Acute Multiple Flexor Tendon Injury and Carpal Tunnel Syndrome After Open Distal Radius Fracture

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Abstract

Although the rupture of extensor tendons after distal radius fractures is well described, acute flexor tendon ruptures are much less common. We report a case of acute rupture of the flexor pollicis longus and flexor carpi radialis tendons with acute carpal tunnel syndrome after a Gustilo-Anderson type II open distal radius fracture. We reviewed the literature to identify risk factors for tendon rupture and the development of carpal tunnel syndrome.

The literature on extensor tendon rupture and even chronic flexor tendon rupture after volar plating and distal radius fracture malunion is ubiquitous. However, acute and subacute flexor tendon ruptures caused by distal radius fractures have been reported only in limited case reports. These rare injuries may involve multiple tendons and are associated with high-energy mechanisms. This case report details the involvement of multiple flexor tendon injuries associated with a Gustilo-Anderson type II distal radius fracture and the development of acute carpal tunnel syndrome (CTS) after a motor vehicle collision. The patient provided written informed consent for print and electronic publication of this case report.

Case Report

The patient is a 46-year-old woman who was involved in a motor vehicle collision. She was triaged as a trauma patient via Advanced Trauma Life Support protocol, and treated with antibiotic and tetanus prophylaxis. Radiographs showed an open, comminuted, displaced intra-articular distal radius fracture on the right side (**Figures 1A, 1B**). The fracture was closed reduced and splinted in the emergency department (**Figures 2A, 2B**). On initial examination, the patient had diffuse paresthesias in the digits that were most pronounced in the median nerve distribution. Motor examination was limited secondary to pain; however, she demonstrated gentle flexion and extension of the digits. The hand was well perfused, and

Figure 1. (A) Anteroposterior and (B) lateral radiographs of right forearm from emergency department.

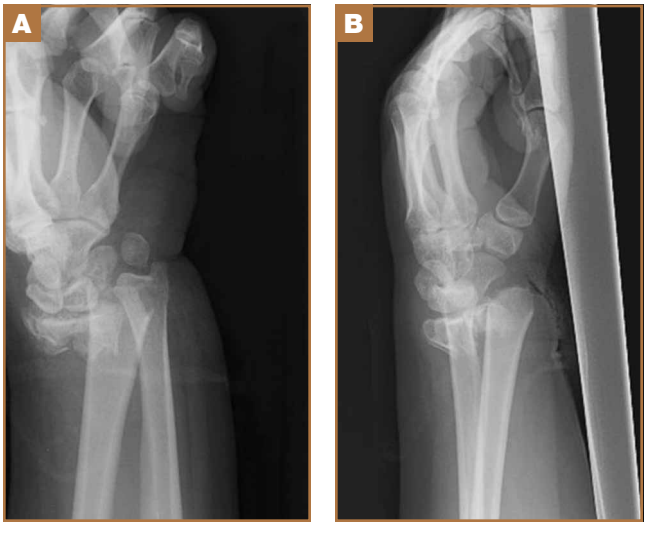
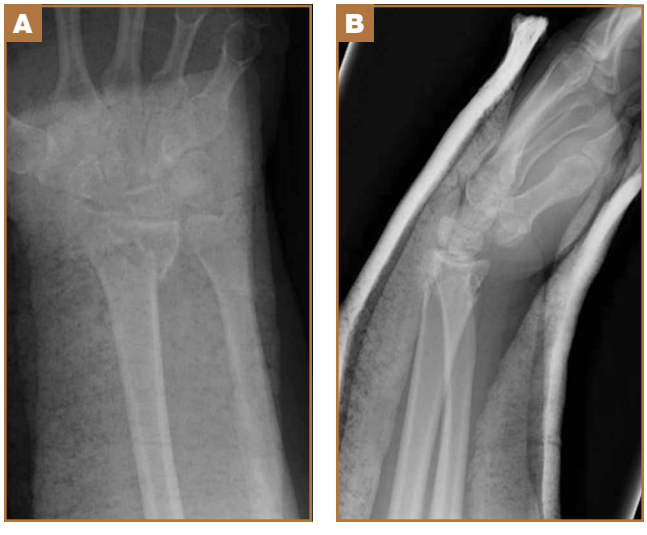


Figure 2. Postreduction (A) anteroposterior and (B) lateral radiographs of right wrist.



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a palpable radial pulse was present.

After clearance was obtained, she was taken urgently to the operating room. The wound was volar and transverse, approximately 2 cm in length, and approximately 4 cm proximal to the wrist crease. The wound was extended proximally and distally for a standard volar (Henry) approach. The flexor carpi radialis tendon was found to be partially lacerated, comprising 60% of the tendon. The fracture was readily identified because the deep fascia and the pronator quadratus were disrupted. No deep tendon lacerations were identified. The median nerve was found to be in continuity. After satisfactory débridement of the fracture and the wound, reduction and fixation was achieved with a volar locking plate and a single Kirschner wire. The flexor carpi radialis tendon was repaired with a modified Kessler stitch and epitenon repair. The wound was closed primarily in layers (**Figures 3A, 3B**).

The patient's immediate postoperative neurologic examination was compromised secondary to the patient having a supraclavicular nerve block for anesthesia. Regional anesthesia was chosen because the patient's pulmonologist recommended avoiding general anesthesia owing to her history of severe asthma that frequently required corticosteroid treatment. Once the block wore off, she complained of persistent paresthesias in all digits but most pronounced in the median nerve distribution. She was able to flex the interphalangeal joint to the index finger but could not flex the interphalangeal joint to the thumb. Over the course of the night, she was also noted to have worsening pain out of proportion to her injury.

