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Minimally Invasive Approach to Achilles Tendon Pathology

Kenneth W. Hegewald, DPM, AACFAS [1], Matthew D. Doyle, MA, MS [2], Nicholas W. Todd, DPM, AACFAS [3], Shannon M. Rush, DPM, FACFAS [4]

[1] Fellow, Silicon Valley Reconstructive Foot and Ankle Fellowship, Palo Alto Medical Foundation, Mountain View, CA
[2] Third Year Podiatric Medical Student, California School of Podiatric Medicine, Samuel Merritt University, Oakland, CA
[3] Attending Foot and Ankle Surgeon, Palo Alto Medical Foundation, Mountain View, CA
[4] Fellowship Director, Silicon Valley Reconstructive Foot and Ankle Fellowship, Palo Alto Medical Foundation, Mountain View, CA

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ABSTRACT

Many surgical procedures have been described for Achilles tendon pathology; however, no overwhelming consensus has been reached for surgical treatment. Open repair using a central or paramedian incision allows excellent visualization for end-to-end anastomosis in the case of a complete rupture and detachment and reattachment for insertional pathologies. Postoperative wound dehiscence and infection in the Achilles tendon have considerable deleterious effects on overall functional recovery and outcome and sometimes require plastic surgery techniques to achieve coverage. With the aim of avoiding such complications, foot and ankle surgeons have studied less invasive techniques for repair. We describe a percutaneous approach to Achilles tendinopathy using a modification of the Bunnell suture weave technique combined with the use of interference screws. No direct end-to-end repair of the tendon is performed, rather, the proximal stump is brought in direct proximity of the distal stump, preventing overlengthening and proximal stump retraction. This technique also reduces the suture creep often seen with end-to-end tendon repair by providing a direct, rigid suture to bone interface. We have used the new technique to minimize dissection and exposure while restoring function and accelerating recovery postoperatively.

Many surgical procedures have been described for Achilles tendon pathology; however, no overwhelming consensus has yet been reached for surgical treatment (1,2). Open repair using a central or paramedian incision allows excellent visualization for end-to-end anastomosis in the case of a complete rupture and detachment and reattachment for insertional pathologies (3). Anastomosis is most frequently achieved using Kessler, Krackow, or Bunnell suture techniques (3). Many have reported the complications occurring with open repair, including sural nerve damage, wound dehiscence, tendon necrosis, scarring, and infection. Postoperative wound dehiscence and infection in the Achilles tendon have considerable deleterious effects on overall functional recovery and outcome and can require plastic surgery techniques to achieve coverage (4). With the aim of avoiding such complications, foot and ankle surgeons have studied less invasive techniques for repair (5–9). Ma and Griffith (9) first reported their percutaneous technique as a method of circumventing the postoperative complications associated with open repair. Numerous percutaneous and minimally invasive techniques have been used over the years (10–15). Some studies have used a modification of the Bunnell suture weave (13,16). Bunnell (17) originally described his suture weave technique for tendon rupture in the hand secondary to trauma, which was later applied to the Achilles tendon. We describe a percutaneous approach to Achilles tendinopathy using a modification of the Bunnell suture weave technique combined with the use of interference screws.

Surgical Technique

The procedure is done with the patient under general anesthesia or intravenous sedation in a prone position. For acute Achilles tendon ruptures, a transverse incision is placed over the rupture site, which verified by the palpable dell. Dissection is carried down through the peritenon, where the acute hematoma is evacuated to expose the proximal and distal stumps of the rupture site. Enough dissection is performed to expose the medial and lateral borders of Achilles tendon (Fig. 1).

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Address correspondence to: Matthew D. Doyle, MA, MS, California School of Podiatric Medicine, Samuel Merritt University, Oakland, CA 94609.
E-mail address: doyle.matt14@gmail.com (M.D. Doyle).

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Fig. 1. Incision placement for acute Achilles tendon rupture.

Six stab incisions are made overlying the proximal stump at the medial and lateral borders, separated at distance of 2 cm (Fig. 2). If proximal migration of the Achilles tendon is noted, it should be brought distally with the use of an Allis clamp. Next, no. 2 nonabsorbable braided polyblend suture is used in a percutaneous modified Bunnell weave, with the entrance and exit sites at the corresponding stab incisions. The suture weave is performed in numerical order as seen in Fig. 2. The suture tails are pulled distally through the transverse incision. Using a banana lasso, the sutures tails are brought distally across the rupture site through the distal stump to exit through 2 stab incisions at the posterior aspect of the calcaneus. The tails are then anchored into the calcaneus using interference screws.

