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CLINICAL CASE

Management of Allen II digital tip injury with cross flap in a specialized hand surgery center in Mexico

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Abstract

The cross-finger flap is a procedure used to cover defects in the proximal and middle phalanges by transposition of tissue from adjacent healthy fingers with good esthetic and functional results. We present the case of a patient who suffered a fingertip crush injury. Reconstruction of the digital tip of the fourth finger was performed with the digital cross flap of the third finger, taking and application of full thickness thenar skin graft, and was followed up for 2 months. The evolution was favorable, obtaining an adequate esthetic and functional result. This technique can be performed by surgeons without much experience in hand surgery.

Keywords: *Finger cruciate flap. Microsurgery. Reconstruction. Trauma.*

Introduction

Hand injuries account for 5-10% of all emergency department visits. There are different treatment modalities for certain fingertip injuries. Treatment options full-thickness skin grafting and both local and regional soft tissue, as well as skin flaps. All these options strive for the same common goals: the restoration of a sensitive and pain-free fingertip in a fully mobile finger of the maximum possible length, rapid healing, and a limited duration of functional disability[1,2]. The cross-finger flap is a 2-stage procedure first published by Gurdin and Pangman in 1950 but was used by Cronin as the original procedure since 1945. The flap is taken from the dorsum of an adjacent finger, usually at the level of the middle phalanx, and is used to cover a pulp amputation unfavorable to flying. The cross-toed flap is reliable and can cover extensive pulp loss from the fingers and thumb[3,4]. The main goal of treating this type of injury is to restore the length, appearance, function, and feel of the finger[5,6]. Possible complications that may occur in this type of procedure are scarring, deficiency in flexion and/or extension of the finger, stiffness, and loss of finger length[7,8].

Case presentation

A 49-year-old male patient with a history of smoking since he was 18 years old. His condition began on May 19, 2023, at 3 p.m. when he changed a tire on his car, the hydraulic jack lost its resistance and caused crushing trauma to the fourth finger of his right hand, he presented intense pain and bleeding, so he went to the emergency department. On physical examination: right hand with oval-shaped wound 22 mm high by 15 mm wide, irregular borders, located on the volar surface of the distal phalanx of the fourth finger, which began 2 mm above the flexion fold of the distal interphalangeal joint and ended in the dorsal region with loss of 40% of the plate and nail bed. He compromised skin and subcutaneous cellular tissue, full thickness (Wolfe-Krause), presented bone exposure of the head of the distal

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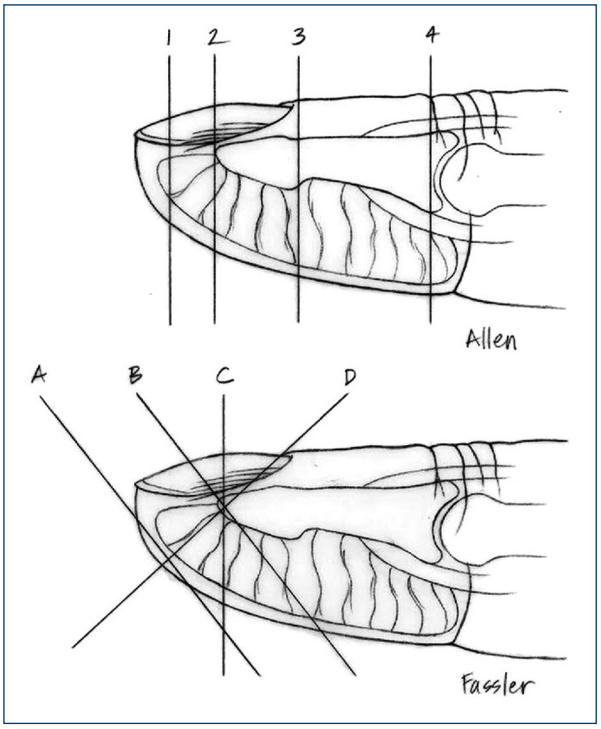

Figure 1. Allen and Fassler classification.

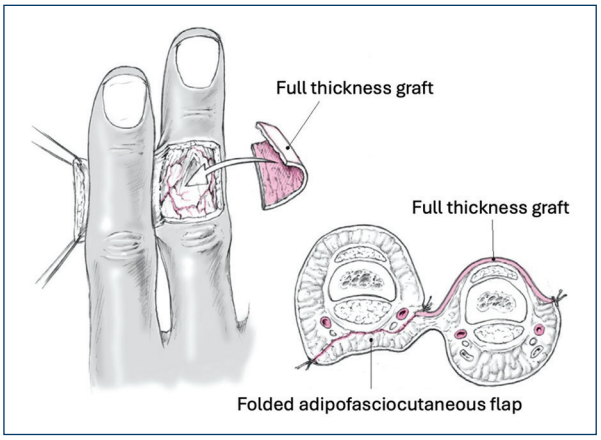

Figure 2. The flap donor area is covered by a full-thickness graft.

