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Second toe microsurgical free-flap for aesthetic and sensory reconstruction of palmar soft tissue defects of fingers

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Summary *Objectives:* To illustrate the surgical methods and clinical efficacy of microsurgical free-flaps obtained from second toe for the reconstruction of palmar soft-tissue defect of fingers.
Methods: We enrolled 22 patients (13 men and 9 women), who received second toe free-flap for 22 finger defects between August 2007 and July 2013. The average age was 35 years (range, 18–62 years). The average size of flap was 2.7 cm × 2.0 cm (range, 1.5 cm × 1.5 cm–3.5 cm × 2.5 cm).
Results: All flaps survived well without any complications. Follow-up period ranged from 8 to 30 months (mean 15 months). The Visual Analog Scale for flap appearance (VAS flap) was ranged from 8 to 10 (average, 9.5). Based on the CISS questionnaires, 6 cases had mild cold intolerance. The average value of Michigan Hand Outcome Questionnaire (MHOQ) scoring for overall hand function was 8 (range, 5–13). The sensibility outcomes in 10 patients who underwent nerve repair were satisfactory. Average value of static two point discrimination (2PD) was 6.4 mm (range, 4–10 mm) and SWM test was 3.45 (range 2.83–4.12).
Conclusions: Second toe free micro-flap is a very useful and reliable alternative for the reconstruction of palmer soft-tissue defect of fingers.
Level of Evidence: IV.

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Introduction

Palmar soft-tissue defects of the finger are very common in clinical practice. If left untreated, these defects may result in severe functional disability. Several techniques, ranging from skin grafting to free tissue transfer, have been described for resurfacing these defects.[1–13] However, none have yielded entirely satisfactory results.

Second toe microsurgical free-flap has been found to be very useful in reconstructing palmar soft-tissue defects of fingers.[14–19] This flap is harvested from the medial aspect of second toe and offers glabrous tissue with histological similarity to finger soft-tissue. This flap is probably the best alternative for cases in which local flaps are not feasible. However, most previous studies suffer from small sample size and lack rigorous analysis of outcomes to support the indication of this reliable flap. Therefore, in this study, we report our experience of finger soft-tissue defects reconstruction using second toe free-flap. In addition, we analyze aesthetic, sensory and functional outcomes of reconstruction.

Patients and methods

We reviewed clinical data records of patients who received second toe free-flaps in our hospital. Patients with palmar soft-tissue defect of fingers were included and patients with thumb defects were excluded. For each of the patients, the following data were recorded: age, sex, mechanism of injury, sites of the defect, injury to operation time, size of the flap, donor site coverage and duration of follow-up.

We enrolled 22 patients (13 men and 9 women), who received second toe free-flap for 22 finger defects between August 2007 and July 2013. The average age was 35 years (range, 18–62 years). The mechanisms of injury were crush injury (14 patients) and avulsion injury (8 patients). The location of the defect included proximal palmar surface (14 patients) and distal pulp tissue (8 patients). Digital nerve and artery were injured in 10 patients. The average size of flap was 2.7 cm × 2.0 cm (range, 1.5 cm × 1.5 cm–3.5 cm × 2.5 cm). The mean time between the injury and operation was 4 h (range, 2.2–7 h) [Table 1].

Surgical technique

Patients were explained thoroughly about the risks and benefits of the procedure and written informed consent were obtained. Patency of the donor toe's arterial systems was confirmed by Doppler ultrasonography. We performed all surgeries under general anesthesia aided by pneumatic tourniquet control, loupe magnification and surgical microscope. Meticulous debridement was done to remove non-viable tissues. The pattern of the flap was designed at medial aspect of ipsilateral second toe according to the size of the defect. The flap was dissected carefully under loupe magnification, which enabled identification of the subcutaneous vein for isolation of the proper planter digital

Table 1 Patient's demographics.

Patients	Age (years)/Sex	Injured finger	Mechanism of injury	Location of defect	Injury to operation time (hour)	Flap size (cm × cm)	Neurovascular defect
1	31/M	Index	Crush	Pulp	3	1.5 × 1.5	Present
2	42/M	Index	Crush	Proximal	3.5	2.0 × 2.8	Absent
3	57/M	Index	Crush	Pulp	2.2	2.0 × 1.6	Present
4	18/M	Long	Avulsion	Pulp	6.5	2.3 × 2.0	Present
5	22/F	Index	Crush	Proximal	4.7	2.7 × 2.2	Present
6	21/F	Ring	Avulsion	Proximal	7	3.5 × 1.7	Absent
7	41/M	Index	Crush	Proximal	2.7	2.2 × 2.8	Absent
8	35/M	Index	Avulsion	Pulp	3.6	3.0 × 2.3	Present
9	40/F	Ring	Crush	Pulp	2.8	3.0 × 2.0	Present
10	28/F	Long	Crush	Pulp	4.8	2.5 × 2.5	Present
11	47/F	Ring	Crush	Proximal	5.2	3.1 × 2.0	Absent
12	30/M	Index	Avulsion	Proximal	3.1	3.1 × 2.2	Absent
13	62/M	Index	Crush	Proximal	2.7	3.2 × 2.1	Absent
14	50/M	Long	Avulsion	Proximal	3.9	1.7 × 1.7	Absent
15	19/M	Long	Crush	Proximal	7	2.3 × 1.6	Absent
16	27/M	Index	Crush	Pulp	3.3	3.5 × 2.5	Present
17	36/F	Ring	Crush	Proximal	4.4	3.0 × 2.2	Absent
18	44/F	Ring	Avulsion	Proximal	2.6	2.5 × 1.8	Present
19	32/M	Index	Avulsion	Proximal	2.5	3.4 × 2.0	Absent
20	24/M	Index	Crush	Pulp	4.5	2.8 × 2.0	Present
21	25/F	Index	Crush	Proximal	4.3	3.0 × 2.4	Absent
22	42/F	Long	Avulsion	Proximal	5	3.4 × 1.6	Absent
Mean	35.1				4.05	2.7 × 2.0	

M, male; F, female.