

Postoperative CT Is a Superior Modality for Assessment of Acetabular Fracture Reduction

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Purpose: The quality of reduction after acetabular fracture surgery is an important predictor for clinical outcome. We hypothesized that pelvic CT after acetabular fracture fixation is superior to pelvic radiography (PXR) in detecting residual displacement and for predicting the need for total hip arthroplasty (THA).

Methods: All adult patients who received operative fixation for an acute acetabular fracture were identified from the prospective orthopaedic trauma database (1992-2012). Inclusion criteria consisted of at least 2-year follow-up (or an early conversion to THA following surgery) and availability of full radiographic imaging (both digital DICOM [Digital Imaging and Communications in Medicine] and predigital imaging were assessed when available), which yielded a cohort of 201 cases. Residual displacement was measured on postoperative PXR and graded according to Matta's criteria (anatomic 0-1 mm, imperfect 2-3 mm, poor >3 mm). The postoperative CT scans were evaluated in axial, sagittal, and coronal planes for quality of reduction. The same Matta measurement criteria were then applied to the CT scans. In order to be anatomic, all 3 reformatted images (axial, sagittal, and coronal) needed concentric reduction with 0-1 mm of gap or stepoff. The association between an anatomic (<2 mm) versus a nonanatomic reduction (≥ 2 mm) and the need for THA was determined for PXR and CT-based measurements. A subanalysis was performed in younger patients (<65 years). All measurements were performed by fellowship-trained traumatologists in blinded fashion. None of the surgeons performing measurements were involved in the surgical care of the patients.

Results: Based on PXR, 101 of the cohort of 201 patients (50%) had an anatomic, 66 (33%) an imperfect, and 34 (17%) a poor reduction. CT, however, showed that 74 anatomic reductions (73%) had residual displacement of ≥ 2 mm (imperfect [35%] or poor [39%] reductions). Furthermore, CT showed that 33 imperfect reductions (50%) had residual displacement of >3 mm (poor reductions) and 6 (9%) had <2 mm displacement on CT (anatomic reductions). Lastly, a poor reduction on PXR was confirmed on CT in 32 (94%); 2 (6%) were imperfect reductions on CT. Patients were followed up for a mean duration of 7.3 years (range, 0.2-23.2), and THA was performed in 45 patients (22%). In patients with an anatomic reduction on PXR, 17 (17%) required THA versus 28 (28%) in nonanatomic reductions ($P = 0.064$). Conversely, in patients with an anatomic reduction on CT (33), 1 (3%) required THA versus 44 (26%) in nonanatomic reductions (168); $P = 0.002$. In 150 younger patients, the difference for this association between both modalities was even more pronounced ($P = 0.202$ [PXR] vs $P = 0.005$ [CT]).

Conclusion: Computed tomography is able to more accurately detect residual displacement after acetabular fracture fixation than PXR. A substantial number of patients with an apparent anatomic acetabular reduction on PXR have a nonanatomic reduction according to CT imaging. The quality of reduction as assessed on postoperative CT (versus PXR) is

more strongly associated with eventual need for THA, particularly in younger patients. It is unlikely patients with an anatomic reduction on CT will require THA at midterm follow-up.