Calcaneal Osteotomy Safe-Zone to Prevent Neurological Damage: Fact or Fiction?

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Introduction/Purpose: Calcaneal osteotomy is a relatively common procedure used to address hindfoot deformities with a lateral calcaneal slide being utilized in the treatment of varus deformities and a medial slide for valgus deformities. This procedure does put neurological structures at risk. Specifically, a lateral approach jeopardizes the sural and lateral calcaneal nerves, while a medial approach endangers the medial plantar, lateral plantar, and calcaneal nerves. A previous cadaveric study described a neurological “safe zone” 11.2 mm anteriorly from “line A” which was described as extending from the posterior-superior aspect of the calcaneal tuberosity to the origin of the plantar fascia. We performed a retrospective chart review to correlate the positioning of the calcaneal osteotomy and the presence of neurological injuries.

Methods: In this retrospective study, we reviewed charts of patients who underwent calcaneal osteotomy at our institution in the past 5 years (January 1, 2011 to December 31, 2015). All immediate postoperative radiographs were examined and the distance between the calcaneal osteotomy line and line A was measured. If this distance was less than 11.2 mm the osteotomy was defined as “inside the safe zone”, over 11.2 mm was defined as “anterior to safe zone”, and osteotomies posterior to line A were defined as “posterior to the safe zone”. We correlated the positioning of the osteotomy with the presence of postoperative neurological findings, including damage to the sural, calcaneal, or plantar nerves, presenting as paresthesias or numbness in the nerves’ distributions.

Results: Overall, we identified 179 calcaneal osteotomy cases with adequate radiographs and follow-up for inclusion in our analysis. Seven patients experienced postoperative neurological deficits consistent with iatrogenic nerve injury. Of these patients, 28.6% (2/7) had osteotomies anterior to the safe zone with an average distance of 18.40 mm anterior to line A. The remaining 5 (71.4%) received osteotomies inside the safe zone, an average of 7.12 mm anterior to line A. Of the patients who did not sustain nerve injuries 36.0% (62/172) had osteotomies anterior to the safe zone with an average distance of 15.40 mm anterior to line A, 66.2% (107/172) were inside the safe zone with an average distance of 7.84 mm, and 1.7% (3/172) were posterior to the safe zone.

Conclusion: Our findings suggest a clinical safe zone in calcaneal osteotomies may not actually exist. Although not statistically significant due to the low prevalence of nerve injury overall, a greater percent (71.4%) of patients with nerve injuries had their osteotomies performed within the safe zone when compared to neurologically intact postoperative patients (66.2%). This data may indicate the lack of a true safe zone, likely due to wide anatomical variation of the implicated nerves, as described in prior studies. Patients should be properly counseled preoperatively on the low, but seemingly fixed risk of nerve injury before undergoing calcaneal osteotomy.

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