phalanx, and loss of skin coverage in the pulp. An X-ray was taken that showed oblique amputation proximal to distal, from volar to dorsal of the distal portion of the head of the distal phalanx of the fourth finger. The other fingers of the right hand are without compromise in motor skills and sensitivity. The diagnosis of trauma due to crushing of the fourth finger of the right hand and digital tip injury was integrated: Allen II, Fassler B (Fig. 1). Since no viable artery was located, it was decided to

Figure 3. Transoperative. Cross-flap fixation is observed to cover the loss of skin coverage of the digital tip of the fourth finger.

perform reconstruction of the digital tip of the fourth finger with a crossed digital flap of the third finger and the collection and application of a full thickness thenar skin graft. Under local median, radial, ulnar nerve block of the right hand with 2% lidocaine and epinephrine 1 mg/mL. Antisepsis was performed with chlorhexidine, sterile drapes were placed. The flap collection site was marked on the dorsal surface of the middle phalanx of the third finger with a 20 × 15 mm ulnar base. A graft was taken from the hypothenar region, a 25 × 20 mm marking was performed, and a full-thickness graft was lifted (Fig. 2). Cross-flap fixation was continued to cover the loss of skin coverage of the digital tip of the fourth finger, the cutaneous edges of the wound were remodeled into the digital tip of the fourth finger, it was fixed to the surrounding skin with simple stitches with 5-0 nylon and then a full-thickness fenestrated graft was placed at the flap donor site. It was set with single points with nylon 4-0 (Fig. 3). A tie-over was placed on the skin graft. Hemostasis and adequate skin coverage were confirmed. A resting flying splint was placed on the third and fourth fingers and the surgical procedure was terminated without complications (Figs. 4 and 5).

Figure 4. Immediate post-surgery of the dorsal aspect of the right hand. Adequate coloration of the flap is observed.

Figure 5. Immediate post-operative period. A resting flying splint was placed on the third and fourth fingers and the surgical procedure was terminated without complications.

The patient was kept under daily surveillance, and a favorable evolution was observed with adequate capillary filling and coloration of the donor area. When the patient had been in the case for 10 days, the cotton loop that compressed the graft was removed, and 90% integration was observed. 19 days after the initial procedure, the second intervention was performed under local anesthesia with a block of both fingers, which consisted of separating the third and fourth fingers by means of an incision in the flap, having good coloration and with a favorable evolution (Figs. 6 and 7). At his follow-up appointment 1 month after surgery, the patient was performing all his daily activities, without any limitation.

Discussion

The survival rate of reimplanted fingers is 45-65% in crush injuries, which is much lower compared to more common amputations. In avulsion lesions, it is often difficult to estimate the degree of tissue injury, even with the aid of a surgical microscope[5,6]. The main criticism of the cross-toed flap is that it is a 2-stage procedure, uses an uninjured finger, and can lead to stiffness of the donor finger. Although the flap is not an innervated flap, it has been shown that this flap can achieve good sensory recovery and good outcomes with younger patients. In addition, a handful of studies reported that they did not have a reduced range of motion of the donor finger. Flap division can be done safely at 2-3 weeks with very few reports of flap necrosis. It is postulated that early flap division can reduce the degree of stiffness in the donor and recipient finger[3,4]. Understanding the usefulness of various fingertip reconstruction options, as well as the advantages and disadvantages of each technique, is critical to maximizing patient outcomes with these complex lesions. The plan must be individualized. The knowledge, experience, and creativity of the treating surgeon are essential to achieve good functional and esthetic results and ensure high patient satisfaction[1,2]. Cross-flap flaps are an applicable method that can achieve an esthetic and functional appearance very close to normal; it can be performed by surgeons who o not have a large learning curve and by those who do not master microsurgery techniques[7,8].

Conclusion

The patient in our medical center presented a functional and esthetic final result. The technique mentioned

Figure 6. Post-surgical 19 days after the procedure and after finger separation.

Figure 7. Post-surgical at 19 days after finger separation. The flap is observed with adequate coloration.

has been used for several years but due to its ignorance or lack of time by doctors, it is not practiced regularly. This good prognosis was obtained with comprehensive pre-operative planning since this type of lesion has a high success rate.

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Conflicts of interest

The authors declare no conflicts of interest.

Ethical considerations

Protection of humans and animals. The authors declare that no experiments involving humans or animals were conducted for this research.

Confidentiality, informed consent, and ethical approval. The authors have followed their institution's confidentiality protocols, obtained informed consent from patients, and received approval from the Ethics Committee. The SAGER guidelines were followed according to the nature of the study.

Declaration on the use of artificial intelligence. The authors declare that no generative artificial intelligence was used in the writing of this manuscript.

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