



A subacute case of traumatic avulsion of the flexor digitorum profundus tendon due to recurrent enchondroma of the distal phalanx

Un caso subacuto di avulsione traumatica del tendine flessore profondo associata a encondroma ricorrente della falange distale

Danila Oldani¹, Silvio Tocco², Letizia Marenghi¹

¹ Clinica Ortopedica, Dipartimento Chirurgico generale e Specialistico, Università di Parma; ² Centro Riabilitativo della Mano e Arto Superiore, Parma

Corrispondenza

Danila Oldani

E-mail: danila.oldani@studenti.unipr.it

Conflitto di interessi

Gli Autori dichiarano di non avere alcun conflitto di interesse con l'argomento trattato nell'articolo.

Come citare questo articolo: Oldani D, Tocco S, Marenghi L. A subacute case of traumatic avulsion of the flexor digitorum profundus tendon due to recurrent enchondroma of the distal phalanx. Rivista Italiana di Chirurgia della Mano 2022;59:36-40. <https://doi.org/10.53239/2784-9651-2022-4>

© Copyright by Pacini Editore Srl



OPEN ACCESS

L'articolo è OPEN ACCESS e divulgato sulla base della licenza CC BY-NC-ND (Creative Commons Attribuzione - Non commerciale - Non opere derivate 4.0 Internazionale). L'articolo può essere usato indicando la menzione di paternità adeguata e la licenza; solo a scopi non commerciali; solo in originale. Per ulteriori informazioni: <https://creativecommons.org/licenses/by-nc-nd/4.0/deed.it>

Summary

Introduction. Avulsion of the flexor digitorum profundus (FDP) tendon associated to an enchondroma fracture in the distal phalanx is very rare. We report a subacute case of a type II FDP tendon avulsion of the small finger at its insertion, in combination with a fracture of the distal phalanx due to enchondroma.

Material and methods. The bone lesion was curetted and grafted using autogenous bone harvested from the ipsilateral radius. The FDP tendon was reattached to the distal phalanx using the pullout transosseous technique. Delayed protected active mobilization was used to treat the repaired tendon.

Results. According to the adjusted Strickland score, a good result was obtained and grip strength was similar between hands and PRWHE score was very low at 5 months from surgery.

Conclusions. Early diagnosis leads to a fast surgery with good functional mobility and pain outcomes. If closely monitored by an experienced medical team, as this case demonstrates, an attempt to treat the benign tumor with a curettage, bone filling and reattachment of the tendon through the pullout technique in young motivated patients can be an alternative.

Key words: enchondroma, avulsion flexor digitorum profundus tendon, Jersey finger, rugby finger

Riassunto

Introduzione. L'avulsione del tendine del flessore profondo delle dita (FDP) associata a una frattura da encondroma a livello della falange distale è molto rara. Riportiamo un caso subacuto di avulsione tendinea di tipo II FDP del mignolo alla sua inserzione, associata a una frattura della falange distale per encondroma.

Materiale e metodi. La lesione ossea è stata curettata e innestata utilizzando osso autogeno prelevato dal radio omolaterale. Il tendine FDP è stato reinserito alla falange distale utilizzando la tecnica transossea pullout. La mobilizzazione attiva protetta è stata utilizzata per trattare il tendine riparato.

Risultati. In accordo con il sistema di valutazione Strickland modificato, è stato ottenuto un buon risultato, la forza di presa era simile tra le due mani e il punteggio PRWHE era molto basso a 5 mesi dall'intervento chirurgico.

Conclusion. La diagnosi precoce permette di eseguire un intervento chirurgico in tempi rapidi, che porta a un buon outcome funzionale in assenza di dolore. Se monitorato da vicino da un'équipe medica esperta, come dimostra questo caso, un tentativo di trattare il tumore benigno con un curettage, riempimento osseo e reinserzione del tendine attraverso la tecnica del pullout può dimostrarsi una valida alternativa di trattamento in pazienti giovani e motivati.

Parole chiave: encondroma, disinserzione tendinea flessore profondo delle dita, Jersey finger, rugby finger

Introduction

Avulsion of the flexor digitorum profundus (FDP) tendon is a rare injury caused by forced hyperextension of the distal interphalangeal (DIP) joint while the finger is flexed into a forceful grasp. This injury is called "jersey finger" or "rugby finger"¹. This leads to a rupture of the FDP tendon at its physiologically weakest point: the insertion into the distal phalanx leading to inability to actively flex the DIP joint².

