



Research Paper

Tenolysis Procedure for Long Flexor Tendon Graft Rupture following Palmar Anatomical Plate Osteosynthesis: A Case Report

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ABSTRACT:

Introduction: Hand flexor tendon injuries, especially traumatic ones, can severely affect hand gripping function, leading to a significant functional challenge. Rupture of the long flexor tendon of the thumb due to plate osteosynthesis is rare, and there are limited reports on the subject. In this article, we present a case of tenolysis of a long flexor tendon graft following rupture on a palmar anatomical plate of the distal radius. We present the functional and aesthetic outcomes observed at the one-year follow-up.

Case report: We present a case of a 50-year-old female architect who sustained a closed left wrist injury from a fall. She underwent surgical treatment involving internal fixation with a T-locked anatomical plate on the distal end of the radius. Nine months post-surgery, the patient reported sudden pain and inability to flex P2 on P1 of the thumb. An ultrasound revealed a rupture of the long flexor tendon of the thumb above the flexor retinaculum. During surgical exploration, a complete rupture of the long flexor tendon of the thumb was discovered. A graft of the palmar long tendon was taken through the same approach, and a termino-terminal suture was performed. However, no clinical improvement was observed, necessitating a second surgical intervention that involved tenolysis procedure. The patient demonstrated a marked recovery in active flexion of P2 on P1 of the thumb, and after four weeks of rehabilitation sessions, the outcome was favorable, resulting in complete restoration of hand function.

Discussion: The use of locked anterior plates to treat fractures of the distal radius can lead to complications, and rupture of the long flexor tendon of the thumb is one of them. Several therapeutic options have been proposed in such cases, including tendon grafting or transfer. However, post-repair complications such as tendon rupture, suture failure, and adhesions are marked. Tenolysis procedure can be effective in restoring hand function, but rehabilitation is crucial for successful outcomes

Conclusion: our case report highlights the rarity of long flexor tendon rupture following plate osteosynthesis and the challenges associated with its repair. Tenolysis following tendon graft rupture is an effective intervention for improving thumb flexion and restoring hand function in such cases. Proper pre- and post-operative assessments, as well as rehabilitation, are crucial for optimal outcomes.

KEYWORDS: LONG FLEXOR OF THE THUMB ; PALMAR PLATE ; SUBCUTANEOUS RUPTURE ; PALMARIS LONGUS ; SINGLE-STAGE GRAFT ; ADHERENCE ; TENOLYSIS

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I. INTRODUCTION

The flexor tendon system, consisting of flexor tendons and digital pulleys, constitutes a critical anatomical element for hand gripping function. Injuries to the hand flexor tendons, particularly traumatic ones, can be severely debilitating, given the crucial role of the hand in daily life. However, patients and even physicians often underestimate the functional severity of these injuries. Various factors can cause flexor tendon ruptures, such as assaults, household accidents, sports-related incidents, manual labor, and traumatic wounds. Nevertheless, rupture of the long flexor tendon of the thumb resulting from plate osteosynthesis is exceedingly rare, with only a few reported cases in the literature. These tendon ruptures, located in the upper limb in relation

to osteosynthesis material, mostly involve the extensor pollicis longus and are frequently seen after intra- or extra-focal pinning. Direct suture repair is generally impossible due to muscle retraction, thus presenting a significant functional challenge. Several therapeutic options have been proposed in these cases, including single or two-stage tendon grafting or tendon transfer. Nonetheless, post-repair complications such as non-negligible tendon rupture, suture failure, and adhesions are marked. In this article, we report a case of tenolysis of a long flexor tendon graft following rupture on a palmar anatomical plate of the distal radius.

II. CASE REPORT

We present a case study of a 50-year-old right-handed female architect who sustained a closed left wrist injury from a fall down the stairs, with direct impact on the palm of her hand in a hyperextended position, eleven months prior to presentation. At the time of the injury, the patient experienced severe acute pain and total functional impotence of the affected limb. Upon clinical examination, the patient appeared stable but agitated, exhibiting a typical upper limb trauma attitude. The wrist was swollen with dorsal fork deformity, but no associated skin or vascular-nerve injuries were noted. Standard wrist radiographs in the anteroposterior and lateral views revealed a sagittal fracture of the distal radius joint. The patient underwent surgical treatment via an anterior Henry approach with fluoroscopic guidance. The procedure involved internal fixation with a T-locked anatomical plate on the distal end of the radius. The patient received three weeks of immobilization for pain control, followed by six weeks of rehabilitation with two sessions per week. The patient regained wrist joint mobility with good fracture consolidation. Nine months post-surgery, the patient reported sudden pain along the path of the long flexor tendon of the thumb, followed by an inability to flex P2 on P1 upon forced thumb flexion. Although wrist and finger joint mobility were preserved, examination revealed an inability to flex P2 on P1 of the thumb. The remaining examination, including vascular-nerve examination, was unremarkable. Standard radiography showed a consolidated fracture site with the osteosynthesis material in place, but partially detached and protruding at the distal end of the radius (Figure 1).



