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Technical Tips

Distal fibular periosteal flap for superior peroneal retinaculum reconstruction

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Abstract

Peroneal tendon instability is a common injury that occurs in physically active individuals, often as a result of trauma and in the context of an anatomically shallow distal fibular groove. Subluxation of these tendons over the lateral malleolus is accompanied by superior peroneal retinaculum injury. Several techniques have been described in the literature, including fibular groove deepening and retinaculum repair, but few reconstruction techniques are available for cases with insufficient residual retinaculum. We report the case of a 53-year-old man, without a history of trauma, who presented with chronic peroneal instability with a completely obliterated, unsalvageable retinaculum which we treated with a combination of fibular groove deepening and fibular periosteal flap to reconstruct the superior peroneal retinaculum.

Level of Evidence V; Case Report; Expert Opinion.

Keywords: Joint instability; Periosteum; Tendons; Tendon injuries; Ligaments.

Introduction

Dislocation or subluxation of the peroneal tendons is a common injury that occurs in athletes or physically active individuals often after trauma and can lead to chronic peroneal tendon instability. A shallow fibular groove is frequently associated with this pathology, and the superior peroneal retinaculum injuries are systematic[1,2]. In cases of chronic peroneal tendon instability, there is little evidence that conservative management can lead to significant healing; therefore, many researchers support surgical treatment[1,3-6].

Several procedures can be used to restore peroneal tendon stability[1,3]. In cases of a shallow fibular groove, surgical groove deepening is frequently performed in combination with repair or reinforcement of the superior peroneal retinaculum[5,6]. Usually, the damaged retinaculum is still present and allows direct suture, or it can be used as an anchor point for reinforcement. In the context of ancient chronic instability, the superior peroneal retinaculum may be obliterated and unusable.

The purpose of this study was to report a case of chronic peroneal instability with an obliterated peroneal retinaculum and to describe the surgical procedure we used to reconstruct the superior peroneal retinaculum with a fibular periosteal flap.

Case Description

This study was approved by an Institutional Review Board and the patient provided informed consent.

A 53-year-old active male patient suffered from chronic instability of the peroneal tendons in the right ankle for many years and did not report any history of trauma. The peroneal instability was initially asymptomatic, and the pain developed progressively within a few months. He was treated with an ankle brace which did not provide significant benefit.

Study performed at Department of Orthopaedic and Rehabilitation. University of Iowa, Carver College of Medicine, Lowa City, IA, USA.

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Subluxation of the peroneal tendons was confirmed clinically and triggered pain (Figure 1). Hindfoot alignment was neutral. Magnetic resonance imaging showed slight signs of peroneal tendinopathy, a deficient superior retinaculum, and an accessory peroneus quartus (Figure 2). Weight-bearing computed tomography assessment confirmed good alignment of the foot (foot and ankle offset, 4.41%) and insufficient peroneal groove depth.

Figure 1. Subluxation of the peroneal tendons in inversion.

After careful explanation of the disease and treatment options, the patient decided to proceed with surgical treatment.

Surgical procedure

With the patient in the supine position under general anesthesia with a tourniquet placed onto the operative thigh and inflated to 300 mm Hg after limb exsanguination, we made a 7-8-cm longitudinal incision along the course of the peroneal tendons at the level of the distal fibula. We carefully dissected the subcutaneous tissue down to the level of the peroneal retinaculum and noted a completely insufficient, obliterated superior peroneal retinaculum, with subluxation of the peroneal tendons anterior and lateral to the distal fibula after inversion of the subtalar joint. We also noted a low-lying peroneus brevis muscle belly and a peroneus quartus and resected them by sharp dissection. No peroneus brevis or peroneus longus tendon tears or splits were noted.

We then proceeded with groove deepening of the distal fibula. We inserted a 3.5-mm cannulated drill with a guidewire distal to proximal into the distal fibula and then made a drill hole in the posterior aspect of the distal fibula. We used a bone tamp to collapse the posterior surface of the distal fibula and deepened the peroneal groove without creating a rough raw bone surface (Figure 3).

We used a distal fibular periosteal flap to reconstruct the superior peroneal retinaculum due to insufficient retinaculum. We performed dissection anteriorly at the level of the distal fibular periosteum with a knife and elevated a 4-cm-long distal fibular periosteal flap from proximal to distal while keeping

