Non-operative treatment: Two to three months of custom accommodative orthotics are tried. EVA (ethylvinylacetate), soft rubber-like inserts, are preferred.

Useful for Grade 2 deformities. The foot should be reducable at the talonavicular joint in equinus. As the heel cord is contracted, the foot cannot be totally reduced to neutral. If the talonavicular joint does not move enough to allow the heel to invert, and the forefoot to be pronated to neutral, the deformity is really Grade 3, and a triple arthrodesis is preferred.

“All-American” operation: The following sequence is preferred for the multiple procedures.

Excision of Posterior Tibial tendon (PTT): The tendon is excised from the navicular tuberosity to the area of the medial malleolus. A small stump is left distally, if one wants to transfer the flexor digitorum longus (FDL) to the PTT insertion. Histologically, the tendon has become fibrocartilage, and has areas of mucinous degeneration and intratendinous clefts. Therefore it cannot be tightened or salvaged.
FDL exposure: This tendon is found through the PTT sheath, and exposed beyond the Master Knot of Henry, to the area where it becomes larger, as it becomes the four slips which travel to the lesser toes. It is sectioned here. A transfer of the distal portion of the FDL to the flexor hallucis longus (FHL) tendon is not necessary, as the intrinsic muscles of the foot will continue to flex the lesser toes.

Heel cord lengthening: A triple-cut lengthening is performed percutaneously, two hemisections medially, and one laterally.

Distal calcaneal osteotomy: This is performed vertically, 1.2 cm proximal to the calcaneocuboid joint. This cut falls between the anterior and medial calcaneal facets, although they cannot be seen from this approach. The peroneal tendons and sural nerve are protected inferiorly. The osteotomy is spread open with a lamina spreader, correcting the foot abduction and creating an arch. The long plantar ligament is probably responsible for the bowstringing effect of the osteotomy.

Calcaneal tuberosity osteotomy: The tuberosity is cut with a saw, perpendicular to the long axis of the calcaneus. The osteotomy is spread open with a large lamina spreader to free and stretch the medial periostium and muscles. The tuberosity is then shifted medially 5-10 mm, depending on the magnitude of the deformity. It may be held there temporarily with a stout K-wire. Two 6.5 mm short-threaded lag screws are placed across the osteotomy site (45-55 mm long). They are stacked vertically. Axial and lateral radiographs confirm that the screws are in the bone.

Iliac crest bone graft: A tricortical structural graft is taken from the anterior crest, behind the lateral femoral cutaneous nerve. It is cut with a small saw, with a slight taper. The length is determined from how much is needed to fill the space in the spread distal calcaneal osteotomy. We have used grafts from 5-16mm in length, depending on the amount of the deformity.

The graft is inserted into the spread distal calcaneal osteotomy. Bone tamps are used and the lamina spreader is gradually withdrawn as the graft is inserted. Avoid tapping in the center of the graft to prevent breakage. Lining up the cortices will prevent late collapse. A nonlagged cortical screw (3.5-4.0 mm diameter) is placed from the tip of the anterior process of the calcaneus, aimed posteriorly, across the graft, into the lateral portion of the calcaneus. Anteroposterior and lateral radiographs of the hindfoot confirm graft and screw placement.

The FDL tendon is then attached to the stump of the PTT by looping it through a stab incision in the stump, medially. Alternatively, it may be placed through 4.5 mm drill holes in the navicular or medial cuneiform.

Additional procedures: Occasionally a plantarflexing, opening wedge osteotomy of the first metatarsal base may be added to further “desupinate” the first ray. An additional small wedge graft may be taken from the iliac crest, placed in a transverse metatarsal base osteotomy, and fixed with a screw. Alternatively, the base of the first metatarsal can be fused to the medial cuneiform, with or without a wedge graft, if the joint is arthritic or hypermobile. The naviculocuneiform joint may be treated similarly.

A tenotomy of the peroneus brevis tendon may be done if it is excessively tight, or a peroneus brevis to longus transfer may be done, if preferred.

A gastrocnemius slide procedure may be substituted for the heel cord lengthening in active patients with mild to moderate deformities, if desired.

After treatment: A bulky Jones-type of dressing is applied postoperatively. The foot is maintained at neutral. At three weeks, the staples are removed and the patient is placed in a cam “walker” boot, but is not allowed to bear weight. They may remove the boot and do gentle dorsiflexion-plantarflexion exercises throughout the day. Eight weeks postoperatively, they may begin partial weightbearing in a large shoe, gradually adding approximately 25 pounds every 3 days until full weightbearing is reached.
At three months postoperatively the foot is still somewhat swollen, stiff and tender. This is normal and is called the “three-month-blues.” Reassurance is needed, and at four months most of the symptoms resolve. If pain or tenderness continues posteriorly or laterally, screw removal after four to six months generally resolves the problem. The screws can be removed as an outpatient, and the patient may bear weight quickly. Approximately one-third of the patients will need some or all of the screws removed.

**Complications:** Painful hardware is common. Undercorrection, overcorrection, block nonunion, and late collapse have been seen infrequently. The procedure will fail in patients with diabetic neuropathy and a fusion should be performed instead. With hyperelasticity the foot may collapse later and require a triple arthrodesis. If recognized preoperatively, additional medial column arthrodeses for stability have been successful in hyperelasticity.

**References:**


