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Tendoscopy of the Posterior Tibial Tendon

C. Niek van Dijk, Ph.D., Nanne Kort, M.D., and Peter E. Scholten, M.D.

Summary: An anatomic cadaver study was performed and subsequently, in a prospective study, diagnostic and therapeutic tendoscopy (tendon sheath endoscopy) was performed in 16 consecutive patients with a history of persistent posteromedial ankle pain for at least 6 months. All patients had pain on palpation over the posterior tibial tendon, a positive tibial tendon resistance test, and local swelling. The indications were diagnostic procedure after surgery in 5 patients, diagnostic procedure after fracture in 5, diagnostic after trauma in 1, chronic tenosynovitis in 2, screw removal in 1, and posterior ankle arthrotomy in 2 patients. Inspection and surgery of the complete tendon and its tendon sheath can be performed by a standard two-portal technique. A new finding is the vincula that was consistently present in all our autopsy specimens as well as all our patients. At 1-year follow-up, 3 of the 4 patients in whom resection of a pathological thickened vincula, and 2 patients in whom tenosynovectomy and tendon sheath release were performed, were free of symptoms. Other procedures such as removal of adhesions and screw removal could well be performed. In 2 patients with a posteromedially located loose body, successful removal took place by means of a posterior tibial tendoscopic approach. There were no complications. **Key Words:** Tendoscopy—Tendon—Endoscopy—Posterior tibial tendon—Vincula—Surgical technique.

Disorders of the ankle joint can be caused by intra-articular as well as extra-articular pathology. During the last decades, the arthroscope has become a major tool in the diagnosis and treatment of intra-articular ankle lesions, such as impingement syndromes, synovitis, osteochondral defects, loose bodies, and arthrosis.¹⁻⁴ In the absence of intra-articular pathology, posteromedial ankle complaints most often are caused by disorders of the posterior tibial tendon.⁵ In the event of failure of conservative treatment, posterior tibial tendon disorders can be treated by open surgery.^{6,7} A possible endoscopic procedure would offer the advantages of less morbidity, reduction in postoperative pain, and outpatient treatment.⁸ Postoperative open surgical treatment requires plaster immobilization to prevent

equinus malformation and stimulate wound healing.^{6,7} Endoscopic surgery on the contrary can be expected to be followed by functional postoperative treatment. A cadaver study was performed and, in a subsequent prospective study, diagnostic and therapeutic tendoscopy (tendon sheath endoscopy) was performed in 16 consecutive patients.

ANATOMIC STUDY

Seven ankles in five specimens with no previous history of ankle pathology were dissected. Special attention was paid to the relation of the posterior tibial tendon to the posteromedial aspect of the tibia, the flexor digitorum longus, the neurovascular structures, and to the insertion onto the navicular bone.

The dorsomedial surface of the tibia constantly showed a slightly concave smooth surface. A consistent (seven out of seven) membranous mesotendineal structure was found between tendon and tendon sheath. This thin vincula-like structure runs between the posterior tibial tendon and to the tendon sheath of the flexor

From the Department of Orthopaedic Surgery, the Academic Medical Center, University of Amsterdam, The Netherlands.

Address correspondence and reprint requests to C. Niek van Dijk, Ph.D., Department of Orthopaedic Surgery, the Academic Medical Center, University of Amsterdam, P.O. Box 22700, 1100 DE Amsterdam, The Netherlands.

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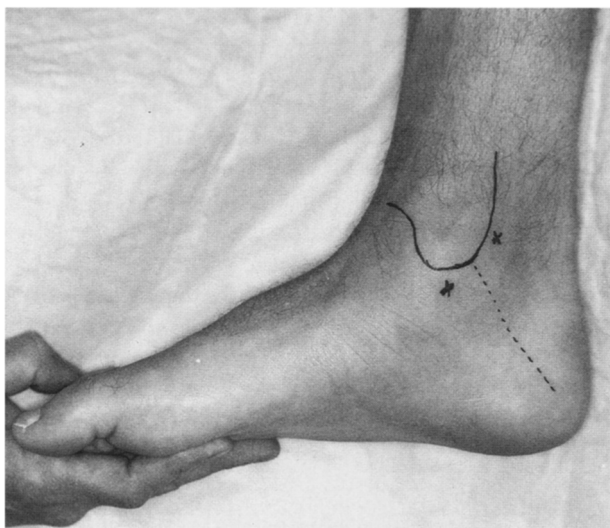


FIG 1. Right ankle: the two main portals are located directly over the posterior tibial tendon 1.5 to 2 cm distal and 1.5 to 2 cm proximal to the posterior edge of the medial malleolus.

digitorum tendon. It runs from all the way proximal to end with a free edge 3 to 4 cm above the level of the posteromedial tip of the medial malleolus.

