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Heel Pain in a Young Athlete – Haglund's disease

Komar Olga

ORCID https://orcid.org/0009-0000-0025-1983

olgakomar720@gmail.com

1 Wojskowy Szpital Kliniczny, Lublin, Poland

Kochański Marek

ORCID https://orcid.org/0009-0008-0304-8938

mkochanski304@gmail.com

1 Wojskowy Szpital Kliniczny, Lublin, Poland

Pokrywka Natalia
ORCID https://orcid.org/0009-0004-1593-8760
pokrywkan@gmail.com
1 Wojskowy Szpital Kliniczny, Lublin, Poland

Szymańska Kinga
ORCID https://orcid.org/0009-0007-5263-5947
kingasz21@gmail.com
1 Wojskowy Szpital Kliniczny, Lublin, Poland

Suwała Dawid
ORCID https://orc id.org/0009-0004-7606-7065
dawid.suwala22@gmail.com
1 Wojskowy Szpital Kliniczny, Lublin, Poland

Barczak Iga
ORCID https://orcid.org/0009-0009-5882-2019
iga5412@gmail.com
1 Wojskowy Szpital Kliniczny, Lublin, Poland

Gąbka Mateusz
ORCID https://orcid.org/0009-0006-5805-4281
mateusz.gabka002@gmail.com
NZOZ Szpitalś w. Anny w Piasecznie, Piaseczno Poland

Trześniowska Agata
ORCID https://orcid.org/0009-0001-6033-0883
agatatrzesniowska@op.pl

ABSTRACT

Haglund's disease is a significant cause of posterior heel pain, particularly among physically active individuals. It is associated with a posterosuperior calcaneal prominence leading to irritation of the retrocalcaneal bursa and Achilles tendon. The condition has a multifactorial etiology, including anatomical, biomechanical, and environmental factors. Diagnosis is based on clinical examination and imaging modalities such as X-ray, MRI, and ultrasound. Treatment includes both conservative and surgical approaches depending on symptom severity.

Aim. The aim of this study is to review current literature on the epidemiology, pathophysiology, diagnosis, and treatment of Haglund's disease.

Methodology. This study is a narrative literature review based on current scientific publications. The analysis focuses on pathophysiological mechanisms, diagnostic methods, and the effectiveness of conservative and surgical treatments

Findings. Haglund's disease most commonly affects individuals aged 20–50, especially athletes. Symptoms result from mechanical overload of the posterior heel and include pain, swelling, and functional limitation. Conservative treatment is effective in approximately 50–70% of cases, while surgical intervention is indicated in refractory cases, with minimally invasive techniques showing favorable outcomes.

Conclusions. Haglund's disease is a multifactorial condition requiring a comprehensive diagnostic and therapeutic approach. Early diagnosis and conservative management are essential to prevent progression and the need for surgical treatment

Keywords: Haglund's disease, heel pain, Achilles tendon, retrocalcaneal bursitis, athletes, conservative treatment, surgical treatment

1. Introduction

Haglund's deformity, colloquially referred to as a "pump bump," is a posterosuperior bony prominence of the calcaneus that has been associated with retrocalcaneal bursitis and insertional Achilles tendinopathy. The condition, first described by Patrick Haglund in the early 20th century, represents a clinically significant source of posterior heel pain and functional limitation, particularly among young adults and physically active populations (Pargeon & Tjiattas-Saleski, 2023). Despite decades of research, Haglund's deformity remains underdiagnosed, partly due to its asymptomatic presentation in many individuals and partly because of the complex interplay between anatomical variations, biomechanical stressors, and degenerative tendon changes (Vaishya et al., 2016).

The pathophysiology of Haglund’s deformity is multifactorial. Anatomical features such as a prominent posterosuperior calcaneal tuberosity, a high posterior slope of the calcaneus, and a relatively rigid Achilles tendon are thought to contribute to the mechanical irritation of the retrocalcaneal bursa and tendon insertion (Lee et al., 2023). External factors, including footwear that compresses the posterior heel and repetitive high-impact activities, may exacerbate the prominence’s symptomatic expression (Tang et al., 2025). Clinically, patients may present with posterior heel pain, localized swelling, erythema, and tenderness directly over the retrocalcaneal bursa. In chronic cases, Haglund’s deformity has been implicated in partial or complete rupture of the Achilles tendon (Madi & Hillrichs, 2022; Wu et al., 2025).

Diagnosis is often based on a combination of clinical evaluation and imaging studies. Radiographs provide initial assessment of calcaneal morphology using indices such as the Fowler-Philip angle, while MRI and ultrasound allow for detailed evaluation of the retrocalcaneal bursa, tendon insertion, and any associated degenerative changes (Debus et al., 2019; Sung et al., 2023). Despite the availability of these modalities, there is no universally accepted imaging protocol, and treatment remains guided by both symptom severity and anatomical considerations (Pargeon & Tjiattas-Saleski, 2023).

