CHAPTER **5**

TECHNIQUES OF THE EVANS CALCANEAL OSTEOTOMY

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INTRODUCTION

First used in 1961 to treat calcaneovalgus in a patient with poliomyelitis, Dillwyn Evans applied his understanding of the medial and lateral columns and performed what is now referred to as the Evans calcaneal osteotomy (1). Now routinely used to correct both pediatric and adult pes planovalgus deformities, the Evans procedure has been proven a consistent method of treatment (2-14). As described by Evans, lengthening the lateral column allows preservation of the calcaneo-cuboid joint while "pushing the navicular bone medially and so straightening the foot" (1).

First line therapy for pediatric pes planovalgus typically consists of conservative measures to decrease pain and instability. Orthotics, bracing, and nonsteroidal anti-inflammatory drugs may relieve symptoms short term, however severe deformities may best respond to surgical intervention. Historically, a variety of surgical procedures for pes planovalgus have been utilized, with most attention placed on the Evans calcaneal osteotomy. Since the procedure was first introduced, a variety of surgical variations have been described and debated. Different incisional approaches, distraction devices, fixation choices, and bone graft options have been tested, though much of the procedure's technique can be traced back to Evans himself (2-14). From the senior author's years of experience, the following technique has been refined and proven highly effective.

SURGICAL TECHNIQUE

The Evans calcaneal osteotomy is usually performed under general anesthesia with a mid-calf tourniquet, unless doing a gastrocnemius recession when a thigh tourniquet is employed.

An oblique incision (Figure 1) approximately 4 cm in length is made over the lateral aspect of the calcaneus. Incisional placement is crucial for adequate exposure of the osteotomy and graft insertion. Incisional landmarks include the anterior beak of the calcaneus distally, and the inferior surface of the calcaneus proximally. The location of the planned osteotomy, approximately 1 cm proximal to the calcaneal-cuboid joint, should be the center of the incision.

Dissection is deepened through the subcutaneous tissue, taking care to either cauterize or tie off any of the superficial crossing veins.

When working with children, it is important to remember the delicate nature of their tissues. Especially in this anatomic area, the subcutaneous layer is particularly thin (Figure 2). The subcutaneous tissue is elevated from the surface of the deep fascia in a circumferential manner to

Figure 1. Incision placement.

Figure 2. Subcutaneous tissue layer.

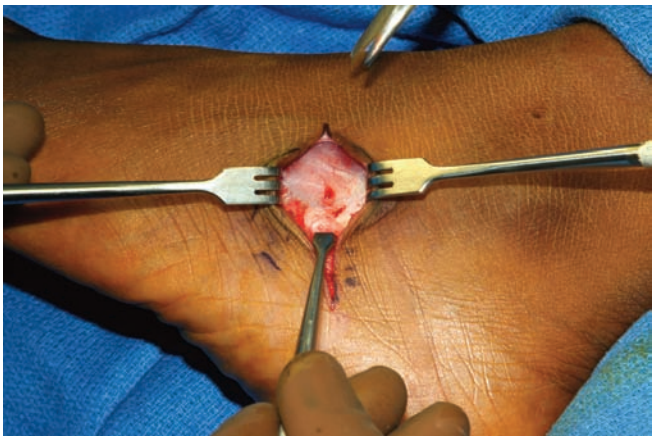

Figure 3. Protection of peroneal tendons and sural nerve.

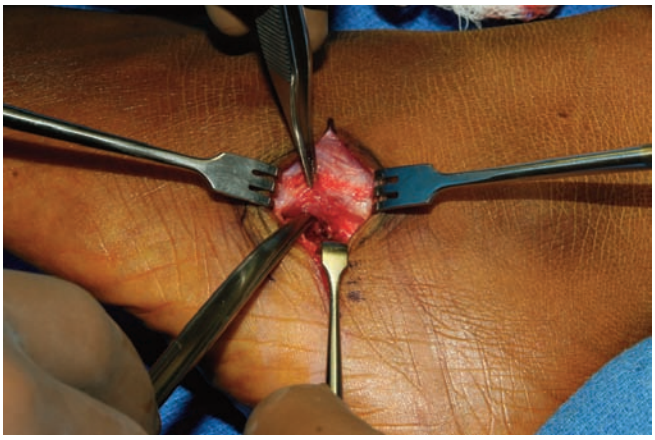

Figure 4. Reflection of EDB muscle belly.

