

## Posterior Facet Settling and Changes in Bohler's Angle in Operatively and Nonoperatively Treated Calcaneus Fractures: Implications for Management

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**Background/Purpose:** Bohler's angle (BA) is the most commonly used parameter to measure the amount of depression of the posterior facet after calcaneus fractures and has been shown to be prognostic for outcomes. Some patients exhibit a decrease in BA during the recovery period following either operative or nonoperative treatment. This settling may be multifactorial in nature and may lead to worse functional outcomes. Critical examination of patient demographic and surgeon-specific factors that may contribute to settling has not been studied in the literature. The purpose of this study was to identify the predictive factors that may lead to settling so that surgeons can limit this secondary loss of alignment and possibly improve calcaneus fracture outcomes.

**Methods:** 234 patients with intra-articular calcaneus fractures were analyzed. All patients had preoperative plain radiographs, at least 5 months of orthopaedic follow-up, and CT scanning performed. BA was measured on injury radiographs for all patients. For operatively treated patients, BA was measured on immediate postoperative radiographs and compared to the last available radiograph. For nonoperatively treated patients, BA was measured on the last available radiograph. All patients were fully weight-bearing at the time of final follow-up. Demographic data including age, gender, energy of injury mechanism, tobacco use, diabetes, osteoporosis, rheumatoid arthritis, and substance/alcohol abuse were retrospectively collected. Fractures were classified utilizing the Essex-Lopresti and Sanders classifications. Time to full weight bearing was documented, as were any reports of noncompliance with weight-bearing restrictions. For patients treated operatively, type of fixation (calcaneal-specific perimeter plate, non-perimeter plate, screw fixation), utilization of locking screws, use of bone graft or graft substitutes, and the number of screws supporting the posterior facet were documented.

**Results:** ANOVA (analysis of variance) confirmed a statistically significant amount of settling within the operative ( $P < 0.001$ ) and nonoperative ( $P < 0.001$ ) groups but no statistically significant difference in the average settling of BA between the two groups. The average decrease in BA for the operative and nonoperative group was  $8^\circ$  ( $P = 0.80$ ). Of the different variables examined by multivariable linear regression modeling, older age ( $P < 0.001$ ), diabetes ( $P = 0.03$ ), and alcohol ( $P = 0.02$ ) were significant and independent predictors of the amount of posterior facet settling irrespective of treatment.

**Conclusion:** The average amount of posterior facet settling was  $8^\circ$ , irrespective of operative or nonoperative treatment. The amount of settling increases with increasing patient age, alcohol abuse, and diabetes. This information can help guide treatment of patients with calcaneus fractures by allowing for a better understanding of the factors that affect posterior facet settling. Appropriate counseling of patients as well as a modification in weight-bearing protocols in certain patient populations may be warranted.

The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device he or she wishes to use in clinical practice.