

Case Report

Acute bilateral extensor pollicis longus tendon rupture following bilateral displaced distal radius fracture: A case report

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ABSTRACT

Extensor pollicis longus tendon ruptures are rarely reported after traumatic events, especially after distal radius fractures. Its classical presentation is a late-onset and unilateral rupture after a non-displaced distal radius fracture. In this case report, we present the treatment of a patient with acute bilateral extensor pollicis longus tendon ruptures after bilateral displaced distal radius fractures. The patient was treated with bilateral open reduction and volar plate fixation via a volar Henry approach for distal radius fractures and bilateral extensor indicis proprius tendon transfer for extensor pollicis longus tendon ruptures. We achieved satisfactory results, and no complications were reported with these treatment approaches. However, this case report demonstrates that extensor pollicis longus tendon rupture may occur at the time of fracture; thus, clinicians should be aware of this issue.

Introduction

Extensor pollicis longus (EPL) tendon rupture following distal radius fractures is rarely observed, however, a well-reported complication in the literature. Since it was first reported as a case presentation in 1932 in the English literature, several authors published small case series and case reports on EPL tendon ruptures following distal radius fractures with a varying reported incidence between 0.2% and 5%.¹⁻⁵ The typical case presentation is a late-onset rupture after a non-displaced/minimally displaced distal radius fracture or distal radius volar plating.⁵ The possible mechanisms of tendon injury were believed to be narrowed third-extensor compartment caused by the fracture line or protruding volar plate screws causing damage to the watershed area of the EPL tendon in the Lister's tubercle.⁵ These mechanisms are thought to be valid as most ruptures are usually reported 3-6 weeks following a distal radius fracture.⁶ To the best of our knowledge, an acute EPL tendon rupture following a displaced or non-displaced distal radius fracture is not yet reported in the current literature. Thus, in this study, we present a case with bilateral and acute EPL tendon ruptures after bilateral distal radius fractures; to our knowledge, there is not a similar case report in the literature.

Case Presentation

A 56-year-old female patient presented to our clinic complaining of pain and swelling on both wrists after falling on ice on both hands in an extended wrist position. The patient also complained about her inability to properly move both of her thumbs. On physical examination, we observed moderate swelling and pain with palpation in both wrists of the patient. In addition, the patient was

unable to extend both thumbs, and the EPL tendon could not be palpated. No gross deformity was noted on both wrists of the patient. On plain radiographs, we observed bilateral extra-articular and dorsally displaced distal radius fractures with moderate dorsal angulation and mild radial shortening (Figure 1). A distal metaphyseal dorsal cortical spike was detected on the lateral view of both distal radius fractures. The patient was unemployed, and she had a right-hand dominance. We were unable to detect any history of rheumatic or connective tissue disease in the medical history of the patient; moreover, the patient did not have any medical comorbidities. The facility in which all the following interventions on the patient were performed was a private hospital orthopedics and traumatology clinic. The clinician performing all the interventions was an experienced orthopedics and traumatology surgeon. Initial closed reduction was not attempted, and surgical treatment with bilateral distal radius volar plating for distal radius fractures and extensor indicis proprius (EIP) tendon transfer for EPL tendon ruptures were offered to the patient. Informed consent was obtained from the patient before the surgical procedures and before the publishing of this case report.

Surgical technique

Under general anesthesia and with supine patient positioning, both upper extremities of the patient were placed on radiolucent hand surgery tables. Upper arm tourniquets were then placed. Both extremities were prepared with povidone-iodine solution and draped. A 7-cm-long volar Henry incision was made. Deep surgical dissection was made between the flexor carpi radialis tendon and radial artery. Pronator quadratus muscle was reflected from the distal radius volar surface, and the fracture line was thereafter visualized.

