Surgical Treatment of Retro-calcaneal Bursitis (Haglund's Disease): Anatomy, Evaluation, Surgical Options, Complications, and Outcome

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Abstract

Retrocalcaneal bursitis (RCB) is one of the common causes of heel pain. Symptoms will often respond well to conventional methods of treatment. Those patients who do not respond to conventional treatment may get benefit from surgical interventions. An awareness of appropriate diagnostic and evaluation techniques are is necessary to diagnose and plan the surgical treatment. Initial treatments of Haglund's disease include non-steroidal anti-inflammatory drugs, footwear modification, and various physiotherapeutic modalities. Bony hump excision is the main surgical treatment option, which can be performed by various surgical approaches, such as open procedures or by endoscopic techniques. Factors such as local skin condition, and medical co-morbidities which may retard tissue healing, possibilities of Achilles tendon damage and post-operative pain must be considered while selecting the best surgical option. This article examines patient evaluation, surgical options, complications, and outcome of Haglund's disease.

Keywords: Retrocalcaneal bursitis, Haglund's disease, Calcaneal osteotomy, Endoscopic surgery, Complications.

Introduction

The Haglund's deformity is the most common reason for pain at Achilles tendon insertion. Haglund's syndrome is a triad of posterosuperior calcaneal exostosis, insertional Achilles tendinopathy, and retrocalcaneal bursitis (RCB) [1].

The pain in Haglund's syndrome is anterior and superior to Achilles tendon insertion in the calcaneus [2]. In the early 1890s, Albert and white were introduced retro-calcaneal bursitis RC Binto the literature [3]. Later Patrick Haglund, in 1928, described the inflammation of the retro-calcaneal bursa (RB) and a prominence at the postero-superolateral aspect of the calcaneus [4]. The RCB retrocalcaneal bursae gets hypertrophied due to mechanically induced inflammation and then become adherent to the underlying tendon [5]. Lateral X-ray of the heel will show a prominent posterior-superior calcaneal projection (hump) and/or calcification of the Achilles tendon [2,6].

The treatment of Haglund's syndrome by non-operative measures may not always successful [6,7]. The common surgical treatment includes excision of the RCB, calcaneal osteotomy, and endoscopic decompression of the retrocalcaneal space and calcaneoplasty [8-11].

The degree of bone decompression (humpectomy) is one of the most important factors deciding the outcome; often poor results from this procedure is related to inadequate osteotomy [5,12]. However, an aggressive bone resection may increase the risk of calcaneus fracture, weakening of the Achilles tendon insertion, ankle pain, and stiffness [13,14]. The endoscopic calcaneoplasty, a recent and popular alternative to open techniques, has many advantages over open techniques. Endoscopic technique has good control and precision in bone removal and reduced post-operative complications [12,15,16].

This review gives a general overview on the anatomy, etiology, pathology, and the surgical principles with its merits and demerits.

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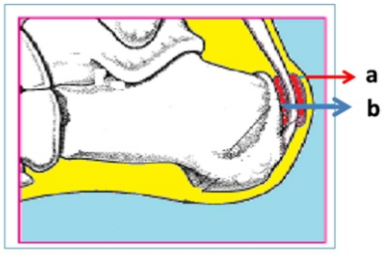

Figure 1
a: Posterior Achilles tendon bursas b: Retro-calcaneal bursa (RB)

Figure 1: diagram showing retrocalcaneal bursa (RB) and posterior Achilles tendon bursa in relation to the Achilles tendon.

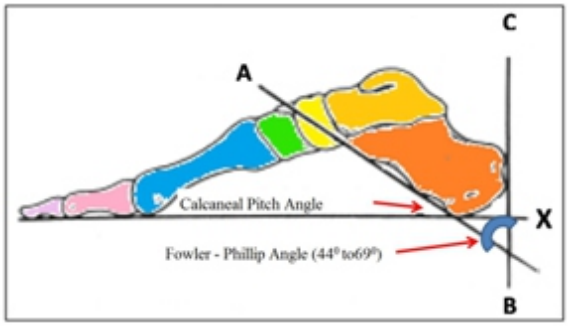

Figure 2: How to draw the Fowler and Philip angle and calcaneal pitch angle.

