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Achilles tendinopathy: new insights in cause of pain, diagnosis and management

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Chapter 10

Endoscopic calcaneoplasty

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INTRODUCTION

In 1928, the Swedish orthopedic surgeon Patrick Haglund described a patient with a painful hindfoot caused by a prominent posterosuperior aspect of the calcaneus in conjunction with a sharp rigid heel counter⁸. The term Haglund's disease, deformity and syndrome have been used interchangeably, but have also been described as different entities by others.

Nowadays, the term 'Haglund's *deformity*' is used to describe tenderness and pain on the posterolateral aspect of the calcaneus. On physical examination, a bony prominence can be palpated at this location. This entity is described by a variety of different names such as 'pump-bump'⁵, 'cucumber heel'⁶, 'high-prow heels'³¹ and 'winter heel'⁶.

There is more uncertainty on the definition of Haglund's *disease*. It is described to be a synonym for deformity or syndrome, but has also been referred to as an osteochondrosis of the accessory navicular bone^{1,30,35}. For this reason, it will not be considered in this chapter. In Haglund's *syndrome*, the retrocalcaneal bursa is inflamed with concomitant swelling. The swelling is present on both sides of the Achilles tendon at the level of the posterosuperior calcaneal prominence, sometimes in combination with insertional tendinopathy of the Achilles tendon. The syndrome is caused by repetitive impingement of the retrocalcaneal bursa between the anterior aspect of the Achilles tendon and the enlarged posterosuperior aspect of the calcaneus. It occurs most often at the end of the 2nd or the 3rd decade, mainly in females, and is often bilateral. However, it may occur in both sexes and at any age.

In this chapter, the diagnosis and endoscopic treatment for patients with complaints of a *chronic retrocalcaneal bursitis* is described, which can be part of Haglund's deformity and Haglund's syndrome.

DIAGNOSIS

Patients typically describe the onset of pain when starting to walk after a period of rest. The distinction between Haglund's deformity, Haglund's syndrome, and other pathologic conditions of the posterior aspect of the heel, most importantly Achilles tendinopathy, should be made.

Insertional tendinopathy is defined as a tendinopathy of the tendon at its insertion. The pain is most frequently located in the midline at the insertion into the calcaneus. Co-existence with retrocalcaneal bursitis is known.

In Haglund's deformity, a bony prominence can be seen at the posterosuperolateral aspect of the heel, which is painful on palpation. The superficial bursa may be swollen, and the overlying skin can be thickened and dyschromic. A retrocalcaneal bursitis occasionally develops as a result of this deformity.

In Haglund's syndrome, on physical examination swelling can be seen on both sides of the tendon at the level of the posterosuperior calcaneal prominence, and pain can be reproduced

by palpation of the lateral and medial side of the Achilles tendon at this level. With dorsiflexion of the ankle, the anterior part of the tendon impinges against the posterosuperior rim of the calcaneus, leading to retrocalcaneal bursitis. A hindfoot varus and a pes cavus are both predisposing factors for heel pain. In the cavus foot, the calcaneus is not only in varus malalignment, but it is also more vertical, which results in a more prominent projection posteriorly⁷.

MANAGEMENT

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Multiple options have been described to manage chronic retrocalcaneal bursitis, including avoidance of tight shoe heel counters, cast immobilization, NSAIDs, activity modification, padding, shock wave treatment, physical therapy and a single injection of corticosteroids into the retrocalcaneal space. If conservative management fails, there are essentially two distinct operative methods, and one endoscopic surgical technique. The open operative alternatives include resection of the posterosuperior part of the calcaneus or a calcaneal wedge osteotomy. Complications include skin breakdown, tenderness in the region of the operative scar, esthetically non-appealing operative scars and altered sensation around the heel^{2,9,15,19,25}. More serious complications include Achilles tendon avulsions and calcaneal (stress) fractures^{14,15,19}. Recurrent persistent pain secondary to an inadequate amount of bone resected, and stiffness of the Achilles tendon resulting in decreased dorsiflexion have also been reported²². Wound healing problems have been described in 30% of patients treated with open procedures²⁹.