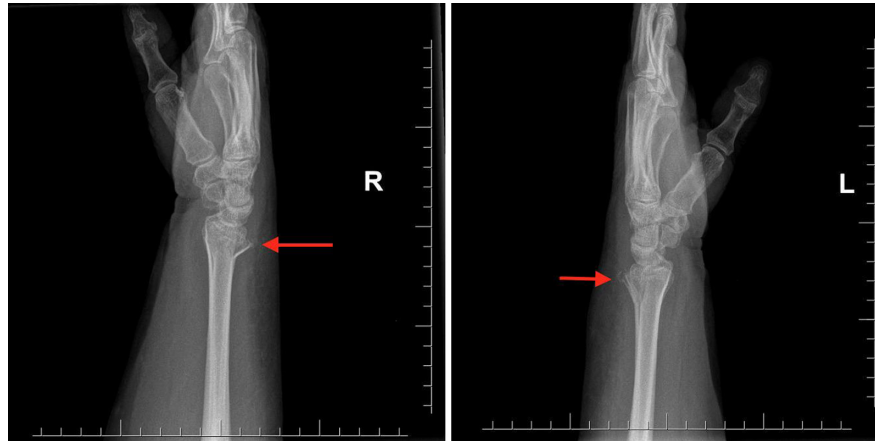


Figure 1. Lateral radiographic images of the right and left distal radius fractures, respectively. Red arrows indicate the dorsal metaphyseal spikes caused by the dorsally displaced distal radius fractures.

Distal radius fracture was reduced under fluoroscopy and temporarily fixed with percutaneous K-wires. The fracture was fixed with an anatomic distal radius volar plate and locking screws. Caution was taken not to breach the dorsal cortex of the distal radius with locking screws. The reduction and implant position were confirmed via fluoroscopy. The forearm was pronated, and a 4-cm longitudinal dorsal incision centered over Lister's tubercle was made. After subcutaneous skin flaps were made, the third-extensor compartment sheath was identified and opened with its course to explore the EPL tendon. We observed that EPL tendons were ruptured at the level of Lister's tubercle; the muscle bellies of the EPL tendons were retracted, and EPL tendon rupture was not amenable to a tension-free primary repair. Extensor pollicis longus tendons were ruptured at the musculotendinous junction, and the torn tendon edges were irregular. No pathological finding that may predispose to rupture was detected in ruptured EPL tendons (Figure 2). As the dorsal incision was applied after the reduction of the distal radius fracture and volar fixation, the dorsal spike was not observed along the course of the EPL tendon; therefore, no bone exploration was performed. With these findings, the tendon ruptures were assessed as irreparable ruptures; we then decided to continue the procedure with EIP tendon transfer, as planned before the surgery. A 2-cm-long dorsal skin incision was made over the second metacarpal head, and the EIP tendon was identified at the same level. Extensor indicis proprius tendon was then transected and pulled into the dorsal wrist incision. A 2-cm incision was made over the EPL tendon at the level of the first metacarpal head, and the EPL tendon stump was identified. The EIP tendon was transported to the first metacarpal incision via a subcutaneous tunnel and transferred to the EPL tendon stump using the Pulvertaft technique with the interphalangeal joint in full extension and the wrist in a neutral position. Since the "wide-awake" technique could not be used because the patient was operated under general anesthesia, the tension of the tendon transfer was adjusted using the classical "mild over tensioning" technique.⁷ With EIP tendon transferred outside the

EPL tendon sheath through a subcutaneous tunnel, the dorsal spike that could disturb the transferred tendon in the distal radius dorsal cortex was not explored, and no intervention was made on this spike. The EPL tendon sheath was covered with an extensor retinaculum flap at the level of Lister's tubercle, and the transferred EIP tendon was prevented from entering this tunnel and coming into contact with the dorsal cortex of the radius. The wounds were irrigated, and the layers were then closed anatomically. The extremity was put in a short-arm spica cast. The same surgical procedure was utilized for both distal radius fractures and EPL tendon ruptures.

Postoperative follow-up and clinical results

The patient was discharged on the first postoperative day. The stitches were removed, and the spica cast was changed to a thumb and wrist spica orthosis at 2 weeks. A range of motion exercises for the wrist and fingers, except for the thumb, was started at this time. At 6 weeks, the orthosis was discontinued, and active range of motion exercises was allowed for the thumb. The patient achieved a full range of motion for both wrists and fingers at 8 weeks (Figure 3). No physical therapy was required for the patient. At the last follow-up at 6 months, the patient was nearly pain-free, and the Disabilities of the Arm, Shoulder, and Hand scores were 10.8 and 11.7 for the right and left hands, respectively. At this time, the dorsal cortical spikes on the distal radius dorsal cortex can still be seen on both wrists via lateral X-ray (Figure 4). However, since the EIP tendons were transferred through a subcutaneous tunnel, and the EPL tendon sheaths were covered with extensor retinaculum flaps, there were no signs or symptoms of irritation on the transferred EIP tendons. The

