Quantification of Lateral Calcaneus Exposure through the Extensile Lateral and Sinus Tarsi Approaches

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Summary:
The surface area of the posterior calcaneal facet and the lateral calcaneus exposed using the extensile lateral compared to the sinus tarsi approaches was quantified and analyzed with calibrated digital photographs. The sinus tarsi approach provides a similar amount of exposure of the posterior facet compared to the extensile lateral approach; though more of the lateral calcaneal body was exposed with the extensile lateral approach.

Introduction:
The extensile lateral (EL) approach is a commonly used approach for open reduction and internal fixation of calcaneous fractures. However, the sinus tarsi (ST) approach has been proposed as a less invasive alternative to the extensile lateral approach for fixation of certain calcaneus fractures that may reduce wound complications and sural nerve injury. The primary purpose of this study was to evaluate the exposure of the posterior facet with the EL approach compared to the ST approach. We hypothesize that the ST approach will provide a similar exposure of the posterior calcaneal facet.

Methods:
Sixteen sequential ST then EL approaches were performed. Calcaneal landmarks were identified by direct visualization or palpation: anterior process, middle facet, lateral calcaneal body, and posterior facet. The posterior facet was sub-divided into the superomedial, superolateral, inferomedial and inferolateral corners for precise quantification. Calibrated digital photographs of the posterior facet and lateral calcaneal body were taken from a standardized positions, and used to calculate the exposed surface area. Next, we attempted to place three different calcaneal plates (H plate, Y plate, and Wave plate™) on the lateral calcaneus using each exposure. Finally, the horizontal distance from the distal most aspect of the lateral malleolus to the sural and superficial peroneal nerves was measured.

Results:
The average square area of the posterior facet exposed with the ST approach was not significantly different than with the EL approach (331.3 mm² compared to 282.4 mm², p = 0.432). Significantly more of the lateral calcaneal body was seen with the EL approach (1894.8 mm² compared to 1192.2 mm², p = 0.009). Excluding the posterior facet superomedial corner, all of the landmarks evaluated were visualized in 100% of approaches. The superomedial corner could be visualized in significantly more of the cadavers with the EL approach (75% compared to 12.5%, p = 0.0076), and it was able to be palpated in 1/8 of the remaining cadavers in both approaches. The average horizontal distance from the distal aspect of the lateral malleolus to the superficial peroneal nerve was 3.49 + 1.38 cm and 1.91 + 0.32 cm to the sural nerve. Two plates (Y plate and Wave plate™) fit appropriately on the lateral calcaneus in both exposures on all cadavers; one plate (H plate) fit in all EL approaches but only 12.5% of ST approaches.

Conclusion:
The sinus tarsi approach provides a similar amount of exposure of the posterior facet compared to the extensile lateral approach. However, use of the sinus tarsi approach may limit fixation options, particularly the use of larger plates.