Review Article

Controversies in the Management of Distal Radius Fractures

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Abstract

Controversies span the entire spectrum of management of distal radius fractures—fracture assessment, diagnosis, treatment, and evaluation of outcomes. The utility of multiple radiographic views described in the literature has not been validated. Likewise, the several classification systems that exist have yet to demonstrate substantial interobserver and intraobserver reliability. Nonsurgical controversies involve fracture reduction, use of anesthesia, type of fracture immobilization, and forearm position during healing. Surgical controversies include surgical indications, need for release of carpal tunnel, fracture fixation method, and the need for augmentation (ie, bone graft). Postoperatively, rehabilitation, medication, and physical therapy also remain highly controversial. The best outcome measure has yet to be established. A strong need remains for high-level, prospective studies to determine the most effective way to assess, diagnose, treat, and measure outcomes in patients with distal radius fractures.

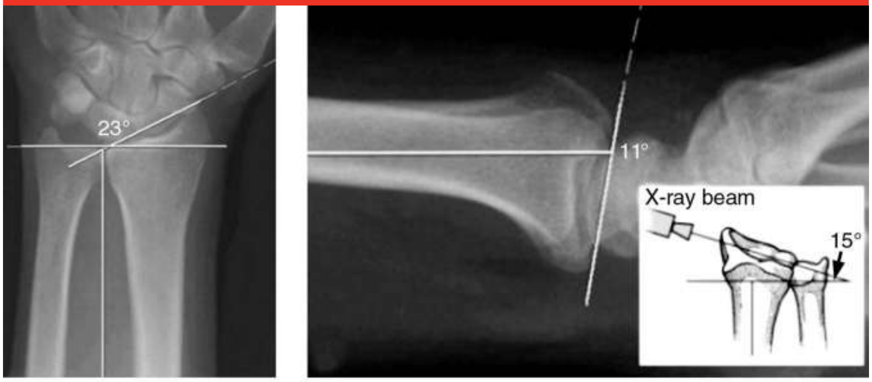
Distal radius fractures commonly present in the emergency department; annual incidence is >600,000. These fractures occur in a bimodal distribution, with highest incidences among younger men after high-energy trauma and older women after low-energy falls. In 2007, Medicare made \$170 million in distal radius fracture–related payments.[1]

Proper management of distal radius fractures necessitates accurate fracture assessment, diagnosis, treatment, and evaluation of outcomes. Controversies span this entire spectrum. In 2009, the American Academy of Orthopaedic Surgeons (AAOS) established distal radius practice guidelines.[2] Of the 29 published recommendations, not one received a grade of strong. In addition, the Cochrane Database has concluded that evidence is lacking regarding many aspects of management of distal radius fractures.[3-8]

Assessment Controversies

Numerous imaging protocols have been described to evaluate distal radius fractures. PA, lateral, and oblique views are often obtained to assess radial inclination, radial length, and volar tilt (Figure 1). The dorsal rim of the distal radius on PA views and the "teardrop" on lateral views have been described as standard anatomic findings, as well. The dorsal rim projects 3 to 5 mm beyond the proximal cortex of the radius on PA imaging (Figure 2). The teardrop projects 3 mm palmar from the radial diaphysis on lateral imaging.[9] A line drawn tangential to the teardrop extending to a line drawn down the longitudinal axis of the radius forms an angle averaging 70° (Figure 3). Volar tilt may appear corrected after fracture reduction, yet intra-articular fracture malreduction may still be present with a dorsiflexed

Figure 1



A, PA radiograph demonstrating radial inclination. **B,** Lateral radiograph demonstrating volar tilt. *Inset,* accurate image of subchondral bone.

Figure 2

PA radiograph demonstrating the dorsal rim of the distal radius (dashed line). This rim projects approximately 3 to 5 mm beyond the proximal cortex of the radius.

volar rim. The oblique view offers the advantage of an additional view to assess intra-articular extension of distal radius fractures. Its utility has yet to be validated.

PA images obtained by different methods may change the radiographic appearance of the distal radius. A forearm PA image obtained in pronation captures the radius as it crosses over the ulna. This pronation results in a loss of 0.5 mm of radial length compared with a forearm in neutral rotation.[10] The radius and ulna shafts also converge proximally in pronation, which results in a net decrease in measured radial inclination, volar tilt, and radial height. Likewise, in supination, these values increase.[11]

The dorsal tangential view is one of the most recently described views. This view is obtained as the wrist is flexed 75° while the forearm is placed between two ends of the mini C-arm, with the dorsal forearm tangential to the x-ray beam[12] (Figure 4, A and B). The dorsal tangential view was described to identify dorsal compartment screw penetration during fixation of distal radius fractures (Figure 4, C). This view has yet to be validated for assessment purposes.

