CHAPTER **30**

INSERTIONAL ACHILLES TENDINOPATHY

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INTRODUCTION

Posterior heel pain is a common entity that frequently involves the Achilles tendon. There are 2 categories of Achilles tendinopathy: insertional and noninsertional. Insertional Achilles tendinopathy accounts for 20-24% of all Achilles pathology.[1,2] There are a myriad of diagnoses that can present with symptoms reflective of insertional Achilles tendinopathy, such as Haglund's deformity, retrocalcaneal bursitis, retrocalcaneal exostosis, and Achilles tendinosis. Most of these conditions often coexist and can confound the primary diagnosis of insertional Achilles tendinopathy. Noninsertional Achilles tendinopathy, which will not be presented in this article, is another common cause of Achilles tendon symptomatology. It is important to distinguish between insertional and noninsertional Achilles tendinopathy because the treatment options will differ.

First described by Patrick Haglund in 1928, Haglund's deformity is one of the primary causes of heel pain (Figure 1).[3] Historically, it was defined as an enlarged posterior-superior border of the os calcis and was originally thought to be the result of wearing rigid, low-back shoes. Today it is defined by a combination of inflammation of the retrocalcaneal bursa and insertional Achilles tendinopathy. It is thought that the osseous protuberance impinges on the retrocalcaneal bursa causing an inflammatory reaction.[4] One of the primary etiologies of a Haglund's deformity is related to a high calcaneal inclination angle, thus it is commonly associated with a cavovarus foot type. Clinically, the patient presents with posterosuperior or posterosuperior-lateral heel prominence, local erythema, effusion, and pain on dorsiflexion secondary to tethering of the anterior aspect of the Achilles tendon against the bursal projection.[2]

Figure 1. Lateral weightbearing radiograph demonstrating Haglund's deformity. Note the large eminence on the posterior-superior margin of the calcaneal tuberosity.

Retrocalcalneal bursitis, another component of heel pain, is commonly associated with a Haglund's deformity and rarely exist independently of other coexisting conditions. The retrocalcaneal bursa is located just superior and anterior to the insertion of the Achilles tendon.[4] This condition can be unilateral or bilateral and typically occurs due to shoe gear irritation in runners and in people who wear high-heeled shoes. The chief complaint is posterior heel pain, which typically worsens with activity.[3] Clinically, bursitis presents with pain to palpation anterior to both the medial and lateral margins of the Achilles tendon. This clinical finding distinguishes it from other types of posterior heel pathology.[2]

Retrocalcaneal exostosis, is another common cause of posterior heel pain. It occurs mostly in middle-age and elderly individuals, but can occur in younger individuals. The chief complaint and clinical findings are similar to that in Haglund's deformity. There is often a palpable prominence in the Achilles tendon, most notably at its insertion. It is easy to differentiate from Haglund's deformity by location. A true Haglund's deformity is a posterosuperior or posterosuperior-lateral calcaneal prominence, whereas retrocalcaneal exostosis has an intratendinous component and is typically located 1- to 2-cm distal to the superior aspect of the posterior calcaneal tubercle (Figure 2).[4,5]

Last, insertional Achilles tendinosis is a chronic condition often associated with overuse and chronic pull of the tendon on the posterior aspect of the heel. Tendinosis is seen typically in Haglund's deformity at the anterior aspect of the tendon at the bursal projection. As the foot dorsiflexes during gait, the tendon glides against the posterosuperior prominence of the calcaneus causing pathologic changes within the tendon. Retrocalcaneal exostosis typically presents with thickening and calcific changes of the Achilles tendon at its insertion due to repetitive pulling and microtearing. According to Paavola et al, these degenerative processes may be secondary to hypoxic degeneration, hyaline degeneration, mucoid or myxoid degeneration, fibrinoid degeneration, fatty degeneration, calcification, and fibrocartilaginous or osseous metaplasia.[6]

ETIOLOGY

The etiology of insertional Achilles tendinopathy is multifactorial. It is typically broken down into intrinsic and extrinsic risk factors. Intrinsic risk factors include structural or biomechanic foot, ankle, and lower extremity conditions. Common extrinsic factors are overtraining, improper stretching/preparation, shoe gear, obesity, age, and mechanical overload.[7-10] All of these etiologies are anecdotal and have yet to be proven.

