

Ectopic Banking of Amputated Great Toe for Delayed Thumb Reconstruction: Case Report

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Ectopic banking of amputated parts is a recognized technique for delayed replantation of an amputated part when the amputation stump will not permit immediate replantation. This is conventionally performed with the intent of transferring the injured part back to its anatomic position when the amputation stump is more appropriate for replantation. Current warfare conditions have led to a commonly encountered military trauma injury pattern of multiple extremity amputations with protected trunk and core structures. This pattern poses many challenges, including the limit or absence of donor sites for immediate or delayed flap reconstructive procedures. We describe a case in which we ectopically banked the great toe of an amputated lower extremity for delayed thumb reconstruction. (*J Hand Surg Am.* 2014;39(7):1323–1326. Copyright © 2014 by the American Society for Surgery of the Hand. All rights reserved.)

Key words Ectopic banking, heterotopic banking, toe-to-thumb transfer, extremity salvage, blast injury.

SINCE THE DESCRIPTION OF Godina et al,¹ the techniques and indications for ectopic banking of amputated parts for use in extremity replantation have been widely reported and refined. Cases reported include amputated digits, hands, entire upper

extremities, feet, scalp, and penis.^{1–8} In these cases, immediate conventional replantation was deemed impossible because of the patient's hemodynamic instability or because the recipient bed was compromised by massive soft tissue loss and/or gross contamination. After serial debridement and soft tissue management of the amputation stump, the parts were returned to their native position when the transfer was considered likely to succeed. This technique evolved in response to the often-encountered injury of an adequately preserved amputated single extremity with an inadequate replantation bed.

Modern body armor enables military personnel to survive severe blast injuries. However, the result is the commonly encountered injury pattern of multiple extremity amputations with a relatively protected core. Blast injuries are often complicated by gross contamination, foreign debris, evolving necrosis, and devitalized tissue. Multiple digital amputations are common. These injuries typically warrant serial debridement before soft tissue reconstruction. Additional challenges include lack of the usual donor sites for flap coverage, nerve grafts, and vein grafts. With the loss of 1 or both legs, the option for toe transfer for thumb reconstruction may not be available.

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FIGURE 1: View of the left hand after blast injury.

We describe a case of ectopic banking of an amputated great toe for delayed secondary transfer to the thumb position in the setting of multiple extremity amputations resulting from military trauma.

CASE REPORT

As the result of a rocket-propelled grenade blast, a 27-year-old, right-handed soldier sustained near-complete amputation through the proximal left leg. Distally, the foot was relatively uninjured. The left hand sustained a small finger amputation, a severe ring finger crush injury, and a midmetacarpal-level thumb amputation (Fig. 1).

He underwent a left below-knee amputation, left hand debridement, and ring finger fillet-flap. After assessing the amputated part's condition and considering the need for delayed thumb reconstruction, the surgical team elected to ectopically bank the great toe from the amputated left foot on the injured left forearm.

Long lengths of the great toe's digital nerves, extensor hallucis longus, flexor hallucis longus tendons, a large dorsal vein, and the dorsal intermetatarsal artery with its accompanying veins were included in the transferred toe, as was a large segment of metatarsal. The great toe's dorsal intermetatarsal artery was anastomosed in an end-to-side fashion to the radial artery in



FIGURE 2: Left great toe ectopically banked on the left forearm.

midforearm. An end-to-end anastomosis between the toe's dorsal vein and the cephalic vein was performed. The patient was stable over the next 24 hours, the banked great toe remained well-perfused, and he was transferred to the United States (Fig. 2).

At Walter Reed National Military Medical Center, the patient underwent serial debridements, followed by toe-to-thumb transfer surgery performed 3 weeks after injury. The toe was elevated with a generous portion of the proximal radial artery and a cuff of surrounding forearm soft tissue to avoid disrupting the original anastomoses. The same technique was used with the vein, raising the toe with a long length of attached cephalic vein. This permitted the second-stage anastomoses to be performed on larger caliber vessels proximal to the field of injury.

The toe was then transferred into the thumb position. Fixation of the distal first metatarsal to the proximal first metacarpal was achieved with 90–90 interosseous wiring. Extrinsic flexor and extensor tendons were repaired with the weave technique. Nerve repairs were performed as distally as possible while resecting the digital nerves back to healthy fascicles. Despite the banked digital nerve length, a sural nerve graft was required to provide a tension-free reconstruction.

Arterial repair was performed with an effort to restore radial artery supply to both the hand and toe. We harvested a Y-shaped reversed lesser saphenous vein graft endoscopically. The proximal end was anastomosed to the proximal radial artery and 1 of the distal ends was anastomosed to the distal radial artery. The second distal end was anastomosed to the segment of radial artery that was harvested en bloc with the toe. The cephalic vein segment harvested en bloc with the toe transfer was anastomosed to a large dorsal hand vein.

Toe harvest with surrounding soft tissue cuff resulted in a large forearm volar-radial soft tissue defect that was covered with a dermal regenerative matrix (Integra Lifesciences, Plainsboro, NJ) and was skin-grafted 2 weeks later. The transferred toe healed without complication (Fig. 3). At 16-month follow-up, sensation had reached the interphalangeal joint and continued to progress. The

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