

Tendoscopic Synovectomy of Tibialis Anterior Tendon of the Ankle



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Abstract: Tenosynovitis of the tibialis anterior tendon may occur as an overuse injury due to repetitive foot dorsiflexion. Most cases respond to conservative treatment with rest, shoe modification, anti-inflammatory agents, and physical therapy. Surgery may be required for chronic cases recalcitrant to conservative treatment. Other causes of tibialis anterior tenosynovitis include rheumatologic and infectious conditions. Classically, an operation on the tibialis anterior tendon is performed with open approach requiring dissection of the extensor retinacula. The purpose of this Technical Note is to describe the technical details of a tendoscopic approach to synovectomy of the tibialis anterior tendon. This can preserve the integrity of the extensor retinacula.

The tibialis anterior tendon of the foot and ankle passes under the superior and inferior extensor retinacula, inserting on the first metatarsal base and the medial cuneiform bone.¹⁻³ The saphenous nerve runs along the medial side of the tendon and crosses over the tendon close to its insertion. The deep peroneal nerve runs along the posterolateral side of the tendon and crosses under the extensor hallucis longus tendon just above the ankle level to the lateral side of the extensor hallucis longus tendon. The tendon is covered by a true synovial sheath, extending from above the proximal arm of the inferior extensor retinaculum to the level of the talonavicular joint.¹⁻³ The tendon distal to the talonavicular joint does not have a synovial sheath. Instead, there is a synovial bursa between the distal extrasynovial portion of the tendon and the medial metatarsocuneiform joint and

Table 1. Indications and Contraindications of Tendoscopic Synovectomy of Tibialis Anterior Tendon

Indications	Contraindications
Chronic tenosynovitis	Cellulitis at expected portal sites
Acute infectious tenosynovitis	Presence of extensive tendinopathy that may require open debridement and reconstructive surgery

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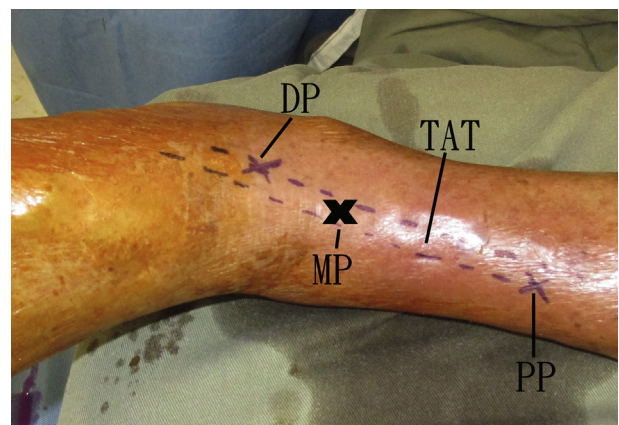


Fig 1. Tendoscopic synovectomy of left tibialis anterior tendon (TAT). The patient is in the supine position with the legs spread. Three portals along the TAT are used for this procedure. The proximal portal (PP) is located at the proximal end of the tendon. The distal portal (DP) is at the level of the talonavicular joint. The middle portal (MP) is at the level of the anterior ankle joint line.

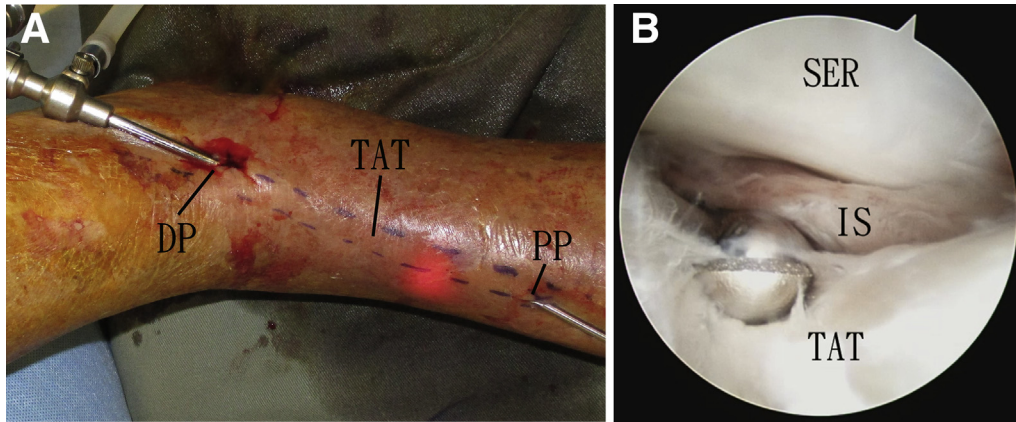


Fig 2. Tendoscopic synovectomy of left tibialis anterior tendon (TAT). The patient is in the supine position with the legs spread. (A) The distal portal (DP) is the viewing portal, and the proximal portal (PP) is the working portal. (B) An endoscopic view shows synovectomy of the proximal portion of the TAT. (IS, inflamed synovium; SER, superior extensor retinaculum.)

