

AP Pelvis Radiograph Has Poor Sensitivity Compared to CT as Screening Test for Unstable Sacral Fractures

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Purpose: The orthopaedic surgeon taking general call will encounter patients who have sustained pelvic ring injuries. We investigated the sensitivity of the AP pelvis radiograph as a screening test for clinically serious unstable sacral fractures that merit consultation with an orthopaedic trauma specialist and possibly transfer to a higher level of care.

Methods: A retrospective clinical cohort of consecutive patients with unstable sacral fractures presenting to a regional Level I trauma center from 2006 to 2019 was identified from a trauma registry. Fractures were confirmed by review of pelvis CT and documentation and classified by the AOSpine Sacral Fracture Classification. The sensitivity of the initial AP pelvis radiograph for a new diagnosis of pelvic ring injury was determined using the transcribed attending radiology report. Report reference to concomitant or outside hospital pretransfer imaging was grounds for exclusion. Three fellowship-trained orthopaedic traumatologists blinded to the study purpose then interpreted the AP pelvis radiograph set for «any pelvic ring injury» on a picture archiving and communication system workstation using ImageJ software (National Institutes of Health, Bethesda, MD). The sensitivity of the AP pelvis radiograph as interpreted by radiologists on duty versus the orthopaedic traumatology panel was compared for disruptions of the pelvic ring. Interrater agreement was assessed by Fleiss' unweighted κ . Predictors of missed diagnosis were explored by multivariable regression.

Results: 114 unstable U/Y/H-pattern sacral fractures were identified from 29,917 trauma activations (incidence 0.4%). 63 patients were included (24 U, 23 Y, and 16 H-pattern sacral fractures) after exclusion of 51 radiograph reports referencing antecedent pelvis CT results. The visualization of 94% of sacra on the AP pelvis radiograph was obscured by artifact. On-duty radiologists identified 54% of complete sacral fractures and 2% of unstable U/Y/H-type sacral fractures. The orthopaedic traumatologist panel identified 63% of complete sacral fractures (range 43%-75%, $\kappa = 0.27$) and 12% of unstable U/Y/H-type sacral fractures (range 5%-27%, $\kappa = 0.11$). The presence of a pelvic binder was significantly associated with failure to detect a complete sacral fracture, while sacral dysmorphism, anterior pelvic ring disruption, extrasacral posterior pelvic ring disruption, and the presence of "stepladder" disruption of the sacral neural foramina were each independently associated with greater likelihood of identifying a complete sacral fracture.

Conclusion: The AP pelvis radiograph demonstrates poor sensitivity and poor agreement for complete and unstable sacral fractures, whether interpreted by radiologists or orthopaedic traumatologists. Pelvis CT should be considered when radiography is negative but clinical concern for a pelvic ring injury remains.