A similar technique can be performed for reattachment of the Achilles tendon after retrocalcaneal exostectomy. A transverse incision is made over the prominent calcaneal exostosis. Achilles tendon detachment is performed, and the exostosis is removed. Six stab incisions are made as described, and the Achilles tendon is sutured using a percutaneous weave (Fig. 3). The suture tails are then routed subcutaneously, exiting at 2 stab incisions at the posterior calcaneus (Fig. 4). The suture tails are then anchored into the posterior calcaneus with interference screws to complete the Achilles tendon reattachment (Fig. 5). We have adopted an accelerated postoperative protocol compared with that used after traditional open Achilles procedures. Our protocol typically involves 2 weeks of non-weightbearing in a Jones compression splint immediately after the surgery. The sutures are removed at the 2-week mark, and the patient is placed into a cast boot with a one-quarter-in. felt heel lift. The patients begin weightbearing at 2 to 3 weeks postoperatively, depending on their pain and comfort level. They are kept in the cast boot with protected weightbearing for 6 weeks, at which point they transition out of the boot to normal shoe gear and begin a formal physical therapy regimen. In contrast, our open end-to-end Achilles repair technique typically involves 4 to 6 weeks of non-weightbearing with short leg cast immobilization.

We have been pleased with the short- and medium-term results with this technique. We have found the recovery to be quicker and easier on our patients, because the pain is typically diminished with this minimally invasive approach. Furthermore, very little concern exists for wound dehiscence or heavy scar tissue formation, which allows the patients to begin earlier, protected weightbearing. We have also been pleased with the clinical strength and functional capacity this technique restores, although we have not undertaken objective parameters to measure our patients' strength or range of motion.

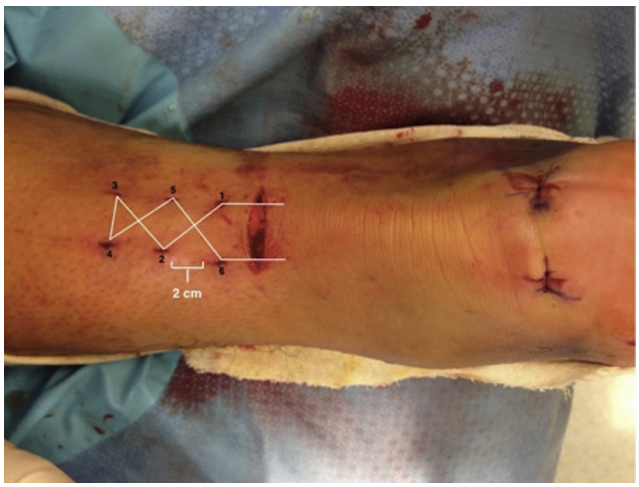

Fig. 2. Placement of stab incisions along medial and lateral Achilles tendon borders. Numbers represent suture course in percutaneous fashion.

Discussion

Achilles tendinopathy is multifaceted in origin and comprises both insertional and noninsertional pathologic features (18). Various percutaneous and minimally invasive techniques, first described by Ma and Griffith (9), have been reported for Achilles tendon

Fig. 3. Suturing Achilles tendon in percutaneous fashion.

Fig. 4. Suture tails brought distally through stab incisions over the posterior calcaneus.

Fig. 5. Repair is completed by anchoring the suture tails into the posterior aspect of the calcaneus.

augmentation and repair (9–15). We believe that this technique avoids extensive dissection and tendon exposure, minimizing the postoperative wound healing problems that are not uncommon with classic longitudinal extensile approaches to the Achilles tendon. The use of interference screws restores immediate function to the musculotendinous unit, similar to an allograft Achilles tendon procedure. No direct end-to-end repair of the tendon is performed, rather the proximal stump is brought in direct proximity to the distal stump, preventing overlengthening and proximal stump retraction. This technique also reduces the suture creep often seen with end-to-end tendon repair (19), by providing a direct, rigid suture to bone interface.

In conclusion, wound healing complications continue to be a problem with traditional longitudinal exposure of the Achilles tendon. We have used a new technique to minimize dissection and exposure while restoring function and accelerating recovery postoperatively.

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