ENDOSCOPIC TREATMENT

Endoscopic treatment offers advantages that are related to any minimal invasive surgical procedure, such as a low morbidity, excellent scar healing, functional aftertreatment,



Figure 1. (A) A patient with Haglund's syndrome in the right hindfoot. **(B)** The typical swelling (S) on both sides of the Achilles tendon (AT) at the level of the posterosuperior calcaneal prominence is indicated

short recovery time and a shorter time to sport resumption as compared to open surgical approaches. Here we describe the technique of endoscopic calcaneoplasty, and compare the results of this minimal invasive technique³⁴ with those reported for the open surgical techniques.

Indication

Patient complaints include pain at rest, when standing, walking (uphill), running and walking on hard surfaces. Conventional lateral radiographs show hypertrophy of the posterosuperior

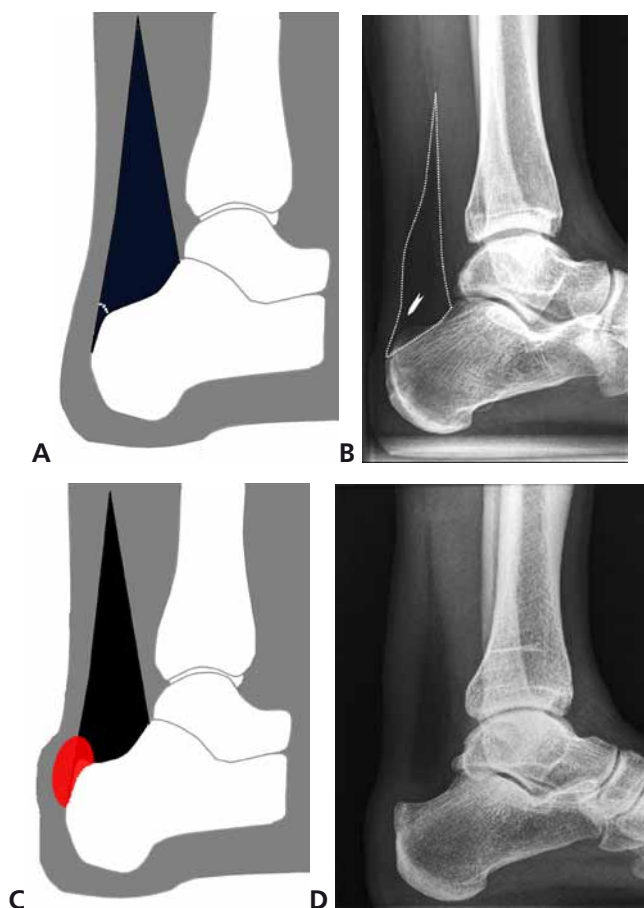


Figure 2. (A) Schematic lateral view of a hindfoot showing Kager's triangle (black). (B) Plain conventional lateral standing radiograph of an ankle with a normal aspect of the bony and soft tissues in the hindfoot. Kager's triangle is indicated (dotted line). The arrow points at the retrocalcaneal recess. (C) Kager's triangle is schematically drawn (black). Indicated in red is the fluid-filled retrocalcaneal bursa. (D) Lateral standing radiograph of a patient's right ankle showing hypertrophy of the posterosuperior aspect of the calcaneus with infiltration of the retrocalcaneal recess of Kager's triangle by the fluid-filled retrocalcaneal bursa

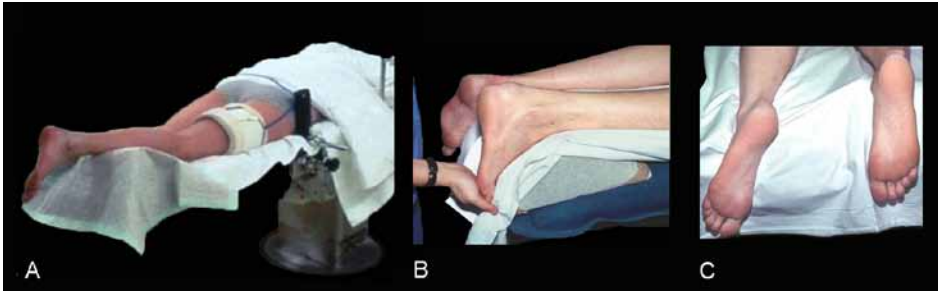


Figure 3. The patient is placed in prone position (A). The affected right leg is placed on a bolster and right over the end of the table (B). The other foot is positioned in a way that the surgeon has sufficient working area (C)

