Distal Radius Fractures: Nonoperative and Percutaneous Pinning Treatment Options

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KEYWORDS

• Distal radius fracture • Non-operative treatment • Pinning

Nonoperative treatment of distal radial fractures by reduction and immobilization remains the most common form of treatment, as seen in many epidemiological studies in the literature. In this article, the indications, technique, predictors of failure, outcomes, and complications are reviewed. A variety of treatment options have been proposed for distal radial fractures that are predicted, or subsequently identified, to be too unstable for nonoperative management. Percutaneous pinning is an effective option for select fractures. The authors also review the indications, described techniques, complications and outcomes associated with this treatment option.

NONOPERATIVE MANAGEMENT

Historically, many authors have described a high rate of satisfaction and good results based on subjective outcomes, regardless of radiographic appearance, after nonoperative management of distal radius fractures.[1,2] When validated objective and subjective outcomes scores are used, it becomes clear that significant functional deficiencies are correlated with poor reductions at intermediate and long-term follow-up.[3–7] There are significant changes in radiocarpal stress concentration and distribution with malalignment of the distal radius.[8,9] Malalignment of the distal radius can also lead to distal radio-ulnar joint incongruity, limiting forearm rotation.[8–13] In an early retrospective review of 565 distal radius fractures, Cooney and colleagues[4] found that malunion was frequently associated with pain, limited range of motion, and decreased strength. The basic science data, in conjunction with longer-term radiographic and functional outcomes measures, clearly support the treatment of distal radius fractures with more than just benign neglect in most patients.

Nonoperative treatment by reduction and immobilization remains the most common treatment, based on the incidence of appropriate fracture types, as seen in many epidemiological studies in the literature. The indications, technique, predictors of failure, outcomes, and complications are reviewed below.

Indications for Nonoperative Treatment

Successful nonoperative management of distal radius fractures is dependent on appropriate injury pattern and patient selection. Most distal radial fracture classification schemes are based on the location of the fracture, number of articular fragments, involvement of the distal ulna, and direction of angulation. Analysis of the biomechanical and functional outcome literature suggests that predicting the success of nonoperative treatment may be better determined by a different set of radiographic parameters and patient factors.

Clinical outcome studies and the biomechanic literature[8,9] demonstrate that maintenance of palmar tilt[14–16] (normally 11°), ulnar variance

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(normally −2 mm) and radial height[15,17,18] (normally 12 mm) are probably the most important factors in attaining acceptable patient outcomes. An articular gap of less than 2 mm,[19] and a step of 1 mm or less is required to reduce the risk of residual pain and wrist dysfunction.[20] Failure to achieve these goals in a cogent, functional patient, following a reduction if required, suggests that nonoperative management may not be able to achieve the desired outcomes. The authors' suggested minimal requirements for an acceptable reduction are ulnar variance negative or neutral (or within 2 mm of the unaffected contralateral wrist), less than 10° of angulation from the normal volar tilt in either the volar or dorsal direction, radial inclination greater than 15°, and a congruent articular surface (**Fig. 1**A, B).

Accurately evaluating these radiographic parameters requires standardized postero-anterior and lateral views in the neutral position, and may include comparative views of the unaffected wrist. Computed tomography improves the reliability of injury characterization for intra-articular fractures, frequently altering the treatment plan.[21,22] The addition of three-dimensional CT reconstructions is of value in the assessment of complex intra-articular injuries, particularly for coronal plane fractures and central die punch fractures.[23]

If the fracture is minimally displaced, reduction and immobilization may not be necessary;[24,25] however, some authors have demonstrated displacement in initially undisplaced fractures, suggesting that treatment without immobilization requires careful patient selection and monitoring.[26] The indications for nonoperative management advocated by the authors of this article include patients presenting with a fracture in acceptable position, or patients in whom the fracture can be maintained in an acceptable position following reduction.

The indications for nonoperative management may be broader in the elderly, low-demand patient for several reasons. The fracture often represents a low-energy fragility fracture with less articular involvement. Frequently, there are associated comorbid factors that increase the risks associated with operative management. In this population, there appears to be less correlation between radiographic and functional outcomes, with the evidence suggesting that most distal radius fractures in older patients may be treated conservatively with satisfactory functional outcomes likely.[1,2,6]

Reduction Techniques

Adequate pain control is necessary when a closed reduction is required. This can be accomplished with a hematoma block, intravenous regional anesthetic (Bier block), or interscalene block. Occasionally, neuroleptic or general anesthesia is required; however, regional techniques are preferred where possible. Although no one particular regional technique has been demonstrated to be clearly superior or clinically safer, there is evidence to suggest that hematoma blocks provide inferior pain control and may compromise reduction.[27]

After achieving adequate analgesia, in-line traction facilitates relaxation of the forearm musculature. The use of finger-traps and the gentle application of weights may assist in achieving this with relative pain control, but has not been demonstrated to improve reduction rates or long-term outcomes.[28] Required manipulation will depend on the presenting fracture, but for the typical dorsally angulated fracture with minimal

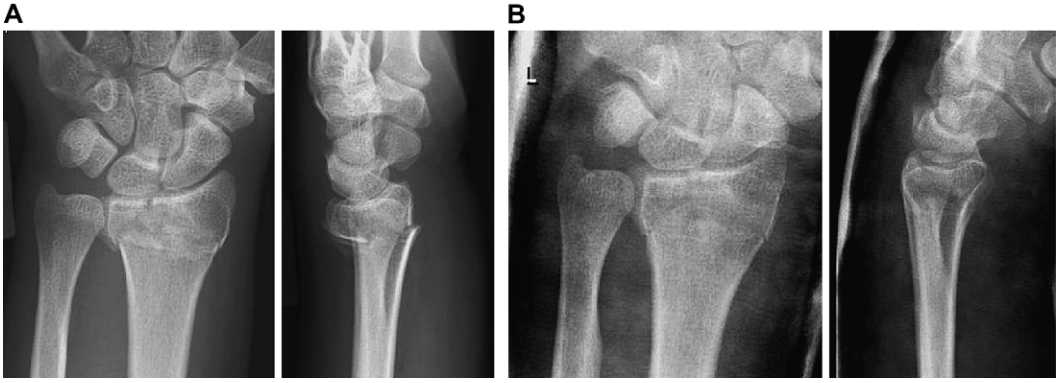

Fig. 1. (*A*) Intra-articular distal radius fracture in a 36-year-old female. Closed reduction is indicated based on patient function and radiographic measurements. (*B*) Postreduction radiographs demonstrate acceptable reduction based on radiographic criteria.