IMAGING

There are 3 imaging modalities that aid in the diagnosis of Achilles tendinopathy: plain radiographs, magnetic resonance imaging (MRI), and ultrasound. Plain radiographs are useful in the diagnosis of Haglund's deformity, retrocalcaneal exostosis, and intratendinous calcification. As previously described, Haglund's deformity is most appreciated on a lateral radiograph, which demonstates a large posterosuperior prominence (bursal projection). An associated high calcaneal inclination angle is also common. Other angles including Fowler-Philip angle, parallel pitch lines, and total angle of Ruch have been used to describe this deformity.[11-13] Retrocalcaneal exostosis is again best viewed on lateral radiographs. The prominence presents at the main insertion of the Achilles tendon with enlargement of the posterior calcaneal tubercle and intratendinous calcification.

MRI is beneficial in determining inflammation (bursitis), tendon tear or rupture, tendon thickening (tendonosis), calcification, and degeneration. As with the case of degeneration, it appears as increased signal intensity within the tendon on T2-weighted images and decreased intensity on T1-weighted images (Figure 3). We typically order MRI's for surgical planning in patients we are concerned about significant insertional Achilles tendinosis and possible need for complicated reconstruction and consideration for utilizing flexor hallucis longus tendon transfer.

Ultrasound is beneficial in dynamic assessment of tendinopathy. It is also a fast and repeatable modality, however it is very technician-dependent. In a study reviewing histologic biopsy of injured Achilles and comparing it with the diagnosis made with modalities such as MRI or ultrasound, the conclusion was that both MRI and ultrasound provided similar findings.[14]

CONSERVATIVE TREATMENT

Conservative treatments such as rest, ice, compression, elevation, modification of workout, heel lifts, and orthosis accounts for 85-95% of relief of symptoms.[15] Initial treatment of any Achilles tendinopathy begins with RICE (rest, immobilization, compression, and elevation). The use of NSAIDs (nonsteroidal anti-inflammatory

Figure 2. Lateral weightbearing radiograph demonstrating a retrocalcaneal exostosis. Note the large spur and calcification at the insertion of the Achilles tendon.

Figure 3. Sagittal plain T1-weighted magnetic resonance image demonstrates a large Haglund's deformity with associated Achilles tendon thickening and calcification.

drugs) has been advocated for Achilles tendonosis, however it is debatable. A study of the NSAID piroxicam, found no benefit in treatment of Achilles tendinopathy.[16] Accommodative therapies such as change of shoe gear (lower or no heel counter), addition of heel lifts, and orthotics have shown relief of symptoms, but does not correct the underlying pathology. The use of corticosteroid injections should be used with caution due to the risk for potential tendon rupture. Physical therapy and rehabilitations have shown success. Gastrocnemius-soleal stretching exercises have shown improvement in symptoms in patients with retrocalcaneal exostosis and especially when there is coexisting equinus. Eccentric muscle strength training has been shown to reduce tendon thickening and increase tendon neovascularization in noninsertional Achilles tendinopathy.[17] However, eccentric calf muscle training should not be used in insertional Achilles tendinopathy. Fahlstrom et al found only 32% of patients with insertional Achilles tendinopathy to have improvement of symptoms when utilizing eccentric strength training.[18]

Therapeutic ultrasound has also been used and studies show it to increase rate of collagen synthesis by providing silent mechanical vibration in high frequencies that penetrate the deep tissue. The use of iontophoresis therapy for heel pain has found to provide some relief, although there are no studies showing its efficacy. Extracorporeal shock wave therapy (ESWT) has shown effectiveness in treating many chronic musculoskeletal injuries. A few small studies have looked at the use of ESWT in insertional Achilles tendinopathy.[19-21] Results so far appear to be promising but more research is needed.