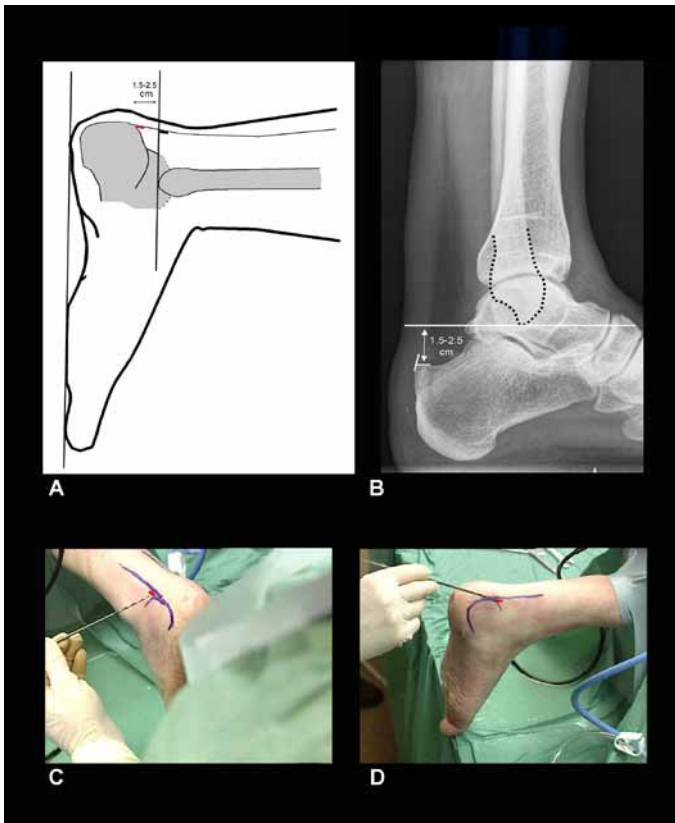


Figure 4. (A) Schematic drawing of lateral view of the foot. The ankle is placed in plantigrade position. A line is drawn through the tip of the fibula parallel to the sole of the foot. The incision for the lateral portal in conventional posterior arthroscopy is placed directly above this line; the center of the incision in patients undergoing endoscopic calcaneoplasty is placed 1.5-2.5 cm below this line (red). (B) Preoperatively this can be verified by drawing these same lines on a lateral standing radiograph of the foot. (C) Location of lateral and medial (D) portal as indicated by the probe (red line)

aspect of the calcaneus and deep retrocalcaneal bursitis, identified by diminished radiolucency of the retrocalcaneal recess and the lower portion of Kager's triangle (Figure 2).

If conservative treatment fails, we undertake endoscopic surgery.

Surgical technique

Surgery is performed with the patient in prone position under general or regional anesthesia. The involved leg is marked with an arrow by the patient, to avoid wrong side surgery. The feet are positioned just over the edge of the operation table. The involved leg is slightly elevated by placing a bolster under the lower leg (Figure 3).

The position of the foot is in plantarflexion through gravity. Prior to surgery important anatomical structures are marked. These include the medial and lateral border of the Achilles tendon and the calcaneus (Figure 4).

The lateral portal is made first, just lateral of the Achilles tendon at the level of the superior aspect of the calcaneus. This portal is produced as a small vertical incision through the skin only. The retrocalcaneal space is penetrated with a blunt trocar. A 4.5 mm arthroscopic shaft with an inclination angle of 30° is introduced (Figure 5).

Irrigation is performed by gravity flow. A 70° arthroscope can also be used but is seldom necessary. Under direct vision, a spinal needle is introduced just medial to the Achilles tendon, again at the level of the superior aspect of the calcaneus, to locate the medial portal (Figure 6).