In six of the seven specimens, a small 1- to 2-cm wide interruption in the vincula was found, 1 to 2 cm proximal of its distal free edge. As far as we know, these structures have not been previously described at this site. After traumatic injury to the ankle, this mesotendinal structure may have clinical implications.

SURGICAL TECHNIQUE

An autopsy study was performed to verify portal anatomy. Access to the tendon can be obtained anywhere along its course. However, the two main portals are located directly over the tendon 1.5 to 2 cm distal and 1.5 to 2 cm proximal to the posterior edge of the medial malleolus (Fig 1).

The distal portal is made first: the incision is made through the skin only and the tendon sheath is penetrated by the arthroscope shaft with blunt trocar. The 2.7-mm arthroscope with an inclination angle of 30° is introduced and the tendon sheath is filled with saline. The 1-mm needle scope and the 1.8-mm arthroscope were used at first but were found to give inferior access and view. Another important advantage of the 2.7-mm arthroscope is the far better flow that is necessary when surgery is performed. Under direct visualization, the proximal portal is made by introduction of a spinal

needle and subsequently an incision is made through the skin into the tendon sheath.

Instruments such as blunt probe, scissors, retrograde knife, and shaver system can be introduced. The distal portal allows a complete overview of the tendon from its insertion to the navicular bone to some 6 cm above the level of the tip of the medial malleolus. The complete tendon sheath can be inspected by rotating the scope around the tendon. Special attention is given to inspect the tendon sheath covering the deltoid ligament, the posterior medial malleolus surface, and the posterior ankle joint capsule. More proximally, the free edge of the vincula can be inspected. The operation is performed as an outpatient procedure under general, regional, or local anesthesia. Local anesthesia has the advantage of a possible dynamic investigation. Before the anesthesia is administered, the patient is asked to actively invert the foot. The posterior tibial tendon thus can be palpated and the location of the portals can be drawn onto the skin. In case of local anesthesia, the anesthetic (plus epinephrine) is administered around the portals and into the tendon sheath. When a total synovectomy of the posterior tibial tendon is to be performed, it is advisable to create a third portal distally. In the case of tendon sheath release, we use a small retrograde knife. Under direct visualization, a release of the complete tendon sheath can be performed from 6 cm above the joint level up to the navicular bone. The neurovascular structures are located posterior and are not in danger because they are still covered by the flexor digitorum tendon. Nevertheless, the release is performed on the medial side.

In cases where access to the posteromedial compartment of the ankle joint is desired, this can be obtained by means of posterior tibial tendoscopy approach. The foot is brought into an inverted equinus position. The arthroscope is introduced through the distal portal and placed in between the tendon and medial malleolus. The probe comes down from the proximal portal and crosses behind the posterior tibial tendon to palpate the posterior ankle joint capsule. By moving the ankle up and down, the posterior joint level can be identified by the surgeon's palpating finger from the outside, as well as with the probe under direct visualization from inside the tendon sheath. The shaver is introduced through the proximal portal and the tendon sheath can be opened at the posterior joint level. The posterior joint capsule can then be partially resected, and the arthroscope (through the distal portal) and the shaver or other instrument (through the proximal portal) can both be brought into the posterior ankle joint compartment. Synovectomy or loose body removal can subsequently be performed.

TABLE 1. *Tendoscopy of the Posterior Tibial Tendon: Indications and Procedures*

Tenosynovectomy
Tendon sheath release
Tendon debridement in partial rupture
Resection of pathological thickened vincula
Removal of exostosis/irregularity of posterior tibial sliding channel
Endoscopic screw removal medial malleolus
Adhesiolysis
Posteromedial ankle arthrotomy (two portals)
Diagnostic procedure

At the end of the procedure the portals are sutured. Postoperative treatment consists of a pressure bandage and partial weight bearing for 2 to 3 days. Active movements are stimulated from the first day.

