

## A CASE STUDY: RUPTURE OF THE FLEXOR POLLICIS LONGUS TENDON FOLLOWING DISTAL RADIUS FRACTURE TREATMENT WITH PLATING

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### ABSTRACT

Damage to the flexor pollicis longus (FPL) tendon is an uncommon but serious complication after plating for distal radius fractures. This report presents a clinical case of FPL tendon rupture following distal radius fracture fixation, highlighting the potential risk factors for this complication, methods to minimize its occurrence, and the appropriate treatment strategies when it arises.

**Keywords:** tendon rupture, distal radius fracture, osteosynthesis

### I. INTRODUCTION

Plating for distal radius fracture fixation has become a commonly used method for treating displaced and unstable fractures of the distal radius. Placing the plate on the volar side is theoretically advantageous as it minimizes tendon irritation compared to dorsal plating. However, clinical reports have documented cases of tendon irritation and flexor tendon ruptures associated with volar plating, as highlighted by researchers such as Soong (2011) [1], Selvan (2014) [2], and Floquet A. (2021) [3]. This report presents a case of flexor pollicis longus (FPL) tendon rupture after distal radius fracture fixation using volar plating. It explores the

contributing factors to this complication, preventive strategies to avoid it, and the management approaches when it occurs.

### II. CLINICAL CASE SUMMARY

A 61-year-old female patient, V.T.H, was admitted to the hospital on October 7, 2024, for treatment of loss of flexion function in the distal phalanx of her right thumb, which occurred after undergoing distal radius fracture fixation with plating 6 months earlier. The accident occurred in April 2024 when the patient fell at home and injured her right wrist. She experienced significant pain and went to the hospital, where she was diagnosed with a closed distal radius fracture and underwent internal fixation by plating. Two months post-surgery, the patient developed numbness in the palm and was diagnosed with carpal tunnel syndrome, which was treated with steroid injections, resulting in some improvement. However, two weeks before admission, she lost the ability to flex her right thumb. After multiple consultations with no improvement, she was admitted for further treatment.

Upon examination, the right wrist showed no swelling, and the surgical scar had healed well. The patient had lost the ability to flex the distal phalanx of the thumb, but movements of other fingers were normal. A computed tomography scan, analyzed using RadiAnt DICOM Viewer software (Figure 1), showed a rupture of the FPL tendon, with the tendon on the unaffected side remaining

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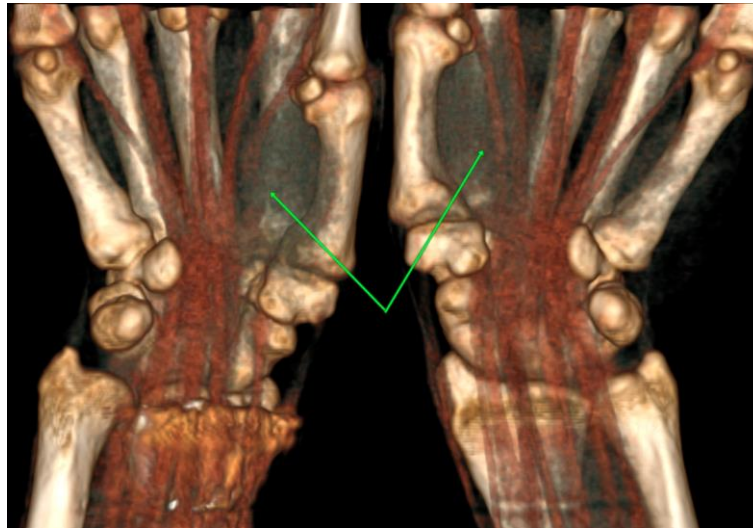
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intact. X-rays of the wrist upon admission (Figure 2) showed that the plate was positioned low, classified as Soong grade 2 [1]. We explained to the patient that she would undergo surgery to remove the plate, explore and locate the ends of the ruptured

FPL tendon. If the tendon length allowed for end-to-end repair, it would be performed; otherwise, a tendon graft using a segment from the palmaris longus tendon of the same side would be required, and bio-adhesive glue would be used to prevent adhesions.



