10:38 – 11:16 am

Session 4: Flatfoot

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Session 4: 10:38 am

Posterior Tibial Tendon Recovery after Evans Procedure in Stage 2 Adult Acquired Flatfoot

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INTRODUCTION
Adult acquired flatfoot deformity (AFFD) stage II has been described by Johnson and Strom (1) as a flexible flatfoot deformity with pain due to dysfunction of the posterior tibial tendon (PTT) without complete rupture of the tendon. Patients are unable to perform a single-leg heel rise with inversion of the hindfoot. Operative management usually involves combination of bony and soft-tissue procedures (2). Augmentation of the incompetent posterior tibial tendon with the flexor digitorum longus (FDL) is commonly performed to restore dynamic function of the posterior tibial tendon. Associated bony procedure attempts to treat the underlying deforming forces due to bony deformity and protect PTT augmentation. Among bony procedures, opening wedge osteotomy of the anterior calcaneus has been described by D. Evans (3). Although originally described as a treatment for flatfoot deformity in pediatric patients, it is currently performed associated with PTT augmentation in adults with satisfactory results (4, 5). Conservative orthotic treatment has been documented to be a viable option in stage II (6, 7, 8). However it includes potential long-term dependence upon a brace that leads most patients in our practice to ask for a surgical treatment. Because of the lack of strong evidence in favor of PTT augmentation in the surgical management of
stage II AFFD we proposed our patients a treatment limited to bony realignment by Evans calcaneus osteotomy and tendons balance by lengthening of Achilles and peroneus brevis tendons. The goal of the study was to clinically evaluate the recovery of the posterior tibial muscle strength with this conservative surgical treatment.

**MATERIAL AND METHODS**

Indication for surgery was symptomatic stage II AFFD refusing orthotic treatment. Diagnosis of adult AFFD was based on patient history and clinical examination. Only feet that lack of active hindfoot inversion during single-support heel rise test associated with passively correctable deformities were included in this series. Patients with complete posterior tibial tendon rupture were excluded. Surgery was performed by the senior author. Case collection began in February 2004. Posterior tibial muscle strength recovery was assessed by an independent observer with a two-years minimum follow-up.

The main outcome measures were posterior tibial muscle strength, passive mobility of the subtalar joint and radiographic correction of the deformity. Posterior tibial muscle strength was clinically assessed with single-support heel rise test. Radiographic measurements were obtained from standard weightbearing AP and lateral radiographs of the foot as well as hindfoot standing alignment radiographs. AP talonavicular coverage angle and lateral talo-first metatarsal angle were measured using the technique described by Sangeorzan et al. (9). Hindfoot frontal alignment was measured according to the technique described by Méary et al. (10).

Other outcome measures included rating scales and bone union. The American Orthopedic Foot and Ankle Society (AOFAS) Ankle hindfoot score (11) was used to quantify the clinical outcome. Patients were asked regarding their footwear requirement utilizing an item from the AOFAS Midfoot score. Non-union was defined as painful incomplete radiographic healing 6 months postoperatively. Specific attention was given to the subtalar joint during examination: stiffness, spontaneous pain or pain from mobilization of the joint was reported.

Statistical analysis comparing preoperative and postoperative AOFAS scores and radiographic measurements was performed. Statistical significance was defined as a p value of less than 0.05 using the Student paired t-test.

**SURGICAL TECHNIQUE**

Peroneus brevis tendon was lengthened first with two hemisections were performed allowing the tendon to shear longitudinally and to lengthen without complete transection. The equinus was addressed using an Achilles tendon triple hemisection percutaneous lengthening procedure. The calcaneal osteotomy was performed along the posterior facet from lateral to medial keeping the medial cortex intact. As opening the wedge osteotomy using a lamina spreader correction of the midfoot abduction was obtained. The length of the interposition tricalcium phosphate wedge was based on the amount of opening required to induce correction of the midfoot abduction while keeping a normal eversion thus preventing from overcorrection. Fixation was completed with a lateral staple. The foot was placed into a well-padded splint that was then replaced by a non-weight bearing fiber splint for a 6 weeks period. After documented bone healing, splint was removed and patients were instructed to weight bear on the operated foot as tolerated and start rehabilitation in order to gradually return to full activities.

**RESULTS**

Twenty feet were operated on. The patient population included 17 patients (15 females, 2 males). The average age at the time of surgery was 51 years (range, 19 to 73). All feet but 3 had additional forefoot procedures. All osteotomies healed. One case presented persistent postoperative subtalar pain requiring subtalar fusion at one-year post op.
Evaluation of the 16 remaining feet was performed at an average of 4 years (range 24 to 76 months with 11 feet having follow-ups greater than 3 years). All feet performed single-support heel rise test with 13 feet presenting active inversion of the hindfoot during elevation. Mild subtalar pain was observed in 4 feet. Subtalar joint mobility was assessed as normal in 13 cases and limited in 3. No calcaneocuboid pain was observed.

Significant radiographic improvements were observed: AP talonavicular coverage angle improved from mean 27.3° (range 17° to 35°) preoperatively to 5.9° (range 0° to 10°) at follow-up (p < 0.001); lateral talo-first metatarsal angle improved from mean -13.9° (range -3° to -29°) preoperatively to 1.9° (range -2° to 8°) at follow-up (p < 0.001); hindfoot frontal alignment angle improved from median 7.6° (range 4° to 12°) preoperatively to 3.7° (range 1° to 11°) at follow-up (p < 0.001). The American Orthopedic Foot and Ankle Society (AOFAS) Ankle hindfoot score improved from 38 (range 22 to 72) to 89 (range 65 to 100). All patients returned to normal footwear.

DISCUSSION

The results of this study support the ability of the PTT to recover in stage II AFFD. Bony procedures usually attempt to treat the underlying deforming forces due to deformity to protect PTT augmentation. In this series, balance and deformity correction allowed deficient PTT to recover in 81% of cases. This questioned our understanding of early flatfoot acquired deformity (12) as well as the mechanics and effects of the modified Evans osteotomy we performed.

REFERENCE

5. Hintermann, B; Valderrabano, V; Kundert, HP: Lengthening of the lateral column and reconstruction of the medial soft tissue for treatment of acquired flatfoot deformity associated with insufficiency of the posterior tibial tendon. Foot Ankle Int. 20:622 – 629, 1999