Figure 1 : Invoice for the lower end of the radius at nine months postoperative, treated with a slightly detached and low-inserted anatomical plate

Following an ultrasound that revealed a rupture of the long flexor tendon of the thumb above the flexor retinaculum, surgical intervention was proposed to remove the osteosynthesis material and restore thumb flexion. During surgical exploration, a complete rupture of the long flexor tendon of the thumb was discovered in zone O5 of the flexors, with the distal end blocked and frayed in zone T3 of the flexors, in alignment with A1 of the thumb (see Figure 2). Additionally, there was a partial rupture of almost 30% of the tendon of the common flexor of the second finger.

As a second step, a graft of the palmar long tendon was taken through the same approach, after regularizing the edges of the long flexor tendon of the thumb. A termino-terminal suture was performed using a 3.0 nylon thread, followed by reinforcement of the deep flexor of the index finger with separate stitches, as depicted in Figure 4.



Figure 2 : Rupture of the tendon of the long flexor of the thumb

Following the initial surgery, the patient underwent pre- and post-operative assessments, including testing of tendon tension, which yielded satisfactory results. The patient received one week of immobilization post-surgery but was subsequently lost to follow-up for a month. Upon reevaluation, it was noted that the thumb was flexible and painless but had limited active mobility, particularly an inability to flex the interphalangeal joint. An ultrasound was performed to exclude suture failure but did not confirm tendon adhesion. Although the patient received proper rehabilitation, no clinical improvement was observed, necessitating a second surgical intervention.



Figure 03 : Postoperative control X-ray after removal of osteosynthesis material



Figure 4 : Tendon graft using the palmaris longus with end-to-end sutures



Figure 5 : Tendon adhesions of the long flexor of the thumb along the flexor retinaculum

