Bony Incarceration of the Extensor Pollicis Longus Tendon Mimicking Rupture

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Abstract

Background Distal radius fractures are a relatively common injury, and rupture of the extensor pollicis longus (EPL) has been known to occur in a small number of nondisplaced distal radius fractures. In contrast, bony incarceration of the EPL tendon is an exceedingly rare occurrence and warrants special attention.

Case Description Here we present a case of bony incarceration of the EPL tendon following distal radius fracture that mimicked tendon rupture. Following EPL release, the patient had improved function and pain in the wrist.

Literature Review We identified three case reports of EPL tendon entrapment following distal radius fracture, and compared and contrasted the clinical features of tendon rupture versus bony entrapment.

Clinical Relevance Our results suggest that both the type of fracture (displaced vs. nondisplaced) and the chronicity of symptoms may provide important diagnostic clues for the hand surgeon managing distal radius fracture patients presenting with EPL dysfunction.

Keywords

- ▶ distal radius fracture
- ▶ tendon entrapment
- ▶ tendon rupture
- ▶ wrist fracture

Distal radius fractures are a common injury, accounting for 25% of fractures in pediatric patients and up to 18% of all fractures in the elderly.¹ While surgical outcomes for these injuries are generally good, rupture of the extensor pollicis longus (EPL) tendon has been known to occur in up to 5% of nondisplaced distal radius fractures.² In exceedingly rare instances, entrapment of the EPL tendon within the distal radius has been described.^{3–5} Given the potentially similar presentations of EPL tendon rupture and entrapment, it is important for the clinician to be familiar with each process to help guide diagnosis and treatment. Here we present a case of bony incarceration of the EPL tendon following dorsally angulated distal radius fracture mimicking rupture. We compare this case with other reported cases of bony EPL entrapment and rupture, highlighting the key distinguishing features of each potential complication. The authors have obtained the patient's informed written consent for print and electronic publication of the case report.

Case Report

A 55-year-old right-hand dominant woman presented to our clinic 1 year after sustaining a fracture of her right distal radius (▶ Fig. 1A, B). Her fracture was previously treated at an outside institution with open reduction and internal fixation using a volar locking plate. During the preceding several months, she experienced increasing difficulty extending her thumb, pain in the dorsal aspect of her wrist, and paresthesias in her median nerve distribution. On examination, she was noted to have tenderness over her right dorsal radial wrist, with a palpable bony prominence present just ulnar to Lister's tubercle. Diminished sensation was noted in the median nerve distribution, and she had a positive Tinel's sign at the distal edge of her prior incisional scar. Her EPL was noted to fire but had reduced excursion. Her flexor pollicis longus, flexor digitorum superficialis, and flexor digitorum profundus functions were intact. Radiographs of her wrist

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Fig. 1 (A,B) Anteroposterior and lateral X-ray photographs of the hand taken at the time of injury, showing volar and radial displacement of the distal fracture fragment.

were taken, demonstrating a healed fracture with the plate and screw construct in place (►Fig. 2A, B). There was a large dorsal bony callus on the distal radius, possibly contributing to her dorsal wrist symptoms.

Because of her worsening pain, the patient was taken to the operating room for the removal of hardware, median nerve decompression, and possible EPL tendon repair or reconstruction if the tendon was found damaged (►Fig. 3). During the dorsal approach to the wrist, the EPL tendon was identified and found entrapped within a large bony callus at the distal radius (►Fig. 3A). The dorsal retinaculum was elevated off the radius, and the EPL tendon was found exiting the bone proximally. A rongeur was then used to excise the dorsal radial osteophyte entrapping the tendon, and the completely intact EPL tendon was released (►Fig. 3B). The now freed EPL tendon had full excursion (►Fig. 3C). There was evidence of tenosynovitis of the second, third, and fourth extensor compartments, and this was debrided. The volarly placed screws were found partially protruding through the dorsal distal radius, possibly contributing to the inflammation seen in her extensor compartments. Her previous volar wrist incision was reopened, and the median and palmar cutaneous nerves were decompressed and released from surrounding scar tissue. The flexor tendons of the carpal tunnel were examined and appeared healthy. The volar buttress plate and screws were then removed. The wound was dressed, and the arm was placed in a volar splint.

At her 2-week follow-up visit, the patient was found to have improved median and palmar cutaneous nerve symptoms, as well as full active range of motion in her thumb with full EPL excursion and strength. Normal EPL function has persisted.

Discussion

Bony entrapment of the EPL tendon following distal radius fracture is exceedingly rare.^{3–5} In contrast, EPL tendon rupture is a well-described, though uncommon, complication of distal radius fracture.² In either case, patients suffer both passive and active limitations in thumb function due to impaired extension at the thumb interphalangeal joint (IPJ). The lack of the tenodesis effect, which is often useful in diagnosing a ruptured tendon, would also be present in the case of an incarcerated tendon. Patients also complain of pain around the area of the healed fracture and Lister's tubercle in both scenarios. Thus, clinical examination alone may not provide sufficient information to correctly diagnose the underlying pathology. An understanding of the relative incidence and pathoanatomy characteristic of each would have important implications for guiding diagnostic work-up and planning an appropriate operative approach. Here, we present a case of EPL bony incarceration within the distal radius mimicking rupture. The presentation and clinical course of this case can provide valuable insight for clinicians evaluating patients presenting with EPL dysfunction.

Fig. 2 (A,B) Anteroposterior and lateral X-ray photographs taken 9 months following open reduction and internal fixation of the distal radius fracture. A large dorsal bony callus is present on the distal radius.