medial cuneiform bone, close to the tendon insertion.^{2,3} Pathology of the tibialis anterior tendon can be spontaneous, trauma related, or associated with arthropathy or systemic conditions such as diabetes mellitus. It includes tendinopathy,³⁻⁵ tenosynovitis,³ tendon tear,⁶⁻⁸ and bursitis.³

Tibialis anterior tenosynovitis may occur as an over-use injury due to repetitive foot dorsiflexion. It is common in sports that require the use of high-top shoes, as well as running, skiing, cycling, and mountain climbing. Direct irritation from the upper edge of the shoes or boots could also account for the inflammation. Occasionally, the whole synovial lining is involved.^{3,5} Most cases respond to conservative treatment with rest, shoe modification, anti-inflammatory agents, and physical therapy. Surgery may be required for chronic cases recalcitrant to conservative treatment.^{3,9} Moreover, tenosynovitis of the tibialis anterior tendon can result from rheumatologic¹⁰ or infectious¹¹⁻¹³ causes. Classically, an operation on the tibialis anterior tendon is performed with an open approach.^{14,15} Recently, a tendoscopic approach to the tibialis anterior tendon

has been reported with the advantages of minimally invasive surgery and preservation of the extensor retinacula.^{2,9,16}

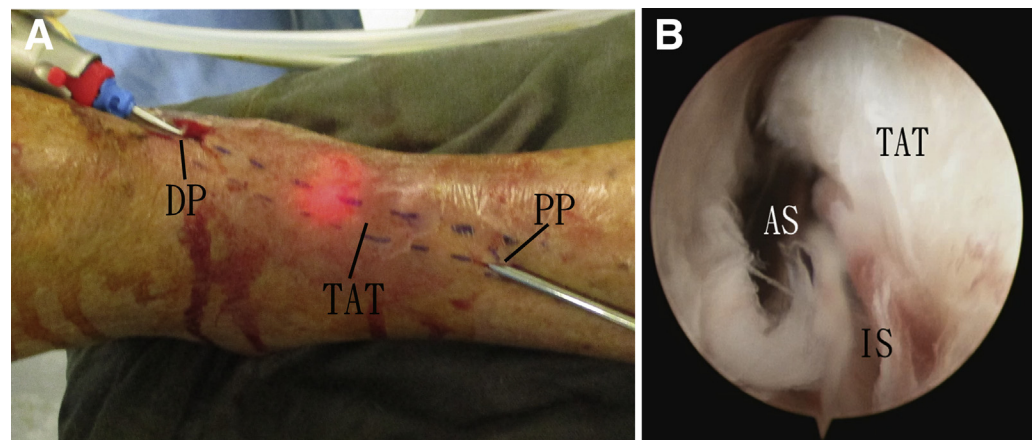
The purpose of this Technical Note is to describe the technical details of tendoscopic synovectomy of the tibialis anterior tendon. It is indicated for chronic tenosynovitis or acute infectious tenosynovitis. It is contraindicated if there is cellulitis at the expected portal sites or the presence of extensive tendinopathy that may require open debridement and reconstructive surgery (Table 1).

Technique

Preoperative Planning and Patient Positioning

Clinical assessment alone may not be able to differentiate tendon pathologies; therefore, imaging studies are often necessary to plan appropriate treatment for prompt functional recovery. Radiography can be useful in conditions such as calcific tendinopathy or in the assessment of adjacent arthropathy. Ultrasound and magnetic resonance imaging are useful imaging tools to

Fig 3. Tendoscopic synovectomy of left tibialis anterior tendon (TAT). The patient is in the supine position with the legs spread. (A) The proximal portal (PP) is the viewing portal, and the distal portal (DP) is the working portal. (B) An endoscopic view shows synovectomy of the distal portion of the TAT. (AS, arthroscopic shaver; IS, inflamed synovium.)



