ORIGINAL ARTICLE

Peroneal tendoscopy: Our experience


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Abstract

Background: The peroneal tendon pathology is a common cause of posterolateral ankle pain. Recently, the incidence and awareness of this disease and its treatment are booming thanks to the development of tendoscopic procedures.

Objective: To describe and assess the current role and indications of tendoscopy for peroneal tendon pathology.

Material and methods: From June 2010 to July 2011, twenty three patients with retrofibular pain were treated with peroneal tendoscopy. We founded twelve peroneal brevis tendon tears, six peroneal longus tendon tears, three cases of tenosynovitis and two cases of luxation, one patient with an intrasheath subluxation and another one of extrasheath. Of the 23 patients, 12 had another injury associated: 4 talar osteochondral lesions, 3 instabilities and 7 cases of soft tissue impingement.

Discussion: The three main indications include tendon tears, tenosynovitis and subluxation or luxation. It is a technically demanding procedure that requires extensive experience in arthroscopic management of small joints and can be particularly complex in cases of wide tenosynovitis, broad tendon tears or anatomical defects but very useful for the evaluation of the lesions and for the treatment of peroneal tendon disorders.

Conclusions: Tendoscopy is a useful procedure with low morbidity and excellent functional results to treat the pathology of the peroneal tendons.

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PALABRAS CLAVE

Tendoscopy; Peroneal tendons; Subluxation of the peroneal tendons; Ankle tendoscopy; Peroneal tendon surgery

Tendoscopia de los peroneos: nuestra experiencia

Resumen

Introducción: La patología de los tendones peroneos es una causa frecuente de dolor postero-lateral de tobillo. En los últimos años, la incidencia y el conocimiento de esta patología y de su tratamiento están en auge gracias al desarrollo de las técnicas tendoscópicas.
Peroneal tendoscopy: Our experience

Introducción

La técnica de endoscopía peronea fue descrita por Van Dijk y Kort en 1998. Van Dijk123 realizó un estudio del anatomía de los tendones. Desde entonces, se ha tenido en cuenta importancia y popularidad para el tratamiento de problemas que afectan a los tendones peroneos. No se ha realizado el estudio de la anatomía del tendón peroneo. Aunque se ha realizado un análisis de la posición y mobiliidad en el seno de la esfera, esto se realiza mediante un procedimiento que requiere una amplia experiencia en el tratamiento artroscópico de pequeñas articulaciones y puede ser especialmente complejo en los casos de tenosinovitis extensa o amplias roturas tendinosas, pero muy útil para la evaluación y tratamiento de dicha patología.

Conclusiones: La endoscopía peronea es un procedimiento de gran utilidad para el abordaje de la patología de los tendones peroneos, con baja morbilidad y excelentes resultados funcionales.

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Objetivo: Describir y evaluar el estado actual y las indicaciones de la endoscopía peronea en la patología de los tendones peroneos.

Material y método: Desde junio de 2010 hasta julio de 2011 se realizaron 23 endoscopías peroneas en pacientes con dolor retropílorico persistente. Encontramos 12 casos de rotula del peroneus brevis, 6 del peroneus longus, 3 casos de tenosinovitis y 2 casos de luxación, uno de ellos con una luxación intravaina y otra extravaina. De los 23 pacientes, 12 presentaban además otra lesión asociada: 4 lesiones osteocondrales de astrágalo, 3 inestabilidades anterolaterales de tobillo y 7 casos de pinzamiento de partes blandas.

Discusión: Las 3 indicaciones principales de esta técnica son las tenosinovitis, las roturas tendinosas y la luxación de los tendones. Es un procedimiento técnicamente exigente, que requiere una amplia experiencia en el tratamiento artroscópico de pequeñas articulaciones y puede ser especialmente complejo en los casos de tenosinovitis extensa o amplias roturas tendinosas, pero muy útil para la evaluación y tratamiento de dicha patología.

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Anatomía

La técnica de endoscopía peronea fue descrita por Van Dijk y Kort1 en 1998. Van Dijk123 realizó un estudio del anatomía de los tendones. Desde entonces, esta técnica ha sido de gran importancia y popularidad para el tratamiento de problemas que afectan a los tendones peroneos. No se ha realizado el estudio de la anatomía del tendón peroneo. Aunque se ha realizado un análisis de la posición y mobiliidad en el seno de la esfera, esto se realiza mediante un procedimiento que requiere una amplia experiencia en el tratamiento artroscópico de pequeñas articulaciones y puede ser especialmente complejo en los casos de tenosinovitis extensa o amplias roturas tendinosas, pero muy útil para la evaluación y tratamiento de dicha patología.