We identified three case reports on EPL tendon entrapment following distal radius fracture that are similar yet different to the case presented here (→ **Table 1**). Murakami and Todani described the case of a 20-year-old patient with a Smith's fracture whose EPL tendon became trapped between fracture fragments immediately following closed reduction and percutaneous pinning.³ The patient ultimately required surgical release of his EPL tendon. Kumar and Kelly described another case of EPL bony entrapment in a 24-year-old male who suffered a Smith's fracture and an ulna fracture who was initially treated with open reduction and internal fixation.⁴ Over 3 months postoperatively, the patient developed dorsal wrist pain that was exacerbated by thumb flexion. MRI provided the diagnosis, and the patient underwent surgical release of the EPL tendon that had become trapped within a dorsal radius bony tunnel. Finally, Cavanilles Walker et al described the case of a 6-year-old boy who suffered a Colles' fracture and ulna fracture.⁵ Five months after closed reduction with percutaneous pinning, he lost the ability to extend his thumb at the IPJ. At surgery, his EPL tendon was found tunneled within the radius, and an extensor indicis proprius to EPL tendon transfer was performed to restore thumb extension. These cases share two important features with ours. First, all of the patients described had displaced fractures. Second, excluding the patient who became symptomatic immediately following surgery, patients became symptomatic at least 3 months and up to 1 year after their initial treatment. The case of the patient who lost his EPL function immediately following surgery suggests that there was a structural abnormality secondary to poor reduction.

Comparing the clinical characteristics of EPL bony entrapment with those of EPL rupture reveals an interesting pattern.

The incidence of EPL rupture following distal radius fracture may be higher following nondisplaced fractures.^{6–9} Several mechanisms have been proposed for causing rupture of the EPL tendon, including transection by a bone spicule, vascular insufficiency, and/or injury during reduction.^{2,6,7,9} Perhaps the most widely accepted theory to date was described by Helal in 1983.⁶ It was proposed that in the case of nondisplaced distal radius fractures, the wrist extensor retinaculum remains intact on either side of the fracture site. Thus, any fracture callus that forms will impinge on the overlying EPL tendon, eventually resulting in attritional rupture. On the other hand, each case of EPL tendon entrapment occurred following a displaced radius fracture. One potential explanation for this observation is that in the setting of displaced radius fractures, the extensor retinaculum of the third compartment is disrupted, allowing the EPL tendon to remain intact. Furthermore, disruption of the normal fascial planes in a displaced fracture may lead the bone to grow out and around the EPL tendon, resulting in its entrapment within the fracture callus. Our case report seems to fit this pattern, as she suffered a displaced distal radius fracture that then led to the entrapment of the EPL tendon within a bony callus. Given the small number of cases currently available, further work will be needed to explore this potential mechanism further. However, it is clear from these studies that fracture type may provide one very important diagnostic clue for differentiating EPL tendon rupture from entrapment.

Another interesting pattern emerges when comparing the clinical history of patients who suffered EPL tendon entrapment or rupture. EPL rupture has been shown to occur approximately 6 weeks following fracture, though some studies show them to occur as early as 3 weeks and as late as 12 weeks postinjury.² In contrast, except for the patient whose

Fig. 3 Intraoperative photographs showing (A) the distal extensor pollicis longus (EPL) tendon found tunneling into the distal radius, (B) the intact EPL tendon following release from the bony tunnel, and (C) excellent excursion of the freed EPL tendon.

Table 1 Key clinical features of EPL incarceration following distal radius fracture

Author	Patient age/sex	Fracture type	Time to presentation	Symptoms	Treatment
Barrera et al (this study)	55 y/F	Displaced	1 year following ORIF	Reduced excursion, dorsal wrist pain	Tendon release, removal of hardware
Murakami and Todani ³	20 y/F	Displaced (Smith's)	Immediately following CRPP	Inability to extend at the IP joint	Tendon release at 2 months
Kumar and Kelly ⁴	24 y/M	Displaced (Smith's)	3 months following ORIF	Dorsal wrist pain, worsened with thumb flexion	Tendon release
Cavanilles Walker et al ⁵	6 y/M	Displaced (Colles')	5 months following CRPP	Inability to extend the IP joint	EIP to EPL tendon transfer

Abbreviations: CRPP, closed reduction percutaneous pinning; EIP, extensor indicis proprius; EPL, extensor pollicis longus; IP, interphalangeal; ORIF, open reduction and internal fixation.

EPL tendon was entrapped during fracture reduction, all cases of EPL bone entrapment occurred at least 3 months and up to 1 year following their initial injury. Although a larger number of cases would be needed to determine whether this pattern is significant, the timing of onset of symptoms (i.e., less than vs. greater than 3 months) may provide a potential diagnostic clue when evaluating a patient with EPL dysfunction.

Finally, it is important to remember the importance of physical examination in determining between EPL tendon incarceration and rupture. Perhaps the best way to differentiate between the two preoperatively would be to attempt passive thumb metacarpophalangeal (MP) and interphalangeal (IP) flexion. In the case of EPL rupture, there would be a full passive range of motion. In the case of EPL incarceration, there would be limited passive range of motion. With severe incarceration, the thumb may be fixed in extension and not easily correctible with passive flexion. With EPL rupture, the thumb might not be fixed in extension and there would be an easy passive range of motion at both MP and IP joints. Of note, our patient demonstrated limited passive range of motion, suggestive of EPL incarceration.

While the incidence of EPL dysfunction following distal radius fracture is quite low, hand specialists should be prepared to evaluate patients presenting with this condition. This case report underlines the importance of careful history gathering and examination in helping to diagnose underlying pathology and guide appropriate care for these patients. Further studies are needed to elucidate the mechanism by which EPL bony entrapment occurs, as this knowledge may have implications for improving distal radius fracture reduction and follow-up care for patients.

Conflict of Interest

None declared.

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