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Original article

Two-stage extensor tendon graft using the Paneva-Holevitch procedure: A new technique

Greffe de tendons extenseurs en deux temps utilisant l'artifice de Paneva-Holevitch : une nouvelle technique

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ABSTRACT

Reconstruction of the extensor tendons remains a therapeutic challenge. Tendon transfers and grafts are a potential source of morbidity at the donor site, and the graft stock is limited. In the index finger, the tendon of the extensor indicis proprius can be anastomosed to the tendon of the extensor digitorum, and then the extensor digitorum tendon turned over after being cut at the forearm. We assessed the feasibility of this reconstruction on 12 upper limbs from 6 cadavers and we report the case of a 24-year-old patient who suffered destruction of the extensor apparatus in the index and middle fingers. For the cadaver study, in each case, the tendon could be moved onto the proximal interphalangeal joint, after having done an anastomosis downstream of the extensor retinaculum. The mean graft length was 13 cm (9.7–15.2). This method was used in one clinical case with an excellent outcome. This is a simple technique that is without consequences since the tendons used are already cut, therefore saving a tendon graft. This technique should be part of our therapeutic arsenal.

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RÉSUMÉ

La reconstruction des tendons extenseurs reste un challenge thérapeutique. Les transferts tendineux et les greffes sont potentiellement des sources de morbidité du site donneur et le stock de greffons est limité. Sur l'index, il est possible de réaliser une anastomose entre les tendons de l'extensor indicis proprius et de l'extensor digitorum de l'index, puis de retourner l'extensor digitorum après l'avoir sectionné à l'avant-bras. Nous avons étudié cette technique de reconstruction dans douze membres supérieurs issus de six sujets anatomiques et nous rapportons le cas clinique d'un patient de 24 ans présentant une destruction de l'appareil extenseur de l'index et du majeur. Dans l'étude anatomique, il était possible de retourner le tendon jusqu'à l'articulation interphalangienne proximale dans tous les cas après avoir réalisé une anastomose au-delà du rétinaculum des extenseurs. La longueur moyenne du greffon était de 13 cm (9,7–15,2). Dans le cas rapporté, le résultat était excellent. Il s'agit d'une technique simple n'ayant aucune répercussion puisque nous utilisons des tendons interrompus et permettant d'épargner un greffon tendineux. Cette technique doit faire partie de notre arsenal thérapeutique.

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1. Introduction

Extensor tendons on the dorsum of the hand are superficial and particularly vulnerable to trauma [1]. Injuries to the dorsum of the hand are often associated with tendon rupture and significant loss of function. Reconstruction of these tendons remains a therapeutic challenge [2].

In case of significant loss of functional tendon elements, multiple grafting techniques (fascia lata, palmaris longus, etc.) and tendon transfers are available, both vascularized and non-vascularized [3–5]. However, these techniques are potentially a source of morbidity at the donor site [2]. Also, our graft stock is limited. When multiple tendons need to be repaired, it is important to save them. Paneva-Holevich [6] described a procedure for flexor tendon repair where the superficial and deep flexors are sutured to one another at the palm level, in view of a two-stage reconstruction. This technique has the advantage of not wasting a tendon graft, while only using the tendons of the finger in question. The index finger has two extensor tendons: the extensor indicis proprius (EIP) and the extensor digitorum of the index finger (ED2). We used this method on the extensor apparatus of the index finger by suturing its two tendons together. We felt it was relevant to describe this very simple technique used on a patient, after verifying its feasibility in a cadaver study.

2. Cadaver study

2.1. Methods

The purpose of this study was to demonstrate the reconstruction possibilities with this technique. We dissected 10 upper limbs from 5 fresh cadaver subjects. First, an incision was made on the dorsum of the hand, from the index finger to the forearm. The two extensor tendons of the index finger were sutured to each other downstream of the retinaculum with a McLarney stitch [7]. The ED2 tendon was then severed on the forearm, as proximal as possible, with an incision at the middle third of the forearm. Once cut, we tested the possibility of reversing this tendon and bringing it back on the distal phalanx. The graft length was measured with calipers.

2.2. Results

In each case, the graft could be brought back to the proximal interphalangeal (PIP) joint (Fig. 1). The mean graft length was 13 cm (9.7–15.2). The graft reached the middle phalanx 9 times, PIP joint 2 times and distal interphalangeal joint 1 time.

3. Case report

We report the case of a 24-year-old student, right hand-dominant, non-smoker, non-athletic, without any significant past medical history. He was victim of a car accident, resulting in a major laceration of the right hand in zones 5, 6 and 7. This was accompanied by a significant loss of the extensor apparatus of the index and middle fingers, through the metacarpal bones, about 10 cm on the index and 7 cm on the middle finger. There also was bone abrasion of the back cortex of the second and third metacarpal bones, without any fracture, and opening of the respective metacarpophalangeal (MCP) joints (Fig. 2).

Surgical debridement of the wound was performed urgently, as well as a parascapular free flap, anastomosed to the radial artery. Three months later, we performed arthrolysis of the metacarpophalangeal joints of the index and middle fingers because of severe



Fig. 1. Dissection on cadaver subject: it is possible to bring the tendon graft up to the distal interphalangeal joint in this case when the suture is below the extensor retinaculum.



Fig. 2. Severe laceration of right hand, secondary to a car accident with destruction of extensor apparatus of index and middle fingers. Photograph taken after debridement.

stiffness, despite suitable rehabilitation. Due to the need for intensive postoperative rehabilitation to maintain mobility, we decided to postpone the extensor apparatus reconstruction and to perform a two-stage procedure. End-to-end suture of the two

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