FULL TEXT ARTICLE

Peroneal Tendon Pathology

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Orthopedic Clinics of North America, The, 2020-01-01, Volume 51, Issue 1, Pages 121-130,

Peroneal tendon pathology is becoming an increasingly recognized source of lateral-sided ankle pain. High clinical suspicion, along with judicious physical examination coupled with confirmatory advanced imaging modalities, are necessary to make an accurate diagnosis and aid in guiding treatment. Peroneal pathology encompasses several distinct conditions. Peroneal tendon tears and injuries to the peroneal retinaculum must be identified to guide treatment. Patients with peroneal pathology report high levels of satisfaction after surgical management with most returning to their preinjury level of function. An early and accurate diagnosis, along with treatment tailored to the individual, is necessary to obtain optimal outcomes.

Key points

- Peroneal tendon pathology is becoming a more commonly understood source of lateral-sided ankle pain.
- Early diagnosis in peroneal tendon pathology is important in dictating treatment and ensuring optimal outcomes.
- A strong clinical suspicion coupled with physical examination findings and advanced imaging studies is necessary to accurately diagnose peroneal tendon pathology.
- The surgical treatment of peroneal tendon tears results in good to excellent outcomes with most patients returning to their preinjury level of function with positive patie nt reported outcome measures.

Introduction

One of the first reported cases of peroneal pathology was a peroneal dislocation in a ballerina by Monteggia in the 1800s. [1] Despite a body of literature replete with data, peroneal tendon instability is still often confused for lateral ligament sprains and a definitive diagnosis can be delayed in up to 40% of cases. [2] More recently, there has been an evolution in the understanding of the anatomy, mechanisms of injury, and different pathologies. Although still considered uncommon, peroneal tendon tears are recognized as a not rare cause of lateral ankle pain, especially when the pain is located posterior to the distal aspect of the fibula.

A multitude of pathologic conditions affecting the peroneal tendons can cause lateral ankle pain, including stenosing tenosynovitis, subluxation and dislocation, tendinosis, tenosynovitis, pathology related to the os peroneum, and peroneal tendon tears. With respect to acute peroneal tendon subluxations and dislocations, conservative treatment renders recurrent instability approximately 50% of the time. Numerous investigators advocate for early surgical intervention for cases of acute peroneal tendon instability when considering the high rate of failure coupled with the typically young, active patient population. 3 4

Comparatively, cases of symptomatic chronic peroneal tendon instability predominantly indicate for surgical intervention. Cases concerning peroneal tendon tears are categorized as either acute or chronic tears. It is important to recognize the temporal relationship of acute versus chronic is not the time to presentation. In fact, acute peroneal tears perpetually occur after a traumatic injury, yet often go unappreciated and present in a delayed manner. It is their relationship to an injury that categorizes them as acute. Conversely, chronic tears tend to be attritional in nature and have an insidious onset of pain. When evaluating patients with lateral ankle pain, the clinician must maintain high suspicion of peroneal tendon pathology. With a thorough understanding of anatomy, biomechanics, the spectrum of disease states of the tendons, and several treatment options, the clinician can elect appropriate treatment algorithms to optimize the patient's recovery and return to activity. Although countless publications report high rates of success regarding several surgical treatment modalities, a dearth of high-level studies exist. Clinicians are limited in their decision-making with respect to the optimal treatment of peroneal tendon instability. Limited evidence-based data exist, with only level III and level IV studies to draw from.

Anatomy

The lateral compartment of the lower leg includes the peroneus brevis and peroneus longus muscles and tendons. They course posterior to the fibula at the level of the ankle curve distally at the fibular tip within the retromalleolar groove. Both muscles receive their innervation from the superficial peroneal nerve and act as the primary everters of the foot. Additionally, they offer weak contribution to plantarflexion because they pass posterior to the midaxis of the tibiotalar joint.