CT is also used to assess distal radius fractures. A study by Pruitt et al[13] comparing CT scans to plain radiographs found that CT scans were better at demonstrating fracture extension into the distal radioulnar joint, the extent of articular surface depression, and amount of comminution. These authors concluded that CT should be used only in patients undergoing open reduction and internal fixation (ORIF) or when information about comminution and joint depression is needed. No validated studies demonstrate better functional outcomes with CT imaging before surgical intervention.

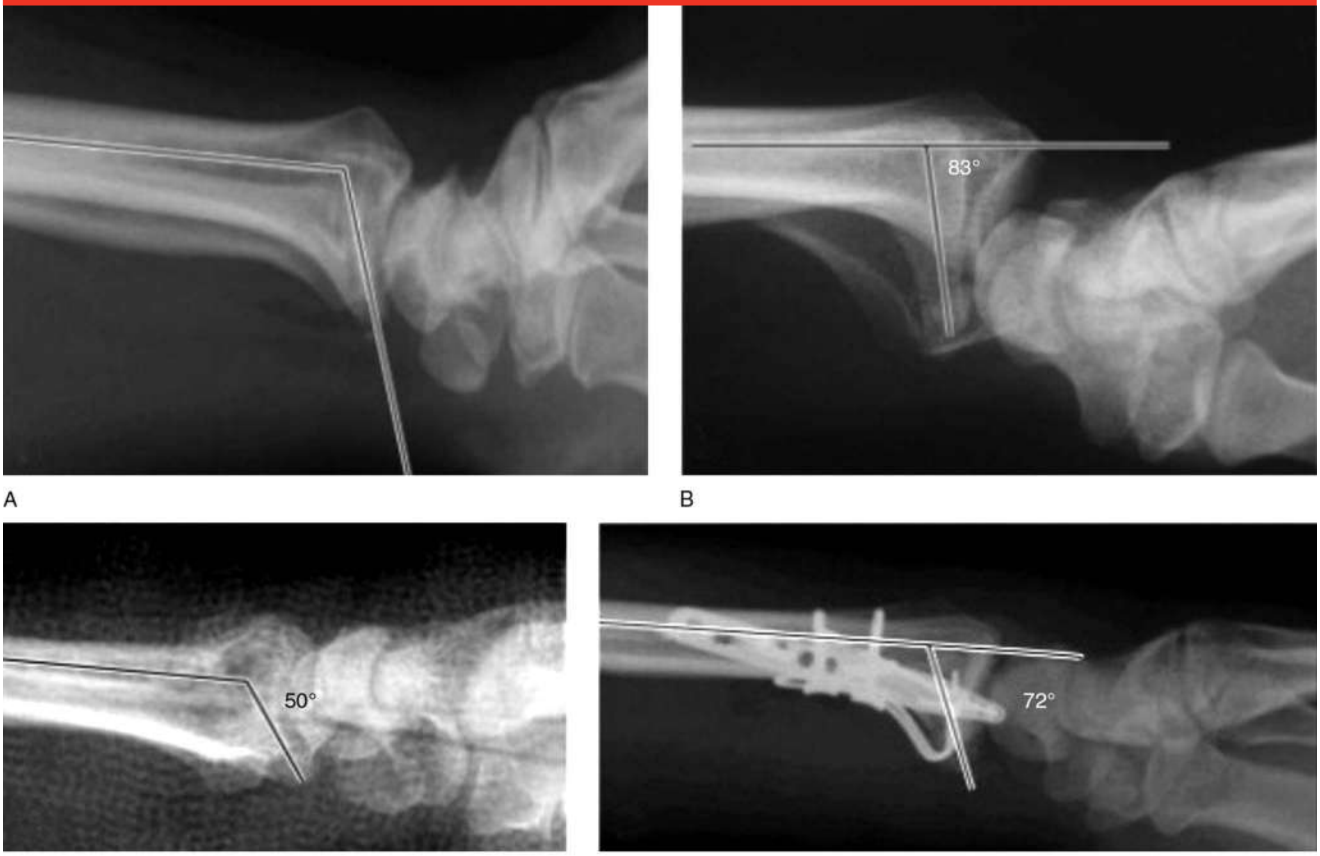
MRI has been used to assess soft-tissue injury about the wrist, especially when suspicion of concurrent scapholunate ligament injury is high. The sensitivity and specificity of MRI to diagnose these tears were recently reported to be 63% and 86%, respectively.[14] The authors of this study recommended against using MRI for the diagnosis of scapholunate ligament injury.

Several attempts have been made to identify predictors of distal radius fracture stability. In 1989, Lafontaine et al[15] concluded that an increasing number of instability factors were associated with loss of fracture reduction, despite immobilization in a cast. Instability factors included initial dorsal angulation >20°, dorsal comminution, fracture extension into the radiocarpal joint, associated ulna fracture, and patient age >60 years. Although this study assessed radiographic loss of reduction after initial fracture reduction, it did not report clinical outcomes.