After having prepared the medial portal by a vertical stab incision, a 5.5 mm bonecutter shaver (Dyonics Bonecutter, Smith & Nephew, Andover, USA) is introduced and visualized by the arthroscope. The inflamed retrocalcaneal bursa is removed first (Figure 7) to provide a better view. Now the superior surface of the calcaneus is visualized and its fibrous layer

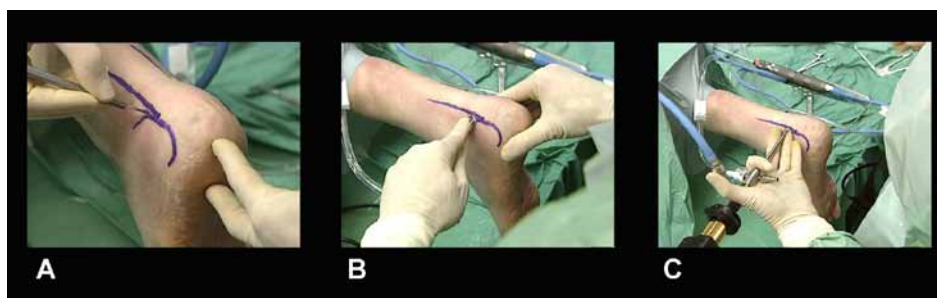
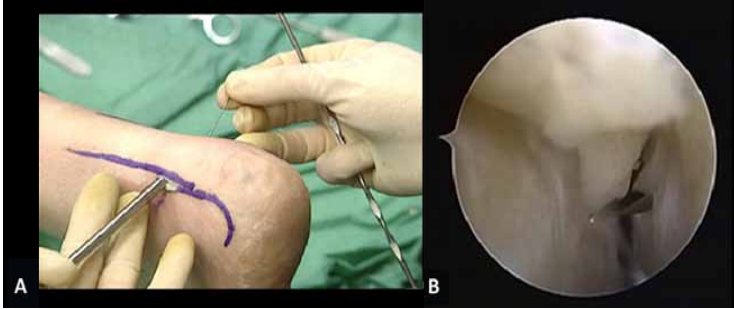


Figure 5. (A) incision for lateral portal in a left ankle. (B) Penetration of retrocalcaneal space with blunt trocar followed by blunt dissection. (C) Introduction of arthroscope with 30° inclination angle



166 **Figure 6.** (A) Introduction of spinal needle (left ankle) under direct vision (B) for placement of medial portal

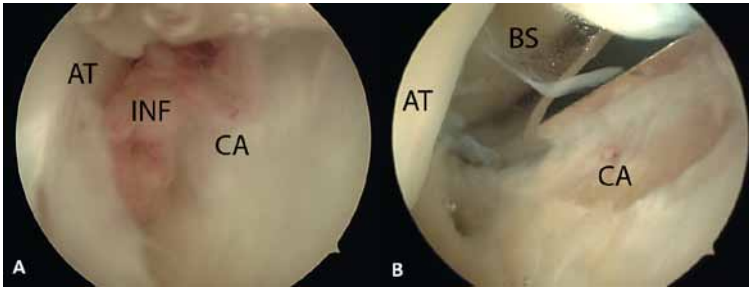


Figure 7. Endoscopic calcaneoplasty of the right hindfoot of a 38-year-old female patient with Haglund's syndrome. (A) The retrocalcaneal recess. AT= Achilles tendon; INF= inflamed retrocalcaneal bursa; CA= calcaneus. (B) Retrocalcaneal bursa is removed with bonecutter shaver. BS= bonecutter shaver

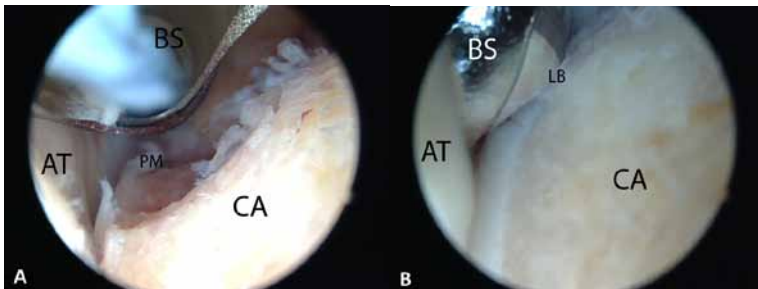


Figure 8. (A) Removal of bone at the posteromedial border of the calcaneus with arthroscope in the lateral portal. (B) Removal of bone at the lateral border of the calcaneus after change of portals. AT= Achilles tendon; BS= bonecutter shaver; PM= posteromedial border of calcaneus; LB= posterolateral border of calcaneus; CA= calcaneus

and periosteum are stripped off. During resection of the bursa and the fibrous layer and periosteum of the superior aspect of the calcaneus, the full radius resector is facing the bone to avoid damage to the Achilles tendon.