SURGICAL MANAGEMENT OF POSTERIOR HEEL PATHOLOGY

There have been multiple approaches described for the surgical management of posterior heel pathology. Incisional approaches include posterior central, lateral heel, "J" shape, and transverse approaches. Another recent technique is endoscopic decompression, which so far showed to be effective in treating Haglund's deformity and retrocalcaneal bursitis and resulted in a better cosmetic appearance.[22] We typically approach a Haglund's deformity from a lateral approach unless there is significant calcific tendinosis and/or concurrent enthesophyte. The patient is placed in a lateral decubitus position or sometimes a supine position when a large bump exists and when other procedures are to be performed. A thigh tourniquet is used to facilitate hemostasis. The incision is made along the lateral wall of the calcaneal tubercle, just anterior to the anterior margin of the Achilles tendon (Figure 4). The incision starts 2-cm proximal to the superior margin of the calcaneal tubercle and extends distally to the junction of the lateral and plantar skin. The incision is posterior to the course of the sural nerve, therefore it is made full thickness down to the calcaneal periosteum.

Next the retrocalcaneal bursa is typically observed and removed from the surgical site. Minimal lateral periosteal elevation is necessary to identify the posterior superior calcaneal prominence. A retractor is placed into the wound and the Achilles is retracted posterior. An osteotome or sagittal saw is then utilized to remove the Haglund's deformity. After removal of the prominence, this is visualized under fluoroscopy so that adequate removal is noted. Next the Achilles tendon is examined for any thickening or calcinosis. If significant pathology is identified, then it is excised with care being taken to not debulk too much of the tendon. If only thickness is identified without calcification, radiofrequency ablation may be used. The wound is then flushed and if significant periosteal elevation was necessary, suture anchors may be warranted. We typically re-approximate the periosteum with absorbable sutures. The wound is then closed in layers. We typically use an absorbable suture for skin closure and apply half-inch Steri strips. Nonadherent dressing is applied along with a 2-layer compression dressing and a posterior splint.

Retrocalcaneal exostosis is approached from a central posterior incision, beginning 2-cm proximal to the superior aspect of the calcaneus and extending distally 1 to 2-cm distal to the junction of the posterior and plantar skin (Figure 5). The incision is made full thickness down to the deep fascia. Undermining is performed both medially and laterally, releasing the subcutaneous tissue from the deep fascia. Next a linear deep fascia and paratenon incision is performed midline from proximal to distal. The incision can

Figure 4. Lateral incisional approach for removal of a Haglund's deformity. The incision is extended proximal enough so excellent visualization can be obtained to successfully excise the posterior-superior prominence.

Figure 5. Posterior incisional approach for removal of a retrocalcaneal exostosis. The incision is carried inferior so that visualization of the retrocalcaneal exostosis can be obtained and for the ability to easily re-approximate the Achilles tendon.

Figure 6. Intra-operative picture of a retrocalcaneal exostosis. As shown here, significant detachment of the Achilles tendon is needed for adequate visualization and removal of the spur.

be deepened full thickness through the Achilles tendon at its attachment to the calcaneus. The deep fascia and paratenon are then bluntly dissected as one unit from its attachment to the Achilles tendon. Even though at this level the Achilles does not glide extensively through the paratenon, re-approximation is important because it contributes to the blood supply of the tendon.

The Achilles tendon is then sharply freed medially and laterally from its attachment to the calcaneal tuberosity with care taken to keep the most medial and lateral expansions of the tendon intact. At this time direct visualization of the retrocalcaneal exostosis is accomplished (Figure 6). A sagittal saw is utilized to remove the posterior prominence. If a Haglund's deformity is present, it is also excised at this time. Fluoroscopy is used to make sure all prominences are successfully removed. A reciprocating rasp is used to further contour the posterior calcaneal tuberosity and to roughen this area so that we can facilitate reattachment of the Achilles tendon. The wound is flushed and reattachment of the Achilles is initiated.

There have been a variety of ways to re-approximate the Achilles using such devices as screws, DePuy spider plate, and bone anchors. The use of the spider plate was used often in the past but due to its posterior prominence and the need for removal, it has lost popularity. More recently, knotless anchor systems have gained popularity. Arthrex Achilles Suture Bridge and Topaz Magnum are 2 devices on the market that have been used successfully.