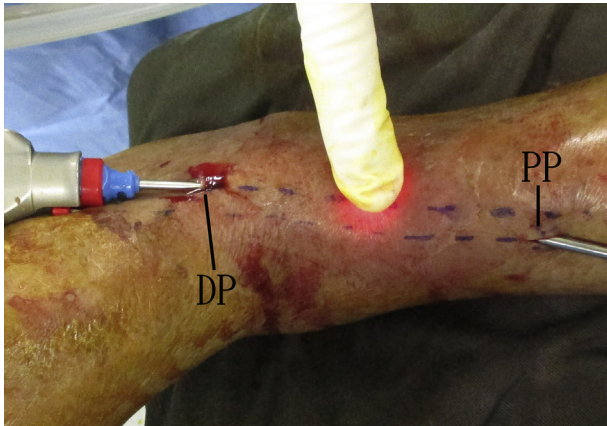


Fig 4. Tendoscopic synovectomy of left tibialis anterior tendon. The patient is in the supine position with the legs spread. Finger pressing on the arthroscopic light spot pushes the inflamed synovium toward the shaver blade. (DP, distal portal; PP, proximal portal.)

assess the degree and extent of tenosynovitis and the condition of the tibialis anterior tendon.^{2,3}

The patient is placed in the supine position with the legs spread. A thigh tourniquet is applied to provide a bloodless surgical field. Fluid inflow is by gravity, and no arthropump is used. A 2.7-mm 30° arthroscope (Henke Sass Wolf, Tuttlingen, Germany) is used for this procedure.

Portal Placement

Three portals along the tibialis anterior tendon are used for this procedure (Video 1, Fig 1). The proximal portal is located at the proximal end of the tendon. The distal portal is at the level of the talonavicular joint. The middle portal is at the level of the anterior ankle joint line.

Tendoscopic Synovectomy of Proximal Portion of Tibialis Anterior Tendon

Three- to four-millimeter longitudinal skin incisions are made at the proximal and distal portals. The

subcutaneous tissue is bluntly dissected down to the synovial tendon sheath by a hemostat. The tendon sheath is penetrated by the hemostat. Sometimes, the proximal portal cannot be clearly defined by palpation because of local soft-tissue swelling. In this case, the distal portal is created first. A trocar cannula is inserted into the distal portal and advanced proximally alongside the tibialis anterior tendon. The ankle is plantar flexed and the foot is everted to facilitate passage of the trocar cannula alongside the tendon and across the ankle. There should be no resistance during advancement of the trocar cannula. Excessive force should be avoided to reduce the risk of tendon or neurovascular injury. The trocar is then removed, and an arthroscope is incorporated into the cannula. The proximal portal is marked with a needle, and proper localization of the portal site is confirmed endoscopically.

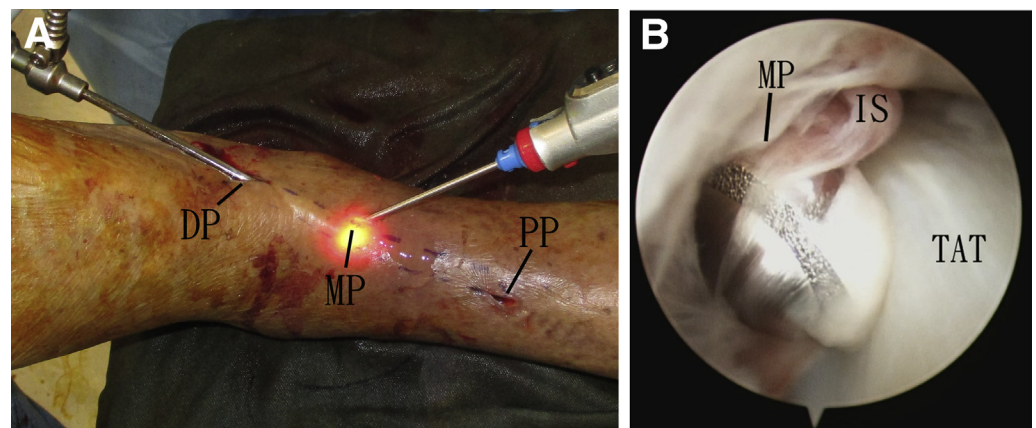
With the distal portal as the viewing portal, the proximal portion of the tibialis anterior tendon is examined for any tearing and the presence of inflamed synovium. Synovectomy is performed with an arthroscopic shaver (Dyonics; Smith & Nephew, Andover, MA) through the proximal portal (Fig 2). Because there is no fibrous tendon sheath on the lateral side of the tendon, synovectomy on the posterolateral side of the tendon above the ankle level should be performed under strict endoscopic visualization to avoid injury to the deep peroneal nerve and the anterior tibial artery.