When the foot is brought into full dorsiflexion, impingement between the posterosuperior calcaneal edge and the Achilles tendon can be perceived. The foot is subsequently brought into plantarflexion and now the posterosuperior calcaneal rim is removed. This bone is quite soft and can be removed by the aggressive synovial full radius resector or bone cutter. A burr is not needed at this point. The portals are used interchangeably for both the arthroscope and the resector, so as to remove the entire bony prominence. It is important to remove a sufficient amount of bone at the posteromedial and lateral corner (Figure 8). These edges have to be rounded off by moving the synovial resector beyond the posterior edge onto the lateral respectively medial wall of the calcaneus.

The Achilles tendon is protected throughout the entire procedure by keeping the closed end of the resector against the tendon. With the foot in full plantarflexion, the insertion of the Achilles tendon can be visualized.

The bonecutter is placed on the insertion against the calcaneus to smoothen this part of the calcaneus. Finally, the resector is introduced to clean up loose debris and to smooth possible rough edges. In the first several patients, fluoroscopic control can be used to ascertain whether sufficient bone has been resected. With some experience, this will no longer be necessary. Figure 9 shows an endoscopic view of the end result.

To prevent sinus formation, at the end of the procedure the skin incisions are closed with 3.0 Ethilon sutures. The incisions and surrounding skin are injected with 10 ml of a 0.5% bupivacain/morphine solution. A sterile compressive dressing is applied.

Post-operative management

Postoperatively, the patient is allowed weight-bearing as tolerated and is instructed to elevate the foot when not walking. The dressing is removed 3 days postoperatively, after which the patient is allowed to shower. Patients are encouraged to perform active range of motion exercises for at least 3 times a day for 10 minutes each. The patient is allowed to return to wearing regular shoes as soon as tolerated. The sutures are removed after two weeks. A conventional lateral radiograph is made to ensure that sufficient bone has been excised (Figure 10). With satisfaction of the surgeon and patient, no further outpatient department contact is necessary. Patients with limited range of motion are directed to a physiotherapist.

Patient outcome

Between 1995 and 2000 in the Academic Medical Center in Amsterdam we performed 39 procedures in 36 patients²⁸. The average age was 35 years (range 16-50). Patients had a

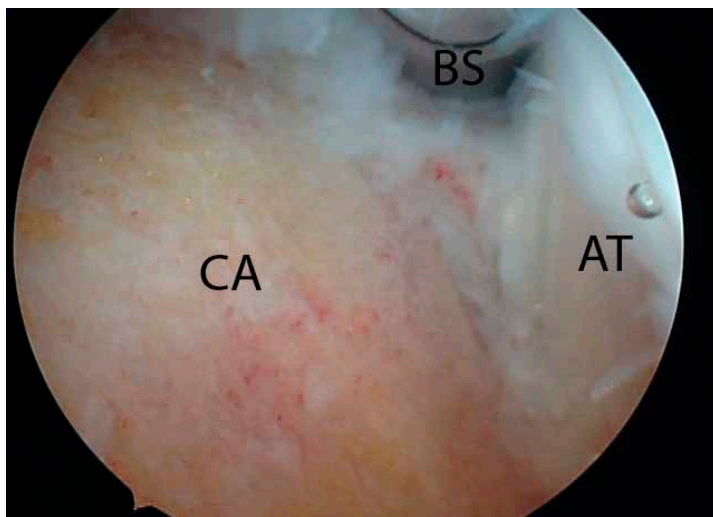


Figure 9. Result at the end of procedure. CA= calcaneus, BS= bonecutter shaver, AT= Achilles tendon