The peroneus brevis originates at the distal two-thirds of the lateral fibula and inserts on the lateral aspect of the fifth metatarsal base. The ovoid peroneus brevis tendon courses directly posterior to the fibula, which is coated with fibrocartilage to enhance gliding. The musculotendinous junction of the brevis lies at a variable location; although typically proximal to the superior peroneal retinaculum (SPR), anatomic variation often results in a low-lying muscle belly that extends within or distal to the level of the SPR. A low-lying muscle belly is recognized as a potential cause for peroneal inflammation at the level of the SPR due to increased volume within the retrofibular space. [5]

The peroneus longus originates near the head of the fibula and upper one-half to two-thirds of the lateral fibular shaft, as well as the lateral condyle of the tibia. The peroneus longus continues plantarly through the cuboid groove before eventually inserting on the medial cuneiform and first metatarsal base. The musculotendinous junction of the peroneus longus lies proximal to that of the peroneus brevis and its tendon has a more circular morphology. With contraction, the peroneal longus tendon compresses the brevis against the fibula. As the tendons of the peroneus brevis and longus course distally beneath the SPR, they enter the retromalleolar groove, a fibroosseous tunnel through which the peroneal tendons share a common tendon sheath approximately 2.5 to 3.5 cm from the fibular tip to the level of the peroneal tubercle. The 2 tendons then separate into their individual tendon sheaths with the brevis sitting above the peroneal tubercle and the longus below. The peroneus brevis sits closer to the fibula and glides along the fibrocartilage lining of the retromalleolar groove. A higher incidence of peroneal tendon pathology has been reported in patients whose musculotendinous junction of the peroneus brevis lies within the retromalleolar groove. [5] This is considered to be a result of the increased volume of tendon and muscle within the fibroosseous canal, which cannot expand, therefore increasing pressure on the peroneus brevis tendon against the distal fibula. [6]

The retromalleolar groove's morphology was described in a study by Edwards. [7] Of cadaveric specimens, 82% were concave, ranging from slight concavity to 3-mm depth, 11% had a flat retromalleolar groove, and 7% were convex. In most patients, the sulcus of the retromalleolar groove was 6 to 7 mm wide. A 3-mm to 4-cm long lip of fibrocartilaginous tissue borders the retromalleolar groove, therefore increasing stability of the tendons in a similar manner to the labrum in the glenohumeral articulation. [8] The medial border of the groove is formed with the posterior talofibular ligament, calcaneofibular ligament (CFL), and the posterior-inferior tibiofibular ligaments. Although it was previously postulated that a flat or convex peroneal groove played a role in peroneal tendon stability, a study by Adachi and colleagues [9] found no correlation between the retromalleolar morphology and rate of peroneal dislocations.

The SPR forms the posterior and lateral borders of the retromalleolar groove. Several studies have identified the SPR as the primary restraint to peroneal instability. 6 7 8 9 10 Davis and colleagues [11] conducted a cadaveric study to assess the anatomy of the SPR. All specimens shared a common origin along the periosteum of the posterolateral ridge of the fibula. The width of the footprint of the origin demonstrated a higher degree of variation. A total of 5 distinct insertions were reported. The os peroneum, a sesamoid bone within the peroneus longus near the cuboid groove, has varying degrees of ossification and is reported to exist in nearly 20% of patients in anatomic studies. [12] It is key to identify the os peroneum as a plausible pain generator. Painful fractures of the os peroneum have a high correlation with peroneus longus tears but are often overlooked.

Both muscles receive their blood supply from the peroneal artery. Petersen and colleagues [13] performed a cadaveric study to better understand the blood supply to the tendons. Near the fibular tip, the peroneus brevis has a single avascular zone as the tendon approaches its insertion. Two avascular zones were recognized in the peroneus longus. The first present as the tendon spans from the distal tip of the fibula to the peroneal tubercle, and the second while coursing through the cuboid notch. This sequence of avascularity is coherent because it correlates to frequent areas of tendonpathy.

The peroneus quartus muscle is an anatomic variant present within the lateral compartment of the leg in up to 21.7% of patients. It typically originates from the peroneus brevis muscle belly and inserts on the peroneal tubercle of the lateral calcaneus. It is thought to result in attenuation of the SPR and hypertrophy of the peroneal tubercle. Similar to the low-lying muscle belly, attenuation of the SPR is thought to result from the increased volume within the fibroosseous tunnel when the peroneus quartus muscle is present. Both the hypertrophy of the peroneal tubercle and the peroneus quartus tendon can lead to stenosing synovitis. [14]

Biomechanics

Physiologic hindfoot valgus is vital for properly functioning balance of the peroneal tendons. With excessive valgus hindfoot alignment, the tendons are constricted between the fibular tip and lateral calcaneus, which may cause subfibular impingement and tendinosis. A varus hindfoot alignment may increase strain on the peroneal tendons, therefore making the patient susceptible to a spectrum of peroneal pathology.

