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Original Article

Tendoscopy in stage I posterior tibial tendon dysfunction: results after minimum follow-up of 8 years

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Abstract

Objective: To evaluate the progression of patients with this pathology treated by tendoscopy and with a minimum 8-year follow-up.

Methods: This is a retrospective study of patients operated on between 2008 and 2011. During that period, 11 patients with this pathology aged between 28 and 56 years (average 37 years) underwent surgery. The patients were assessed subjectively using the VAS scale and the AOFAS scale was used as the objective method.

Results: Nine of the 11 operated patients could be evaluated. Tendon injury was evident in three patients during the tendoscopy and open repair was indicated. Seven patients improved their symptoms according to the VAS and did not progress to stage II. Two patients progressed to stage II and underwent hindfoot reconstruction: one with tendon injury and the other without. The AOFAS scale improved on average from 64 to 96 in the patients who did not progress to stage II.

Conclusion: Tendoscopic synovectomy of the PTT is an effective surgical procedure to treat patients with stage I PTTD. It has the advantages of less pain and fewer complications of the soft tissues. If a tendon injury is encountered during the tendoscopy, it must be repaired through a 3 to 4cm incision above the injured area of the tendon.

Level of Evidence IV; Therapeutic Study; Case Series.

Keywords: Tendons/injuries; Tendons/surgery; Posterior tibial tendon dysfunction/therapy; Endoscopy/methods; Synovitis; Treatment outcome.

Introduction

Posterior tibial tendon dysfunction (PTTD) is a condition that involves progression from tenosynovitis to rupture and insufficiency of the posterior tibial tendon (PTT), causing adult acquired flatfoot deformity in its advanced stage[1-5]. Stage I was defined by Johnson and Strom[6] as tenosynovitis or tendinitis, in which the longitude of the tendon stays normal, there is no hindfoot deformity, and the diagnosis is basically clinical, characterized by swelling and pain in the posterior region of the medial malleolus due to swelling in the tendon path[7] that may radiate distally[8]. The tendon has a hypovascular zone of 14 mm in length, approximately 40 mm from its insertion into the scaphoid and normally this is the area where the patient's symptoms are generated.

In stage I of PTTD[6] the strength of the tendon may be normal, and the patient may be able to rise on their toes on the affected side, sometimes with much and others with little pain along the tendon. The condition is frequently incorrectly diagnosed as a sprained ankle[9] and regrettably delays a correct diagnosis and thereby proper treatment, which could help to improve the patient's symptoms and stop the progression of the condition, preventing it from progressing to the next stage and developing into adult acquired flatfoot[10,11].

Ultrasound (US) and nuclear magnetic resonance (MRI) can help to make the diagnosis more accurate. Comparing both methods[12], US proved to be less sensitive than MRI for this pathology. We routinely request an MRI for patients suspected of stage I PTTD to clarify and confirm the diagnosis.

Study performed at the Hospital de Clinicas Caracas, Caracas, DC, Venezuela.

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Myerson et al.[13] defined two different age groups with PTTD: a group of young adults with an average age of around 30 years with some form of systemic inflammatory disease (seronegative spondyloarthropathy) and a second group of older patients with an average age of around 55 years and a history of microtrauma and overuse that could be the cause of the condition.

Analyzing the different clinical and biomechanical factors[14] associated with stage I of this condition, a comparative study was conducted with healthy patients evaluating the differences in the height of the plantar arch, the muscle strength around the ankle, and biomechanical factors. In runners with PTTD, there was a significant difference when the plantar arch was lower, with a greater and longer eversion angle during gait, as compared to healthy runners. The hypothesis is that the greater pronation of the foot transmits a greater load to the posterior tibial muscle, which may explain the progressive nature of this condition.

Patients with stage I PTTD[15] are initially treated non-surgically with non-steroidal anti-inflammatory drugs, cryotherapy, local US[16], and a special ankle brace that supports the midfoot and hindfoot (preferably with the PTTD Airlift brace (Aircast)) for 3 to 6 months. Alvarez et al.[17] recommended a protocol with orthotics and a program of repetitive exercises with activities of aggressive plantar flexion, including lengthening of the gastrocnemius-soleus complex. After four months of treatment, 84% of the 47 patients studied had excellent subjective and functional results. Kulig et al.[18] described a protocol of working with progressive eccentric load on the tendon and lengthening of the gastrocnemius-soleus complex performed twice a day for ten weeks. This protocol was implemented in ten patients with early stage PTTD, resulting in improved symptoms and function without changes in the morphology or neovascularization of the tendon.

