Haglund Deformity: Diagnosis and Treatment

Ahmad Fauzi
RSUD Budhi Asih, Jakarta, Indonesia

ABSTRAK

Deformitas Haglund adalah kelainan anatomi tulang kalkaneus berupa eksostosis di bagian posterosuperior, merupakan penyebab kedua tersering keluhan nyeri tumit sisi belakang pada atlet profesional dan amatir. Patogenesisnya masih belum diketahui; pada fase kronis, bursa retrokalkaneal dan tendon insersi Achilles akan ikut meradang. Kombinasi ini disebut dengan sindrom Haglund. Diagnosis ditegakkan dengan anamnesis komprehensif, pemeriksaan klinis, dan pencitraan diagnostik (*X-ray*, ultrasonografi, dan *magnetic resonance imaging*) secara cermat. Tata laksana lini pertama adalah terapi konservatif untuk mengurangi tekanan pada eksostosis. Lini kedua adalah pembedahan untuk menghilangkan eksostosis dengan atau tanpa debridemen bursa retrokalkaneal yang meradang dan/atau tendinopati Achilles.

Kata kunci: Deformitas Haglund, sindrom Haglund, tendinopati inersi Achilles.

ABSTRACT

Haglund deformity is an exostosis of the posterosuperior calcaneus. It is the second most common cause of posterior heel pain in professional and amateur athletes. The pathogenesis is still unknown; in the chronic phase, the retrocalcaneal bursa and Achilles insertional tendon will be inflamed. This condition is also known as Haglund syndrome. Diagnosis required comprehensive history-taking, clinical examination, and diagnostic imaging (X-ray, ultrasound, and magnetic resonance imaging). First-line treatment is conservative therapy to reduce pressure on the exostosis. The second line is surgery to remove the exostosis with or without debridement of the inflamed retrocalcaneal bursa or Achilles tendinopathy. **Ahmad Fauzi. Haglund Deformity: Diagnosis and Treatment**

Keywords: Achilles insertional tendinopathy, Haglund deformity, Haglund syndrome

INTRODUCTION

One of the frequent clinical symptoms of lower extremity pain is heel pain (calcaneodynia). Any tendon, bursa, nerve, and bone pathology surrounding the heel can precipitate the pain. The pain is categorized based on location, which is posterior, plantar, and midfoot heel pain. Posterior heel pain may be caused by Achilles tendinopathy, Haglund deformity with or without retrocalcaneal bursitis, or Sever disease.[1]

Haglund deformity, a prominent (exostosis) posterosuperior part of the calcaneus bone, is an anatomical pathology that may act as an irritative focus to the bursal structure at the anterior aspect of Achilles tendon insertion, the retrocalcaneal bursa. It formed tendino-bursitis entrapment on the heel and caused repeated friction during ankle dorsal and plantar flexion. The repeated friction causes inflammation, swelling, and tenderness on direct palpation.[1–4] It is also correlated with Achilles insertional tendinopathy (Achilles tendon – calcaneus bone insertion) because the irritative friction causes inflammation on the Achilles tendon. This correlation is called Haglund syndrome.[5] This deformity could also be causing pain at the superior aspect of the posterior calcaneus without any signs of bursa or tendon inflammation.[1]

This article will review Haglund's deformity, its clinical presentation, choices of the diagnostic workup, and treatment options.

ANATOMY

Calcaneus is the biggest bone on the foot and forms the heel area's prominence. Its position is below and articulated with a talus and cuboid in the front. This elongated, irregular, box-shaped bone is within the long axis along the foot's midline. It has six surfaces: anterior, posterior, superior, inferior, medial, and lateral. The anterior surface articulates with cuboid bone; the posterior surface is attached to the Achilles tendon. The superior surface has sulcus calcanei that articulate with the talus. The inferior surface has anterior, medial, and lateral tubercles. The medial surface has sustentaculum tali that assist support to the talus. The lateral surface has a flat surface.[6]

The posterior surface of the calcaneus is divided into three parts: upper, middle, and lower. The upper part is above the retrocalcaneal bursa. It is a smooth, triangular-shaped surface. The middle part has a rough surface where the Achilles tendon is attached (on the calcaneal tubercle), and the retrocalcaneal bursa is located. The lower part is the weight-bearing part, located below the calcaneal tubercle continuous to the plantar surface of the bone, the calcaneal tuberosity.[7]

