



Reconstruction of Chronic Injury to the Extensor Apparatus of the Finger with Palmaris Longus Autograft: Case Report

Reconstrucción de ruptura crónica del aparato extensor del dedo con autoinjerto de palmaris longus: Reporte un caso

Luis Beraún Coronel¹ Jorge Eric Danz del Pozo²

¹ Orthopedic Surgery and Traumatology Service, Hospital II-2 MINSATarapoto, Tarapoto, Peru

² Orthopedic Surgery and Traumatology Service, Hospital Nacional Dos de Mayo, Lima, Peru

Address for correspondence Luis Beraún Coronel, MD, Servicio de Cirugía Ortopédica y Traumatología, Hospital II-2 MINSATarapoto, Jr. Angel Delgado Morey Nro. 503, 22200, Tarapoto, Perú (e-mail: langel_15@hotmail.com).

Rev Iberam Cir Mano 2022;50(2):e142–e145.

Abstract

Chronic injuries of the extensor apparatus of the fingers are the product of an initial injury that was not treated or was treated inadequately. These injuries require adequate and thorough management to achieve a good functional result. We present the case of a 26-year-old patient with a traumatic injury to the extensor apparatus of the third finger due to a traffic accident that occurred 8 months before. It required an intraoperative approach from Verdan zones I to V, and reconstruction with a palmaris longus (PL) autograft. The patient obtained an excellent functional result at 12 weeks, which persisted up to 9 months of follow-up.

Keywords

- ▶ extensor apparatus
- ▶ reconstruction
- ▶ autograft
- ▶ palmaris longus

Resumen

Las lesiones crónicas del aparato extensor de los dedos son producto de una lesión inicial que no fue tratada o fue tratada inadecuadamente. Estas lesiones requieren de un adecuado y minucioso manejo para lograr un buen resultado funcional. Presentamos el caso de un paciente de 26 años con lesión traumática del aparato extensor del tercer dedo debido a un accidente de tránsito ocurrido 8 meses antes. Intraoperatoriamente, requirió abordar desde la zona I hasta la V de Verdan y reconstruir con autoinjerto de *palmaris longus* (PL). El paciente obtuvo un excelente resultado funcional a las 12 semanas, que persistía hasta los 9 meses de seguimiento.

Palabras clave

- ▶ aparato extensor
- ▶ reconstrucción
- ▶ autoinjerto
- ▶ palmaris longus

Introduction

Injuries to the extensor apparatus of the fingers are very common due to its superficiality, which makes it vulnerable to a traumatic event.¹ This apparatus, made up of tendons of

the extrinsic musculature (tendon of the extensor digitorum communis EDC), intrinsic (tendons of the interosseus and lumbrical muscles) and the extensor aponeurosis (retinacular ligaments and covering of the extensor tendon),² is interconnected to perform the extension. The compromise

received
February 10, 2020
accepted
June 10, 2022

DOI <https://doi.org/10.1055/s-0042-1754329>.
ISSN 1698-8396.

© 2022. SECMA Foundation. All rights reserved.
This is an open access article published by Thieme under the terms of the Creative Commons Attribution-NonDerivative-NonCommercial-License, permitting copying and reproduction so long as the original work is given appropriate credit. Contents may not be used for commercial purposes, or adapted, remixed, transformed or built upon. (<https://creativecommons.org/licenses/by-nc-nd/4.0/>)
Thieme Revinter Publicações Ltda., Rua do Matoso 170, Rio de Janeiro, RJ, CEP 20270-135, Brazil

of one or several of these components, added to the chronic nature of the lesion, which is often accompanied by retractions, contractures and adhesions,³ results in a difficult approach with a high possibility of failure.

Chronic injuries, in turn, are accompanied by tendon defects that require reconstruction techniques that lead to the use of tendon grafts. The reconstruction must be precise since shortening by as little as 1 mm can result in loss of digital movement.⁴

We herein report a case of chronic injury of the extensor apparatus treated by reconstruction with a palmaris longus (PL) autograft in a single surgical time.

Clinical case

A 29-year-old male who suffered a traffic accident, with a clinical history of open fracture of the femur, open dislocation of the left forearm, amputation of the second finger of the left hand, and multiple injuries to the back of the hand, was admitted to the emergency department and then treated for fracture stabilization. Eight months later, he came for an outpatient consultation due to the impossibility of performing full extension of the third finger. Upon physical examination, he presented a 5-cm long scar on the back of the third finger from the metacarpophalangeal (MCP) region to the proximal interphalangeal region, complete limitation of the extension of the interphalangeal joints, and complete extension of the MCP joint, leaving the finger in the form of a claw in extension (►Fig. 1A), with preserved finger flexion.

