

Utility of Advanced Imaging in Treating Pelvic Ring Insufficiency Fractures in the Geriatric Population

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Background/Purpose: The incidence of pelvic insufficiency fractures is increasing with the aging population. Previous studies have estimated that insufficiency fractures make up nearly two-thirds of all pelvic fractures, and 94% of pelvic fractures in patients greater than 60 years old. The diagnostic evaluation of geriatric pelvic fractures can be problematic. Posterior ring injuries are frequently missed on radiographs and the use of advanced imaging (CT or MRI) to evaluate for posterior ring injuries in this cohort is controversial. Patients referred to the orthopaedic trauma service at our institution have frequently already undergone advanced imaging. This study investigates the utility of advanced imaging to evaluate the posterior pelvic ring in the setting of a pelvic insufficiency fracture. We hypothesized that advanced imaging of the pelvis, either positive or negative for posterior ring injuries, would not change the clinical management of these patients.

Methods: A retrospective review was performed on patients who sustained pelvic insufficiency fractures (OTA 61-A based on radiographs) and received treatment by orthopaedic surgeons at our institution from 2004-2014. Our inclusion criteria were age greater than 60 years and low-energy mechanism (eg, fall from standing). Patients were identified via CPT codes. Imaging was reviewed by two orthopaedic surgeons and a radiologist. Radiography and advanced imaging, if applicable, were analyzed for anterior and posterior pelvic ring injuries. Clinical notes were reviewed to determine if the patient's weight-bearing status was altered or if they were indicated for operative treatment based on the findings of advanced imaging.

Results: A total of 87 patients met our criteria. 42 patients had undergone advanced imaging to evaluate for posterior ring injuries (10 MRI, 32 CT). Table 1 shows the distribution of pelvic ring injuries in these patients. In the advanced imaging cohort, two patients had a posterior ring injury identified on radiographs alone, and an additional 24 patients had posterior ring injuries identified via advanced imaging (2 of 42 vs 26 of 42, $P < 0.0001$). Of the posterior ring injuries, 23 were sacral impaction fractures and 3 were complete posterior ring injuries (1 complete sacral fracture and 2 crescent fractures). In the non-advanced imaging cohort, 7 of the 45 patients had posterior ring involvement noted on radiographs. Overall, 57 patients had at least 6-week follow-up and 41 patients at least 3-month follow-up. The treatment plan for all patients remained protected weight-bearing as tolerated, irrespective of advanced imaging findings. Furthermore, no patient underwent surgical intervention by final follow-up.

Conclusion: Many clinicians resort to advanced imaging to identify or further characterize posterior pelvic ring injuries to aid in determination of treatment, at a substantial cost to the health-care system and radiation to the patient. In our study, despite advanced imaging identifying additional posterior pelvic ring injuries in 57% of the advanced imaging cohort, no patient's treatment course was altered. Therefore, our data support that it may

be unnecessary to obtain advanced imaging studies in geriatric patients that sustain pelvic insufficiency fractures identified on plain radiographs. Further study should investigate pelvic displacement and clinical outcomes in these patients.

Table 1: Summary of Radiographic Findings

Posterior Injury	Anterior Injury	Advanced Imaging (n = 42)	No Advanced Imaging (n = 45)
None	Unilateral Ramus	16 (38%)	38 (84%)
	Bilateral Rami	0	0
Incomplete	No Rami	1 (2%)	0
	Unilateral Ramus	20 (48%)	5 (11%)
	Bilateral Rami	2 (5%)	2 (5%)
Complete	Unilateral Ramus	3 (7%)	0

The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device he or she wishes to use in clinical practice.