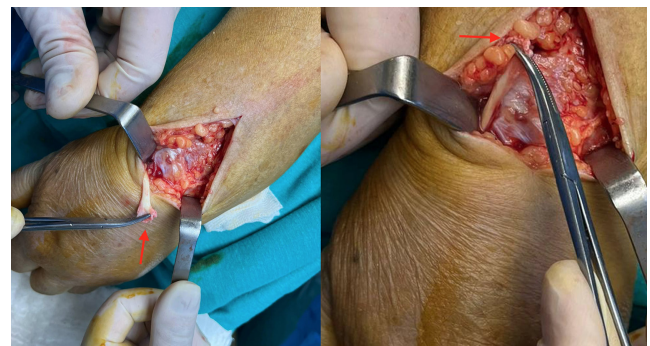


Figure 2. Intraoperative images of the extensor pollicis tendon ruptures. The red arrows indicate the tendon rupture at the musculotendinous junction of the EPL tendon with irregular tendon edges.

HIGHLIGHTS

- Extensor pollicis longus is the most common injured tendon after distal radius fractures and although it is commonly a late onset event, it may occur acutely after the fracture.
- This case presentation describes a patient with acute bilateral extensor pollicis longus tendon ruptures after bilateral displaced distal radius fractures.
- Extensor indicis proprius tendon transfer technique is a good option with favorable outcomes in the treatment of extensor pollicis longus tendon ruptures and can be performed concomitantly with distal radius volar plating.



Figure 3. Clinical picture of the patient at 8 weeks after surgical intervention. The patient was nearly pain-free, and the full range of motion was achieved at this time point.

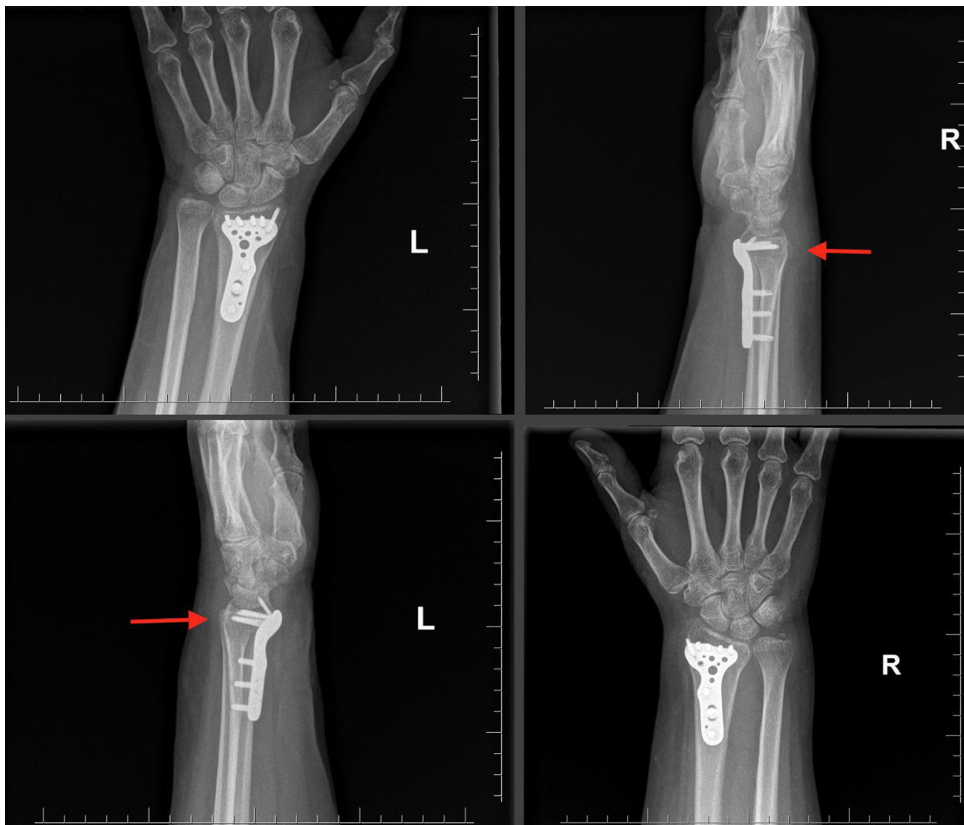


Figure 4. Postoperative radiographs of the left and right wrist of the patient, respectively. The red arrows indicate the mild dorsal cortical spikes on the dorsal cortices of both distal radii. However, the patient had no signs or symptoms related to these spikes since the EIP tendons were transferred through a subcutaneous tunnel.