The peroneal tendons act as the primary everters of the foot, with 63% of eversion strength attributed to the peroneal tendons, the peroneus brevis is accountable for 28%, and the peroneus longus is accountable for the other 35%. [15] These 2 tendons counterbalance the tibialis posterior and tibialis anterior. Not only do the peroneal tendons evert the foot but they also contribute 4% to plantarflexion as they span posterior to the midaxis of the tibiotalar joint in the sagittal plane. Furthermore, dynamic stability of the ankle greatly relies on the peroneal tendons.

Mann [16] described the function of the peroneal tendons using the gait cycle. The tendons are active during the stance phase of gait in which they begin firing at 12% of the cycle. At midstance, while the foot rests flat on the floor, the tendons fire eccentrically. Then, at heel rise, the tendons start to contract concentrically. Immediately before toe-off, they become quiescent at 50% of the gait cycle.

Incidence and etiologic factors

Peroneal Instability

Traumatic subluxation and dislocation of the peroneal tendons has invariably been reported with sports-related activities, especially those that involve extensive lateral movement. [17] [18] [19] Several studies have shown the SPR to be the primary restraint to dislocation of the peroneal tendons. [8 17] Forceful contraction of the peroneal tendons within the retromalleolar groove produces sufficient energy to disrupt the SPR either by tearing through its periosteal attachment on the fibula or by vigorous subperiosteal elevation. Both mechanisms permit the tendons to dislocate or subluxate. [10 17 20 21 22]

Debate exists as to which position of the foot is most likely to cause subluxation or dislocation. The foot positioned in dorsiflexion and eversion with a forceful contraction of the peroneal tendons is most frequently described. [23] This position allows the peroneal tendons to contract an anterolaterally directed force, therefore overcoming the SPR's restraint. [24]

Other studies suggest that acute peroneal tendon instability can be attributed to a forceful contraction with an inverted position of the foot. [25] The CFL is strained with the foot dorsiflexed and inverted, thus limiting the space within the retromalleolar groove. This reduced space causes a forceful contraction of the peroneal tendons, contributing to the likelihood of tearing of the SPR and subluxating or dislocating. [22 26] For this reason, it is hypothesized that peroneal tendon instability has a correlation to lateral ankle instability. Two separate cadaveric studies demonstrated the peroneal tendons as secondary stabilizers of the lateral ankle, with sectioning of the lateral ligaments resulting in a predisposition to injury of the SPR, resulting in peroneal tendon instability. [27 28]

Peroneal Tendon Tears

Acute tears prove to be less common than chronic tears and require severe clinical suspicion to accurately diagnose. Sammarco [29] reported that even with acute onset of symptoms, only 1 patient was diagnosed within 2 weeks of sustaining a traumatic inversion injury. On average, the duration of symptoms persisted approximately 7 to 48 months before accurate diagnosis. Arbab and colleagues [30] similarly described the relative delay in diagnosis with acute peroneal tears, considering that an accurate diagnosis was made nearly 11 months after the onset of symptoms during a study. The predominant theme, including in other studies that exist mainly in case report formats, is that in cases of acute tendon ruptures, an antecedent inversion type ankle injury occurred and the longus tendon was disproportionately affected. [31 32 33]

The general incidence of both acute and chronic peroneal tendon tears is considered significantly more common than previously postulated. In a cadaveric study, Sobel and colleagues [34] found a 37% (21 out of 57) incidence of peroneus brevis tears, with the majority existing within the retrofibular groove. They concluded that mechanical trauma was a probable cause for tearing, considering their location.

Sammarco and DiRaimondo [35] reported that 23% (11 out of 47) of patients experienced concomitant pathology in a study evaluating the incidence of peroneus brevis pathology in patients facing lateral ligament stabilization. DiGiovanni and colleagues [36] observed the incidence of peroneal pathology in patients treated surgically for chronic lateral ankle instability. Attenuation of the SRP was noted in 54% of patients, tenosynovitis was noted in 77% of patients, and peroneus tears were noted in 25% of patients.