When carrying out the preoperative planning, the presence of the PL tendon was clinically evaluated; once confirmed, the surgical procedure was carried out, after anesthetic blockade and ischemia cuff, making a dorsal incision including the scar extending sinuously and progressively from zones V to I of Verdan, finding rupture and adherence of the ECD tendon at the level of the diaphysis of the proximal phalanx with the presence of abundant fibrosis, alteration of the anatomy of the extensor zones III to V of Verdan (►Fig. 1B). The adhesion was released until the integrity of the EDC tendon began to be evident. Then, the PL

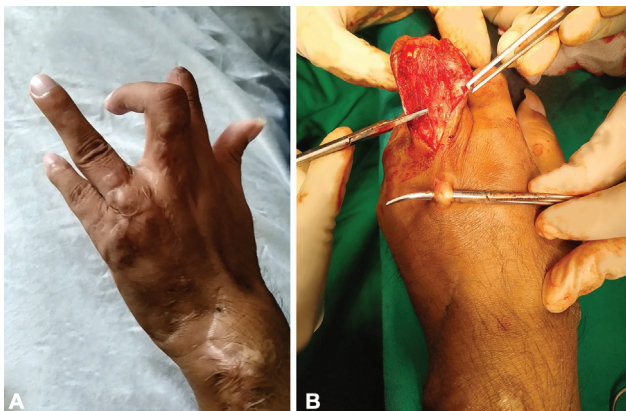


Fig. 1 (A) Claw deformity of the third finger in extension, skin lesions are also evident. (B) Adherence of the EDC tendon to the proximal phalanx, allowing extension of the MCP joint.



Fig. 2 The tendon graft after traversing below the remnant of the retinacular ligaments until reaching the distal phalanx.

tendon graft was extracted through small incisions in the volar region of the forearm, and the tendon graft segment to be used was calculated in extension from the proximal end in Verdan zones V to I (►Fig. 2). Then, with nylon 3-0 and the modified Kessler-type suture technique, tenorrhaphy of the proximal region was performed, reinforcing the epitendon with nylon 5-0. Afterwards, the graft was crossed under a remnant of the retinacular ligaments until reaching the distal phalanx (►Fig. 3). At the level of base of the distal phalanx, an oblique perforation was made with a 1.5-mm drill bit, and the hole was crossed with an 18-G epidural needle. Then, 2

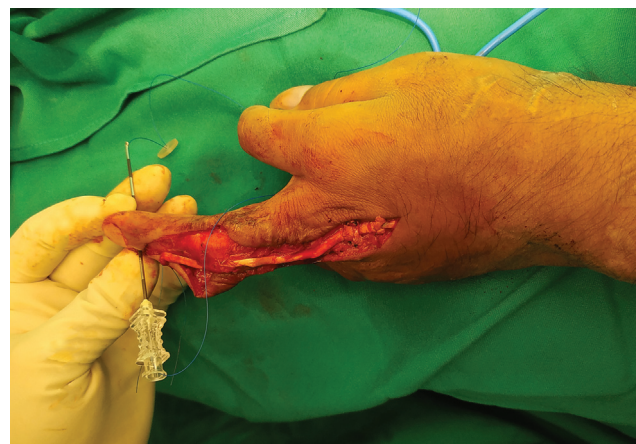


Fig. 3 Passage of the nylon through the epidural needle, previously linked to a button.

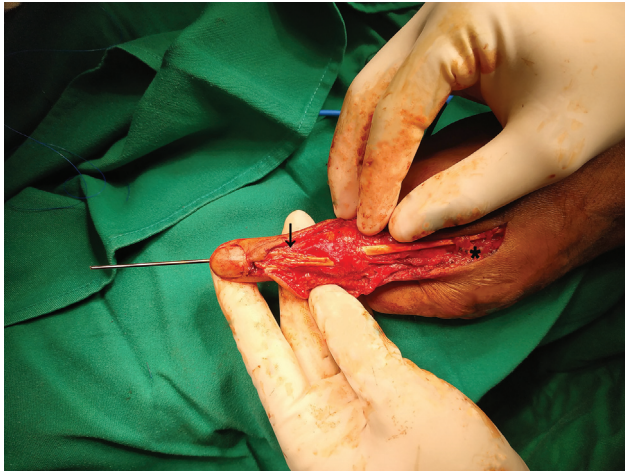


Fig. 4 (Black arrow) Distal end of the tendon after performing the tenodesis; it was shaped like a fan and the edges were fixed to the conjoined lateral bands. (Black asterisk) Recreation of the sagittal band made with the remaining tendon graft, to avoid dislocation of the tendon in flexion.

