

Minimally Invasive (Sinus Tarsi) Approach for Open Reduction and Internal Fixation of Intra-Articular Calcaneus Fractures in Children: Surgical Technique and Case Report of Two Patients



Amr A. Abdelgawad, MD¹, Enes Kanlic, MD²

¹ Associate Professor, Department of Orthopedic Surgery, Paul L. Foster School of Medicine, Texas Tech University Health Science Center at El Paso, El Paso, TX

² Professor, Department of Orthopedic Surgery, Paul L. Foster School of Medicine, Texas Tech University Health Science Center at El Paso, El Paso, TX

ARTICLE INFO

Level of Clinical Evidence: 4

Keywords:

adolescent injury
calcaneus fracture
complications
operative treatment
pediatric foot fracture
skin necrosis

ABSTRACT

Calcaneus fractures in children differ from those in adults. Most calcaneus fractures in children can be managed nonoperatively, with good long-term results expected. The width and height of the calcaneus can remodel with time in children. Recently, there has been a trend toward operative treatment of displaced intra-articular fractures of the calcaneus in children to correct the articular deformity. Studies of calcaneal fracture fixation in children used an extended lateral approach, with its possible complications. In the present report, we describe the operative treatment of 2 children (12 and 13 years old), who had a displaced intra-articular fracture of the calcaneus, using a minimally invasive sinus tarsi approach. Adequate reduction was obtained in both cases with no soft tissue complications or implant discomfort. Fixation was obtained using 3.5-mm cortical screws. Anatomic joint alignment was restored. The children were followed up until they had both resumed their full activities with no complications. We recommend this approach for operative treatment of displaced intra-articular fractures of the calcaneus, because it addresses the intra-articular displacement, which is the most important element of the deformity in children.

© 2015 by the American College of Foot and Ankle Surgeons. All rights reserved.

Calcaneus fractures in children are different from their counterparts in adults. Unlike adults, calcaneus fractures are rare injuries in children (1,2). Most pediatric calcaneus fractures will be nondisplaced or minimally displaced fractures. These fractures in children have traditionally been viewed as benign injuries, although they are usually considered lifestyle-changing fractures in adults (3).

Most calcaneus fractures in children can be managed nonoperatively, because nonoperative treatment has been reported in most cases to provide adequate results (4–10). Recently, some studies have reported on open reduction and internal fixation of intra-articular calcaneal fractures in children (11–14). Reduction of calcaneus fractures in children has been described using the extended lateral approach. This approach involves extensive dissection, with possible soft tissue complications (15,16). Recently, the use of a minimally invasive sinus tarsi approach to address reduction of the intra-articular calcaneal fracture has been described in adults

(17–23); however, this approach has never been previously described for use in children.

In the present report, we describe the use of the minimally invasive sinus tarsi approach to perform open reduction and internal fixation of intra-articular calcaneus fractures in the pediatric patient. We describe the technique used and report the results for 2 children who underwent this procedure.

Surgical Technique and Postoperative Protocol

The patient was placed supine with a relatively large “bump” underneath the affected hip to allow for better exposure of the lateral part of the foot. A tourniquet was used over the proximal thigh. A straight incision was done over the subtalar joint just anterior to the tip of the fibula and extending for about 4 cm in the direction of the fourth toe.

The sheath of the peroneal tendons was released, and the peroneal tendons were retracted toward the plantar side. The subtalar joint was identified, and the lateral capsule was released to be able to visualize the posterior talus (which will act as guide for reduction).

The posterior part of the lateral segment of the calcaneus with the attached articular surface was depressed and tilted down (about 40° to 70°), causing incongruity of the subtalar joint (Fig. 1). A freer elevator was introduced underneath this fragment and pushed in an

Financial Disclosure: None reported.

Conflict of Interest: None reported.

Address correspondence to: Amr A. Abdelgawad, MD, Department of Orthopedic Surgery, Texas Tech University Health Science Center at El Paso, 4801 Alberta Avenue, El Paso, TX 79905.

E-mail address: amr.abdelgawad@ttuhsc.edu (A.A. Abdelgawad).

