

Sustentaculum Screw Placement During Calcaneal Open Reduction and Internal Fixation: When Is the Screw Out?

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Background/Purpose: During fixation of calcaneal fractures a screw is often placed from lateral to medial into the sustentaculum as the constant fragment. This can be technically difficult as the sustentaculum is a small anatomic structure and this screw is generally placed from lateral to medial under fluoroscopic guidance using the axial Harris calcaneal heel view. Misplacement of this screw can result in significant complications given the high density of functionally important structures in this anatomic area, including the flexor digitorum longus, flexor hallucis longus, subtalar joint, tarsal canal, and neurovascular structures. Therefore the aims of this study were to determine whether there are certain fluoroscopic axial heel views taken at specific angles that can accurately confirm correct placement or misplacement of the sustentacular screw.

Methods: Lateral and medial dissection was performed on one cadaver foot specimen to remove skin and subcutaneous tissues. A 4.0-mm cancellous screw was placed from lateral to medial in five different configurations: (1) screw placed anatomically within the sustentaculum, (2) screw misdirected inferior to the sustentaculum, (3) screw misdirected superior to the sustentaculum, (4) screw misdirected anterior to the sustentaculum, and (5) screw misdirected posterior to the sustentaculum. A large C-arm was used to obtain Harris heel views at five different angulations (10°-50°). Two orthopaedic residents and one orthopaedic attending analyzed the C-arm images to determine at which angulation the screw placement could be confirmed in each cadaver.

Results: A screw placed anatomically was noted to be radiographically within the sustentaculum in all five views (Harris heel view at 10°, 20°, 30°, 40°, and 50°). An inferiorly misdirected screw appeared to be radiographically within the sustentaculum at 30°, 40°, and 50° but was confirmed to be misplaced inferiorly on the 10° and 20° views. A posteriorly misdirected screw was confirmed to be misplaced posteriorly on all five views (10°, 20°, 30°, 40°, and 50° Harris heel views). An anteriorly misdirected screw appeared to be radiographically within the sustentaculum on the 10° view but was confirmed to be misplaced anteriorly on all other views (20°, 30°, 40°, and 50° views). A superiorly misdirected screw was confirmed to be misplaced on all views (10°, 20°, 30°, 40°, and 50° Harris heel views). Interobserver agreement on placement of the sustentacular screw was 100% among all three authors.

Conclusion: Clinicians should be aware that in order to verify correct placement of the sustentacular screw several axial Harris heel views are required. Axial heel views must be obtained at 10° to 20° to assess for inferior misplacement of the screw and views must be obtained at 20° to 50° to evaluate for anterior misplacement of the screw.

Current Faculty and Residents

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