A radiographic study by O'Neil and colleagues [37] examined 294 MRIs in which no hindfoot pathology was surmised, and identified some evidence of peroneal pathology in 35% (103 out of 294), despite a lack of symptoms or antecedent injury.

Several studies have attempted to identify the actual incidence of tendon involvement when pathology of the peroneal tendons exists. Peroneus brevis tears in 88% of patients surgically treated for peroneal pathology were reported in a study by Dombek and colleagues. Only 13% of patients experienced peroneus longus tears, whereas 38% of patients had concomitant tears of both tendons. 38 39

Although most peroneus brevis tears occur in the retromalleolar groove, peroneus longus tears have 2 discrete patterns of tearing. When tearing was present at the cuboid notch, 100% were complete tears. Of patients with tears proximal to the peroneal tubercle, 8 out of 9 had partial tears. Moreover, a higher proclivity for concomitant peroneus brevis tears was found when the peroneus longus tendon had been affected at the cuboid notch. [40]

Thompson and Patterson [41] noted the strikingly reduced frequency of peroneus longus tears compared with brevis tears, which tend to occur after a trauma or sports-related injury. Kilkelly and McHale [42] further examined the role of sports-related injuries on peroneus longus ruptures with their description of an acute peroneus longus tear in a competitive runner.

Classification of peroneal tendon dislocation

Seventy-three operative cases of acute peroneal tendon dislocations were originally described by Eckert and Davis. [8] Grade I dislocations involved elevation of the SPR from the fibula along with the fibular periosteum, thus permitting the tendons to displace between the fibula and periosteum. Grade II dislocations involved the elevation of the SPR, including the fibular periosteum and the fibrocartilaginous rim of tissue bordering the lateral aspect of the fibula. This allowed the tendons to displace between the periosteum and fibula. Meanwhile, grade III dislocations involved an avulsion of cortical bone from the lateral aspect of the fibula, including the fibrocartilaginous rim, the periosteum, and the SPR thus, allowing the tendons to displace between the fibula and periosteum. Grade IV dislocations were described by Oden [23] as torn SPRs that permitted the peroneal tendons to dislocate through the rent in the retinaculum.

The distinctive case of intrasheath peroneal tendon subluxation was noted by Raikin and colleagues. [43] Two distinct groups of patients were reported in cases in which the SPR remained intact while the tendons subluxated within the retromalleolar groove. Type A patient group was described as having an intrasheath subluxation involving intact tendons that shift their anatomic alignment within the retromalleolar groove with circumduction of the ankle; whereas the intrasheath subluxation of type B patient group involved a split tear in the peroneus brevis tendon through which the peroneus longus tendon herniates with circumduction of the ankle.

Clinical presentation

Accurately diagnosing an acute peroneal tendon tear is quite challenging. Patients presenting with an acute tear consistently sustained an inversion injury, causing lateral-sided ankle and/or hindfoot pain and swelling. Differentiating a peroneal tear from an ankle sprain proves to be difficult on initial presentation. Therefore, the clinician must be of high suspicion for peroneal pathology considering the multitude of other pathologic conditions that can cause lateral-sided ankle pain. Studies approximate that the delay in diagnosis of peroneal tears varies from 11 to 48 months, with a paucity of cases diagnosed on initial presentation. [29, 30] Although diagnosing a peroneal tear acutely may not necessarily alter the patient's acute treatment, an accurate diagnosis is integral in counseling a patient with regard to their rehabilitation potential and possible need for future surgical intervention.

Step one to making an accurate diagnosis is to inspect the affected extremity. Because hindfoot varus is posited to contribute to the incidence of peroneal tendon pathology, a standing examination is vital. One study found that 82% of patients with peroneus longus pathology also presented a cavovarus alignment. [40] This study was further expounded on by Manoli and Graham [44] who reported that retrofibular swelling was as common in patients with peroneus brevis tears. Redfern and Myerson [39] noted that there is a high likelihood for peroneus brevis tears and involvement of both tendons when swelling and pain transpires adjacent to the fibular tip. Swelling at the distal base of the fifth metatarsal is more likely to denote a peroneus longus tear, especially when it extends into the cuboid notch.