Patients with hindfoot valgus and forefoot pronation whose symptoms improve with conservative treatment may benefit from shoe modifications to protect any hindfoot valgus[19]. Adding scaphoid support and posteromedial elevation with an insole can take stress off the PTT.

If the symptoms persist following conservative treatment[3], surgical debridement and synovectomy of the PTT have been suggested. Mann[20] recommended tenosynovectomy for early stage I injuries because synovitis can invade the tendon and cause damage or rupture it. He suggested considering tenosynovectomy after three months of failed conservative treatment in patients with tenosynovitis caused by overuse or mechanical causes and tenosynovectomy earlier (at six weeks) in patients with seronegative disease.

Teasdall and Johnson[21] reported complete improvement of symptoms or mild pain in 17 out of 19 patients following open debridement through a curvilinear incision over the PTT path[3,22-27]. Debridement and synovectomy of the PTT can be performed endoscopically. Chow et al.[27] suggested endoscopic debridement in stage I PTTD to avoid problems in the soft tissues, infection, pain, adhesions, and prolonged hospitalization, demonstrating that it is a safe procedure that can achieve the same effectiveness as the traditional open procedure.

The objective of this study is to evaluate the results of patients diagnosed with stage I PTTD whose painful symptoms persisted after conservative treatment and underwent surgical treatment with endoscopic synovectomy with a minimum of eight years of follow-up.

Methods

This is a retrospective study of patients diagnosed with stage I PTTD with torpid progression under conservative treatment and who underwent endoscopic synovectomy with eight years of follow-up. Patients with autoimmune or seropositive rheumatological diseases were excluded from the study.

The patients were operated on at the Hospital de Clínicas Caracas from 2008 to 2011. During this period 11 patients with this pathology underwent surgery, nine females and two males ranging from 28 to 56 years of age, with an average age of 37 years. The average duration of painful symptoms in the region of the affected tendon prior to surgical treatment was analyzed.

The patients were subjectively assessed using the VAS scale, the results of which were classified as excellent, good, fair or poor according to the patient's responses. The AOFAS scale was used as the objective method.

Surgical technique

As we have described in previous studies of this pathology[28], we performed the two-portal technique described by Van Dijk et al.[29] The patient is placed in the supine position and we always perform the procedure under pneumatic ischemia. The operation can be performed under general or conductive anesthesia. The patient is examined, and the PTT path is marked on the skin using the medial malleolus and the scaphoid bone as references. The two portals are created over the tendon: the distal portal 2 cm proximal to the insertion into the scaphoid and the proximal portal 3 cm posterior and superior to the medial malleolus (Figure 1A).

An incision is made in the skin and the tendon sheath is opened with scalpel and mosquito forceps, respectively. The arthroscope of 2.7 mm and 30 degrees is introduced, and saline solution is injected into the tendon sheath (Figure 1B). The PTT is visualized from its insertion into the scaphoid up to 4 cm proximal to the proximal portal and examined with the probe. The synovectomy is performed with a small joint shaver (Figure 2). At the end of the procedure, the portals are sutured.

Following the procedure, the patient is placed in an airlift PTTD ankle brace (AIRCAST) for six weeks, the first two weeks with partial support and then full support. The patients then will remain with orthotic insoles in their regular shoes, protecting the hindfoot in a slight varus with a scaphoid support and posteromedial elevation to protect the tendon.

Posterior tibial tendon injury

If there is evidence of any injury of the PTT during the tendoscopy, the tendon sheath must be opened through a 3 or 4 cm long incision and the injury repaired by resecting the injured area and debriding the fissures. The defect is closed using non-absorbable 2-0 suture (ethibond) and the tendon sheath is left open to prevent fibrotic scarring (Figure 3).

After repair of the tendon injury, the patient is placed in an unsupported walking boot for three weeks and then partial support is authorized for an additional three weeks. At six weeks following surgery, the patient is transferred to the airlift PTTD ankle brace (AIRCAST) for six weeks.