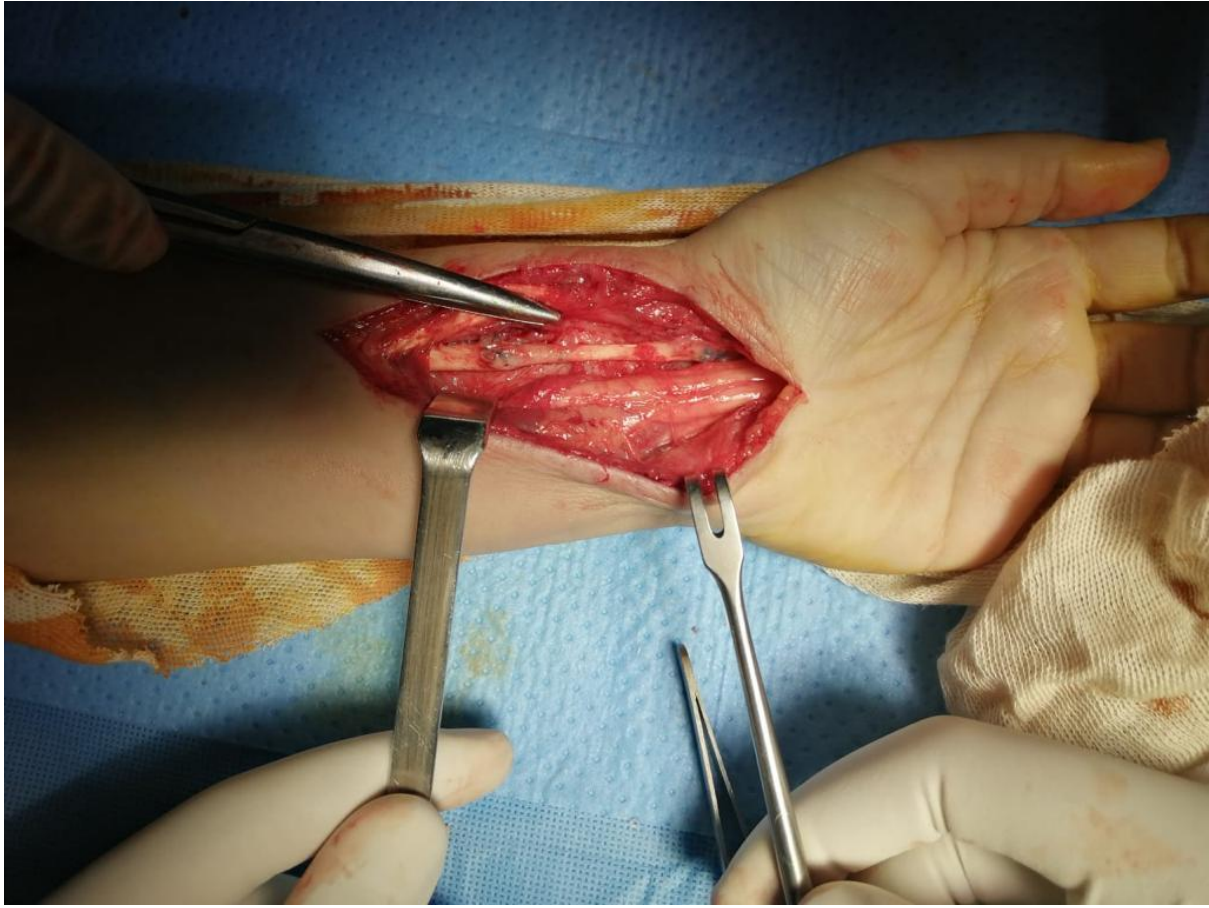


Figure 06 : Graft status after 6 months postoperative secondary reconstruction



Figure 7 : Tenolysis of the long flexor of the thumb

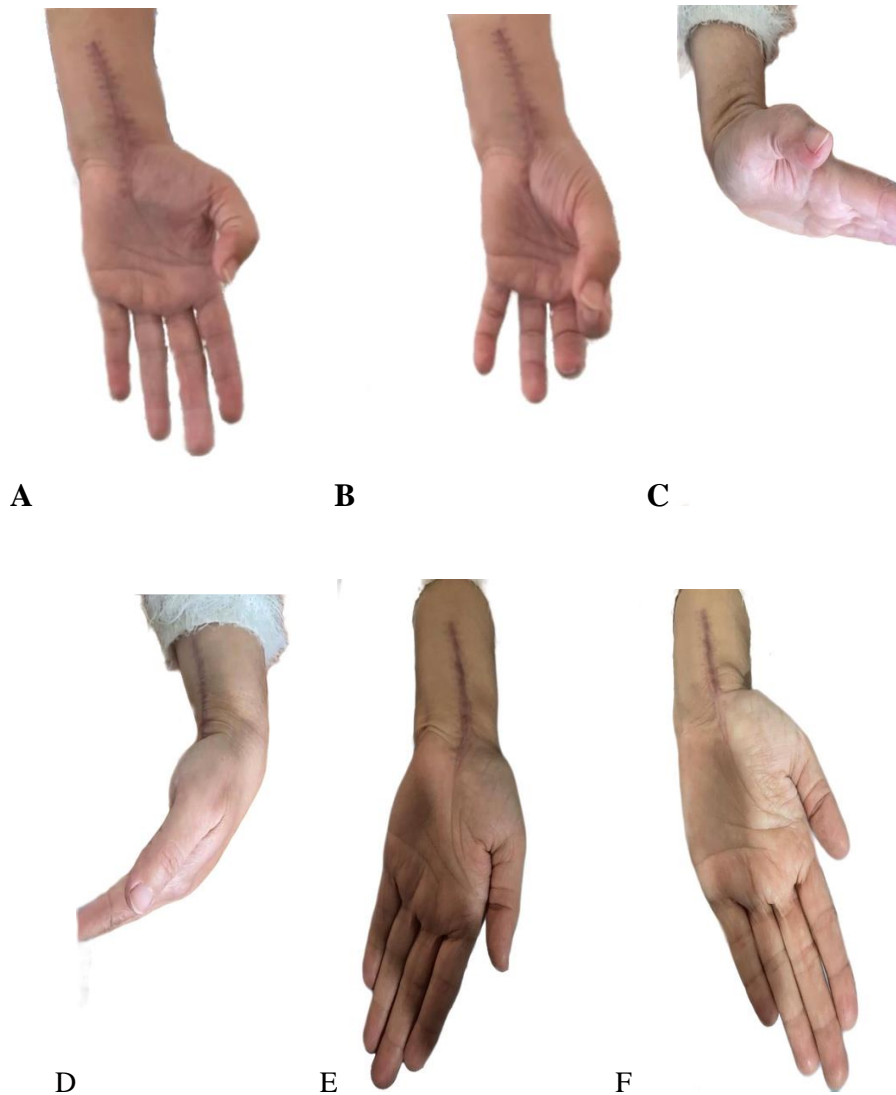
During the second surgery, the long flexor tendon of the thumb was found to be intact, with secure tendon sutures. However, adhesions were identified along the flexor retinaculum, leading to a tenolysis procedure.

Upon postoperative examination, the patient demonstrated a marked recovery in active flexion of P2 on P1 of the thumb. After a series of four weeks of rehabilitation sessions, the outcome was favorable, resulting in

complete restoration of the thumb amplitudes (Figure 9 A/B), in addition to the amplitudes of other finger joints (Figure 9 A/B/C/D/E/F), trophicity (Figure 10), and hand strength. Consequently, the patient was able to resume work after six months of follow-up.