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Figure 1  Anatomical relation of the peroneal tendons. 1: SPR; 2: IPR.
Source: courtesy of Dr. X. Martin Oliva.

Figure 2  Normality variant. Tendoscopic image of the peroneus quartus.

Peroneus quartus often originates in the PB and is inserted into the peroneal tubercle of the calcaneus. Knowledge of these anatomical variants is important to rule impingement syndromes of the peroneals, due to a space conflict in the retromalleolar canal (Fig. 2).

Surgical technique

Patients were placed in a lateral position under regional spinal anesthesia and ischemia. The distal and proximal portals were created along the path of the peroneal tendons 1–1.5 cm distally and 3 cm proximally to the tip of the lateral malleolus, respectively. Accessory portals were sometimes created, depending on the location and extent of the disease.

We first created the distal portal by making an incision on the skin and tendon sheath, using the standard, 4.0 mm, 30° arthroscope. So as to avoid tearing the sheath and damaging the tendons, this procedure was performed with the ankle in plantar flexion. Once the distal portal was created, and under direct visualization, we established the proximal portal. The presence of synovitis was a common finding, in which case we conducted an endoscopic synovectomy prior to tendon exploration. Longitudinal tears of the tendons could be debrided and repaired by tendoscopy with a curved needle (Arthrex® Mini Suture Lasso).

Material and method

Between June 2010 and July 2011, a total of 23 patients presenting retromalleolar ankle pain were operated by tendoscopy of the peroneal tendons at the Department of Orthopedic Surgery of 12 de Octubre University Hospital and Quirón-USP San Camilo Hospital, in Madrid (Fig. 3). Of these, 20 were male. The mean age at the time of surgery was 32 years (range: 21–43 years) and the mean follow-up period was 6 months (range: 6–21 months). A total of 20 patients had a history of previous sprain with a forced inversion mechanism in the affected ankle prior to the onset of symptoms.

Results

In total, 11 patients suffered an isolated pathology of the peroneal tendons, whilst 12 presented associated injuries: 4 astragalus (or talus) osteochondral lesions (2 grade II and 2 grade III), 3 cases of anterolateral ankle instability and 7 cases of anterolateral soft tissue impingement. One patient presented a grade III osteochondral lesion associated with anterolateral instability and another presented instability associated to anterolateral ankle impingement.

<table>
<thead>
<tr>
<th>Posterolateral ankle pain</th>
<th>23 patients retention</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 Isolated peroneal lesions</td>
<td>12 with associated lesions</td>
</tr>
<tr>
<td>3 PL tears</td>
<td>1 PB tears</td>
</tr>
<tr>
<td>Tenosynovitis</td>
<td>I SPR suturing</td>
</tr>
<tr>
<td>1 SPR tears</td>
<td>Anterolateral ankle dislocation</td>
</tr>
</tbody>
</table>

Figure 3  Distribution of the lesions.
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Table 1  Type of lesion and associations.

<table>
<thead>
<tr>
<th></th>
<th>Isolated</th>
<th>Associated</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>PB tears</td>
<td>5</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 OCL</td>
<td>1 transverse</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 impingement</td>
<td>1 longitudinal greater than 50%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 instability</td>
<td>4 longitudinal greater than 50%</td>
</tr>
<tr>
<td>PL tears</td>
<td>4</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 OCL</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 impingement</td>
<td>6 longitudinal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 instability</td>
<td></td>
</tr>
<tr>
<td>Tenosynovitis</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 OCL</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 impingement</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 instability</td>
<td></td>
</tr>
<tr>
<td>Dislocations</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 OCL</td>
<td>1 intra-sheath of the PB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 impingement</td>
<td>1 extra-sheath of the PB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 instability</td>
<td></td>
</tr>
</tbody>
</table>

PB: peroneus brevis; PL: peroneus longus; OCL: osteochondral lesion.

