Referencing the Center of Rotation of the Talus to Restore Tuber Length in Anatomic Reduction of Calcaneus Fractures

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Introduction: The deforming forces of calcaneus fractures shorten, push into varus, and disrupt its articular surface. The height of the calcaneus depends on restoration of Bohler's Angle (BA) and Tuber Length (TL). Contraction of the gastrocsoleus plantarflexes the ankle around the center of rotation of the talus (COR). The moment arm of the Achilles tendon is the calcaneal tuber. The purpose of this study is to define the COR, assess the TL after reconstruction of the calcaneal tuber and assess its influence on calcaneal height and work of the Achilles tendon.

Methods: An IRB-approved retrospective study included 345 calcaneal fracture operative cases at a level 1 trauma center over 10 years. Of them, 39 cases had lateral x-rays of both operated and uninjured feet. X-rays were sized to each other on the Detroit Bonesetter App, which was used to find BA and COR. The moment arm of the Achilles tendon was defined as the distance from the tendon insertion to the COR of the talus. It was also the measurement used to describe TL.

Results: The average postoperative TL was 5.72 ± 0.47 cm, and the average contralateral TL was 5.99 ± 0.42 cm (p=0.01). This resulted in a calculated average of 4.48% ± 5.28% increased gastrocsoleus work in all patients compared to the contralateral extremity. ORIF had shorter TL compared to CRPF (p=0.02). Eight of the 39 patients had shortened TL despite adequately restored BA.

Conclusions: While BA restoration has served as the operative marker of success for intra-articular calcaneus fractures, it does not consider the change in mechanical work of the Achilles tendon, which may be a better indicator of the functional length of the calcaneus. This study demonstrates that there is increased work on the Achilles with shortened TL even when the reduction has adequately restored BA. Finding COR and referencing it to measure TL compared to the contralateral foot should be considered as an additional goal to restoration of BA, anatomic reduction, and varus deformity correction when treating calcaneal fractures.