INDICATIONS

With an accurate clinical examination, a differentiation can be made between intra-articular and extra-articular pathology in most cases. On the posteromedial side, intra-articular lesions, such as posteromedial impingement syndrome, calcifications in the dorsal capsule of the ankle joint, subtalar pathology, loose body, or osteochondral defect have to be excluded. The most common extra-articular disorders are tenosynovitis of the posterior tibial tendon, disorders of the flexor hallucis longus tendon, and the tarsal tunnel syndrome.

Postsurgery and postfracture adhesions and irregularity of the posterior aspect of the tibia (posterior tibial sliding channel) can be responsible for symptoms in this region. The posterior tibial tendon plays an important role in normal hind-foot function.⁹ Several investigators have described development of posterior tibial dysfunction as the disease progresses from peritendinitis to elongation, degeneration, and rupture.^{5,7,10-12}

Tenosynovitis is often seen in association with flat feet and with psoriatic and rheumatic arthritis. In the early stage of posterior tibial dysfunction, tenosynovitis is the main symptom. Tenosynovectomy can be performed if conservative treatment fails.¹³

Flexor hallucis longus problems are most often seen in ballet dancers.¹⁴ Entrapment of the posterior tibial nerve within the tarsal canal is commonly known as a tarsal tunnel syndrome.¹⁵ Clinical examination should be sufficient to differentiate these disorders from an isolated posterior tibial disorder. A summary of indications for posterior tibial tendoscopy is given in Table 1.

PATIENTS

Since 1994, 16 procedures have been performed in 16 patients; 7 women and 9 men. The average age was 33.6 years (range, 16 to 54 years). The right ankle was involved in 9 cases. All patients had a history of persistent posteromedial ankle pain for at least 6 months with pain on palpation over the posterior tibial tendon, positive resistance test results, and often some local swelling. The indications were diagnostic procedure after surgery in 5 patients, diagnostic procedure after fracture in 5, diagnostic procedure after trauma in 1, chronic tenosynovitis in 2, screw removal medial malleolus in 1, and posterior ankle arthrotomy in 2 patients.

RESULTS

The mean follow-up is 1.1 years (range, 4 months to 2 years). There were no complications. In 2 patients, the tendon sheath of the flexor digitorum longus was entered first. Passive movement of the toes made the tendon move up and down its channel, thereby easily disclosing the mistake. In both cases, inspection of the flexor digitorum longus tendon and tendon sheath could be performed well and showed no abnormality.

In the diagnostic postsurgery group, 2 patients showed a pathological thickened vincula, which was removed in both cases (Fig 2). One patient showed adhesions, which were removed. In the diagnostic postfracture group, two patients showed irregularity of the sliding channel. In both cases, the sliding channel was smoothed. Two patients showed adhesions, which were removed. In one patient, a pathological thickened vincula was found and removed. In the diagnostic post-trauma patient (recurrent supination trauma), a pathological thickened vincula was found and resected.

At follow-up, 3 of the 4 patients with resection of a pathological vincula and the 2 patients who underwent tenosynovectomy and tendon release, were free of symptoms. Of the 3 patients whose adhesions were removed, 1 had a good result with diminished pain, but the other 2 patients were not relieved of their symptoms.

Of the 7 patients in whom adhesions or a pathological vincula was removed, 5 subjectively experienced improvement in dorsiflexion of the ankle. However, in none of them could an increase of more than 5° be measured.

The 2 patients in the diagnostic postsurgery group, where no pathology was found, were not relieved of their symptoms. Both patients in whom a posterome-

