CHAPTER **11**

POSTERIOR CALCANEAL DISPLACEMENT OSTEOTOMIES FOR FLEXIBLE PES PLANUS DEFORMITY

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It is apparent that there are various causes of pes planus; therefore it is understandable why an abundance of surgical options are available. Any procedure for the correction of flexible flatfoot should be done for disabling pain, and then only after all conservative measure have been exhausted. Flexible pes planus or adult acquired flatfoot deformity caused by posterior tibial tendon insufficiency rarely requires surgical treatment, because conservative therapy in the form of orthoses, anti-inflammatory medication, corrective shoes, immobilization and physical therapy modalities will usually cause symptoms to subside.[1] Although, orthotics are a mainstay of treatment for pes planus it is important to realize that orthotics may actually make the patient's symptoms worse, until a concomitant heel cord contracture is relieved, and orthotics will not alter osseous relationships and may therefore be ineffective.

Certain general principles should be followed in the treatment of flexible pes planus deformity. Surgical management of pes planus is very dependent on the age of the patient, the severity of the symptoms and deformity, and the etiology of the flatfoot. The goals of any therapy are relief from pain, biomechanical control of excessive pronation, restoration of function, and prevention of the progression of deformity.

Surgical intervention should be considered when conservative therapy fails, the unstable foot is not controlled by orthotics/mechanical devices, and secondary changes are present or can be definitely predicted. Achilles tendon lengthening procedures are frequently required in surgery for pes planus deformity. It is important to realize that a continued lack of sufficient ankle dorsiflexion will doom any excellent surgical correction to failure. There is no universally accepted surgical procedure for correction of the pes planus deformity; an almost endless list of operative procedures has been available for pes planus since the late1800s. It has been recognized that surgical procedures can be categorized by planal dominance (Table 1), osseous versus soft tissue procedures and medial column versus calcaneal procedures. These surgeries are frequently performed alone or in conjunction with each other.

The posterior calcaneal displacement osteotomies (varus-producing osteotomies) restore the normal angle of the long axis of the calcaneus to the floor in the pes planus foot. (Table 2) Osteotomies of the posterior calcaneus have general similarities in approach, function, management, and indications. The purpose of each posterior column osteotomy is to realign the calcaneus to assume normal architecture and function.[2] This concept for treating the valgus heel with a calcaneal osteotomy is well described and understood. Realignment of the calcaneus positions the heel perpendicular to the supporting surface and aligns the ankle so that the weight passes centrally through it. The medial shift of the calcaneus alters the biomechanical axis of the lower limb, reducing the valgus thrust on the hindfoot. By displacing the calcaneus medially, it also re-directs the pull of the gastrocnemius-soleus muscle group slightly medial to the axis of the subtalar joint. This effectively places the Achilles tendon slightly medially, increasing its varus pull on the hindfoot.[3,4] As the hindfoot supinates, the medial longitudinal arch is supported, preventing midfoot collapse.[4] Functional alignment allows normal eversion for shock absorption, even though the heel functions vertically.

The disadvantages to the posterior calcaneal displacement osteotomies include its inability to correct for a large amount of forefoot abduction. Patients with a large amount of forefoot abduction may require a distraction arthrodesis of the calcaneocuboid joint. Recent cadaveric studies have alluded to the fact that posterior calcaneal displacement osteotomies may alter the distribution of contact stresses in the tibiotalar joint, which may predispose the ankle joint to degenerative changes.[5,6]

In 1893, Gleich[7] described an oblique osteotomy through the body of the calcaneus midway between the posterior lip of the STJ and the Achilles tendon insertion, allowing triplanar correction of the posterior calcaneus and tuberosity via primarily medial and plantar displacement. The goal of this surgery was to restore the calcaneal pitch angle. Subsequently, other authors have reported on treatment of flatfoot with calcaneal osteotomy, performed with a variety of techniques.[8-11]

Myerson et al discovered that the posterior calcaneal displacement osteotomy with the flexor digitorum longus tendon transfer provided correction of the talo-first metatarsal angle on both the AP and lateral radiograph, improved the talar head coverage with the talonavicular joint, and provided structural support to the medial longitudinal arch.[8] Myerson and Corrigan[12] treated 32 patients with stage II posterior tibial tendon dysfunction with a calcaneal osteotomy (Koutsogiannis procedure) and flexor digitorum longus tendon transfer with a improved result in the 94% of the patients.