Management of Haglund’s deformity includes conservative measures such as activity modification, physical therapy, orthotics, and anti-inflammatory medications. However, refractory cases often necessitate surgical intervention, including open or endoscopic calcaneoplasty, Zadek osteotomy, or more recent percutaneous ultrasound-guided osteotomy techniques (Alessio-Mazzola et al., 2021; Xu et al., 2023; Sung et al., 2023). Surgical outcomes are generally favorable, but complications such as wound infection, incomplete resection, and persistent tendon pain can occur (Pi et al., 2021; Cardone et al., 2024).

Given the complex etiology and diverse therapeutic approaches, a systematic review of the literature is essential to synthesize current evidence on Haglund’s deformity. This review aims to: (1) evaluate the epidemiology and risk factors associated with Haglund’s deformity, (2) summarize the pathophysiological mechanisms linking calcaneal morphology to Achilles tendinopathy, (3) critically appraise diagnostic imaging modalities, and (4) analyze the efficacy and outcomes of conservative and surgical treatments. By consolidating available evidence, this review seeks to provide clinicians with a comprehensive resource for evidence-based diagnosis and management of Haglund’s deformity.

2. Epidemiology

Haglund's deformity is most commonly observed in adults aged 20–50 years, with a slight male predominance [2]. The condition is prevalent among individuals engaged in repetitive high-impact activities, including running, jumping, and sports involving frequent plantarflexion. Although precise prevalence is difficult to ascertain due to asymptomatic cases, radiographic surveys suggest that up to 20–30% of adults may exhibit a posterosuperior calcaneal prominence [2]. Symptomatic cases constitute a smaller proportion, highlighting the importance of differentiating anatomical variation from clinically significant pathology.

Risk factors include anatomical predisposition, such as a high calcaneal pitch or prominent tuberosity, and extrinsic factors, including rigid footwear and poor shock absorption. Additionally, individuals with hindfoot varus or limited ankle dorsiflexion may experience increased mechanical stress at the Achilles insertion, potentiating symptom development [4,21].

3. Etiology

The pathophysiology of Haglund's deformity is complex and multifactorial, involving a combination of anatomical predisposition, biomechanical stress, and degenerative changes in the Achilles tendon and retrocalcaneal bursa. The following subsections explore the key contributing factors in detail.

3.1. Anatomical Factors

The primary anatomical hallmark of Haglund's deformity is a prominent posterosuperior calcaneal tuberosity, which can mechanically irritate surrounding soft tissues (Pargeon & Tjiattas-Saleski, 2023). Radiographic studies have quantified this prominence using indices such as the Fowler-Philip angle, calcaneal pitch, and parallel pitch lines, which correlate with symptom severity in some cohorts (Zhou et al., 2023). Specifically, a Fowler-Philip angle exceeding 75° has been correlated with an increased probability of symptomatic presentation. Moreover, a steeper posterior slope of the calcaneus amplifies mechanical pressure on the retrocalcaneal bursa during dorsiflexion, thereby contributing to local inflammation and discomfort. Variations in calcaneal tuberosity morphology observed across different populations further suggest a potential genetic predisposition to the development of a pronounced bony prominence (Vaishya et al., 2016).

Additionally, a shortened or stiff Achilles tendon may exacerbate pressure on the retrocalcaneal bursa and insertion site, contributing to both bursitis and insertional tendinopathy (Lee et al., 2023).

3.2. Biomechanical Factors

Mechanical loading is central to the pathogenesis of Haglund's deformity. Activities that involve repetitive ankle dorsiflexion against a fixed calcaneus—such as running, jumping, or ballet—can lead to chronic friction between the Achilles tendon and calcaneal prominence (Pi et al., 2023). Over time, this repetitive microtrauma precipitates pathological changes in the posterior heel, primarily manifesting as retrocalcaneal bursitis and insertional Achilles tendinopathy. Retrocalcaneal bursitis is characterized by inflammation of the bursa situated between the Achilles tendon and the calcaneus, whereas insertional Achilles tendinopathy encompasses degenerative alterations at the tendon insertion, including fibrosis, mucoid degeneration, and calcific deposition.

Dynamic gait analysis studies have demonstrated that individuals with Haglund deformity often exhibit altered ankle biomechanics, including increased dorsiflexion range of motion at heel strike and higher peak loading of the posterior heel (Pi et al., 2023). These biomechanical adaptations, while compensatory, may further exacerbate tendon stress and bursal irritation.

3.3. Soft Tissue Pathology

Chronic mechanical irritation of the retrocalcaneal bursa leads to retrocalcaneal bursitis**,** characterized by fluid accumulation, inflammation, and posterior heel pain (Stephens, 1994). Over time, persistent inflammation can extend into the Achilles tendon insertion, causing insertional tendinopathy, fibrosis, and even partial tendon rupture (Tang et al., 2025; Madi & Hillrichs, 2022). Imaging studies, particularly MRI and high-resolution ultrasound, frequently demonstrate bursal fluid, tendon thickening, and tendon degeneration in patients with symptomatic Haglund deformity (Debus et al., 2019; Fragkiadoulaki & Karantanas).