We identified 12 PB tendon ruptures, 6 PL longitudinal ruptures, 3 cases of tenosynovitis and 2 patients with dislocations, 1 intra-sheath type B and 1 extra-sheath. PB lesions were mostly longitudinal tears, 4 of which were greater than 50% of the cross section and requiring surgical repair (1 mini-open and 3 tendoscopic sutures) and 7 cases with tears less than 50%. In 1 patient who underwent PB repair due to a longitudinal tear we associated a deepening of the retromalleolar groove due to intra-sheath dislocation. Another case suffered a transverse PB tear which required a mini-open repair technique. PL tears were longitudinal in all cases, requiring debridement and tubulisation (Table 1). Two operated patients required a lateral displacement osteotomy of the calcaneus (inverted Koutsogiannis) and all patients with ankle instability were treated with an associated surgical action: through reinsertion of the anterior talofibular ligament in 1 case and with an arthroscopic homograft plasty in 2 cases.

Regarding complications, we observed 1 case neuropraxia of the sural nerve which has recovered partially.

Discussion

Peroneal tendon pathology is often overlooked or misdiagnosed as a sprained lateral external ankle ligament, with patients following multiple conservative treatments which fail to correct the symptoms. It is important to take into

Table 2  Surgical treatment and indications.

<table>
<thead>
<tr>
<th>Pathology</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tenosynovitis</td>
<td>Tenosynovectomy</td>
</tr>
<tr>
<td>Tendinopathy</td>
<td>Debridement and excision of the tendinosis area</td>
</tr>
<tr>
<td>Tears</td>
<td>Endoscopic debridement and tubulisation</td>
</tr>
<tr>
<td>Partial longitudinal tears less than 50%</td>
<td>Tendoscopic suture ± deepening of retromalleolar groove</td>
</tr>
<tr>
<td>Partial longitudinal tears greater than 50%</td>
<td>Deepening of retromalleolar groove</td>
</tr>
<tr>
<td>Tendon dislocations</td>
<td>Tendonoscopic reconstruction of the SPR</td>
</tr>
<tr>
<td>Extra-sheath grades 1 and 2</td>
<td>Deepening of retromalleolar groove</td>
</tr>
<tr>
<td>Extra-sheath grade 3</td>
<td>Deepening of retromalleolar groove + repair of the PB</td>
</tr>
<tr>
<td>Intra-sheath type A</td>
<td></td>
</tr>
<tr>
<td>Intra-sheath type B</td>
<td></td>
</tr>
<tr>
<td>Impingement by peroneus tercius/quartus</td>
<td>Excision</td>
</tr>
<tr>
<td>Muscle hypertrophy (low insertion belly of the PB)</td>
<td>Resection of distal muscle fibers</td>
</tr>
<tr>
<td>Bone ridges of the peroneal malleolus</td>
<td>Excision</td>
</tr>
<tr>
<td>Impingement by prominent peroneal tubercle</td>
<td>Excision/milling/flattening</td>
</tr>
<tr>
<td>Stenosis of the retromalleolar canal</td>
<td>Resection/release of retinaculum</td>
</tr>
<tr>
<td>Adherence of tendons by thick vinculum</td>
<td>Release of vinculum</td>
</tr>
<tr>
<td>Post-fracture/postoperative adherences</td>
<td>Debridement</td>
</tr>
</tbody>
</table>

PB: peroneus brevis; SPR: superior peroneal retinaculum.
account that isolated sprains of the posterior talofibular ligament are exceptional, so we must always suspect the existence of this pathology when patients present pain at that level. When deciding the most appropriate surgical technique it is essential to support the decision with a correct history which includes a clinical examination to evaluate the mechanism of injury, the tendon path in dorsal flexion and inversion-eversion and the anterolateral stability of the ankle, as well as hindfoot varus desaxation along with a detailed study of the malleolar groove and the remaining possible anatomical variants and predisposing factors.

Tendoscopy allows us to carry out a more detailed assessment of both tendon injuries and other associated lesions, as well as enabling a dynamic assessment thereof in the interior of the sheath and throughout the entire path. Our indications were all those included in Table 2. This is a minimally invasive technique with less surgical morbidity than open procedures, which allows a shorter hospital stay and a quicker recovery and return to sport activities.

The technique can be performed under local anesthesia as a diagnostic procedure in selected patients. Its main disadvantage is that it is technically demanding, requires extensive experience in the arthroscopic management of feet, ankles and small joints and can be particularly complex in cases of extensive tenosynovitis, with large tendon ruptures or anatomical defects and in patients who have undergone prior surgical interventions.