Pain with palpation at the retromalleolar groove and ankle instability can signify split tearing of the peroneus brevis in patients without swelling. When swelling is absent, pain and instability may be the only symptoms. [45]

Particular physical examination exercises may aid in recognizing peroneal tendon pathology. Maneuvers such as passive inversion and plantarflexion may reproduce pain, whereas resisted eversion and dorsiflexion of the ankle may cause pain along with weakness. Typically, there is weakness and pain with first ray plantarflexion when a peroneus longus tear is present.

Imaging

When imaging patients suspected of having peroneal tendon tears, the first step is to obtain weight-bearing anteroposterior, oblique, and lateral radiographs of both the foot and ankle. It is recommended to examine plain films for common fractures associated with inversion injuries, including fractures of the malleoli, lateral talar process, and anterior process of the calcaneus and fifth metatarsal base. Avulsion from the lateral aspect of the distal fibula may be a fleck sign, thus signifying a rupture of the peroneal retinaculum.

Although soft tissue injuries such as tendon tears typically cannot be seen on radiographs, certain radiographic findings can suggest a tendon rupture. Numerous studies have described the migration of the os peroneum or diastasis of a bipartite of peroneum as a definitive sign of a peroneus longus rupture. 42 46 47 In a study by Stockton and Brodsky, [48] 87.5% of surgically confirmed cases of peroneus longus ruptures displayed radiographic evidence of a fracture or proximal migration of the os peroneum. Though not a pathognomonic sign of peroneus brevis tearing, styloid process fractures at the fifth metatarsal base have been associated with brevis tears. [49]

The ideal modality for assessing soft tissue lesions is MRI. On T2-weighted imaging, acute peroneal tears have increased signal intensity and may appear as bisected, C-shaped, or flattened. [50] A study by Khoury and colleagues [51] noted peroneus longus tears as presenting a linear or round area of increased signal intensity within the tendon on T2-weighted imaging. Bony edema, visible fractures, and diastasis of the os peroneum also serve as evidence of a peroneus longus tear. [48]

Fig. 1 (fig1) demonstrates an axial T1-weighted image of the ankle at the level of the tibial plafond. The peroneus brevis is noted to be flattened with the tubular-appearing peroneus longus posterior in orientation. Fig. 2 (fig2) demonstrates an axial T1-weighted image of the ankle at the level of the peroneal tubercle. The peroneus brevis is noted to have a complete split tear, with the tubular-appearing peroneus longus between the 2 segments of the peroneus brevis.

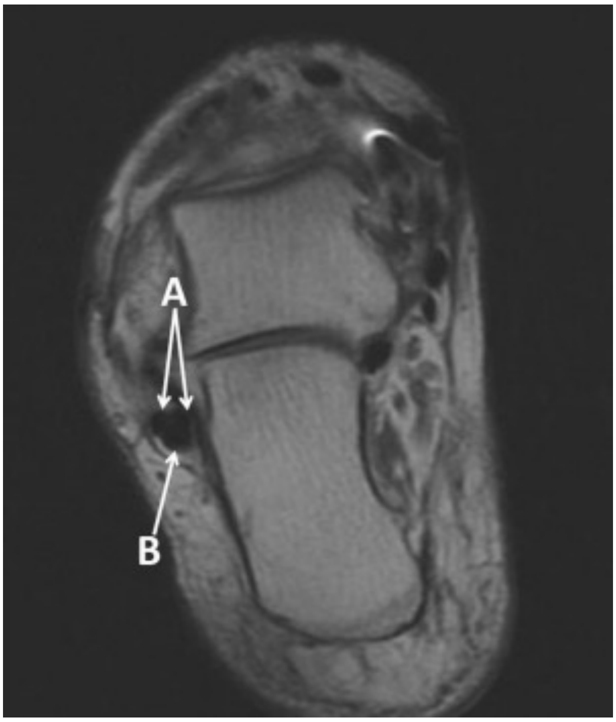

Fig. 1

Axial T1 image of the ankle at the level of the tibial plafond. The peroneus brevis (*arrows A*) is noted to be flattened with the tubular appearing peroneus longus (*arrow B*) posterior in orientation.