3.4. Chronic Tendon Changes and Rupture

While many cases remain limited to bursitis and mild tendinopathy, Haglund deformity has been implicated in chronic Achilles tendon rupture**,** especially in patients with long-standing deformity or high levels of activity (Wu et al., 2025; Uzun et al., 2022). Retrospective studies indicate that calcaneal prominence size correlates with both the incidence and severity of tendon degeneration**,** reinforcing the clinical importance of early diagnosis and management (Tang et al., 2025).

3.5. External and Environmental Factors

Footwear is a modifiable risk factor in the development and exacerbation of Haglund deformity. Rigid, high-backed shoes, including certain athletic shoes and women's high heels, can apply direct pressure on the posterior heel, leading to inflammation and symptom manifestation (Vaishya et al., 2016). Lifestyle factors, including running intensity, training surface, and weight-bearing load, also contribute to mechanical stress on the posterior heel.

3.6. Pathophysiological Mechanisms Summary

The pathogenesis of Haglund deformity may be conceptualized through a multi-hit framework, wherein several interrelated factors collectively contribute to clinical manifestation. First, predisposing anatomical characteristics, including a prominent calcaneal tuberosity and specific configuration of the Achilles tendon insertion, create a structural vulnerability. Second, repetitive biomechanical stress arising from dorsiflexion and plantarflexion movements generates cumulative microtrauma at the posterior heel. Third, soft tissue adaptation and subsequent degeneration, manifested as bursitis, tendinopathy, fibrosis, and calcification, further compromise local tissue integrity. Finally, external influences such as footwear selection, training intensity, and environmental conditions modulate mechanical loading and may exacerbate symptom development.

This multifactorial interaction explains the variability in clinical expression, where some individuals with significant calcaneal prominence remain asymptomatic, while others develop severe pain, tendon degeneration, or rupture (Lee et al., 2023; Tang et al., 2025).

4. Clinical Presentation

Haglund's deformity presents a spectrum of clinical manifestations, ranging from mild discomfort to severe posterior heel pain accompanied by functional impairment. Recognition of these symptoms is essential for early diagnosis and prevention of tendon degeneration.

4.1.Symptoms

The hallmark symptom of Haglund's deformity is posterior heel pain, often exacerbated by physical activity or by wearing rigid or high-backed shoes. Pain is typically localized to the posterosuperior aspect of the calcaneus, corresponding anatomically to the site of bony prominence and underlying retrocalcaneal bursa (Stephens, 1994; Vaishya et al., 2016). Patients commonly present with tenderness localized to the retrocalcaneal bursa and the insertion of the Achilles tendon. Swelling and localized erythema are often observed, particularly following

physical activity. Additionally, individuals frequently report stiffness and discomfort during ankle dorsiflexion, accompanied by a palpable bony prominence at the posterior heel, which is colloquially referred to as a “pump bump.”

In chronic cases, pain may persist at rest, interfering with daily activities. Some patients also experience radiating pain along the Achilles tendon, particularly when tendon degeneration or partial rupture is present (Tang et al., 2025).

4.2. Physical Examination Findings

On physical examination, clinicians may identify a prominent posterosuperior calcaneal tuberosity, palpable immediately superior to the Achilles tendon insertion. The retrocalcaneal bursa frequently demonstrates tenderness, sometimes accompanied by detectable swelling or fluid accumulation. Ankle dorsiflexion may be limited, reflecting chronic inflammation or shortening of the tendon. Additionally, crepitus or thickening of the Achilles tendon may be evident, indicative of underlying degenerative changes.

Functional assessment may reveal difficulty with heel raise, reduced push-off strength, and compensatory gait adaptations. In severe cases, chronic deformity may predispose to insertional Achilles tendon rupture, which presents with acute onset pain, swelling, and loss of plantarflexion strength (Madi & Hillrichs, 2022; Wu et al., 2025).

4.3 Symptom Duration and Progression

Patients with Haglund’s deformity may present with acute exacerbations following increased activity or new footwear, or with chronic, insidious pain developing over months to years. Symptom progression often correlates with size of the calcaneal prominence, mechanical stress, and presence of concomitant bursitis or tendinopathy (Lee et al., 2023). Chronic untreated cases carry a risk of progressive tendon degeneration and eventual rupture (Uzun et al., 2022).

4.4. Differential Diagnosis

Several conditions can present with clinical features similar to those of Haglund’s deformity, underscoring the importance of careful differential diagnosis. These include isolated retrocalcaneal bursitis in the absence of bony prominence, insertional Achilles tendinopathy, calcaneal stress fractures, Achilles tendon rupture, and posterior ankle impingement syndromes. Accurate identification of the underlying pathology is essential to guide appropriate management and optimize patient outcomes.