In 2004, Nesbitt et al[16] assessed 50 patients with unstable distal radius fractures, according to the Lafontaine criteria.[15] All patients in this study were treated conservatively with closed reduction and sugar-tong splinting. At 4 weeks postreduction, 46% of these fractures maintained reduction. These authors concluded that in closed management of potentially unstable distal radius fractures, age greater than 60 years was the only significant predictor of secondary displacement.

In 2006, Mackenney et al[17] examined 4,000 distal radius fractures regarding factors at initial presentation that affect radiographic outcomes.

Figure 3



A B C D

On lateral imaging, the teardrop projects 3 mm palmar from the radial diaphysis. A line tangential to the teardrop extended to a line drawn down the longitudinal axis of the radius forms an angle averaging 70°. **A,** Lateral radiograph demonstrating the teardrop angle. **B,** An increased teardrop angle (83°) in a volarly displaced distal radius fracture. **C,** A decreased teardrop angle (50°) in a dorsally displaced distal radius fracture. **D,** A normal teardrop angle (72°) after fixation of a distal radius fracture. (Reproduced with permission from Wolfe S: Distal radius fractures, in Wolfe SW, Hotchkiss RN, Pederson WC, Kozin SH, eds: *Green's Operative Hand Surgery*, ed 6. Philadelphia, PA, Churchill Livingstone, 2011, pp 561-638.)

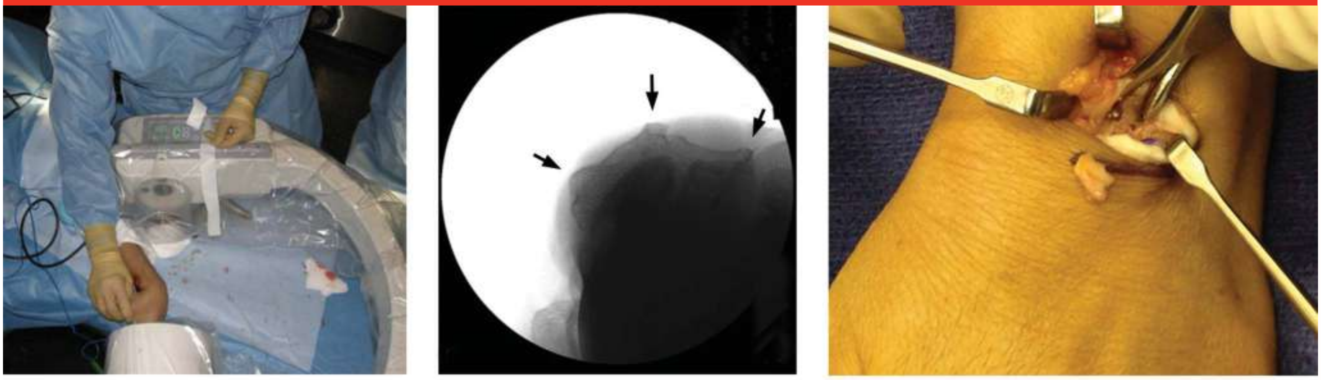
They concluded that patient age, metaphyseal comminution, and ulnar variance were the most consistent predictors of radiographic outcome. Initial dorsal angulation was not found to be predictive of radiographic outcomes. Currently, patient age appears to be the only repeatedly validated factor predictive of fracture stability.

Diagnostic Controversies

The Frykman, Mayo, Melone and AO/OTA classification systems are most commonly referenced in the literature. Andersen et al[18] assessed the interobserver and intraobserver reliability of these four fracture classification systems. Two orthopaedic hand surgeons and two radiologists classified 55 sets of distal radius fracture radiographs according to the Frykman, Mayo, Melone, and AO/OTA classification systems. Interobserver agreement was rated as moderate or fair for each system. Intraobserver reliability was substantial for one observer with the Frykman, Melone, and Mayo classifications. Intraobserver agreement was raised to the substantial level for all four observers when the AO classification (Figure 5) was reduced to its three main subtypes. This study concluded these four classifications systems should not be used to determine treatment or comparison of outcomes.

