



## Successful replantation in ten-digit amputation

Ümit KANTARCI, Selim ÇEPEL, Halil BULDU\*

*Istanbul Hand Surgery and Microsurgery Center; \*Department of Orthopedics and Traumatology, Memorial Hospital, both in Istanbul*

Amputations involving ten digits are very rare because of different lengths of the digits. A 34-year-old man working in a printing house presented one hour after guillotine amputation involving all ten digits. Surgery was initiated 80 minutes after admission and took seven hours. Under axillary anesthesia, the operation was performed by two teams each consisting of two microsurgeons and two assistants. Replantation was completed without the use of any skin graft or flap. Fingertip examination showed poor arterial circulation in the second, third, and fourth digits of the left hand after 24 hours of replantation and surgical exploration was performed, during which anastomosis of the ulnar digital artery of the second digit was re-established and a Y-shaped vein graft was placed at the level of the third web to restore revascularization of the third and fourth digits. However, these interventions did not prevent the development of necrosis in the distal segment of the fourth digit which resulted in dry gangrene that required amputation. After 38 months of replantation, radiographic examination showed complete union in all fingers without malunion or damage to the joint surface and about 8 degrees of medial angulation in the proximal phalanx of the fourth digit of the right hand. The patient did not have difficulty in performing daily activities and had a considerably good pinching. Losses of active range of motion of the metacarpophalangeal and interphalangeal joints were within the range of 10 to 30 degrees in both hands. In the assessment of sensation, static and dynamic two-point discrimination test results were 6.1 mm and 4.0 mm, respectively.

**Key words:** Amputation, traumatic/surgery; finger injuries/surgery; microsurgery; replantation.

Replantation of amputated fingers is a frequent surgical application in microsurgery centers; however, amputation of all the fingers in both hands and its surgical replantation have been reported in few cases in the literature.

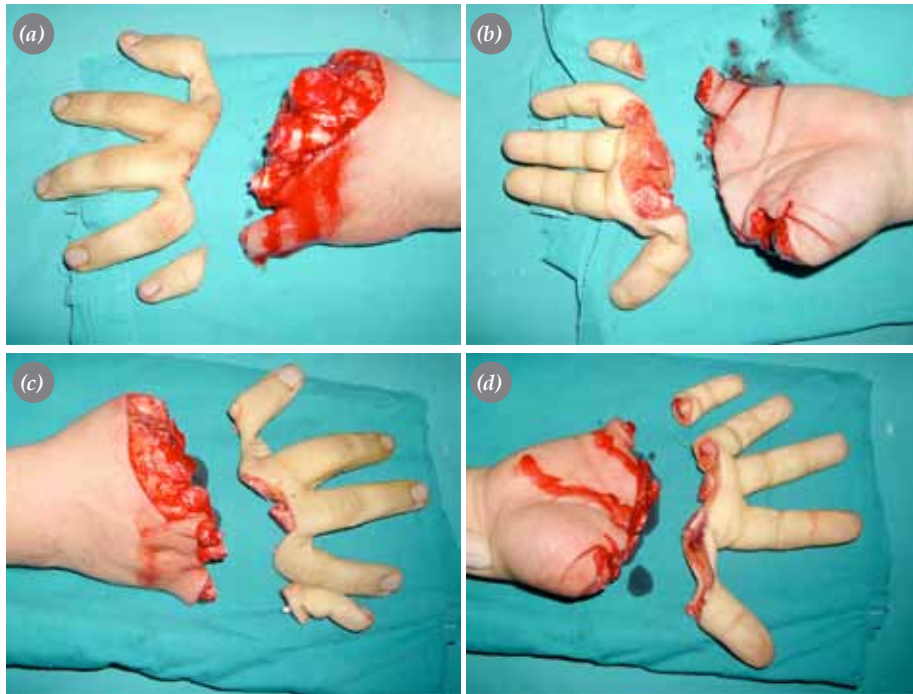
We report on a patient who underwent successful replantation of 10 amputated fingers and followed-up for 38 months.

### Case report

A 34-year-old man working in a printing house presented one hour after guillotine amputation involving all ten digits while using paper cutter. Tissues to be replanted were brought in a cold chain (Fig. 1). The

general condition of the patient was good. He was taken to the operating room within 20 minutes following tetanus prophylaxis, administration of parenteral antibiotics and intravenous fluid. The amputated tissues were put in a 0.09% NaCl solution and deposited at 4 °C in a refrigerator.

Surgery was initiated 80 minutes after admission. Following axillary nerve block, Esmarch bandage was applied and tourniquets in both upper limbs were inflated up to 300 mmHg. The operation was performed by two teams each consisting of two microsurgeons and two assistants starting with the first digit. For bone fixation, an intramedullary K-wire was used for each digit. Tenorrhaphy was performed with flexor tendon suture



**Fig. 1.** Ten-digit amputation caused by a guillotine type paper cutter. Dorsal and palmar aspects of the (a, b) left and (c, d) right hands.

