PERONEAL TENDON PATHOLOGY AND REPAIR TECHNIQUES

Jose M. Gonzalez, DPM
Alan S. Banks, DPM

INTRODUCTION

Peroneal tendon pathology can range from simple longitudinal tears of one unit, to significant compromise of one of both units, to complete rupture. Repair techniques may differ based on the degree of tendon damage and the personal philosophy of the surgeon relative to their views regarding tendon augmentation. The purpose of this article is to describe techniques that have been employed for peroneal tendon repair and the approach favored by the authors.

ETIOLOGY

It is felt that the peroneal tendons are well vascularized and are not prone to degeneration secondary to poor blood supply (1), but more frequently due to other mechanisms, primarily trauma. Typically this is more of an acute wear and tear process as opposed to an acute event. Tears of the peroneus brevis tendon purportedly occur in the region of the peroneal sulcus in the posterior and distal region of the fibula (2-4). The most frequent tear in the peroneus brevis is a longitudinal tear, but sometimes "bucket handle" tears have been noted. A "bucket handle" tear is where the brevis tendon splits and the peroneus longus acts like a wedge between the two segments (5).

Tears of the peroneus longus also occur in areas of high mechanical stress, but are not as common as injury to the peroneus brevis (6). Three different anatomic zones have been described for the purpose of evaluating injuries to the peroneus longus tendon. Zone A involves the tip of the fibular malleolus and includes the area of the superior retinaculum. Zone B contains the lateral trochelar process and the inferior retinaculum. Zone C consists of the area of the cuboid notch. In one study, 17 of 22 peroneus longus injuries occurred in Zone C, with all 6 complete tears found in this zone, and 8 of 9 partial tears occurred in Zone B (7).

Magnetic resonance imaging (MRI) is a good modality for preoperative assessment, and may help the surgeon to anticipate the degree of tendon disruption that may be encountered at the time of surgery (8). Evaluation of the overall foot structure will also demonstrate deformities such as a rearfoot varus alignment that may need to be addressed simultaneously to ensure the best long term result (3, 6, 7, 9, 10-12). Patients with chronic ankle instability may also need additional procedures to reduce mechanical stress to the repaired tendons (3, 6, 7, 9, 10, 12).

REPAIR CONSIDERATION

The goal of surgical repair is to remove degenerative and compromised segments of the tendon(s) that are felt to be beyond repair, provide sufficient repair of remaining viable segments when of sufficient mass, or to create some means of residual function from the defects that remain after debridement, if they are beyond primary repair. Some of the earlier discussions regarding the operative treatment of peroneal tendon tears were based on the amount of remaining viable tendon following debridement. Brodsky and Krause recommended that tears involving <50% of the cross-sectional area of the tendon be treated by excision of the degenerative segments followed by tubularization of the remaining tendon. If >50% of the cross sectional area of the tendon was involved, then tenodesis of the two units was recommended proximally and distally. Proximal tenodesis was recommended 3 to 4 cm above the tip of the fibular malleolus and distal tenodesis was recommended 5 to 6 cm below the tip of the lateral malleolus to avoid irritation and fibular impingement.This same approach has also been employed by others (6, 10-14). However, some surgeons have felt that with tenodesis the funtional integrity of the muscle-tendon unit may be compromised (3, 11, 15, 16), and alternatively reconstructed the defect using tendon allograft (15), autogenous tendon graft or transfer, or an acellular dermal matrix allograft (16).

Mook et al recommended bridging of an intercalary segment defect using either a peroneal or semitendinosus allograft. These were then anchored to the distal native stump of the tendon with a Pulvertaft weave, or to the fifth metatarsal using 3.5 mm suture anchors. Adequate muscle-tendon unit tension of the reconstruction was performed before fixating proximally. This was assessed with the foot in neutral inversion and eversion as well as neutral ankle dorsiflexion. The allograft length was then set after careful intraoperative measurements. The mean follow-up demonstrated that all the patients were able to return to their preinjury activity level (15).