The pathognomonic finding in the physical examination of jersey finger is the inability to actively flex the DIP joint³.

Enchondroma is a benign and most common tumor of the hand arising from the medullary cavity of the bone. The proximal phalanx is the most common location. Only a small number of distal phalanx (DP) cases have been reported in the literature^{4,5}. Pathological fracture is the most common way that enchondroma reveals itself⁶.

The typical presentation of enchondroma include: swelling and/or pathological fracture that often occurs after a relatively trivial injury, though many are found incidentally on x-ray in asymptomatic patients⁷.

The combination of these two pathologies is very rare. Even more rare is the presentation and treatment in a subacute setting. We thus report a subacute case of FDP avulsion in the small finger secondary to DP enchondroma.

Case report

This was a 29-years-old, right-handed male, with a previous history of injury of the small finger associated with two pathological DP fractures dating back 2 and 4 years earlier. The patient consulted us several days after a low energy trauma. On clinical examination, the right fifth DIP joint was tender and swollen with loss of active flexion. In addition, the global flexion of the finger was compromised. The x-ray showed an avulsion fracture and confirmed the presence of a well-known lytic lesion, referable to an enchondroma, at the DP (Fig. 1).

Seventeen days after the injury we performed surgical treatment. A Bruner-type incision was made over the volar midline of the fifth finger, the cystic lesion was treated and a specimen was sent for histological examination, which confirmed the diagnosis of enchondroma and the surgical time

confirmed a type II Leddy and Packer injury. After curettage, the bone defect was filled with autogenous ipsilateral radius cancellous bone.

Through the opening of the A1, A3 and A5 pulleys, the FDP tendon was recovered at the level of proximal phalanx (Fig. 2A). It was then passed under the pulley system and inserted on the grafted bone using the pullout wire technique⁸ (Figs. 2B, C). The A3 and A5 pulleys were sutured and



Figure 1. X-ray showed an avulsion fracture at the base of DP.

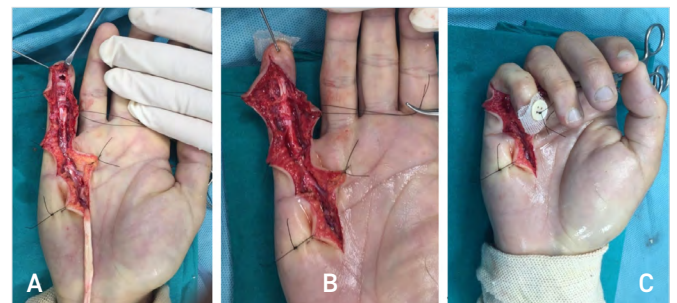


Figure 2. Intra-operative timing: (A) Bruner-type incision, curated cystic lesion and recovered FDP tendon; (B) relocated FDP tendon under the pulley system secured with pull-out technique after distal phalanx autologous bone grafting; (C) assessment of the digital cascade.

a dorsal cast was positioned immediately to immobilize the long fingers and wrist in a safe position. The patient was referred to a local specialized hand rehabilitation center within 5 days.

Orthotic management and exercise program

- 5 days post-surgery: a dorsal blocking orthosis (DBO) was custom fitted to immobilize the wrist in neutral position, the metacarpophalangeal joints of the long fingers in 70° of flexion and the interphalangeal joints in full extension. Edema control was addressed. Immediate rehabilitation included active composite extension, progressive composite and isolated DIP/PIP joints passive flexion in the DBO. The patient was well aware of the risks of tendon rupture, peritendinous adhesions and/or bone failure, so the exercises were done every 2-3 hours per day.
 - 2 weeks post-surgery: start protected active flexion in order to allow some initial healing of the bone filling.
 - 6 weeks post-surgery: the DBO was discontinued fully and pullout button removed. A progressive strengthening began with soft putty and functional electrical stimulation. The rehabilitation program was intensified after this diagnostic check-up and grippers and heavier grasping exercises were included in the program. Home-program after 6 weeks post-surgery consisted in active differential gliding exercises and very light use of the hand in ADL's.
- Light FDS tendon activation was perceived with palpation over the repaired site but not motion was observed at 1 month after surgery.
- 7 weeks post-surgery: was observable initial active motion at the DIP joint (DIP PROM 0°-5°). Ultrasonography and MRI were thus performed in suspicion of suture failure and retraction of FDP: both turned out negative.
 - 11 weeks post-operatively: PIP joint flexion contracture deformity became evident and a No-Profile PIP joint extension orthosis⁹ was custom-fabricated to be worn at night and 4-6 hours during the day.
 - Full use of the hand was allowed at 12 weeks.
 - Patient discharge occurred at 4 months post-operatively with the final outcomes at 5 months of 0°-35° DIP AROM and 0°-95° PROM (Figs. 3, 4).
 - According to the adjusted Strickland score¹⁰, this was a good result. This is corroborated by a very low PRWHE¹¹ score at final follow-up (7.5/100) and a nearly full grip strength ratio (98%).