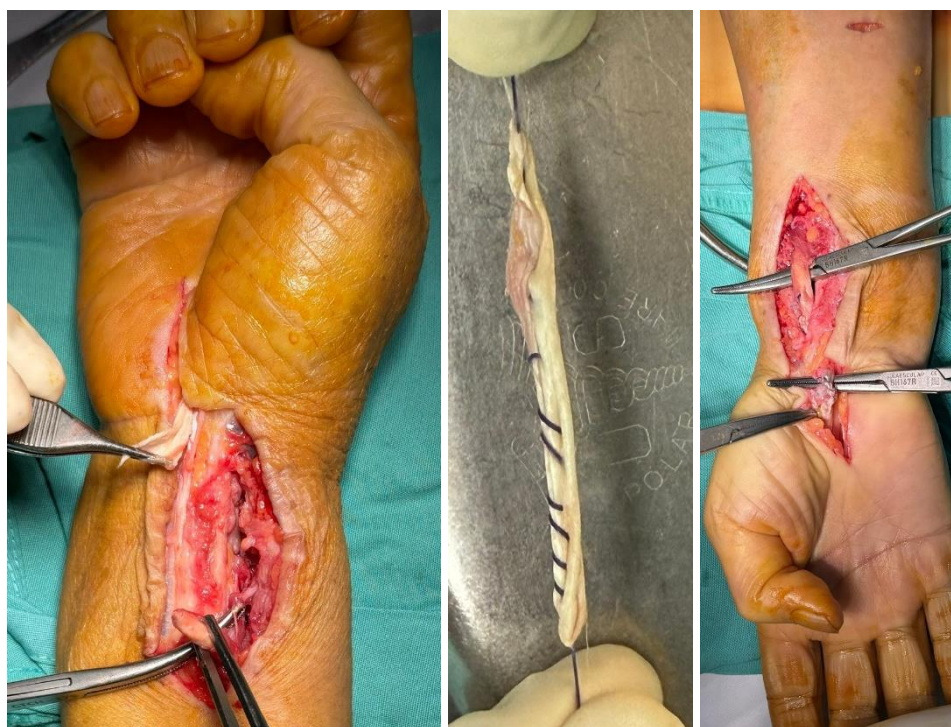
**Figure 1:** *The discontinuity of the FPL tendon at the distal site compared to the intact side (indicated by the green arrow) on the computed tomography scan*

\* Source: Author's research materials



**Figure 2:** *The lateral X-ray shows a low positioning of the plate, Soong grade 2*

\* Source: Author's research materials



**Figure 3: Intraoperative illustration (from left to right: locating the two ends of the ruptured tendon, graft segment from the palmaris longus tendon, tendon after repair)**

\* Source: Author's research materials

After surgery, the thumb and wrist will be immobilized, and the patient will return for follow-up in 3 weeks for physical therapy.

### III. DISCUSSION

#### 3.1. Factors increasing the risk of complications

Injury to the flexor tendon after plating fixation for distal radius fractures is an uncommon complication in clinical practice, though it has been reported by several authors. Soong et al. (2011) documented 13 instances of flexor tendon irritation, including one case of FPL tendon rupture 8 months after surgery, which was managed through plate removal and tendon transfer [4]. Saeed Asadollahi et al. (2013) reviewed 21 studies, showing that the average time for detecting flexor tendon injury was 9 months, with the earliest case occurring 3 months post-surgery and the latest at 10 years. The

FPL tendon was the most commonly affected [5]. Wurtzel et al. (2017) also observed that the incidence of FPL tendon rupture ranged from 1% to 12% [6].

Positioning the plate on the volar side during distal radius fracture surgery provides benefits, such as reducing the risk of tendon injury by preventing direct contact between the tendons and the bone. Moreover, the volar plate's increased thickness allows it to better endure load. However, two primary factors that contribute to flexor tendon injury following internal plate fixation are the surgical technique and underlying tendon pathology.

In terms of surgical technique, several critical factors must be considered, including the surgeon's expertise, plate placement, screw length, restoration of anatomical volar tilt, and wrist positioning. Poor plate positioning, such as placing it too low, can

