Plantar Closing Base Wedge Osteotomy of the Medial Cuneiform for Treatment of Symptomatic Pes Planovalgus Deformity in the Pediatric Population

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INTRODUCTION

Symptomatic stage II pes planovalgus deformity may stem from a variety of etiologies and may present with a wide range of associated deformities. A pes planovalgus deformity is characterized as a medial arch sag, predominantly at the navicular-cuneiform joint, leading to progressive hindfoot valgus, collapse of the medial column, and ultimately forefoot supination. In addition, the forefoot may exhibit a varus deformity in the frontal plane. If such a deformity is not appropriately addressed during correction, it has been shown to cause recurrence of the flatfoot deformity.

Plantarflexory osteotomies of the medial cuneiform and/or arthrodesis of the medial column have been effectively proven to address the forefoot varus deformity associated with pes planovalgus. The authors of this paper present a plantar closing wedge osteotomy of the medial cuneiform (PCWOMC) as an ancillary procedure for correction of symptomatic stage II pes planovalgus deformity, which hold advantages as compared to the traditional medial cuneiform opening wedge osteotomy.

MATERIALS / METHOD

All patients requiring operative management of Stage II PTTD between April 2019 and June 2020 were prospectively entered into a database. Those patients that received a plantar closing wedge osteotomy of the medial cuneiform (PCWOMC), alongside adjunct procedures, were reviewed retrospectively. In general, the decision to perform a PCWOMC was determined intraoperatively. Patients in our study underwent correction of Stage II PPTD with a combination of the following procedures: calcaneal lengthening osteotomy (Evans) with/without internal fixation or medializing calcaneal osteotomy; posterior tibial tendon plication and strengthening; and a plantar closing wedge osteotomy of the medial cuneiform. Two patients in our study underwent application of TL-Hex External Fixator (Orthofix™ Medical Inc. 2020) for gradual correction in addition to the noted procedures. An assessment for the presence of forefoot supination was performed both preoperatively and intraoperatively. The hindfoot was passively corrected to neutral and the talar head positioned for appropriate talonavicular coverage. If forefoot supination was present, a medial column procedure was performed, specifically in those patients with a mildly unstable 1st tarsometatarsal joint and no presence of arthritic changes. Patients with the presence of arthritis of the 1st tarsometatarsal joint or severe instability were excluded from the study.

During this period, 7 feet in 6 patients underwent a flatfoot reconstruction with a PCWOMC under the senior author (M.E.S). All patients received greater than 12 months follow-up. Radiographic analysis was collected preoperatively, intraoperatively, and postoperatively for all patients. Therefore, all 8 feet in 7 patients were included in this study. The patient records were reviewed, and demographic, operative, and adverse outcome data was collected. Of the evaluated patients, 2 were female and 4 were male. 1 patient underwent bilateral procedure at 6-month time span between the two procedures. Average patient age was 13.83 years (range, 11 – 16 years). Patients were followed for an average of 12.6 months (range, 12 – 14 months). Patients were monitored based on clinical observation and radiological confirmation.

Standardized, radiological parameters regarding preoperative weight-bearing radiographs were measured in office and validated by the senior author. Standardized radiographs were obtained at a minimum of 6 months following surgery with the final radiographic analysis performed at an average of 10 months. Measurements were conducted by the senior and junior author in order to reduce bias. On the lateral radiograph, talar-1st metatarsal angle and calcaneal inclination angle were measured on the institutions digital imaging system.

RESULTS

Our study looked at 6 patients, 7 feet, with an average follow up of 12.6 months (range, 12 – 14 months) All patients healed uneventfully and where successfully transitioned into an orthotic post-operatively and returned to normal physical activity.

DISCUSSION

If not properly addressed, a residual forefoot varus will result in compensatory eversion from the rearfoot which may lead to eventual failure of any reconstruction efforts. The value of the cuneiform osteotomy has been demonstrated by Hirose and Johnson and Lutz and Myerson[1] in their case series. Both studies showed significant improvements to lateral talus-1st metatarsal angle, calcaneal pitch, and medial-cuneiform-to-ground distance when the Cuneiform was added to a comprehensive flatfoot reconstruction. This study looked at 7 feet and also saw significant improvements to the same radiographic parameters with the added benefit of not necessitating a bone graft. All 7 osteotomies healed without complication.

The main advantage of the PCWOMC is that no bone graft or bone graft substitute is needed and the osteotomy may be manually compressed for appropriate fixation following a medially course incision, rather than dorsal.

One disadvantage to the PCWOMC is that the osteotomy is inherently unstable requiring fixation to prevent any plantar gapping. Comparatively, traditional cotton is known to be stable and does not always require fixation, though most surgeons elect to fixate regardless. 2 of the patients in this study received TL-Hex External Fixators so no internal fixation was required. The remaining osteotomies were fixed with a 10-12mm staple (Arthrex).

A limitation of the study is that the PCWOMC is an adjunctive procedure and therefore it is hard to evaluate the amount of radiographic correction attributable to the cuneiform osteotomy as compared to the hindfoot reconstruction which were varied across patients. Another limitation is the absence of weightbearing post-operative X-rays to quantitatively evaluate improvements in radiographic angles.

The authors recommend the PCWOMC be considered as an alternative procedure to the Cuneiform osteotomy for the management of pes planovalgus. Indications include instability of 1st metatarsal-tarsal joint with arthritic component.

REFERENCES


DISCLOSURE

We have no financial disclosures or conflicts of interest.