Early Weightbearing Using Achilles Suture Bridge Technique for Insertional Achilles Tendinosis: A Review of 43 Patients

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- Achilles tendon

Abstract

Posterior heel pain caused by insertional Achilles tendinosis can necessitate surgical intervention when recalcitrant to conservative care. Surgical treatment can necessitate near complete detachment of the Achilles tendon to fully eradicate the offending pathologic features and, consequently, result in long periods of non-weightbearing. A suture bridge technique using bone anchors is available for reattachment of the Achilles tendon. This provides restoration of the Achilles footprint on the calcaneus, including not only contact, but also actual pressure between the tendon and bone. We performed a review of 43 patients who underwent surgical treatment of insertional Achilles tendinosis with reattachment of the Achilles tendon using the suture bridge technique. The mean age was 53 (range 29 to 87) years. The mean follow-up period was 24 (range 13 to 52) months. The mean postoperative American Orthopaedic Foot and Ankle Society score was 90 (range 65 to 100). The mean preoperative visual analog scale pain score was 6.8 (range 2 to 10) and the mean postoperative visual analog scale pain score was 1.3 (range 0 to 6). The mean interval to weightbearing was 10 (range 0 to 28) days. No postoperative ruptures occurred. Of the 43 patients, 42 (97.6%) successfully performed the single heel rise test at the final postoperative visit. Concomitant procedures were performed in 35 patients, including 33 (77%) requiring open gastrocnemius recession and 2 (5%) requiring flexor hallucis longus tendon transfer. A total of 42 patients (97.6%) returned to regular shoe gear, and 42 (97.6%) returned to their activities of daily living, including running for 20 athletic patients (100%). Complications included postoperative wound dehiscence requiring surgical debridement in 2 patients (5%) and soft tissue infection requiring antibiotics and surgical debridement in 1 (2%) patient. Our findings support using the Achilles tendon suture bridge for reattachment of the Achilles tendon in the surgical treatment of insertional Achilles tendinosis.

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Insertional Achilles tendinosis commonly presents in athletes but can affect persons of all ages and activity levels (1). When the etiology of posterior heel pain has been identified as insertional Achilles tendinosis, it is imperative to consider that the symptoms likely involve more than just the Achilles tendon. The Haglund’s triad has been described and consists of retrocalcaneal bursitis, Achilles calcification or retrocalcaneal exostosis, and Haglund’s deformity of the posterior superior calcaneus (2,3). These pathologic entities can occur as isolated conditions, but they more frequently present together as a triad. Conservative modalities are effective in treating insertional Achilles tendinosis (1,4,5). When the condition becomes refractory to these treatments, the patients might require surgical intervention to more aggressively manage the diseased and pathologic structures involved.

To appropriately address insertional Achilles tendinosis, surgical exposure should allow for full removal of any and all of the identified etiologic structures, although percutaneous and endoscopic approaches have been described (6–8). An open approach allows for the greater exposure that is often necessary to adequately address the entire triad. Many different incisions have been described for an open approach, including a lazy S, medial and/or lateral, J-shape, transcervical, and single central longitudinal incisions (2,3,9–13). Additionally, different techniques have been described for resecting the calcific and diseased Achilles tendon, including no, partial, or complete detachment and a central splitting approach. Depending on the extent and severity, it may become necessary to detach a significant portion of the Achilles footprint on the calcaneus. Studies have demonstrated that the risk of postoperative rupture is minimal if less than 50% of the Achilles tendon has been detached (12,14). If more than 50% requires
Patients and Methods

We performed a retrospective review of 43 patients who had undergone surgical treatment of insertional Achilles tendinopathy. The postoperative American Orthopaedic Foot and Ankle Society (AOFAS) hindfoot-ankle scores and both preoperative (reported by the patient postoperatively) and postoperative visual analog scale (VAS) scores for pain were obtained. The charts were reviewed for patient age, interval to weightbearing, ability to perform the single heel rise test, wound healing, frequency of concomitant gastrocnemius recession and debridement of prominent tendon and bone.

detachment, reattachment with bone anchors has been advocated (13,15,16). Reattachment techniques have also been described to avoid lengthy periods of non-weightbearing and immobilization. Several reports have been published, but no true consensus has been reached regarding when it is appropriate for patients to resume weightbearing. Therefore, we report on a series of patients treated with the Arthrex Achilles SutureBridge® (Arthrex, Naples, FL) for reattachment of the Achilles tendon in the surgical repair of insertional Achilles tendinosis.