We currently used the Arthrex Achilles Suture Bridge

Figure 7. Intra-operative picture demonstrating the Arthrex Achilles Suture Bridge. The suture bridge creates a figure 8 pattern. The implant is knotless, thus preventing any extra bulk to the posterior heel.

(Figure 7). The construct consist of two 5.5-mm Bio-Corkscrew FT anchors placed 1-cm proximal to the distal insertion of the Achilles tendon and central to each half of the tendon. Each Bio-Corkscrew FT anchor is double-loaded with two #1 Fiberwire sutures, one in blue and one in black and white. One of the Fiberwire sutures is removed from each of the anchors, leaving one anchor with blue Fiberwire and the other with black and white. Next a single stitch is performed in each medial and lateral aspects of the Achilles tendon. Just distal to the end of the Achilles tendon insertion and directly inferior to the Bio-Corkscrew FT anchor placements, the 3.5 mm PushLock anchor punch is used to create 2 holes for the distal row. One blue and one black and white FiberWire suture from each of the proximal anchors are passed through the eyelet of the 3.5 mm Bio-PushLock anchor. Suture tension is achieved by pulling 1 suture at a time. With appropriate tension maintained on the sutures, the anchor is driven into the bone using a mallet. This is then repeated again just distal to the other Bio-Corkscrew FT anchor. The ends of the suture are then cut as close to the cortex as possible. The resulting suture pattern should look similar to a capital 'M.'

The wound is then flushed and the deep fascia, paratenon are closed as 1 layer, followed by the subcutaneous layer and skin using an absorbable suture. Half inch Steri's are then applied to assist in closure. A 2-layer compression dressing is applied along with a posterior splint. Postoperatively, patients are nonweight-bearing in a 2-layer compression dressing and posterior splint for 2 weeks until the incision is healed and if nonabsorbable sutures are used they are removed at this time. The patient is then placed in a compression stocking and removable boot for 4 weeks.

If minimal detachment of the Achilles was performed the patient may begin weightbearing in a cam-boot at 2 weeks and back into regular shoes at 4 weeks post-operatively. If significant detachment is performed, the patient is allowed protective weightbear in a walker boot for a combined 6 weeks so that proper tendon healing can take place. At 6 weeks, the patient is allowed to return to regular shoes. Patients are encouraged not to return to any high impact aerobic activity for at least 4 to 5 months postoperatively.

The most common complications in posterior heel surgery are wound healing complications.[24-26] The vascular supply to the posterior heel is often more delicate than other parts of the foot and inherently raises the risk of delayed healing. Local wound care and antibiotics if needed will assist in healing. If significant necrosis or exposed tendon occur, aggressive wound debridement may be necessary. Other complications include inadequate resection of bone, tendon rupture and nerve entrapment.[24-26] We have not encountered any tendon ruptures, but have had a few symptomatic nerve entrapments of branches of the lateral calcaneal nerve. In each case sclerosing alcohol injections were utilized and uneventful resolution of symptoms occurred.

CONCLUSION

In summary, insertional Achilles tendinopathy is associated with multiple causes, and its etiology as to date is still debatable. After failing conservative treatment, surgical options are explored. We focused on one particular surgical technique, however there are many other ways to treat the pain of insertional Achilles tendinopathy. Regardless of the technique used, the goal of the procedure is to provide relief to the patient by removal of the calcaneal prominence and/or retrocalcaneal bursa.

