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Traumatic bilateral isolated palsy of Flexor Pollicis Longus: an uncommon case report

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ABSTRACT

INTRODUCTION AND IMPORTANCE: Flexor Pollicis Longus (FPL) lies in the volar compartment of the forearm and is responsible for the flexion of the distal phalanx of the thumb. The innervation of FPL is provided by an isolated motor branch of the anterior interosseous nerve (AIN), a branch of the median nerve. AIN dysfunction causes symptoms of exclusive motor involvement concerning the FPL muscle. Solitary paralysis of the FPL is very uncommon in clinical practice.

PRESENTATION OF THE CASE: We report the case report of a bilateral isolated paralysis of Flexor Pollicis Longus (FPL) that occurred after a trauma. Two years after the injury, no organic lesions were found and instrumental exams did not suggest any diagnosis. Surgical exploration of FPL and its innervation allowed to diagnose a pure post-traumatic bilateral neuroapraxia sustained by the presence of post traumatic connective fibrous bands.

DISCUSSION: Diagnostic and therapeutic bands release allowed the immediate functional recovery of the nerve function and the consequent restoration of FPL function. The surgical exploration of the suspected injured nerve was the resolutive procedure for diagnosis and treatment of the disease. During the surgical exploration, the cause of FPL palsy was identified and removed with a complete recovery of the neuromuscular unit function.

CONCLUSION: This case is very peculiar because of the clinical presentation with an important bilateral functional limitation of FPL. The release allowed the complete restoration of FPL function. No similar cases were described in literature.

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1. Introduction

The Flexor Pollicis Longus (FPL) lies in the volar compartment of the forearm. It originates from the proximal portion of the radius through the volar aspect of the forearm and it ends in a long tendon deep to the transverse carpal ligament at the base of the distal phalanx of the thumb [1]. It provides the flexion at the interphalangeal (IP) joint of the thumb [2]. The innervation of the FPL muscle is provided by a constant and isolated motor branch of the anterior interosseous nerve (AIN), a branch of the median nerve [3]. AIN emerges when the median nerve has passed between the two portions of the pronator teres muscle. Then, it runs in the forearm along the interosseous membrane and lies between FPL and Flexor Digitorum Profundus (FDP), providing proper motor branches for these muscles. This branch of the median nerve is responsible for three of the deep flexors of the forearm (FPL, FDP for the second and third finger and Pronator Quadratus) and also provides a sensory branch

for the volar region of the anterior capsule of the wrist joint. The integrity of AIN and its motor branches can be assessed asking the patient to perform a circular OK sign with the thumb and the second finger. In this way, the patient will show the integrity of FPL and FDP [4]. If any dysfunction is present, the person will not be able to flex the distal phalanx of the involved fingers (Kiloh-Nevin syndrome [5]).

Several causes of AIN compression can be assessed:

- tendon anomalies, as in the case of the deep head of the pronator teres or the origin of the head for the superficial flexor of the third finger [6];
- the presence of accessory muscles as in the case of the Gantzer muscle [7], an accessory head of the FPL that may originate from either the Flexor Digitorum Superficialis (FDS) muscle, coronoid process of the ulna or medial epicondyle of the humerus;
- vascular problems, such as anomalous radial artery or vascular alterations of the ulnar collaterals' branches;
- acute direct trauma with consequent neurotmesis.

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Fig. 1. Clinical presentation of the patient at the time of the admission to our observation.

AIN disfunction causes symptoms of exclusive motor involvement, concerning the FPL muscle and the FPD in its component for the second and third finger; the involvement of the pronator quadratus (PQ) muscle is expected but it remains mostly asymptomatic.

There are no associated sensitive disorders. The patient reports difficulty in performing refined movements where a thumb-index grip is required, such as in the case of writing, using or collecting needles or sheets on the surface of a table. This is due to the reduced strength of the FPL and FPD in its component for the index finger. The syndrome can present various degrees of severity both in relation to the severity and duration of compression, and due to the possible presence of nerve anastomoses between the median and ulnar nerve, Martin-Gruber anastomosis, reported in about 25% of the population.

Solitary paralysis of the FPL is uncommon in clinical practice [8]. Only a few cases are reported in which unilateral FPL palsy occurs for acute lesion involving the branch or branches of the anterior interosseous nerve to the FPL [9], after complex forearm fractures [10] or during surgical procedures at the elbow or at the wrist [11]. We reported the peculiar case of a patient who underwent a bilateral solitary FPL paralysis and who completely recovered after our procedure.