Tearing of the tendon sheath should be avoided during the passage of the surgical instrumentation, causing a collapse of the sheath and fluid extravasation which impede the tendoscopy. It is also possible to damage the tendons themselves when entering the sheath, especially when adhesions are present. In order to avoid this, it is important to inject an adequate amount of serum into the sheath, thus creating more space around the tendon, and to insert the instruments with the ankle in plantar flexion. Lesions of the superficial peroneal nerve (or its medial and intermediate dorsal cutaneous branches) above zone A when creating the proximal or sural nerve portals, which may be very close to the distal portal in zone B, are infrequent.

Therefore, the possibility of a lesion of the peroneal tendons should be taken into account in all cases of lateral malleolar pain, with symptoms ranging from tenosynovitis to longitudinal or transverse (much less frequent) tendon ruptures, or dislocations thereof. A study of this pathology should be performed routinely in order to rule out the presence of varus desaxation and anterolateral ankle instability. Hindfoot varus desaxation must be corrected while treating the tendon lesion, especially in cases of tears which may progress to larger sizes and intra-sheath dislocations.

In our series, we found 3 patterns of tendoscopic findings: (1) tenosynovitis, (2) tendon ruptures, and (3) tendon instability. Surgical results were uniformly good in all 3 groups.

**Tenosynovitis**

Until recently, the most common indication for a tendoscopy was tenosynovitis. This is caused by a prolonged and repeated activity, and mainly appears in athletes or chronically in patients who have suffered recurrent sprains or ankle deformities and instability. Furthermore, certain anatomical factors, such as the presence of peroneus tertius or quatermus, peroneal muscle hypertrophy or a low insertion belly of the PB, can predispose towards a narrowing within the retromalleolar groove, thus favoring the onset of inflammatory processes (Fig. 4). The presence of tumefaction in the path of the tendons together with pain which increases upon passive plantar flexion and inversion, and with dorsiflexion and active resisted eversion is very characteristic. Magnetic resonance tests in T2 reveal the presence of fluid around the tendons. Occasionally, the injection of an anesthetic agent into the sheath may help in the differential diagnosis with other causes of posterolateral ankle pain.

Tendoscopy is indicated in cases which are refractory to conservative treatment after 6 months, including debridement and tenosynovectomy, as well as correction of any associated anatomical variants such as resection of accessory muscles or cases with low implantation bellies, which may cause retromalleolar impingement.

**Tendon ruptures**

Isolated tears of the peroneal tendons are rare, most are the result of ankle inversion trauma. The prevalence of PB tendon injury found in cadaver studies ranged between 11% and 37%, while that of PL tears was less frequent. Dombek et al. described PB lesions in 88% and PL lesions in 13% of 40 patients treated surgically for tendon ruptures.
Among patients treated surgically for torn peroneal tendons, up to 33% also presented lateral ankle instability requiring ligament reconstruction, 20% dislocation, 10% an insufficient retromalleolar groove, 33% had a low insertion belly of the PB muscle and between 32% and 82% had a cavo-varus hindfoot.

PB tears are usually found within the malleolar sulcus, which indicates that their origin is probably mechanical trauma in this region. It is less frequent for PB tendon ruptures to occur just proximal to their insertion into the fifth metatarsal by a sudden foot inversion mechanism. PL tears usually occur at the level of the cuboid, in the os perineum, in the peroneal tubercle or at the tip of the lateral malleolus. As proposed by Krause and Brodskyn,° for partial longitudinal tears (less than 50% of the cross section) we recommend tendoscopic debridement and tubulisation (Fig. 5), while in tears affecting over 50%, the treatment of choice is tendon suture, associated or not to a deepening of the retromalleolar groove (Fig. 6). When the repair requires more than 2 or 3 sutures, we believe that conducting selective open repair is most appropriate.

**Peroneal tendon instability**

Monteggia® was the first author to describe instability of the peroneal tendons in a ballet dancer in 1803. Its incidence is estimated at 0.3–0.5% of ankle injuries. In general, dislocation of the peroneal tendons is secondary to a history of trauma with the foot in dorsiflexion, abduction and inversion, resulting in a sudden contraction of the peroneal muscles. Patients present pain in the posterolateral region of the ankle and sometimes a feeling of instability on uneven surfaces and of a projection in the lateral malleolus. There are 2 main factors that can contribute to tendon dislocation: anterolateral ankle instability and varus malalignment of the hindfoot. Both factors should be examined and treated in case they coexist.

