Radiographic Evaluation of Medial Arch Correction of the Flexible Flatfoot Using the Cotton Osteotomy

Presenting Author:
Amiethab Aiyer, MD

Additional Authors:
Graham Dall; Jeffrey Shub, BS; Mark Myerson, MD

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Introduction/Purpose: The opening wedge cuneiform (Cotton osteotomy) has been used to correct forefoot supination in flexible flatfoot deformity reconstruction. The purpose of this study was to identify the radiographic effects of the Cotton osteotomy on the medial column joints, the 1st tarsometatarsal (TMT) and naviculocuneiform (NC) joints.

Methods: We retrospectively analysed 67 patients who underwent a Cotton osteotomy as part of a routine flatfoot reconstructive procedure which included a calcaneus osteotomy, peroneus brevis to longus transfer, flexor digitorum longus transfer and gastronemius recession. The indications for use of the Cotton osteotomy included fixed forefoot varus after operative hindfoot correction, in the absence of severe medial column instability or midfoot arthritis where an arthrodesis would have been selected.

We evaluated 12 radiographic parameters including the articular surface angles of the foot, Meary’s angle and a newly defined Medial Arch Sag Angle (MASA), (Fig 1). A matched cohort of 28 patients of patients who underwent a similar flatfoot reconstruction but did not undergo a Cotton osteotomy were compared to the Cotton osteotomy study group patients to identify the effects of the osteotomy.

Results: In all patients who underwent a Cotton osteotomy, there were statistically significant changes in the articular surface angles and medial arch height (p < 0.05). No radiographic secondary sag of the medial column was seen at final follow up. Compared to 28 matched controls, the use of the Cotton osteotomy did not statistically significantly alter the postoperative Meary’s angle but it did significantly improve the MASA by 6.5 degrees (p=0.002) . Sag of the medial arch was improved via plantarflexion through the TMT and NC joints. Arch height was also improved with use of the Cotton osteotomy, but this was not statistically significant.
Conclusion: The data indicates that the MASA is a useful radiographic measurement for assessing midfoot collapse, in the setting of pes planovalgus. The current study demonstrated the corrective capacity of the Cotton osteotomy on the MASA, with increased plantar flexion through both the NC and 1st TMT joints, although the effect was more noticeable at the 1st TMT joint. The current study demonstrates that either a TMT or NC arthrodesis may not be routinely warranted for medial column stabilization in the setting of flatfoot reconstruction.

Fig 1: Schematic and radiographic measurement of the medial arch sag angle (MASA). The MASA was $13^\circ$ preoperatively and $2^\circ$ postoperatively.