result in the edges of the plate becoming prominent, leading to tendon irritation or abrasion. Similarly, excessively long screws may protrude and damage the tendon during movement. Soong et al. (2011) classified plate prominence using lateral X-rays taken after surgery, employing a "critical line" drawn parallel to the radial shaft cortex. Plates placed near the volar rim of the distal radius but not exceeding this critical line were labeled as grade 0, those extending beyond it were grade 1, and plates positioned past the volar rim were graded as grade 2. The authors concluded that plates with greater prominence near the joint surface heightened the risk of flexor pollicis longus (FPL) tendon rupture [1]. Selvan (2014) also found that a radial inclination of less than 25° increases the risk of tendon rupture, whereas maintaining a greater distance between the joint surface and the plate reduces this risk [2]. Wurtzel's study (2017) emphasized that both volar tilt and wrist extension positioning significantly impact tendon-plate contact risk. If the volar tilt is not properly restored, tendon-plate contact can occur during wrist extension, potentially leading to flexor tendon injury. When the plate is positioned near the watershed line and the volar tilt is restored anatomically, no contact between the tendon and plate occurs. However, if the volar tilt deviates by +5° to -20° from the anatomical angle, tendon-plate contact may occur at 20° of wrist extension. If the plate is placed below the watershed line, tendon-plate contact can happen as early as 58° of wrist extension, even if the volar tilt is anatomically restored [6].

As for intrinsic tendon pathology, in this case, the patient experienced numbness 2 months post-surgery, and was diagnosed with carpal tunnel syndrome, treated with steroid injections. Steroid injections are a known risk

factor for tendon rupture, as they reduce tendon tensile strength, leading to degeneration and increased susceptibility to rupture during movement [7]. You-Cheng Lin (2016) reported several cases of spontaneous tendon rupture related to local corticosteroid injections, such as Achilles, patellar, and finger tendons, with histopathological findings showing collagen bundle degeneration [8].

In this patient's case, the FPL tendon rupture was discovered 2 weeks before admission, likely due to multiple factors, including tendon degeneration from steroid injections and low plate positioning. As the patient moved her thumb, the tendon likely rubbed against the plate, leading to gradual rupture.

### ***3.2. Measures to minimize the risk of complications***

Several solutions have been proposed to reduce the risk of tendon abrasion when placing the volar plate: Proper positioning of the plate in relation to the watershed line is essential from the outset. Ideally, the plate should align with or stay above the watershed line. However, this optimal placement can vary depending on the fracture type. For fractures extending below the watershed line, positioning the plate too far from the fracture site may fail to provide adequate stabilization for the fracture fragments [5]. Additionally, the pronator quadratus muscle is often re-sutured to cover the plate after its placement (Figure 4). During the procedure, the muscle must be incised to position the plate. Re-suturing aims to facilitate smoother flexor tendon gliding and minimize irritation caused by the plate. However, this step is not always effective, particularly in cases of complex fractures where the pronator quadratus muscle is extensively damaged, posing challenges for successful reconstruction [9].





**Figure 4: Reattaching the pronator quadratus muscle following distal radius plate fixation**

\* Source: according to Armangil M. (2014) [10]

Last but not least, early plate removal. In cases where the plate is prominent and poses a risk of tendon abrasion, early plate removal should be considered. However, adequate bone healing must be ensured to avoid the risk of refracture after plate removal. Maria Oulianski's (2022) study showed that X-rays indicated the fracture line began disappearing between the 6th and 9th weeks, with most fractures healing completely by the 26th week [11]. However, Joost J.A. de Jong's (2014) report indicated that bone healing was incomplete by the 12th week in most women [12].

### **3.3. Treatment options for flexor pollicis longus tendon rupture**

In this specific case, we performed plate removal and tendon grafting using a segment from the palmaris longus tendon. At 6 months post-surgery, X-rays confirmed that the bone had healed, and the patient no longer experienced wrist pain, making plate removal a reasonable option to prevent the new grafted tendon from contacting the plate, which could compromise the surgical outcome. During surgery, we found that the tendon ends were far apart and degenerated, making direct repair impossible. Therefore, we opted for the palmaris longus tendon

graft, as it is a superficial tendon that is easy to locate and expose (Figure 3).

To minimize the risk of tendon adhesion to surrounding tissues, which could affect finger function, we used bio-adhesive glue to prevent adhesion by creating a lubricated surface between the tissues. Postoperative immobilization in the Edinburgh resting position was applied to prevent joint stiffness and contraction of the intrinsic muscles (lumbricals and interosseous muscles).

## **IV. CONCLUSION**

Rupture of the flexor tendon following plating for distal radius fractures is an uncommon yet severe complication. During surgery, special attention must be given to the positioning of the plate to avoid prominent edges that can cause tendon irritation and abrasion. Early plate removal should be considered in cases of prominent plates to minimize the risk of tendon rupture and related complications.

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