Acta Orthop. Belg., 2022, **88**, 757-760

ORIGINAL STUDY

doi.org/ 10.52628/88.4.03

Reconstruction of flexor pollicis longus tendon with palmaris longus interposition graft: results in 14 patients

Tine Peters, Pieter Caekebeke, Joris Duerinckx

From the Department of Orthopaedic Surgery and Traumatology, Ziekenhuis Oost-Limburg, Genk, Belgium

The flexor pollicis longus tendon is prone to attritive rupture and retraction. Direct repair is often not possible. Interposition grafting is a treatment option to restore tendon continuity, although the surgical technique and postoperative results have not been well defined. We report our experience with this procedure. 14 patients were prospectively followed for a minimum of 10 months after surgery. There was one postoperative failure of the tendon reconstruction. Postoperative strength was comparable to the contralateral side, but thumb range of motion was significantly reduced. In general, patients reported excellent postoperative hand function. This procedure seems a viable treatment option with lower donor site morbidity than tendon transfer surgery.

Keywords: thumb; flexor pollicis longus; reconstruction; repair; palmaris longus; interposition.

INTRODUCTION

Atraumatic rupture of the flexor pollicis longus (FPL) tendon is rare. Formerly it was a typical condition for patients with rheumatoid arthritis, known as a Mannerfelt lesion *(1)*. Osteophytes on the scaphoid can erode through the volar wrist capsule and cause fraying of the FPL-tendon. Advances in medical therapy have made this presentation rare *(2,3)*. The increased popularity of volar plate and screw osteosynthesis to treat distal radius fractures since 2000[2] has been associated with a flare-up of FPL-tendon ruptures *(4,5,6,7)*. Plate positioning superficial or distal to the watershed line increases the risk of flexor tendon wear over the distal edge of the plate *(8,9)*.

Primary repair of chronic FPL tendon ruptures is difficult due to tendon abrasion and muscle retraction. Surgical treatment options are transfer of the flexor digitorum superficialis (FDS) tendon of the middle or ring finger to the thumb *(10)*, tendon reconstruction with an interposition graft *(11,12,13)*, tendon advancement *(14)* or fusion of the interphalangeal joint *(15,16)*. Preferred management has not been determined yet as only few reports present the outcome of their surgical treatment in detail *(4,6,12,17,18)*.

The purpose of the present study was to evaluate the outcome of all reconstructions of the FPL tendon

■ Tine Peters, MD, resident
■ Pieter Caekebeke, MD,
■ Joris Duerinckx, MD, PhD.
Department of Orthopaedic Surgery and Traumatology, Ziekenhuis Oost-Limburg, Belgium.
Correspondence : J. Duerinckx, Department of Orthopaedic Surgery and Traumatology, Ziekenhuis Oost-Limburg, Schiepse Bos 6, 3600 Genk, Belgium. Phone: +32 89326118. Email : joris.duerinckx@zol.be

The authors declare they have no conflict of interest.

with a free palmaris longus (PL) interposition tendon graft performed in our institution.

MATERIALS AND METHOD

14 patients (seven female, seven male) who had a degenerative or attritive rupture of the FPL tendon underwent tendon reconstruction with a palmaris longus interposition graft in our institution. The left thumb was involved in six patients and the right in eight. In all patients the FPL tendon was not amenable for direct repair. Tendon rupture was caused by friction against a volar distal radius plate (nine patients), a prominent screw head (one patient), K-wires (one patient) and attrition against carpal osteophytes (two patients). We also included one patient who had a two-stage flexor tendon reconstruction with temporary placement of a silicone tendon rod after failed primary tendon repair.

Surgeries were performed between March 2012 and March 2020. Mean patient age at the time of tendon reconstruction was 64 years (range 32-79). Mean interval between tendon reconstruction surgery and study assessment was 40 months (Range 10-65). There were no patients with prodromal symptoms of tendon rupture. The interval between loss of active thumb flexion and surgical repair averaged 2,4 months (range 0,4-9,1). All patients underwent FPL tendon reconstruction with a PL tendon interposition autograft using the surgical technique described by Berger et al. *(13)* (Fig 1). Postoperatively a dorsal blocking splint was applied, immobilizing the wrist and thumb in moderate flexion. Immediate active flexion – extension exercises of the thumb were allowed under supervision of a hand therapist with protective bracing and avoidance of resisted thumb flexion for 6 weeks. Labor and sports activities were allowed at 3 months postoperatively.

A single surgeon (JD) performed all surgeries. Another physician (TP) assessed the patients for this study. The involved extremity was examined and the contralateral limb was used as a control. All motions were actively performed. Flexion and extension of the interphalangeal (IP) joint of the thumb and opening of the first webspace were measured with a manual goniometer. Thumb opposition was scored as described by Kapandji. Thumb retropulsion was measured as the distance in centimeters from a flat surface to the thumb pulp with the palm placed flat on the surface and the thumb actively elevated to maximum retropulsion. Thumb pinch strength and grip strength were assessed with a pinch gauge and a dynamometer respectively (Jamar, Patterson Medical, Warrenville, IL, USA). Pain at the operated hand was scored with the Visual Analogue Scale. Functional outcome was measured with the Disabilities of the Arm, Shoulder, and Hand questionnaire (qDASH, Dutch version). The paired Student's t-test was used to evaluate if the results of the operated and the contralateral side were significantly different. The study was approved by the institutional ethical review committee (reference number: B3712020000019).

