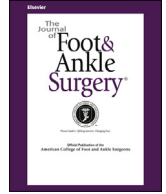




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Plantar Rotational Flap Technique for Panmetatarsal Head Resection and Transmetatarsal Amputation: A Revision Approach for Second Metatarsal Head Transfer Ulcers in Patients with Previous Partial First Ray Amputation

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ABSTRACT

Transfer ulcers beneath the second metatarsal head are common after diabetes-related partial first ray amputation. Subsequent osteomyelitis of the second ray can further complicate this difficult situation. We present 2 cases depicting our plantar rotational flap technique for revision surgery involving conversion to either panmetatarsal head resection or transmetatarsal amputation (TMA). These cases are presented to demonstrate our indications, procedure selection criteria, flap technique, operative pearls, and staging protocol. The goals of this surgical approach are to excise and close the plantar ulcer beneath the second metatarsal head, remove any infected bone, allow staged surgery if needed, remove all remaining metatarsal heads to decrease the likelihood of repeat transfer ulcers, preserve the toes when practical, avoid excessive shortening of the foot, avoid multiple longitudinal dorsal incisions, and create a functional and cosmetically appealing foot. The flap is equally suited for either panmetatarsal head resection or TMA. The decision to pursue panmetatarsal head resection versus TMA largely depends on the condition of the remaining toes. Involvement of osteomyelitis in the base of the second proximal phalanx, the soft tissue viability of the remaining toes, the presence of a preoperative digital deformity, and the likelihood that saving the lesser toes will be beneficial from a cosmetic or footwear standpoint are factors we consider when deciding between panmetatarsal head resection and TMA. Retrospective chart review identified prompt healing of the flap in both patients. Neither patient experienced recurrent ulcers or required subsequent surgery within the first 12 months postoperatively.

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Transfer ulcers beneath the second metatarsal head are common after diabetes-related partial first ray amputation. Subsequent osteomyelitis of the second ray can further complicate this difficult situation. Murdoch et al (1) reported a 60% repeat amputation rate after first ray amputation. Dalla Paola et al (2) reported a much lower 12% ipsilateral repeat ulceration and 9% repeat amputation rate with the institution of custom inserts and rocker-bottom shoes after first ray amputation. The most common location of transfer ulceration was beneath the second metatarsal head (1,2). A recent systematic review by Zgonis et al (3) showed a 19.8% reamputation rate for all levels of partial first ray resection.

Two cases of second metatarsal phalangeal joint (MTPJ) transfer ulceration are presented to highlight our plantar rotational flap

approach for revision surgery involving either panmetatarsal head resection or transmetatarsal amputation (TMA). We present these cases to demonstrate our indications, procedure selection criteria, flap technique, operative pearls, and staging protocol. The goals of this surgical approach are to excise and close the plantar ulcer beneath the second metatarsal head, remove any infected bone, allow staged surgery if needed, remove all remaining metatarsal heads to minimize the likelihood of repeat transfer ulcers, preserve the toes when practical, avoid excessive shortening of the foot, avoid multiple dorsal longitudinal incisions, and create a functional and cosmetically appealing foot.

Giurini et al (4) reported panmetatarsal head resection had several advantages compared with TMA, including a more natural gait, improved fit with extra depth shoes, and a more normal-appearing foot that is more psychologically acceptable to patients. Our plantar flap approach is equally suited for panmetatarsal head resection or TMA. Our decision to pursue panmetatarsal head resection or TMA for a given patient largely depended on the condition of the remaining toes, which we attempted to preserve when practical.

Giurini et al (4) favored the dorsal incision approach when performing panmetatarsal head resection. Multiple longitudinal dorsal

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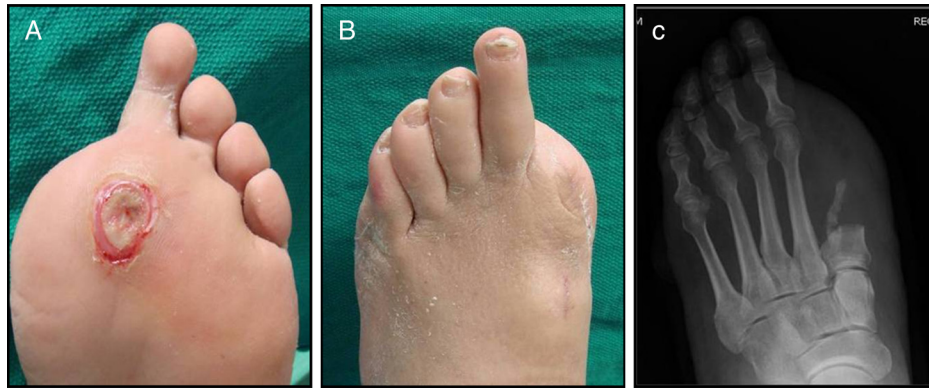


Fig. 1. (A–C) Preoperative photographs and radiograph depicting patient 1 with recurrent and worsening second metatarsal phalangeal joint transfer ulcer with a history of first ray amputation. Surgery was delayed until the dorsal cellulitis had resolved, although a 2-stage approach has been commonly used for deep infection. Note, the patient had minimal lesser toe deformity, healthy digital skin, and no evidence of osteomyelitis in the second proximal phalanx. Deep wound probing identified bone exposure. Because of these findings, revision surgery involved plantar rotational flap panmetatarsal head resection.

incisions have been commonly used in an effort to avoid incisions on the plantar weightbearing surface. The dorsal incisional approach does not, however, allow primary excision and closure of the plantar ulcer, which is often extensive. Dorsal incisions can also compromise the dorsal soft tissues if, in the future, it is necessary to convert panmetatarsal head resection to TMA.