strands of 3-0 nylon previously attached to the holes of a button were passed through the epidural needle, the needle was removed, and the strands were attached to the end of the tendon. The distal end of the tendon was flattened by fixing the edges with 5-0 nylon to the conjoined lateral bands. Subsequently, the distal interphalangeal (DIP) joint was blocked with a 1.2-mm Kirschner wire. In the proximal region, at the level of the metacarpal head, with the remaining tendon graft, a ligament was created that mimicked the function of the sagittal band, and it was fixed to the capsule with 4-0 nylon. (►Fig. 4). We proceeded to lavage with saline solution, skin synthesis, and placement of antebrachio-palmar splint in neutral position. The stitches were removed at 10 days, the plaster splint was removed at 21 days, and the Kirschner wire and the button were removed topically at 6 weeks, and passive mobilization of the fingers and then

physical therapy at 8 weeks were indicated. Control was performed at 12 weeks, with the patient presenting a degree of total active mobility of 230, which corresponds to an excellent functional result according to the formula of the American Society for Surgery of the Hand (ASSH)⁵ (►Fig. 5A and B), which persisted until the end of the 9-month follow-up.

Discussion

In injuries to the extensor apparatus of the fingers, timely management is recommended because these injuries hinder the person's daily routine. In addition, in a chronic injury, an excellent functional result is hardly achieved due to the complexity, the length of the tendon defect, and the retractions, adhesions, and joint stiffness that are generally accompanied.^{3,4} Little attention has been paid in the literature to the management of chronic injuries of the extensor apparatus as opposed to chronic injuries of the flexor zone.⁴ The reports found refer to the use of local tendon graft in defects measuring between 0.5 cm and 1 cm, depending on the area of injury, and the interposition of a tendon graft in larger injuries, preferably a PL tendon graft.^{3,6} In lesions of zones III to V, Lebailly and Chantelot⁷ recommend the performance of a Foucher plasty using a hemitendon of the EDC, which is rotated in the form of a hinge and is fixed at the level of the middle phalanx. Adams⁸ reported the reconstruction of the extensor apparatus in stages, first using silicone implants until the formation of a fibrous tunnel. Then, in a second time, the space was replaced with a tendon graft, and better results were obtained inserting the graft at the level of the middle phalanx, because, in the distal phalanx, they had had cases with delayed extension of the proximal interphalangeal (PIP) joint and decreased flexion of the DIP joint, due to the fact that the contraction force of the EDC was directed first to the DIP joint.⁸

In the case herein presented, in view of the large tendon defect and with the aim of restoring the extensor

