Case Study

Utilizing Acu-Loc® 2, Avulsion Hook Plate, and Frag-Loc® Compression Screw to Treat Comminuted Intraarticular Distal Radius Fracture from a Volar Approach with Dorsal Supplementation

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Dr. Nicholas Crosby, MD, is an orthopedic surgeon specializing in hand and upper extremity surgery at the Indiana Hand to Shoulder Center, with a special interest in shoulder and elbow reconstruction, trauma, and sport-related conditions. Dr. Crosby received his medical degree from Wake Forest University School of Medicine, residency from UPMC Hamot, and his Hand Fellowship training at Indiana Hand to Shoulder Center. He is actively involved in hand surgery academic advancement through research, scientific writing, and education.

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Case Presentation

A 19-year-old, right-hand dominant male patient presented to clinic three days after a fall while playing basketball. Radiographs showed a highly comminuted intraarticular left distal radius fracture with distal fragments, displacement of dorsal comminution, and central die-punch fragments. Non-surgical and operative options were discussed with the patient, who is a member of the National Guard and preparing to start his first year of college. Based on intraarticular comminution and displacement, open reduction and internal fixation (ORIF) was recommended.

Preop Plan

Due to the extreme distal nature of the comminution and multiple fragments, Dr. Crosby initially considered a dorsal spanning plate for temporary fixation. Based on experience with similar fracture patterns, he felt that stable volar plating with subchondral support and fragment-specific control of dorsal fragments using a combination of Frag-Loc® compression screws and Avulsion Hook Plate (AHP) would provide appropriate fixation. In particular, the AHP can be used in the far ulnar and radial distal hole locations to rotate as needed under the Frag-Loc screw heads to capture and compress multiple dorsal fragments.

Operative Findings and Approach

Dr. Crosby used the volar trans-flexor carpi radialis (FCR) Henry approach to access the fracture. Finger traps and 10 lbs of traction were applied. Once the volar distal fragment was aligned with the intact metaphyseal cortex, the plate was positioned and held temporarily with K-wires through the distal targeting block and the proximal plate. A 5–30° kickstand was used to elevate the proximal plate off the diaphysis to match the distal dorsal angulation of the main articular fragments. Once the plate was properly positioned, ensuring the distal K-wires were just proximal to the subchondral articular bone, the distal end of the plate was compressed with a clamp. At this point, Dr. Crosby noticed the dorsal fragments were still significantly displaced and decided to use the Frag-Loc 2-piece Compression Screw system for reduction and compression. Both ulnar and radial distal screw holes were used with bicortical drilling and placement of the volar locking sleeve. A guidewire was passed by hand through the volar sleeve and out through the dorsal skin. A 1 cm longitudinal incision was made adjacent to each guide wire and blunt dissection was carried out down to the cortex.

Dr. Crosby next positioned the AHP around the dorsal component under the Frag-Loc screw head, which was then passed over the guidewire. As the screw was advanced to engage the volar outer sleeve, the AHP was rotated to the appropriate position to control the desired fragment. Direct visualization confirmed appropriate placement on bony cortex of the dorsal rim of the distal radius. Due to the metal-in-metal compression of the screws, serial images with fluoroscopy were needed to determine the appropriate amount of compression. Once the dorsal fragment was compressed to the volar plate and in good

Preoperative

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Postoperative

position, the remainder of the distal screws were placed with unicortical drilling and far-cortex abutting locking screws. Distal K-wires were left in place during indirect reduction to temporarily support the distal fixation. With the kickstand and proximal K-wire removed, the plate was compressed down to the volar diaphysis and held with a clamp. Diaphyseal screws were placed with bicortical fixation, and then styloid fixation was achieved with smooth pegs. All remaining K-wires were removed. Final radiographies were taken, and surgical closure was performed. Surgical time for this complex fracture pattern took one hour and 15 minutes.

Follow-up

The patient began physical therapy with a certified hand therapist on postop day 11 to manage edema, initiate range of motion (ROM), removal of sutures, and obtain a thermoplastic splint. During first follow-up at five weeks, patient showed a healed incision, no infection, mild edema, and full forearm motion with 35 degrees of wrist flexion and 55 degrees of extension. At 10 weeks postop, he improved to 65 degrees of flexion and 70 degrees of extension. Radiography showed stable fixation, partial fracture healing, and full ROM. Patient had no pain and full function and declined further follow-up.

The following summer, the patient returned for an unrelated new injury, and Dr. Crosby decided to reexamine the left wrist. Radiography showed that reduction was maintained and fixation was stable. The patient improved ROM to a steady arc from 80 degrees of flexion and 75 degrees of extension, and continued to experience no pain.

Discussion

For specific fracture patterns where dorsal fragment control and fracture-specific fixation would be beneficial, Dr. Crosby decided to use the combination of the AHP and Frag-Loc Compression Screw.

In this particular case, a minimally invasive, dorsal fixation approach, in tandem with classic volar plating, ensured stability and early range of motion for the patient's very complex distal fracture.

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