ETIOLOGY

Patrick Haglund reported the first case in 1928.[5] This deformity is found in males or females, predominantly aged 20 – 30 years, and often bilateral.[8,9]

It is the second most common heel pain

Alamat Korespondensi *email: md.ahmadfauzi@gmail.com*


among professional and amateur athletes.[10] The specific pathogenesis is unknown; the hypothesis is a developmental condition related to a chronic calcaneal apophysitis (repetitive inflammation and stress injury on growth plate) in childhood.[4,5,11] This deformity is a predisposing mechanical factor for Achilles insertional tendinopathy and retrocalcaneal bursitis. The posterosuperior exostosis acts as an irritative focus, causing repetitive friction to the retrocalcaneal bursa and the insertion of the Achilles tendon in the calcaneus.[2] One in four patients with insertional Achilles tendinopathy have Haglund deformity.[12]

Figure 1. Haglund deformity *(yellow arrow)*. [13]

RISK FACTORS

Risk factors for retrocalcaneal bursitis and Achilles tendinopathy are repeated use of tight shoes (especially on the heel part), high heels, pes cavus (more vertical heel resulting in abnormal bone-tendon contact), tense Achilles tendon, heredity, over-practice runners, or dealigned subtalar joint causing altered biomechanics of foot joints.[1,3,4,9] Analysis study by Kraemer, *et al,* (2012) found up to fivefold risk among those who have relatives with Achilles tendon disorder.[14]

CLINICAL PRESENTATION

Clinically, the Haglund deformity does not present any sign of inflammation, only a painful prominent bone at the posterosuperior of the calcaneus **(Figure 1).** Pain may be located lateral to the Achilles tendon if the prominent bone is at the posterosuperior lateral side.[8] If accompanied by retrocalcaneal bursitis and Achilles insertional tendinitis, it is known as Haglund Syndrome; signs of inflammation would be obvious, consisting pain, erythema, swelling around the Achilles tendon, and tenderness on direct palpation of Achilles tendon insertion.[1,4] In chronic cases, the inflammatory signs would be diminished.[15]

The pain is triggered by initiation to walk after a period of rest.[9] Exercise, climbing stairs, and running or walking on uneven surfaces could aggravate the pain. The pain is mostly elicited during heel strike and maximum dorsiflexion. Pain could also be provoked by shoe wear, especially tight-on-heel models because it puts higher mechanical pressure on the Achilles tendon and retrocalcaneal bursa.[13] In contrast, it would be relieved by wearing open-heel shoes or even bare-walking because there is no pressure on the calcaneus.[8] There is also limited plantar flexion of the foot associated with limping.[5,9] On physical examination, specific pain, and swelling location could differentiate between Achilles insertion tendinitis and retrocalcaneal bursitis. Achilles insertional tendinitis commonly presents as a posterior heel sharp pain worsened by passive dorsiflexion, tenderness along the tendon, and might have a palpable thickened tendon. If pain and tenderness are felt around Achilles tendon and on direct palpation, it is possibly caused by retrocalcaneal bursitis.[1,16]

DIAGNOSIS

Diagnosis needs a thorough history-taking and clinical examination. Diagnostic imaging might improve diagnosis and facilitate pre-operative planning to achieve a better outcome.[11]

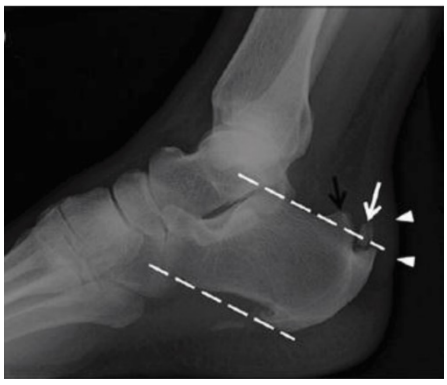

Figure 2. Lateral heel plain radiograph showing Haglund deformity *(black arrow),* fractured enthesophyte *(white arrow),* and soft tissue swelling around the Achilles tendon *(white arrowheads).* The parallel line is the Heneghan-Pavlov test angle to evaluate the Haglund deformity.[17]

Radiographic evaluation is essential in diagnosing Haglund's deformity. This condition is initially assessed on plain lateral weight-bearing foot and ankle radiography **(Figure 2).**

It might also be able to assess any calcification of the Achilles tendon insertion **(Figure 3).**[1] Bone landmarks could serve as reference points and be used as guidance in assessing the angles.