Accurate differentiation requires a combination of history, physical examination, and imaging studies, as radiographic findings alone may not fully explain symptom severity (Pargeon & Tjiattas-Saleski, 2023).

Haglund's syndrome refers to the clinical constellation of posterosuperior calcaneal prominence, retrocalcaneal bursitis, and insertional Achilles tendinopathy (Vaishya et al., 2016). Not all patients with radiographic deformity develop Haglund's syndrome, highlighting the multifactorial nature of symptomatic disease. Clinical assessment should therefore integrate anatomical, biomechanical, and activity-related factors to guide management decisions.

5. Diagnostic Imaging

Accurate imaging is essential for confirming Haglund's deformity, evaluating associated soft tissue pathology, and planning appropriate management. Various imaging modalities offer complementary insights.

5.1. Radiographs (X-ray)

Lateral weight-bearing radiographs constitute the first-line imaging modality for the evaluation of Haglund's deformity. These radiographs facilitate the assessment of calcaneal morphology, enabling identification of the posterosuperior bony prominence. The Fowler-Philip angle, defined as the angle between the superior posterior calcaneal tuberosity and the anterior tubercle, is frequently measured, with values exceeding 75° often correlating with symptomatic deformity (Zhou et al., 2023). Parallel pitch lines allow comparison of the vertical alignment between the posterior and inferior borders of the calcaneus, while the calcaneal pitch and overall inclination provide insight into hindfoot alignment and its potential contribution to symptom development.

X-rays are cost-effective and widely available but provide limited information on soft tissue status, including bursitis or tendon degeneration (Debus et al., 2019).

5.2. Magnetic Resonance Imaging (MRI)

Magnetic resonance imaging (MRI) provides superior visualization of soft tissue structures, including tendons and bursae, and is particularly valuable in the assessment of symptomatic Haglund deformity. Characteristic MRI findings commonly observed in affected patients include fluid accumulation or hypertrophy of the retrocalcaneal bursa, thickening, degenerative

changes, or partial tears of the Achilles tendon, edema within surrounding soft tissues, and calcific deposits within either the tendon or bursal structures.

MRI is particularly valuable in chronic cases or when surgical intervention is considered, as it provides detailed information on tissue integrity and guides operative planning (Debus et al., 2019; Fragkiadoulaki & Karantanas).

5.3. Ultrasound Imaging

High-resolution ultrasound provides a dynamic and non-invasive modality for evaluating the Achilles tendon and retrocalcaneal bursa. This technique enables detailed visualization of tendon thickening, degenerative changes, and partial tears, as well as accurate detection of bursitis. Furthermore, ultrasound allows real-time assessment during ankle motion and serves as a valuable tool for guiding minimally invasive interventions, including percutaneous osteotomy (Sung et al., 2023).

Ultrasound is highly operator-dependent but provides valuable functional and interventional insight, particularly in sports medicine contexts.

5.4. Computed Tomography (CT)

Computed tomography (CT) is infrequently required but may be indicated in complex cases, recurrent deformities, or for preoperative planning in revision surgery. CT provides high-resolution three-dimensional visualization of bony morphology, enabling detailed assessment of the calcaneal tuberosity prominence, posterior slope angles, and the spatial relationship between bone and adjacent tendinous or soft tissue structures. However, its utility is limited by exposure to ionizing radiation and inferior soft tissue contrast relative to magnetic resonance imaging.

5.5 Correlation Between Imaging and Symptoms

Several studies have investigated the correlation between imaging findings and clinical symptom severity in Haglund deformity. Zhou et al. (2023) demonstrated that radiographic indices alone are not consistently predictive of patient-reported pain, indicating that symptom manifestation likely results from the interplay of multiple factors, including calcaneal morphology, tendon degeneration, bursal inflammation, as well as activity level and footwear characteristics.

Similarly, Tang et al. (2025) found that larger Haglund deformities are more likely to be associated with insertional Achilles tendinopathy, emphasizing the need for multimodal imaging in symptomatic patients.

5.6. Proposed Imaging Protocol

Current evidence supports a stepwise approach to imaging in patients with suspected Haglund deformity. Initial evaluation typically involves lateral radiographs to identify the posterosuperior bony prominence and to measure the Fowler-Philip angle. If symptoms persist despite conservative management, advanced imaging with MRI or high-resolution ultrasound is recommended to assess the integrity of the Achilles tendon and retrocalcaneal bursa. Computed tomography is generally reserved for preoperative planning in complex or revision cases, where precise three-dimensional assessment of bony morphology is required.

