Dual-incision Approach for Repair of Peroneal Tendon Dislocation Associated With Fractures of the Calcaneus

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Abstract: Dislocation of the peroneal tendons associated with calcaneus fractures should be repaired during fracture fixation to prevent complications. The only documented approach for repair is by proximal extension of the vertical limb of the lateral extensile approach to the calcaneus. However, enlarging the inherently fragile calcaneus flap places it at further risk of damage. Using a separate anterior incision to repair the dislocation, thus avoiding problems caused by excessive flap elevation, seemed intuitive. This approach proved technically effective and reliable in producing favorable outcomes in a series of 14 patients. [Orthopedics. 2014; 37(2):96-100.]

Acute traumatic peroneal tendon dislocation associated with calcaneus fractures is a well-established entity in the radiology and orthopedic literature. Acute traumatic peroneal tendon dislocation is associated with intra-articular calcaneal fractures, specifically Sanders grade IV, and with a widened heel. It may occur when the blown-out fragment of the thin lateral wall of the calcaneus lacerates the superior peroneal retinaculum, allowing the peroneal tendons to dislocate anterolaterally from their original location in the fibular groove of the distal fibula. Orthopedic surgeons should maintain an especially high level of suspicion for peroneal tendon dislocation when encountering calcaneal fractures. Computed tomography (CT), commonly used to delineate fracture anatomy in preoperative planning, reliably shows peroneal tendon dislocation. The current authors have found that it is also possible to appreciate the dislocation clinically in the presence of a swollen and bruised hindfoot, as the dislocated tendons can be palpated anterior to their normal position.

It is widely accepted that an acute dislocated tendon should be reduced for optimal function. If an acute dislocated tendon is left unreduced, tendon biomechanics will become altered and, physiologically, the muscle-tendon unit will atrophy and shorten. At this stage, reduction is often impossible and salvage procedures may be suboptimal. The patient with a missed peroneal tendon dislocation may have a myriad of chronic symptoms, ranging from lateral ankle pain to snapping to weak hindfoot eversion to instability when walking on uneven surfaces.

To the best of the current authors’ knowledge, the only surgical approach described for the repair of a dislocated peroneal tendon associated with a calcaneus fracture is via extension of the J-shaped extensile lateral approach to the calcaneus. The vertical limb of this traditional approach is extended proximally as much as required to identify the anteriorly dislocated peroneal tendons. The current authors have found that it is also possible to appreciate the dislocation clinically in the presence of a swollen and bruised hindfoot, as the dislocated tendons can be palpated anterior to their normal position.

The vertical limb of this traditional approach is extended proximally as much as required to identify the anteriorly dislocated peroneal tendons. The tendons are then repositioned into the peroneal groove, and the ruptured superior peroneal retinaculum is reconstructed using retinacular and periosteal tissue. The main concern the authors have with this technique is the excessive flap dissection and handling, risking flap devitalization and wound breakdown. In addition, this incision may damage the sural nerve.

The authors prefer a dual-incision approach for repair
of the dislocated peroneal tendons and fixation of the calcaneal fracture. After open reduction and plate fixation of the calcaneal fracture, a separate 30-mm incision is made on the posterior ridge of the distal fibula to identify, reduce, and repair the dislocation. This additional incision eliminates further handling of the flap, decreases the likelihood of wound complications, and diminishes the risk of damage to the sural nerve. The authors have found this approach effective and reliable, with no subsequent wound problems. It produces consistent outcomes, and there are no symptoms associated with the peroneal tendons during follow-up.

**MATERIALS AND METHODS**

From May 2004 through January 2011, the authors used the dual-incision approach for these combined injuries in 14 patients (16 fractures). There were 10 male and 4 female patients with a mean age of 37 years (range, 16-62 years). Twelve patients had unilateral calcaneal fractures, and 2 patients had bilateral fractures. There were 10 closed and 6 open fractures, all resulting from high-energy trauma (mostly motor vehicle accidents). Twelve of the fractures were classified as Sanders III and 4 as Sanders IV.

All fractures, including the bilateral cases, were associated with peroneal tendon dislocations. The dislocations were suspected clinically in all cases. In addition, the well-described “flake fracture” was present on standard radiographs of 12 fractures. For all fractures, the dislocated tendons were visualized on preoperative CT scans. Initial management consisted of application of a below-the-knee splint and elevation of the limb. After resolution of edema and healing of fracture blisters, definitive surgery was performed.

**SURGICAL TECHNIQUE**

The patient is placed in the lateral decubitus position. A pneumatic tourniquet is placed on the patient’s thigh, not at the calf, to avoid compression of the peroneal muscles and consequent retraction of the tendons.

The operation begins with the extensile J-shaped incision, as described by Letournel, for exposure and open reduction and internal fixation (ORIF) of the calcaneal fracture. A full-thickness subperiosteal flap must be raised off the lateral aspect of the calcaneus. When there is no peroneal tendon dislocation, the sheathed peroneal tendons are located within the flap. In cases of peroneal tendon dislocation, the authors have observed that elevation of the flap is technically easier because the tendons are no longer in the field. After ORIF of the calcaneus fracture, a separate longitudinal incision is made over the posterior ridge of the distal fibula, beginning approximately 10 mm proximal to the tip of the lateral malleolus. The incision is extended proximally for 30 mm (Figure 1), where one can visualize the dislocated tendons as they cross the fibula obliquely in their abnormal position (Figure 2). Through this same incision, the anteriorly dislocated tendons may be gently reduced into the peroneal groove with a freer (Figure 3). At a point on the fibular ridge 15 mm proximal to the tip of the lateral malleolus, a 2.8-mm suture anchor is inserted securely into bone (Figure 4). The torn superior peroneal retinaculum layer is reattached to the posterior aspect of the distal fibula (Figure 5), preventing recurrent anterior dislocation.