Figure 3. Lateral heel plain radiograph showing calcification of the Achilles insertion tendon *(blue arrow).*[15]

Several angles in the lateral heel radiograph can be assessed for the diagnosis of Haglund deformity.

- Fowler-Philip angle **(Figure 4).** It is the angle formed by the tangent of the straight line to the posterior side of the greater tuberosity of the calcaneus with the lowest point of the posteromedial tuberosity and the end of the calcaneocuboid joint line. The normal range is between 44° – 69°; >75° is considered pathological.[18]

- Ruch calcaneal pitch angle **(Figure 5).**The angle that is tangent to the lowest point of the posteromedial tuberosity and the end of the calcaneocuboid joint line the same as one of the Fowler-Philip line, with the horizontal line of the ground. The normal range is between 15° – 18° and >30° considered pathological. The angle between 18° - 30° is challenging to classify.[18]

- Heneghan-Pavlov parallel pitch lines (**Figure 2, 6**). It assesses whether a greater tuberosity crosses the top parallel line. Two lines run parallel. The first line runs through the plantar surface of the calcaneus and the second line, parallel to the first, runs through the posterior

edge of the talocalcaneal joint surface. If the superior line crosses the greater tuberosity, it is coined as positive.[18]

- Chauvex-Liet angle (**Figure 7**).This angle value is the difference between the Ruch calcaneal pitch (α) **(Figure 5)** and the angle that is made by a perpendicular line to the ground passing the most posterior point of the calcaneus with the posterior tuberosity of the calcaneus (β). The average angle range is <12°.[18] X/Y ratio **(Figure 8).** The newest radiological calcaneal measurement. In the Tourne, *et al,* study, there were no significant differences between groups for Chauveaux angle, Ruch pitch, and Fowler-Philip angle for sensitivity, specificity, PPV, and NPV.[13,18] The study reveals that the X/Y ratio has 100% sensitivity and 95% specificity of Haglund deformities. The ratios are <2.5 in Haglund deformities and >2.5 in non-Haglund deformities. X/Y ratio is defined as X as the total calcaneal length (the most anterior point of the greater apophysis to the most posterior point of the physiological calcaneus (exclude calcifications)), and Y is the length of the greater tuberosity (from the most posterior point of the calcaneal thalamus surface to the summit of the greater tuberosity).[18]

- Ultrasonography provides safer diagnostic imaging from ionizing radiation, faster and portable. It can show inflammatory changes in the underlying skin, differentiate retrocalcaneal bursitis (hypoechoic fluid within the retrocalcaneal bursa) from Achilles tendinopathy, and also evaluate any calcification within the Achilles tendon.[11,13]
  MRI of the ankle and foot positioned the patient in a supine with their ankle flexed and toes toward the ceiling.[17] MRI related to Haglund deformity shows an impingement between the posterosuperior calcaneal spurring with the Achilles tendon.[9] MRI also has the superiority to differentiate the inflamed retrocalcaneal bursa and the surrounding Achilles tendon **(Figure 9).** The retrocalcaneal bursa can be evaluated; a small amount of fluid in the retrocalcaneal bursa is considered normal but may become pathologic if the dimension exceeds 6 mm superior to inferior, 3 mm transverse, and 2 mm anteroposterior.[17] The disadvantages of this procedure are the expensive cost and the hospital's MRI machine availability.

Figure 4. Fowler-Philip angle.[18]

Figure 5. Ruch Calcaneal Pitch angle.[10]

Figure 6. Heneghan-Pavlov parallel pitch line.[18]

Figure 7. Chauveaux & Liet angle.[18]

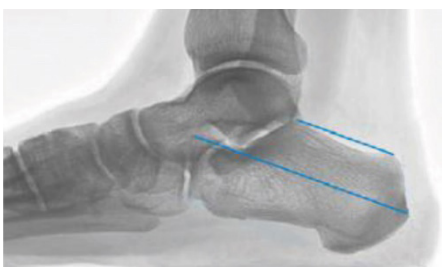

Figure 8. X/Y Ratio : X is the bottom line and Y is the top line.[18]