In 2007, Jin et al[19] assessed the interobserver and intraobserver reliability of the Cooney classification. Five orthopaedic surgeons with ≥10 years of experience in orthopaedic trauma assessed 43 sets of distal radius fracture films. This study identified moderate and substantial interobserver and intraobserver reliability when the Cooney classification system was used without subtypes. The

Figure 4



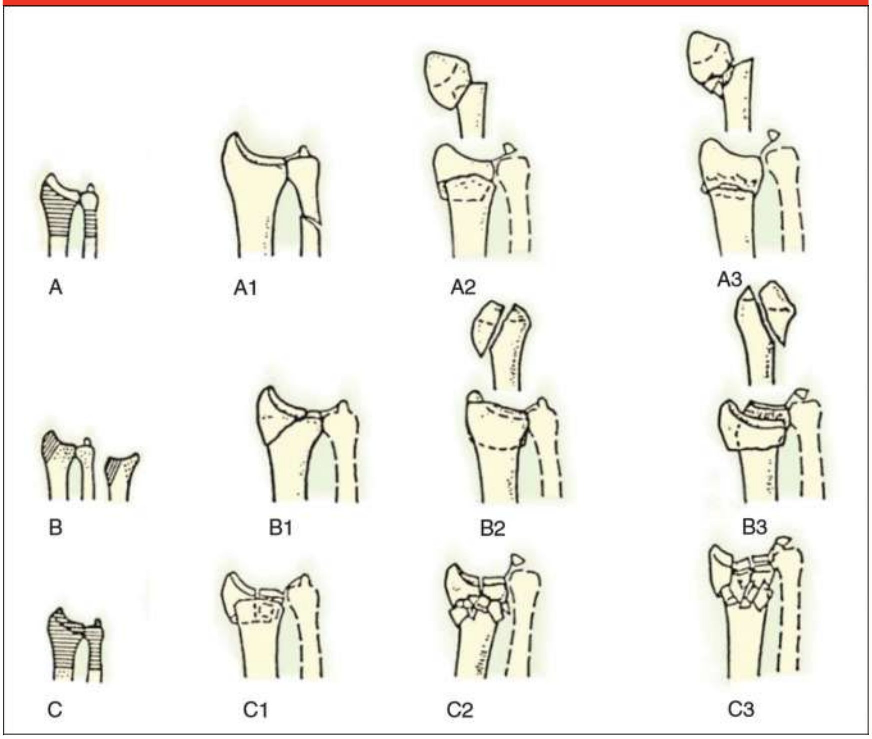
A B C

A, Clinical photograph demonstrating patient wrist position during dorsal tangential imaging of the distal radius. **B,** Dorsal tangential radiograph of the distal radius. The arrows identify, from left to right, the radial styloid, Lister tubercle, and dorsal/ulnar corner of distal radius. **C,** Intraoperative photograph demonstrating dorsal compartment screw penetration after fixation of a distal radius fracture. This screw caused irritation to this patient's extensor pollicis longus tendon. (Panels A and B reproduced with permission from Ozer K, Toker S: Dorsal tangential view of the wrist to detect screw penetration to the dorsal radius after volar fixed-angle plating. *Hand [N Y]* 2011;6(2):190-193.)

authors observed only slight reliability when subtypes were used. This study concluded that the Cooney classification system might not be useful for treatment decisions.

In 2010, Kural et al[20] assessed the reliability of five classification systems used for distal radius fractures. This study also assessed interobserver and intraobserver reliability of classification systems. Nine orthopaedic surgeons classified radiographs of 32 patients with distal radius fractures. They used the Frykman, AO/OTA, Melone, Fernandez, and Universal (ie, Cooney) classification systems. The highest intraobserver agreement was identified in the Universal classification system (0.621). Interobserver agreement was insufficient in all classification systems. This study concluded that current classification systems used to classify displaced distal radial fractures are insufficient. Kural et al[20] suggested that a new classification system with three-dimensional fracture assessment may be useful.

Figure 5



The AO classification of distal radius fractures. A, Extra-articular fractures. B, Partial-articular fractures. C, Complete articular fractures. Each fracture may then be further classified based on location and comminution.

In 2006, Harness et al[21] published a study that assessed the utility of radiographs, two-dimensional CT, and three-dimensional tomography. Four observers evaluated images of thirty intra-articular distal radius fractures. This study concluded that three-dimensional CT improved the reliability and accuracy of radiographic characterization of articular fractures of the distal radius. Furthermore, the use of three-dimensional imaging influenced treatment recommendations, resulting in a greater number of decisions for an open approach.

Currently, commonly used classification systems have been associated with low intraobserver and interobserver reliability. Most agree that no classification system is adequate to determine treatment and predict outcomes unless interobserver and intraobserver reliability is substantial.

Treatment Controversies

Treatment remains the most controversial aspect of distal radius fracture management. Nonsurgical controversies involve fracture reduction, use of anesthesia, type of fracture immobilization and forearm position during healing. Surgical controversies include surgical indications, need for release of carpal tunnel, fracture fixation method, and need for augmentation (bone graft). Postoperatively, rehabilitation, medication, and outcome measures remain controversial.