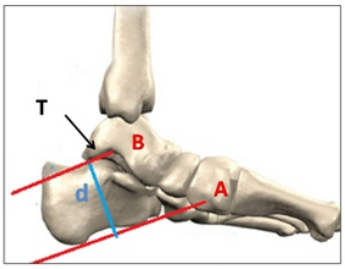

Figure 3
A: Lower PPL, B: Upper PPL
T: Talar articular facet, d: Perpendicular line

Figure 3: How to draw the parallel pitch lines of Pavlov.

Anatomy, Pathology, and Etiology

The anatomy of skin, soft tissue and osseous variables of the posterior heel is significant in many ways. The relaxed skin tension lines course transversely, sometimes with hyper keratotic tissue, overlying the bony eminence. The subcutaneous tissue is composed of a thin layer of normal areolar adipose tissue, through which the saphenous vein and its tributaries runs through. The Sural nerve passes along the lateral border of Achilles tendon [17]. The sensory supply to the posterior heel by sural nerve superiorly and distally by calcaneal nerves. Blood supply to this area comes from the calcaneal anastomotic cascade formed by the posterior tibial artery, Peroneal artery, calcaneal arteries, and branches from plantar arteries. Two bursae are closely associated with the Achilles tendon which may sometimes be a common area for irritation, inflammation, and pain. One bursa located between the skin and the Achilles tendon (posterior Achilles tendon bursa) and the other lies between the anterior aspect of the tendon and posterior OsCalcis (anterior Achilles tendon bursa or RB) (Fig. 1).

The RB is found constantly in all individuals of size about 1-2 cm long as a synovial fold with a volume of 1–1.5 ml [18]. The inner surface of it is covered by unilayered synovial membrane [18]. The bottom part of RB is covered by a thin layer of fibrous cartilage into which the Achilles tendon being attached [18]. RB is more commonly involved than posterior Achilles tendon bursa. RB provides a smooth surface to the superior third of the calcaneus where Achilles tendon courses posterior to it until its insertion [19]. This is the area where inflammation occurs secondary to mechanical irritation by postero-superior calcaneus [20]. The posterior aspect of the calcaneus has three important anatomic regions- inferior, middle, and superior [21].

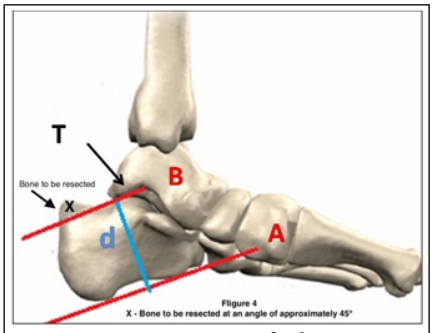

Figure 4: How to quantify the amount of bone resection.

The inferior third is continuous with the plantar aspect of the calcaneus, where the fibers of the plantar aponeurosis and continuing fibers from the Achilles tendon are attached. The middle third is trapezoidal in shape, which provides the insertion for Achilles tendon. The superior third is triangle shaped facet with the apex superiorly. The RB is situated on the superior third to prevent the friction between Achilles tendon and bone [21].

The Kager's fat pad (pre-Achilles) is a mass of adipose tissue lying within the Kager's triangle (Bounded anteriorly by flexor hallucis longus, posteriorly by the Achilles tendon, and inferiorly by the calcaneus)[22]. It acts as a variable space filler which being continuous with RB. As the insertional angle between the Achilles tendon and the bone increases during plantar flexion, the sliding motion of the Kager's fat pad in and out of the bursa gives a better mechanical advantage to the Achilles tendon

Figure 5a: Pre op planning with parellel pitch lines and the excision angle is 45°

Figure 5b: Post excicion X ray

insertion [23].

Pathologic forces in Achilles tendon results in an initial inflammation and subsequent degeneration of the tendon with calcium deposition at the superficial fibers [24]. This increases the rigidity of the tendon as it courses over the supero-lateral aspect of the calcaneus, further inflaming the retro-calcaneal bursa. RCB is often caused by frequent minor traumas induced by excessive walking, jumping, or running (overuse on the Achilles attachment). Individuals who suddenly intensify their exercise programs without adequate stretching and muscle conditioning may easily get RCB [25].

Haglund's deformity can be related to the rigid back of pump style shoes, giving the name "pump bump deformity". This type of shoes can increase the pressure over the posterior calcaneus creating an irritation that can aggravate the bone enlargement. Apart from the known predisposing condition such as cavus foot and a tight Achilles tendon, three other foot deformities can predispose to retro-calcaneal pain, which includes hind-foot varus, compensated fore-foot valgus, and plantar flexed first ray [26]. Since these conditions can be of hereditary origin, it gives a hereditary etiology for Haglund's disease.

