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Trauma Tips and Tricks: "Kickstand Screw" for Restoration of Volar Tilt in Distal Radius Open Reduction Internal Fixation

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Background

Distal radius fractures are among the most common fractures in the upper extremity.[1] Multiple treatment options are available including closed reduction and cast immobilization, percutaneous K-wire fixation, volar or dorsal plates, bridge plating, external fixator, or some combination of these techniques. Selection is based on the characteristics of the fracture.[2,3] Restoration of volar tilt is one measure of correct surgical treatment. Correction to a volar tilt to 11 +/− 5 degrees has been shown to restore biomechanical function of the wrist.[4] Current guidelines from the American Academy of Orthopaedic Surgeons recommend surgical fixation of distal radius fractures with dorsal tilt greater than 10 degrees from neutral.[5]

Volar locking plates are a popular method fixation. Use of a volar locked plating system is associated with a small (1.9 ± 3.3 degrees), but statistically significant, loss of volar tilt when comparing immediate postoperative alignment with that seen at 12 months postoperatively.[6] This makes the restoration of the volar tilt intra-operatively particularly important. One method described in the literature is to position and secure the plate on the radial shaft and then reduce the articular block to the plate, which can result in an incomplete reduction or poorly balanced plate.

The use of a "kickstand screw" or "lift-off screw"— a proximal locking screw inserted into the plate prior to plate application perched on the volar cortex— can facilitate restoration of the volar tilt.[7,8,9] Below, we highlight the "kickstand" technique using an example case.

Example Case

The patient is a 23-year-old right-hand dominant female with history of Ehlers-Danlos (hypermobility type), asthma, and obsessive compulsive disorder who presented to the emergency department with left wrist pain after a mechanical fall off of a stepladder. Physical exam demonstrated a closed injury with neurovascularly intact extremity. Radiographs revealed a left-sided comminuted intra-articular dorsally angulated (approximately 22 degrees) distal radius fracture with associated ulnar styloid avulsion fracture (Figure 1). She was stabilized in a sugar tong splint. Via a shared-decision making model, the patient elected to proceed with operative management of her distal radius fracture.

Surgical Technique

The patient was placed supine on a radiolucent hand table. Fluoroscopic imaging was positioned on the ipsilateral side of the table. A modified Henry approach was used. Once the fracture site was debrided, the radius was noted to be short with dorsal angulation of the distal fragment. An AO elevator was used to elevate the articular fragment and restore length. Manipulation alone did not restore the volar tilt. A 6-hole narrow distal, 3-hole proximal distal radius plate (Depuy Synthes, West Chester, PA) was felt to be the most appropriate implant for the patient's anatomy. A locking ("kickstand") screw was inserted into the most proximal locking hole of the plate. The plate was then inserted through the surgical incision, positioned optimally relative to the articular block, and perched on the volar cortex without drilling though the cortex (Figure 2A). The distal portion of the plate was flush with the volar cortex. K-wires were inserted to provisionally secure the plate and verify satisfactory plate balance. Locking screws were then inserted into the most distal holes. The use of non-locking screws in the articular block does not provide adequate compression of the plate to bone due to the quality of the metaphyseal bone in this region. Once fluoroscopic imaging confirmed appropriate placement of the distal locking screws, the "kickstand" screw was removed. The plate was reduced to bone with a non-locking cortical screw in the distal-most proximal hole resulting in restoration of the volar tilt (Figure 2B). Non-locking cortical screws were placed in the remainder of the proximal holes (Figure 2C). The distal radioulnar joint was stressed and found to be stable. Final fluoroscopic evaluation revealed good length, alignment, and angulation of the radius with appropriately placed hardware (Figure 3).

Figure 1. AP **(A)** and Lateral **(B)** radiographs of a left-sided comminuted intra-articular dorsally angulated distal radius fracture with associated ulnar styloid avulsion fracture.

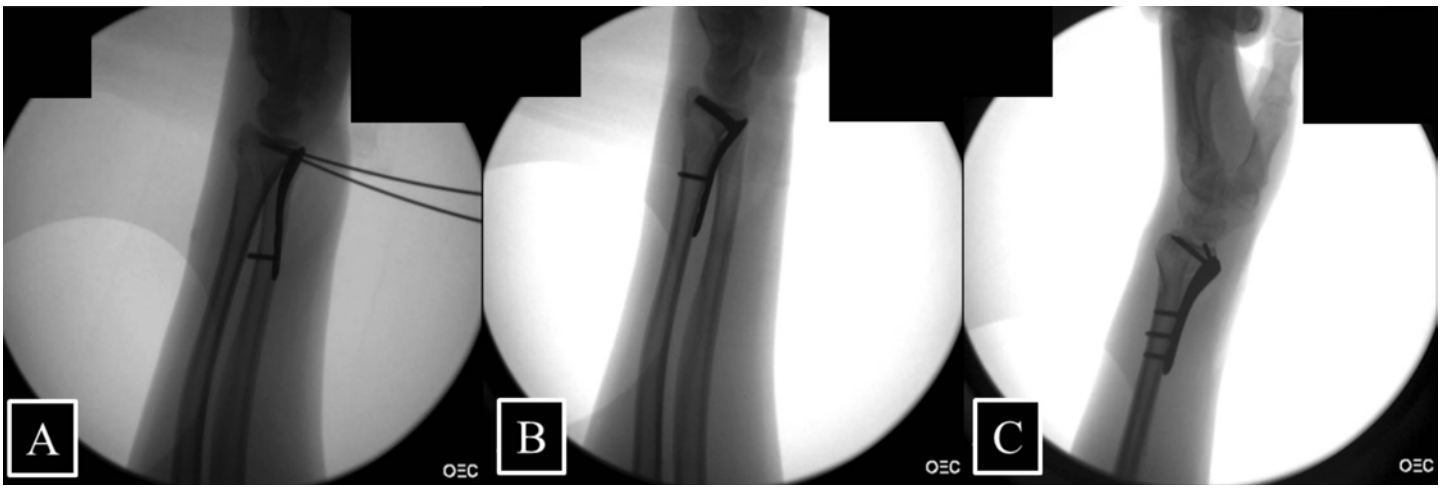

Figure 2. Intraoperative fluoroscopic images revealing **(A)** "kickstand screw" in the proximal locking hole of the distal radius perched on the volar cortex with K-wires in place to provisionally secure the plate distally, **(B)** insertion of distal locking screws securing fixation of the articular block to the plate followed by insertion of a cortical screw through the most distal diaphyseal screw hold, and **(C)** non-locking cortical screws in the remainder of the proximal holes.

Figure 3. AP **(A)** and Lateral **(B)** final radiographs demonstrating restoration of the volar tilt to approximately 11 degrees

Post-operative Care

The patient was made non-weight bearing in a soft dressing with immediate range of motion. She was then transitioned to physical therapy two weeks after surgery. She was allowed to begin weight bearing at six weeks post-op when interval radiographs demonstrated callous formation without loss of reduction.

Conclusion

In summary, the use of a locking proximal "kickstand" screw through a volar plate offers a simple and reproducible technique for restoring the volar tilt in distal radius fractures to match the volar tilt of the implant being applied.

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