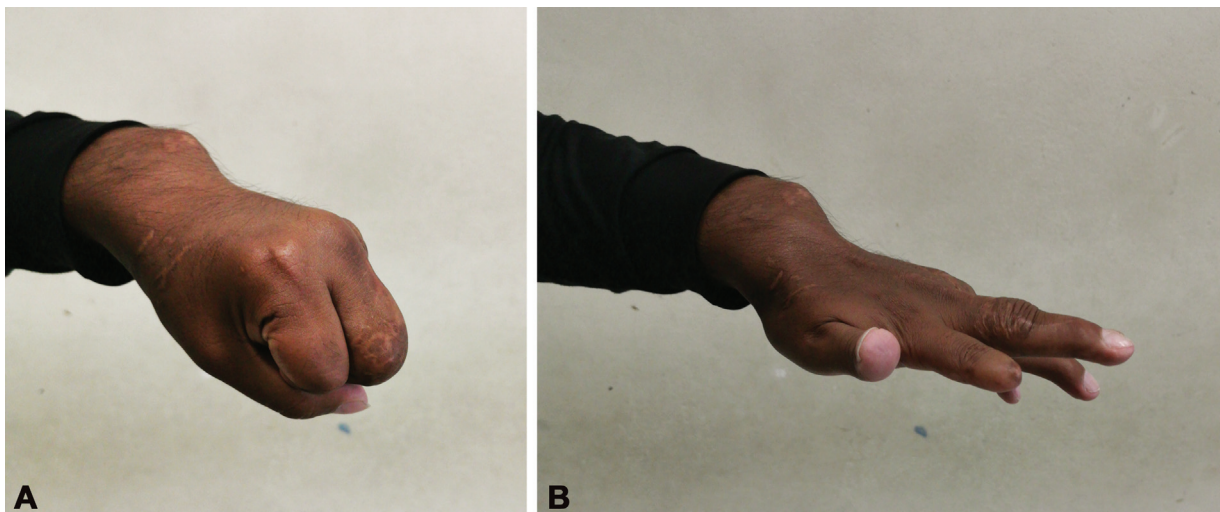


Fig. 5 (A,B) At 12 weeks, an excellent functional result was already observed, which was maintained up to 9 months of follow-up.

mechanism, we proposed reconstruction with a long tendon graft with a more tubular shape in order to obtain a greater moment of force. There are different anatomical points for obtaining tendon grafts; however, the PL graft on the same side of the lesion was preferred due to its proximity and ease. It is important in the previous clinical examination to verify the existence of this tendon, because it is absent in between 2.8% and 24% of the population.⁹ In the case herein reported, the second surgical stage proposed by Adams⁸ was imitated to avoid the delay of the PIP joint; after fixing the tendon in the distal phalanx, it was flattened in the shape of a fan, resting on the area of the triangular ligament in the middle phalanx, to form an adhesion, enabling PIP extension and, by moment of force, extension of the MCP joint.¹⁰ The edges were fixed to the conjoined lateral bands, to transmit tension to the terminal tendon and achieve extension of the DIP and also to limit, in flexion, the lateral displacement of the lateral extensor tendons. The DIP joint was stabilized with a Kirschner wire to avoid possible deformities, such as hammer toe, and to reduce the tension force at that level.

At the level of the metacarpal head, imitating the function of the sagittal bands, which are bands that maintain the axis of the tendon when flexing,^{2,10} this ligament was recreated by fixing it to the joint capsule, thus avoiding dislocation of the tendon graft (→ Fig. 4).

With the above, we believe that the case could serve as an alternative example to reproduce in more patients with chronic injuries of the extensor apparatus with a large tendon defect and in whom the anatomy is often altered.

Conflict of interests

The authors have no conflict of interests to declare.

References

- 1 Griffin M, Hindocha S, Jordan D, Saleh M, Khan W. Management of extensor tendon injuries. *Open Orthop J* 2012;6:36–42. Doi: 10.2174/1874325001206010036
- 2 Kapandji AI. Capítulo 5: La mano. En: *Fisiología articular: esquemas comentados de mecánica humana*. España: Médica Panamericana; 2006:234–249
- 3 Bellemère P. Treatment of chronic extensor tendons lesions of the fingers. *Chir Main* 2015;34(04):155–181. Doi: 10.1016/j.main.2015.05.0
- 4 Kochevar A, Rayan G, Angel M. Extensor tendon reconstruction for zones II and IV using local tendon flap: a cadaver study. *J Hand Surg Am* 2009;34(07):1269–1275. Doi: 10.1016/j.jhsa.2009.04.009
- 5 Kleinert HE, Verdan C. Report of the Committee on Tendon Injuries (International Federation of Societies for Surgery of the Hand). *J Hand Surg Am* 1983;8(5 Pt 2):794–798
- 6 Türker T, Hassan K, Capdarest-Arest N. Extensor tendon gap reconstruction: a review. *J Plast Surg Hand Surg* 2016;50(01): 1–6. Doi: 10.3109/2000656X.2015.1086363
- 7 Lebailly F, Chantelot C. Appareil extenseur: plaie récente avec perte de substance tendineuse. En *La traumatologie des parties molles de la main*. Francia: Springer; 11–20 Doi: 10.1007/978-2-287-99068-7_2
- 8 Adams BD. Staged extensor tendon reconstruction in the finger. *J Hand Surg Am* 1997;22(05):833–837
- 9 Soltani AM, Peric M, Francis CS, et al. The variation in the absence of the palmaris longus in a multiethnic population of the United States: an epidemiological study. *Plast Surg Int* 2012; 2012:282959. Doi: 10.1155/2012/282959
- 10 Marshall TG, Sivakumar B, Smith BJ, Hile MS. Mechanics of Metacarpophalangeal Joint Extension. *J Hand Surg Am* 2018;43 (07):681.e1–681.e5