

An Alternative Thumb Reconstruction by Double Microsurgical Transfer From the Great and Second Toe for a Carpometacarpal Amputation

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Thumb amputation at the carpometacarpal level is very incapacitating. Pollicization may be considered. We describe an alternate technique for thumb reconstruction at the level of the metacarpal base using a trimmed great toe along with a vascularized second metatarsophalangeal joint, including the second metatarsal, all supplied on a single vascular pedicle. Two patients who had a combined soft tissue defect and amputation of the thumb close to the carpometacarpal joint were reconstructed with this method. A transposition of the second toe was performed on top of the remaining proximal phalanx of the great toe to decrease donor site morbidity. This technique provides adequate length to the thumb without compromising another finger by creating a new thumb using a double microsurgical toe transfer on a single vascular pedicle. We minimize donor site morbidity by transposing the second toe onto the great toe. (*J Hand Surg Am.* 2018; ■(■):1.e1-e9. Copyright © 2018 by the American Society for Surgery of the Hand. All rights reserved.)

Key words Toe-to-hand transfer, thumb reconstruction, pollicisation, carpometacarpal amputation, trimmed toe transfer.



POSTTRAUMATIC AMPUTATION OF the thumb causes a substantial loss to hand function especially if it is at the base of the metacarpal. The thumb contributes between 40% and 50% of hand function. In addition, it possesses the unique ability to circumduct and oppose, making it indispensable when performing activities such as pinch, grasp, and fine manipulation that are essential in daily life.

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Restoring both function and aesthetic appearance of the hand after traumatic loss of the thumb is the main goal of thumb reconstruction. Selection of the method to be used depends on a variety of factors, such as the level of amputation, presence of other injuries to the same hand, patient preferences, and surgeon experience. Multiple techniques have been described to restore the native thumb ranging from osteoplastic techniques,¹ pollicization,² to different microsurgical toe transfers.³ When dealing with an amputation through, or just distal to, the carpometacarpal (CMC) joint, the principal difficulty is providing adequate bone length and soft tissue coverage including a suitable first web space to the reconstructed thumb. Pollicization of the index finger is usually the recommended technique for reconstruction of the thumb at this level, but there are also different techniques of toe-to-thumb transfers for such thumb reconstruction. When the injury involves the adjacent fingers, pollicization may be precluded.

The first dorsal metatarsal artery (FDMA), originating from the dorsalis pedis artery, provides the primary vascular pedicle for the great and second toe, which have been used to create different models of compound flaps for thumb reconstruction.^{4,5}

We describe an alternate technique for thumb reconstruction at the level of the metacarpal base using a trimmed great toe along with a vascularized second metatarsophalangeal (MTP) joint, including the second metatarsal, all supplied by a single vascular pedicle. Two patients who had a combined soft tissue defect and amputation of the thumb close to the CMC joint were reconstructed with this method. Transposition of the second toe on top of the proximal phalanx of the great toe was performed as well in order to improve foot appearance and function.

INDICATIONS AND CONTRAINDICATIONS

Indications for performing this technique are thumb amputations at the base of the first metacarpal. Contraindications do not differ from the general contraindications for microsurgical techniques.

SURGICAL TECHNIQUE

The first step requires identifying the presence of the FDMA using a Doppler probe. Next, measurements of the healthy contralateral thumb are taken, including the length and the circumference of the normal thumb as well as the length of the first metacarpal. These dimensions are transferred onto the ipsilateral toe.

Flap design and harvesting

A zigzag incision is made on the dorsum of the foot down to the first web. The incision then proceeds around the great toe and a cutaneous strip is left on the medial side. Proximal palmar and dorsal V flap extensions are also included in the lateral side of the great toe (Fig. 1). Under tourniquet without exsanguination, the dorsal approach on the foot is used to expose the subcutaneous veins and the FDMA. Once the vessels are isolated, the dissection proceeds distally up to its bifurcation into the dorsal digital arteries of the first and second toe. Special attention should be paid to protecting the articular branch of the second MTP joint, during the dissection in the interosseous space. Osteotomies are performed at different levels on each toe's proximal phalanx. A third osteotomy is done at the base of the second metatarsal to provide adequate thumb length



FIGURE 1: Skin incisions have been marked with broken black lines over the dorsum of the foot and the great toe.

(Fig. 2). The flap from the great toe is incised and the trimmed toe is elevated as described by Wei et al.⁶ At this point, we prefer to also expose the plantar digital artery of the great toe and dissect it in case we may need an extra vascular supply. The second MTP joint with the distal two-thirds of the metatarsal shaft is isolated and elevated without the overlying skin or extensor or flexor tendons. The tourniquet is released to check perfusion of the composite tissue flap made up of the trimmed toe and a vascularized second MTP joint including the second metatarsal, using the FDMA as a single pedicle (Fig. 3). If necessary, the vessels can even be dissected proximally by extending this dissection up into the lower leg.

Creation of custom made thumb

The proximal phalanx of the great toe is fixed to the distal portion of the MTP joint using K-wires or double interosseous wiring with perpendicular (90°–90°) configuration. The wires are twisted, leaving the ends turned laterally to avoid impinging on the tendons. The medial side of the great toe that was previously debulked is now sutured (Fig. 4).

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