Posterior Tibial Tendon Endoscopic Debridement for Stage I and II Posterior Tibial Tendon Dysfunction

2LT Jeffrey Wake, B.S., A.T.C., and MAJ Kevin Martin, D.O.

Abstract: Adult acquired flatfoot deformity (AAFD), formerly known as posterior tibial tendon (PTT) dysfunction, is one of the most common problems of the foot and ankle. It was first described as tendon failure but has since been revealed as ligamentous failure in addition. AAFD is a spectrum of deformities that ranges from tenosynovitis (stage I) to AAFD (stages II-IV). Regarding mild stage I and stage II disease, it was once standard to perform an open synovectomy completely removing the inflamed synovium; this procedure required a large 6-cm medial ankle incision. Postoperative management included plaster cast immobilization for 3 weeks, followed by a boot with controlled ankle movement for another 3 weeks. Now, the standard is shifting to PTT endoscopy, which has proved to be an efficient way to treat tenosynovitis in stage I and II AAFD with a shorter postoperative period. Using this technique, we can achieve 360° visualization of the PTT within the tendon sheath, allowing for a complete exploration and debridement. We hope that by using this video description, practitioners could avoid the increased morbidity associated with open procedures, as well as help patients return to activity sooner after surgery.

Adult acquired flatfoot deformity (AAFD), formerly known as posterior tibial tendon (PTT) dysfunction or insufficiency, is one of the most common problems of the foot and ankle. It was first described as tendon failure but has since been revealed as ligamentous failure in addition. AAFD is a spectrum of deformities that ranges from tenosynovitis (stage I) to AAFD (stages II-IV).[1] Regarding mild stage I and stage IIa disease, it was once standard to perform an open synovectomy completely removing the inflamed synovium, requiring a large 6-cm medial ankle incision. Postoperative management included plaster cast immobilization for 3 weeks, followed by a boot with controlled ankle movement for another 3 weeks.[2,3] Now, the standard is beginning to shift to PTT endoscopy, which has proved to be an efficient way to treat tenosynovitis occurring in stage I and II AAFD. For stage I, only endoscopy and synovectomy are required, allowing for postoperative treatment consisting of partial weight bearing for 2 to 3 days.[3] Treatment of stage II is slightly more involved, consisting of a calcaneal slide and Cotton procedure in addition to the endoscopy with synovectomy.

From the Rocky Vista University College of Osteopathic Medicine (J.W.), Parker; and Evans Army Community Hospital (K.M.), Fort Carson, Colorado, U.S.A.

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Address correspondence to 2LT Jeffrey Wake, B.S., A.T.C., Rocky Vista University College of Osteopathic Medicine, Parker, CO 80134, U.S.A. E-mail: jeffrey.wake@rvu.edu

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Technique

This Technical Note will outline treatment of stage II AAFD that includes a calcaneal slide, Cotton procedure, and finally, PTT endoscopy with synovectomy.

Preoperative Preparation

The patient is prepared and draped in the supine position to expose the appropriate lower extremity. A tourniquet is applied to the ipsilateral thigh to limit blood flow to the surgical site while allowing for free motion of the PTT. A medium-sized thigh bump, fashioned out of a blanket and tape with an added strand of tape to act as a cord, is positioned under the ipsilateral hip to allow for exposure during the calcaneal slide and Cotton procedure (Fig 1). After these 2 procedures, the bump is removed, using the tape cordage, to allow for external rotation of the lower extremity and access to the PTT. Three or four towels are placed under the foot to allow for leverage, and an assistant adds inversion as

