Radial Distraction to Stabilize Distal Radioulnar Joint in Distal Radius Fixation

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Persistent distal radioulnar joint (DRUJ) instability after internal fixation of distal radius fractures can be managed with soft tissue or bony stabilization and prolonged immobilization. However, these strategies limit postoperative motion. To address this limitation, we report our technique of indirect ulna shortening by radial distraction followed by early mobilization and provide a case example. We use this technique in cases of persistent DRUJ instability during standard volar plating of distal radius fractures. Radial lengthening is achieved by distraction through the fracture site using the oblong hole of the plate until DRUJ stability is obtained. No immobilization of forearm rotation and a standard, early mobilization rehabilitation program are used. Indirect ulnar shortening by distraction through the distal radius fracture site provides a simple and novel strategy for the management of persistent DRUJ instability during volar plating, obviating the need for prolonged immobilization or to alter standard postoperative protocols. *(J Hand Surg Am. 2018;43(5):493.e1-e4. Copyright © 2018 by the American Society for Surgery of the Hand. All rights reserved.)*

Key words Distal radioulnar joint instability, distal radius fracture, plating, ulnar styloid base fracture, distraction.

Online Exclusive

DISTAL RADIUS FRACTURES (DRFS) are common injuries treated by hand surgeons, and operative treatment with a volar locking plate and early mobilization has been reported to have good functional results in the early postoperative period.[1] Several common combined patterns of injury are seen with DRFs. Among these, ulnar-sided pathologies including triangular fibrocartilage complex (TFCC), distal radioulnar joint (DRUJ) ligament tears, or ulnar styloid fracture (USF) are particularly common. The TFCC is the primary stabilizer of the DRUJ, with its radioulnar ligaments arising from the sigmoid notch and inserting into the fovea and the base of the ulnar styloid. Therefore, DRFs combined with a TFCC tear or ulnar styloid base fracture may result in DRUJ instability. Although not all studies have found a difference in clinical outcome, DRUJ instability has been identified as a poor prognostic factor in some outcomes after DRFs.[2]

To prevent the long-term sequelae of acute DRUJ instability, some studies suggest prolonged immobilization preventing forearm rotation by either temporary DRUJ pinning or above-elbow orthosis.[3] Other studies suggest that fixation of DRFs combined with arthroscopic TFCC repair yields good results without DRUJ instability.[4] Although these strategies have been shown to successfully confer DRUJ stability, they prevent early mobilization and stiffness is a potential complication.

Biomechanical cadaveric studies suggest that the DRUJ is stabilized by ulnar shortening.[5] Ulna shortening can be obtained indirectly by radial lengthening. We hypothesized that volar plate fixation of DRFs

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combined with indirect ulnar shortening by radial distraction would: (1) simply and reliably confer DRUJ stability, (2) allow for use of a standard early mobilization rehabilitation protocol, and (3) not result in complications such as radius nonunion in management of these combined injury patterns. Here, we describe our technique and present a case demonstrating a good clinical and radiographic outcome in a patient with persistent DRUJ instability during volar plating.

SURGICAL ANATOMY

This technique can be used during distal radius fixation with volar plating. The modified volar Henry approach using the plane between the radial artery and flexor carpi radialis tendon and elevating pronator quadratus off its radial attachment is suitable for volar plating of most of DRFs and for this method.

INDICATIONS

This technique is employed in patients who have a positive radioulnar stress test after volar plate fixation in the reduced position for DRF. It is also indicated for patients with USF associated with instability of the DRUJ.

CONTRAINDICATIONS

Contraindications include AO B-type fracture (partial intra-articular type) because the distraction through the fracture site may cause articular step-off. We additionally do not use the technique in patients with pre-existing arthritis involving the DRUJ.

SURGICAL TECHNIQUE

Distal radius open reduction and internal fixation is performed under general or regional anesthesia, with pneumatic tourniquet control and with the patient in the supine position. A longitudinal skin incision is made between the flexor carpi radialis and radial artery, beginning at the volar crease of the wrist and extending approximately 5 cm proximally. The approach is carried bluntly through the interval of the flexor carpi radialis and radial artery. The pronator quadratus is incised at the distal and radial margins for elevation off the radius to expose the fracture site. In the case example, a 2.4-mm variable-angle locking distal radius plate (Two-Column VA-LCP; Synthes, Oberdorf, Switzerland) was applied to the volar aspect at the metaphyseal area of distal radius. Initial fixation is obtained in the distal fracture fragment. After all desired locking screws are applied distally, the plate is used to reduce the fracture and a cortical screw is placed in the distal-most portion of the oblong hole, avoiding the locking segment, for provisional reduction (Fig. 1A, B).

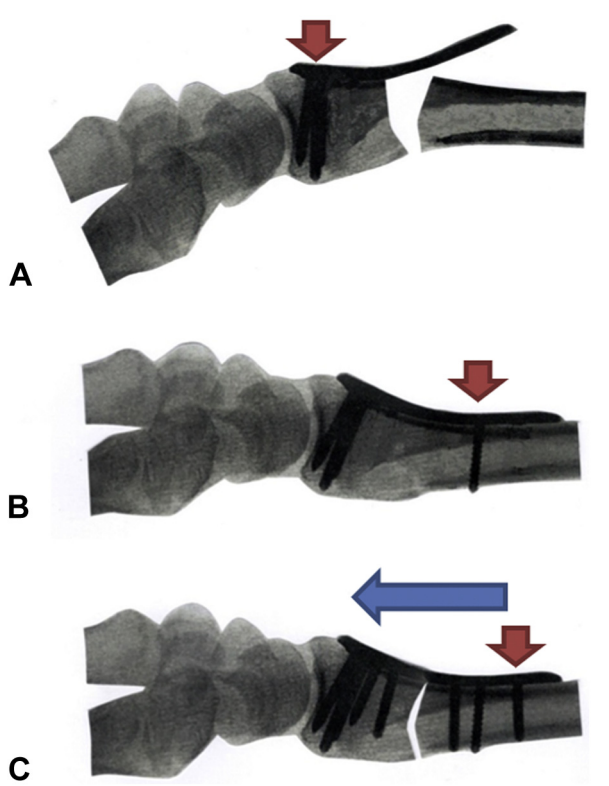

FIGURE 1: Schematic of the surgical technique. **A** Step 1: plate is applied with locking screws in the distal fragment. **B** Step 2: fracture is reduced and a cortical screw placed in the distal aspect of the oblong hole. **C** Step 3: in cases of the positive DRUJ stress test, distraction is performed by translating the plate distal on the screw in the oblong hole and then the remaining holes are filled.

At this point, fluoroscopic and clinical assessments are performed. After confirming adequate fracture reduction radiographically, a radioulnar joint stress test is performed. Under neutral forearm rotation, the distal radius is grasped with one hand and the distal ulna is translated in a dorsal-volar direction with respect to the radius by the other hand using the thumb and the index finger. The test is considered positive if the distal ulna can be translated substantially more than the contralateral side or if it demonstrates different end-point resistance.

If this radioulnar stress test is positive, distraction through the fracture site (indirect ulna shortening) is performed. The screw in the oblong hole is loosened and the plate translated distally using the tip of Halstead-mosquito forceps in the proximal screw hole and then retightened (Fig. 1C). The final distance of distraction depends on feeling the end point