

Intraoperative O-Arm Imaging of AO/OTA C2 and C3 Distal Radius Fractures Identifies Malreduced Final Reductions in up to 30% of Cases

*Brian Vickaryous, MD; J. Dean Cole, MD; Bob Meuret, MD
Florida Hospital Orlando, Orlando, Florida, USA*

Background/Purpose: Fractures of the distal radius are one of the most common orthopaedic injuries and account for over 600,000 emergency room visits per year. Severity of injury has been correlated with need for surgical fixation and restoration of articular congruity has been noted to correlate with posttraumatic degenerative changes. Current standard of care utilizes intraoperative evaluation with two-dimensional (2D) C-arm imaging techniques, whereas 3D O-arm imaging techniques are now available and feasibly should improve the diagnostic and management abilities of the operating surgeon. The purpose of this study is to assess the quality of intraoperative definitive provisional reduction of AO/OTA C2 and C3 fractures of the distal radius through 3D O-arm visualization and its effects on intraoperative management and short-term radiologic outcomes.

Methods: This is a prospective nonrandomized trial evaluating 48 consecutive AO/OTA C2 and C3 distal radius fractures comparing intraoperative intention to treat based on standard 2D C-arm radiography assessment after provisional reduction versus the same reduction adequacy after O-arm 3D visualization. From June 2015 to January 2016, a consecutive series of 48 patients were enrolled in the study, and underwent pre- and postreduction radiographs and CT to evaluate severity of injury. Inclusion criteria were displaced (2 mm or more) intra-articular distal radius fractures in skeletally mature, mentally competent individuals. Eligible patients had the following parameters recorded on a prospectively maintained database: age, duration of surgery, duration of O-arm imaging, intent to treat based on adequacy of reduction via C-arm imaging, and adequacy of initial reduction. Patient records and radiographs were reviewed for accuracy and any additional findings recorded that were pertinent to the O-arm intervention that are pertinent to the study outcome.

Results: There were 48 patients enrolled (30 female, 18 male) with 46 AO/OTA type C3 and 2 AO/OTA C2 intra-articular fractures. There were 12 patients whose initial reduction was noted as anatomically reduced via C-arm fluoroscopy and were found by subsequent O-arm to be inadequately reduced. In total, 25% of all fractures were found to be malreduced and would have been deemed erroneously fixed by the operating surgeon. Of note on further review, 2 patient O-arm studies showed findings that should have been addressed intraoperatively, one loose body in the joint and residual articular displacement of 2 mm (4.2%). There was a total of 14 patients or 29.2% of all treated distal radius fractures in this series that would have been or were erroneously fixated in a malreduced position or had other findings that may interfere with outcomes. The average O-arm imaging time was 6 minutes (range, 3-13 minutes) and did not significantly affect operative length.

Conclusion: Current standard 2D fluoroscopic imaging and subsequent surgical treatment of AO/OTA type C2 and C3 fractures allows for up to 30% of all fractures to be fixed in a malreduced position, particularly at the articular surface. With long-term posttraumatic degenerative joint changes correlating with degree of articular displacement, future fixa-

tion efforts in these fractures might benefit from the routine use of advanced intraoperative imaging modalities such as the 3D O-arm.