Volar Cortical Displacement Reliably Predicts Delayed Displacement of Isolated Distal Radius Fractures

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Purpose: Distal radius fractures (DRFs) represent 18% of adult fractures. Treatment decisions are based on both patient factors and radiographic parameters at the time of injury and at subsequent follow-up. Predicting which DRFs will displace between the initial reduction and follow-up is challenging. Delayed displacement requiring subsequent operative treatment is associated with worse functional outcomes and prolonged recovery. The goals of this study were to determine the reliability and validity of radiographic parameters in predicting delayed displacement of DRFs.

Methods: A combined multicenter retrospective cohort study and case-control study were performed. Eligible patients were identified using diagnostic codes from a provincial database. The first cohort included patients ≥18 years with an isolated DRF and minimum 3-month follow-up. Radiographs were reviewed by a minimum of 3 independent raters to assess radial volar tilt, radial inclination, ulnar variance, radial height, radiocarpal alignment, intra-articular step-off, intra-articular gap, volar cortical displacement, dorsal comminution, and cast index. Intraclass correlation coefficient (ICC) was calculated for pre-reduction and post-reduction parameters. An age- and sex-matched cohort of patients who had delayed surgical intervention was subsequently identified. A multivariable conditional logistic regression analysis was completed to identify radiographic parameters that were predictive of conversion to operative treatment for delayed displacement.

Results: 213 patients (mean age = 50 ± 14 years; 81% female) were included in the retrospective cohort. Several parameters demonstrated moderate reliability across reviewers, including pre-reduction volar cortical displacement (ICC = 0.73), intra-articular gap on lateral radiographs (ICC = 0.64), and volar tilt (ICC = 0.51), as well as post-reduction volar tilt (ICC = 0.68). 168 patients (mean age = 49 ± 14 years; 87% female) were included in the case-control portion of the study. Pre-reduction radial inclination, radial height, and volar cortical displacement, and post-reduction radial inclination, radial height, volar cortical displacement, and ulnar variance were predictive of conversion to operative management following delayed displacement (all $P<0.05$).

Conclusion: Multiple predictors of delayed displacement were identified. Most notably, pre- and post-reduction volar cortical displacement was identified as a novel predictor of delayed displacement of DRFs and was associated with an increased likelihood of conversion to operative management.