EJMI

DOI: 10.14744/ejmi.2023.22698
EJMI 2023;7(3):231–234

Research Article

Extensor Pollicis Longus Tendinitis Developing after Fracture is not a Cause of Tendon Rupture in the Early Period: Prospective Study

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Abstract

Objectives: The aim of this study is to determine the extensor pollicis longus (EPL) changes that develop after distal radius fractures and to show their effects on the risk of EPL tendon rupture in the acute period.

Methods: In 36 patients operated because of distal radius fracture, ultrasonographic evaluations were made at 1 day, 3, and 6 weeks postoperatively. Measurements were taken from the thickness of the tendon sheath and the EPL tendon in the third compartment at the level of the distal radius. The patients were separated into two groups as those who developed (n=18) and did not develop (n=11) tendinitis. In both groups, measurements were statistically compared to the unaffected side.

Results: The EPL tendon thickness measured at 3-time points was found to be statistically significantly different in the group with tendinitis. A statistically significant difference was determined between the normal wrist and the 3-week postoperative EPL tendon thickness measurement. The EPL tendon sheath thickness measured at 3-time points was found to be statistically significantly different in the group with tendinitis. The differences between the EPL tendon sheath thickness measurements in the normal wrist and the operated wrist on day 1 and at 3 weeks postoperatively were determined to be statistically significant. At 6-week postoperatively, there was no statistically significant difference between measurements of the two groups.

Conclusion: Tendinitis developing in the EPL tendon is not a risk of tendon rupture in the acute period and in the subsequent period, it shows regression.

Keywords: Extensor pollicis longus, fracture, radius, rupture, tendon

Cite This Article: *Alic T, Hassa E. Extensor Pollicis Longus Tendinitis Developing after Fracture is not a Cause of Tendon Rupture in the Early Period: Prospective Study. EJMI 2023;7(3):231–234.*

The extensor pollicis longus (EPL) tendon is located in the third extensor compartment of the wrist. Rupture of the EPL tendon may be due to screws protruding before the tear following volar plate fixation of a distal radius fracture.[1] Ultrasonography (USG) has an important role in the evaluation of the presence of EPL tendon rupture.[2] USG shows the tendon in real-time and provides a rapid evaluation of the tendon integrity.[3] The EPL is the most affected tendon as it becomes compressed within the groove through which it courses. The reason for tendon irritation and rupture is thought to be associated with protruding screws or intraoperative piercing of the dorsal surface by the drill.[4–10]

EPL tendon ruptures can be seen following non-displaced or minimally displaced distal radius fractures. The EPL has a section that is poorly vascularized and it is thought that

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Submitted Date: September 13, 2022 **Revision Date:** December 12, 2022 **Accepted Date:** January 12, 2023 **Available Online Date:** March 21, 2023

this could be a reason for spontaneous rupture of the tendon.[11] Spontaneous EPL ruptures can also be seen associated with reasons such as steroid drugs, rheumatoid arthritis, tenosynovitis, and synovitis.[12]

The aim of this study was to determine the changes in the acute healing period of EPL injuries that develop after plate screw application in the treatment of distal radius fractures and to show whether or not these laid the ground for EPL tendon rupture.

Methods

This study was given ethical approval by our institution. The study included 36 patients operated on and applied with volar plate because of distal radius fracture. After the exclusion of seven patients who developed infection, the remaining 29 patients for evaluation were separated into two groups as 18 determined with tendinitis in the EPL and 11 who did not develop tendinitis. The tendon thickness and tendon sheath thickness measurements were statistically compared with the measurements of the non-operated side in both groups.

Radiological Methods

All the patients were evaluated with USG on post-operative day 1, then at 3 weeks, and 6 weeks. An Affiniti 70 ultrasound system (Philips Healthcare; Bothell, WA, USA) was used with a 12 MHz frequency linear probe, with focal zone, depth and gain set appropriate for surface tissues. Transverse and sagittal slices were obtained at the level of the distal radius from the dorsal surface of the wrist. The thickness of EPL tendon and the thickness of the tendon sheath were measured, and tendon integrity and echogenity were evaluated. The presence of hypoechoic-anechoic fluid in the sheath and around the tendon was recorded. At the same time, the thickness of the same tendon and sheath in the contralateral non-operated wrist was measured for comparison. In the USG evaluations, the presence of at least 5 mm thickening in the tendon compared to the normal side and/or the presence of fluid in the sheath or around the tendon and thickening was accepted as "tenosynovitis." Non-homogeneity, partial, or complete breakage and retraction of the inner fibrils of the tendon were evaluated as "rupture."[13, 14]