Nonsurgical Treatment

Need for Reduction and Repeat Reductions

It is common practice to attempt closed reduction for stable and unstable distal radius fractures, yet a clear consensus regarding indications for closed reduction does not exist. In a 2003 study by Beumer and McQueen,[22] 53 of 60 fractures (88%) undergoing closed reduction and casting in low-demand elderly patients lost fracture reduction; 75% of fractures that lost reduction did so in the first week of initial reduction. McQueen et al[23] prospectively assessed treatment of redisplaced, unstable distal radius fractures. Patients treated with remanipulation alone had a 67% rate of malunion. Another study identified no benefit of closed reduction for patients with moderately to severely displaced distal radius fractures.[24] The efficacy of closed reduction in the management of distal radius fractures remains to be validated in large prospective controlled trials.

Reduction Method

Nonsurgical reduction options include manual closed reduction, with or without finger traps. Earnshaw et al[25] assessed 225 displaced fractures randomized to finger trap traction or manipulation. The two methods did not differ with failure rate or final position of fracture at 5 weeks.

Anesthesia for Reduction

Hematoma block, intravenous regional anesthesia (ie, Bier block), regional nerve blocks, sedation, and general anesthesia are all used during treatment of these fractures. In 2002, the authors of a Cochrane Database study indicated that hematoma block provided poorer analgesia than did intravenous regional anesthesia. The authors concluded that insufficient evidence from randomized trials exists in the literature to establish the effectiveness of different methods of anesthesia.[7] Another Cochrane study concluded that no difference in fracture reduction could be appreciated with or without intravenous regional anesthesia or hematoma block.[4]

Anesthesia for Surgical Treatment

Recent studies have assessed the effectiveness of perifracture injections and intravenous regional anesthesia pain control postoperatively. A 2010 study concluded that perifracture injections did not provide additional pain control benefit during the first 2 days after surgery.[26] In 2012, Egol et al[27] reported that regional anesthesia improved outcome scores and decreased pain compared with general anesthesia during ORIF of these fractures. The literature supports the use of intravenous regional anesthesia during treatment; however, randomized, prospective studies comparing multiple anesthesia options remain to be performed.

Fracture Splinting and Forearm Position

Closed management of distal radius fractures involves the use of a removable splint or of rigid immobilization (ie, plaster, fiberglass). Controversy exists regarding splint types, immobilization duration, splint length, and forearm position. Furthermore, we are aware of no randomized prospective studies that assess forearm position during immobilization.

In 2006, Bong et al[28] compared the sugar tong splint with a short-arm radial gutter splint. This prospective, randomized series identified no difference in fracture reduction maintenance. The authors recommended that the short-arm splint be used initially to immobilize displaced distal radius fractures because patients tolerated the short-arm splint better. In 2009, the AAOS published guidelines regarding removable splints and rigid fixation of distal radius fractures. The 2009 AAOS Clinical Practice Guideline (CPG) concluded that moderate strength existed to suggest rigid immobilization be used over removable splints to manage displaced distal radius fractures. This same panel could not recommend using removable splints to treat nondisplaced distal radius fractures.[2] A meta-analysis of 37 trials concluded that insufficient evidence exists to suggest the best method and duration of immobilization during nonsurgical treatment of distal radius fractures.[3]

Surgical Treatment

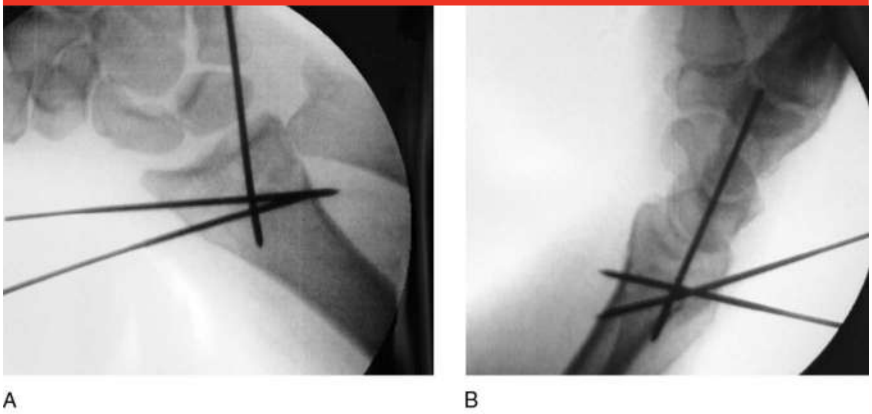
Indications for Surgery

Consensus is rare regarding surgical indications of closed distal radius fractures. The 2009 AAOS CPG recommends, with moderate strength, that surgical fixation of fractures be performed when postreduction radial shortening is >3 mm, dorsal tilt is >10°, or intra-articular displacement or step-off is >2 mm.[2] In patients aged ≥55 years, the AAOS concluded that available evidence does not demonstrate any difference between casting and surgical fixation. A 2011 Austrian study suggests that functional outcomes are similar for surgical fixation and nonsurgical treatment in patients aged >65 years.[29] Seventy-three patients with displaced intra-articular distal radius fractures were prospectively randomized to ORIF or reduction and cast. At 12-month follow-up, there was no statistical difference in Patient-Rated Wrist Evaluation (PRWE) scores, Disabilities of the Arm, Shoulder, and Hand (DASH) scores, range of motion (ROM), or levels of pain. Patients in the surgical group had better grip strength at all time points and better radiographic parameters. Patients in the nonsurgical group had increased deformity of the affected wrist. No similar studies have been repeated in the United States.