Surgical Technique and Postoperative Management

After administration of a popliteal regional nerve block by the anesthesia department, the patient was placed in the prone position on the operating table. A well-padded thigh tourniquet was used. Sterile draping was performed in typical fashion. If a gastrocnemius equinus component was identified preoperatively, we addressed this by performing an open Strayer-type gastrocnemius recession procedure (17,18). At this point, we prefer a longitudinal slightly medial incision over the posterior heel. The paratenon was then sharply incised linearly and centrally to offset with the skin incision and expose the underlying Achilles tendon and was tagged with suture for later repair. Once adequate exposure was obtained, a central tendon splitting incision was made as proximally as necessary to adequately debride the Achilles tendon (Fig. 1). Typically, this has been around 6 to 8 cm proximal to the insertion and carried distally to the calcaneus. Both medial and lateral extensions should be sharply reflected off the posterior calcaneus to expose the exostosis and Haglund’s prominence. Typically, it will not be necessary to completely detach the most medial and lateral slips of the tendon. The Achilles tendon was inspected and debrided of any degenerative or calcified portions of the tendon. If it were necessary to remove more than 50% of the Achilles tendon, an FHL tendon transfer was performed. An oscillating saw was then used to fully resect the exostosis and Haglund’s prominence with care to avoid violating the subtalar joint. Any remaining spurs or prominent bone were removed and smoothed with a rasp. Intraoperative fluoroscopy has been helpful in assessing the resection and inspecting for any residual bone that might become symptomatic.

The Achilles footprint was then restored using a modified double-row Achilles suture bridge technique. Two holes were created using a punch and tap, approximately 1 cm proximally to the distal insertion of the Achilles tendon (Fig. 2). Care should be taken to angle toward the midline to avoid disruption of the medial and lateral cortical walls of the calcaneus. A 4.5-mm Bio-Corkscrew FT Anchor® (Arthrex) was then placed in each hole. Both strands of suture were then advanced through the tendon from deep to superficial at the level and directly overlying each anchor (Fig. 3). At that point, the Achilles tendon was tensioned and reapproximated with suture to cover as much of the footprint as possible and to interface the tendon to the bone. The 3.2-mm drill was then used just distally to the most distal aspect of the insertion and directly below each of the superior anchors to create a double-row configuration. To create the suture bridge construct, 1 blue, braided polybend suture (FiberWire®, Arthrex) and 1 black and white striped braided polybend suture (TigerWire®, Arthrex) from the superior row of anchors was then passed into the eyelet of the 3.5-mm Bio-PushLock Anchor®, which was inserted into the inferior row. It is imperative to leave some slack in the suture before placing the anchor, because it will tension with advancement into the bone canal. This should be performed with each suture set to complete a suture bridge crisscross configuration restoring both contact and compression at the tendon–bone interface (Fig. 4).
Finally, a routine layered closure was completed and a well-padded splint placed with the foot in slight plantarflexion. The weightbearing status was determined according to age, weight, comorbidities, activity level, and concomitant procedures. This can range from protected immediate weightbearing using a cam walker boot or walking cast to several weeks of non-weightbearing in a splint or below the knee cast. Physical therapy should be initiated at approximately 3 to 4 weeks, with a return to regular shoe gear at approximately 6 weeks.

**Results**

A retrospective review was performed of 43 patients in whom surgical treatment was required for Achilles insertional tendinosis and the Achilles SutureBridge® (Arthrex) was used for reattachment from 2009 to 2011. A chart review was performed by all authors but surgery was performed only by the senior authors (J.M.C., A.V.). The average patient age was 53 (range 29 to 87) years. The mean postoperative AOFAS score was 90 (range 65 to 100). The mean preoperative and postoperative VAS score was 6.8 (range 2 to 10) and 1.3 (range 0 to 6), respectively. The mean interval to weightbearing was 10 (range 0 to 43) days. No postoperative ruptures or detachments occurred (0%). The mean follow-up duration was 24 (range 13 to 52) months. Of the 43 patients, 42 (97.6%) successfully performed the single heel rise test at their final postoperative visit. Of the 43 patients, 33 (77%) had undergone open concomitant gastrocnemius recession, and 2 (5%) had required transfer of the FHL tendon because of intraoperative debridement of more than 50% of the Achilles tendon. Of the 43 patients, 42 (97.6%) were able to return to their regular shoe gear. Also, 42 patients were able to return to activities of daily living, including the ability to return to work, ambulate, and exercise. This was further defined as the ability to run for 20 of 20 athletic patients (100%). Complications included 2 patients with superficial wound dehiscence that resolved after surgical debridement. Additionally, soft tissue infection developed in 1 patient who required oral antibiotics and surgical debridement of the Achilles tendon. This patient ultimately required an FHL tendon transfer secondary to the extent of Achilles tendon debridement. The infection completely resolved; however, this patient has continued to ambulate with open back shoe gear only (Table).