Tendoscopic Synovectomy of Distal Portion of Tibialis Anterior Tendon

With the proximal portal as the viewing portal, the distal portion of the tibialis anterior tendon is examined for any tearing and the presence of inflamed synovium. Synovectomy is performed with an arthroscopic shaver through the distal portal (Fig 3).

If the ankle cannot be plantar flexed and the foot cannot be everted effectively, the arthroscope may not be able to pass across the ankle alongside the tibialis

Fig 5. Tendoscopic synovectomy of left tibialis anterior tendon (TAT). The patient is in the supine position with the legs spread. (A) The distal portal (DP) is the viewing portal, and the middle portal (MP) is the working portal. (PP, proximal portal.) (B) An endoscopic view shows synovectomy of the middle portion (MP) of the TAT. (IS, inflamed synovium.)



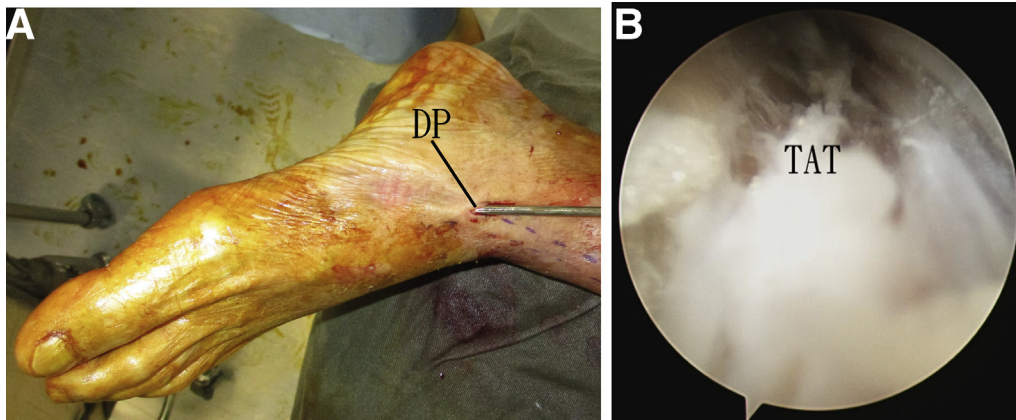


Fig 6. Tendoscopic synovectomy of left tibialis anterior tendon (TAT). The patient is in the supine position with the legs spread. (A) The distal extrasynovial portion of the TAT is examined through the distal portal (DP). (B) An endoscopic view shows the distal extrasynovial portion of the TAT.

anterior tendon. In this case, the middle portal is created. Synovectomy of the proximal portion of the tibialis anterior tendon is performed through the proximal and middle portals, and synovectomy of the distal portion of the tendon is performed through the distal and middle portals.

Tendoscopic Synovectomy of Middle Portion of Tibialis Anterior Tendon

Synovectomy of the middle portion of the tibialis anterior tendon at the ankle level can be performed through the proximal and distal portals if the ankle can be plantar flexed effectively. This can also be facilitated by pressing the arthroscopic light spot (finger-pressing maneuver) (Fig 4). This pushes the inflamed synovium toward the shaver blade.

Synovectomy at the ankle level is more effectively performed through the middle portal. The proximal and distal portals are used as the viewing portals, and the middle portal is the working portal (Fig 5).

Examination of Distal Extrasynovial Portion of Tibialis Anterior Tendon

The distal extrasynovial portion of the tibialis anterior tendon can be examined through the distal portal (Fig 6). Any inflamed bursa or bone spur from the medial naviculocuneiform joint impinging on the distal insertion of the tibialis anterior tendon can also be resected endoscopically.^{2,17}

Examination of Musculotendinous Junction of Tibialis Anterior Tendon

The musculotendinous junction of the tibialis anterior tendon can be examined through the middle portal. The distal muscle belly can be reflected by an arthroscopic shaver through the proximal portal to examine the deep surface of the junction (Fig 7).