Other salvage procedures proposed by various authors include transfer of the flexor digitorum longus (FDL) (6, 17, 18) or the flexor hallucis longus (FHL) (3, 18). Transfer of the FDL can be a single or two-stage procedure. Both involve attaching the transferred tendon into the base of the fifth metatarsal. However, the staged procedure involves the use of a silicone rod much like the hamstring allograft procedure discussed above. Even though either transfer is considered adequate, there is some indication that the transfer of the FHL may be favored (18). This is either due to higher postoperative scores with improved eversion strength, FHL being stronger in comparison to the FDL, or relative work capacity measurements. Relative work capacity is calculated by dividing a given muscle's volume by the total volume of all the calf muscles added together through the use of MRI scanning (18). This study demonstrated that both the FHL and FDL muscles were stronger than the peroneus longus, with no significant difference between peroneus longus and brevis muscles.

Rapley et al recommended the use of acellular dermal matrix allograft to either bridge the segmental defect, or to wrap around the defect or repaired tendon remnants (16). Branch described a combination strip and weave technique to repair peroneal tendons with acellular matrix. A small segment of the matrix was placed centrally in the defect and sutured into place. The accellular matrix was then cut into a long thin segment that was woven through the repair (19).

In most instances the peroneus brevis is primarily involved to a variable degree. Generally, the peroneus longus can be salvaged, even if degenerative to some extent. However, there are some less frequent encounters where both tendons are beyond primary repair. In the face of two irreparable tendons, Redfern and Myerson (3) performed an isolated reconstruction of the peroneus brevis as a staged or as a single procedure. Initially, they employed a Hunter rod to enhance formation of a tendon pseudosheath. Then for the second stage, a hamstring allograft was inserted with the aim of the silicone rod. However, they noted that the staged procedure produced more scarring, and therefore, advocated for a single stage procedure. There have also been case reports where a traumatic rupture of both peroneus longus and brevis tendons were surgically repaired by direct end-to-end suture, with excellent functional outcome at 1-year follow-up (20).

Patients who present with lateral ankle instability and chronic lateral ankle pain may also possess a cavus deformity of the hindfoot (3, 6, 9, 7, 10-12). Boffeli et al (9), have advocated a single lateral incision for simultaneous repair of both the peroneal tendons and the hindfoot varus deformity.

The primary repair of peroneal tendons has demonstrated good results, as have patients where repair was augmented by either allograft reconstruction (15) or acellular dermal matrix allograft (16). Regardless of technique, good functional outcomes have been reported.

AUTHORS´ CURRENT TECHNIQUES

1. It is the intent of the authors to avoid the use of acellular matrix allografts whenever possible and to employ the patient´s own tissue. This is simply surgeon preference as opposed to being based on any scientific data.
2. The authors feel that the use of the Topaz coblation technique is a useful augmentation relative to the healing process of tendon repair, and this device is used after debridement of compromised tendon segments to enhance blood flow to the residual tendon.
3. There are situations where one may encounter a completely flattened peroneus brevis, and provided the tendon substance is of sufficient quality, a round tendon segment can be created from this flat unit via tubularization.
4. Tubularization is preferably performed via an inside-out technique (21) whereby the amount of nonabsorbable suture that remains on the external surface of the tendon is minimized.
5. If the peroneus brevis is beyond repair, then the authors prefer to anastamose the proximal and distal stumps to the peroneus longus, leaving one single bridge across the ankle area.
6. If both tendons are beyond salvage the authors prefer to employ a free graft of proximal peroneal tendon to create a single unit traversing the ankle region, suturing the graft into both stumps proximally and distally.
7. Correct osseous deformity as needed to alleviate mechanical stress to the tendons that caused failure originally. Patients with ankle instability will undergo a lateral ankle stabilization procedures as well.
8. A single lateral incision is employed when both a heel osteotomy and peroneal tendon repair are performed. Two incisions are used with simultaneous repair of the tendons and lateral ankle stabilization, the latter of which is typically achieved via a primary repair of the lateral ankle ligaments.

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