Results

Endoscopic debridement was performed for stage I PTTD in 11 patients between 2008 and 2011. Nine (81%) of the 11 patients were able to be evaluated after a minimum of eight years of follow-up.

Functional results

Seven (78%) of the nine patients evaluated improved their symptoms according to the VAS and did not progress to stage II. In three (33%) patients a tendon injury was discovered during the tendoscopy and open repair surgery was indicated.

The average AOFAS scale score improved from 64 to 96 in the patients who did not progress to stage II.

Patients reported painful symptoms of an average of six months evolution prior to the surgical treatment, ranging from less than three to greater than 11 months.

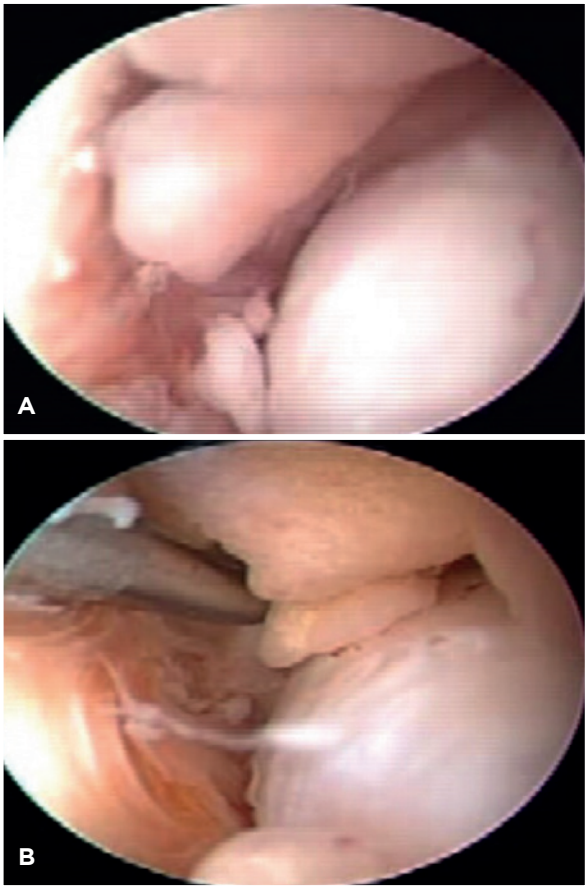

Figure 2. Tendoscopic image of the posterior tibial tendon, showing free bodies and synovitis around the tendon.

Figure 1. Surgical reference for tendoscopy of the PT. A. The path of the PTT is examined and marked on the skin using the medial malleolus and the scaphoid bones as the reference.

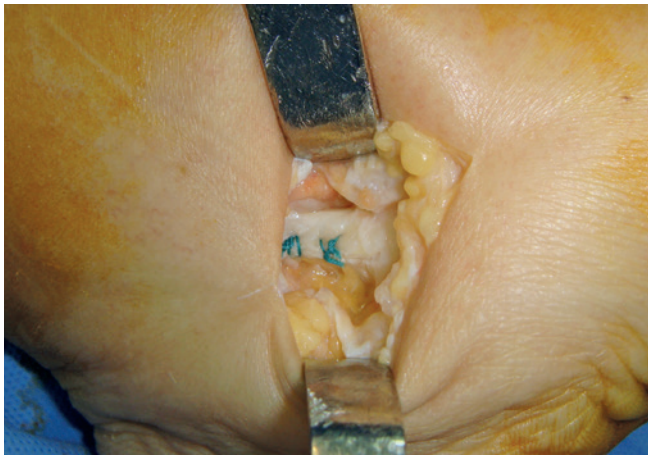

Figure 3. Repair of the tendon. The tendon sheath must be opened through a 3 to 4cm incision and the injury is repaired, resecting the injured section and debriding the fissures, The defect is closed using 2-0 non-absorbable sutures (ethibond), and the tendon sheath is left to prevent fibrotic scarring.

Two patients (22%) progressed to stage II and were indicated for hindfoot reconstruction with FDL tendon transfer, medializing calcaneal osteotomy and Cotton opening wedge osteotomy prior to completing two years following the tendoscopy. One of these patients, who reported ten months painful symptoms before surgery, had a tendon injury that required an open suture of the tendon and the other patient without a tendon injury, who reported five months painful symptoms symptoms before surgery, in the insertional region of the posterior tibial tendon, was treated with a simple tendoscopy.