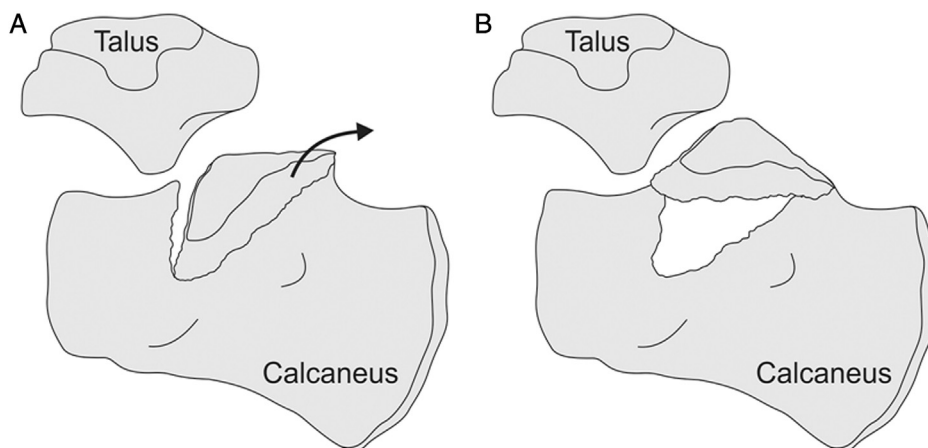


Fig. 1. (A) Joint depression intra-articular fracture of the calcaneus. The posterior facet of the calcaneus is tilted downward, causing an irregular subtalar joint. The fracture segment should be pushed backward and upward using the undersurface of the talus as a guide. (B) After elevating the piece, the surfaces of the talus and calcaneus are now parallel, with creation of a void underneath the articular surface of the calcaneus. This leads to indirect correction of the Bohler angle.

upward and posterior direction for reduction of the depressed fragment. This will result in reduction of the step in the articular surface of the subtalar joint and indirect restoration of the calcaneus height. The posterior subtalar joint surfaces of the talus and the calcaneus should now be parallel to each other (Fig. 1).

Preliminary fixation of the reduced fragments was performed using Kirschner wires, and 3.5-mm cortical screws were used to fix the fragments together (the reduced lateral fragments to the medial sustentaculum part). Washers can be used when the lateral walls have been weakened by comminution. Intraoperative fluoroscopy was used to assess the reduction and ensure that the screws had not penetrated into the subtalar joint. Bone graft substitutes were not used. We did not use screws that go through the tuberosity of the calcaneus to avoid iatrogenic damage to the growth plate.

After irrigation, the tendons were allowed to return to their position; no repair of the tendon sheath was done. Closure of the subcutaneous tissues was achieved using Vicryl® sutures (Ethicon, Endo-Surgery, Cincinnati, OH), and the skin was closed using interrupted nylon suture. A posterior splint was applied postoperatively for 1 week, followed by cast application in the clinic for 2 more weeks, and the patient was not allowed to bear weight. At 3 weeks postoperatively, the cast was removed, the sutures were taken off, and radiographs were obtained to assess the alignment and healing. The children were encouraged to perform range of motion exercises for the ankle and subtalar joints. Non-weightbearing status was continued for about 8 weeks postoperatively until the radiographs had shown full union of the fracture. At 8 weeks after surgery, weightbearing was gradually advanced, and therapy was initiated to regain full range of motion and strength. The patients were allowed to return to sports activity around 3 months after surgery.

Case Reports

Patient 1

A 12-year-old male had injured his left foot while skiing. He had a left calcaneus fracture with intra-articular affection (joint depression type). The Bohler angle was -6° . A minimally invasive sinus tarsi approach was used to reduce the articular surface of the subtalar joint, with fixation using three 3.5-mm cortical screws (one of them over a washer). The patient's fracture had healed by 8 weeks postoperatively, and activity was gradually resumed during the subsequent months.

By 3 months postoperatively, the patient had been able to regain full function and was able to participate in all sports activities with no foot pain. The Bohler angle showed improvement to $+10^\circ$. He had no complaints related to foot pain or limping. No tenderness related to the implant was present. No soft tissue complications or fixation failure occurred. The patient had maintained these findings at the final follow-up visit 1 year postoperatively (Fig. 2).

Patient 2

A 13-year-old male with autistic features had jumped from the second floor. The patient had a left calcaneus fracture with disruption of the posterior subtalar joint and a decreased Bohler angle of 13° . The patient also had right second, third, and fourth metatarsal fractures. On the left side, a minimally invasive sinus tarsi approach was used to reduce the articular surface, followed by fixation using three 3.5-mm cortical screws (2 over a washer). The Bohler angle improved to 28° . The metatarsal fractures were managed by percutaneous intra-medullary Kirschner wires. By 2 months postoperatively, the patient's fractures had healed, and he was allowed to begin weightbearing as tolerated. By 3 months postoperatively, he had returned to full activity. No soft tissue complications or fixation failure occurred. No implant discomfort was noted. At the final follow-up visit (9 months postoperatively), the patient continued to be pain free, with full regain of function and no gait abnormality (Fig. 3).

Discussion

Calcaneus fractures are relatively common injuries in adults. Many studies have discussed the operative versus nonoperative treatment choices for these fractures in adult patients (24–27). In the pediatric population, these fractures are uncommon, with many fewer studies reporting on the treatment options for this type of trauma (1–15). Fracture of the calcaneus is a rare injury in children, because the thick cartilage and surrounding soft tissues around the heel act as resorbing factors in children who sustain vertical compressive loads (2,8,9).

Calcaneus fractures have classically been treated nonoperatively. Multiple case series studies have suggested that children with non-displaced or minimally displaced intra-articular fractures can be treated conservatively, with good clinical results (3–10). Schmidt and Weiner (8) reviewed the data for calcaneus fractures in children aged 1 to 19 (average 11) years. They found that from age 8 through

Download English Version:

<https://daneshyari.com/en/article/2715047>

Download Persian Version:

<https://daneshyari.com/article/2715047>

[Daneshyari.com](https://daneshyari.com)