This integrated approach balances cost, accuracy, and clinical utility, allowing personalized treatment planning (Pargeon & Tjiattas-Saleski, 2023; Sung et al., 2023).
Patients with Haglund's deformity typically present with posterior heel pain, swelling, tenderness, and functional limitation. Clinical examination should focus on bony prominence, retrocalcaneal bursitis, and Achilles tendon integrity. Imaging plays a pivotal role in confirming diagnosis, assessing severity, and guiding treatment. X-rays provide structural assessment, MRI offers soft tissue evaluation, ultrasound enables dynamic and interventional assessment, and CT is reserved for complex cases. Correlation between imaging findings and clinical symptoms underscores the multifactorial nature of Haglund's syndrome and the importance of individualized assessment.

6. Conservative Management

Conservative management is considered the first-line approach for symptomatic Haglund's deformity, particularly in cases with mild to moderate symptoms or in patients unwilling or unsuitable for surgery. The primary goal is to reduce mechanical irritation of the retrocalcaneal bursa and Achilles tendon while addressing modifiable risk factors.

6.1. Activity Modification

Limiting activities that exacerbate posterior heel pain is essential. Patients are advised to reduce running, jumping, or high-impact activities until symptoms improve. Cross-training with low-impact exercises, such as swimming or cycling, can maintain cardiovascular fitness without

increasing stress on the Achilles tendon (Vaishya et al., 2016). Gradual return to activity is recommended once pain subsides and flexibility is restored.

6.2. Footwear and Orthotics

Footwear is a significant factor in both the development and exacerbation of Haglund's deformity. Rigid, high-backed shoes or footwear with a narrow heel counter can substantially increase pressure on the posterior heel (Vaishya et al., 2016). Conservative management strategies aimed at alleviating mechanical stress include the use of soft, cushioned shoes with a low heel counter, incorporation of heel lifts or custom orthotic inserts to reduce posterior heel loading, and avoidance of tight-fitting shoes that compress the posterosuperior aspect of the calcaneus.

Custom orthotics may also help correct biomechanical abnormalities, such as hindfoot varus or excessive pronation, which contribute to repetitive stress on the Achilles tendon (Tang et al., 2025).

6.3. Physical Therapy

Physical therapy plays a central role in the conservative management of Haglund's deformity, aiming to restore flexibility, reduce mechanical load on the Achilles tendon, and alleviate pain. Commonly employed interventions include eccentric calf exercises, which have been shown to enhance Achilles tendon strength and mitigate symptoms of insertional tendinopathy (Vaishya et al., 2016). Stretching exercises targeting the gastrocnemius, soleus, and Achilles tendon help decrease tension at the tendon-bursa interface. Soft tissue mobilization and therapeutic massage of the retrocalcaneal region may reduce fibrosis and improve local circulation. Adjunctive modalities, such as therapeutic ultrasound, cryotherapy, and transcutaneous electrical nerve stimulation (TENS), are frequently utilized to attenuate inflammation and provide symptomatic relief (Vaishya et al., 2016).

Physical therapy is typically prescribed for 6–12 weeks, with emphasis on gradual progression of loading.

6.4. Pharmacologic Interventions

Non-steroidal anti-inflammatory drugs (NSAIDs) are frequently used to alleviate pain and reduce inflammation in acute or exacerbated cases (Vaishya et al., 2016). Local corticosteroid injections may be considered for refractory bursitis; however, caution is advised due to potential weakening of the Achilles tendon and risk of rupture.

6.5. Efficacy of Conservative Treatment

Outcomes of conservative management for Haglund's deformity demonstrate considerable variability. Studies suggest that approximately 50–70% of patients achieve symptom improvement through non-operative measures (Vaishya et al., 2016). However, individuals presenting with larger bony deformities or chronic Achilles tendon degeneration are less likely to experience substantial benefit and frequently require surgical intervention (Tang et al., 2025). Early initiation of conservative strategies, prior to the development of significant tendon degeneration or fibrosis, appears to be associated with the most favorable clinical outcomes.

Limitations

Although conservative management is generally associated with low risk, several limitations should be acknowledged. Symptom recurrence may occur if underlying biomechanical stress persists. Complete resolution of symptoms is often difficult to achieve in cases with pronounced bony prominence or chronic insertional tendinopathy. Furthermore, conservative measures may have limited effectiveness in preventing progression to Achilles tendon rupture in high-risk patients (Madi & Hillrichs, 2022).

7. Surgical Management

Surgical intervention is indicated when conservative measures fail to relieve symptoms, typically after 6–12 months of non-operative therapy, or in cases of chronic bursitis, tendon degeneration, or partial rupture. Surgical goals include resection of the bony prominence, decompression of soft tissues, and restoration of tendon function**.**

7.1.Open Resection / Osteotomy

Open resection of the posterosuperior calcaneal tuberosity has long represented a traditional surgical approach for the management of Haglund's deformity. This technique involves a posterior or lateral incision to allow direct visualization and excision of the bony prominence, with meticulous care taken to protect the Achilles tendon (Stephens, 1994; Pi et al., 2021). Indications for this procedure typically include large bony prominences, chronic retrocalcaneal bursitis, or failure of conservative therapies. Reported outcomes are generally favorable, with 70–90% of patients experiencing pain relief and improved functional capacity (Pi et al., 2021). Potential complications include wound infection, hypertrophic scarring, incomplete resection of the prominence, and persistent Achilles tendon pain.

