PRELIMINARY RESULTS OF THE CALCANEAL SCARF OSTEOTOMY FOR ACQUIRED ADULT FLATFOOT DEFORMITY

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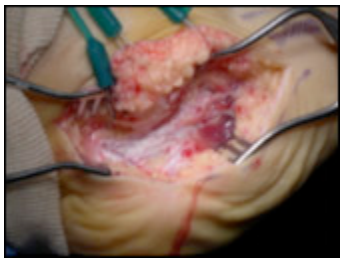
BACKGROUND

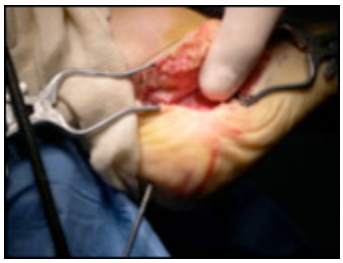
Adult acquired flatfoot deformity (AAFD) is a chronic condition of the foot and ankle that often encompasses weakness of the posterior tibial tendon and may progress to a disabling deformity. The lack of strength of the tendons and ligaments leads to a decreased arch height, increased valgus of the heel, and increased abduction of the midfoot. Depending on the severity of the deformity and failure of non-operative alternatives, there are a multitude of procedures that can be utilized for deformity correction. In the presence of frontal plane deformity of the hindfoot, a Medial Displacement Calcaneal Osteotomy (MDCO) has been shown to be successful in reducing valgus of the heel while preserving joint motion. The Evans Anterior Calcaneal Osteotomy has been shown as an effective alternative for adolescents and adults in correction of the transverse plane deformity. When both pathologies exist in AAFD, these two osteotomies are used in concert to provide planar correction for proper realignment of the foot. The Calcaneal Scarf Osteotomy (CSO) is a procedure that combines the principles of both the MDCO and the Evans through one contiguous osteotomy. The purpose of this study was to provide preliminary results of the CSO for the surgical correction of adult pes valgus

MATERIALS AND METHODS

An extensile, lateral "L" incision is made on the lateral aspect of the heel and a full thickness fasciocutaneous flap is developed to expose the lateral wall of the calcaneus. Care is taken to protect the sural nerve, peroneal tendons, and calcaneofibular ligament.. Using a long osteotomy Guide, a "Scarf" type osteotomy is outlined on the lateral wall of the calcaneus consisting of a dorsal-proximal arm, longitudinal central arm, and plantar-distal arm. The posterior vertical limb is directed at a 45 degree angle from lateral to medial, approximately 1.5 cm anterior to the posterior superior tuberosity. The transverse cut is directed anterior and plantar ward to an area 3 cm proximal to the calcaneal cuboid joint. A distal vertical osteotomy directed at a 45 degree angle is made from the junction of the horizontal osteotomy to the plantar aspect of the calcaneus at this level. An osteotome is used to complete all three cuts through the lateral wall. The CSO is then "mobilized" with the aid of a small laminar spreader. After manual, medial displacement of the calcaneal body (9-12 mm), the laminar spreader is placed in the posterior vertical osteotomy and opened 9-12 mm. At times, it is necessary to release the long plantar ligament under the distal vertical osteotomy to facilitate this maneuver. Under fluoroscopic control with the laminar spreader in place, an axial calcaneal temporary pin is used to maintain position of the osteotomy. Fixation is obtained with a large cannulated screw, which is started using power instrumentation, and completed with a manual screwdriver. The proximal and distal osteotomy "voids" are filled with either tricortical or synthetic bone graft materials, which are sized appropriately and gently tamped into place. The prominent lateral wall of the calcaneus is then tamped

flush with the inferior calcaneal body. The ancillary procedures that were performed in this study were metatarso-cuneiform arthrodesis (n=2), naviculocunieform arthrodesis (n=1), Cotton Osteotomy (n=6), Cobb tendon transfer (n=7), tendo-achilles lengthening (n=12), Subtalar joint arthroereisis (n=1), and repair of spring ligament (n=1).





Measurement	TC Angle	TC Uncover	Talo-1st (AP)	Talo-1st (Lat)	Arch Height	CIA
Mean Pre-Op	25.4	14.8	18.6	13.9	3.5	14.1
Mean Post-Op	20	8.6	7.6	5.4	6.8	19.6
p-Value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001

RESULTS

From 2001 and 2004, 21 patients/24 feet underwent CSO for AAFD. There were 11 females and 10 males. Patients age ranged from 11 to 70 years of age with an mean age of 46. Nine of the procedures were on the right foot and 13 procedures were on the left foot. One patient had the procedure performed bilaterally 12 weeks apart.

The authors retrospectively reviewed 21 patients (22 feet) who underwent CSO for the correction of flexible, AAFD. Weightbearing anteroposterior, oblique, lateral, and axial calcaneal radiographs were taken pre-operatively and at one year post operatively.
Statistical analysis using a paired student t-test was performed on the preoperative and postoperative radiographic angles. Based on the results, there was a statistically significance difference between the pre- and post-operative radiographic measurements. The mean anteroposterior talo-calcaneal angle improved from 25.4 degrees to 19.9 degrees ($p<.001$). There was a mean improvement of talar-navicular uncovering from 14.8mm to 8.6mm ($P<.001$) and arch height from 3.5mm to 6.7mm ($p<.0001$). The mean talar-1st metatarsal angle was decreased on the anteroposterior and lateral views, from 18.6 to 7.6 on AP and 13.9 to 5.4 on the lateral. The calcaneal inclination angle was improved in the lateral view in all patients. At one year follow-up, there was no sign of arthritis in the subtalar or midtarsal joint. There were four patients that required a removal of hardware, while one patient had a wound dehiscence that resolved with local wound care and oral antibiotics. Other than screw removal, there were no revisions necessary and all patients rated their results as Grade II (occasional discomfort, full movement, full activity) on Roles & Maudsley Classification.

DISCUSSION AND CONCLUSION

Calcaneal osteotomies play an important role in the surgical correction of patients with AAFD. The use of the “All-American” osteotomy (MDCO and ECO) has been shown to be beneficial in the treatment of a two-plane AAFD. Malerba described a “Z” Osteotomy of the calcaneus for the frontal plane correction of calcaneal varus. The CSO combines the principles of the transverse and frontal plane correction through a contiguous, scarf type osteotomy in the calcaneus. Our results showed radiographic improvement in all planes after a one-year follow-up and similar subjective results as reported in the literature for the “All-American” procedure.. In addition, there were no non-unions and only one delayed union in this series. In conclusion, the advantages of the Calcaneal Scarf Osteotomy are: (1) ability to correct a two plane deformity through a single, contiguous osteotomy with excellent configuration for rapid healing; (2) patients able to partially bear weight with crutches at 4 weeks post operatively; (3) no post-operative complaints of calcaneocuboid pain; (4) ability to use bone substitutes as bone void fillers, and not rely on the graft to maintain structural alignment. Although the follow up is short term and the results retrospective in nature, the radiographic measurements are compelling. We are in process of doing a prospective study that will include preoperative/post operative ankle-hindfoot scores, pedobarographic E-MED computerized, gait analysis, and SF-36 assessment.

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