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Current Concepts in the Management of Haglund Deformity and Insertional Achilles Tendinopathy: A Narrative Review

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Abstract:

Background: Haglund syndrome and insertional Achilles tendinopathy (IAT) are common causes of posterior heel pain that significantly affect functional mobility and quality of life. These conditions are characterized by mechanical irritation between the posterosuperior calcaneal prominence, retrocalcaneal bursa, and Achilles tendon insertion. Management strategies range from conservative modalities such as physiotherapy, extracorporeal shockwave therapy, platelet-rich plasma injection, and shoe modification to various surgical interventions including open calcaneoplasty, endoscopic decompression, tendon augmentation, and osteotomy procedures. Recent advances in minimally invasive surgery and tendon preservation techniques have improved clinical outcomes and reduced postoperative complications.

Keywords: Haglund syndrome, Insertional Achilles tendinopathy, Retrocalcaneal bursitis, Calcaneoplasty, Achilles tendon, Endoscopic surgery, Extracorporeal shockwave therapy

Introduction:

A painful musculoskeletal disorder called Haglund syndrome is characterized by a posterosuperior calcaneal protrusion that is linked to insertional Achilles tendon pathology and retrocalcaneal bursitis. The disorder causes chronic inflammation, tendon degradation, and posterior heel pain as a result of repeated mechanical impingement between the calcaneal tuberosity and the Achilles tendon insertion. Patients frequently exhibit edema, soreness, trouble wearing closed shoes, and restricted physical activity. Non-steroidal anti-inflammatory medications, shoe adjustments, stretching exercises, eccentric loading programs, physical therapy, and extracorporeal shockwave therapy are examples of conservative treatment, which is still the first line of treatment. These techniques seek to lessen mechanical strain on the Achilles insertion, enhance tendon repair, and reduce inflammation. (1) Despite improvements in non-operative care, many patients still have chronic problems that necessitate surgery. When conservative therapy has failed for at least six months, or sooner in extremely active persons, surgery is typically recommended. Open excision of the posterosuperior calcaneal prominence, tendon-splitting approaches, lateral and medial approaches, endoscopic calcaneoplasty, Zadek's calcaneal osteotomy, and flexor hallucis longus tendon transfer are only a few of the surgical methods that have been reported. Because endoscopic and minimally invasive techniques offer lower rates of complications, quicker recovery, and less soft-tissue morbidity than standard open surgery, they are becoming more and more popular. To maximize postoperative results and lower recurrence, however, thorough patient selection and precise tendon degeneration assessment are still crucial. (2) By using conservative and/or surgical methods, the Haglund deformity's therapy aims to minimize inflammation, lessen friction brought on by the deformity, and ease Achilles tendon stress. The initial line of treatment is the conservative approach, which includes shoe modifications, physical therapy, stretching exercises, steroid injections, and topical or oral anti-inflammatory and analgesic medications. (1, 3)

Non operative management:

NSAIDS & corticosteroid injection:

In the acute stage of Achilles tendon-related illnesses, non-steroidal anti-inflammatory medications (NSAIDs) are frequently used to relieve pain and lessen stiffness. However, research indicates that NSAIDs may also hinder tendon healing by preventing cellular proliferation and tenocyte migration, which may have an impact on the regular healing process. (4) Short-term advantages of corticosteroid injections have been documented, including improvements in ultrasound-detected inflammatory alterations surrounding the tendon and a decrease in pain and soft-tissue edema. Despite these early positive effects, their use is still debatable because of a high prevalence of problems, with some studies reporting negative outcomes in as many as 80% of cases. Tendon atrophy, decreased tensile strength, and a higher chance of tendon rupture are some of these issues. (5) Injections of corticosteroids can be given directly into the retrocalcaneal bursa or perilesionally around the Achilles tendon. Ultrasound guidance is highly suggested to guarantee exact injection localization for maximum accuracy and to reduce problems. However, there is a risk of tendon weakening and possible rupture when steroids are injected percutaneously near the Achilles tendon. Before administering corticosteroid injections, the advantages should be weighed against any possible hazards. (6)

Platelet-rich plasma:

