Percutaneous Displacement Calcaneal Osteotomy

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Gleich (1) first described in 1893 the calcaneal osteotomy as a plantar-medial wedge resection to increase the calcaneal inclination angle. Later, Dwyer (2) and Silver (3) each described closing- and opening-wedge osteotomies for calcaneal realignment with promising results. Koutsogiannis (4) popularized the medial displacement osteotomy in 1971.

It has been shown that the medial displacement osteotomy addresses the flatfoot deformity in all 3 planes (5). The calcaneal displacement osteotomy (CDO) can also be used to reposition the heel in all 3 cardinal body planes. The tuberosity can be rotated to accommodate a frontal-plane deformity. It can be translocated medially and laterally or in the sagittal plane (6). Several authors suggest that the complication rate for medial displacement osteotomies is low (7, 8). Wound complications, especially in immunocompromised individuals, may pose a threat to the outcome of the procedure. Furthermore, the relationships of the soft tissues on the medial side of the calcaneus must be understood to minimize trauma to this area. A recent study by Greene et al (9) analyzed the topography of the medial neuro vascular supply and its relationship to the site of the open CDO. They surveyed the medial plantar nerve, lateral plantar nerve, posterior tibial artery, and their branches. Neither the medial plantar nerve nor its branches crossed the osteotomy site in any of the 22 specimens. The lateral plantar nerve crossed the site in only 1 specimen; however, its calcaneal branch crossed the site 86% of the time. This intersection occurred at approximately 20% of the distance from the proximal portion of the calcaneus. Additionally, the second lateral plantar nerve branch crossed in 95% of the specimens at two-thirds from the proximal point. The posterior tibial artery crossed the osteotomy site in 2 specimens. Branches crossed in 77% of the cases at the midsection of the osteotomy. They concluded that, when performing the CDO, the medial cortex should be approached in a controlled manner to avoid damage to these structures (9).

We describe a percutaneous CDO involving 3 or 4 incisions that should improve overall postoperative cosmesis, minimize soft-tissue trauma, and decrease the risk of neurovascular compromise. Additionally, our experience suggests that the design of this procedure may result in more rapid bony consolidation.

Surgical Technique

Using fluoroscopic guidance, the proximal and distal portions of the osteotomy site are determined and then marked on the overlying skin both medially and laterally. Three incisions are commonly made: 2 on the lateral aspect of the foot and 1 at the distal-medial landmark. The distal-lateral incision is deepened to the level of the periosteum, which is incised. A subperiosteal tunnel is made by dissecting along the medial, lateral, and superior aspect of the calcaneus, through each incision. By maintaining a subperiosteal tunnel, the neurovascular structures should be protected (Fig 1). A fourth incision may be necessary on the medial aspect for adequate dissection.

A small Gigli saw is clamped within a curved hemostat and is passed subperiosteally from the distal medial incision in a superior direction to the proximal lateral incision. From there it is passed subperiosteally to the distal lateral incision. Radiographic confirmation of saw placement is made, and the saw is passed through the calcaneus (Fig 2). Care should be taken to not be overzealous when nearing completion of the osteotomy because the saw could easily violate the plantar soft-tissue structures originating from the calcaneus. Also, 2 large Kirschner wires may be inserted from the plantar aspect of the foot, parallel to the planned osteotomy and to one another, which may serve as a cutting guide.

After completion of the osteotomy, the saw itself is cut and removed from the field. This eliminates the potential for trauma by dragging the entire saw through the wound. The tuberosity is now freely mobile, and it is translated or rotated to correct the deformity. Using fluoroscopic guidance, 2 cannulated 7.3-mm screws are inserted perpendicular to the osteotomy (Fig 3). The wounds are reapproximated with interrupted skin sutures.

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FIGURE 1 Intraoperative photograph showing the distal lateral incision. Subperiosteal dissection is being performed by using a periosteal elevator.

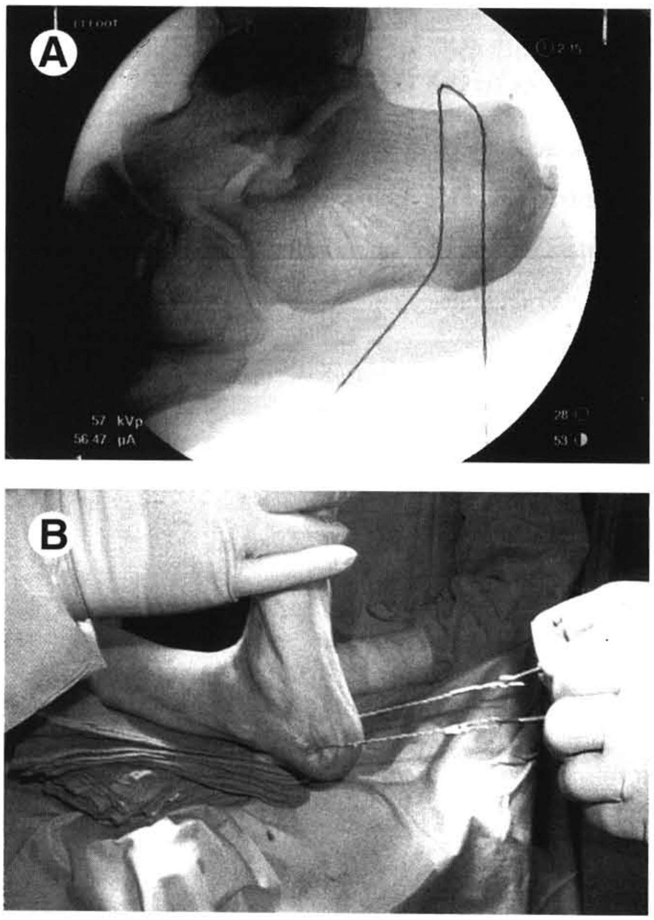

FIGURE 2 (*A*) Intraoperative fluoroscopic image showing accurate placement of the saw for passage through the bone. (*B*) Technique of passing the saw through the calcaneus.

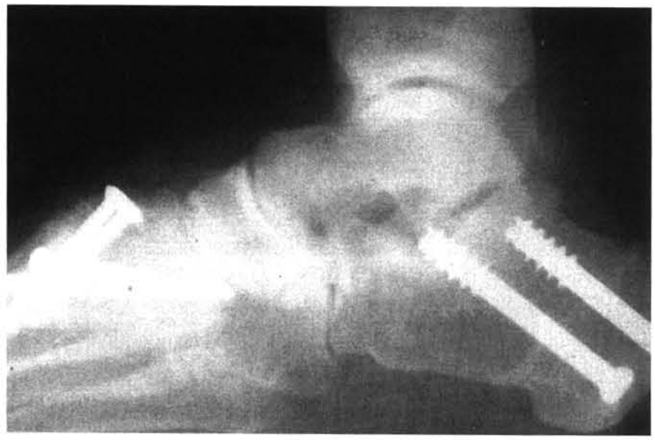

FIGURE 3 Lateral projection showing final screw placement.

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