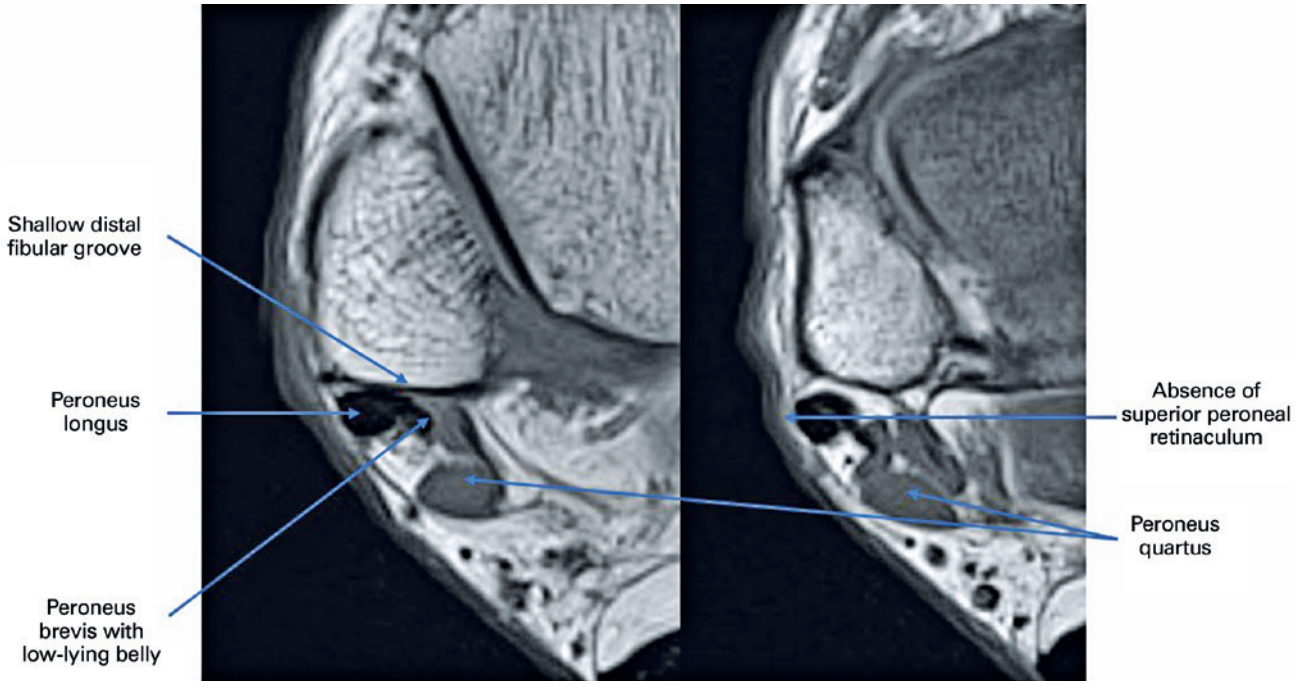

Figure 2. Axial T1-weighted magnetic resonance image showing the peroneal compartment in the retrofibular groove.

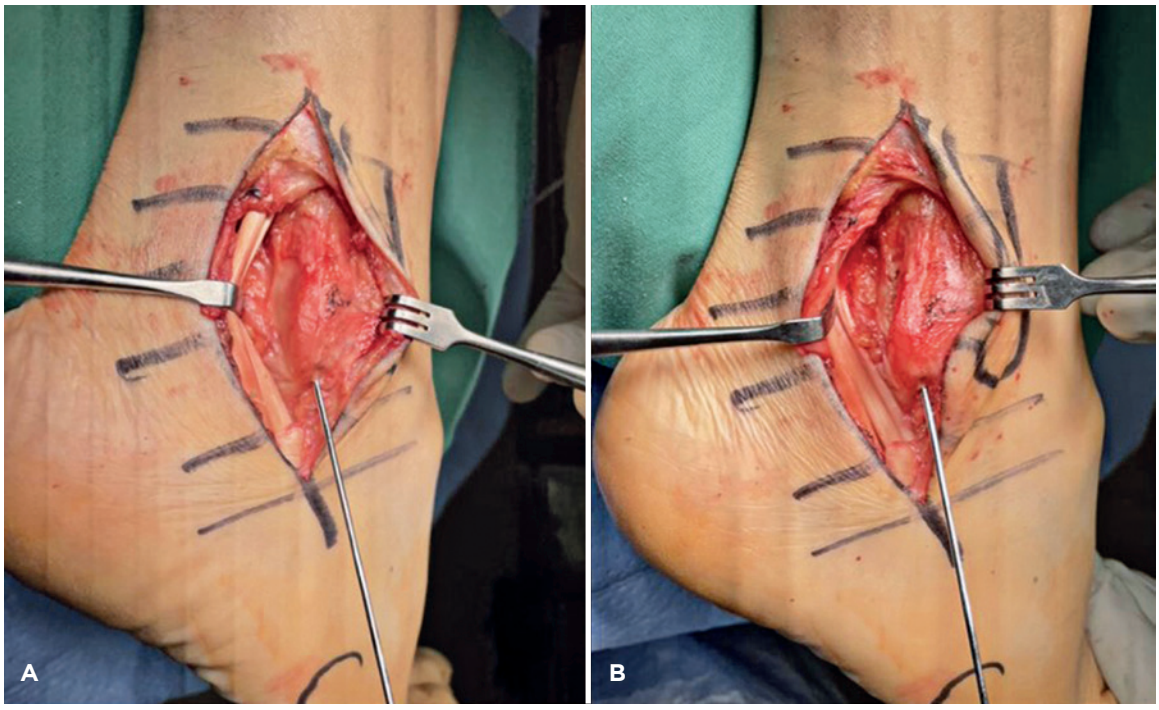

Figure 3. Deepening of the peroneal groove. A) Before deepening. B) After deepening.