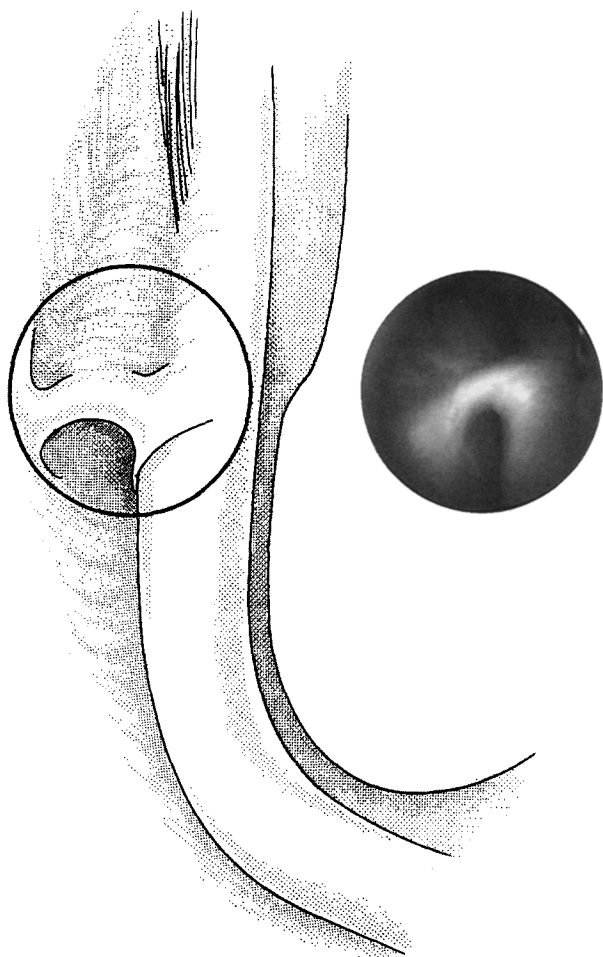


FIG 2. Left ankle: pathological thickening of the free edge of the vincula. The free edge of the vincula is situated some 4 cm proximal from the posterior distal edge of the medial malleolus and connects the tendon to the tendon sheath.

dial ankle arthrotomy through the posterior tibial tendon approach was performed, had a successful removal of a posteromedially located loose body.

CASE REPORT

A 54-year-old man had a long-standing history of pain and swelling over the posteromedial aspect of his left ankle. On investigation, there was a flat-foot deformity, unlimited range of motion, and swelling over the posterior tibial tendon. Echography showed fluid around the posterior tibial tendon, an intact tendon, and thickening of the tendon sheath. The diagnosis was made of chronic tenosynovitis of the posterior tibial tendon.

Conservative treatment with inlays, physiotherapy,

and three cortisone injections failed. Subsequently through an open procedure, tenosynovectomy with release of the posterior tibial tendon was performed. The patient was discharged from the hospital after 7 days. Postoperative treatment consisted of 3 weeks of plaster immobilization, followed by physiotherapy. The patient was pain free 6 months after the operation.

Two years later he returned with the same condition on the right side. After failure of conservative treatment, open surgery was offered. Because of the long and painful recuperation after the open surgery on the left side, the patient asked if his problem could be solved endoscopically. Subsequently, the above mentioned cadaver study and trial operations (cadaver) were performed. Through a three-portal technique, a tendoscopic total synovectomy was performed with a release of the tendon sheath over its full length. The posterior tibial tendon was found to be intact (Figs 3-6). Two weeks postoperatively, there was no swelling and an unrestricted range of motion. At the 4-month and 2-year follow-up, the patient was still symptom free.

DISCUSSION

The posterior tibial tendon plays an important role in normal hind-foot function. Posttraumatic posterior tibial dysfunction can lead to peritendinitis. Tenosynovitis is often seen in association with flat-foot deformity.

Post-traumatic and postsurgical complaints of pain at the posterior margin of the medial malleolus often pose a difficult diagnostic and therapeutic problem. In the absence of intra-articular pathology, adhesions and irregularity in the tendon sliding channel can be responsible for symptoms in this region. Open tendon release requires postoperative plaster immobilization with the subsequent possibility of new adhesion formation.^{6,7}

Endoscopic release offers several advantages. This diagnostic and therapeutic procedure can be performed as an outpatient procedure under local anesthesia, it allows functional aftertreatment, quick recovery, and the risk of neurovascular damage is minimal.

A new finding is the vincula that connects the posterior tibial tendon with its tendon sheath. It was consistently present in all our autopsy specimens as well as in all our patients. As far as we know, these structures have not been described previously at this site. Several authors have detected vincula within the tendon sheath of the flexor tendons of the fingers.¹⁶⁻²⁰ Other locations include the flexor tendon sheath of the toe flexor at