Satterfield and Jolly (5) described a plantar rotation advancement flap for removal of painful plantar forefoot lesions. The length of the transverse flap incision was described as 4 to 5 times the width of the base of the triangular portion of the tissue to be excised (5). We have used the same basic flap design and principles when performing plantar rotational flap panmetatarsal head resection or TMA. The plantar approach allows direct access for metatarsal head removal when performing panmetatarsal head excision. This will be especially helpful when dorsal MTPJ dislocation is present. The plantar flap technique for panmetatarsal head resection can be easily converted to TMA owing to the transverse nature of the plantar incision.

The severity of local soft tissue infection dictates whether surgery should be performed as a multistage or single-stage procedure. An acutely infected foot involving abscess or cellulitis is typically treated in a 2-stage approach. Osteomyelitis without acute soft tissue infection can be treated with a single-stage approach. The first stage of surgery for acute soft tissue infection involves excision of the ulcer, resection, and biopsy of the second metatarsal head, open packing of

the wound, and revision within a few days when the acute cellulitis has resolved. Staged flap surgery requires preoperative planning for the flap donor site. The proposed flap is drawn before making any incision. This ensures that the first-stage incision used to drain the infection does not compromise the subsequent flap options.

Cases

We have presented 2 typical cases to illustrate our technique for combining a plantar rotational flap with either panmetatarsal head resection (patient 1; Figs. 1–3) or TMA (patient 2; Figs. 4–6). Both patients had undergone previous partial first ray amputation, with subsequent transfer ulceration beneath the second MTPJ. Transfer ulcers in this location that fail to heal despite local wound care and frequent offloading, can become complicated by osteomyelitis of the second metatarsal. Osteomyelitis was suspected in both patients because of bone exposure found with deep wound probing and the elevated laboratory values (Fig. 1). Both patients exhibited intact foot pulses and adequate ankle joint dorsiflexion.

The decision to perform panmetatarsal head resection or TMA was largely determined by the condition of the remaining toes. Patient 1 had minimal lesser toe deformity, healthy digital skin, and no radiographic evidence of osteomyelitis in the base of the second proximal phalanx (Fig. 1A–C). Because of these findings, we performed plantar rotational flap panmetatarsal head resection in patient 1. Patient 2 had compromised interdigital skin, rigid hammertoe deformity, previous third toe amputation, and likely osteomyelitis at the base of the second proximal phalanx, in addition to the second metatarsal head, according to the radiographic findings (Fig. 4A–C). Because of these findings, we performed plantar rotational flap TMA in patient 2.

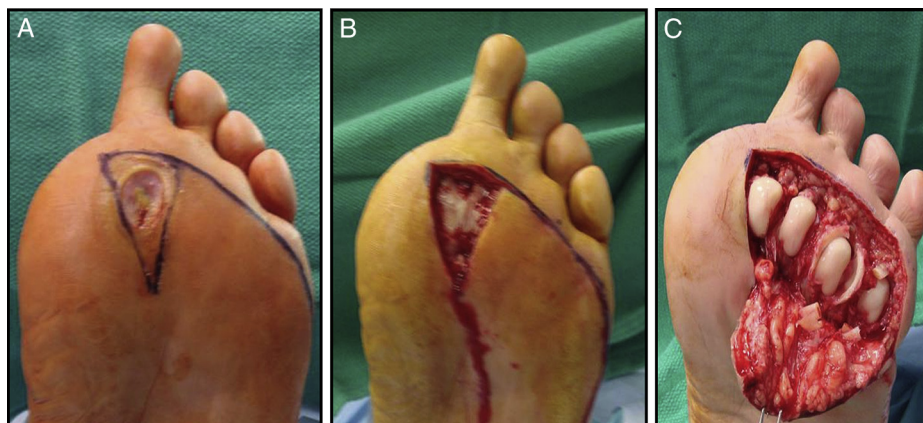


Fig. 2. Photographs depicting (A) flap design and surgical technique for plantar rotational flap panmetatarsal head resection in patient 1. The ulcer was excised before raising the flap (B). The wide transverse incision provided easy access for metatarsal head resection and sufficient flap size to close a fairly large soft tissue defect created by ulcer excision (C). The flap was raised full thickness off the metatarsal heads.

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