Because of its potential to improve tendon healing, platelet-rich plasma (PRP) injection has been studied more and more in the treatment of insertional Achilles tendinopathy (IAT). PRP is an autologous concentrate that may promote soft-tissue repair processes since it is high in cytokines and growth factors. It has been proposed that PRP improves the expression of collagen types I and III, which are critical for tendon strength and structure, and stimulates tenocyte activity. Furthermore, PRP may increase the release of vascular endothelial growth factor, which would promote angiogenesis and aid in the general remodeling and healing of tendon tissue. (7)

Shoe modification:

The shoe can be altered to lessen the friction caused by the bone protrusion. For example, the upper trim line of the shoe can be placed beneath the bone protrusion, and in the case of high arched feet, heel lifts or heel pads can be placed inside the shoe to place the posterior heel over the upper trim. (8)

Physiotherapy:

After the rest period, one could try eccentric and stretching exercises. By quickly strengthening the calf muscles, eccentric exercise may aid in the strategy to lessen pain and enhance the healing process. By prolonging the myotendinous unit and reducing neovascularization in the tendon, eccentric exercise may also help alleviate symptoms like discomfort (fig. 1). (9)

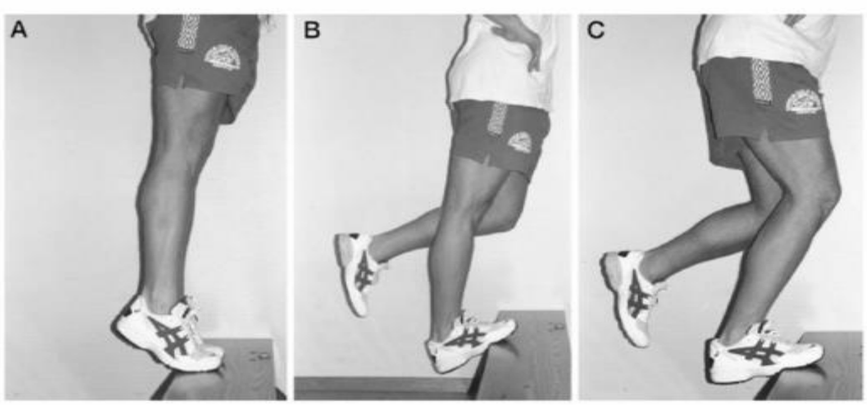

Figure 1: Eccentric exercise for insertional Achilles tendinopathy. (9)

Extracorporeal shockwave therapy (ESWT):

One non-operative therapeutic option for insertional Achilles tendinopathy (IAT) is extracorporeal shock wave therapy (ESWT). It is thought to produce analgesia by selectively inhibiting sensory unmyelinated nerve fibers, which is accompanied by neurophysiological alterations at the dorsal root ganglia level. Furthermore, ESWT causes controlled disruption of the extracellular and interstitial matrix, which may serve as a mechanical stimulus for tissue repair and encourage a healing response. (10)

It is believed that the mechanical effects of ESWT start tendon regeneration by creating a temporary pro-inflammatory and catabolic environment that makes it easier for deteriorated matrix components to break down and be removed. Enhanced angiogenesis and neovascularization at the tendon–bone junction, which facilitates tissue remodeling, have also been linked to subsequent clinical improvement. Additionally, ESWT may help reduce pain by modulating or partially degenerating sensory nerve fibers in the afflicted area. (10)

Surgical management:

Conservative treatment for insertional Achilles tendinopathy may not always be sufficient to alleviate symptoms, and the condition may have a high recurrence rate. Surgical intervention is typically recommended when symptoms do not improve after six months of carefully managed non-operative treatment. To restore function and enable a prompt return to activity, an earlier surgical approach may be taken into consideration in some patient groups, such as professional athletes or people with high functional demands who are unable to continue sporting activities. (11) In order to remove mechanical impingement and relieve pressure on the surrounding soft tissues, especially the Achilles tendon and retrocalcaneal bursa, the main objective of surgery for Haglund deformity is to excise the posterosuperior calcaneal exostosis. Nonetheless, a considerable percentage of cases—roughly 25%—are linked to concurrent insertional Achilles tendinopathy, either with or without retrocalcaneal bursitis; this condition is known as Haglund syndrome. When calcaneal resection is combined with debridement of the deteriorated Achilles tendon and/or excision of the inflammatory retrocalcaneal bursa, both the bony and soft-tissue components of the pathophysiology are addressed, leading to better clinical outcomes. (12)