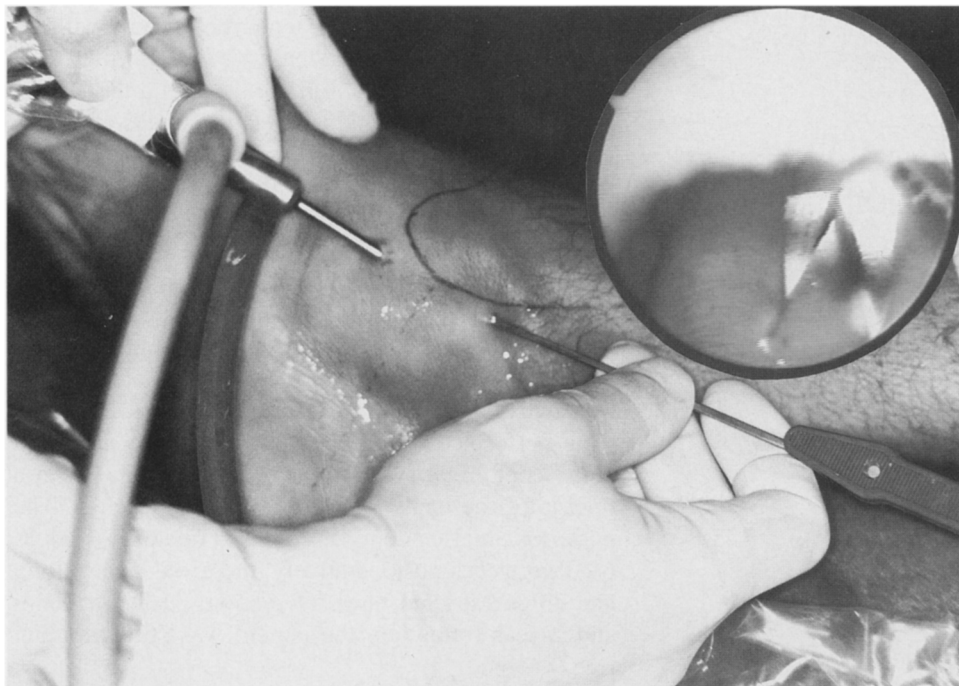


FIG 3. Posterior tibial tendon sheath release and synovectomy in a 54-year-old man with chronic tenosynovitis of the left ankle. The 2.7-mm arthroscope is introduced through the distal portal, the retrograde knife through the proximal portal.

FIG 4. Same patient as in Fig 3 after release of the tendon sheath. The cut in the thickened tendon sheath can easily be seen.

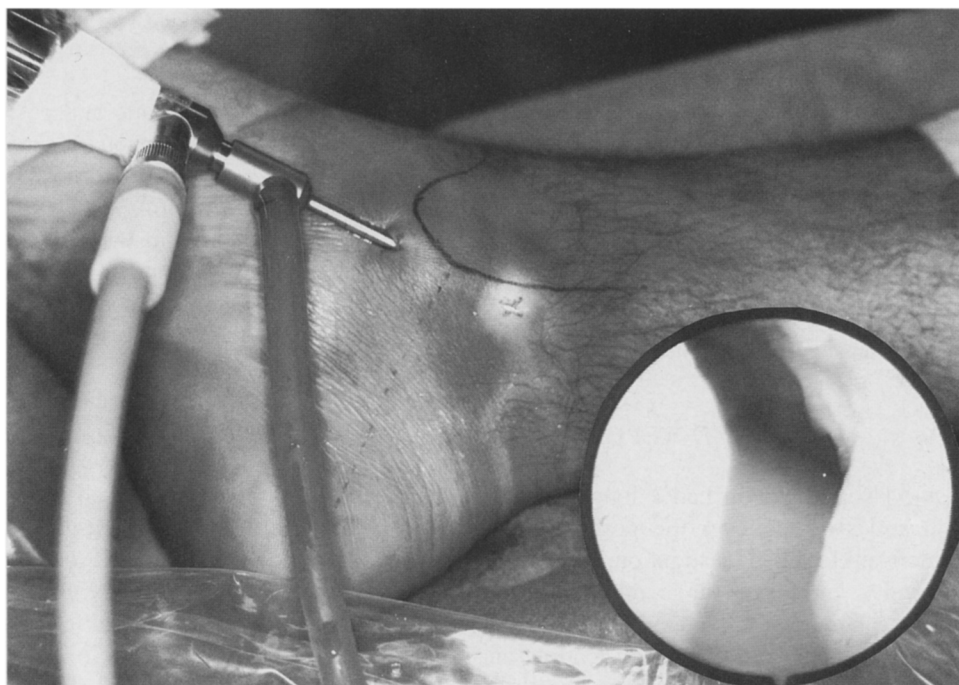


FIG 5. Same patient as in Fig 3 with the 2.7-mm synovial resector blade a synovectomy of the proximal tendon sheath is performed.

