Spare Parts Surgery with a Free Posterior Interosseous Artery Perforator Flap for Thumb Tip

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Summary: Replantation is an ideal method for treating fingertip amputation. However, in some cases, replantation is known to be a challenging issue. This report described a successful thumb tip reconstruction performed with bone and nail bed salvaged as spare parts, and a free posterior interosseous artery perforator (PIAP) flap. A 75-year-old man accidentally amputated his left thumb with an electric saw, and emergency replantation was started under brachial plexus block. However, the distal stump of digital artery was unable to be identified, forcing the initial plan to change to flap reconstruction. After vascular anastomosis, complex tissue containing nail bed and side nail fold was grafted on the adipofascial tissue of PIAP flap. Both PIAP flap and the complex tissue survived completely. At 12 months after surgery, only a slight deformity in the nail plate was observed. Spare parts surgery is a surgical procedure effectively salvaging and utilizing tissue that is going to be discarded in severe limb trauma. This idea can be applied to treatment for the finger amputation. In this case, replantation would be difficult in the thumb tip amputation, so spare parts surgery was performed with a PIAP flap. The innervated PIAP flap is reported, including the posterior antebrachial cutaneous nerve. In this case, the cutaneous nerve was able to be identified, neurorrhaphy was performed, and sufficient sensory recovery was obtained. Surgical procedure with PIAP flaps was found to be a useful method for immediate reconstruction with salvaged spare parts after fingertip replantation was considered to be difficult intraoperatively. (Plast Reconstr Surg Glob Open 2021;9:e3624; doi: 10.1097/GOX.0000000000003624; Published online 7 June 2021.)

CASE REPORT

The patient was a 75-year-old man who was a carpenter, and his left thumb was amputated with an electric saw accidentally. His left thumb tip was completely amputated at zone 1 level according to Tamai’s classification (Fig. 1). Upon arrival at hospital, the amputated thumb was wrapped in a wet handkerchief in a plastic bag, which was cooled with ice water, for 2 h after injury. Emergency replantation was started under brachial plexus block at 3 h after the patient’s arrival at the hospital. However, the distal stump of digital artery was unable to be identified, forcing the initial plan to change to flap reconstruction. After vascular anastomosis, complex tissue containing nail bed and side nail fold was grafted on the adipofascial tissue of PIAP flap. Both PIAP flap and the complex tissue survived completely. At 12 months after surgery, only a slight deformity in the nail plate was observed. Spare parts surgery is a surgical procedure effectively salvaging and utilizing tissue that is going to be discarded in severe limb trauma. This idea can be applied to treatment for the finger amputation. In this case, replantation would be difficult in the thumb tip amputation, so spare parts surgery was performed with a PIAP flap. The innervated PIAP flap is reported, including the posterior antebrachial cutaneous nerve. In this case, the cutaneous nerve was able to be identified, neurorrhaphy was performed, and sufficient sensory recovery was obtained. Surgical procedure with PIAP flaps was found to be a useful method for immediate reconstruction with salvaged spare parts after fingertip replantation was considered to be difficult intraoperatively. (Plast Reconstr Surg Glob Open 2021;9:e3624; doi: 10.1097/GOX.0000000000003624; Published online 7 June 2021.)

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and nail bed combined with side nail fold were collected carefully as spare parts. The bone was fixed with a 0.7-mm K-wire, then the tip of the distal phalanx was covered with the skin paddle, and the dorsal side of distal phalanx was wrapped with the adipofascial tissue of the PIAP flap. After covering the exposed bone, the PIAP was anastomosed to the ulnar proper digital artery, and the concomitant vein was anastomosed to the dorsal cutaneous vein in an end-to-end anastomosis fashion with a 11-0 nylon, and end-to-end neurorrhaphy was performed with the 10-0 nylon. The salvaged complex tissue consisting of the nail bed and side nail fold was grafted on the adipofascial tissue of the PIAP flap (Fig. 3). Postoperatively, the patient received 10,000 IU heparin and 60-µg alprostadil per day by continuous intravenous drip for 7 days. At 7 days after surgery, the PIAP flap was found to survive completely on the thumb tip, and the combined tissue of nail bed and side nail fold grafted on the flap survived completely. At 10 days, the patient was discharged from the hospital without any trouble. At 12 months, because the Semmes-Weinstein monofilament test showed blue, the flap transplanted to the thumb tip was confirmed to obtain the protective sensation. Slight deformity was observed in the nail plate (Fig. 4).
DISCUSSION

Replantation is the most suitable method for treating fingertip amputation. Successful replantation gives the satisfactory results of both function and appearance of the fingertips. Although highly successful rates are reported frequently, in some cases, the sites could progress to necrosis and require reconstructive surgery later. Despite many reports, when the nail matrix is found to be preserved with defects in the bone or nail bed, simply covering the stump with flaps will give the fingertips deformities and shorter finger length, resulting in poor satisfaction. In addition, homodigital and heterodigital flaps for fingertip reconstruction need longitudinal incisions on the injured finger, and the incisions may cause scar contracture and flexion contracture of the interphalangeal joint due to the volar deviation of the neurovascular bundle. In this case, if the harvest of a short pedicle free flap and the preparation of recipient vessels were performed, the best functional and aesthetic prognosis would be obtained. Furthermore, the secondary transplantation of bones and nail beds needs the sacrifice of autologous tissue. Spare parts surgery is a surgical procedure effectively salvaging and utilizing tissue going to be discarded. Normal tissue other than injury zone can be used as a flap, and tissue in the injury zone is used as a graft. In this case, distal phalanx and nail bed were recovered from the amputated thumb as spare parts and used as a graft. Actually, spare parts surgery is first described in fingertip amputation. Surgery with PIAP flaps is a useful fingertip reconstruction method. The morbidity is lower at the donor site, and the vascular pedicle is highly reliable. In addition, compared with other free flaps, the PIAP flap is easily collected with the thin and wide adipofascial tissue. As an advantage, the PIAP flap can sufficiently cover the exposed distal phalanx with the adipofascial tissue. The innervated PIAP flap is reported to include the posterior antebrachial cutaneous nerve for the purpose of reconstructing finger skin defect and sensory recovery. After fingertip replantation was found to be difficult, the PIAP flap surgical procedure was a useful method for immediate reconstruction with salvaged spare parts. Interestingly, hair growth was noticed at the thumb tip due to hair follicles in the transplanted flap, and laser hair removal was performed.

CONCLUSION

After replantation was found to be difficult intraoperatively for treating fingertip amputation, immediate reconstruction was performed with a PIAP flap, and the bone and nail bed in the separated fingertip were salvaged as spare parts.

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