The concepts of medial displacement calcaneal osteotomies are similar with certain modifications. The Koutsogiannis osteotomy[11] displaces the posterior calcaneal fragment, with heel-cord insertion and weight-bearing tubercle medially, to neutralize abnormal pronatory forces. This osteotomy occurs in the posterior third of the calcaneus and is typically combined with a transfer of the FDL tendon and medial talonavicular capsular plication. This osteotomy is considered one of the more popular posterior calcaneal displacement procedures. Other posterior calcaneal displacement procedures include the Gleich, Lord, Silver, Dwyer, and Scarf; all of which are variations of the Koutsogiannis osteotomy.

OPERATIVE TECHNIQUE (KOUTSOGIANNIS OSTEOTOMY)

The posterior displacement calcaneal osteotomy is performed with the patient positioned in the lateral decubitus position. The incision is made approximately 1.0 cm posterior to the tip of the lateral malleolus and 1.0 – 2.0 cm anterior to the insertion of the Achilles tendon. The incision extends from the superior border of the calcaneus anterior to the retrocalcaneal space, to the inferior border of the calcaneus deep to the plantar fascia (the incision passes obliquely in an anterior and distal direction). The sural nerve and peroneal tendons are avoided. The dissection is continued down to the periosteum, which is reflected at the proposed osteotomy site, and a transverse osteotomy is made in line with the skin incision with a large oscillating saw blade. The cut is made approximately 1 cm posterior to the posterior process of the talus to avoid violating the articular surface. The cut is made perpendicular to the lateral border of the calcaneus and is inclined posteriorly at an angle of approximately 45° to the plane of the foot. No wedge is removed from the calcaneus, and the tuberosity is not shifted into varus. Care is taken not to overextend the saw blade to avoid damage to the medial neurovascular structures. A toothless lamina spreader is placed in the osteotomy site and spread to relax the medial soft-tissue attachments to the calcaneus. The lamina spreader is withdrawn, and the posterior calcaneal tuberosity is then translated 1.0 – 1.5 cm medially and secured with a 6.8-mm or 7.3 mm cannulated self-drilling self-tapping screw. Care is taken to keep the posterior tuberosity from sliding proximally. To ensure rigid fixation and avoid inserting the screw into the posterior facet of the subtalar joint, the screw is inserted from posterior, medial, and inferior to anterior, lateral, and superior, ie. directed toward the sinus tarsi. A drain is then placed before wound closure due to increased bleeding from the calcaneal osteotomy.

When an Achilles tendon lengthening is performed in conjunction with this procedure, the lengthening is completed prior to the posterior calcaneal displacement osteotomy. Other common adjunctive procedures include a flexor digitorum longus tendon transfer, which is completed after the calcaneal osteotomy.

POSTOPERATIVE COURSE

The foot is immobilized in equinus and varus nonweightbearing cast for 4 weeks, and then a more plantigrade position is assumed in the cast over the subsequent 2-4 weeks. Patients commence ROM exercises at 6-8 weeks and are placed in a camwalker type boot for 2-4 more weeks. Normal activities including sports are permitted by 6 months; provided that patients are able to perform repetitive heel rises without pain.

CONCLUSION

The medial displacement osteotomy of the calcaneus offers an option in the treatment of flexible pes planus deformity. It offers mechanical advantages resulting in improvement in radiographic parameters and provides adequate reduction in the hindfoot valgus deformity.

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