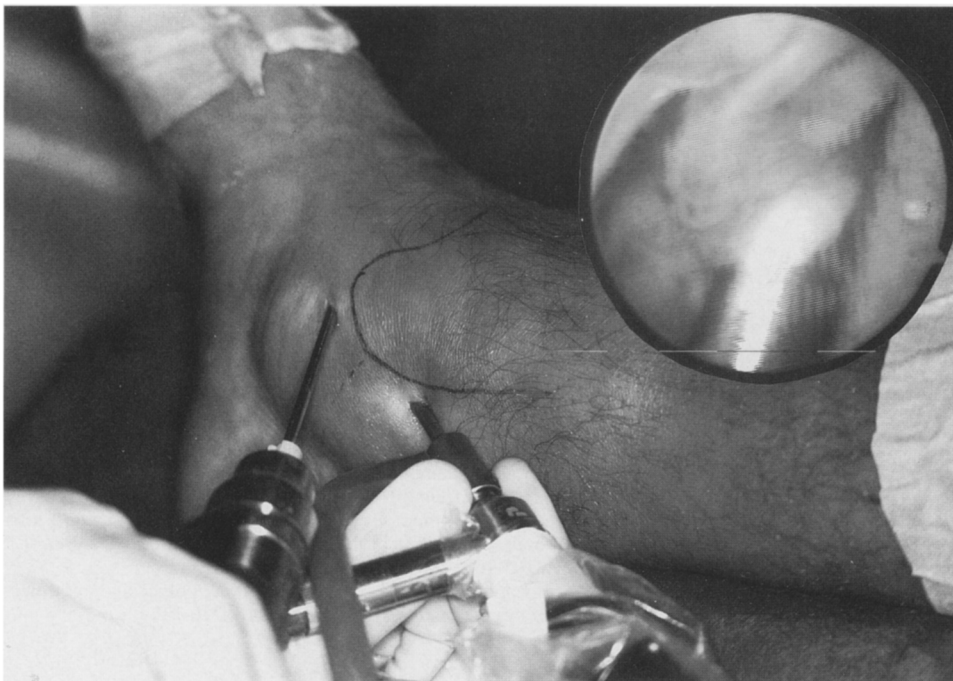


FIG 6. Same patient as in Fig 3. The arthroscope is now introduced through the proximal portal looking distally, while the shaver is introduced through the distal portal. In the arthroscopic view, the tendon is located on the right side where synovial overgrowth is seen. The thickened, irritated synovium with synovial folds can easily be identified.

the level of the foot, the anterior tibial tendon, and the peroneal tendons.^{18,21,22} The vinculae are described as a synovial lining reflected around the tendon or as special folds of connective tissue.^{16,18} They are thought to play a role in the microvascularity of the tendons.²¹⁻²⁶ However, the vinculae seem to play no crucial role in the vascularisation of the tendon.^{27,28} Nerve fibers are found within the vincula.²⁹ In the hand, the vincula is described to apply traction and transmit some flexion force even after a laceration of the tendon.^{30,31} Damage to the vincula can cause thickening, shortening, and scarring of its distal free edge. In post-traumatic, post-surgery, and postfracture situations, they then can become symptomatic. In these patients, a painful local thickening can be palpated at the posterior distal edge of the tibia some 3 to 5 cm above the posterior tip of the medial malleolus. Because nerve fibers are found within the vincula, active movements and passive maximal dorsi flexion can be painful because of traction through this shortened thickened vincula to the surrounding tissue. Endoscopic resection was successful in these patients. Although a biomechanical role is described in the hand, we do not believe that the vinculae in the foot have this accessory role.^{30,31}

Tendoscopy of the posterior tibial tendon proved to be successful in tendon sheath release, synovectomy, and removal of a pathological thickened vincula. In cases of posteromedial ankle joint pathology, posterior tibial tendoscopy offers the possibility of a two-portal posteromedial ankle joint approach. Further research will have to determine the place of tendoscopy of the posterior tibial tendon for other indications like snapping tendon phenomena, adhesions, and irregularities in the tibial sliding channel.

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