A number of surgical procedures are used to treat Haglund syndrome in order to relieve mechanical impingement and treat related soft-tissue disease. Endoscopic calcaneoplasty, calcaneal osteotomy, and open resection of the posterosuperior calcaneal prominence with excision of the inflammatory retrocalcaneal bursa are some of these alternatives. Depending on the degree of pathology and the surgeon's preferences, open resection can be carried out using a variety of surgical techniques. The lateral technique minimizes tendon damage while providing sufficient exposure by making an incision posterior to the sural nerve and lateral to the Achilles tendon. A midline (central tendon-splitting) method, on the other hand, offers direct access to the insertional pathology, where it would be necessary to partially detach the Achilles tendon and then repair it using suture anchors. Another option for surgical exposure has been described: a medial J-shaped route. (11, 13)

Since the necessity for debridement or augmentation treatments is frequently determined by the degree of intratendinous pathology. Partial detachment of the Achilles tendon may be necessary in cases of severe insertional tendinopathy in order to enable sufficient debridement and bone excision. Suture anchors have shown consistent fixation strength and positive functional results when used to restore tendon continuity. Furthermore, to avoid chronic mechanical irritation and lower recurrence rates, sufficient excision of the posterosuperior calcaneal prominence is crucial. In order to maximize recovery and functional results, postoperative rehabilitation protocols such as early mobilization and a gradual return to weight-bearing are essential. (11, 13)

Enzo Sella et al. (14) presented a method in 1998 that uses radiography to determine the required quantity of bone removal. Using Enzo J. Sella's method, preoperative radiographs were assessed to ascertain the required quantity of bone removal. Preoperative measures and postoperative x-rays were compared.

According to Enzo Sella et al. (14), consuming the recommended amount of bone is crucial and beneficial. Planning both before and during surgery is aided by this technique. It is advised to use an angle of 48°–49°. A acceptable result can be anticipated if such an angle is reached and proper postoperative care is adhered to.

The method used to determine bone removal prior to surgery is diagrammatically depicted in Figure 2. A line known as the calcaneal inclination line is drawn along the plantar aspect of the calcaneus on a lateral radiograph. The posterior cortex of the tuberosity (point 2) and the base of the flare of the anterior process of the calcaneus are then connected by a parallel line. Another line is drawn from the base of the deformity's flare (point 4) on the posterior and superior tuberosity to meet line 3 at the calcaneus's most posterior point, creating a 50° angle. The bone that needs to be removed is represented by the region behind this line. (14)

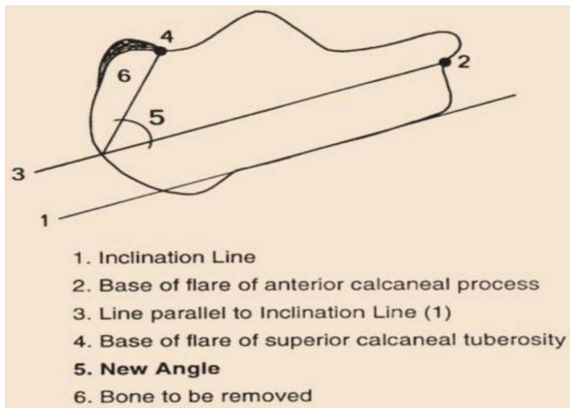

Figure 2: Method used to determine the necessary amount of bone removal. (14)

Figure 3 shows preoperative and postoperative x-rays. On the preoperative radiographs, Enzo J. Sella et al. measured the angle between lines 3 and 4 and designated this the desired angle to be achieved at surgery. Using the same method, they measured the angle on the postoperative x-rays and designated that as the actual angle achieved. (14)