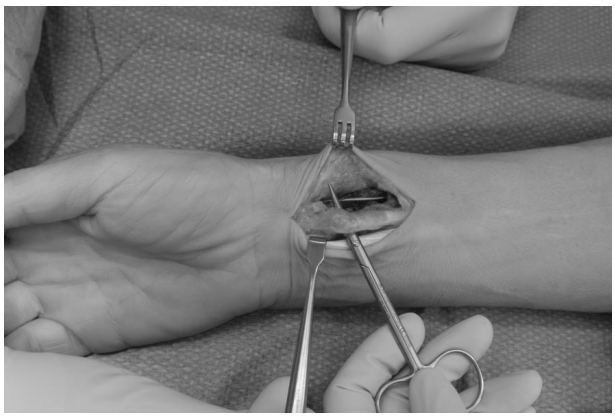

Figure 1. — The flexor pollicis longus tendon is torn over the distal edge of a distal radius plate and held in continuity by thick fibrous tissue resembling a pseudo-tendon.

RESULTS

The results of our patients are shown in Table I. Active flexion of the interphalangeal joint and opposition were significantly diminished in the operated thumbs compared to the normal contralateral side. The other measurements were comparable between the operated and non-operated thumb. One patient experienced failure of the reconstruction at 6 weeks after surgery. No reoperation was performed. No patient had developed complex regional pain syndrome or other complications at final follow-up.

Table I. — Postoperative results. Mean (range)

DASH	9 (1-28)		
VAS pain	1 (0-5)		
	Operated side	Contralateral side	Significance (P-score)
IP flexion (°)	49 (15-80)	75 (60-100)	0,0005
IP extension deficit (°)	4 (0-30)	0	0.3559
Thumb opposition (Kapandji)	8 (5-10)	10 (9-10)	0,0046
Thumb retropulsion (cm)	3,2 (0-5)	3,8 (1,5-5)	0.1106
First webspace opening (°)	68 (40-100)	76 (45-100)	0,0781
Key pinch (kg)	8 (5,5-20)	9,4 (5,5-25)	0,0739
Power grip (kg)	34 (20-54)	36 (24-60)	0,0597

DISCUSSION

Flexor tendon irritation by volar plate and screw osteosynthesis of the distal radius is currently the most common cause of rupture of the flexor pollicis longus tendon. Hardware placement prominent to the watershed line should be avoided because it is directly correlated with an increased risk of tendon rupture *(8,9)*. Of all the flexor tendons the FPL tendon is most prone to fraying, followed by the flexor digitorum profundus tendon to the index finger *(19)*. Tendon ruptures after wrist plating may not be amenable for primary repair because of attritional changes in the tendon tissue. A free tendon graft can be interposed to bridge the defect. The PL is usually of suitable length and diameter and conveniently near. Other tendons that can be used are plantaris and extensor indicis proprius. To be successful, the FPL muscle must still be functional. Excessive shortening is an inherent risk because there are no restraints to proximal retraction. Normal excursion of the FPL tendon is 5.5-6 cm *(10)*. According to Matev, only 1.0 to 1.5 cm of remaining passive stretch is needed to achieve a satisfactory result *(20)*. In our series remaining passive stretch of the FPL muscle was 2-4 cm, resulting in a mean active flexion of the IP-joint of 49°.

An alternative technique is to transfer the flexor superficialis tendon of the 4th finger to the distal stump of the FPL tendon. Potential morbidity at the donor finger and the need for cortical reorganization are inherent drawbacks of this treatment. In a series of 23 patients where this technique was used for reconstruction of posttraumatic FPL ruptures, post-operative mobility of the IP joint averaged 53.5° *(21)*.

Although active IP-joint flexion and thumb opposition did not normalize after surgery, patients reported excellent functional results. The mean DASH score in our study population is comparable with the mean DASH score of 13 points that is found in the normal population *(23,24)*. The primary function of the FPL tendon is to position and to stabilize the thumb for tip-to-tip pinch and fingernail pickup *(22)*. This function requires 20° to 30° of IP joint flexion and can be expected after PL tendon interposition. In our series, grip and key pinch strength were unaffected. The can probably be explained by the higher contribution of the adductor pollicis muscle to thumb flexion power than the FPL.

Although we presented the largest patient group to date, we consider the relatively small number of patients a shortcoming of this study.

The preferred surgical treatment for degenerative FPL tendon rupture has not been determined yet. FPL reconstruction with PL autograft rehabilitates the function of the original FPL muscle belly and does not carry the risk to compromise the function of a neighboring finger like in tendon transfer procedures. Our results demonstrate that tendon reconstruction does not restore normal active thumb motion, but it can provide excellent functional recovery of hand function.