As the paresthesias became denser in the median nerve distribution, she was diagnosed with acute CTS and was taken urgently back to the operating room under general anesthesia. After releasing the carpal tunnel through a separate incision, the original wound was reopened and explored. The median nerve was again visualized and found to be in continuity. All 4 tendons to both the flexor digitorum superficialis and flexor digitorum profundus were identified. The flexor pollicis longus (FPL) was not visualized in the wound. The distal portion of the FPL was retracted in the thumb tendon sheath and retrieved blindly with a tendon passer. The proximal portion was retracted to the mid-forearm. The laceration occurred distal to the musculotendinous junction. The tendon was repaired with a modified Kessler stitch as well as a box suture, resulting in 4 core strands across the tendon. The hand and the wrist were splinted in a thumb spica cast, and the patient was started on a modified Duran protocol 1 week after surgery. Median nerve function improved postoperatively.

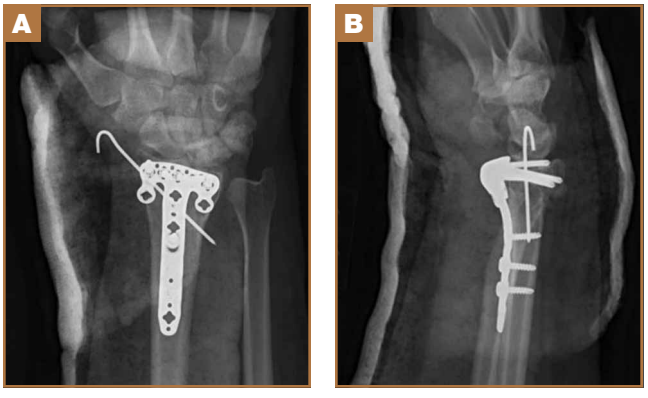

Figure 3. Postoperative (A) anteroposterior and (B) lateral radiographs of right wrist.

Discussion

The rupture of the extensor pollicis longus tendon in nondisplaced distal radius fractures is not uncommon, but occurs in fewer than 5% of nondisplaced distal radius fractures.[1] Although less common, chronic complications with flexor tendon rupture after distal radius fracture are well described.[1-6] Flexor tendon rupture after distal radius malunion or volar plating is a known complication and is thought to be the result of attritional tendon wear because the flexors rub against protruding bone or plate;[3,4,7] however, the initial tendon injury may play a role in those tendons that rupture more quickly.[3] When secondary to volar plating, the rupture typically occurs within 1 year of injury,[7] but, in both plating and malunion, it has been characterized as a late complication up to 10 years and even 20 years after injury.[3,4] Similar to other reports, this rupture was encountered during a volar wrist approach. It has been suggested that, as the incidence of volar plating rises, more acute flexor tendon injuries may be diagnosed because of anatomic exposure,[2] but this has not been reported in the literature.

Acute and subacute flexor tendon ruptures are rarely reported in the literature. To our knowledge, there are only 2 other reports of acute flexor tendon rupture[2,5] after a distal radius fracture, neither of which involved the FPL. These cases, which involved ruptures of the flexor digitorum superficialis and flexor carpi radialis, were thought to be the result of tendon laceration by a volar bone spike. There is also one report of subacute FPL and flexor digitorum profundus rupture approximately 4 weeks after closed reduction of a distal radius fracture.[6] Although sparse, the literature regarding flexor tendon rupture and distal radius fractures suggests that involvement of the flexor digitorum superficialis and the flexor digitorum profundus tendons is most common and that the rupture typically occurs in 1 to 4 months.[1]

We report a rare case of 2 acute flexor tendon lacerations after a Gustilo-Anderson type II open distal radius fracture, likely caused by the volar spike of bone that created the open injury. This case also was complicated by the development of acute CTS.

To our knowledge, despite a rate of acute CTS reported as high as 5.4% in operatively treated distal radius fractures, there are no established associations between acute CTS and flexor tendon rupture in the setting of distal radius fracture.[8,9] In a 2008 retrospective case–control study by Dyer and colleagues,[8] fracture translation is the most important risk factor for the development of acute CTS associated with fracture of the distal radius. Although not statistically significant, ipsilateral upper extremity trauma, higher-energy injuries, younger age, and

male sex were also associated with the development of acute CTS. Open injuries occurred in only 3 of 50 cases of acute CTS.[8]

In agreement with published reports, the probability and the timing of tendon rupture are likely related to the severity of the deforming forces applied during the initial insult rather than the resultant stresses.[1] Clinicians should have a high suspicion of acute CTS and possible tendon injuries after a high-energy injury with a significantly displaced open distal radius fracture and median nerve paresthesias. A thoughtful and complete preoperative examination of the flexor tendons may prevent the need for reoperation. Concerns for flexor injury and acute CTS should be elevated with the observation of a disrupted pronator. For patients with a volarly displaced fragment after fracture reduction, this concern should be even more elevated.[9] Preoperative median nerve symptoms in the setting of the severely displaced fracture should necessitate an acute carpal tunnel release. If 1 flexor tendon is injured, the surgeon should remember that multiple flexor tendons may be involved. We recommend that any injured tendons be repaired primarily, if possible, and the patient started on appropriate rehabilitation.

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This paper will be judged for the Resident Writer's Award.