To ensure peroneal tendon stability has been achieved, an intraoperative peroneal tendon stress maneuver is performed by moving the ankle passively through a full range of motion.

The authors recommend first closing the extensile lateral incision and then the smaller peroneal incision. As a result, the soft tissue bridge (mean distance, 50 mm) formed between the shorter peroneal incision anteriorly and the longer extensile lateral incision posteriorly will stretch posteriorly to help achieve a tension-free closure of the fragile extensile lateral wound. The deep layer is meticulously closed starting from the proximal and distal ends to reduce tension at the apex of the wound using absorbable 2-0 Vicryl (Ethicon, Neuchatel, Switzerland) to reapproximate the subcutaneous layer over a deep suction drain. The skin is closed with nonabsorbable 4-0 Prolene (Ethicon) using the Allgöwer modification of the Donati suture. The anterior
peroneal incision is closed in a similar fashion. Sterile dressing and adequate padding is applied to the wounds while avoiding excessive compression and pressure necrosis. The tourniquet is deflated after the wounds are dressed. The ankle is maintained in a neutral position by placing the leg in a cushioned posterior metal splint. The patient’s hip and knee should be flexed to aid in correct placement of the foot and ankle into the splint. The ankle is immobilized in a cast for 6 to 8 weeks, and the patient is maintained nonweight bearing.

**CASE REPORT**

A 40-year-old man had a closed right calcaneus fracture with peroneal tendon dislocation after a high-energy motor vehicle accident. Initial lateral radiographic images (Figure 6) revealed an intra-articular calcaneus fracture classified as Sanders IV (Figure 7). The associated peroneal tendon dislocation was also visualized in the CT soft tissue window. On day 7 after injury, the patient underwent ORIF of the calcaneus fracture using a calcaneal plate and screws through a standard lateral extensile approach. This was followed by repair of the peroneal tendon dislocation using a suture anchor through the additional incision described here. Radiographs immediately postoperatively revealed a well-reduced posterior facet with excellent calcaneal height as shown by a near normal Bohler’s angle and crucial angle of Gissane, and an in situ suture anchor in the distal fibula used for the peroneal dislocation repair (Figure 8).

**RESULTS**

Mean follow-up in this series of 14 patients was 37 months (range, 12-56 months). In all patients, the anterolateral peroneal wounds healed with no complications. Two patients (2 fractures) had delayed healing at the apex of the flap that required repeated dressing changes. No infection was present, and satisfactory healing was noted at 4 weeks. Twelve patients had uneventful healing. No sural neuropathy was noted. At latest follow-up, none of the patients reported symptoms suggestive of peroneal tendon dysfunction, specifically redislocation, snapping, or pain. All fractures healed with restoration of satisfactory calcaneal height and width. All patients had some residual stiffness in the subtalar joint, likely due to the seriousness of the injuries.

**DISCUSSION**

The authors used the dual-incision technique for all patients who had peroneal tendon dislocations in association with intra-articular calcaneus fractures. None of these patients had wound complications, and there were no recurrent dislocations.

This direct approach to the peroneal tendons protects vascularity of the calcaneal flap. The additional anterior incision permits direct identification and reduction of the dislocated peroneal tendons. More importantly, it obviates the need to substantially extend the vertical limb of the incision to create a larger flap or further dissect within the flap to locate the displaced tendons, as in the standard technique, which risks damage to the lateral calcaneal artery. In their cadaveric study concerning vascularity of the lateral calcaneal flap, Borrelli and Lashgari demonstrated that disruption of the blood supply to the surgically created flap played an important role in the development of wound complications. Of the 3 arteries consistently found along the lateral aspect of the hindfoot, the lateral calcaneal artery provides the dominant supply to the apex of the flap and is most prone to injury because of its proximity to the vertical limb of

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**Figure 5:** Photographs of reattachment of retinaculum. The torn superior peroneal retinaculum (A) is sutured to the posterior part of the distal fibula (B) to close the dislocation chamber.

**Figure 6:** Standard lateral radiograph (A) and lateral computed tomography scan (B) of the injury.

**Figure 7:** Coronal computed tomography scan showing the Sanders IV calcaneus fracture.

**Figure 8:** Postoperative lateral radiograph showing restoration of the posterior facet and calcaneal height. The suture anchor used for peroneal tendon repair is seen in the distal fibula.
the lateral extensile approach. It has been reported that the most common complication encountered in the treatment of intra-articular fractures of the calcaneus, even by skilled surgeons, is wound breakdown or necrosis. Additional insult in the form of flap extension and dissection can only increase this.

A second benefit of the dual-incision approach is that the separate incision minimizes injury to the sural nerve. The incidence of sural nerve injury in patients treated via the extensile lateral approach has been reported to be 7.7% to 10%. Schepers, in his review of the sinus tarsi approach to intra-articular calcaneal fractures, believed injury was due to the sural nerve being at risk at both the proximal and the distal ends of the extensile lateral approach. The sural nerve is exposed to an increased risk at both the proximal and the distal ends of the extensile lateral approach. The second incision is easily closed despite its being stretched for ease of closure of the first wound.

**CONCLUSION**

The dual-incision approach is simple, reliable, and effective. None of these patients experienced redislocation or reported symptoms related to peroneal tendon dysfunction. The technique decreases the possibility of wound complications observed with the traditional approach by preserving the vascularity and integrity of the flap and minimizing the risk to the sural nerve.

**REFERENCES**