A Prospective Trial Comparing Magnetic Resonance Imaging-Detected Pelvic Ligament Injury to Displacement on Pelvic Stress Examination Under Anesthesia

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Purpose: Recently both pelvic stress examination under anesthesia (EUA) as well as pelvic magnetic resonance imaging (MRI) have been reported as means to potentially evaluate pelvic ring fracture stability. However, the relation of findings on these two tests to each other is unknown. We hypothesized that MRI-detected pelvic ligament injury pattern would correlate with findings on pelvic stress EUA.

Methods: Twenty patients with acute pelvic ring injury (OTA 6.1-A2, 6.1-A3, 6.1-B or 6.1-C) were enrolled in a prospective trial from 2013-2014. All patients underwent the study intervention of pelvic stress EUA and MRI within 14 days of injury, and were included in the analysis. IRB approval was obtained and informed consent obtained. EUA was performed according to the method of Sagi et al, with the use of a calibrated radio-opaque marking ball. Fifteen standardized fluoroscopic views were obtained and analyzed at each EUA. Maximum horizontal, vertical, and combined vector displacement was measured on each view. MRI scans were graded for ligament and pelvic floor musculature injury by three independent musckuloskeletal radiology attending physicians. Ligament injury was scored as either complete tear, partial tear, or intact. Radiologists were blinded to the side of injury. For the cases when radiologists did not agree on MRI findings, an MSK (musculoskeletal) consensus committee reviewed the MRI, with the decision of the senior MSK radiologist final. Ligament injury on MRI was correlated with various measures of displacement on pelvic EUA using Pearson correlation coefficient (two-tailed, $P < 0.05$). Interrater agreement was assessed using intraclass correlation coefficient (ICC). IBM SPSS Statistics v.20.0 was used for statistical analysis.

Results: We found no significant correlation between MRI-detected ligament injury and either horizontal, vertical, or combined vector displacement on the 15 pelvic stress EUA images. We did, however, find that contralateral ligament and pelvic floor injury injury was observed in 75% of cases while only 30% of patients were thought to have bilateral injury by CT and radiographic classification alone. We found substantial interrater agreement between radiologists. The highest agreement was observed for anterior sacroiliac ligament injury (ICC = 0.9, confidence interval: 0.83-0.95, $P < 0.0001$). External, internal, and vertical displacement on pelvic stress EUA ranged from 9 to 71 mm, 0 to 31 mm, and 5 to 79 mm, respectively, indicating the wide range of injuries in the study.

See pages 47 - 108 for financial disclosure information.

Conclusion: In this study, MRI-detected pelvic ligament injury pattern did not correlate with stress EUA displacement. Our finding of a high rate of contralateral ligament and pelvic floor injury suggests that a higher percentage of pelvic ring fractures may be associated with bilateral ligament injuries than previously thought. Our hope was that EUA could be used to predict the findings on MRI; however, our results appear to indicate that EUA is not a good predictor of which ligaments are injured in this patient population. The clinical role of both pelvic EUA and MRI awaits further research, but our data indicate that MRI and EUA appear to measure unique aspects of pelvic ring injuries.