The research work has been reported in line with the SCARE Guidelines 2020 [12] and the patient signed an informed consent for the publication of this case report and accompanying images.

2. Presentation of the case

A 55-years old female patient self-presented to our observation. She was a nurse in good clinical conditions with a right-hand dominance and she reported that she had an accident two years before during her working activities falling down with open palms with abducted and extended thumbs. After the fall, she noticed that she was unable to flex her right and left thumb. After a first clinical examination in another hospital, a diagnosis of tenosynovitis of the thumbs was made. For this reason, six months after the trauma she underwent a first surgical procedure of tenolysis and synovectomy of the thumbs but the function of the fingers did not recover. She did not take any pharmacological therapy. After two years, the clinical presentation was the same (Fig. 1).

In the previous two years, the patient underwent several diagnostic exams. Upper limbs electromyography was negative for the neurotmesis of the median, ulnar and radial nerve. The only finding was a mild delay in electric conduction at the median nerve bilaterally. Ultrasounds and the Magnetic Resonance showed no signs of discontinuity at the FPL on both sides from its origin to the insertion.

We did not recognize any organic injury but the FPL disfunction was clinically evident. We hypothesized a potential motor nerve

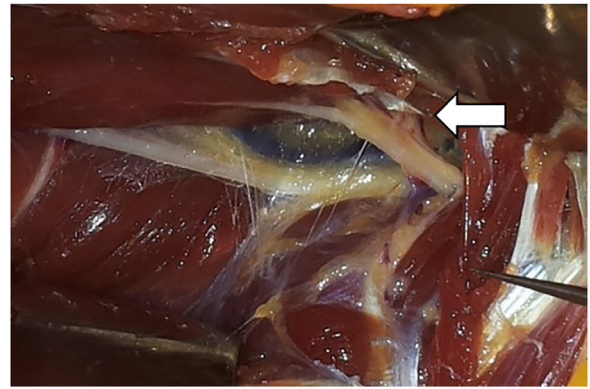


Fig. 2. Connective fibrous band causing neuroapraxia of FPL nerve at the right forearm.



Fig. 3. Right forearm. Intraoperative electrostimulation of the motor branches for FPL at the beginning of the procedure. The thumb is extended due to neuroapraxia of FPL motor nerve.

compression syndrome but we did not know at what level. For this reason, we planned the surgical exploration of the AIN and of the motor branch of FPL on the right side, that was the dominant one.

3. Surgical technique

The patient was operated on by the two senior authors (DSP, MM). She was placed on a supine position, under locoregional anesthesia.

We used a volar approach to the proximal forearm to expose the proximal portion of FPL.

We used the Flexor Carpi Radialis (FCR) as a landmark, below which FPL lies. We isolated FPL and we explored it in order to find its motor branch. Finally, we found an important stenosis of this branch produced by fibrous bands that were compressing the nerve (Fig. 2). This finding confirmed that the anatomopathological cause of the clinical presentation was due to a stage 1–2 of Sunderland [13] neuroapraxia (axonostenosis versus axonocachessia).

Intraoperative electrostimulation allowed us to highlight both the topographical property of the innervation (Fig. 3) and the restoration of the nerve conduction after surgical decompression (Fig. 4).

Ten days postoperatively, the patient showed the restoration of the FPL function. She was able to flex the distal phalanx of the right thumb with no pain or paresthesia (Fig. 5).

At one-month follow-up, there was a complete restoration of the FPL function on the right side comparing to the left one (Fig. 6).

At this time, we decided to perform the same procedure on the left side, finding a similar lesion and a similar intraoperative response to electrostimulation (Figs. 7–9).

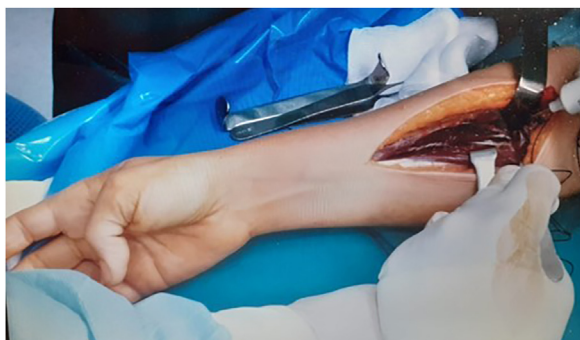


Fig. 4. Right forearm. Intraoperative electrostimulation of the motor branches for FPL at the end of surgical decompression. The thumb was flexed because of the restoration of the nerve conduction.