Carpal Tunnel Release

Carpal tunnel syndrome can develop in the setting of distal radius fractures. Some evidence exists in the literature to suggest that release of the carpal canal is beneficial in patients with symptoms.[30] However, the 2009 AAOS CPG indicated that inconclusive evidence exists to suggest nerve decompression be performed when nerve dysfunction persists after reduction.[2]

Figure 6



A, PA radiograph after percutaneous intrafocal pin fixation in a distal radius fracture. **B,** Lateral radiograph of the same wrist.

Type of Fixation

Multiple options exist with respect to fixation options for distal radius fractures. These include percutaneous pinning, external fixation, ORIF techniques, intramedullary fixation, and arthroscopy.

Percutaneous Pinning

Percutaneous pinning uses two or three Kirschner wires (K-wires) to reduce and fix a fracture. Kapandji (ie, intrafocal) pinning uses dorsal and radial pins for reduction and fixation of extra-articular distal radius fractures (Figure 6).

The 2009 AAOS CPG concluded that insufficient evidence exists to determine whether using two or three K-wires is optimal as no studies were qualified to address this question.[2] Rosenthal and Chung[31] compared intrafocal pinning to cast treatment of distal radius fractures and determined that pinning provided better maintenance of volar tilt 3 months postoperatively. A meta-analysis of 13 trials examining dorsally displaced distal radius fractures treated with percutaneous pinning concluded that, although low-level evidence exists to support percutaneous pinning, the role and method are not supported by validated studies.[32]

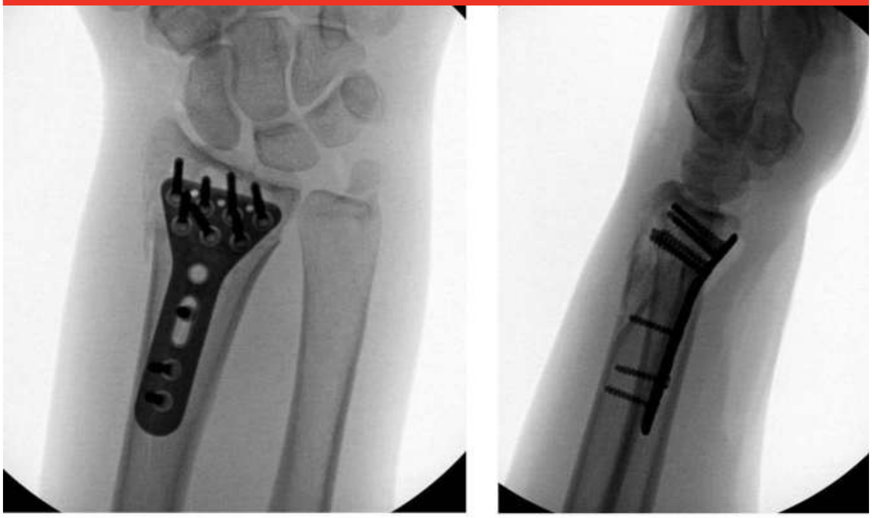
External Fixation: Bridging and Nonbridging

External fixation of distal radius fractures may be accomplished via a radiocarpal joint spanning (bridging) or radiocarpal joint free (nonbridging) construct. Controversy exists regarding the type of external fixation, the use of additional K-wires with external fixation, the amount of wrist distraction, the duration of fixation, and the indications for external fixation.

McQueen[33] published results comparing bridging and nonbridging external fixation in a randomized, prospective study assessing unstable fractures. The author concluded that ROM, grip strength, volar tilt, and carpal alignment were superior in the nonbridging group. In contrast, a 2008 meta-analysis review of nine trials did not demonstrate sufficient evidence to determine the relative effectiveness of different methods of external fixation.[34]

Wrist distraction has been evaluated regarding clinical outcomes. In a retrospective study of 26 patients treated with external fixation, the authors concluded that some distraction of the carpus at the initial fracture was correlated with improved clinical results.[35] A 2009 study further validated this claim.[36] However, to date,

Figure 7



A B

A, PA radiograph after open reduction and internal fixation with locked volar plating of a four-part distal radius fracture with comminution. **B,** Lateral radiograph of the same wrist.

prospective randomized studies do not exist to assess the effects of overdistraction.