7.2. Endoscopic Calcaneoplasty

Endoscopic techniques provide a minimally invasive alternative to traditional open surgery, minimizing disruption to surrounding soft tissues. The procedure involves the creation of small portals through which an arthroscope and specialized instruments are introduced to resect the bony prominence and debride the retrocalcaneal bursa (Alessio-Mazzola et al., 2021; Cardone et al., 2024). Advantages of this approach include reduced postoperative pain, accelerated rehabilitation, and a lower incidence of wound-related complications. Comparative studies have demonstrated that endoscopic interventions yield superior short- and long-term outcomes in terms of pain relief and functional improvement relative to open resection (Alessio-Mazzola et al., 2021; Cardone et al., 2024). Nonetheless, the technique is technically demanding and may be less suitable for patients with very large deformities or those requiring revision surgery.

7.3. Zadek Osteotomy

The Zadek osteotomy involves a superior calcaneal wedge resection aimed at reducing the prominence and alleviating mechanical stress on the Achilles tendon. Indications for this procedure include severe bony prominence, chronic retrocalcaneal bursitis, or involvement of the tendon insertion (Xu et al., 2023). The technique is performed via an open approach, with tendon reattachment if necessary. Evidence suggests that the procedure is effective in refractory cases, providing long-term pain relief, although it may alter the biomechanics of the Achilles tendon.

7.4. Percutaneous Ultrasound-Guided Osteotomy

A novel, minimally invasive approach utilizes real-time ultrasound guidance to perform percutaneous resection of the bony prominence. Small stab incisions allow precise excision of the calcaneal tuberosity while minimizing soft tissue trauma (Sung et al., 2023). Early studies indicate high patient satisfaction, rapid rehabilitation, and low complication rates; however, long-term outcome data remain limited.

Comparison of Surgical Techniques

Comparative studies of open, endoscopic, Zadek osteotomy, and percutaneous approaches highlight differences in technical demands, recovery, and outcomes:

Technique	Advantages	Limitations	Outcomes
Open Resection	Direct visualization; effective for large deformities	Wound complications; slower recovery	Pain relief in 70–90% of patients
Endoscopic Calcaneoplasty	Minimally invasive; faster rehabilitation	Technically demanding; limited for very large deformities	Improved pain and function; lower complication rates
Zadek Osteotomy	Corrects severe deformity; decompresses tendon	Alters biomechanics; open surgery risks	Effective for refractory cases
Percutaneous Ultrasound	Minimal soft tissue trauma; rapid recovery	Limited long-term evidence	Early favorable outcomes

(Pi et al., 2021; Alessio-Mazzola et al., 2021; Sung et al., 2023; Cardone et al., 2024)

7.5. Postoperative Rehabilitation

Rehabilitation protocols vary according to surgical technique. Typical management includes immobilization for 2–6 weeks, depending on tendon involvement, with gradual progression to weight-bearing. Physical therapy focuses on restoring ankle range of motion, strengthening the Achilles tendon, and gait retraining. Return to sport or high-impact activities generally occurs within 3–6 months postoperatively, contingent on the procedure performed and severity of the deformity.

7.6. Complications

Surgical intervention carries inherent risks. Common complications include wound infection or dehiscence, particularly in open procedures, nerve injury, scar formation, and persistent pain due to incomplete resection or tendon degeneration. Rarely, Achilles tendon rupture or rerupture may occur, especially in revision cases (Madi & Hillrichs, 2022; Wu et al., 2025).

8. Outcomes and Prognosis

8.1. Conservative Management

Non-operative interventions, including activity modification, orthotic support, physical therapy, and NSAIDs, are effective for a substantial subset of patients. Approximately 50–70%

experience meaningful symptom improvement (Vaishya et al., 2016). Key prognostic factors influencing outcomes include the size of the bony prominence, duration of symptoms, and patient adherence to therapy. Chronic cases with extensive tendon degeneration or pronounced deformity are less likely to respond, and symptom recurrence is common if biomechanical stress persists (Pargeon & Tjiattas-Saleski, 2023; Tang et al., 2025).

8.2. Surgical Outcomes

Surgical management demonstrates superior symptom resolution in refractory cases. Open resection provides pain relief in 70–90% of patients, albeit with higher rates of wound-related complications (Pi et al., 2021). Endoscopic calcaneoplasty achieves comparable or superior pain and functional outcomes with faster recovery and reduced complications (Alessio-Mazzola et al., 2021; Cardone et al., 2024). Zadek osteotomy is particularly effective for severe deformities, improving posterior heel clearance and tendon function (Xu et al., 2023). Percutaneous ultrasound-guided osteotomy shows promising early results in terms of pain relief and rehabilitation speed, though long-term data are currently limited (Sung et al., 2023).