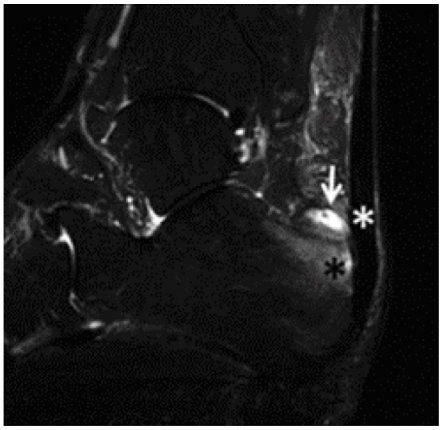

Figure 9. MRI of Achilles insertion tendinosis. Thickened Achilles tendon (*white asterisk*), retrocalcaneal bursitis (*white arrow*), and calcaneal tubercle marrow edema (*black asterisk*).[17]

TREATMENT

The treatment goals of the Haglund deformity are to alleviate the inflammation, diminish the friction caused by the deformity, and reduce the tension in the Achilles tendon by conservative and/or surgical treatment. The Conservative approach is the first-line treatment; the choices include shoe modifications, physical therapy, stretching exercise, steroid injection, and oral or topical anti-inflammatory and analgesic drugs.[1,9,11,16]

The shoe can be modified to reduce the friction of the bone protrusion, such as putting the upper trim line of the shoes under the bone protrusion, putting heel lifts inside shoes to position the posterior heel over the upper trim, or wearing sandals.[16] Physical therapy and stretching exercises, such as daily calf-stretching exercises, are helping to ease the tension of the Achilles tendon.[9,11] The steroid injection is done on perilesional or percutaneous around the Achilles tendon or directly into the retrocalcaneal bursae. This injection should be done ultrasound-guided to achieve a better injection location. However, percutaneous injection of steroids around the Achilles tendon has a risk of tendon rupture.[11]

Nonetheless, conservative therapy will fail in almost half of patients, especially those with retrocalcaneal bursitis and/or Achilles insertional tendinopathy.[11,19] Conservative therapy is considered failed if unresponsive after six months. Surgical management is the following line of treatment.[10]


The goal of surgery for Haglund deformity is to remove the exostosis/bone prominence on the posterosuperior calcaneus and relieve the pressure against its surrounding tissue. However, based on the Sundararajan study, there is a 25% chance of having insertional Achilles tendinopathy, with or without retrocalcaneal bursitis (Haglund syndrome).[12] In this case, a better surgical outcome is achieved with debridement on their degenerative Achilles tendon and/or retrocalcaneal bursa.[10]

The surgery options for Haglund deformity include open resection of the exostosis and inflamed bursa (with retrocalcaneal bursitis), endoscopic calcaneoplasty, and calcaneal osteotomy.[8] Open resection has more than one approach: lateral approach (the incision lateral to the tendon and posterior to the sural nerve), mid-line approach (Achilles tendon will be split and detached, then later reattached to the calcaneus with suture anchor), Cincinatti incision, or medial J-shaped.[13,15,19]

Another technique to be considered is Zadek osteotomy which is reserved for the larger bone prominence evidenced by an X/Y ratio <2.5 and Ruch angle >20°. This technique can be combined with any tendon and bony procedures, such as debridement of the degenerative Achilles tendon, bone anchor reattachment of the Achilles tendon, and endoscopic calcaneoplasty.[10]

Postoperative protocols after open resection with midline incision in the first two weeks required the foot to be placed in an equinus position (25° plantar flexion of the ankle), non-weight-bearing. Weight-bearing is progressively permitted every two weeks until the eighth week; patients can use regular walking shoes.[19] The other operative technique, the endoscopic calcaneoplasty, requires more skills and enables the patient to do early post-surgery ankle mobilization and weight-bearing within pain tolerance.[3]

Possible complications include sural nerve entrapment caused by scar formation in the incision site (lateral incision approach), wound dehiscence, ankle stiffness, and Achilles tendon avulsion.[9,13]

CONCLUSION

Haglund's deformity caused an isolated pain on the superior aspect of the posterior calcaneus. Another pathology of retrocalcaneal bursa and Achilles insertional tendinopathy might add another inflammatory sign. Diagnostic imaging, such as MRI and US, is crucial to identifying those lesions. Conservative therapy is the first line of treatment. It is considered a failure if it. Surgery becomes the second-line choice if the symptoms do not ameliorate within six months.

