

Intra-articular Air – A Novel Predictor of Posterior Wall Acetabulum Fracture Instability

Jonathan D. Ellis, MD; *Jacob Meyer, BS; Joseph P. Johnson, MD; Clay A. Spitler, MD; Michael Beltran, MD; Michael T. Archdeacon, MD, FIOTA; H. Claude Sagi, MD; Quade Jonathan*

Purpose: The presence of intra-articular air can be indicative of a recent hip dislocation event because of a negative pressure phenomenon. Intra-articular air may be a marker of hip instability in patients with a posterior wall acetabulum fracture (AO/OTA 62-A1), especially patients with hip dislocations that auto reduced prior to presentation. The purpose of this study is to determine if intra-articular air correlates with fracture instability on examination under anesthesia (EUA).

Methods: This was a retrospective study of patients with posterior wall fracture who underwent an EUA from 2014 to 2024 at two Level I trauma centers. Chart review was performed to record demographic, injury, and management information. Radiographs and CT scans were reviewed to evaluate fracture size (Calkins, Keith, and Moed methods), distance from dome, displacement, and intra-articular air. EUA positive and negative groups were compared using Fisher's exact and Mann-Whitney U tests for categorical and nominal variables, respectively.

Results: In the study, 73 patients underwent EUA, resulting in 40 positive (unstable) and 33 negative (stable) EUAs. EUA positive and negative groups had similar mean age (28 vs 34 years, $p = 0.148$) and body mass index (31 vs 30 kg/cm², $p = 0.322$). The EUA positive group had a higher rate of intra-articular air (80 vs 9%, $p < 0.001$), hip dislocation on injury radiograph (58 vs 18%, $p < 0.001$), and increased fracture displacement (>5 mm, 75 vs 30%, $p < 0.001$). The EUA negative group had more patients with smaller fracture size ($<20\%$ with Calkins method, 49 vs 13%, $p = 0.002$). Otherwise, there was no significant difference between groups with regard to fracture size measurements. In the 35 patients without a hip dislocation on injury radiograph, EUA positive patients had a higher rate of intra-articular air (71 vs 7%, $p < 0.001$), and increased fracture displacement (71 vs 22%, $p = 0.005$).

Conclusion: Posterior wall acetabulum fracture instability is significantly higher in patients with intra-articular air or increased fracture displacement (>5 mm) regardless of presence or absence of hip dislocation history. EUA should be performed in posterior wall acetabulum fractures that have intra-articular air or increased fracture displacement.