Statistical Methods

Statistical analyses in this study were performed using the SPSS (Version 22.0, SPSS Inc., Chicago, IL, USA Hitit University Licensed) package program. Descriptive statistics were reported using mean±standard deviation for normally distributed numeric data, median (min-max) for non-normally distributed numeric data, and number and percentage (%) for categorical data. The normal distribution test of the data was analyzed with the Shapiro–Wilk test. The Mann–Whitney U test was used to compare the numerical data between two independent groups since the data were not normally distributed. Friedman test was used in the comparison of numerical data between more than two dependent groups since the data were not normally distributed. Post hoc tests were used to determine which groups caused the difference after the Friedman test. Correlations between numerical variables were investigated with Spearman correlation coefficient in accordance with the data normal distribution. The statistical significance level was accepted as $p<0.05$.

Results

The EPL tendon thickness measured at 1 day, 3 weeks, and 6 weeks postoperatively was found to be statistically significantly different in the group with tendinitis. The results of the post hoc multiple comparisons showed a statistically significant difference between the normal wrist and the 3-week post-operative EPL tendon thickness measurement.

In the group with tendinitis, the EPL tendon sheath thickness measured at 3-time points was found to be statistically significantly different. As a result of the post hoc multiple comparisons, the differences between the EPL tendon sheath thickness measurements in the normal wrist and the operated wrist on day 1 and at 3-week postoperatively were determined to be statistically significant.

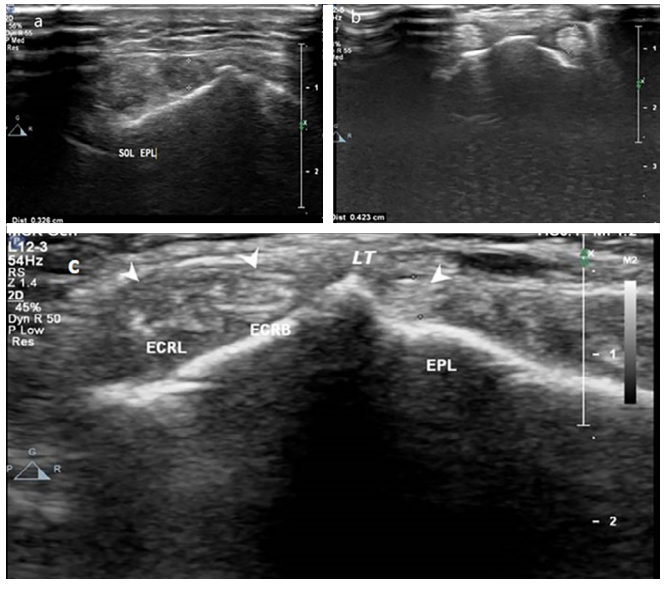

Figure 1. EPL thickness measurements in patients with **(a)** and without **(b)** tendinitis ultrasonographic image of EPL including its localization in the extensor compartment **(c)**.

In the group without tendinitis, no significant difference was found between the tendon and tendon sheath thickness measurements in the post hoc multiple comparisons.

In the comparisons made at 6-week postoperatively, no significant difference was determined between the groups with and without tendinitis in respect of the measurements of the operated and non-operated wrist.

These findings demonstrate that the increased thickness formed in the EPL tendon and tendon sheath are a valuable method in the determination of tendinitis. The EPL tendinitis that developed postoperatively was determined to reach the highest level in the 3rd week and then regress in the following time period. At 6-week postoperatively, no significant difference was determined in the measurements compared to the non-operated side. EPL tendon rupture was not seen in any patient. This showed that the tendinitis developing in the acute post-operative period did not constitute a risk for EPL tendon rupture.