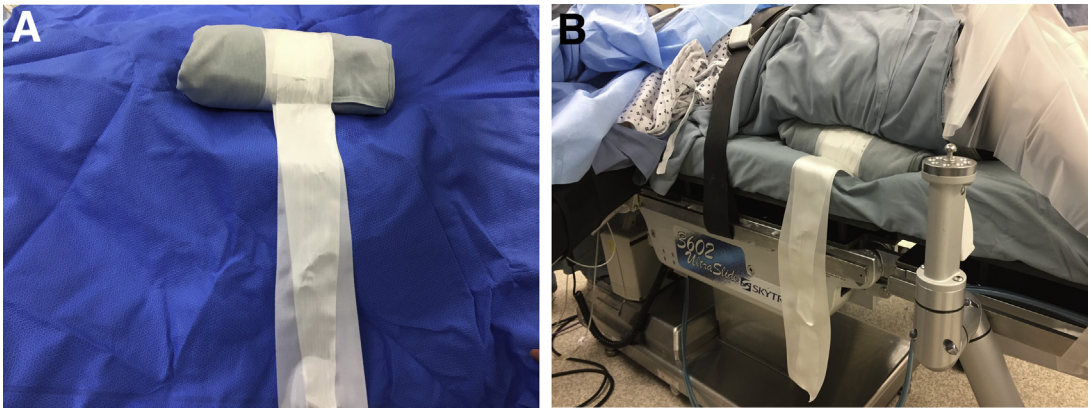

Fig 1. (A) A taped thigh bump allows for easy removal by a nonsterile assistant when ready to proceed to posterior tibial tendon endoscopy after the medial calcaneal and Cotton osteotomy. (B) The thigh bump is placed under the ipsilateral hip to assist in internal rotation of the leg when performing the calcaneal and Cotton osteotomy. Removal of the thigh bump allows for external rotation of the lower extremity and access to the posterior tibial tendon.

needed to provide better visualization of the tendon (Video 1).

Proximal Arthroscopic Portal Placement

The medial malleolus and PTT are palpated and marked. Portal sites are marked along the PTT; the proximal port site is approximately 4 cm proximal to the medial malleolus (Fig 2), and the distal port is approximately 2 cm distal to the medial malleolus (Fig 3). The nick-and-spread technique is used to reach the PTT sheath: By use of a No. 15 blade scalpel, a 5-mm incision is made at the proximal port site mark, and a straight hemostat is used to perform blunt dissection down to the PTT sheath. The skin is retracted to allow visualization of the sheath and prevent damage to surrounding structures. The sheath is then incised to allow passage of a 2.7-mm Stryker arthroscope. Once inserted, the foot is inverted and everted to confirm placement into the PTT sheath; flexion and extension of the toes without movement of the tendon further confirm the placement of the arthroscope on the sheath of the PTT and not the flexor digitorum or flexor hallucis longus (Video 1).

Exploration and Synovectomy

Exploration of the tendon is performed proximal to and at the watershed area of the PTT for tears, synovitis, or other pathology. The distal port site is then opened by use of the same nick-and-spread method to allow passage of a 2.7-mm Stryker shaver. Retractors are used again to prevent damage to the medial plantar nerve, which is in proximity. Debridement of the PTT is

Fig 2. The proximal portal is made approximately 4 cm proximal to the medial malleolus. By use of a straight hemostat, the nick-and-spread technique is performed to achieve blunt dissection to the tendon sheath. Once the tendon sheath is visualized, it is incised with a scalpel to allow for insertion of the arthroscope.

Fig 3. The distal port is made approximately 2 cm distal to the medial malleolus. By use of a straight hemostat, the nick-and-spread technique is performed to achieve blunt dissection to the tendon sheath. Once the tendon sheath is visualized, it is incised with a scalpel to allow for insertion of the arthroscopic shaver.

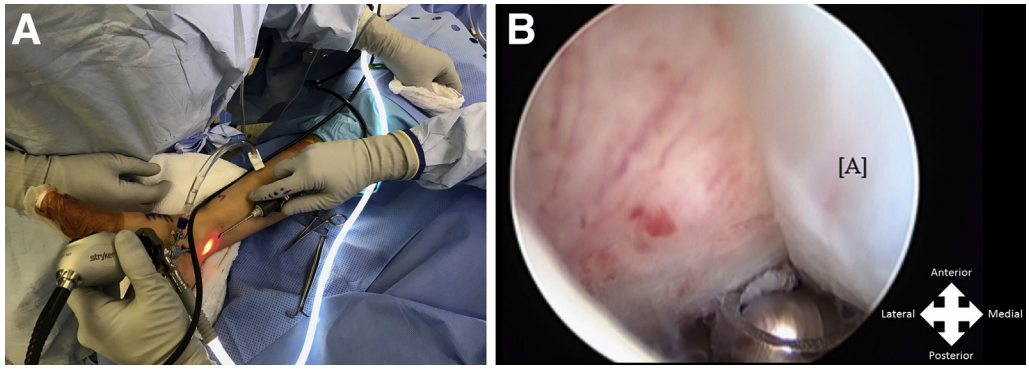

Fig 4. The arthroscope is in the distal portal, and the arthroscopic shaver is in the proximal portal. (A) The surgeon's hands are positioned close to the patient's foot and leg to help limit excessive motion and assist in instrumentation positioning. (B) The labeled structure (A) is the posterior tibial tendon.

performed from this orientation. Next, the instrumentation is switched to allow visualization distal to and at the watershed area of the PTT (Figs 4 and 5). The tendon is explored, and debridement resumes as described earlier (Table 1, Video 1).