A comprehensive, systematic review and meta-analysis of 46 articles on external and internal fixation of the distal radius was reported in 2005.[37] No statistically significant difference between external and internal fixation was identified in pooled grip strength, wrist ROM, radiographic alignment, pain, or physician-rated outcomes. A higher rate of infection, hardware failure, and neuritis were identified in the external fixation group. Higher rates of tendon complications and early hardware removal were identified in the internal fixation group. Precision of this study was affected by the heterogeneity of studies reviewed.

Open Reduction and Internal Fixation

Open reduction and internal fixation of distal radius fractures is often used to treat unstable fractures. Locked volar plating has become increasingly common for surgical intervention in unstable distal radius fractures (Figure 7). Other methods of ORIF include radial-sided plates, dorsal plates, multi-plate constructs, and fragment specific fixation.

Current literature validates the use of locked volar plating to treat comminuted intra-articular distal radius fractures; however, the utility of this treatment compared with other interventions remains to be validated.[2] Wright et al[38] compared volar locked plating to external fixation in unstable distal radius fractures. This study demonstrated improved postoperative intra-articular step-off, volar tilt, radial length, and ROM in the ORIF group; however, PRWE and DASH scores were equivalent.

Volar locked plating has been compared with nonsurgical treatment of unstable distal radius fractures in patients aged >65 years. Arora at al[29] performed a prospective randomized controlled study in which patients with unstable, displaced distal radius fractures were randomized to nonsurgical treatment or to ORIF with volar locked plating. The surgical group had improved DASH and PRWE scores at early follow-up, but at 1 year, there were no significant differences between the groups. Radiographically, the surgical group had achieved appropriate reduction on all fractures postoperatively and at 1 year. A 100% malunion rate occurred in the nonsurgical group. Grip strength was higher in the surgical group at all time points. All patients reported being satisfied with their treatment. A review of the current literature indicates that it is unclear whether volar locked plating offers long-term functional advantage over other methods of fracture fixation in an age group older than 65 years, regardless of radiographic outcome.

Fragment-specific fixation uses small plates and clips to provide fixation to individual bone fragments. In a recent study by Konrath and Bahler,[39] 27 displaced and unstable distal radius fractures were treated with fragment-specific fixation. Reliable and anatomic reduction with high patient satisfaction was seen at 2- to 3-year follow-up. In a prospective cohort trial, Sammer et al[40] compared fragment-specific fixation with volar locked plating. At 1-year follow-up, similar functional outcomes were seen, but the fragment-specific fixation group had increased complications and reoperation.

Intramedullary Fixation

Intramedullary fixation of distal radius fractures involves nail insertion through a radial styloid portal and allows for placement of interlocking screws. In 2012, Tan et al[41] reported the results of 63 adult patients with distal radius fractures treated with an intramedullary device or casting. At 12 months, the flexion-extension arc and grip strength were higher in the intramedullary nail group; also, the intramedullary nail group reported lower DASH scores and better radiographic indices. Randomized, controlled, validated studies comparing intramedullary nail devices to ORIF techniques have yet to be performed.

Arthroscopically Assisted Fixation

Wrist arthroscopy can be used to visualize the articular surface of distal radius fractures during fixation. In a study of 33 patients with a 2-year follow-up, Augé and Velázquez[42] used arthroscopy to assess the articular surface of distal radius fractures after reduction and external fixation. The surgeon's assessment of intra-articular fracture severity tended to increase based on arthroscopy findings, necessitating reduction modification. The AAOS review of the literature cited in the distal radius CPG indicated evidence to support the use of arthroscopy to assist with reduction of distal radius fractures remained weak.[2]

Ulnar Styloid Fracture Fixation

Ulnar styloid fractures commonly occur in the setting of distal radius fractures. After fixation of a distal radius fracture, the distal radioulnar joint (DRUJ) is often stable. This may be becauseof an intact distal oblique bundle of the interosseous membrane and distal radioulnar ligaments acting with an anatomically reduced distal radius. In the setting of a stable DRUJ, ulna styloid fracture size and displacement do not affect patient outcomes.[43,44] In the presence of an unstable DRUJ, styloid fixation is indicated.[45] This may be accomplished though several methods, including the use of K-wires, anchor fixation, tension bands, and screw fixation.

Fracture Augmentation

Allograft and autograft are used to fill metaphyseal voids during treatment of distal radius fractures. The indications, efficacy, and benefit of one graft over another remain controversial.

Cassidy et al[46] performed a prospective randomized trial assessing the treatment of distal radius fractures by external fixation or casting with and without calcium phosphate cement. At 6 to 8 weeks, patients in the allograft group had better grip strength, wrist ROM, digit motion, and hand use and less swelling. At 1 year, no clinical differences were detected between the two groups. Furthermore, four patients with intra-articular extravasation of cement were detected; no clinical sequelae developed.