Figure 3. Post-operative X-ray.



Figure 4. Clinical assessment at 5 months after surgery.

Discussion

Among bone tumors, only 6% occur in the hand and most are benign. Enchondroma accounts for about 90% of these hand tumors. They are mainly located in the proximal phalanges and metacarpals and more rarely in the distal phalanges^{12,13}.

The diagnosis of FDP tendon detachment is based on a clinical examination that looks for flexion deficit in the DIP joint. Radiographs and ultrasonography help to define the lesion. Initially described in 1977 by Leddy and Packer² FDP avulsion are classified on the basis of the proximal extent of the retraction of the FDP and the presence or absence of a bony avulsion fracture fragment.

In Type I injuries the tendon is retracted in to the palm, the long and short vincula are both ruptured, leading to compromised tendon nutrition. These injuries have a worse prognosis if not diagnosed and treated within 7-10 days as the tendon contacts and becomes less viable. Type II injury is the most common type. The tendon retracts to the level

of PIP joint with vincula preservation. Due to maintenance of tendon length and blood supply, Type II injuries may be successfully repaired up to a few months following injury. In Type III injuries the tendon is retracted to the level of the A4 pulley of the middle phalanx and are associated with large bony fragment trapped within this pulley.

The Leddy and Packer classification was later expanded to include Types IV and V injury patterns, which are less common than the other injury patterns. Type IV is similar to type III: it involves a bony avulsion and the FDP tendon subsequently retracts into the finger or palm^{14,15}. Type V is the most complex injury of all because it involves a concomitant distal phalanx fracture with the FDP avulsion¹⁶. Al-Qattan sub-classified Type V injuries into extra-articular (Type Va) and intra-articular (Type Vb) distal phalanx fracture¹⁷.

Early diagnosis of "jersey finger" leads to a fast surgery (recommended in ten days of injury) with excellent functional mobility and pain outcomes. For chronic tears, a DIP arthrodesis is recommended.

As a general and well-established rule, a flexor tendon avulsion injury demands early exploration. The same is true for an enchondroma of the distal phalanx which leads to a surgical indication once the diagnosis has been confirmed. This will prevent the FDP tendon from detaching from the pathological bone. It is not appropriate to simply assess the injury radiologically.

Arthozoul et al. summarized the published 10 cases of FDP rupture secondary to enchondroma and found a consensus on treating these injuries simultaneously with curettage, bone grafting and pull-out for tendon fixation in acute setting¹⁸.

The clinical case we reported shows the treatment of a subacute combination of both injuries instead. In literature there are not indications on management of subacute cases in which the injuries are combined yet.

Conclusion

This case shows a rare and challenging presentation of subacute jersey finger associated to an enchondroma.

In our case, most potentially good prognostic factors were absent but because of the patient's young age and strong self-motivation we decided to reinsert the FDP tendon and, simultaneously replace the enchondroma with a bone filling rather than propose a two-stage reconstruction procedure, DIP tenodesis or arthrodesis. Ultimately, the surgical team's competencies, the patient's compliance and the hand therapy team's expertise successfully avoided suture failure and adhesions, with a good functional outcome.

