

Surgical Treatment of Calcaneal Avulsion Fracture in Elderly Patients Using Cannulated Cancellous Screws and Titanium Wire



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ABSTRACT

Avulsion fractures of the calcaneus are relatively uncommon and are seen most frequently in elderly or osteoporotic patients. A surgical method that avoids displacement of the avulsed fragment after fixation has not been developed. We report the cases of 3 patients (a 73-year-old male, an 85-year-old male, and an 81-year-old female) treated by open reduction and internal fixation using titanium wire and cannulated cancellous screws. The posterior approach was used by way of a vertical midline incision. The fracture was fixed with 2 screws, and then a titanium wire was passed through the holes of the cannulated screws. A small incision on the lateral side of planter was added for the exit and return of the wire. The wire knot was bent inside the proximal Achilles tendon bursa in 2 patients and was directed to the plantar side in 1 to avoid irritation. Bony union was achieved without repeat displacement of the fragment in all 3 patients. Normal ankle function was restored, and the patients recovered the activities of daily living almost to the original level. Although an additional plantar incision is required, this surgical technique provides strong internal fixation.

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Calcaneal avulsion fractures in elderly persons are a relatively rare type of calcaneal fracture. It is well known that maintaining reduction of the fragment after fixation of such fractures can be quite challenging, because the body of the calcaneus (which resists traction by the Achilles tendon) is usually porotic with poor bone quality. In addition, delayed wound healing and infection frequently occur owing to the prominence of the displaced fragment. However, a surgical method that can avoid displacement of the avulsed fragment and associated wound dehiscence or skin irritation after fixation has not yet been established.

We report the cases of 3 patients in whom a calcaneal avulsion fracture was treated successfully using titanium wire (NexMed International, Chiba, Japan) and headless cannulated cancellous screws (CCSs; Acutrak 4/5; Acumed, Hillsboro, OR) in 2 patients and CCSs with a head (NexMed International) in 1 patient.

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Conflict of Interest: None reported.

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Fig. 1. Diagram showing the posterior vertical midline curved incision and the small lateral plantar incision.

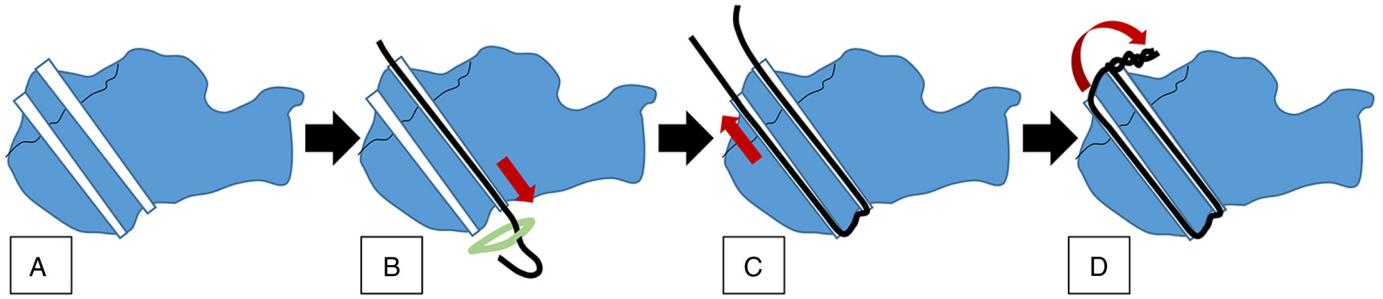


Fig. 2. (A) The fragment was reduced through the posterior incision and 2 cannulated cancellous screws (CCSs) were inserted. (B and C) We passed a titanium wire through the cannulated screw from head to tip antegradely. The wire ran over the plantar cortex of the calcaneus and then returned retrogradely through the other screw. (D) The wire knot was bent inside the proximal Achilles tendon bursa.

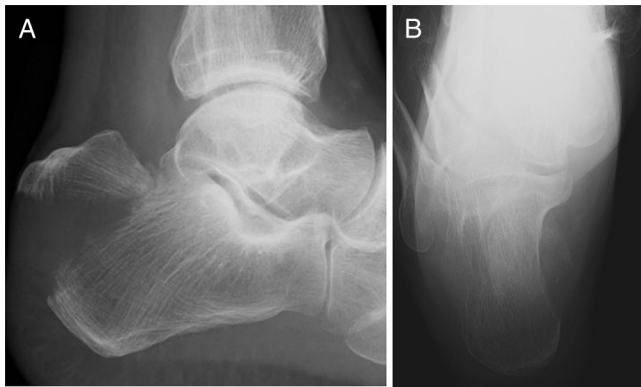


Fig. 3. Plain (A) lateral and (B) axial radiographs showing a calcaneal avulsion fracture (Beavis type 2).

Surgical Technique

A thigh tourniquet was used to assist with hemostasis. The patient was placed in the prone position to allow the use of both posterior and plantar approaches. A C-arm fluoroscope was



Fig. 4. Lateral radiograph showing a type 2 Beavis fracture.

positioned perpendicularly to the operating table such that both lateral and axial (or Harris) images could be obtained by rotating and tilting the arm.

A posterior vertical midline curved incision was made directly over the Achilles tendon, and both the tendon and fracture site were visualized. After the fragment was reduced through the posterior incision, 2 guide pins for the CCS were inserted almost vertically parallel and directed toward the lateral plantar of the calcaneus. Next, a small lateral plantar incision was made using the subcutaneously protruding guide pins as a marker. We retracted the plantaris muscles medially to expose the tips of the guide pins at the plantar surface of the calcaneus (Fig. 1).

The length of the screws was measured under direct vision through these incisions. After 2 CCSs were inserted, a titanium wire was passed antegradely through the hole of 1 CCS from head to tip. The wire ran over the cortex of the plantar aspect of the calcaneus and then returned retrogradely through the hole in the other screw. The wire knot was bent inside the proximal Achilles tendon bursa or was directed to the planter side to avoid irritation (Fig. 2).

After releasing the tourniquet, we irrigated the wounds, sutured the subcutaneous tissue with 2-0 absorbable sutures, and closed the skin with 3-0 nonabsorbable sutures. A short leg plaster was applied for 2 weeks with non-weightbearing. Partial weightbearing was allowed with an insole at 4 to 6 weeks postoperatively, and full weightbearing (FWB) was allowed at 6 to 8 weeks postoperatively.

Our 3 patients were a 73-year-old male (patient 1), an 85-year-old male (patient 2), and an 81-year-old female (patient 3). Patients 1 and 2 were injured after falling. In both patients, radiographs showed a calcaneal avulsion fracture (type 2 according to

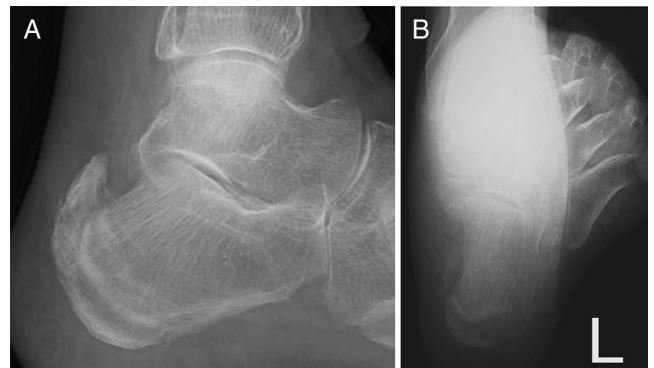


Fig. 5. Plain (A) lateral and (B) axial radiographs showing a type 1 Beavis fracture.

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