Figure 8 : A/B : Perioperative testing



**Figure 9 : A : Recovery of interphalangeal flexion of the thumb
B : Thumb-index pinch; C: Active hand extension D: Active wrist flexion
E : Active ulnar deviation of the hand; F : Active radial deviation of the hand**



Figure 10 : Hand trophic condition

III. DISCUSSION

The use of locked anterior plates to treat fractures of the distal radius has become widespread, but it is not without complications. Complication rates range from 9.7% to 32%, regardless of the type of fracture (1).

One of the well-described complications of this treatment is the rupture of the long flexor tendon of the thumb at the wrist (2). Although rare(3), it is a significant complication reported in the literature by various authors (Kozin et Wood (4) , Meine (5), Duparc et Valtin (6), Cooney et al. (7), Bonatz et al. (8), Hove (9), Lugger et Pechlaner (10), Stern et Derr (11)It is worth noting that postoperative extensor ruptures are more common than flexor ruptures (3). The incidence of postoperative long flexor tendon rupture of the thumb has been reported to be 0.4% by Vernet et al. (12).

Several studies have shown that the long flexor tendon of the thumb (FPL) is the most commonly ruptured tendon, followed by the flexor digitorum profundus of the index finger (13). This observation has been confirmed by Cognet et al., who reported that the flexor pollicis longus (FPL) was the most commonly affected tendon, followed by the flexor digitorum profundus and superficialis (FDP, FDS) of the index finger, and then the FDP and FDS of the other fingers (14).

The rupture of a normal tendon is rare (3). Mc Master has demonstrated that a rupture can only occur if the tendon is weakened due to partial rupture or ischemia, which can occur acutely or progressively (15).

Orthopedic treatment has been shown to increase the risk of such complications due to various mechanical and biological factors, as highlighted in studies by Kozin and Wood (4), Bonatz et al. (8), and Hirasawa et al. (16). Cognet et al. identified two causes responsible for these ruptures: malunion after distal radius fracture or an anterior osteosynthesis plate, which can in certain cases lead to secondary rupture of flexor tendons (14).

The prominence of the plate and/or secondary displacement can result in progressive damage to the tendon, ultimately leading to rupture during sudden extension or forced flexion of the fingers. These factors align with those observed in our patient, who had a distal, prominent, and non-curved plate that, through a see saw effect, likely contributed to the tendon rupture.

To mitigate potential conflicts with the flexor apparatus, the plate should not extend beyond the watershed line at the distal edge of the pronator quadratus (PQ) (12).

Vincent et al. demonstrated the efficacy of the pronator quadratus square suture in preventing long thumb flexor rupture (17).

To minimize the risk of long flexor pollicis tendon conflict, it is recommended to use the volar locking plate (VLP) system with facet screw locations on the ulnar side (13).

The diagnosis of subcutaneous rupture of the long flexor pollicis tendon is primarily clinical and can be confirmed by ultrasound. Standard radiography can provide indirect signs, such as prominent plates and posterior displacement of the callus with posterior tilt. On average, the time to rupture was reported to be 22 weeks (14), while in our patient's case, it occurred after 36 weeks.

Rehabilitation is necessary to maintain joint mobility, trophicity, and prevent stiffness (18).

The patient underwent a series of rehabilitation sessions, and her range of motion and trophicity of the thumb joint were deemed normal.

Surgical intervention for aged flexor tendon ruptures, particularly the long flexor tendon of the thumb, entails direct termino-terminal or termino-lateral suture, one-stage or two-stage tendon graft (14) (18). Our patient underwent a tendon graft procedure utilizing the long palmar tendon with termino-terminal suture.

Tenolysis of the flexor tendons is a challenging surgical procedure that entails releasing the tendons. If the flexor tendons adhere to the tendon graft, tenolysis is conducted after a duration of 8 to 9 months. In our scenario, the patient underwent tenolysis after 6 months with good local condition, allowing for immediate rehabilitation.

In Cognet et al's series, functional recuperation was reported in 17 cases, with complete recuperation observed in 15 cases, partial in one case, and absent in one case (direct suture). (14).

IV. CONCLUSION

In conclusion, flexor tendon injuries can be severely debilitating, and patients and physicians should not underestimate their functional severity. Rupture of the long flexor tendon of the thumb following plate osteosynthesis is exceedingly rare, but it is a significant complication reported in the literature. Various therapeutic options have been proposed, including single or two-stage tendon grafting or tendon transfer, but post-repair complications such as non-negligible tendon rupture, suture failure, and adhesions are marked. This case study highlights the importance of careful surgical intervention, adequate rehabilitation, and close follow-up to achieve satisfactory functional outcomes.

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