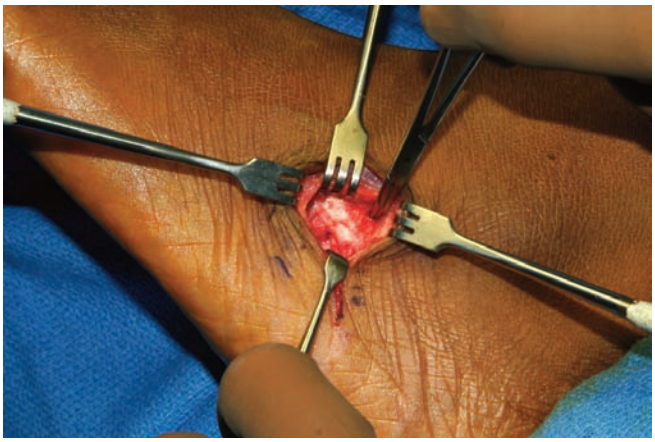

Figure 5. Exposed lateral calcaneal wall.

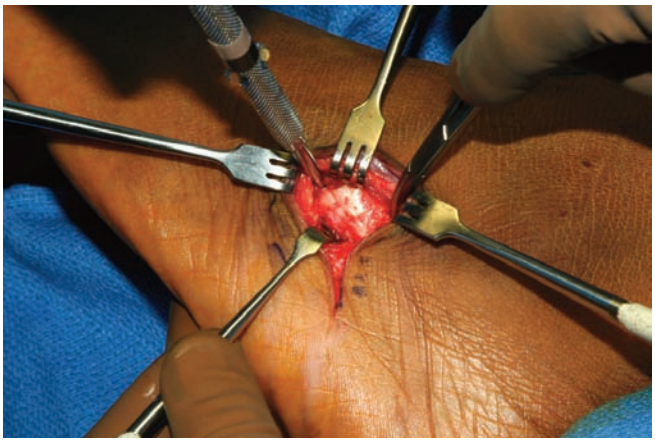

Figure 6. Identification of the calcaneo-cuboid joint.

expose the majority of the extensor digitorum muscle belly (EDB). This dissection is not extended inferiorly over the peroneal tendons. The subcutaneous layer overlying the tendons is undermined without dividing the tissue and a Ragnell retractor is inserted inferiorly to protect the sural nerve (Figure 3). Adequate reflection of the superficial fascia gives linear access to the lateral aspect of the calcaneus lying beneath the EDB muscle.

The deep fascia is then incised along the inferior margin of the EDB muscle, above the course of the peroneal tendons. The Ragnell retractor is then reinserted beneath the peroneal tendons to expose the periosteal surface of the inferior lateral calcaneal wall. The EDB muscle belly is then gently separated and retracted from the dorsolateral aspect of the calcaneal cuboid joint and wall of the calcaneus (Figure 4). Proximal attachments of the EDB may need to be released over the entrance to the sinus tarsi.

With reflection of the extensor digitorum muscle belly superiorly and the peroneal tendons inferiorly, the lateral aspect of the calcaneus is exposed (Figure 5). Next, the calcaneal-cuboid joint is identified. A Freer elevator is introduced into the joint (Figure 6) to appreciate its orientation and alignment. The osteotomy must be made parallel to the calcaneal-cuboid joint.

Once the obliquity of the joint is visualized, a periosteal incision is made approximately one centimeter proximal and parallel to the calcaneal-cuboid joint (Figure 7). A Freer elevator is used to reflect the periosteum several millimeters in the proximal direction from the incision line. The periosteum is specifically left intact distally as to avoid disruption of the dorsal calcaneal-cuboid joint ligaments.

At this point, a sagittal saw is used to cut the calcaneal osteotomy. The osteotomy is made approximately 1 cm proximal, and parallel, to the calcaneal-cuboid joint (Figure 8). The osteotomy technique includes cutting of the lateral, dorsal and plantar cortices. The medial cortex of the calcaneus is contacted but not transected, creating a stable hinge for distracting of the osteotomy.