Confirmation of Completeness of Synovectomy

Finally, the whole synovial portion of the tibialis anterior tendon is examined for any residual inflamed

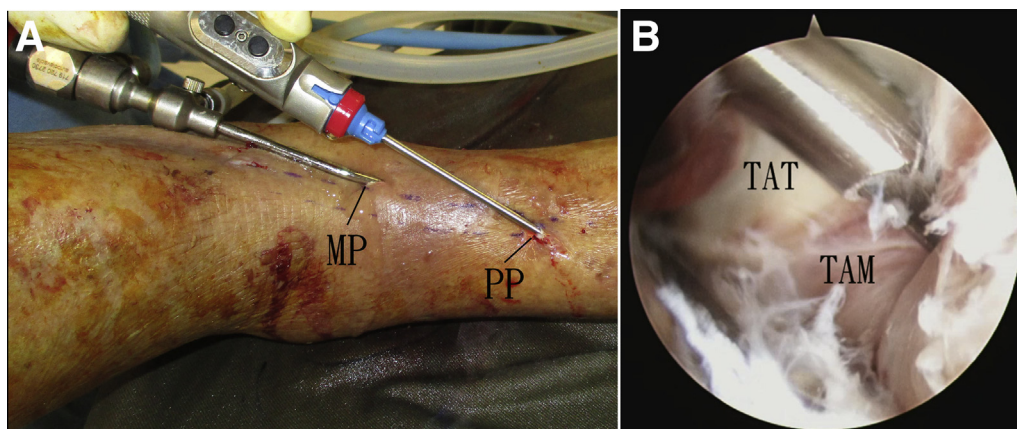


Fig 7. Tendoscopic synovectomy of left tibialis anterior tendon (TAT). The patient is in the supine position with the legs spread. (A) The middle portal (MP) is the viewing portal, and the proximal portal (PP) is the working portal. (B) The distal muscle belly of the tibialis anterior muscle (TAM) is reflected by the arthroscopic shaver. The deep surface of the musculotendinous junction is examined.



Fig 8. Tendoscopic synovectomy of left tibialis anterior tendon (TAT). The patient is in the supine position with the legs spread. The distal portal is the viewing portal. The synovial portion of the TAT is examined for any residual inflamed synovium.

synovium through the proximal, middle, and distal portals (Fig 8, Table 2).

Discussion

The anterior tibial tendon is a superficial structure through its whole course. An open approach to the tendon does not require extensive soft-tissue dissection. However, the extensor retinacula may need to be incised to gain access to the tendon. Repairs of the retinacula need to be protected by a period of ankle

Table 2. Pearls and Pitfalls of Tendoscopic Synovectomy of Tibialis Anterior Tendon

Pearls	Pitfalls
The proximal portal can be created under endoscopic guidance.	Synovectomy of the lateral side of the tendon above ankle level should be performed under strict arthroscopic guidance to avoid injury to the deep peroneal nerve and anterior tibial artery.
Finger pressing on the arthroscopic light spot can push the inflamed synovium toward the shaver blade.	
The middle portal is important for synovectomy of the middle portion of the tibialis anterior tendon.	

Table 3. Advantages and Risks of Tendoscopic Synovectomy of Tibialis Anterior Tendon

Advantages	Risks
Better cosmesis	Infection
Less soft-tissue dissection	Injury to tibialis anterior tendon
Less postoperative pain	Injury to saphenous nerve
Complete assessment of whole course of tendon	Injury to deep peroneal nerve
Preservation of extensor retinacula	Injury to anterior tibial artery

immobilization. Failure of the repair of the inferior extensor retinaculum can result in bowstringing of the tibialis anterior tendon during ankle dorsiflexion.⁹ Moreover, the inferior extensor retinaculum supplies the retinacular roots of the sinus tarsi. Insufficiency of the inferior extensor retinaculum may result in subtalar instability. Anterior tibial tendoscopy eliminates the need for release of the retinacula and risk of tendon bowstringing and subtalar instability.

The advantages of this arthroscopic technique include better cosmesis, less soft-tissue dissection, less postoperative pain, complete assessment of the whole course of the tendon, and preservation of the extensor retinacula. The potential risks of this procedure include infection and injury to the tibialis anterior tendon, saphenous nerve, deep peroneal nerve, or anterior tibial artery (Table 3). This is not a technically demanding procedure and can be attempted by average foot and ankle arthroscopists.

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