Differential Diagnosis

The differential diagnosis includes retrocalcaneal exostosis, Achilles insertional calcific tendonltis, rheumatic conditions insertional pathology expansion fascitis and diffuse idiopathic skeletal hyperostosis.

Patient Presentation and Evaluation

Clinical examination is necessary for localizing the site of pain, deformity and pathology. Reviewing the onset, duration, and presentation of retro-calcaneal pain as well as style of shoes narrows the differential diagnosis. The usual symptom of Haglund's deformity is a dull aching soreness over the back of the heel [27]. Often it is associated with a hyperkeratotic postero-superolateral abnormal prominence near the insertion of Achilles tendon. In severe cases, repeated micro-trauma causes the formation of an inclusion cyst or ulcerations over the swelling [27]. Pain can be elicited with direct palpation, as well as with dorsiflexion of the ankle joint. A systematic evaluation of all anatomic regions around the heel is beneficial for ruling out other differential conditions. A thorough examination of ankle and foot for the sagittal and frontal plane deformities is important to rule out predisposing deformities. A plantarflexed and rigid first toe can predispose to Haglund's deformity and retrocalcaneal bursitis, as it can cause hind-foot varus [28]. A protuberance can be observed on the postero-superior part of heel, usually on the lateral side, most often with soft soft-tissue swelling and local inflammatory changes [28]. Physical examination alone maybe some times inadequate to distinguish Haglund's syndrome from other causes of hindfoot pain. It could be the local manifestation of some systemic diseases such as Reiter's disease or rheumatoid arthritis. Although the diagnosis is made mainly by clinical methods, imaging studies are recommended for confirmation. Imaging modalities are helpful for quantifying the abnormal prominence of the posterior calcaneus[29]. Specific biochemical and immunological studies are required to distinguish between local conditions from systemic diseases. Identification of the underlying pathology is mandatory to formulate the correct treatment plan.

Radiological Evaluation

Lateral X-ray of the ankle is most beneficial in evaluating calcaneal reference points. The radiological anatomy of calcaneus shows, on posteriorly, there is the posterior tuberosity which provides the Achilles tendon insertion. Inferiorly, there is an anterior tubercle and a medial tubercle. Superiorly, the talar articulation and the postero-superior border bear the bursal projection [21]. Quantitative measurement of the posterior-superior prominence of Calcaneus calcaneus has been discussed by various authors, as the prominence correlated with an increased incidence of RCB [26,29,30,31].

The Fowler and Phillip angle (Fig. 2) is the relation of the inferior calcaneus to the posterior Calcaneus [30]. It is formed by the intersection of the baseline tangent to the anterior tubercle and the medial tuberosity (AB) with the line tangent to the posterior surface of the

Table 1: Keck and Kelly criteria on the post-operative result of surgical treatment

Grading	Pain	Functional activity	Shoe wearing ability
Good	Completely relieved	No restriction	No alteration is required to the standard shoes
Fair	Pain is significantly reduced	Only strenuous activity has to be avoided	Minor alteration of shoes can relieve the pain
Poor	Recurrence of pain, bursa or a bone spur	Limited ordinary walking	Discomfort that cannot be relieved by shoe modification

bursal projection and posterior tuberosity (BC). Normally, it measures 44°– 69°, values greater than >75° designated by them to be abnormal. The Calcaneal pitch angle is another measure which is formed by the intersection of the baseline tangent (X) to the anterior tubercle and the medial tuberosity with the horizontal surface[29] (Fig. 2).

Later Ruch, along with Vega et al., described the influence of the calcaneal inclination angle in combination with the Fowler-Phillip angle on retrocalcaneal pathology (total calcaneal angle), stating that increased symptoms are associated with values greater than >90° [26].

The postero-superior abnormal bony prominence can be assessed by drawing the parallel pitch lines (PPLs) in the lateral view X-ray of the ankle, which was described by Pavlov [29] (Fig. 3).

The lower PPL (A) is the baseline, drawn from the anterior Calcaneal tubercle to the medial posterior tubercle (constructed as for the posterior calcaneal angle). Then, a perpendicular (d) is constructed between the posterior lip of the talar articular facet (T) and the baseline. The upper PPL (B) is drawn parallel to the PPL (A) at a distance d, starting from the talar articular surface anteriorly to the posterior tuberosity. A bony projection touching or below line B is normal and not prominent (PPL-negative) and a bony projection above B is considered prominent (PPL-positive), which needs surgical removal. This will be a useful method for the post post-operative assessment of the extent of resection.