**Discussion**

Ideally, insertional Achilles tendinosis that is unresponsive to conservative treatment is surgically addressed with proper resection of the etiologic factors, including the diseased tendon, enthesopathy, retrocalcaneal exostosis, bursectomy, and Haglund’s deformity. It is of equal importance, if the Achilles tendon requires detachment, to provide a stable and reliable construct for reattachment to avoid lengthy postoperative periods of non-weightbearing. It is understood that the stronger the repair, the sooner the patient can be allowed to return to full activity. We report a mean interval to weightbearing of 10 days postoperatively. The decision for a safe return to weightbearing was made on a case-by-case basis, taking into consideration patient age, weight, comorbidities, activity level, and concomitant procedures. In general, patients who were athletic, young, and healthy were allowed immediate protected
weightbearing in a cam walker boot or walking cast. However, patients who were elderly, overweight, or had required a concomitant FHL transfer were kept non-weightbearing for up to 4 weeks. We did not encounter any postoperative ruptures in any of our 43 patients.

To our knowledge, no previous studies have assessed the suture bridge technique for posterior heel debridement. Thus, we have studied other locations for tendon to bone healing. For example, studies have reported in the repair of rotator cuff tears, that the restoration of the anatomic footprint with the SutureBridge®, providing increased contact and compression, will enhance the biologic healing process, leading to increased mechanical strength (19). Ultimately, the sooner the tendon reattaches to the bone, the quicker the patient can begin therapy and resume weightbearing. Behrens et al (20) stated that tendon-to-bone healing is affected by mechanical factors and the goals of repair are to optimize healing by minimizing gap formation and maintaining repair stability.

The technique we have described uses a central tendon splitting approach, which has been advocated because it affords excellent exposure (2,5,12,16). This approach was recently described by Nunley et al (11) in 2011, who reported using midline posterior incision and a central tendon splitting technique. They performed a retrospective review of 27 patients and reported that only 1 patient developed a superficial wound infection that was treated with oral antibiotics and resolved without additional surgical intervention. Two 3.5-mm corkscrew suture anchors were used for fixation, and the patients were kept strictly non-weightbearing for 2 weeks. At 4 years of mean follow-up, their average AOFAS hindfoot score was 96 and no strength deficits were present. They also concluded that using a central incision resulted in 96% of patients being pain free at 7 years, with little to no loss of strength. They did not perform this approach on young athletic patients (11). Instead, their patient population consisted of sedentary, overweight, and elderly patients.

The interval to weightbearing after near complete detachment of the Achilles tendon has been a topic of discussion. Reports have ranged from immediate weightbearing to several months of no weightbearing. Bone anchors have been advocated to allow for earlier weightbearing. Sammarco and Taylor (21), in 1998, performed a retrospective review of 65 patients with symptomatic Haglund’s deformity and found that 65% of these patients required surgical treatment. Detachment and reattachment of the Achilles tendon used bone anchors for fixation. The patients were kept non-weightbearing for 4 weeks postoperatively, before they were allowed to place any weight on the surgical limb. Maffulli et al (9) reported on 21 patients with 48.4 months of follow-up who were treated with surgical detachment and debridement for insertional Achilles tendinosis. They used multiple bone anchors to fixate the Achilles tendon and advocated partial detachment to resect the calcific diseased tendon. The number of bone anchors incorporated was directly proportional to the percentage of tendon detached. They allowed patients to bear weight immediately but in a plantarflexed, below the knee cast. One patient required revisional surgery and five could not return to their preoperative athletic activity level. They also reported no postoperative detachment of the Achilles tendon.