CONCLUSION

Reconstruction of a degenerative FPL tendon rupture with a PL tendon interposition graft is a reliable treatment option with lower donor site morbidity than tendon transfer surgery. Thumb range of motion cannot be completely restored with this surgery, but complete recovery of strength and excellent postoperative hand function can be expected.

REFERENCES

1. **Mannerfelt L, Norman O.** Attrition ruptures of flexor tendons in rheumatoid arthritis caused by bony spurs in the carpal tunnel. A clinical and radiological study. J Bone Joint Surg Br. 1969;51(2):270-277.
2. **Orbay JL.** The treatment of unstable distal radius fractures with volar fixation. Hand Surg. 2000;5(2):103-112.
3. **Breedveld FC.** Current and future management approaches for rheumatoid arthritis. Arthritis Res. 2002;4(2):16-21.
4. **Bell JSP, Wollstein R, Citron ND.** Rupture of flexor pollicis longus tendon. A complication of volar plating of the distal radius. J Bone Joint Surg (Br).1998;80-B:225-6.
5. **Johnson NA, Cutler L, Dias JJ, Ullah AS, Wildin CJ, Bhowal B.** Complications after volar locking plate fixation of distal radius fractures. Injury. 2014;45:528-533.
6. **Klug RA, Press CM, Gonzalez MH.** Rupture of the flexor pollicis longus tendon after volar fixed-angle plating of a distal radius fracture: a case report. J Hand Surg. 2007;32A:984-988.
7. **Adham MN, Porembski M, Adham C.** Flexor tendon problems after volar plate fixation of distal radius fractures. Hand. 2009;4(4):406-409.
8. **Soong M, Earp BE, Bishop G, Leung A, Blazar P.** Volar locking plate implant prominence and flexor tendon rupture. J Bone Joint Surg Am. 2011;93(4):328-335.
9. **Yamak K, Karahan HG, Karatan B, Kayalı C, Altay T.** Evaluation of Flexor Pollicis Longus Tendon Rupture after Treatment of Distal Radius Fracture with the Volar Plate. J Wrist Surg. 2020;9(3):219-224.
10. **Schneider LH, Wiltshire D.** Restoration of flexor pollicis longus function by flexor digitorum superficialis transfer. J Hand Surg Am. 1983; 8(1):98-101.
11. **Urbaniak JR, Goldner JL.** Laceration of the flexor pollicis longus tendon: delayed repair by advancement, free graft or direct suture. J Bone Joint Surg Am. 1973;55(6):1123-1148.
12. **de Panafieu E, Upex P, Doursounian L, Robert N.** Free tendon grafts in elder patients, a case report of repair of flexor pollicis longus tendon with a free palmaris longus graft in an 89-year-old woman. Ann Chir Plast Esthet. 2014;1260(14):167-168.
13. **Berger P, Duerinckx J.** Flexor Pollicis Longus Tendon Rupture After Volar Wrist Plating : Reconstruction With Palmaris Longus Interposition Graft. Acta Orthop Belg. 2017;83(3):467-472.
14. **Schmitt S, Mühldorfer-Fodor M, van Schoonhoven J, Prommersberger KJ.** Restoration of thumb flexion at the interphalangeal joint by transposition of the flexor digitorum superficialis tendon from the ring finger. Oper Orthop Traumatol. 2013;25(4):321-330.
15. **Toledano B, Terrono AL, Millender LH.** Reconstruction of the rheumatoid thumb. Hand Clin. 1992;8(1):121-9.
16. **Bickert B, Kremer T, Kneser U.** Sekundäre Sehnenrekonstruktionen am Daumen [Secondary tendon reconstruction on the thumb]. Unfallchirurg. 2016;119(12):986-992.
17. **Valbuena SE, Cogswell LK, Baraziol R, Valenti P.** Rupture of flexor tendon following volar plate of distal radius fracture. Report of five cases. Chir Main. 2010;29:109-113.
18. **Chong CW, Chen SH.** Step Cut Lengthening: A Technique for Treatment of Flexor Pollicis Longus Tendon Rupture. Ann Plast Surg. 2018;80(4):353-355.
19. **Asadollahi S, Keith PA.** Flexor tendon injuries following plate fixation of distal radius fractures: a systematic review of the literature. J Orthopaed Traumatol. 2013;14:227-234.
20. **Matev IB.** Reconstructive surgery of the thumb. Pilgrim's Press, Brentwood, 1983:50-56.
21. **Posner MA.** Flexor superficialis tendon transfers to the thumb-an alternative to the free tendon graft for treatment of chronic injuries within the digital sheath. J Hand Surg Am. 1983;8(6):876-881.
22. **Kilgore ES, Newmeyer WL, Graham WP, Brown LG.** The dubiousness of grafting the flexor pollicis longus. Am J Surg. 1976;132:292-296.
23. **Jester A, Harth A, Germann G.** Measuring levels of upper-extremity disability in employed adults using the DASH questionnaire. J Hand Surg Am. 2005;30(5):1074. e1-1074.e10.
24. **Aasheim T, Finsen V.** The DASH and the QuickDASH instruments. Normative values in the general population in Norway. Journal of Hand Surgery (European Volume). 2014;39(2):140-144.