Discussion

EPL tendon rupture can be seen at varying frequencies after closed radius distal fractures. It generally occurs in a 6-week period after distal radius fracture.[15] Insufficient vascularization or the mechanical effect of fracture fragments has been shown to be causes of EPL rupture.[16, 17] In patients applied with volar plate in the treatment of distal radius fracture, the mean time from surgery to EPL rupture has been reported to be 49.8 days.[18] Implant protrusion in the distal radius line can increase the risk of tendon rupture. EPL tendon rupture caused by locking screw protrusion during the surgery or piercing of the EPL tendon is a widely reported injury.[19, 20] It is interesting that EPL tendon rupture seen in radius distal end fractures' not surgically treated occur in the first 6-week period. This has attracted interest in respect of the mechanism of formation and observation of changes in the tendon in this period. Therefore, in this study, the early, mid, and late-term changes in the tendon were revealed with USG in the first 6-week period.

In a study by Sato et al.[21] of volar plate applied after distal radius fractures, the frequency of EPL tendon rupture was reported as 0.29%, and as 0.3–5% in patients with distal radius fracture followed up conservatively. It has also been reported that EPL tendon rupture can develop in the late-term after radius fractures at the rate of 0.3%.[22] Alter et al.[23] reported a total tendon complication rate of 3.5%, with extensor tendon rupture 1% and extensor tenosynovitis 0.6%. However, there is no consensus as to whether every injury in the tendon can cause rupture. We expected that we could detect tendinitis and subsequent EPL rupture with the USG measurements we made at different times. On the contrary, we have seen that tendinitis does not cause EPL rupture. Although the incidence of EPL tendon injury has been determined as 88% in patients applied with volar plate because of distal radius fracture, it has been reported that none of these resulted in tendon rupture.[24] This supported our study, but the fact that we were able to show the tendon thicknesses and tendon sheath thicknesses with USG offered a more detailed evaluation.

In the present study, tendinitis was determined at the rate of 62.06% according to the measurements of EPL tendon thickness and tendon sheath thickness, and EPL tendon rupture did not develop in any patient. We think that the developing tendinitis may be secondary to the fracture, accompanying soft-tissue trauma and surgical implant. However, when the tendon and tendon sheath thicknesses in the normal wrist are compared with the fractured side, the regression in tendinitis is quite significant. In accordance with the USG measurements, we found that the tendinitis table, which was at the highest level in the 3rd week, started to regress afterwards, and in the 6th week, the measurements returned to the values similar to the normal wrist. This showed that the tendinitis that developed did not create a risk of EPL tendon rupture. Thus, there can be considered to be a need for further long-term studies to investigate EPL rupture associated with chronic irritation. In addition, there is a need for studies showing short- and long-term effects for tendons that are expected to be injured less frequently, except for the EPL tendon.

Conclusion

Tendinitis developing in the EPL tendon is not a risk of tendon rupture in the acute period. EPL rupture may occur in the long-term due to chronic irritations.

Acknowledgments

Supporting the radiological examinations, Dr. Thank you Nurdan Fidan (Hitit University Faculty of Medicine, Radiology Department, Corum, Turkey).

Disclosures

Ethics Committee Approval: Non-Interventional Ethics Committee, Dated: June 6, 2022. Number: 2022/128.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

Authorship Contributions: Concept – E.H., T.A.; Design – E.H., T.A.; Supervision – E.H., T.A.; Materials – E.H., T.A.; Data collection and/or processing – E.H., T.A.; Analysis and/or interpretation – E.H., T.A.; Literature search – E.H., T.A.; Writing – E.H., T.A.; Critical review – E.H., T.A.