Although the calcifications and exostosis are well evident on lateral view [31], their locations on the posterior surface (middle and superior thirds) of the calcaneus may be hidden, and are best seen in a modified calcaneal axial view [32]. This view is taken with the patient standing on the dorsiflexed ankle, with the tube 90° to the plate and angled parallel with the posterior calcaneus. It is often difficult to differentiate Achilles tendinitis from RCB. Retro-calcaneal bursograms can provide an insight into the diagnosis and clinical management of this disorder [33].

Previous sonographic studies have reported 100% specificity but only 50% sensitivity in ultrasound diagnosis of RCB [34]. Use of high-frequency, linear, and 13-MHz transducer sonography is helpful for the evaluation of superficial Achilles bursa, RB, and the Achilles tendon [35]. With ultrasound, RB can be visualized dynamically as well as anesthetic and steroid mixture injection can be performed as part of the examination. CT and MR are the further imaging modalities, which will give additional information on calcaneum and Achilles tendon pathology. CT with 3 mm axial slices and tri-dimensional reconstructions will demonstrate solid bone with true trabeculae at the insertion of Achilles tendon [36]. MRI has superior soft-tissue contrast resolution in comparison to other imaging modalities. MRI will show fluid collection anterior to the Achilles tendon insertion, which will be low signal intensity on T1-weighted sequences and high signal intensity on T2-weighted and STIR sequences [37].

Non-surgical Treatments

The initial treatment of Haglund's disease is non-operative. It includes reassessment/change of footwear the patient currently wearing, use of heel pads, activity modification, physical therapy, and non-steriodal anti-inflammatory medications [38]. Physical therapy also may be helpful, particularly in recalcitrant cases [39]. Activity modification by avoiding repetitive motions causing the posterior heel pain, such as running and hill climbing. Physical therapy to reduce the pain and to maintain the pain pain-free ankle motion [40]. The intra-bursal steroid injection has only a variable length of pain relief (ranging from weeks to months) [40]. Long standing cases often show poor results with non-surgical modalities, probably the reason for pain could be the mechanical pressure by the bone protrusion.

Surgical Treatment

Surgical treatment indicated when all other non-operative treatment modalities have failed to provide adequate pain relief which interferes with activities of daily living.

The surgical treatment involves RCB decompression and humpectomy– which has variable results [28,41,42]. The principle of surgical treatment in Haglund's deformity is the removal of posterosuperior part of the calcaneus (humpectomy) up to the insertion of the Achilles tendon along with the debridement of inflamed RCB [43] (Fig. 4).

The most important factor in the success of the surgical treatment is the degree of bone decompression achieved [5,12].

Open Surgery

The approaches may be either medial/lateral side of the Achilles tendon or a central tendon splitting approach. The postero-superior part of the calcaneus was exposed through the lateral/medial approach by a paratendinous incision. The central tendon splitting approach is made directly down to the paratenon and a central split then made in the Achilles tendon [6]. The postero-superior bone above the upper PPL is then resected at an angle of approximately 45° (Fig. 5 a & b).

Bony edges were then smoothen with a bone rasp until no further protrusion was felt by palpation. Central Achilles tendon-splitting approach provides excellent exposure, facilitating adequate bone resection and debridement of the bursa compared with the lateral/medial incision. Both of these approaches offer effective pain relief, good functional scores, and early return to activity. Great concerns regarding the central tendon-splitting approach include compromise of the Achilles tendon integrity, delayed return to full function, and scar irritation [8]. If greater than 50% of the Achilles tendon insertion had been resected, suture anchors has to be used to anchor the Achilles to the calcaneus [8]. The central part of the tendon should be tensioned accurately before suture anchoring. In a retrospective study by Sella et al. highlighted the significance of adequate decompression of the tendon and the RCB [41].

The endoscopic procedure can be performed with the patient in a prone or semi-prone position. It is being done with two portal approach, the medial, and lateral portals. The fat and RCB should be removed to visualize the Achilles tendon and the bone. Calcaneoplasty may be done with a burr under endoscopic guidance, to avoid injury to the Achilles tendon. The degenerated Achilles tissue may be debrided with the shaver. Studies show that even up to 50% of the Achilles tendon could be released safely for the complete removal of spur [44]. Endoscopic treatment of the Achilles tendon is potentially beneficial because it causes less pain and scarring while allowing a faster recovery time [45].

