Intraoperative O-Arm Evaluation on the Effect of Ankle Position on Accuracy of Syndesmotic Reduction

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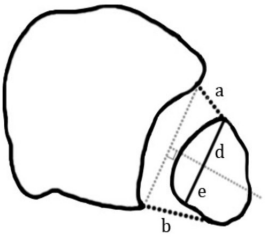
Purpose: This is a prospective study aimed at evaluating the effects of ankle position on the spatial relationships of the tibiofibular syndesmosis by utilizing intraoperative O-arm imaging. The differences in spatial relationships of the tibiofibular syndesmosis during intraoperative dorsiflexion and plantar flexion were observed by comparing each reduction with its contralateral, uninjured side (control). We hypothesize that dorsiflexion of the ankle will result in malreduction of the syndesmosis more frequently than plantar flexion due to the re-creation of the deforming force of external rotation, posterior translation, and proximal migration that occurs with dorsiflexion of the ankle.

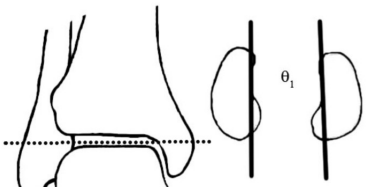
Methods: 20 patients with obvious complete syndesmotic disruptions noted on static radiographs underwent O-arm scans after placement of a clamp across the syndesmosis but prior to definitive fixation. The clamp was placed at the level of the distal tibiofibular joint and at 0° with respect to the tibiofibular axis. O-arm images were then taken with the patient's ankle dorsiflexed to a neutral position and then in resting plantar flexion. The same procedure was repeated on the opposite, uninjured ankle for later comparison. All uninjured ankles had no history of previous injury. The same syndesmotic spatial measurements cited in Dikos et al and Nault et al were used for the measurement of all O-arm scans. Measurements from the injured side were then subtracted by the measurements taken in the same ankle position on the uninjured side. This difference was then compared to the difference in measurements when the ankle was placed in the other position. The significance of this comparison was then assessed.

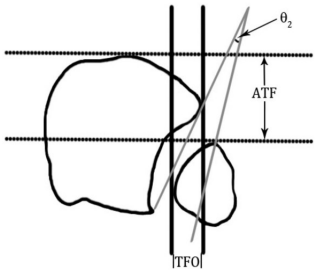
Results: Out of the 14 different types of spatial measurements taken for each ankle position, a significant difference in measurement between ankle positions was found with 7 types of spatial measurements and ratios. These included tibiofibular overlap (TFO) ($P < 0.001$), anterior tibiofibular interval (ATF) ($P < 0.001$), q_1 ($P < 0.001$), q_2 ($P < 0.001$), a ($P = 0.04$), a:b ($P < 0.001$), and d:e ($P < 0.001$). While in dorsiflexion, ATF (mean = 2.4 mm), q_2 (mean = 7.3°),a (mean = 0.1 mm), a:b (mean = 0.1), and d:e (mean = 0.2) were measured to be most similar to their contralateral uninjured measurements when compared to plantar flexion. While in plantar flexion, TFO (mean = 0.5 mm) and q_1 (mean = 5.5°) were measured to be most similar when compared to dorsiflexion.

Conclusion: Seven out of the 14 measurements performed showed a significant difference in reduction depending on ankle position. Compared to the contralateral uninjured ankle, syndesmotic reduction was shown to be closest to anatomic alignment during dorsiflexion in 5 out of the 7 parameters measured. These finding could have implications with regards to the position of the ankle during placement of syndesmotic fixation.

- The FDA has not cleared this drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an "off label" use). For full information, refer to page 600.







See pages 99 - 147 for financial disclosure information.