References

1. Perry DC, Machin DM, Casaletto JA, Brown DJ. Minimising the risk of extensor pollicis longus rupture following volar plate fixation of distal radius fractures: a cadaveric study. Ann R Coll Surg Engl 2011:93:57–60.
2. Chan WY, Chong LR. Anatomical variants of Lister's Tubercle: A new morphological classification based on magnetic resonance ımaging. Korean J Radiol 2017:18:957–63.
3. Ghazal L, Nabi M, Little C, Teh J. Ultrasound assessment of extensor pollicis longus tendon rupture following distal radius fracture: a sonographic and surgical correlation. J Ultrason 2020:20:e1–5.
4. Arora R, Lutz M, Hennerbichler A, Krappinger D, Espen D, Gabl M. Complications following internal fixation of unstable distal radius fracture with a palmar locking-plate. J Orthop Trauma 2007:21:316–22.
5. Al-Rashid M, Theivendran K, Craigen MA. Delayed ruptures of the extensor tendon secondary to the use of volar locking compression plates for distal radial fractures. J Bone Joint Surg Br 2006:88:1610–2.
6. Benson EC, DeCarvalho A, Mikola EA, Veitch JM, Moneim MS. Two potential causes of EPL rupture after distal radius volar plate fixation. Clin Orthop Relat Res 2006:451:218–22.
7. Drobetz H, Kutscha-Lissberg E. Osteosynthesis of distal radial fractures with a volar locking screw plate system. Int Orthop 2003:27:1–6.
8. Lee HC, Wong YS, Chan BK, Low CO. Fixation of distal radius fractures using AO titanium volar distal radius plate. Hand Surg 2003:8:7–15.
9. Nana AD, Joshi A, Lichtman DM. Plating of the distal radius. J Am Acad Orthop Surg 2005:13:159–71.
10. Wong-Chung J, Quinlan W. Rupture of extensor pollicis longus following fixation of a distal radius fracture. Injury 1989:20:375–6.
11. Hirasawa Y, Katsumi Y, Akiyoshi T, Tamai K, Tokioka T. Clinical and microangiographic studies on rupture of the EPL tendon after distal radial fractures. J Hand Surg Br 1990:15:51–7.
12. Taş S, Balta S, Benlier E. Spontaneous rupture of the extensor pollicis longus tendon due to unusual etiology. Balkan Med J 2014:31:105–6.
13. Bianchi S, van Aaken J, Glauser T, Martinoli C, Beaulieu JY, Della Santa D. Screw impingement on the extensor tendons in distal radius fractures treated by volar plating: sonographic appearance. AJR Am J Roentgenol 2008:191:199–203.
14. Daenen B, Houben G, Bauduin E, Debry R, Magotteaux P. Sonography in wrist tendon pathology. J Clin Ultrasound 2004:32:462–9.
15. Roth KM, Blazar PE, Earp BE, Han R, Leung A. Incidence of extensor pollicis longus tendon rupture after nondisplaced distal radius fractures. J Hand Surg Am 2012:37:942–7.
16. Kim CH. Spontaneous rupture of the extensor pollicis longus tendon. Arch Plast Surg 2012:39:680–2.
17. Lee JK, Bang JY, Choi YS, Kim TH, Yu WJ, Han SH. Extensor pollicis longus tendon rupture caused by a displaced dorsal "beak" fragment of Lister's tubercle in distal radius fractures. Handchir Mikrochir Plast Chir 2019:51:199–204.
18. Zenke Y, Sakai A, Oshige T, Moritani S, Menuki K, Yamanaka Y, et al. Extensor pollicis longus tendon ruptures after the use of volar locking plates for distal radius fractures. Hand Surg 2013:18:169–73.
19. Esenwein P, Sonderegger J, Gruenert J, Ellenrieder B, Tawfik J, Jakubietz M. Complications following palmar plate fixation of distal radius fractures: a review of 665 cases. Arch Orthop Trauma Surg 2013:133:1155–62.
20. Satake H, Hanaka N, Honma R, Watanabe T, Inoue S, Kanauchi Y, et al. Complications of distal radius fractures treated by volar locking plate fixation. Orthopedics 2016:39:893–6.
21. Sato K, Murakami K, Mimata Y, Doita M. Incidence of tendon rupture following volar plate fixation of distal radius fractures: A survey of 2787 cases. J Orthop 2018:3;15:236–8
22. Hove LM. Delayed rupture of the thumb extensor tendon. A 5-year study of 18 consecutive cases. Acta Orthop Scand 1994:65:199–203.
23. Alter TH, Sandrowski K, Gallant G, Kwok M, Ilyas AM. Complications of volar plating of distal radius fractures: A systematic review. J Wrist Surg 2019:8:255–62.
24. Naito K, Sugiyama Y, Dilokhuttakarn T, Kinoshita M, Goto K, Aritomi K, et al. A survey of extensor pollicis longus tendon injury at the time of distal radius fractures. Injury. 2017:48:925–9.