patient was satisfied with the results and returned to her previous level of daily activities.

Discussion

EPL has been identified as the most common injured tendon after an occurrence of distal radius fractures.⁸ The incidence of tendon rupture was reported up to 5% after non-displaced distal radius fractures.⁶ However, Naito et al⁵ reported that EPL tendon injuries including tendon fibrillation, laceration, and rupture concomitant with distal radius fractures may be seen as high as 88%. The most common presentation is a late-onset rupture approximately 6 weeks after a non-displaced distal radius fracture.⁶ Non-traumatic bilateral EPL tendon ruptures are usually reported with underlying causes such as rheumatoid diseases.⁹ Ruptures on the EPL tendon were usually reported to be unilateral after traumatic events.¹⁰ In addition, distal radius fractures accompanying an EPL tendon rupture were usually reported as non-displaced fractures.¹⁰ Payne et al¹¹ reported a case report with bilateral EPL tendon ruptures after distal radius fractures; however, the fractures were non-displaced, and delayed EPL tendon ruptures occurred after distal radius fractures. The case report presented in our study is unique, as bilateral ruptures of the EPL tendon occurred after bilateral displaced distal radius fractures. In addition, EPL tendon ruptures occurred in an acute setting. We were unable to detect an acute EPL tendon rupture accompanying a displaced or non-displaced distal radius fracture when we search the current literature.

Different injury mechanisms were proposed for EPL tendon ruptures after distal radius fractures. Proposed injury mechanisms were laceration of the tendon by sharp bone fracture ends, injury during reduction, local adhesions, and disruption of blood flow.⁶ In an anatomical cadaver study, Hirasawa et al¹² described a watershed area of the tendon at the Lister's tubercle area. Helal et al¹³ reported that the extensor retinaculum is not disrupted but narrowed after non-displaced distal radius fractures, leading to catching of the EPL tendon by narrowed tendon sheath and fracture callus causing a tendon rupture. All of the injury mechanisms proposed earlier may explain the subacute or chronic fashion of the ruptures on the EPL tendon after non-displaced or minimally displaced distal radius fractures. However, bilateral ruptures of the EPL tendon were observed acutely after bilateral distal radius fractures in our case presentation. This type of injury needs to be further examined. In our case report, we assumed that the patient fell on both hands open with the wrist and thumb in an extended position to lower the impact of the trauma to the ground. At the time of the injury, the third compartment was narrowed by the fracture line and the tendon faced sharp fracture edges. At that moment, sudden contraction of the EPL muscle belly led to the cutting of the tendon in the third compartment sheath.

To the best of our knowledge, this is the first case report demonstrating an acute and bilateral EPL tendon rupture after displaced distal radius fractures. However, this report is not without limitations. First, this is a single case report; thus, it may not give clear conclusions on

the acute injury mechanism of the EPL tendon rupture. In addition, the ruptures of the EPL tendons might have been caused by the sudden contraction of the EPL muscle belly at the time of injury because the ruptures were observed at the musculotendinous junction. The acute EPL tendon ruptures may not be related to distal radius fractures and may occur without a fracture.

Conclusion

In contrast to previous literature, our case report demonstrates EPL tendon ruptures may occur acutely after distal radius fractures. In addition, and to our knowledge, this is the first bilateral and acute EPL tendon rupture after distal radius fractures reported in the literature. As per our case report, clinicians should be aware that EPL tendon ruptures may occur acutely at the time of the injury of distal radius fractures. Early recognition of these ruptures may prevent the patient from treatment delays and additional surgeries and may prevent the clinicians from medicolegal issues.

Informed consent: Informed consent was obtained from the patient.

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