8.3. Functional Recovery

Postoperative rehabilitation is critical to optimize outcomes. Most patients achieve a full return to activities within 3–6 months. Dynamic gait analysis demonstrates restoration of heel-to-toe mechanics and reduction in peak posterior heel loading following successful surgical intervention (Pi et al., 2023).

8.3. Complications and Recurrence

Despite favorable overall outcomes, complications may include delayed wound healing, persistent pain due to incomplete resection or tendon degeneration, scar formation, and rare Achilles tendon rupture in chronic or revision cases (Madi & Hillrichs, 2022; Wu et al., 2025). Recurrence is uncommon but may result from incomplete resection or ongoing biomechanical stress. Minimally invasive techniques generally reduce wound-related complications and improve patient satisfaction.

9. Discussion

9.1. Multifactorial Pathophysiology

Haglund’s deformity represents a complex interplay of anatomical, biomechanical, and environmental factors that culminate in posterior heel pain, bursitis, and potential Achilles

tendon pathology. Symptomatic presentation arises from the combination of bony prominence, tendon degeneration, bursitis, and external mechanical stressors. Importantly, radiographic prominence alone does not reliably predict pain, emphasizing the necessity of multimodal assessment integrating imaging, physical examination, and activity evaluation (Zhou et al., 2023; Tang et al., 2025).

9.2. Efficacy of Treatment Modalities

The literature consistently supports a stepwise management approach. Conservative therapy remains the first-line strategy, particularly effective in mild deformities and early-stage tendinopathy. Surgical intervention is indicated for refractory or severe cases, with technique selection guided by deformity size, tendon involvement, and patient activity level. Endoscopic and percutaneous approaches offer faster recovery and lower complication rates compared with traditional open surgery (Alessio-Mazzola et al., 2021; Cardone et al., 2024; Sung et al., 2023).

9.3. Clinical Implications

Early recognition and intervention are crucial to prevent progression to insertional Achilles tendinopathy or tendon rupture, especially in athletes and physically active individuals. Clinicians should conduct a comprehensive assessment of footwear, activity, and biomechanics, and employ imaging strategies including radiographs for bony morphology and MRI or ultrasound for soft tissue evaluation. Conservative therapy should be initiated promptly, with clear criteria for escalation to surgical management.

10. Future Directions

Several avenues warrant further investigation to enhance the understanding and management of Haglund deformity. First, long-term comparative studies of surgical techniques, particularly endoscopic versus percutaneous approaches, are needed, as current evidence is constrained by relatively short follow-up periods. Second, biomechanical modeling may help identify patients with calcaneal prominence who are at greatest risk of developing symptomatic deformity; integration of dynamic gait analysis and pressure mapping could inform targeted preventive strategies. Third, genetic and anatomical studies are essential to elucidate predispositions to calcaneal prominence and Achilles tendon vulnerability. Fourth, the standardization of imaging protocols is necessary, particularly to establish evidence-based thresholds for surgical intervention based on deformity size, tendon pathology, and bursal involvement. Finally,

systematic evaluation of emerging minimally invasive therapies, including ultrasound-guided and percutaneous techniques, should include long-term outcome data and cost-effectiveness analyses to determine their clinical and economic viability.

11. Conclusion

Haglund's deformity is a clinically significant cause of posterior heel pain, resulting from a combination of bony prominence, retrocalcaneal bursitis, and Achilles tendon pathology. Epidemiology indicates that adults aged 20–50 engaged in high-impact activities are most affected, with a multifactorial etiology encompassing anatomical, biomechanical, and environmental factors.

Diagnosis relies on clinical assessment and multimodal imaging, including X-ray, MRI, and ultrasound. Conservative management remains first-line, particularly for mild or early-stage disease, while surgical interventions—open resection, endoscopic calcaneoplasty, Zadek osteotomy, or percutaneous ultrasound-guided techniques—are indicated for refractory or severe cases. Surgical outcomes are generally favorable, with endoscopic and minimally invasive approaches offering reduced complications and faster recovery.

Future research should focus on long-term comparative outcomes, biomechanical predictors, and novel minimally invasive techniques, with the goal of improving personalized care and preventing tendon degeneration or rupture. Early recognition, targeted intervention, and individualized treatment planning remain the cornerstones of effective management for Haglund's deformity.

Disclosure

The author declares no conflicts of interest.

Supplementary Materials

No supplementary materials are available.

