

# Surgical Treatment of Chronic Traumatic Rupture of the Flexor Digitorum Profundus Tendon in a 9-Years-Old Female: A Case Report

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## Abstract

**Background:** Flexor tendon rupture is a common traumatic event that is treated with surgery. Delay in reconstruction can reduce the chances of successful treatment even the surgeon is forced to choose fuse surgery.

**Case Report:** The study case was a 9-year-old girl who presented after months of traumatic injury with severe deformity of index finger and shortened flexor digitorum profundus (FDP). Although there was no suitable tendon, a plantaris tendon graft was prepared from her left leg. After one year, the range of motion (ROM) in the left hand was normal beyond expectation.

**Conclusion:** Single-stage tendon graft repair surgery even in chronic cases with shortened tendon and severe deformity is a good method which is recommended for similar patients, especially in children.

**Keywords:** Tendon Injuries; Tendon Transfer; Muscles; Hand Deformities; Accidental Falls

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## Background

Flexor tendon injuries are common because of the nearness to the skin and so challenging problems. They cannot heal without surgical treatment (1). It is estimated that the incidence of flexor tendon injury is about 30-42 per 100,000 persons (2).

The surgery procedure to be chosen depends on several factors, including the patient's condition, but in general, in cases where more than three weeks have passed since the tendon rupture, the initial surgery is usually not successful, and muscle function after surgery is not ideal (3). Fusion or tendon graft surgery can be performed in patients (4).

The flexor digitorum profundus (FDP) is one of the important flexors of the hand that plays an important role in daily movements. It exists in the deep volar compartment and can flex the wrist and the metacarpophalangeal (MCP) and interphalangeal joints of the second, third, and fourth fingers. In addition, it helps lumbricals to extend the fingers at interphalangeal joints and flexion of MCP joints (5).

This report reviewed the surgical treatment of a patient whose FDP muscle had been removed from the index finger months ago and whose hand had a severe deformity and decreased strength. Due to her young age, tendon transplantation was performed instead of joint fuse surgery.

## Case Report

A 9-year-old girl, who had difficulty bending the second finger of her left hand a few months after falling which became severe deformity in flexion and appearance, was hospitalized (Figure 1).

On examination, the range of active and passive movements of the index finger and the grip strength of the finger were clearly reduced.



Figure 1. Deformity of the index finger

The patient underwent surgery due to the deformity with the possibility of FDP tendon rupture (Figure 2).



Figure 2. Flexor repair and transplant in surgery



By zigzag incision from the distal second finger of the left hand, it was gradually opened to the proximal and palm to find the head of the FDP. Unfortunately, the FDP was torn from the distal second finger and was not found. It was shortened to the wrist, and finally, the FDP was found in the wrist area, so it could not be attached due to severe shortening. One had to choose between joint fusion or transplant surgery. The decision was made to select a muscle for grafting instead of the damaged flexor. No suitable tendon (in terms of the length required) was found in the hand area for transplantation. Then, a plantar tendon graft was prepared from her left leg by curve incision, and the FDP was repaired. After one year, the range of motion (ROM) in the left hand was normal, and the deformity was corrected (Figure 3).



Figure 3. One year after surgery

The patient (parents of the child) gave informed written consent for publication of the study in medical information and photo of the patient's injured hand for investigative journals and provided her medical records to the research team with the consent and under the supervision of the rules of the Ethics Committee, Qom University of Medical Sciences, Qom, Iran, for the publication of the case report.

## Discussion

In flexor tendon repair surgeries with associated nerve damage, the choice of donor tendon for transplantation is a challenge for the surgeon. Selection of extensor carpi radialis longus (ECRL) tendon as a donor is commonly used in deep flexor muscle injury of the hand, which yields acceptable results (6).

Biceps and brachialis muscles were also used for grafting, though now more as a fascia lata (FL) graft (7, 8).

In our patient, the extent of the injury, excessive shortening of the damaged tendon, and even the presence of deformity and inadequacy of the surrounding muscle tendons did not prevent the choice of tendon grafting and repair method.

Naohito et al. reported a case of 49 year-old man with rupture of both FDP and flexor digitorum superficialis. They performed suture of the FDP and excision of the flexor digitorum superficialis because of mild myostatic contracture of the FDP tendon of the patient. Finally, this operation improved the function of the patient's hand. This study recommended exploring muscle surgery immediately after the injury to maintain hand function with initial repair (9).

This method was not possible in our patient due to the reasons mentioned above.

Srikanth et al. suggested using brachioradialis to FDP

tendon transfer to restore finger flexion in 8 patients between 2013 to 2017, but only in half of the patients, the desired postoperative outcome was reported (10).

Bommier et al. in 2018 reported the results of heterodigital FDP hemi-tendon transfer for 23 flexor tendon injuries. The active ROM increased dramatically, and they concluded that this method restored good function in zone 1 and 2 flexor tendon injuries. Moreover, they concluded that the outcomes of this surgery were better in cases of primary surgery, children, and for the index and little fingers (11).

Our patient's young age also probably influenced the ideal outcome of this tendon transplant. It is suggested that the use of plantar tendon in flexor tendon repair, even chronically, especially in children, always be considered by surgeons. However, generalization of results requires extensive comparative studies in patients with flexor tendon rupture in zones 1 and 2.

