Single Medial versus Two-incision Approach for Double Hindfoot Arthrodesis: Is there a Difference in Joint Preparation?
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Introduction/Purpose: Arthrodesis of the subtalar and talonavicular (TN) joints, also known as double hindfoot arthrodesis (DHA) is a reliable treatment option in cases of lower extremity deformity and arthritis secondary to posterior tibial tendon dysfunction (PTTD), congenital abnormalities and other conditions. DHA has traditionally been performed through two incisions; one on the dorsomedial foot and one over the sinus tarsi. Recent reports, however, described a single, medial incision technique with overall satisfactory outcomes. Reports of complications include both non-union as well as recurrent valgus deformity. The purpose of this study was 1) to evaluate the extent of cartilage debrided via each approach, and 2) to evaluate the competency of the deltoid ligament following dissection.

Methods: Seven matched sets of fresh frozen cadaver lower extremities were acquired for this study. One limb from each set was randomly assigned to the single medial incision DHA while the other was assigned to the two-incision DHA. Stress radiographs were obtained for each limb to evaluate for deltoid insufficiency. The calcaneus, talus and navicular were then disarticulated. Photographs of the articular surfaces of the talonavicular and subtalar joints were taken. Using Image J software, total joint surface and residual cartilage was mapped. Percentage of joint surface debrided was determined by the area of denuded bone divided by the total area of the articular surface to allow for comparison across specimens. The mapping process was blinded to the type of debridement undertaken. Repeated measurements were taken to determine intra- and inter-reliability of the measurements. Student t-tests were used to compare percentage of joint surface debrided.

Results: The percentage of cartilage debrided at the calcaneal posterior facet, the posterior surface of the talus at the subtalar joint, and the talar head were significantly different. In the single and two-incision approaches, the average percent debrided was 62.3%+8.85 and 77.9+10.6% for the calcaneal posterior facet (p=0.01), 53.47+7.64% and 73.63+6.96% for the posterior surface of the talus (p<0.01), and 61.1+20.42% and 88.06+6.06% for the talar head (p<0.01). There were no differences in percent debrided at the calcaneal middle facet, the middle surface of the talus at the subtalar joint, or the navicular. In the single incision group, 5/7 (71%) specimens had radiographic evidence of medial talar tilt compared to 1/7 (14%) in the two-incision group. Inter- and intra-reliability were calculated for all measurements with r>0.8.

Conclusion: There was significantly less cartilage debrided from the posterior facet of the calcaneus, the posterior surface of the talus at the subtalar joint, and the talar head in the single incision compared to the two-incision approach. Additionally, more specimens had radiographic evidence of medial talar tilt (deltoid insufficiency) in the single-incision group compared to in the two-incision group. This suggests for the single-incision technique, greater soft tissue dissection is required to reach the posterior articular surfaces, and possibly at the expense of medial ankle stability.
Figure 1. Comparing the average percent of articular cartilage debrided at the subtalar and talonavicular joints in single medial incision vs. two-incision approaches. Significantly less cartilage was debrided in the single medial incision approach at the posterior facet of the calcaneus, the posterior surface of the talus at the subtalar joint, and the talar head compared to the two-incision approach.

*p< 0.05. STJ = Subtalar joint