References

- Lunn PG, Lamb DW. "Rugby finger" - avulsion of profundus of ring finger. *J Hand Surg Br* 1984;9:69-71. [https://doi.org/10.1016/0266-7681\(84\)90020-2](https://doi.org/10.1016/0266-7681(84)90020-2)
- Leddy JP, Packer JW. Avulsion of the profundus tendon insertion in athletes. *J Hand Surg Am* 1977;2:66-69. [https://doi.org/10.1016/s0363-5023\(77\)80012-9](https://doi.org/10.1016/s0363-5023(77)80012-9)
- Carroll RE, Match RM. Avulsion of the flexor profundus tendon insertion. *J Trauma* 1970;10:1109-1118. <https://doi.org/10.1097/00005373-197012000-00002>
- Froimson AI, Shall L. Flexor digitorum avulsion through enchondroma. *J Hand Surg Br* 1984;9:343-344. [https://doi.org/10.1016/0266-7681\(84\)90060-3](https://doi.org/10.1016/0266-7681(84)90060-3)
- Canovas F, Nicolau F, Bonnel F. Avulsion of the flexor digitorum profundus tendon associated with a chondroma of the distal phalanx. *J Hand Surg Br* 1998;23:130-131. [https://doi.org/10.1016/s0266-7681\(98\)80245-3](https://doi.org/10.1016/s0266-7681(98)80245-3)
- Montero LM, Ikuta Y, Ishida O, et al. Enchondroma in the hand retrospective study - recurrence cases. *Hand Surg* 2002;7:7-10. <https://doi.org/10.1142/s0218810402000893>
- Wong W, Cross K, Mahoney J. Avulsion of the flexor digitorum tendon secondary to enchondroma of the distal phalanx. *Can J Plast Surg* 2004;12:67-68. <https://doi.org/10.1177/229255030401200201>
- Gray Seiler III J. Flexor tendon injury. In: Wolfe SW, Hotchkiss RN, Pederson WC, et al., eds. *Green's operative hand surgery*. 6th ed. Philadelphia: Churchill Livingstone Elsevier 2011, pp. 189-207.
- Boccolari P, Tocco S. Alternative splinting approach for proximal interphalangeal joint flexion contractures: no-profile static-progressive splinting and cylinder splint combo. *J Hand Ther* 2009;22:288-293. <https://doi.org/10.1016/j.jht.2009.04.001>
- Libberecht K, Lafaire C, Van Hee R. Evaluation and functional assessment of flexor tendon repair in the hand. *Acta Chir Belg* 2006;106:560-565. <https://doi.org/10.1080/00015458.2006.11679952>
- MacDermid JC, Tottenham V. Responsiveness of the disability of the arm, shoulder, and hand (DASH) and patient-rated wrist/hand evaluation (PRWHE) in evaluating change after hand therapy. *J Hand Ther* 2004;17:18-23. <https://doi.org/10.1197/j.jht.2003.10.003>
- Bauer RD, Lewis MM, Posner MA. Treatment of enchondromas of the hand with allograft bone. *J Hand Surg Am* 1988;13:908-916. [https://doi.org/10.1016/0363-5023\(88\)90269-9](https://doi.org/10.1016/0363-5023(88)90269-9)
- Henderson M, Neumeister MW, Bueno RA Jr. Hand tumors: II. Benign and malignant bone tumors of the hand. *Plast Reconstr Surg* 2014;133:814e-821e. <https://doi.org/10.1097/PRS.000000000000178>
- Langa V, Posner MA. Unusual rupture of a flexor profundus tendon. *J Hand Surg Am* 1986;11:227-229. [https://doi.org/10.1016/s0363-5023\(86\)80056-9](https://doi.org/10.1016/s0363-5023(86)80056-9)
- Ehlert KJ, Gould JS, Black KP. A simultaneous distal phalanx avulsion fracture with profundus tendon avulsion: a case

- report and review of the literature. *Clin Orthop Relat Res* 1992;283:256-259.
- ¹⁶ Smith JH Jr. Avulsion of a profundus tendon with simultaneous intraarticular fracture of the distal phalanx—case report. *J Hand Surg Am* 1981;6:600-601. [https://doi.org/10.1016/s0363-5023\(81\)80141-4](https://doi.org/10.1016/s0363-5023(81)80141-4)
- ¹⁷ Al-Qattan MM. Type 5 avulsion of the insertion of the flexor digitorum profundus tendon. *J Hand Surg Br* 2001;26:427-431. <https://doi.org/10.1054/jhsb.2001.0619>
- ¹⁸ Arthozoul M, Brun C, Laffosse J-M, et al. Avulsion of flexor digitorum profundus secondary to enchondroma of the distal phalanx. Case report and literature review. *Chir de la Main* 2015;34:210-214. <https://doi.org/10.1016/j.main.2015.03.004>