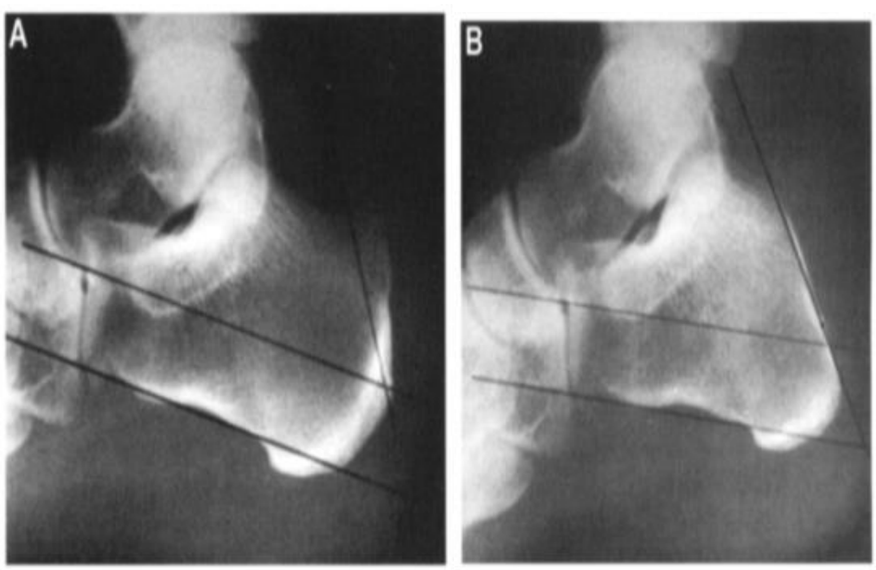

Figure 3: Preoperative (A) and postoperative (B) radiographs showing the amount of bone removed. (14)

Open surgical treatment:

In order to remove enough bone during open surgical treatment of retrocalcaneal bursitis, good exposure is necessary. On the other hand, a considerable proportion of wound and soft tissue issues are associated with high exposure. When employing the open approach, some surgeons recommend postoperative plaster immobilization, which increases the risk of developing new adhesions and scar tissue (15).

Tendon-splitting approach:

A longitudinal midline incision is a common method for open debridement and decompression of the Achilles tendon insertion. Many surgeons prefer it because it makes all relevant tissues, such as the bursa, calcaneal exostosis, and Achilles intrasubstance, clearly visible. It is believed that the posterior tibial arteries and peroneal artery branches will be minimally disrupted by this central tendon-splitting technique. Additionally, compared to a lateral incision, there might be a lower chance of sural damage. Additionally, if augmentation is needed, this method permits access to FHL. However, compared to the other methods, scar irritation is a greater worry. (16)

There are still worries about possible compromise of tendon integrity even though the Achilles tendon-splitting technique provides great exposure of the tendon, enabling sufficient debridement of both the tendon and bursa. These issues include postoperative scar discomfort, especially from pressure from the heel counter, and a delayed return to full function. In various disease situations, arthroscopic procedures have replaced open surgical techniques over the past few decades in order to reduce the risks associated with open surgical techniques, speed up recovery, and increase patient satisfaction. (11, 13)

To prevent neurovascular damage, especially to the sural nerve and the tiny saphenous vein, a longitudinal midline skin incision is made (fig. 4). The Achilles tendon, which extends from the midline to the lateral half, is centrally split and slightly separated from its calcaneal insertion following the paratenon incision. Degenerated Achilles tendon segments and pathological bursae are removed. The posterosuperior calcaneal protrusion (retrocalcaneal exostosis) is then resected from medial to lateral using a curved osteotome. A rasp is then used to reconstruct the calcaneal bone, creating a smooth, non-irritating surface. When mechanical integrity is compromised, the tendon is reattached using non-absorbable suture anchors (often two); otherwise, side-to-side approximation is used to finish the repair (fig. 5). (11, 16)

Figure 4: Landmarks of longitudinal midline incision. (17)

Figure 5: Intraoperative photograph demonstrating placement for 2-anchor, single-row tendon repair. (17)

Lateral approach:

The lateral approach for Haglund deformity excision is a highly effective surgical technique particularly suited for cases where the Achilles tendon remains relatively healthy and free of major degeneration. One of its main benefits is that it eliminates the need for a midline tendon-splitting incision, which greatly lowers the risk of postoperative Achilles tendon avulsion and morbidity. For patients who do not need significant intratendinous debridement, this method provides a safer profile by maintaining the integrity of the tendon medial insertion (fig. 6). Clinically, the American Orthopedic Foot & Ankle Society (AOFAS) scores of patients undergoing a lateral approach frequently improve significantly, and the Visual Analog Scale (VAS) shows a considerable decrease in pain. Additionally, the mini-open lateral method removes the need for expensive anchor sutures or extended immobilization in a postoperative slab and permits early mobilization. (18)