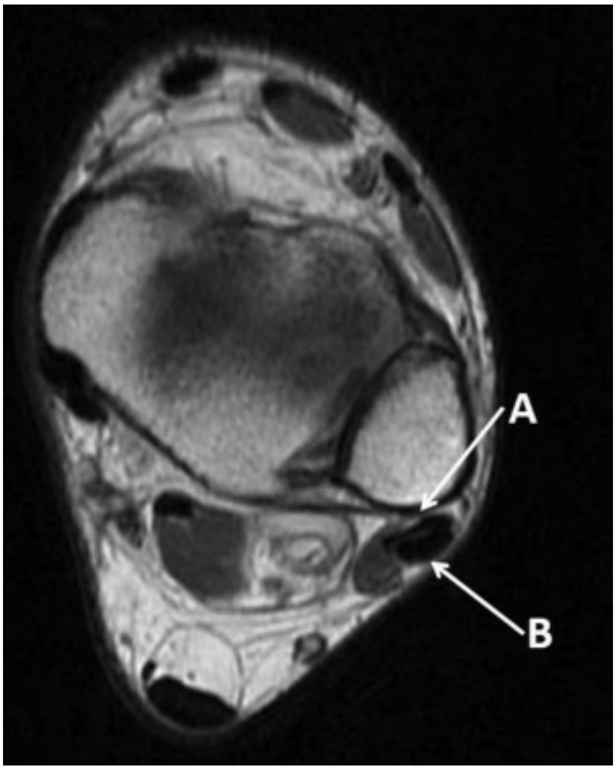

Fig. 2
Axial T1 image of the ankle at the level of the peroneal tubercle. The peroneus brevis (*arrow A*) is noted to have a complete split tear with the tubular appearing peroneus longus (*arrow B*) in between the 2 segments of the peroneus brevis.

Despite being the ideal modality for assessing soft tissue, technical challenges with MRI exist when evaluating for peroneal tendon tears. As a result of their course, the peroneal tendons are susceptible to the so-called magic angle effect, a magnetic phenomenon occurring when the tendon is positioned 55° to the axis of the magnetic field. This angular orientation increases signal intensity, which may be misdiagnosed as pathology. [52] An oblique orientation of the MRI beam toward the midfoot is suggested to potentially mitigate the magic angle effect and increase accurate diagnosis of peroneus longus tears. [53]

Stockton and Brodsky [48] reported variable diagnostic accuracy with MRI compared with surgical exploration and recommended using experienced radiologists who understand the evaluated pathology. Brandes and Smith [40] recommended MRI as an advanced diagnostic study to ascertain the severity of peroneal tears. Counter to these studies, Redfern and Myerson [39] noted that MRI may, in fact, abate the extent of the pathology, especially with regard to peroneus longus tears. In a study concerning brevis tears, Lamm and colleagues [54] noted an 83% sensitivity and 75% specificity compared with intraoperative findings, which were expressed as flattening in MRIs of the patient in both plantarflexion and dorsiflexion. After comparing 97 MRIs to surgical results, Park and colleagues [55] concluded that MRI was specific in diagnosing peroneal tendon disorders but not sensitive. Giza and colleagues [56] attempted to correlate clinical examination with MRI findings and recorded an accurate rate of prediction with MRI to be only 48% with a high degree of incidental findings. O’Neil and colleagues [37] further confirmed these findings when they noted incidental findings indicating peroneal tendon pathology in 35% of asymptomatic patients. This discrepancy in MRI findings correlating to surgical findings should caution the clinician from solely relying on MRI for the diagnosis of peroneal tendon tears.

Under the direction of an experienced diagnostician, ultrasound can be a cost-effective, efficacious modality. Considering its relative cost compared with other advanced imaging modalities, and the lack of exposure to radiation, it can be used for diagnosis and in guiding treatment. As noted by Grant and colleagues,[57] ultrasound is 100% sensitive and 85% specific in diagnosing peroneal tendon tears. Molini and Bianchi[58] noted that ultrasound is a noninvasive, accurate dynamic modality with low morbidity in which radiation exposure is absent. Muir and colleagues[59] examined the accuracy of peroneal tendon sheath injection and concluded that ultrasound is 100% accurate for intrasheath injection. In a recent study by Framm and colleagues[60] of clinical outcomes after ultrasound-guided injection, greater than a third of patients experienced at least 3 months of pain relief with a complication rate of only 1.8%.

