

Utility and Cost Analysis of Radiographs Taken 2 Weeks Following Plate Fixation of Distal Radius Fractures

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Purpose To evaluate the utility of radiographs taken 2 weeks following plate fixation of distal radius fractures.

Methods A retrospective review of patients requiring operative fixation of distal radius fractures was performed with the objective of determining the utility of a 2-week postoperative radiograph in patient management.

Results Three out of 268 (1%) patients had loss of fixation noted radiographically at the 2-week visit that resulted in a reoperation. There was no statistically significant difference in radial inclination, radial height, or volar tilt measured at 2 weeks, 6 weeks, or final follow-up. The average cost of a series of wrist radiographs was \$85 with no additional radiology reading fees.

Conclusions Routine 2-week postoperative radiographs of operatively treated distal radius fractures rarely resulted in a change in patient management; however, they may have added unnecessary cost to the patient and health care system. (*J Hand Surg Am.* 2015;40(6):1106–1109. Copyright © 2015 by the American Society for Surgery of the Hand. All rights reserved.)

Type of study/level of evidence Economic and decision analysis IV.

Key words Distal radius fracture, radiograph, cost, utility.

DISTAL RADIUS FRACTURES ARE ONE of the most common fractures seen in emergency rooms, accounting for approximately 2.5% of all emergency room visits.¹ Recent trends have demonstrated an increase in the percentage of patients having operative intervention for distal radius fractures.¹ Mattilla et al² demonstrated that the operative rate doubled between 1998 and 2008. Medicare studies have demonstrated a decrease in the rate of nonoperative care from 82% to 70% over the last

decade.³ In 2007, Medicare paid \$170 million in distal radius–related expenses, and the number is expected to increase to \$240 million if current trends in operative fixation continue.³

In many institutions, radiographs are a standard part of the first postoperative visit. Recent studies in the United States and several European studies demonstrated that the use of radiographs at several points during the immediate postoperative period provides information that is unlikely to improve patient outcomes while exposing them to ionizing radiation and additional cost.^{4–8}

The purpose of this study was to evaluate the utility and cost of routine use of radiographs taken 2 weeks following plate fixation of distal radius fractures. We hypothesized that obtaining routine 2-week postoperative radiographs would increase the cost of treatment and would not alter the overall treatment of the patient.

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MATERIALS AND METHODS

In a retrospective manner, the database at our institution was queried using Current Procedural Terminology codes 25607 to 25609 to identify operatively treated distal radius fractures for 3 orthopedic hand surgeons at our institution between January 1, 2008, and December 31, 2011. This identified 497 consecutive patients with a total of 508 fractures. Exclusion criteria included skeletal immaturity, patients lacking 2-week postoperative radiographs, and/or fewer than 3 sets of postoperative radiographs. Based upon these criteria, 268 fractures were included in our study; we reviewed these records.

Data collected included patient demographics, Orthopaedic Trauma Association fracture classification of injury films, and method of fracture fixation. Data also included the measurements for radial inclination (RI), radial height (RH), and volar tilt (VT) taken at each visit. Measurements were obtained by a single orthopedic hand surgeon. Data included any changes in normal postoperative management, which was defined as any procedure or surgical intervention that is not typically undertaken after the first postoperative visit.⁴ This did not include any planned, staged fracture fixation or planned removal of hardware. Lastly, the time to final follow-up was also recorded.

All data were collected from review of the office notes of the treating physicians and postoperative radiographs. If injury films were available for review, they were categorized according to AO classification for distal radius fractures. The RI, RH, and VT were measured and recorded on each film in either degrees or millimeters, respectively, according to methods described by Mann et al.⁹ The RH and RI were measured on the posteroanterior radiograph. RI was measured by the angle formed between the long axis of the radius and a line drawn from the tip of the radial styloid to the ulnar corner of the lunate fossa. The RH was measured by drawing a perpendicular line to the long axis of the radius at the tip of the radial styloid and measuring the distance between that line and the distal most point on the ulnar dome. Lastly, the VT was measured on the lateral radiograph by the angle formed between the long axis of the radius and a line drawn along the articular surface.

Statistical methods

The mean and SD were calculated and reported for RI, RH, and VT at 2 weeks, 6 weeks, and final follow-up. Longitudinal changes in the mean values

TABLE 1. Fracture Classifications, Methods of Fracture Fixation, and Patient Demographics

Breakdown of Fracture Classification	
AO Classification	Number of Fractures in Study Population
A1	0 (0%)
A2	18 (7%)
A3	19 (7%)
B1	11 (4%)
B2	12 (4%)
B3	26 (10%)
C1	40 (15%)
C2	77 (29%)
C3	53 (20%)
Not classified	12 (4%)
Total	268 (100%)
Breakdown of Method of Fracture Fixation	
Fracture Fixation	Number of Fractures
Volar plate	186 (69%)
Volar plate with K-wires	28 (10%)
Dorsal spanning plate	11 (4%)
Dorsal plate	10 (4%)
External fixation	2 (1%)
Kapandji pinning	13 (5%)
Fragment-specific fixation	18 (7%)
Total	268 (100%)
Demographics	
Average age at surgery (y)	52 (range, 17–94)
Females	148 (151 fractures) (57%)
Males	113 (117 fractures) (43%)

for RI, RH, and VT were compared using a one-way repeated measures analysis of variance at a significance level of $\alpha = 0.05$. In addition, we quantified intraobserver reliability with regards to repeatability of the methodological approach by calculating intraclass coefficients and their 95% confidence intervals. The score was reported between 0 (no agreement) and 1 (perfect agreement).

RESULTS

A total of 508 operatively treated distal radius fractures in 497 patients were reviewed. Two hundred forty fractures in 236 patients were excluded on the basis of absent 2-week radiographs (154 fractures), incomplete follow-up radiographs (77 fractures), and skeletal

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