The Achilles tendon's broader medial insertion is one benefit of the lateral approach. There is a lower chance of postoperative avulsion when using the lateral technique. However, as iatrogenic neuropathic symptoms continue to be the most commonly reported complication in lateral-based procedures, careful dissection is necessary to identify and preserve the sural nerve throughout the process. Despite this, the lateral method continues to show consistent pain alleviation and excellent patient satisfaction in recent clinical series when carried out with careful technique and suitable patient selection. (19)

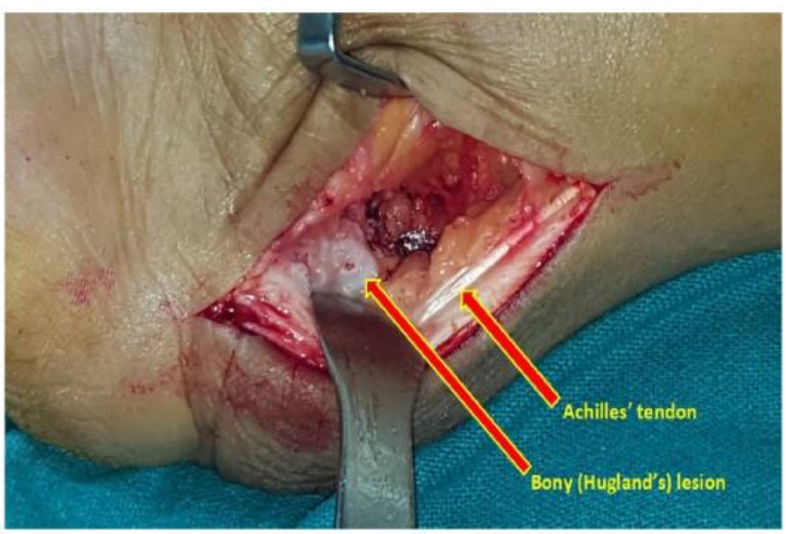

Figure 6: Intraoperative image of the bony lesion in Haglund syndrome. (1)

Medial approach:

The medial technique for Haglund deformity excision offers better access to the anterior and medial sides of the calcaneal tuberosity, enabling more thorough debridement of the anterior surface of the Achilles tendon and more complete removal of the posterosuperior prominence. When pathology extends medially or when insufficient exposure by a lateral incision is expected, this method may be especially helpful. Furthermore, by avoiding the sural nerve's path, the medial approach lowers the danger of iatrogenic nerve damage that is frequently connected to lateral procedures. (20)

However, because of surgeons' lack of experience with it and the possible risk to medial neurovascular structures, such as branches of the posterior tibial nerve and arteries, it is utilized less frequently. Therefore, to maximize results and reduce problems, careful surgical technique and patient selection are crucial. (20)

Endoscopic/Minimally Invasive surgical Procedure:

Compared to open procedures, endoscopic exposure has a number of significant benefits, such as lower surgical morbidity, faster operating times, and less pain following surgery. Because there is less tissue disruption, it is also linked to a lower incidence of wound complications and soft-tissue healing issues. Patients usually recover more quickly as a result, which enables them to return to work and sports earlier. (21, 22)

Additionally, it is possible to distinguish the disease more clearly (fig. 7). Endoscopy can prevent bone over-resection and provide more accurate local decompression. This may lessen the chance of an iatrogenic calcaneal fracture or damage to the Achilles tendon insertion. The patient might be positioned either supine or prone during the procedure. (23)

Additionally, by enabling controlled and targeted bone removal under direct sight, the endoscopic method reduces the risk of damage to the Achilles tendon insertion and helps prevent over-resection of the posterosuperior calcaneal prominence. Certain related contraindications should be taken into consideration, even if this method has been used in cases of Haglund syndrome with varying degrees of Achilles tendon involvement. These include substantial intratendinous ossifications, extensive intratendinous degeneration covering more than 50% of the tendon, and noticeable bony spurs that require secure reattachment of the Achilles tendon insertion and formal open debridement. (24)

Figure 7: Endoscopic image showing Haglund deformity and Achilles insertion. (25)

Nevertheless, endoscopic surgery remains technically demanding and may be time-consuming, as it requires precise visualization and adequate resection of bone from the calcaneal tuberosity, particularly across the medial and lateral margins. Previous studies have emphasized that sufficient bony resection is critical to achieving favorable clinical outcomes. (22,24,26)