Fig. 5. Recovery of the right FPL function ten days after the connective bands release.



Fig. 6. One-month follow-up: right FPL function after surgical release compared with left FPL.

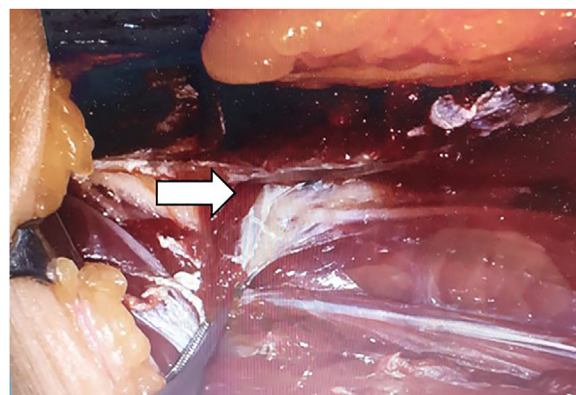


Fig. 7. Connective fibrous band causing neuroapraxia of FPL nerve at the left forearm.

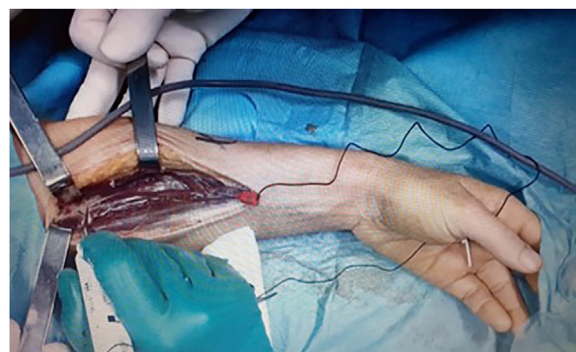


Fig. 8. Left forearm. Intraoperative electrostimulation of the motor branches for FPL at the beginning of the procedure. The thumb is extended due to neuroapraxia of FPL nerve, as in the right side.



Fig. 9. Left forearm. Intraoperative electrostimulation of the motor branches for FPL at the end of surgical decompression. The thumb is flexed because of the restoration of the nerve conduction.



Fig. 10. Complete restoration of the mobility of the left and right thumb after FPL motor branches bilateral surgical decompression.

At one-year follow-up, the patient showed a full functional bilateral recovery of FPL function without any neurological and sensitive complications and a high rate of satisfaction (Fig. 10).

4. Discussion

We reported an uncommon case of bilateral isolated palsy of FPL that persisted two years after the trauma. Non similar case reports were reported in literature. This case is unique for bilateralism of the lesion and its post traumatic genesis that led to a chronic deficit of FPL. This is very peculiar because of the clinical presentation with an important bilateral functional limitation of FPL. In addition, the diagnosis was not supported by any instrumental investigation before. In fact, the resolution power of Ultrasounds and Magnetic Resonance on a small nerve branch is not sufficient to make a diagnosis. In this complex framework, the surgical exploration of the suspected injured nerve was the resolute procedure for diagnosis and treatment of the disease. During the surgical exploration, the cause of FPL palsy was identified and removed with a complete recovery of the neuromuscular unit function.

We have to consider the importance of intraoperative electrostimulation for our surgical strategy because if it had showed a lack of nerve conduction we should have proceed towards a substitutive tendinous transfer.

5. Conclusion

The interesting aspect of this case relies in the uncommon intraoperative diagnosis of pure apraxia of the motor branch for the FPL with motor palsy that was chronically maintain by connective fibrous bands that originated after the trauma, probably due to a post stretch intramural hematoma. Diagnostic and therapeutic bands release allowed the immediate functional recovery of the nerve function and the consequent restoration of FPL function.

Declaration of Competing Interest

Nothing to declare.

Funding

No funds were received in support of this study.

Ethical approval

Nothing to declare.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editor-in-chief of this journal on request.

Authors contribution

Domenico Sergio Poggi – data collection and analysis.
Massimo Massarella – data collection and analysis.
Eleonora Piccirilli – writing the paper.

Registration of research studies

researchregistry6405 available at: <https://www.researchregistry.com/browse-the-registry>.

Guarantor

Eleonora Piccirilli.

Provenance and peer review

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