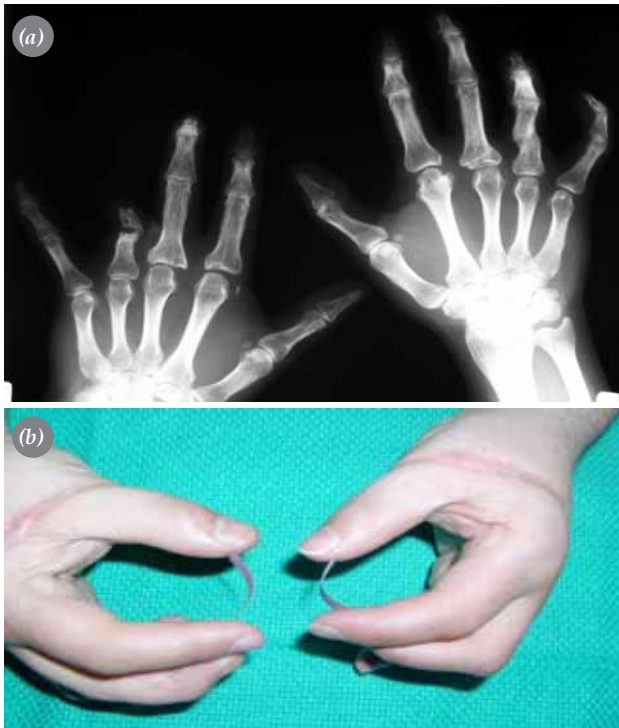
with a modified Kessler technique using 4-0 PDS and circumferential epitenon suture using 6-0 PDS. Extensor tendon repair was accomplished using 4-0 PDS sutures. After appropriate preparation of the ulnar and radial digital arteries and veins, they were brought end-to-end by an approximator and then revascularized with 10-0 Ethilon sutures. Two veins were revascularized for each digit. No vein graft was required for arterial and venous anastomoses. Digital nerves were repaired with the epineural technique using 9-0 Ethilon sutures. After determination of sufficient blood flow and venous return for all arterial and venous revascularizations, the skin was closed in a loose fashion using 5-0 Prolene sutures. Replantation was completed without the use of any skin graft or flap. After short-arm splinting, both upper limbs were kept in elevation in the postoperative period and hand circulation was checked at fingertips. Subcutaneous low-molecular-weight heparin of 0.4 ml/day was initiated following anastomosis and continued for 14 days. The patient received four ampules of pentoxifylline (Trental, Sanofi-Aventis) in 500 ml of intravenous saline solution for the first four days, and 300 mg of daily aspirin and ginkgo biloba extract (Tebokan tablet, Abdi İbrahim) twice daily for 14 days.

Fingertip examination showed poor arterial circulation in the second, third, and fourth digits of the left hand after 24 hours of replantation and surgical ex-

ploration was performed, during which anastomosis of the ulnar digital artery of the second digit was re-established and a Y-shaped vein graft was placed at the level of the third web to restore revascularization of the third and fourth digits. However, these interventions did not prevent the development of necrosis in the distal segment of the fourth digit (Fig. 2). The patient was discharged on the fifth postoperative day. In the control examinations, dry gangrene developed at the level of the middle phalanx of the fourth digit of the left hand, and the necrotic digit was amputated.



**Fig. 2.** Dry gangrene due to poor circulation in the fourth digit of the left hand.



**Fig. 1.** (a) Anteroposterior radiographs obtained at 38 months postoperatively. (b) Functional achievement showing successful pinching.

The final assessment of the patient was made 38 months after replantation. Anteroposterior X-ray of the hands showed complete union in all fingers without malunion or damage to the joint surface, with amputated fourth digit of the left hand and about 8 degrees of medial angulation in the proximal phalanx of the fourth digit of the right hand (Fig. 3a). It was observed that the patient did not have difficulty in performing daily activities such as buttoning, use of forks, spoons, and knives, and handwriting, and had a considerably improved pinching crucial for functional independence (Fig. 3b). Losses of active range of motion of the metacarpophalangeal and interphalangeal joints were within the range of 10 to 30 degrees in both hands. In the assessment of sensation, static and dynamic two-point discrimination test results were 6.1 mm and 4.0 mm, respectively.

## Discussion

In parallel with advancements in the field of microsurgery and enhanced experience, replantation surgery has now become a routine procedure. The success rates have been reported as 91.4% in guillotine amputations, 68.4% in crush injuries, and 66.3% in avulsion type injuries.<sup>[1]</sup>

The operation time for nine- or ten-digit replantations ranged from 19 to 31 hours in eight patients reported by Kim et al.<sup>[2]</sup> and from 25 to 31 hours in four patients reported by Baek and Kim.<sup>[3]</sup> Several other authors reported similar operation times for nine- or ten-digit replantations.<sup>[2-5]</sup> In our case, replantation of 10 digits took seven hours, which was considerably shorter compared to similar cases. Unlike other cases, replantation in our case was performed under axillary anesthesia instead of general anesthesia.

At the end of the follow-up period of 38 months, radiographic examination of the hands showed complete union in all fingers without malunion or damage to the joint surface. Besides the amputated fourth digit of the left hand, there was only a medial angulation of about 8 degrees in the proximal phalanx of the fourth digit of the right hand. The patient's functional recovery was remarkable; he could perform his daily activities without hindrance and with considerably good pinching.

## References

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