Postoperative Period

Postoperative management after the calcaneal slide, Cotton procedure, and endoscopy with synovectomy includes 2 weeks of splinted non–weight bearing followed by 4 weeks in a boot with frequent range of motion. At 6 weeks, progressive weight bearing is allowed as tolerated with the addition of physical therapy.

Discussion

AAFD is a progressive disease that begins with PTT dysfunction and progresses to ligamentous dysfunction and ultimately flatfoot deformity of varying degrees. Early diagnosis and treatment of posterior tibial tenosynovitis can stop the disease process and prevent the development of AAFD. Chow et al.[4] completed a study on 6 patients with stage I AAFD who underwent endoscopic synovectomy of the PTT; none had complications or progressed to stage II AAFD. Khazen and Khazen[5] reported similar results in 9 patients with stage I disease who underwent endoscopic debridement; 8 had pain improvement. Using this minimally invasive endoscopic technique, we can achieve 360° visualization of the PTT within the tendon sheath, allowing for a complete exploration and debridement. These procedures are well tolerated and are equally as effective as traditional open procedures.[4] The major risk with the endoscopic approach to the PTT is injury to the medial plantar nerve. Although this approach stays away from this structure, it is still possible and potentially can increase in patients with severe flatfoot deformities. In conclusion, patients are generally happier with smaller scars when compared with the large open procedure, and patients are able to return to activities more quickly after surgery. We hope that by using this video description, practitioners could avoid the increased

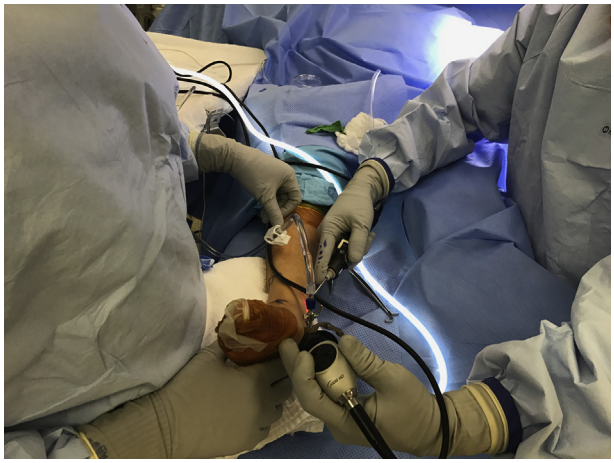

Fig 5. The arthroscope hand and arthroscopic shaver hand (surgeon's left hand and right hand, respectively) are positioned as close as possible to the patient's lower extremity to facilitate proper positioning within the tendon sheath.

Table 1. Pearls of Posterior Tibial Tendon Endoscopy

Pearls
A marking pen should be used to outline the tendon and plan the incision.
The sheath entry should be kept small to allow for insufflation.
A low-pressure pump (<25 mm Hg) should be used.
Using a thigh tourniquet rather than a lower leg tourniquet allows the tendon to slide freely for good visualization.
The arthroscope hand rests on the foot or leg to limit motion and facilitate arthroscope positioning (Fig 5).
The entrance and exit of the portals should be limited to minimize sheath damage.
The surgeon should ensure the distal portal is near the insertion to allow for complete synovectomy.
Pitfalls
Malpositioning (most common)
Insertion of endoscope into wrong tendon; most commonly, flexor digitorum longus
Poor insufflation due to large portal entry into sheath
Medial extension with disruption of medial plantar nerve

Table 2. Advantages and Disadvantages

Advantages
Cosmetically well-accepted scars (two 4- to 5-mm incisions)
Less wound pain
Fewer complications than open procedures
No need for immobilization for wound protection
Disadvantages
Complete visualization may be difficult to attain if foot and leg position are misaligned

morbidity and mortality associated with open exploration procedures, as well as help patients return to activity in a timely manner after surgery (Table 2).

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