## Conclusion

It seems that the use of single-stage tendon graft repair surgery in wide traumatic ruptures of the flexor tendon, especially in children, even in chronic cases with shortened FDP muscle, can have favorable results for the patient and, in addition to treating the deformities, provide a good function for the finger. If the injured muscle is shortened, the choice of plantaris muscle seems appropriate. Extensive and more detailed studies can provide a generalization of the result.

## Conflict of Interest

The authors declare no conflict of interest in this study.

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## References

- Griffin M, Hindocha S, Jordan D, Saleh M, Khan W. An overview of the management of flexor tendon injuries. *Open Orthop J*. 2012;6:28-35. doi: [10.2174/1874325001206010028](https://doi.org/10.2174/1874325001206010028). [PubMed: [22431948](https://pubmed.ncbi.nlm.nih.gov/22431948/)]. [PubMed Central: [PMC3293389](https://pubmed.ncbi.nlm.nih.gov/PMC3293389/)].
- de Jong JP, Nguyen JT, Sonnema AJ, Nguyen EC, Amadio PC, Moran SL. The incidence of acute traumatic tendon injuries in the hand and wrist: A 10-year population-based study. *Clin Orthop Surg*. 2014;6(2):196-202. doi: [10.4055/cios.2014.6.2.196](https://doi.org/10.4055/cios.2014.6.2.196). [PubMed: [24900902](https://pubmed.ncbi.nlm.nih.gov/24900902/)]. [PubMed Central: [PMC4040381](https://pubmed.ncbi.nlm.nih.gov/PMC4040381/)].
- Tang JB. Tendon injuries across the world: treatment. *Injury*. 2006;37(11):1036-42. doi: [10.1016/j.injury.2006.07.027](https://doi.org/10.1016/j.injury.2006.07.027). [PubMed: [17045267](https://pubmed.ncbi.nlm.nih.gov/17045267/)].
- Leddy JP. Avulsions of the flexor digitorum profundus. *Hand Clin*. 1985;1(1):77-83. [PubMed: [4093464](https://pubmed.ncbi.nlm.nih.gov/4093464/)].
- Lung BE, Burns B. Anatomy, shoulder and upper limb, hand flexor digitorum profundus muscle. In: StatPearls [Internet]. Treasure Island, FL: StatPearls Publishing; 2021. [PubMed: [30252302](https://pubmed.ncbi.nlm.nih.gov/30252302/)].
- Sabapathy SR, Gowda DK, Ranade AB, Venkatramani H, Sebastin SJ. Functional outcome of extensor carpi radialis longus transfer for finger flexion in posttraumatic flexor muscle loss. *J Hand Surg Am*. 2005;30(2):267-72. doi: [10.1016/j.jhsa.2004.11.017](https://doi.org/10.1016/j.jhsa.2004.11.017). [PubMed: [15781348](https://pubmed.ncbi.nlm.nih.gov/15781348/)].
- Oberlin C, Durand S, Fox M, Belkheyar Z. Transfer of the recovered biceps to the long flexors of the digits to restore grip function following complete traumatic brachial plexus palsy. *Chir Main*. 2010;29(3):167-71. doi: [10.1016/j.main.2010.03.010](https://doi.org/10.1016/j.main.2010.03.010). [PubMed: [20556886](https://pubmed.ncbi.nlm.nih.gov/20556886/)].
- Bertelli JA, Ghizoni MF. Brachialis muscle transfer to reconstruct finger flexion or wrist extension in brachial plexus palsy. *J Hand Surg Am*. 2006;31(2):190-6. doi: [10.1016/j.jhsa.2005.09.020](https://doi.org/10.1016/j.jhsa.2005.09.020). [PubMed: [16473677](https://pubmed.ncbi.nlm.nih.gov/16473677/)].

9. Naohito H, Masato A, Rui A, Daisuke H, Yusuke Y, Koichi I. Closed rupture of both flexor digitorum profundus and superficialis tendons of the small finger in zone II: Case report. *J Hand Surg Am.* 2011;36(1):121-4. doi: [10.1016/j.jhsa.2010.09.024](https://doi.org/10.1016/j.jhsa.2010.09.024). [PubMed: [21146330](https://pubmed.ncbi.nlm.nih.gov/21146330/)].
10. Srikanth R, Rayidi KR, Kakumanu S. Brachioradialis to flexor digitorum profundus tendon transfer to restore finger flexion. *Indian J Plast Surg.* 2018;51(2):123-30. doi: [10.4103/ijps.IJPS\\_7\\_18](https://doi.org/10.4103/ijps.IJPS_7_18). [PubMed: [30505081](https://pubmed.ncbi.nlm.nih.gov/30505081/)]. [PubMed Central: [PMC6219348](https://pubmed.ncbi.nlm.nih.gov/PMC6219348/)].
11. Bommier A, McGuiire D, Boyer P, Rafee A, Razali S, Oberlin C. Results of heterodigital flexor digitorum profundus hemi-tendon transfer for 23 flexor tendon injuries in zones 1 or 2. *J Hand Surg Eur Vol.* 2018;43(5):487-93. doi: [10.1177/1753193417737920](https://doi.org/10.1177/1753193417737920). [PubMed: [29065767](https://pubmed.ncbi.nlm.nih.gov/29065767/)].