Flexor Tendon Injuries Following Locked Volar Plating of Distal Radius Fractures

Andrew W. Cross, MD, Christopher C. Schmidt, MD

We present 2 cases showing that flexor pollicis longus and flexor digitorum profundus index injury can occur after placement of 2 commonly used locked volar plates. In contrast with the literature, the radii healed in an anatomic position without plate lift-off. The patients presented 6 and 8 months after surgery with new onset of radial wrist pain and tenderness at the site of the plate and absence or weakness of the flexor pollicis longus. In both cases, the plate was positioned anterior to the distal radial rim on the lateral radiograph. We suggest close follow-up of all fractures in which the distal end of the plate is anterior to the radial rim and removal of hardware if symptoms suggest tendon irritation. *(J Hand Surg 2008;33A:164–167. Copyright © 2008 by the American Society for Surgery of the Hand.)*

Key words Complications, distal radius, flexor tendon rupture, fracture, volar plate.

For many surgeons, locked volar plate fixation has become the mainstay of treatment for displaced distal radius fractures.[1–10] These low-profile plates are designed to rigidly hold the fracture fragments while preventing tendon irritation. Nevertheless, even with careful application of these locked volar plates (Hand Innovations, Miami, FL; and Acumed LLC, Hillsboro, OR), partial and/or complete rupture of the flexor pollicis longus (FPL) or the index finger flexor digitorum profundus (FDP) may occur.

Other authors have also noted FPL ruptures with use of volar plates. Bell described 4 patients that developed ruptures of the FPL using a nonlocking volar Synthes T buttress plate (Synthes, Paoli, PA).[11] In each of the ruptures, the fractures subsided or the plate was positioned too distal causing the plate to impinge against the FPL tendon.[11] Klug et al reported 1 case of FPL rupture occurring after placement of a titanium Synthes volar locking plate.[12] In their case, the fracture did not subside, but the plate was positioned on the distal-volar rim of the radius.[12] Several manufacturers now market plates that are rigid and low profile. Orbay and Touhami showed that flexor tendon injury may occur in the presence of a Hand Innovations plate if the fracture collapses and the plate lifts off from the volar radius.[10] In contrast with our 2 patients, to our knowledge, FPL or FDP rupture has not been previously reported as a complication of either the Hand Innovations or the Acumed plates after anatomic radial alignment when the plate has remained firmly applied to bone. These complications occurred when the plate was placed perhaps more anterior than ideal to the volar distal radial rim.

The reason that we present these 2 cases is to alert the surgeon that flexor tendon injuries do occur after restoration of radial anatomy with 2 commonly used locked radial plates and to discuss the diagnosis, treatment, and prevention of this complication.

From the Allegheny Hand Center, Allegheny General Hospital, Pittsburgh, PA.

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Corresponding author: Christopher C. Schmidt, MD, Allegheny Hand Center, 1307 Federal Street, 2nd floor, Pittsburgh, PA 15212; e-mail: cschmidthand@comcast.net.

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CASE 1

A 57-year-old, right-handed woman sustained a dorsally displaced distal radius fracture. She had percutaneous pinning by another surgeon. Fracture alignment was lost and the patient was referred to senior author C.C.S. 3 months after the initial surgery. The patient's complaints were pain and stiffness in the wrist and forearm. Physical examination showed a "silver-fork deformity," a wrist flexion/extension arc of 30°, and a forearm rotation arc of 70° with a greater loss of supination than pronation. Radiographs demonstrated a distal radius malunion with dorsal tilt of 50° and radial shortening of approximately 8 mm.

Surgery was performed using a volar plate (Hand Innovations) and iliac crest bone grafting. A limited dorsal incision was used to cut the radius and place the bone graft. A flexor carpi radialis (FCR) approach was used to visualize the volar radius, and this allowed for plate application.

Postoperatively, the patient's pain abated. Her wrist flexion arc improved to 100°, and her forearm rotation increased to 110°.

Eight months after the corrective osteomy, the patient complained of radial-sided wrist pain. She acknowledged

FIGURE 1: Postoperative anteroposterior radiograph taken after corrective osteotomy showing restoration of radial length and improvement of radial inclination.

FIGURE 2: Postoperative lateral radiograph taken after corrective osteotomy showing union and volar tilt correction to neutral. Note the plate is firmly against the bone and the plate is anterior to the distal radial rim (A).

difficulty with pinching and writing. She had tenderness directly over the plate and pain and weakness with resisted flexion of the thumb interphalangeal joint. Radiographs showed a healed radial osteotomy, and the plate was still well attached to the bone but the distal edge of the plate was positioned more anterior than ideal to the distal radial rim on the lateral radiograph (Figs. 1, 2). The plate and bone elements did not appear changed from the initial postoperative radiograph.

Hardware removal and tendon evaluation was recommended.

Intraoperatively, we found fraying of the FPL tendon where it passed over the distal radial side of the plate (Fig. 3). The radial distal portion of the plate was in contact with

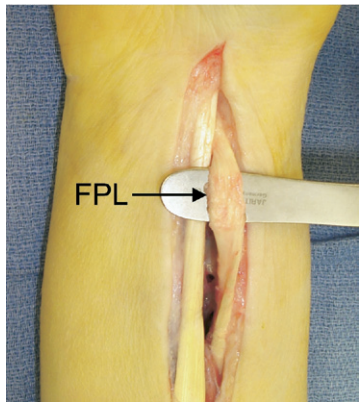

FIGURE 3: Intraoperative photograph of the wrist shows abrasive wear of the FPL.

the radius and not elevated off the cortex. The plate was removed, and the frayed portion of the FPL was debrided.

The patient's pain resolved by the 2-week follow-up visit, and her FPL strength had improved by the sixth week.

CASE 2

A 51-year-old, left-handed woman sustained a left distal radius fracture. She presented to senior author C.C.S. with pain, swelling, and limited motion. Radiographs showed an extra-articular fracture with radial shortening and an ulnar styloid injury.

The radius fracture was reduced using an FCR approach and stabilized with a locked volar plate (Acumed). At the follow-up examination 8 weeks after surgery, the patient was pain free and had regained full forearm and wrist range of motion.

The patient returned 6 months after her initial surgery with the complaint of thumb pain and loss of function. She was avoiding use of her thumb in activities of daily living. She also complained of pain, particularly with pinching. Examination showed tenderness over the FPL tendon and the volar plate. She was unable to flex the interphalangeal joint of the thumb and complained of pain with resisted flexion of the index finger distal interphalangeal joint. Radiographs showed that the fracture was united and the fracture fragments had healed without a change from the initial postoperative position. On the lateral radiograph the plate was not lifted off the bone but was more anterior than ideal to the volar rim of the distal radius (Figs, 4, 5).

At surgery, we found a complete rupture of the FPL and an abraided FDP to the index finger (Fig. 6). Similar to case 1, the plate was still firmly applied to the radial volar cortex. The plate was removed, and the tendons were repaired. Postoperatively, the patient's pain resolved, and she regained full motion and strength of the thumb and index finger.

DISCUSSION

Reduced distal radius fracture fragments have been successfully stabilized with plate fixation. Several studies have