REFERENCES

1. Astrom M, Rausing A. Chronic achilles tendinopathy: a survey of surgical and histopathologic findings. *Clin Orthop* 1995;316:151-64.
2. Myerson M, McGarvey W. disorders of the achilles tendon insertion and achilles tendonitis. *Instr Course Lecture* 1999;48:211-18.
3. Watson A, Anderson R, Davis W. comparison of results of retrocalcaneal decompression for retrocalcaneal bursitis and insertional achilles tendonosis with calcific spur. *Foot Ankle Int* 2000;21:638-42.
4. McBryde A, Ortmann F. Retrocalcaneal buroscopy. *Tech Foot Ankle Surg* 2005;4:174-9.
5. Benjamin M, Ruffian A, Ralphs J. The mechanism of formation of bony spur (enthesophytes) in the Achilles tendon. *Arthritis Rheum* 2000;43:576-83.
6. Paavola M, Kannus P, Jarvinen T, et al. Achilles tendinopathy. *J Bone Joint Surg Am* 2022;84:2062-76.
7. Clement D, Taunton J, Smart G. Achilles Tendonitis and periten-dinitis: etiology and treatment. *Am J Sports Med* 1984;12:179-84.
8. Kaufman K, Brodine S, Shaffer R, et al. The effect of foot structure and range of motion on musculoskeletal overuse injuries. *Am J Sports Med* 1999;25:585-93.
9. Kvist M. Achilles tendon injuries in athletes. *Ann Chir Gyn* 1991;80:188-201.
10. Paavola M, Orava S, Leppilahti J, et al. Chronic Achilles tendon overuse injury: complications after surgical treatment, *Am J Sports Med* 2000;28:77-82.
11. Fowler A, Philip JF. Abnormality of the calcaneus as a cause of painful heel. *Brit J Surg* 1954;32:494-500.
12. Heneghan MA, Pavlov H. The Haglund painful heel syndrome: experimental investigation of cause and therapeutic implications. *Clin Orthop* 1984;187:228-34.
13. McGuigan F, Aierstok M. Disorders of the Achilles tendon and its in-sertion. *Curr Opin Orthop* 2005;16:65-71.
14. Astrom M, Gentz CF, Nilsson P, et al. Imaging in chronic Achilles tendinopathy: a comparison of ultrasonography, magnetic resonance imaging, and surgical findings in 27 histologically verified cases. *Skel Radiol* 1996;25:615-20.
15. Morris KL, Giacopelli JA, Granoff D. Classification of radiopaque lesions of tendo Achilles, *J Foot Surg* 1990;29:536.
16. Astrom M, Westlin N. No effect of piroxicam on Achilles tendinopathy: a randomized study of 70 patients. *Acta Orthopaedics Scandanavia,* 1992;63:631-4.
17. Alfredson H, Pietila T, Jonsson P, et al. Heavy-load eccentric calf muscle training for the treatment of chronic Achilles tendonosis. *Am J Sports Med* 1998;26:360-6.
18. Fahlstrom M, Jonsson P, Lorentzon R, et al. Chronic Achilles tendon pain treated with eccentric calf muscle training. *Knee Surg Sports Traumatology Arthroscopy* 2003;11:327-33.
19. Furia J. High-energy extracorporeal shock wave therapy as a treatment for insertional Achilles tendinopathy. *Am J Sports Med* 2006;34:733-40.

20. Furia J, Rompe J. Extracorpeal shock wave therapy in the treatment of chronic fasciitis and Achilles tendinopathy. *Curr Opin Orthop* 2007;18:102-11.
21. Rees J, Wilson A, Wolman R. Current concepts in the management of tendon disorders. *Rheum* 2006;45:508-21.
22. Maffulli N, Testa V, Capasso G, et al. Calcific insertional Achilles tendinopathy: reattachment with bone anchors. *Am J Sports Med* 2004;32:174-82.
23. Benthien, R A, Aronow, M S, Doran-Diaz , et al. Cyclic loading of Achilles tendon repairs: a comparison of polyester and polyblend suture. *Foot Ankle Int* 2006;27:512-8.
24. Gould J. Insertional tendinitis of the tendo Achilles. *Tech Foot Ankle Surg* 2005;4:222-9.
25. Wagner E, Gould J, Kneidel M, et al. Technique and results of Achilles tendon detachment and reconstruction for insertional Achilles tendonosis. *Foot Ankle Int* 2006;27:677-84.
26. Aronow MS. Posterior heel pain (retrocalcaneal bursitis, insertional and noninsertional Achilles tendinopathy). *Clin Podiatric Med Surg* 2005;22:19-43.