In a prospective randomized study, cancellous allograft was compared with iliac crest autograft to treat comminuted distal radius fractures. No differences in pain or function were observed 1 year after surgery. Bone harvesting from the iliac crest did lead to complications in the autograft group; these included postoperative donor site pain, hematoma, infection, seroma, and paresthesias.[47]

The 2009 AAOS distal radius guidelines indicate that no qualified studies exist to recommend for or against the use of supplemental bone graft or substitute when locking plates are used.[2] This same review indicated that inconclusive evidence exists in the literature to recommend for or against the use of allograft and autograft as an adjunct to other surgical treatments. Our current review of available literature concurs with this assessment.

Rehabilitation

Controversy exists regarding the management of distal radius fractures after surgery and nonsurgical treatment. These controversies include the timing of postoperative immobilization, timing of wrist ROM, the use of home exercises or formal physical therapy, and the utility of ultrasound, ice, and vitamin C.

Distal radius fractures are usually immobilized following nonsurgical treatment and surgery. Patients often then transition to a removable splint. A prospective randomized study compared early wrist ROM (ie, within 2 weeks of surgery) with late wrist ROM (ie, 6 weeks) in patients treated with volar plate fixation of the distal radius.[48] No significant differences were identified with respect to the average flexion-extension arc of the injured wrist at 3 or 6 months postoperative. Also, no functional differences were identified. These authors concluded that early wrist ROM does not offer a benefit when combined with volar plate fixation of distal radius fractures. This study was confounded by allowing patients in the late motion group to remove a splint during showering at a time when they were not supposed to have wrist ROM.

Several randomized trials have compared physical therapy with home exercise programs after treatment of distal radius fractures. Most of these are level II evidence. A 2009 study compared postoperative treatment of distal radius fractures that had undergone volar locked plating.[49] This study concluded that a home exercise program was as effective as formal physical treatment in the postoperative rehabilitation of wrist fractures.

At least one randomized prospective study has assessed distal radius fracture healing rates in patients treated with low-intensity ultrasound.[50] This study compared low-intensity ultrasound to placebo for shortening the time of healing in nonsurgically treated Colles fractures. Mean time to union was 61 days in the ultrasound group and 98 days in the placebo group. No long-term benefit was appreciated in the ultrasound group.

Relatively few studies exist to document the efficacy of ice with respect to pain reduction in distal radius fractures. The 2009 AAOS CPG indicates that weak evidence is available in the literature to support the use of ice as adjuvant treatment.[2]

Medication

Vitamin C is often prescribed postoperatively in an effort to prevent chronic regional pain syndrome (CRPS). Two studies by Zollinger and colleagues[51,52] have assessed vitamin C use and the incidence of CRPS in patients treated with distal radius fractures. The more recent study[51] concluded that 500 mg per day was the optimal dose required to achieve a reduction in CRPS. In contrast, Court-Brown et al[53] published findings suggesting that vitamin C does not improve patient-rated outcome, range of movement, strength, rate of CRPS, or bone healing after distal radius fractures. The AAOS guidelines state that moderate strength exists to suggest the use of vitamin C for the prevention of disproportionate pain.[2] The utility of these studies is limited, however, because no objective method to definitively diagnose CRPS exists. Although vitamin C may be of benefit in the prevention of CRPS, it remains to be validated as a treatment that improves patient-rated outcomes.

The use of diphosphonates perioperatively has been controversial because of the mechanism of diphosphonate inhibition of osteoclast remodeling. Gong et al[54] performed a prospective randomized trial of postoperative diphosphonate initiation starting either 2 weeks or 6 weeks after surgery. No difference was seen between the groups regarding time to fracture union. Further studies with less strict inclusion criteria will be needed to determine the optimal time to initiate diphosphonate therapy and whether it is safe for general use.

Summary

Controversies span the entire spectrum of distal radius fracture management. Multiple radiographic views have been described in the literature without validation of their utility. Numerous classification systems have yet to demonstrate substantial interobserver and intraobserver reliability. Multiple aspects of both surgical and nonsurgical treatment have yet to be validated in high-level studies. Postoperative treatment modalities, including medication, rehabilitation, and physical therapy, also remain highly controversial. In addition, the best outcome measure has yet to be determined. A strong need remains for high-level, prospective studies to establish the most effective way to assess, diagnose, treat, and measure outcomes in patients with distal radius fractures.

References

Evidence-based Medicine: Levels of evidence are described in the table of contents. In this article, references 23, 25, 26, 28, 33, and 46-54 are level I studies. References 4-9, 15, 21, 40, and 44 are level II studies. References 3, 24, 27, 32, 34-38, 41, and 43 are level III studies. References 11-14, 17-20, 22, 30, 39, and 42 are level IV studies. References 10 and 31 are level V expert opinion.

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