An AO "mini-distractor" is inserted to distract the osteotomy. Then 0.062 inch Kirschner wires are inserted on either side of the osteotomy in a dorsolateral to plantar-medial orientation. The osteotomy is then dialed open

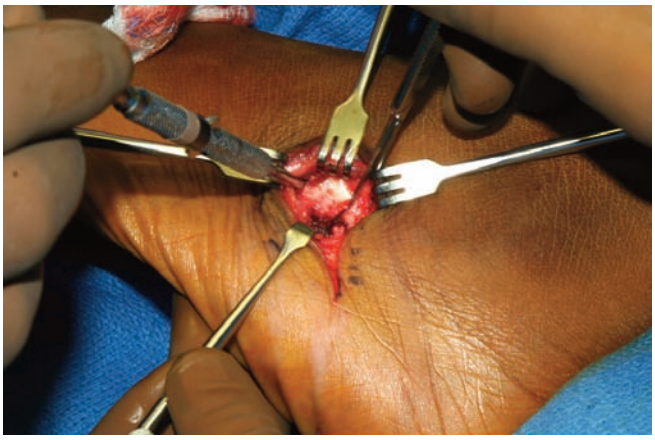

Figure 7. Periosteal incision.

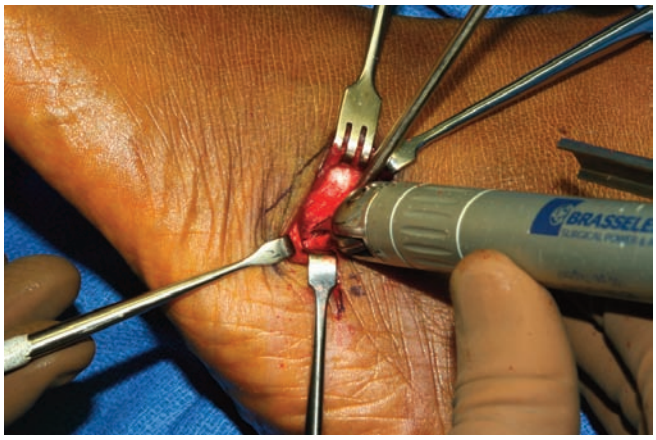

Figure 8. Osteotomy, 1cm proximal and parallel to the calcaneo-cuboid joint.

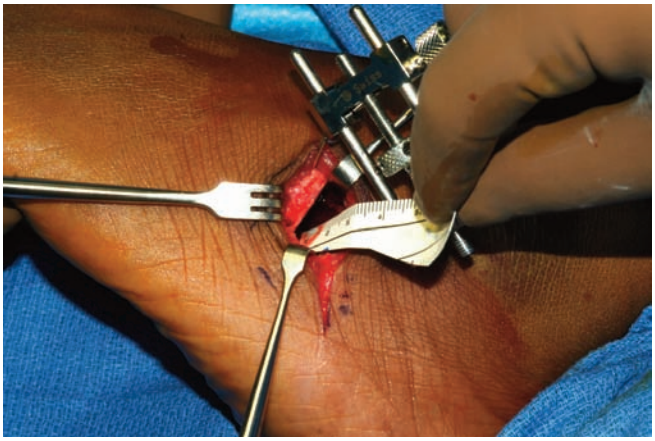

Figure 9. Measuring for the appropriate-sized graft.

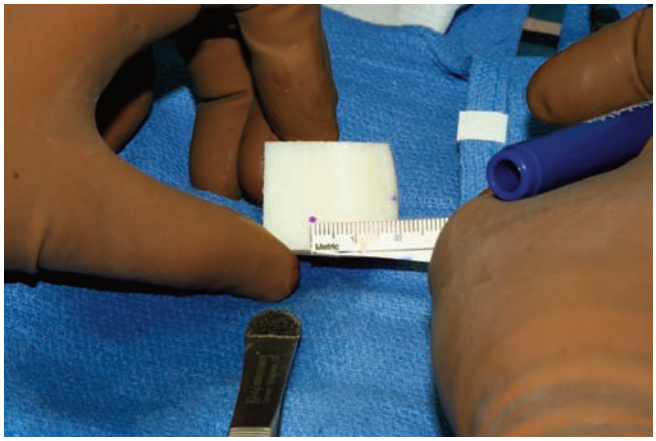

Figure 10. Fashioning the graft.

approximately one centimeter and range of motion of the subtalar and midtarsal joints is evaluated. With adequate correction, the talar head should be captured securely within the medial rim of the navicular. This can be assessed with both manual manipulation and intraoperative fluoroscopy.