There are some anatomical variants that can predispose towards instability or subluxation, including the shape and depth of the retromalleolar groove and the presence or absence of a fibrocartilage groove. Edwards° carried out a classic work on 178 feet from cadavers and described 82% of concave, 11% of flat and 7% of convex retromalleolar grooves. When present, the groove had a mean width of 6 mm (range: 5–10 mm) and a limited depth which occasionally reached 3 mm. An inadequate retromalleolar groove, SPR laxity due to a valgus calcaneus foot and neuromuscular diseases and congenital absence of the SPR, are all factors which may contribute to the mechanism of dislocation.

In 1976, Eckert and Davis® carried out a classification of peroneal tendon dislocations according to SPR disinsertion from the periostium and/or fiber channel. Subsequently, in 1987, Oden® amended it by adding a fourth grade. Grade 1 or subluxation (51%) occurs when the SPR becomes disinserted from the peroneal malleolus, allowing the tendons to move in an anterior direction. In grade 2 (33%), the fibrous annulus is detached along with the SPR. Grade 3 (13%) occurs when a small bone fragment of the peroneal malleolus is avulsed together with the SPR and the annulus (radiologically described as the “fleck sign”). Lastly, grade 4, the least frequent, is defined as a complete avulsion or tear of the posterior insertion of the SPR, with the tendons running superficially and laterally.

**Figure 5** Partial longitudinal tear of the PB, tendoscopic debridement.

**Figure 6** Longitudinal tear of the PB tendon. Tendoscopic repair with 3 2/0 nylon sutures using an Arthrex® Mini Suture Lasso.
Recently, Raikin et al. described a new type of dislocation of the peroneal tendons in which the SPR was intact, and defined it as an intra-sheath dislocation. They classified it into 2 subgroups: type A, in which there is no tendon rupture and the tendons change their relative position momentarily (PL runs deeper than PB), and type B, in which the PL tendon is dislocated by a longitudinal tear of the PB tendon, losing its position in the retromalleolar groove.

The redislocation rate with conservative treatment is very high. It may be an option exclusively in cases of acute dislocation. The success rate in these cases is 40–57% and it is not indicated for high-level athletes.

Surgical treatment provides excellent results, especially in cases of acute dislocation, and is the only option in cases of recurrent dislocation. It is indicated in young patients who practice high-level sports and require a rapid return to activity. Surgery prevents situations such as tenosynovitis and longitudinal tears, which are often associated with peroneal tendon instability.

In cases of extra-sheath dislocation of grades 1 and 2 and in type A intra-sheath dislocation, we recommend techniques which deepen the retromalleolar sulcus, with the tendoscopic technique being of choice when used as an isolated procedure. The association of SPR reconstruction techniques in types 1 and 2 is controversial. In type 3, the treatment of choice is retinacular reconstruction, often using bone anchors seeking consolidation of the avulsed fragment. In type 4, reconstruction or deepening techniques are often insufficient, thus requiring reinforcement. Finally, the treatment of choice in type B intra-sheath dislocations is a repair of the PB longitudinal tear associated to groove deepening.

In 2006, Liu described the endoscopic reconstruction of the peroneal retinaculum. Eckert and Davis published excellent results with this technique, with a redislocation rate of 5%. Subsequently, and Adachi et al. published a series of 20 patients with no redislocations.

Undoubtedly, deepening of the retromalleolar groove is the most common tendoscopic technique. The periosteum is debrided using a vaporizer or synoviotome and the retromalleolar groove is deepened using a 4.0 or 4.5 mm round mill (Fig. 7). The advantages of the tendoscopic technique are unquestionable, since, in addition to being a minimally invasive method with few neurovascular complications and morbidity, it allows an early return to sports activities and also favors a dynamic evaluation of the tendons and the ruling out of associated tendon ruptures. Therefore, this will also be the treatment of choice in cases of type A intra-sheath dislocations.

Conclusions

Tendoscopy is a demanding and emerging technique for the management of peroneal tendon pathology. Its implementation and indications have been increasing in recent years, offering excellent clinical and functional results with few complications.

Level of evidence

Level of evidence IV.

Ethical responsibilities

Protection of people and animals. The authors declare that this investigation did not require experiments on humans or animals.

Confidentiality of data. The authors declare that they have followed the protocols of their workplace on the publication of patient data and that all patients included in the study received sufficient information and gave their written informed consent to participate in the study.

Right to privacy and informed consent. The authors declare having obtained written informed consent from patients and/or subjects referred to in the work. This document is held by the corresponding author.

Conflict of interests

The authors have no conflict of interests to declare.

References