

Results of Emergency Department Stress of Lateral Compression Type 1 Fracture Correlates with Validated Instability Scoring System

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Purpose: Lateral compression type 1 (LC1) pelvic ring injuries represent a heterogeneous group of fractures with controversy surrounding operative indications. Recently, multiple institutions have suggested the safety and reliability of an emergency department (ED) stress to evaluate minimally displaced LC1 fractures. However, it remains unknown how the results of an ED stress examination correlates with prior measures of instability. The purpose of this study was to correlate the displacement of ED stress examination of LC1 fractures against a validated fracture instability scoring system.

Methods: This was a retrospective review of a prospectively collected cohort at a Level I academic trauma center. A consecutive series of 70 patients, presenting with minimally displaced LC1 fractures, were stressed in the ED radiology suite over a 2-year study period. Displacement was measured by comparing calibrated inlet films to static films. Radiographic scores were assigned according to the validated Beckmann scoring system based on fracture pattern and confirmed markers of instability in LC pelvic ring injuries. Three cohorts were created: score <7 (stable, predictive of nonoperative recommendation), score 7 to 9 (indeterminant recommendation), and score >9 (unstable, predictive of operative recommendation). These groups were compared to ED stress positivity defined as greater than 10-mm displacement on calibrated radiographs. Analysis of variance comparisons were performed to determine statistical significance between groups. Multivariate linear regression was performed between gender and Beckmann score categories to determine predictors of ED stress-positive pelvises.

Results: The mean age of the population was 59.2 years with 55.7% females. 13 patients had a positive ED stress examination and 57 stressed negative. The mean displacement was significantly different between the three groups (Beckmann 5-6: 3.31 mm, $\sigma = 2.4$; Beckmann 7-9: 4.23 mm, $\sigma = 3.2$; Beckmann 10+: 12.1 mm, $\sigma = 8.6$; $P < 0.001$). Furthermore, the scoring system was predictive of stress positivity. Zero of 18 patients in the Beckmann 5-6 group stressed positive and only 3 of 38 patients in the indeterminant group stressed positive (7.9%). However, 10 of 14 patients in the Beckmann 10+ group stressed positive ($P < 0.001$). Sacral displacement ($P = 0.001$), superior ramus location ($P < 0.02$), and sacral columns ($P < 0.001$) significantly predicted ED stress positivity.

Conclusion: ED stress of LC1 pelvic ring injuries is an emerging diagnostic adjunct in determining pelvic ring stability. Comparison of a validated instability scoring system to ED stress examination of minimally displaced LC1 fractures showed moderate to excellent correlation, suggesting that the ED stress examination is a useful treatment adjunct. LC1 fracture characteristics should be analyzed to determine which pelvic fracture characteristics determine occult instability prior to stress examination.