Isolated Ring Finger Flexor Digitorum Profundus Entrapment After Closed Reduction and Intramedullary Fixation of Both-bone Forearm Fracture

DANIEL J. SONG, MD; GARRY J. KENNEBREW JR, BS; JEFFERSON W. JEX, MD

abstract

Flexor tendon entrapment after a pediatric forearm fracture is a rarely reported complication that is often diagnosed late. Flexor tendon entrapment is more frequently reported after distal forearm fractures, and possible etiologies include fibrosis secondary to hemorrhage at the fracture site and simple entrapment of the muscle belly.

This article describes a case of ring finger flexor digitorum profundus entrapment in a 12-year-old boy with a closed both-bone forearm fracture that was treated with closed reduction and intramedullary nail fixation. Preoperatively, the patient had full flexion and extension of all fingers. The entrapment was noted at the first postoperative follow-up when the patient could fully extend the ring finger proximal interphalangeal joint but was unable to concomitantly extend the metacarpal phalangeal joint. Magnetic resonance imaging and ultrasound were obtained to identify the entrapment site. Intraoperatively, a portion of the flexor digitorum profundus musculotendinous junction was entrapped in the fracture site. After release of the entrapment, the patient gained immediate passive range of motion. Subsequently, the hardware was removed, and the patient healed and regained full ring finger function.

To the authors’ knowledge, this is the only report of isolated ring finger flexor digitorum profundus entrapment after closed reduction and intramedullary fixation of a pediatric forearm fracture. The authors recommend vigilant physical examination of passive and active range of motion of all digital joints with the wrist in flexion and extension before and after bony manipulation.
Forearm fractures are common in the pediatric population. Flexor tendon entrapment after a pediatric forearm fracture is a rarely reported complication that is often diagnosed late. To the authors’ knowledge, this is the first report of an isolated entrapment of the flexor digitorum profundus of the ring finger after closed reduction and intramedullary fixation of a midshaft both-bone forearm fracture diagnosed with physical examination and verified with ultrasound and magnetic resonance imaging.

**Case Report**

A 12-year-old, right-hand-dominant boy sustained a closed midshaft both-bone forearm fracture after a fall from a standing height. He presented to the emergency room and was evaluated by an orthopedic resident. On physical examination, the patient had full flexion and extension of all fingers and was neurovascularly intact. After unsuccessful closed reduction attempts, the patient underwent successful closed reduction and intramedullary fixation of the radius and ulna with titanium elastic nails (Figure 1). He was placed into a short-arm splint and discharged in stable condition.

At 2-week follow-up, the patient reported difficulty moving his ring finger. Physical examination revealed a lack of active and passive extension of the ring finger proximal interphalangeal joint and distal interphalangeal joint with the wrist in extension; however, the patient had full extension of the ring finger with the wrist in flexion (Figure 2).

Ultrasound and magnetic resonance imaging revealed entrapment of the flexor digitorum profundus of the ring finger in the ulnar fracture site (Figures 3, 4).

Three weeks after intramedullary fixation, the patient underwent exploration of the ulna fracture. An ulnar approach to the midshaft ulna was used between the flexor carpi ulnaris and extensor carpi ulnaris, and the volar aspect of the ulna at the fracture site was exposed. A portion of the flexor digitorum profundus of the ring finger was entrapped in the fracture site (Figure 5). The entrapped portion of the flexor digitorum profundus musculotendinous junction was liberated with a freer and almost full passive range of motion was obtained. The sharp, prominent beak of the ulna fracture where the flexor digitorum profundus had been entrapped was rongeured smooth, providing better glide of the flexor digitorum profundus over the fracture site. The operative site was closed in the standard layer fashion, and the patient was splinted with the wrist and fingers in full extension.

---

**Figure 1:** Anteroposterior (A) and lateral (B) immediate postoperative radiographs from closed reduction and intramedullary fixation.

**Figure 2:** Clinical photograph showing the inability to extend at the proximal and distal interphalangeal joints.

**Figure 3:** Axial magnetic resonance image showing entrapment of the ring finger flexor digitorum profundus muscle belly at the ulnar shaft fracture site.

**Figure 4:** Ultrasound of fracture site showing entrapment of flexor digitorum profundus muscle.

**Figure 5:** Intraoperative photograph showing entrapment of the flexor digitorum profundus muscle belly at the ulnar shaft fracture site.
Postoperatively, the arm was placed into a volar splint with the wrist, metacarpal-phalangeal joint, proximal interphalangeal joint, and distal interphalangeal joint in full extension. The patient presented to a hand therapist 1 week postoperatively and started immediate aggressive passive and active range of motion exercises. At 9 months postoperatively, he reported no pain and had full, active range of motion of his ring finger in all wrist positions and no apparent weakness or functional issues.

**DISCUSSION**

Fifteen cases of flexor tendon entrapment with both-bone forearm fractures have been reported in the English literature. The mean age of the reported patient sample was 12 years, with outliers of 20 and 28 years of age. Tendon entrapments have been reported more frequently to occur distally in the forearm. To the authors’ knowledge, this case is the first report of an isolated ring finger flexor digitorum profundus entrapment after closed reduction and intramedullary fixation. Previous reports list possible etiologies of flexor tendon entrapment, such as fibrosis secondary to hemorrhage at the fracture site, simple entrapment of the muscle belly, or having the hand in a flexed or closed fist position at time of injury. It has also been proposed that flexor digitorum profundus of the ring finger may be predisposed to this complication because its muscle fibers arise from the anterior aspect of mid-shaft ulna. Eleven of 15 reported cases involved the flexor digitorum profundus of the ring finger. It also remains unclear what role, if any, intramedullary fixation has in this complication.

Although the flexor tendon entrapment was diagnosed 2 weeks after injury in this case, the average time to diagnosis in previously reported cases was 15 months. Delay of diagnosis has been attributed to its rarity. In other case reports, the initial treatment after diagnosis included a course of physical therapy. Once diagnosed, surgical exploration and release was the treatment method for all but 1 reported case. Only 2 cases required muscle lengthening.

**CONCLUSION**

The authors recommend vigilant physical examination of passive and active range of motion of all digital joints with the wrist in extension before and after bony manipulation.

**REFERENCES**