

Distal Radius Fractures: Current Concepts

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Despite the frequency of distal radius fractures, the optimal treatment remains without consensus opinion. A trend toward increased distal radius fracture open reduction and internal fixation has been identified, with biomechanical and clinical studies suggesting treatment advantages of certain fixation methods over others. Well-controlled patient trials are still missing to lend objective findings to management algorithms. This article reviews the literature over the past 5 years to guide our management regarding this common upper-extremity injury. (*J Hand Surg* 2012;37A:1718–1725. Copyright © 2012 by the American Society for Surgery of the Hand. All rights reserved.)

Key words Distal, radius, fracture, surgical, fixation.



TREATMENT OVERVIEW

The goal of distal radius fracture treatment is to restore an upper extremity that has both acceptable mobility and durability. Although these fractures are common and often reviewed, there remains little evidence in support of different treatment options. A recent Cochrane Review¹ revealed insufficient literature support for any one method of surgical fixation; an evidence-based clinical practice guideline was unable to recommend one form of treatment over another.²

Despite a lack of consensus, a rise in internal fixation of distal radius fractures has been observed within the United States. Europe is witnessing a similar trend, as evidenced in a nationwide registry review of all surgically treated distal radius fractures in Finland from 1998 to 2008.³ In a country that has universal public health coverage ensuring insurance-unbiased findings, a doubling incidence of surgical treatment for distal radius fractures and a more than 13-fold increase in the inci-

dence of open reduction and plate fixation were observed. The causes of this global increase may be related to greater need or perhaps improved surgical training. Patients treated by members of the American Society for Surgery of the Hand received internal fixation substantially more often than patients treated by surgeons who were not members (33% vs 16%; $P < .001$). Factors such as number of years in practice, practice type, and the particular type of training received contributed most heavily to whether the fracture received internal fixation.⁴

As the incidence of surgical treatment has increased, the cost of different methods has been explored. To accomplish this, health care intervention cost analysis may be employed that determines a treatment's cost per quality-adjusted life-year (QALY) and compares it with societal norms. The current, widely accepted cost limit per QALY is \$50,000, a figure derived from the incremental cost-utility ratio of renal transplantation over dialysis for end-stage renal failure. In patients older than age 65, utility values derived from a decision tree model determined that although casting is the least expensive, internal fixation adds an incremental cost of only \$15,330 per QALY, far less than the limit of \$50,000, rendering it cost effective for these fractures.⁵

IMAGING

Plain radiographs remain the mainstay in diagnostics of distal radius fractures. The posteroanterior (PA) view obtained in neutral variance as well as a lateral view

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with a beam that is inclined 20° will assess ulnar variance and effectively visualize the articular surface. A 45° pronated oblique view is helpful in that it profiles the dorsal ulnar cortex and lends insight into this biomechanically important region. At times, improved fracture visualization through computed tomography scanning is valuable. This is particularly important when nonoperative treatment is being considered and it must be ensured that acceptable articular alignment is present. Computed tomography has demonstrated the ability to better characterize what radiographically may appear as an extra-articular injury. A high percentage of distal radius fractures, classified as extra-articular by standard radiographs, are revealed as intra-articular injuries. Axial views are helpful in visualizing the distal radioulnar joint (DRUJ) and can identify subluxation or frank dislocation in addition to bony fragments suggestive of radioulnar ligament avulsions. Magnetic resonance imaging is reserved for cases in which the mere existence of a fracture is called into question, and also to help identify concomitant soft tissue pathology.

CLASSIFICATION

A multitude of classification systems exist, and a recent evaluation of 5 common systems (Fernandez, AO, Frykman, Melone, and Universal Classification Systems) concluded that all exhibited high interobserver and intra-observer unreliability. A more user-friendly and reliable method incorporating a 3-dimensional assessment was advocated.⁶ The Melone Classification is clinically useful in that it often influences the operative approach. It emphasizes the importance of the radioulnar articulation and categorizes fractures into 5 groups based on the parts involved: shaft, styloid, dorsal medial facet, volar medial facet, and severely comminuted fractures. The AO Classification divides intra-articular involvement into 3 broad groups that can be subdivided into 27 distinct fracture patterns. Type A describes an extra-articular fracture, type B involves a partial disruption of the articular surface, and type C represents a complete separation of multiple articular fragments from the shaft.

CLOSED REDUCTION AND IMMOBILIZATION

Closed reduction and immobilization in a plaster cast remains an accepted method of treatment for most stable distal radius fractures. A stable fracture is one that is acceptably aligned after reduction effort and where the likelihood of displacement is small. Cumulative risk

factors for the loss of reduction have been identified as age over 60, greater than 20° dorsal angulation, 5 mm radial shortening, dorsal comminution, ulna fracture, and intra-articular radiocarpal involvement.⁷ In elderly patients, decreased bone mineral density may cause distal radius fracture instability, resulting in a 30% to 50% risk for secondary displacement after closed reduction and splinting, with redisplacement severity correlated with increasing age.⁷ If closed treatment is considered appropriate, a splint is usually used for the first few days to

accommodate for appropriate swelling. A cast or removable splint is worn thereafter. Radiographs obtained at initial presentation and then at weekly intervals for the first 3 weeks and at 6 weeks status posttrauma will monitor fracture alignment.

If the decision for operative intervention is made, a multitude of stabilization options exist. Factors that must be considered include the biomechanical characteristics of each fixation method, the procedure's associated difficulty, and the soft tissue morbidity.

CLOSED REDUCTION AND PINNING

Closed reduction and percutaneous pin fixation are best suited for fractures without articular involvement and also without substantial metaphyseal comminution. A variety of pinning methods have been described; the most popular is oblique radial styloid to proximal ulnar cortex, as well as placement of the pins through the fracture site. Wires are usually removed 4 weeks after placement to minimize the risk of infection. The decision to use percutaneous pin fixation should be considered with care, because a prospective, randomized trial encountered markedly inferior clinical and radiological results for percutaneous pinning compared with locked volar plating, even for extra-articular distal radius fractures.⁸ A new fixation technique that uses threaded

EDUCATIONAL OBJECTIVES

- State the trend with regard to the surgical treatment of distal radius fractures.
- Discuss the cost per quality-adjusted life year method of assessing treatment.
- List the cumulative risk factors for the loss of reduction in a distal radius fracture.
- Describe the AO Classification of distal radius fractures.
- List the advantages and disadvantages of dorsal plate fixation for distal radius fracture pain.
- Summarize the differences between external fixation in combination with percutaneous pinning versus open reduction and internal fixation using a plate/screw construct.

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