Treatment

There is an array of treatment protocols among practitioners when treating peroneal tendon tears. Treatment protocols vary greatly due to the paucity of high-quality studies pertaining to an optimal treatment algorithm. After querying foot and ankle surgeons on their management of acute peroneal tendon tears, Grice and colleagues[61] noted the distinct differences in treatment protocols and surgical techniques. Of the surgeons in the study, 22% elected a nonoperative treatment for more than a year, whereas 33% eschewed any nonoperative interventions. When operative intervention was elected, 88% of surgeons tubularized tendons after repair, 22% extracted the peroneal tubercle if hypertrophied, and 33% excised redundant tissue. An array of different suture materials and postoperative rehabilitation protocols were also used. Sammarco[29] conducted a similar study which noted a clear variability in the treatment of acute tears. Selmani and colleagues[62] described poor evidence concerning the manner of repair for peroneal tendon tears.

Krause and Brodsky[63] suggested a treatment algorithm that depended on the amount of viable tendon remaining in cross-sectional diameter. They deduced that peroneus brevis tears should be primarily treated operatively. Preferably, tendons with less than 50% involvement have the frayed portion excised, with the remaining healthy tendon tubularized, whereas tendons with greater than 50% involvement undergo en bloc excision of the diseased tendon, with tenodesis to the other tendon.

Alternatively, Redfern and Myerson proposed a treatment algorithm which categorized tears into three patterns. Type I tears were described both tendons being intact and functioning. The torn section of the tendon could be excised and tubularized. Type II tears consisted of one torn and irreparable tendon with the other still functional. The irreparable section of the tendon should be excised in these cases. Lastly, type III tears were described as neither tendon being functional. In these cases, a tendon transfer serves as the optimal treatment. [39]

In cases of irreparable tendons, allograft intercalary tendon reconstruction has been proposed. Pellegrini and colleagues [64] used a cadaveric model testing strength of loading in the tendons of the foot and ankle. In a comparison between tenodesis and allograft reconstruction, allograft tension more closely replicated that of normal tendon tension. Newer clinical evidence is being published on this technique but high level evidence is lacking with respect to its long term efficacy.

Fig. 3 (fig3) demonstrates the intraoperative image corresponding to the MRI from Fig. 1 (fig1) . After intraoperative evaluation, the midsubstance of the peroneus brevis tendon was found to be unsalvageable (see Fig. 3 (fig3) A). The decision was made to perform a peroneus longus to peroneus brevis transfer. 2 to 0 nonabsorbable suture was used to perform a side-to-side tenodesis of the viable proximal and distal segments of the peroneus brevis to the intact peroneus longus (see Fig. 3 (fig3) B).

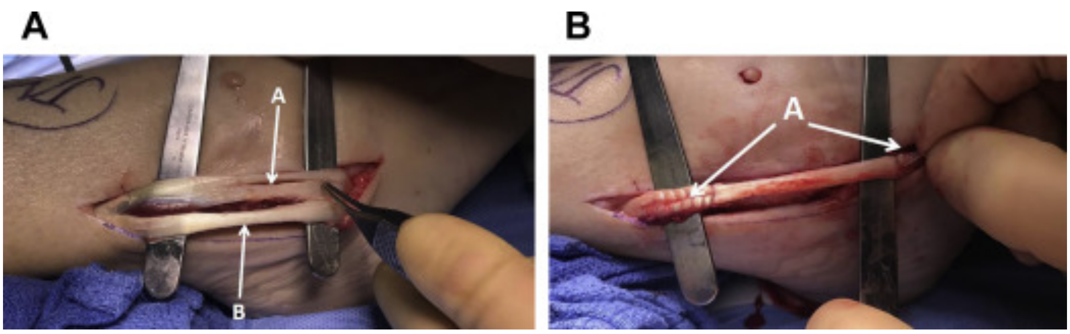

Fig. 3
(*A*) Peroneus brevis tear intraoperatively. The peroneus brevis (*arrow A*) is oriented superior to the peroneus longus (*arrow B*). (*B*) The area of nonsalvageable peroneus brevis has been excised and there has been a side-to-side tenodesis (*arrows A*) of the proximal and distal stumps of the peroneus brevis to the intact peroneus longus.