Figure 10. (A) Preoperative X-ray, with retrocalcaneal bursitis and prominence of the posterosuperior part of the calcaneus (arrow). **(B)** postoperative X-ray. The posterosuperior part of the calcaneus is sufficiently excised (arrow)

painful swelling of the soft tissue of the posterior heel, medial and lateral of the Achilles tendon on physical examination, without pain on palpation of the tendon itself. Conservative management for at least 6 months did not relieve symptoms. The conventional lateral radiograph showed a superior calcaneal angle (subtended by lines drawn from the bursal projection to the posterior calcaneal tuberosity and from the medial calcaneal tuberosity to the anterior calcaneal tuberosity) of more than 75°. An angle larger than 75° has been deemed pathologic^{6,31}. The mean follow up after endoscopic calcaneoplasty was 4.5 years (range 2 - 7.5). There were no surgical complications except from one 1 patient who experienced an area of hypoesthesia over the heel pad. Postoperatively there were no infections, tender or esthetically non-appealing scars and all patients were content with their small incisions. Except for two patients, all patients improved. The Ogilvie-Harris score²³ was rated fair by 4 patients, 6 rated good and 24 had excellent results. Work and sport resumption took place at an average of 5 weeks (range 10 days-6 months) and 11 weeks (range 6 weeks-6 months) respectively^{28,34}.

DISCUSSION

Conservative management for retrocalcaneal bursitis includes a single cortisone injection in the retrocalcaneal bursa^{21,22,32}. Repeated injections are not advised since these can weaken the tendon with the potential danger of rupture.

The aim of surgery for retrocalcaneal bursitis, after failure of the conservative treatment, is preventing impingement between the Achilles tendon and the calcaneus. This can be accomplished by means of removing the inflamed retrocalcaneal bursa followed by either resection of the posterosuperior calcaneal rim or by a closing wedge osteotomy. Posterosuperior calcaneal resection can be performed through a posterolateral or posteromedial incision or via a combination of both^{2,13,25}.

A widely used technique, especially in North America, is the midline-posterior skin incision combined with a central tendon splitting approach for debridement, retrocalcaneal bursectomy, and removal of the calcaneal bursal projection as necessary¹⁸. Another approach is the Cincinnati-type incision, a transverse skin incision at the level of the insertion of the Achilles tendon. With this technique, a wide exposure of the insertion of the Achilles tendon is possible, to debride the peritendinous and tendon tissue and if necessary bursectomy. The transverse skin incision at the level of the Achilles insertion also allows osteotomy of the posterosuperior corner of the calcaneus⁴, and, being in the direction of the skin creases, it has a lesser potential for healing problems than the longitudinal approaches.

Endoscopic calcaneoplasty offers a good, minimally invasive alternative to open surgery. Surgeons familiar with the endoscopic approach tend to favor this procedure, because of its better visualization as compared to the open procedure. Due to inappropriate visualization of the Achilles tendon during the open procedure, weakening or even rupture of this tendon

has been reported^{14,19}. Full recovery time after the open resection can take as long as 2 years. Our patient series shows a high percentage of good to excellent results based on the Ogilvie- Harris score.

Our results are comparable with other recently published reports on endoscopic treatment.

Jerosh and co-workers published a prospective study in which they described the results of endoscopic calcaneoplasty in 81 patients with an average follow-up of 35.3 months (range 12 to 72). Using the Ogilvie-Harris score, 41 patients presented excellent results, 34 presented good results, 3 had fair, and 3 patients showed poor results. These 3 patients showed an ossified area of the Achilles tendon insertion, and were revised in an open procedure. Only one patient experienced a superficial inflammation of the skin was found^{10,11}. Ortmann and co-workers operated on 30 patients (32 heels) with retrocalcaneal bursitis with the endoscopic technique. The mean follow-up was 35 months, and the AOFAS score averaged 62 preoperatively and 97 postoperatively. There were 26 excellent results, three good results and one poor result. One patient ruptured an Achilles tendon, one had residual pain and swelling that required reoperation through an open procedure. There were no other complications. Patients returned to work after an average of 8 weeks, and all athletes resumed their sporting activities in an average of 12 weeks²⁴.

Morag and co-workers treated 4 patients with endoscopic calcaneoplasty, and after an average follow-up of 2 years (range 1 to 3.5 years), no complications, pain, disability, or range of motion deficits were reported²⁰.

The advantages of the endoscopic over the open procedure are the small incisions, avoiding complications such as wound dehiscence, painful and/or ugly scars and nerve entrapment within the scar, as described for the open procedure⁹. He found a considerable amount of residual complaints in 32 clinically and radiographically examined patients treated by surgical resection of the posterosuperior calcaneal prominence for Haglund's syndrome at a mean follow-up of 18.6 years (range 2-41). 14 of these 32 patients had soft tissue problems including excessive scar formation and persistent swelling. In 8 patients not enough bone was excised and 2 had new bone formation, both resulting in persistent painful swelling. The function of the Achilles tendon was disturbed in 8 patients⁹.