REFERENCE

1. Tu P. Heel pain: Diagnosis and management. Am Fam Physician. 2018;97(2):86–93.
2. Femino JE, Amendola N. Leg, ankle and foot. In: Sivananthan S, Sherry E, Warnke P, Miller MD, editors. Mercer's textbook of orthopaedics and trauma. 10th ed. Taylor and Francis Group; 2012. p. 837–40.
3. Lughi M. Haglund's syndrome: Endoscopic or open treatment? Acta Biomed. 2020;91:167–71.
4. Martín FJ, Valdazo A, Pena D, Leroy F, Herrero DH, García D. Haglund's syndrome. Two case reports. Reumatol Clin. 2017;13(1):37–8.
5. Xu Y, Duan D, He L, Ouyang L. Suture anchor versus allogenic tendon suture in treatment of Haglund syndrome. Med Sci Monit. 2020;26:1–9.
6. Wineski, Lawrence E. Snell's clinical anatomy by regions. 10th ed. In: Taylor C, Vosburgh A, Horvath K, editors. Wolters Kluwer. Wolters Kluwer Health - Lippincott Williams & Wilkins; 2019.
7. Drake RL, Vogl AW, Mitchell AW. Gray's anatomy for students. 3rd ed. Vol. Elsevier. Elsevier Inc; 2015 .p. 636–7.
8. Thomas JL, Christensen JC, Kravitz SR, Mendicino RW, Schuberth JM, Vanore JV, et al. The journal of foot & ankle surgery the diagnosis and treatment of heel pain: A clinical practice guideline – Revision 2010. J Foot Ankle Surg [Internet]. 2010;49(3):1–19. Available from: http://dx.doi.org/10.1053/j.jfas.2010.01.001
9. Vaishya R, Agarwal AK, Azizi AT, Vijay V. Haglund's syndrome: A commonly seen mysterious condition. Cureus 2016;8(10):820. doi: 10.7759/cureus.820.
10. Tourne Y, Baray AL, Barthelemy R, Karhao T, Moroney P. The Zadek calcaneal osteotomy in Haglund's syndrome of the heel: Clinical results and a radiographic analysis to explain its efficacy. Foot Ankle Surg. 2022;28(1):79–87. https://doi.org/10.1016/j.fas.2021.02.001
11. Sha MTBM, Wong BSS. Clinics in diagnostic imaging (170). Singapore Med J. 2016;57(9):517–21.
12. Sundararajan PP, Wilde TS. Radiographic, clinical, and magnetic resonance imaging analysis of insertional achilles tendinopathy. J Foot Ankle Surg. 2014;53(2):147–51.
13. Grambart ST, Lechner J, Wentz J. Differentiating achilles insertional calcific tendinosis and Haglund's deformity. Clin Podiatr Med Surg. 2021;38(2):165–81.
14. Kraemer R, Wuerfel W, Lorenzen J, Busche M, Vogt PM, Knobloch K. Analysis of hereditary and medical risk factors in Achilles tendinopathy and Achilles tendon ruptures: A matched pair analysis. Arch Orthop Trauma Surg. 2012;(132):847–53.
15. Oesman I, Hidayat R. Bony resection and suture anchor repair in haglund deformity with insertional achilles tendinopathy. J Indones Ortopaedic Traumatol. 2018;1(1):40–6.
16. Choo YJ, Park CH, Chang MC. Rearfoot disorders and conservative treatment: A narrative review. Ann Palliat Med. 2020;9(5):3546–52.
17. Petersen B, Fitzgerald J, Schreibman K. Musculotendinous magnetic resonance imaging of the ankle. Semin Roentgenol. 2010;45(4):250–76. http://dx.doi.org/10.1053/j.ro.2009.12.003
18. Tourné Y, Baray AL, Barthélémy R, Moroney P. Contribution of a new radiologic calcaneal measurement to the treatment decision tree in Haglund syndrome. Orthop Traumatol Surg Res. 2018;104(8):1215–9. https://doi.org/10.1016/j.otsr.2018.08.014
19. Ricci AG, Stewart M, Thompson D, Watson BC, Ashmyan R. The central-splitting approach for achilles insertional tendinopathy and Haglund deformity. JBJS Essent Surg Tech. 2020;10(1):e0035–e0035.