No direct relationship between the onset of symptoms and progression to stage II posterior tibial tendon dysfunction could be established due to the small patient sample.

Complications

One patient with a tendon injury that required open repair, reported discomfort in the surgical wound that improved eight weeks after the surgery.

Return to work activities

The tendoscopic synovectomy patients returned to work between four and six weeks following surgery and the patients treated for tendon injuries returned on average after ten postoperative weeks.

Discussion

Stage I posterior tibial tendon dysfunction was defined by Johnson and Strom as tenosynovitis or tendinitis where the length of the tendon remains unchanged, there is no hindfoot deformity and the diagnosis is basically clinical, characterized by pain and swelling in the retromalleolar region. Unfortunately, the lack of knowledge about this pathology hinders early diagnosis and most patients who go to or are referred to a physician only do so in stage II or III, when there is hindfoot deformity, and instead of a simple, minimally invasive procedure, require complete hindfoot reconstruction. For this reason, it is important to disseminate to orthopedists the tools to diagnose and treat this pathology in an early stage to prevent its progression.

Patients who are diagnosed early with stage I PTTD are initially treated conservatively with NSAIDs, cryotherapy, ultrasound and are placed in a PTTD airlift brace (Aircast) for 3 to 6 months. If symptoms persist, surgical treatment to perform debridement and synovectomy should be indicated. At first, we waited even more than 6 months before indicating surgical treatment, but now we are a little more aggressive. If the patient's painful symptoms and functional weakness persist after 2 to 3 months of conservative treatment, we suggest surgical intervention with a tendoscopy at that time.

Chow et al.[27] did not report complications after tendoscopy for stage I PTTD. All their patients progressed without pain and with good tendon strength, being able to perform heel raises on the tips of the toes two months after surgery. Among the advantages of this procedure, in addition to a more cosmetically acceptable scar, the patients experienced less pain and fewer complication than patients who underwent open synovectomy. None of their patients progressed to stage II after a follow-up of 4 to 30 months (17 months average). The patients returned to work after 10 weeks and to participating in sports 6 months following surgery. All but two of the patients in our study reported subjective (pain scale) and objective (AOFAS scale) improvement and did not progress to stage II during an 8-year minimum follow-up.

One unsatisfied patient in our study did not have an injured or ruptured tendon. This patient progressed to stage II and required hindfoot reconstruction for this reason. Three patients had tendon injuries and needed open repair, only one of whom presented pain in the surgical wound, which improved in the eighth postoperative week. One of these patients, with a tendon injury that required an open suture, progressed to stage II and required hindfoot reconstruction with FDL tendon transfer, medializing calcaneal osteotomy and opening wedge osteotomy also known as Cotton osteotomy, less than two years following tendoscopy surgery.

Funk et al.[30] reviewed nine patients following synovectomy with and without tendon injury repair. All their patients presented objective and subjective clinical improvement. Pain was reported to be mild or absent in 8 of the 9 patients (89%). Eight patients could perform heel raises on the tips of the toes. In our study, 7 of the 9 patients progressed satisfactorily, pain free and able to perform the heel raise test with strength and without pain.

Conclusion

Endoscopic synovectomy of the PTT is an effective, minimally invasive surgical procedure for treating stage I PTTD patients. It has the advantage of less pain and fewer soft tissue complications. If a tendon injury is discovered during the tendoscopy, it should be repaired with non-absorbable sutures through a 3 to 4 cm incision over the injured region of the tendon.

This study has limitations as a single center study with a small patient sample in which all patients were treated and evaluated by the same authors.

Authors' contributions: Each author contributed individually and significantly to the development of this article: GK *(https://orcid.org/0000-0001-6050-3951) conceived and planned the activities that led to the study, interpreted the results of the study, performed the surgeries, data collection, statistical analysis, bibliographic review, survey of the medical records, formatting of the article, clinical examination, approved the final version; CK *(https://orcid.org/0000-0003-0787-7326) participated in the review process, data collection, statistical analysis, bibliographic review, survey of the medical records, formatting of the article, clinical examination, approved the final version.

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