However, there is still no standardized guideline defining the exact amount of bone that should be excised during calcaneoplasty. Consequently, under-resection may lead to persistent posterior heel pain and unsatisfactory results. Therefore, accurate identification of the site of impingement and careful intraoperative assessment of the extent of resection remain key technical challenges in endoscopic management of Haglund syndrome. (20)

Leitze et al. (26) reported a prospective cohort study in which 33 patients underwent endoscopic decompression of the retrocalcaneal space and were compared to 14 patients who underwent an open procedure. Compared to the open group, patients in the endoscopic group had greater AOFAS scores and fewer complications, including infection, altered sensation, and scar tenderness. However, a limitation of the endoscopic approach is that it may not be possible to entirely remove the bone spur or all diseased tissue in patients with full-thickness intratendinous calcifications. As such, it may be a more appropriate treatment for patients with disease characterized primarily by enlargement of the posterior superior calcaneal tuberosity. Among patients who are candidates for this technique, there have been several case series studies, with 87% to 95% of patients reporting good to excellent results with endoscopic calcaneoplasty.

Lohrer et al. (27) evaluated the morphologic appearance of the superior portion of the calcaneal tuberosity after endoscopic or open resection. They resected tuberosity in 15 isolated fresh-frozen human cadaver lower limb specimens with either open (nine) or endoscopic (six) technique. They measured the outcome radiographically which revealed that the slope of the resection line (osteotomy angle) was steeper and the resected protuberance was larger, whereas the remaining posterior rim was smaller after open resection than after endoscopic resection. Moreover, they evaluated iatrogenic soft-tissue lesions of the distal Achilles tendon, plantaris tendon, and sural nerve caused by the surgical procedure by direct observation after anatomic dissection where they concluded that both approaches may damage soft tissues particularly in the medial Achilles tendon column and in the plantaris tendon, with iatrogenic sural nerve injuries found after both techniques. Moreover, they detected residual bursa tissue only after endoscopy, whereas loose bony fragments were present only after open surgery.

Zadek's calcaneal osteotomy:

When the X/Y ratio is less than 2.5 and the Ruch angle is greater than 20°, Zadek's osteotomy is reserved for the larger bone prominence (fig. 8). This method can be used in conjunction with any tendon and bony operation, including endoscopic calcaneoplasty, bone anchor reattachment of the Achilles tendon, and debridement of the degenerative Achilles tendon. Zadek's osteotomy regulates the tuberosity's location in the sagittal planes. It is a dorsal closing wedge that lessens the conflict with the anterior face of the Achilles tendon by bringing forward the posterior and superior angles of the tuberosity. Because it establishes whether the heel is positioned horizontally, the osteotomy's vertex position is crucial. The tuberosity will rotate forward if the vertex remains posterior. (28)

The heel prominence is reduced by tilting it anteriorly with a dorsal closing-wedge calcaneal osteotomy (DCWCO). This variation aims to raise the tuberosity and lessen the calcaneus' verticalization when the osteotomy's vortex is positioned anteriorly to the plantar calcaneal tubercule. As a result, this movement may have an impact on other factors like the calcaneus's overall length or the Achilles tendon's lever arm. Therefore, the changes in the form of the calcaneus and the tensions at the Achilles tendon and Gastrocnemius muscle appear to be related to the biomechanical effects of this osteotomy on the interaction between the posterior side of the calcaneus and the distal end of the Achilles tendon. It might significantly improve the outcome of the calcaneoplasty (Fig. 9). (28)

