion) | |
| • Normal or slightly limited (75- 100% of the normal mobility) | 6 |
| • Moderate limitation (25 - 74% of the normal) | 3 |
| • Strong limitation (less than 25% of the normal) | 0 |
| Ankle-Hindfoot stability (anteroposterior, varus-valgus) | |
| • Stable | 8 |
| • Unstable | 0 |
| Alignment (10 points) | |
| • Good, plantigrade foot, well-aligned forefoot and hindfoot | 10 |
| • Fair, plantigrade foot, some degree of misalignment of the ankle and hindfoot, asymptomatic | 5 |
| • Poor, non-plantigrade foot, strong and symptomatic misalignment | 0 |
| TOTAL SCORE: _____ | |