Fig. 4 (fig4) demonstrates the intraoperative image corresponding to the MRI from Fig. 2 (fig2) . Evaluation of the peroneus brevis tendon was found to have significant flattening (see Fig. 4 (fig4) A). After evaluating the tendon, the decision was made to perform a tubularization procedure with excision of the nonviable portion of the tendon (see Fig. 4 (fig4) B).

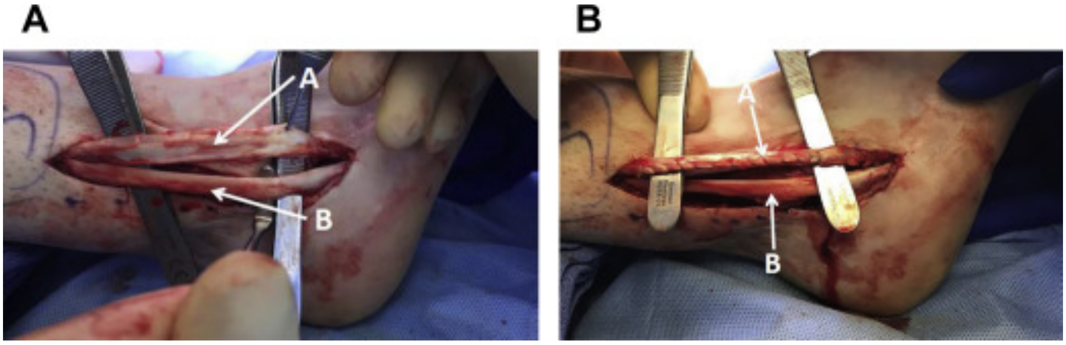

Fig. 4

(*A*) Significant peroneus brevis tendinosis with flattening intraoperatively. The peroneus brevis (*arrow A*) is oriented superior to the peroneus longus (*arrow B*). (*B*) The area tendinosis at the midsubstance of the peroneus brevis (*arrow A*) has been debrided and a tubularization has been performed. The intact peroneus longus (*arrow B*) is posterior to the peroneus brevis tubularization.

Outcomes

Although there is a lack of evidence in the current body of literature in regards to the outcomes after the surgical management of peroneal tendon pathology, many of the studies report favorable outcomes with respect to patients returning to the activities they enjoy and their preinjury level of function.

Most the studies report relatively successful outcomes regarding surgically treated peroneal tendon tears. Accurately diagnosing patients with peroneal tendon tears is necessary to ensure successful and predictable outcomes. [30]

Krause and Brodsky [63] reported a 95% satisfaction rate with a mean postoperative AOFAS score of 85 (54–100) after the surgical management of peroneal tendon tears. Redfern and Myerson [39] obtained similar results in a study with 91% of patients achieving normal to moderate peroneal strength and a mean postoperative American Orthopedic Foot and Ankle Society Score (AOFAS) score of 82. They concluded that peroneus brevis tears performed better surgically than longus tears. Another study reported 87% of patients partaking in sporting-activities within an average of 3.5 months and a mean postoperative AOFAS score of 91. [65] Demetracopoulos and colleagues [66] described the long-term results on primary repairs of peroneal tendon tears, noting the drastic decrease in visual analog scale scores from 39 preoperatively to 10 at the time of final follow-up ($P < .001$), with a marked increase in lower extremity function score from 45 preoperatively to 71 at the time of final follow-up ($P < .001$). Only 1 patient was unable to fully return to sporting-activities.

According to a retrospective review of surgically treated peroneal tendon tears conducted by Dombek and colleagues, [2] 98% of patients experienced no limitations or pain at final follow-up; however, they did report a minor complication rate of 20% which was identified as transient symptomatology. The incidence of major complications, meaning chronic symptoms or a need for additional surgery, was reported at 10%.

A study concerning surgical treatment of all peroneal pathologies, excluding subluxation, reported the mean time to return to work as 2.5 months, whereas the mean time to return to sporting-activities was 8.5 months. Approximately 94.1% of patients were either satisfied or very satisfied with the outcomes of their procedure. [67]

Summary

Though previously considered uncommon, high clinical suspicion coupled with a profound understanding of anatomy and pathophysiology of lateral ankle injuries has led to early diagnosis and treatment, thus directly improving outcomes of injuries to the peroneal tendons.

Disclosure Statement: The authors have nothing to disclose.

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