

**Reliability and Sensitivity of Fluoroscopic and Radiographic Assessment of Articular Congruency in Operatively Treated Ankle Fractures Is Poor**

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**Purpose:** Articular congruency after surgical fixation of ankle fractures has been shown to affect patient outcomes. While evaluation of articular congruency with intraoperative fluoroscopy and postoperative plain radiography is commonplace, the reliability of these modalities has not been determined. The purpose of this study was to determine the sensitivity and specificity as well as the interobserver and intraobserver reliability of intraoperative fluoroscopy and postoperative plain radiographs (XR) in the assessment of articular congruency after open reduction and internal fixation (ORIF) of bimalleolar and trimalleolar ankle fractures.

**Methods:** A prospectively maintained ankle fracture registry was queried for operatively treated ankle fracture patients. Intraoperative fluoroscopy images and initial 2-week postoperative radiographs were read by three independent observers and were compared with postoperative CT as the gold standard. An incongruent joint was defined as an articular step-off of  $>2$  mm, the presence of an intra-articular loose body, or an articular gap of  $>2$  mm.

**Results:** 105 patients were included for analysis. The sensitivities of fluoroscopy and XR were 0.21 and 0.36, respectively. Specificity was 0.95 (fluoroscopy) and 0.89 (XR). Reliability analysis of fluoroscopy resulted in an interobserver reliability of  $k = 0.15$  and mean intraobserver reliability of  $k = 0.32$ . XR interobserver and mean intraobserver reliabilities were  $\kappa = 0.30$  and  $\kappa = .59$ .

**Conclusion:** Although results show acceptable specificity, the reliability and sensitivity of both intraoperative fluoroscopy and postoperative XR in the assessment of ankle articular congruency is low. The results of this study show that articular incongruency may be identified in only 21% to 36% of patients when standard imaging modalities are utilized. This calls into question available literature correlating clinical results with articular reduction. During ORIF of an intra-articular ankle fracture, surgeons should be highly critical of fluoroscopic imaging that appears adequately reduced, and direct visualization of the articular surface should be used as a more reliable reduction aid if possible. Further, in the postoperative period, axial imaging may be warranted in patients who have poor clinical outcomes despite apparent anatomic articular reduction in order to evaluate for occult joint incongruence.