a rotating point distally, still connected to the distal fibula (Figure 4). We used a K-wire to create two tunnels in the distal fibula from anterior to posterior at the posterior border of the distal fibula. We sutured the distal fibular periosteum using 2-0 Vicryl, serving as an external rotation point of the periosteal flap. We rotated the distal fibular periosteal flap medially and laterally to insert it into the posterolateral aspect of the calcaneal tuberosity. We then inserted a suture anchor into the posterolateral surface of the calcaneal tuberosity and used it to advance the periosteal flap, thus reconstructing the most important part of the superior peroneal retinaculum (Figure 5). We performed this process while keeping the peroneal tendons reduced into proper position. We carefully tensioned the suture, avoiding any compression of the peroneal tendons into the peroneal groove. We then placed the residual superior peroneal retinaculum medial tissue back into the distal fibula through transosseous sutures with 2-0 Vicryl and attached it to the newly reconstructed retinaculum (Figure 6).

We cleaned the wounds, released the tourniquet, and confirmed hemostasis. We then sutured the subcutaneous tissue and skin.

The patient was initially non-weight-bearing in a splint and progressively resumed weight-bearing in a walking boot 4 weeks after surgery for 4 supplementary weeks.

Figure 4. Fibular periosteal flap.

Discussion

More than 20 procedures have been described to repair or reinforce the superior peroneal retinaculum[7], but there are few descriptions of entire reconstruction of the peroneal retinaculum. Nevertheless, this procedure is essential in rare chronic cases with insufficient residual retinaculum.

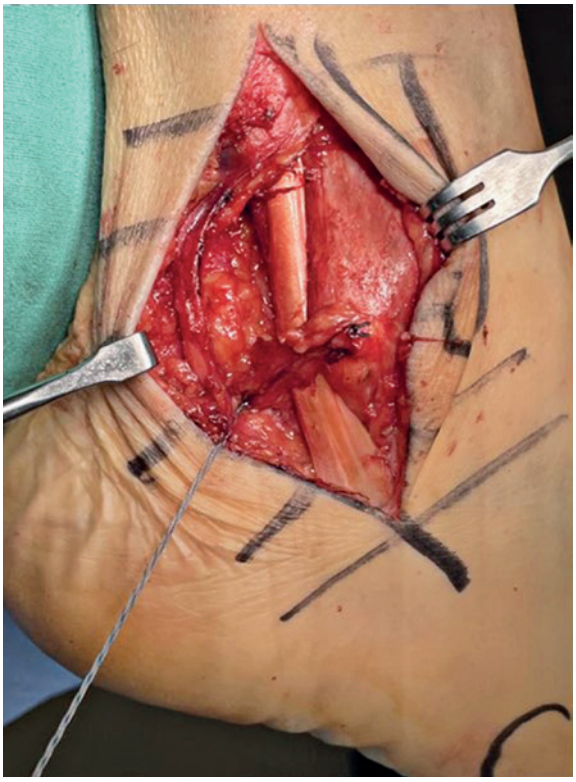

Figure 5. Anchorage of the fibular flap to the calcaneus.

Figure 6. Suture of the proximal part of the residual retinaculum.

Peroneal tendon rerouting behind the calcaneofibular ligament has been proposed[7] to palliate the insufficient peroneal retinaculum. However, this technique is non-anatomic and requires sectioning the calcaneofibular ligament to reroute the tendons and then repairing the calcaneofibular ligament over the latter. Peroneal tendon pathologies are frequently associated with lateral ankle instability and hindfoot varus[7]; therefore, this intervention appeared risky to us.

Tissue transfers, using the plantaris or a strip of the Achilles tendon, have also been proposed to reconstruct the peroneal retinaculum. However, harvesting these structures requires additional incisions[8].

The fibular periosteum is located close to the peroneal groove and is a suitable structure to replace the superior peroneal retinaculum. Several authors have described procedures using a periosteal flap to reinforce the residual retinaculum[7,9], but these techniques require anchoring the periosteal flap to the residual retinaculum. In the present case, the residual retinaculum was insufficient to apply these techniques. In 1930, Hanson described an entire reconstruction of the retinaculum using one periosteal flap from the distal fibula and one from the calcaneus, suturing them over the tendon[6]. We have improved this concept by using an entire fibular periosteal flap to avoid creating a point of fragility caused by suturing the two flaps. For the same reason, we reinforced the flap anchorage on the fibular side by using transosseous sutures and on the calcaneal side by using an anchor. Moreover, this technique respects the original anatomic insertions of the superior peroneal retinaculum on the fibula and on the calcaneus.

Conclusion

In this article, we described the anatomic reconstruction of the superior peroneal retinaculum using a fibular periosteal flap combined with fibular groove deepening. This procedure can be useful in rare cases of chronic peroneal instability associated with insufficient residual retinaculum.

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