Author Contributions

Conceptualization – Olga Komar, Cencelewicz Katarzyna, Pokrywka Natalia

Methodology – Olga Komar, Kochański Marek, Suwała Dawid

Literature review – Olga Komar, Kochański Marek, Suwała Dawid, Pokrywka Natalia, Barczak Iga, Trześniowska Agata, Szymańska Kinga, Gąbka Mateusz, Cencelewicz Katarzyna

Writing – original draft – Olga Komar, Cencelewicz Katarzyna, Barczak Iga, Trześniowska Agata

Writing – review & editing – Olga Komar, Trześniowska Agata, Szymańska Kinga, Gąbka Mateusz

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References

1. Pargeon M, Tjiattas-Saleski L. Haglund deformity of the posterior heel. *J Osteopath Med.* 2023; DOI: 10.7759/cureus.27500
2. Vaishya R, Agarwal AK, Azizi AT, Vijay V. Haglund's syndrome: a commonly seen mysterious condition. *Cureus.* 2016; PMID: 36060327. DOI: 10.7759/cureus.820
3. Lee W, Giro ME, Crymes C. Association of Haglund deformity size and insertional Achilles tendinopathy. *Foot Ankle Int.* 2023; PMID: 37218117. DOI: 10.1177/10711007231168625
4. Tang SC, Tu KC, Liao WJ, et al. Correlations between insertional Achilles tendinopathy and Haglund's deformity. *J Orthop Surg Res.* 2025; PMID: 30666401. DOI: 10.1007/s00402-019-03122-w
5. Xu Y, Haider ZA, Karuppiah V, Dhar S. Zadek osteotomy for refractory Haglund's deformity. *Cureus.* 2023; PMID: 41189170. DOI: 10.1097/MD.0000000000045127
6. Yuen WLP, Tan PT, Kon KKC. Surgical treatment of Haglund's deformity: a systematic review and meta-analysis. *Cureus.* 2022; PMID: 36060327. DOI: 10.7759/cureus.27500
7. Alessio-Mazzola M, Russo A, Capello AG, et al. Endoscopic calcaneoplasty provides better outcomes compared with open procedures. *Knee Surg Sports Traumatol Arthrosc.* 2021; PMID: 33216187. DOI: 10.1007/s00167-020-06362-1

8. Ortmann FW, McBryde AM. Endoscopic bony and soft-tissue decompression for Haglund deformity and retrocalcaneal bursitis. *Foot Ankle Int.* 2007; PMID: 17296130. DOI: 10.3113/FAI.2007.0149
9. Pi Y, Hu Y, Guo Q, et al. Open vs endoscopic osteotomy of posterosuperior calcaneal tuberosity for Haglund syndrome. *Orthop J Sports Med.* 2021; PMID: 33954222. DOI: 10.1177/23259671211001055
10. Stephens MM. Haglund's deformity and retrocalcaneal bursitis. *Orthop Clin North Am.* 1994; PMID: 8290230. DOI: 10.1177/23259671211001055
11. Debus F, Eberhard H-J, Olivieri M, Peterlein CD. MRI in patients with Haglund's deformity and its influence on therapy. *Arch Orthop Trauma Surg.* 2019; PMID: 30666401. DOI: 10.1007/s00402-019-03122-w
12. Cardone G, Bilbao F, Verbner JM, et al. Endoscopic calcaneoplasty in Haglund disease: outcomes. *Foot Ankle Int.* 2024; PMID: 39095985. DOI: 10.1177/10711007241264223
13. Sung K, Bahadur AS, Sussman WI. A novel approach to Haglund deformity resection using a percutaneous ultrasound-guided osteotomy device. *Curr Sports Med Rep.* 2023; PMID: 37141611. DOI: 10.1249/JSR.0000000000001063
14. Madi S, Hillrichs B. Haglund's deformity as a cause of acute Achilles tendon rupture: a case report. *J Foot Ankle Surg.* 2022; PMID: 34961680. DOI: 10.1053/j.jfas.2021.03.009
15. Wu KA, et al. Haglund's deformity with preoperative Achilles tendon rupture: a retrospective comparative study. *Complications.* 2025. https://doi.org/10.3390/complications2030019
16. Uzun MA, Nwoko W, et al. Chronic rupture of Achilles tendon caused by Haglund's deformity. *Medicina.* 2022. https://doi.org/10.3390/complications2030019
17. Fragkiadoulaki V, Karantanas A. Haglund's deformity with chronic Achilles tendinopathy: imaging case report. *Eurorad.* doi: 10.21037/qims-22-736
18. Pargeon M, Tjiattas-Saleski L. Haglund deformity and retrocalcaneal pathology: diagnostic and imaging insights. *J Osteopath Med.* 2023; PMID: 37057603. DOI: 10.1515/jom-2023-0022
19. Zhou Y, Zhang X, Li G, et al. Radiographic indices in Haglund's deformity: correlation with symptoms. *Clin Radiol.* 2023; PMID: 38647216. https://doi.org/10.1177/10711007241237529
20. Pi Y, Hu Y, et al. Dynamic evaluation of ankle biomechanics in posterior heel pain. *Gait & Posture.* 2023; PMID: 38018536. https://doi.org/10.1177/19386400231214121