Complications

Both open and endoscopic methods have own complications. The most common being recurrence which is often associated with inadequate bone removal. The open technique may have a higher incidence of potentially important complications like such as problems of wound healing, scar formation with nerve entrapment, weakening or rupture of the Achilles tendon, and fracture of calcaneus [46].

The most common reason for failures is bone removal [5,10]. Recommendations about the amount of postero-superior bone resection vary widely [47,48]. But However, the bone decompression should be done in a cautious manner as aggressive bone resection will weaken the Achilles tendon insertion and calcaneus fracture [13, 49, 50]. With minimal soft-tissue trauma and better visualization, endoscopic technique has lower complications rate than open technique [51].

Outcome

Patients are supported in an ankle foot orthosis for ten days after surgery. Post-operative rehabilitation with assisted exercises may begin within 2–5 days after surgery. Weight bearing was not allowed for a period 2-3 weeks during the post-operative period [52, 53]. Non-operative measures, not always provide a consistent results compared with surgical treatment, hence surgery is a reasonable option[48].

The results of surgical treatment are commonly estimated according to a criteria suggested by Keck and Kelly [54]. This includes three criteria of pain, functional activity, and shoe wearing ability. The post post-operative result of surgical treatment is graded as good, fair, and poor (Table 1).

Results are graded as good if the pain is completely relieved, with no restriction of activity, and no alteration is required to the standard shoes. A grade of fair may be considered if the pain is significantly reduced after surgery, only strenuous activity has to be avoided and some minor alteration of shoes can relieve the pain. A poor grade is labeled, if there is the recurrence of pain, a bursa or a bone spur, limited ordinary walking, and discomfort that cannot be relieved by shoe modification. The practical applicability and simplicity are the major advantages of this criterion. The American Orthopaedic Foot and Ankle Society ankle-hindfoot Scale and Victorian Institute of Sport Assessment-Achilles scores are the other useful scales for the assessment of clinical outcomes.

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the lateral/medial incision [8]. Both of these approaches offer effective pain relief, good functional scores, and early return to activity. Great concerns regarding the central tendon-splitting approach include compromise of the Achilles tendon integrity, delayed return to full function and scar irritation [8].

The endoscopic calcaneoplasty has become superior and popular alternative to open techniques in the surgical treatment of Haglund's deformity because of its many advantages of early post-operative recovery, fewer incidences of ankle stiffness, less wound healing issues, minimal post post-operative pain, lesser incidence of recurrence, and better cosmetic appearance [12,15,16]. Per-operative assessment of the adequacy of bone resection also constitutes another important advantage of endoscopic calcaneoplasty. It also has much greater control that would result in lower resection volume of bone compared to the open surgical technique [51]. Analysis of patient satisfaction when compared to the procedure-specific complications, endoscopic approach offers superior results over the open approach (91% good or excellent results vs. 73%) [12]. In the same study, a significantly increased complication rate was found consistently with those patients underwent open surgery (0.7% vs. 4.3%).

Adequate bone to be resected for minimising the risk of impingement and recurrence [12]. Endoscopy facilitates more precise local decompression and thus avoids unnecessary resection of bony substance. Those with longer duration of symptoms had poor outcomes to surgical treatment compared to those with shorter duration of symptoms. Angermann found that the final outcome will be better when surgery is performed within 1 year of the onset of symptoms [55]. The outcome of surgery in patients with rheumatoid arthritis is not satisfactory. This finding could be the fact that the cause of retrocalcaneal bursitis was probably inflammatory rather than mechanical [2].

Conclusion

The prominence of complaints associated with Haglund's disease demands a thorough understanding of all aspects related to the calcaneus, RCB, and the structures around. Awareness of the relevant diagnostic techniques is necessary for localizing the pathology. Proper X-ray evaluation is mandatory before proceeding to surgery. In the initial stage of the disease, non-surgical treatment modalities are recommended. However, in chronic cases, the results of conservative treatment are not very promising. Surgical treatment should be considered when non-operative treatment is unsuccessful. Once the patient is opted for surgical intervention, it should be done without much delay for a better outcome.

Open and endoscopic techniques are available; both are basically focusing on the RCB decompression and posterosuperior calcaneal bone removal. The endoscopic technique is considered to be superior in terms of better visualization, greater control, and precision in bone removal with minimal post-operative complications.

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