There is no consensus regarding the ideal open surgical approach: medial, lateral, or both^{2,12,25}. Jones and James performed 10 partial calcaneal osteotomies for retrocalcaneal bursitis, followed by a short leg walking cast for 8 weeks, progressively increasing weight-bearing. Rehabilitation consisted of wearing an elevated heel of 1 inch until the foot came easily to the neutral position. All patients were back to their desired level of activity within 6 months¹². Angermann operated on 40 heels for the same indication using the posterolateral approach in 32 patients. Postoperatively 29 patients were allowed immediate weight-bearing. Complications consisted of one superficial heel infection, one haematoma and two patients with delayed skin healing. At an average follow-up of 6 years (range 1-12) 50%

of the patients were cured, 20% improved, 20% remained unchanged and in 10% the pre-operative symptoms worsened². The rate of poor results in this study corresponds to the results of Taylor, who reported 36% poor results after the same type of surgery³³. Pauker and co-workers operated on 28 heels in 22 patients with Haglund's syndrome. 18 heels were approached laterally, and 10 medially, depending on the direction of the prominent bone. All patients received a short leg walking cast for 4 weeks followed by mobilization exercises for aftertreatment. At a mean follow up of 13 years in 19 patients (range 3-20), 15 had good results, 2 fair and 2 poor. No difference in outcome between the two approaches was reported. The authors advocate using one incision, as many patients have complaints of tenderness over the operative scar up to one year postoperatively which might be exaggerated by a more extensive approach²⁵.

Schepisis and co-workers used the medial approach in 24 patients with retrocalcaneal bursitis: 6 (25%) had a fair result requiring re-operation. In 49 heels (36 patients) operated through a lateral approach with a mean follow-up of 4.7 years (range 1 to 11 years), early complications were reported in 4 cases (3 haematomas and a superficial infection), and late complications in 3 cases resulting in revision surgery. 7 patients noted some improvement, 1 patient described no change and 7 patients reported worsening of their symptoms after surgery²⁷. Brunner and co-workers performed calcaneal osteotomies on 39 heels (36 patients), and reported at an average follow-up of 51 months, an average improvement of the AOFAS score of 32 points as compared to the mean pre-operative score. Recovery time ranged from 6 months up to 2 years. 6 of the 36 patients reported persisting posterior heel pain after surgery³.

There are two comparative studies in which both endoscopic and open procedures were performed. Leitze and co-workers compared the endoscopic approach (n=30, 22 months follow-up) with the open surgical technique (n=17, 42 months follow-up). The endoscopic approach revealed 19 excellent, 5 good, 3 fair and 3 poor results, which was numerically but not significantly better than the open surgical procedure. Recovery time was identical, but operation time, the amount of complications and scar tissue formation favoured the endoscopic approach¹⁶. In a recent study by Lohrer and co-workers, a comparison was made between the endoscopic and open resection for Haglund's syndrome. In this anatomic study, 9 cadaver feet were operated by means of open surgery and 6 were operated through endoscopic calcaneoplasty. After the procedure the ankles were dissected to determine the amount of damage following the surgery. Comparable amounts of damage were found for the sural nerve, the plantaris tendon and the medial column of the Achilles tendon¹⁷. Since this was an anatomic study, no data could be gathered regarding recovery time and scar healing, which seem to be the advantageous points of the endoscopic procedure. Also, cadaveric ankles could have been stiffer as compared to patients, which made the endoscopic approach more difficult to perform.

Overall, looking at the available results of open surgery, studies reported 61-83% good results and 17-36% complications or poor results requiring re-operation^{3,12,16,25,26,33}. Endoscopic surgery leads up to an estimated rate of 83-93% good results, and 0.6- 5% complications or poor results requiring re-operation^{9,11,24,28}.

CONCLUSION

In summary, whether the operation is performed by endoscopic or open surgery, enough bone has to be removed to prevent impingement between the calcaneus and Achilles tendon. The endoscopic calcaneoplasty has demonstrated to show several advantages including low morbidity, functional aftertreatment, outpatient treatment, excellent scar healing, a short recovery time and quick sport resumption as compared to the results for the open technique.

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