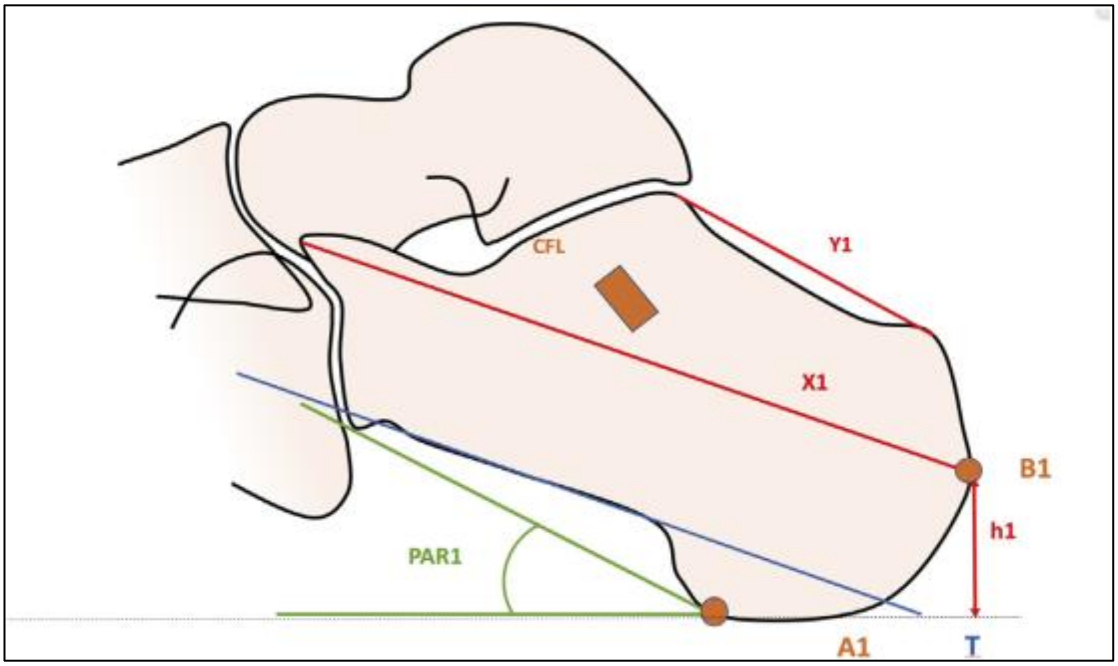

Figure 8: Radiographic measurements used in this report: X/Y ratio and the Pitch angle of Ruch (PAR1). (28)

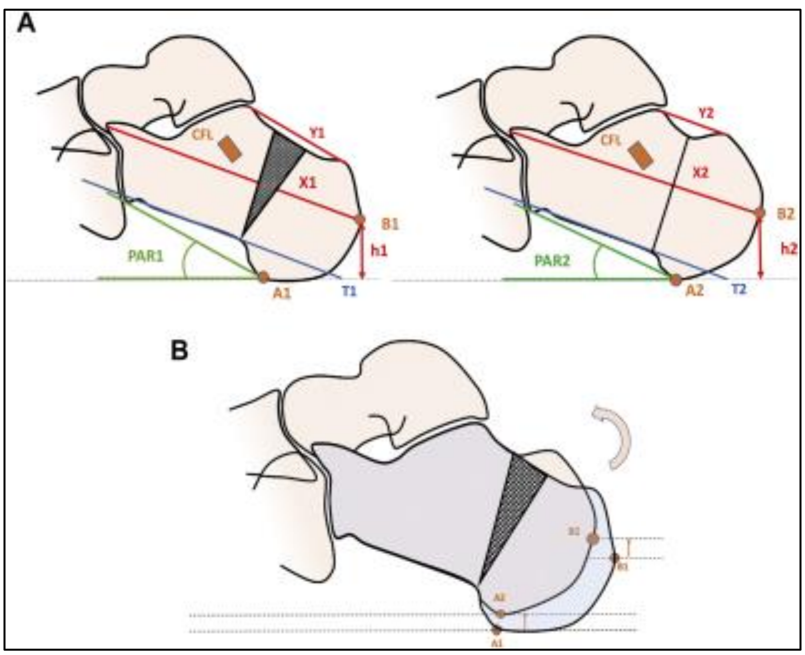

Figure 9: A and B: Effects of the Zadek's calcaneal osteotomy on the calcaneus shape and biomechanical conditions. (28)

Flexor Hallucis Longus (FHL) Tendon Transfer:

When the Achilles tendon is severely degenerating, FHL tendon transfer is frequently utilized to give augmentation. Degeneration, inflammation, and the overall percentage of tendon involvement were higher in those with IAT > 50. FHL augmentation has been proposed as a potential extra benefit for this age range. Although it might not be required for initial procedures, FHL tendon transfer seems to be safe and may increase plantar flexor strength. Additionally, this operation may put the medial or lateral plantar nerve at danger for transection (29)

Gastrocnemius Recession:

A gastrocnemius recession technique can be used alone or in conjunction with open debridement for patients who have a gastrocnemius contracture. Compared to open debridement, isolated gastrocnemius recession has the advantage of a quicker healing period (30)

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