

Subcapital Talar Head Wedge Osteotomy for Correction of Pediatric Flatfoot Deformity

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Introduction

Pes Planovalgus has become an increasingly problematic issue as seen among the pediatric population [1]. Multiple underlying causes attribute to the deformity including idiopathic, neuromuscular diseases, tarsal coalitions, and presence of an accessory navicular. Proper physical examination can assist in determining the driving force for the deformity. Likewise, pediatric flatfoot deformity often presents as a dynamic condition where weight bearing of the affecting extremity is required to unmask the planal dominance of the deformity [1]. Common flexible flatfoot exists when heel valgus can be corrected into a neutral or slight varus position. The forefoot supination as well as Achilles and gastrocnemius contractures are also key assessments that need to be made and are integral in determining the type of surgical correction necessary [2].

Typically, patients exhibit a flatfoot deformity which largely exists in the frontal plane. This deformity typically occurs at the STJ resulting in subluxation. In this setting, subtalar joint arthrodesis is the preferred procedure with favorable outcomes [3]. In frontal plane deformities, the STJ axis is altered to be more perpendicular to the frontal plane leading to more calcaneal eversion than talar abduction. When axis is altered in the frontal plane, the talus abducts beyond normal, resulting in failure of the facet-locking mechanism of the posterior, anterior & middle facet [1].

Those with transverse plane deformities, occur in the lateral column of midtarsal joint by forefoot abduction (Fig. 1ab) [4]. These patients will have normal function of posterior tibial tendon, but presents with an axial change of subtalar joint or oblique midtarsal joint. Staging of the deformity as determined by imaging and clinical evaluation can be the determining factor in procedure selection. In those with the condition, gastrocnemius contracture is typically present. The type of equinus present must be identified and corrected as to help in elimination of deforming forces.

Largely, the determination of conservative versus surgical treatment is dependent upon the level of rigidity of the deformity and how symptomatic the patient may be. In determination of the surgical treatment required, serious consideration must be taken to identify the planal dominance of the deformity.

Multiple procedures can be useful in the surgical correction of pediatric flatfoot frontal plane deformity [1-3], however the use of a talar head opening wedge osteotomy may prove to be a large contributor and the ability of correcting transverse plane deformities in pes planovalgus.



Figure 1a. AP view of left foot transverse plane flatfoot deformity



Figure 1b. Posterior view of left foot transverse plane flatfoot deformity



Figure 2a. Lateral view demonstrating transverse plane flatfoot deformity with fault of the talonavicular joint.



Figure 2b. AP view demonstrating transverse plane flatfoot deformity with increased Talo-calcaneal angle



Figure 3a. Exposure to talar head



Figure 3b. Demonstrating placement of subcapital osteotomy of talar head



Figure 3c. Fixation of subcapital head closing wedge osteotomy.

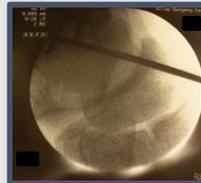


Figure 4a. Fluoroscopic image confirming proper placement of smooth Steinmann-pin fixation to maintain adequate correction



Figure 5a. Lateral view demonstrating reduction of Meary's angle.



Figure 5b. AP view demonstrating restoration of talocalcaneal angle.

Case Study

A 15 year old African American male patient presented to the office with a painful bilateral flatfoot for 2 years. The patient had conservative treatment including custom made orthotics for one year without success. The patient is unable to participate in sports and has difficulty standing or walking for long periods of time at school.

Upon clinical examination, both feet appeared flat non-weight bearing. The patient was noted to have a semi-rigid deformity. Reduction of the talonavicular joint and subtalar joint to neutral with forced plantarflexion of the ankle was observed. Silfverskiöld test was positive with knee flexion and extension and with only a 10-degree plantarflexion.

Radiographs were obtained (Fig. 2ab) demonstrating a talo-navicular fault on the lateral view with increased talo-calcaneal angle and increased cuboid-abduction angle on the AP view. The findings were consistent with a transverse plane flatfoot deformity.

Surgical Technique

A Z-plasty tendoachilles lengthening and medializing calcaneal osteotomy were performed, reducing the equinus contracture and calcaneal position.

When treating a transverse plane flatfoot deformity, identifying the center of rotation and angulation (CORA) of the deformity is imperative. Here, a talo-navicular fault was observed and responsible for the transverse flatfoot deformity. Due to the deformity being semi-rigid, osseous correction would be required for favorable results. Using a sagittal saw, a sub-capital osteotomy closing wedge was performed and fixated using a smooth steinmann-pin (Fig. 3a-5b).

The patient remained NWB for 6 weeks in cast. Following radiographic evidence of union across the osteotomy site, the patient was transitioned into a CAM walker. At 12 weeks the patient was full weight-bearing and ambulating in a shoe.

Discussion

Understanding the planal dominance of pediatric flatfoot is necessary for the surgical correction of pediatric flatfoot. Flatfoot deformity includes excessive plantarflexion of the talus, an abducted and dorsiflexed navicular, STJ eversion, and an externally rotated and valgus calcaneus [5]. These characteristics of flatfoot can be seen on radiograph as increased talonavicular uncovering, a TN fault, talar beaking, possible anteaater sign or C-sign, decreased calcaneal pitch, increased talar declination, and forefoot abduction.

With our case study, the patient exhibited a transverse flatfoot deformity. To correct for the transverse plane deformity the subcapital talar osteotomy was used. In a review of the literature for management of transverse plane flatfoot deformity, few studies have been published demonstrating the efficacy of the procedure. In a retrospective study, Grumbine (1987) described the use of a subcapital talar head osteotomy in 47 patients, noting favorable results [6]. In 2004, Grumbine published a follow up retrospective study of 215 procedures in 117 patients between 1976 and 2004 with a minimum of 1 year follow up [5]. In this study, 58(26.9%) of patients demonstrated excellent results, 121(56.4%) good results, 23(10.7%) fair results, 10(4.6%) poor results, and 3(1.4%) failure. Interestingly, of the 215 procedures, only 1 patient went on to develop avascular necrosis (AVN) of the talar head, a presumed feared complication of the procedure.

In the present case study, the authors noted excellent results in the correction of transverse plane flatfoot through the use of a subcapital talar head closing wedge osteotomy. When evaluating the planal dominance of flatfoot deformity, the foot and ankle surgeon should consider this technique in conjunction with additional corrective procedures in the treatment of transverse dominate pediatric flatfoot deformity.

References

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