Spontaneous rupture of extensor tendons of the index finger. A report of two cases

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Introduction

The closed rupture of the extensor tendons of the hand rarely occurs [6]. The isolated involvement of the *extensor digitorum communis* of the index finger (EDCI) and *extensor indicisproprius* (EIP) tendons after closed trauma barely appears in the literature [3, 6, 8, 9]. Spontaneous rupture of these tendons is described in patients with risk factors

In the cases reported, such rupture takes place at the myotendinous junction level. In cases of spontaneous rupture, the direct reparation is unusual; conservative or surgical treatment through tenodesis or tendon transfer is preferable [6–9]. References about the spontaneous rupture of both extensor tendons of the index finger simultaneously have received scant attention in the literature.

Purpose of the study

We present two patients with spontaneous rupture of EDCI and EIP tendons at the dorsal level of wrist without known risk factors.

We propose in these cases, repair of isolated extension of the index finger using a technique based on the transfer of the flexor digitorum superficialis tendon of the fourth digit (FDS4) to EIP.

Materials and methods

Case 1 A 62-year-old man suffers from acute pain in his right hand (dominant hand) when taking it out of his trousers pocket. He was a farmer for many years in which time he has reported repeated minimal traumas in such hand. He has not suffered from any previous wrist or hand fractures or rheumatic disease.

Case 2 A 53-year-old woman suffers from pain in her right hand (dominant hand) after carrying a shopping bag. She has not suffered from any previous wrist or hand fractures or rheumatic disease.

The patients presented with pain on the dorsal surface of the hand and in the middle third of the forearm, being unable to extend the index finger and having difficulty to bend it because of the pain. The rupture of the EDCI and EIP tendons was confirmed by ecography through the identification of the proximal tendon ends on the distal third of the forearm and the distal tendon ends on the dorsal surface of the hand.

Surgical procedure

The operation took place 8 and 14 days later, respectively. Both cases underwent the same surgical technique.

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Firstly, the rupture of the EDCI and EIP tendons on the dorsal aspect at the level of the base of the second metacarpal was confirmed by minimal incision on the dorsal aspect of the hand (Fig. 1). There was no evidence of tenosynovitis or osteoarthritis.

Following the instructions of Boyes technique [1], the FDS4 was transferred through the interosseous membrane to be sutured with the distal end of the EIP tendon (Figs. 2, 3, and 4).

During the recovery period, the affected hand was kept in rest and immobilized using a metacarpophalangeal splint at 30° on 2° and 3° digits and an interphalangeal at 10–15 flexion degrees for 3–4 weeks. After that time, rehabilitation and reeducation of the patient were initiated.

Results

After 3 months, the patient of the first case was able to perform a completely independent extension and the patient of the second case only presented a 5° deficit, considering the evaluation as good according to Haas scale (Fig. 5).

Discussion

McMaster [5] described the direct and indirect mechanisms of traumatic ruptures. In the direct mechanism, the tendon gets caught between the bone and traumatizing agent; whereas in the more common indirect mechanism, the tendon is subjected to a powerful passive traction in the opposite direction of muscle contraction.

In our cases, we believe responsible for the tendon rupture was the indirect mechanism to perform finger flexion with flexion and pronation of the wrist, just as described in cases of Takami et al. [9]. No patient reported tendon injury after a direct hit. In some cases, sudden unexpected flexion of the wrist presumably initiated a strong reflex extension action that resulted in tendon rupture. This mechanism of extensor tendon rupture has received scant attention in the literature.

The extensor tendons of the fingers may fracture at wrist level in patients with rheumatoid arthritis [10] and as a consequence of distal radial fractures [2, 4, 7], which are unusual [6]. None of our patients had any of the risk factors described.

This injury rarely occurs in patients without predisposing factors, so there are very few cases published in the literature about spontaneous ruptures. Stuart and Briggs [7] published a case in which the complete rupture of the EIP and the incomplete rupture of the EDCI were treated through tenodesis of the distal end of EIP to the proximal portion of the intact EDC. Takami et al. [9] presented a series of ten patients with closed post-traumatic ruptures of the extensor tendons at the

Fig. 1 Confirmation of both extensor tendons of index finger by minimal incision on the dorsal aspect of the hand

myotendinous junction level, five of who had the rupture in the index finger, four of them had both extensor tendons of the index finger affected and one of them presented isolated rupture of the EIP, three of them were treated through end-to-end tenodesis, one case through tendon transfer of the *extensor digiti minimi* tendon (EDM) and one more case was treated through conservative treatment by splinting, obtaining good results. Mudgal and Mudgal [6] presented a similar case treated through tendon transfer of the flexor *carpi radialis* tendon (FCR) around the radius. Sunagawa et al. [8] published a case with the same injury in which the treatment consisted on direct reparation of the EIP and tenodesis of the EDCI to the middle finger. Komura et al. [3] published two cases about

Fig. 2 Intraoperative image obtaining FDS4 tendon. The FDS4 at the level of A1 pulley and on volar side of the distal third of the forearm was identified by tenotomy at proximal level at the Camper's chiasma making a previous A1 pulley opening and removing it in zone 5 and preserving it proximally to favor its excursion

Fig. 3 FDS4 tendon was grasped on the dorsal side of distal third of the forearm with Kocher clamp, through interosseous membrane. Then, the tendon must be taken under the extensor retinaculum using the type of Grasper forceps used in arthroscopy with which the tendon at the dorsal level of the hand was recovered

this injury, one of which was treated through tenodesis to the EDC of the middle finger and the other one through tendon

Fig. 4 Intraoperative image of suturing tendon ends with Pulbertaft technique

Fig. 5 Postoperative results (*star*) showed the complete extension of index finger in neutral position of the wrist

transfer of the EDM to the EPI in order to perform an independent extension of the index finger.

In our cases, the direct reparation of the affected tendons was dismissed. Being the spontaneous rupture at the tendon level, it is assumed that the tissue quality is not suitable to perform direct suture since it may result in failure of the reparation. Any anatomopathological study was carried out to determine the cause of the rupture since macroscopic signals of tenosynovitis were not found.

Publications about the spontaneous rupture of extensor tendons of the index finger at tendon level on the dorsal side of the wrist in patients without predisposing factors are not found in the bibliography consulted.

Conclusions

As authors, we consider that in those cases when reparation of the EIP rupture is not possible, it is important to perform a tendon transfer technique which allows the independent extension of the index finger. The Boyes technique, although it was developed for treating radial paralysis, may be a good option to solve this problem. In this way, the transfer of FDS4 tendon to EIP provides the necessary independence and strength to perform such movement. Therefore, we consider that this option must be reserved to patients with active working or sporting life whereas tenodesis should be used with elder patients.

Conflict of interest Francisco Martinez-Martinez, Jose Manuel Moreno-Fernandez, Pablo Sabino Rotella, Fernando Santonja-Medina, Manuel Medina-Quiros and Antonio Garcia-Lopez declared that they have no conflict of interest.

Statement of human and animal rights All procedures followed were in accordance with the ethical standards of the responsible committee on

human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008 [7]. Informed consent was obtained from all patients for being included in the study.

If doubt exists whether the research was conducted in accordance with the Helsinki Declaration, the authors must explain the rationale for their approach and demonstrate that the institutional review body explicitly approved the doubtful aspects of the study.

Statement of informed consent Informed consent was obtained from all individual participants included in the study

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