Once the desired amount of correction is attained, the width and depth of the distracted osteotomy are measured (Figure 9). A piece of iliac crest allograft is then fashioned to fit the open defect of the calcaneus. A truncated wedge typically provides the best fit, as it mirrors the internal shape of the calcaneus (Figures 10, 11). Once prepared, the graft is inserted into the distracted osteotomy and gently tapped into place with a mallet and tamp. The graft should be implanted so that it is not proud, rather resting within the walls of the surrounding calcanues (Figures 12, 13). The distractor is then dialed closed and removed. If the osteotomy and graft are stable, no internal fixation device has been found to be necessary. The final outcome is then reassessed by clinical manipulation and intraoperative fluoroscopy.

A 3-0 absorbable suture is used to close the EDB muscle belly over the lateral calcaneus and bone graft (Figure 14). The rich vascularity and migration of mesenchymal cells from the muscle tissue provide an optimal environment for graft incorporation within the calcaneus (15). The subcutaneous layer is then re-approximated with an absorbable 4-0 suture and the skin re-approximated with an absorbable 5-0 subcuticular stitch.

Postoperatively, a sterile dressing and below-knee Jones compression cast are applied. Within one week, the initial dressing is removed and a permanent cast applied if swelling has resolved and the wound status is acceptable. Patients should be kept non-weightbearing for approximately 6 weeks, after which they can be transitioned to a walking boot.

CONSIDERATIONS

When correcting pes valgus deformities, a variety of adjunctive procedures are often necessary and coupled with the Evans osteotomy. Most commonly utilized procedures include gastrocnemius recession, Young's tendon suspension, cotton osteotomy, and medial column fusions.

Figure 11. Fashioning the graft.

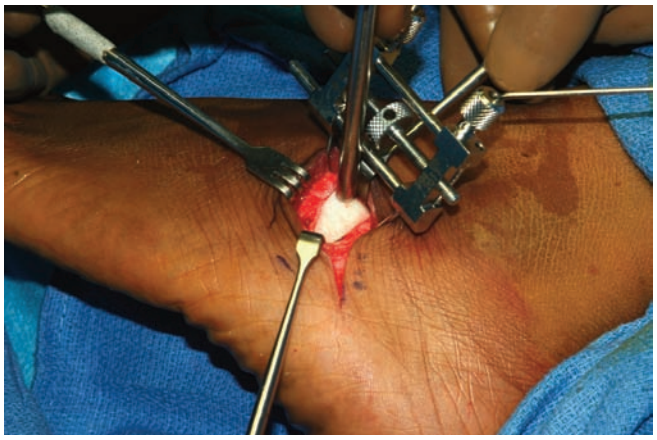

Figure 12. Graft insertion.

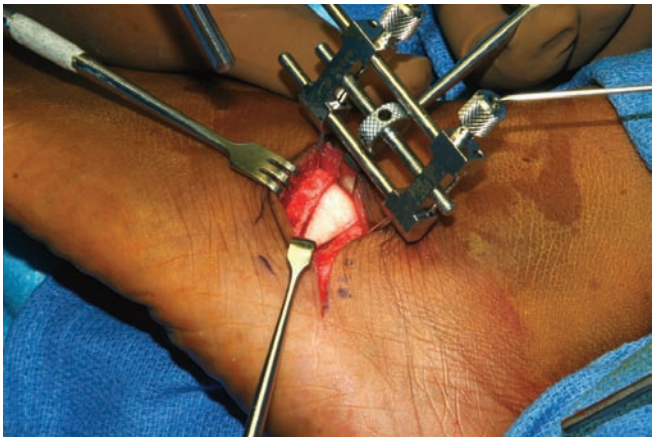

Figure 13. Graft placement within the calcaneus.

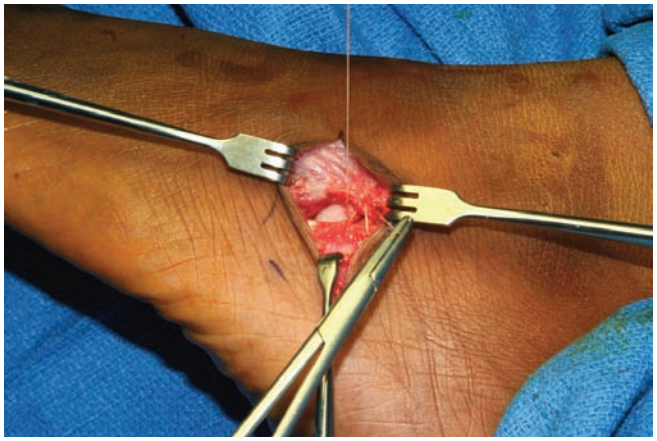

Figure 14. Re-approximation of EDB over graft.

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