There’s No Unreliable Way to Measure a Posterior Wall Acetabular Fracture: An Inter- and Intra-rater Reliability Analysis of Three Methods

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ABSTRACT INTRODUCTION: The fragment size in a posterior wall acetabular fracture is considered a predictor of stability and the need for fixation.1-3 However, even though this is the most common type of acetabular fracture, disagreement exists about the most reliable methods to measure fragment size, as well as conflicting data about the most predictive of need for stabilization. Several different methods, based on axial sections on computed tomography (CT) scans, have commonly been utilized to measure fragment size, but none have been proven to be consistently reliable across different levels of training.

The method described by Calkins et al measures the remaining posterior wall arc at the point of the largest deficit, while the method of Keith et al measures the remaining posterior wall medial-lateral distance at the level of the fovea capitis; the Moed modification measures the remaining posterior wall medial-lateral distance at the point of the largest deficit. The purpose of this study was to determine which method was the most reliable, both between raters and after test-retest of the same raters.

METHODS After approval from our Institutional Review Board, 26 patients with isolated posterior wall fractures were randomly selected from the Orthopaedic Trauma database at our institution. Each fracture was measured by two junior residents, two senior residents, and a fellowship-trained orthopaedic trauma surgeon, using the three methods described above. Intraclass correlations between all raters were calculated for each technique. Additionally, the mean absolute error for the junior and senior residents were compared to the attending, and a student’s t-test was performed to compare these means.

RESULTS SECTION: The intraclass correlation coefficients between all five raters for the Calkins, Keith, and Moed techniques were 0.713, 0.737, and 0.700, respectively, all indicating strong reliability. When comparing the junior and senior residents, the mean absolute error was 12.3% and 12.0% for the Calkins method, 8.4% and 7.3% for the Keith method, and 11.5% and 12.0% for the Moed method, demonstrating a consistent margin of error when compared to the attending) by increasing level of training. Intrarater reliability had an average of 0.827, 0.908, and 0.861 for the Calkins, Keith, and Moed techniques, respectively.

DISCUSSION: All three methods for measuring the fragment size in posterior wall acetabular fractures demonstrate similarly strong agreement, and are somewhat accurate when compared to the attending measurement. The Keith method showed a trend towards higher intra-rater reliability.

SIGNIFICANCE: Orthopaedic surgeons and residents in training should be encouraged to use a consistent method for measuring posterior wall fragment size in acetabular fractures, as all are reliable. Further study is needed to determine the validity of the measures.


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