Johnson et al (15) used bone anchors for reattachment of the Achilles tendon after debridement using a central tendon splitting approach. They reported on 22 patients with an average follow-up of 34 months. The AOFAS score improved from 53 preoperatively to 89 postoperatively. The patients were kept non-weightbearing for at least 3 weeks. DeOrio and Easley (2) recommended initiating protected weightbearing at 3 to 5 weeks postoperatively, depending on the amount of Achilles tendon debrided. DeVries et al (3) also advocated no weightbearing for 3 to 5 weeks after detachment and reattachment using bone anchors. Wagner et al (10) reported up to 8 weeks of no weightbearing for complete detachment using bone anchors for reattachment.

Cottom et al (22) discussed the role FHL tendon transfer plays in posterior heel debridement. They advocated tendon transfer when

### Table

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
</tr>
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<tbody>
<tr>
<td>Patients (N)</td>
<td>43</td>
</tr>
<tr>
<td>Age (y)</td>
<td>53</td>
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<tr>
<td>Mean</td>
<td>29–87</td>
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<tr>
<td>Range</td>
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<tr>
<td>Follow-up (mo)</td>
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<tr>
<td>Postoperative AOFAS score</td>
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<tr>
<td>Mean</td>
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<tr>
<td>Range</td>
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<tr>
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<tr>
<td>Mean</td>
<td>1.3</td>
</tr>
<tr>
<td>Range</td>
<td>0–6</td>
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<tr>
<td>Ability to perform single heel rise test</td>
<td>42 (97.6%)</td>
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<tr>
<td>Concomitant gastrocnemius recession</td>
<td>33 (77%)</td>
</tr>
<tr>
<td>Flexor hallucis longus transfer</td>
<td>2 (5%)</td>
</tr>
<tr>
<td>Return to regular shoe gear</td>
<td>42 (97.6%)</td>
</tr>
<tr>
<td>Return to ADL</td>
<td>42 (97.6%)</td>
</tr>
<tr>
<td>Return to sports/running (20 athletes)</td>
<td>20 (100%)</td>
</tr>
<tr>
<td>Wound dehiscence</td>
<td>2 (5%)</td>
</tr>
<tr>
<td>Soft tissue infection</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>Interval to weightbearing (d)</td>
<td>10</td>
</tr>
<tr>
<td>Mean</td>
<td>0–28</td>
</tr>
<tr>
<td>Postoperative ruptures/avulsions</td>
<td>0 (0%)</td>
</tr>
</tbody>
</table>

Abbreviations: ADL, activities of daily living; AOFAS, American Orthopaedic Foot and Ankle Society; VAS, visual analog scale.

![Fig. 5. Preoperative weightbearing lateral view radiograph depicting Haglund’s deformity with retrocalcaneal exostosis.](image1)

![Fig. 6. Postoperative weightbearing lateral view radiograph demonstrating removal of Haglund’s deformity and retrocalcaneal exostosis.](image2)
greater than 50% of the Achilles tendon was involved (22). They followed up 62 patients for an average of 26.97 months. Using a modified AOFAS hindfoot score (maximum 60), they reported a preoperative and postoperative score of 20.36 (range 0 to 50) and 51.47 (range 30 to 63), respectively. They concluded that the anatomic relationship of the FHL tendon to the Achilles tendon, as well as acting in the same phase, supports the use of an FHL transfer, especially when addressing certain cases of advanced degeneration and distal rupture. Of our patients, 2 required an FHL transfer intraoperatively because of the extent of Achilles debride ment.

It should be acknowledged that the true anatomic footprint of the calcaneus might require complete resection to fully eradicate the offending bone of the posterior heel (Figs. 5–7). Although this can be the case, we promote that the SutureBridge® re-creates an Achilles footprint with actual pressure and bone contact.

The limitations of the present study included its retrospective nature. Additional prospective studies are necessary to directly compare the interval to weightbearing between the SutureBridge® and other previously described techniques for reattachment of the Achilles tendon. Our patient population might not accurately depict the average patient requiring this type of procedure, because our mean patient age was 53 years and our population included 20 athletic patients as young as 29 years old. Younger patients who are more active in sports typically have stronger bone, which might enhance the pullout strength for the anchors. A more conservative approach to weightbearing should be considered for an elderly patient population. Additionally, the preoperativeVAS pain scores were obtained postoperatively at the patient’s final follow-up visit, relying on patient memory, and might not accurately reflect the preoperative score from several months to years previously.

In conclusion, we have reported excellent postoperative AOFAS and VAS scores using the suture bridge technique for reattachment of the Achilles tendon after surgical treatment of insertional Achilles tendinosis. We recommend early weightbearing for the appropriate patient with all the benefits of quicker rehabilitation and return to activity.

References

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