

Plantar Foot Rotational Flap for chemical Burn: Case Report

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Abstract: Double Lobe (bilobed) and Single Lobe (unilobed) rotational flaps are often underutilized in the foot, especially for plantar wounds. There are certain qualifications needed to be able to successfully create the rotational flap which will be discussed in this paper, along with a case study of both a single lobe and double lobe rotational flaps created on the plantar foot due to chemical burns.

Key words: Double Lobe Flap, Single Lobe Flap, Reconstructive Skin Flaps, Chemical Burns,

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INTRODUCTION:

When dealing with wounds in the lower extremity, foot and ankle specialists are often presented with a challenge. Many of the patients in the foot and ankle often have other co-morbidities associated with poor wound healing and other complications. However, there are some patients that may come into your office with limited comorbidities and may be perfect candidates for a reconstructive skin flap. When one segment of skin and subcutaneous tissue is rotated, or transposed to restore a tissue defect, it is defined as a skin flap¹. There are two main ways to classify a skin flap, one depends on the vascularity and the other is dependent on the movement which the flap undergoes. Within the vascular classification, there are random pattern flaps and axial flaps. Random pattern flaps are those which are vascularized not by a single artery and vein but rely on perfusion from underlying vessels in the subcutaneous tissue. The axial pattern flap contains a primary artery and vein

in which it gets its blood supply^{1,3}. In this article, the specific flaps has random pattern vascularity. The movement classification is based off the motion the flap will undergo when being transferred. There are many types of flaps which depend on movement, but the specific flaps discussed here are local rotational flaps. These are semicircular in shape, created adjacent to the defect, and are rotated on a pivot point¹.

Case Report:

A healthy 48-year-old male presents for evaluation of a right foot wounds which were sustained from a chemical burn. He relates getting potassium hydroxide in his work boot but continued to work without changing his shoes or washing the chemical off. He has been seen in the burn center for about 2 months and he has placing Silvadene cream without improvement. He was then referred to podiatry for surgical evaluation.

On physical exam, he was neurovascularly intact. He did not show any signs of musculoskeletal weakness. Dermatologically he has 2 wounds on his plantar right foot that are painful and rated an 8/10 on the pain scale. The right plantar hallux wound is a full thickness ulceration measuring 2.0 cm x 1.8 x 0.5 cm with overlying eschar (figure 1). His right plantar 2nd toe wound is also full thickness with an overlying eschar measuring 1.2 cm x 1.0 x 0.5 cm. (Figure 1). Both wounds show no undermining or extension to bone. No cellulitis, lymphangitis, malodor, crepitus or other signs of infection. Upon radiographic evaluation, there was no osteolysis to suggest osteomyelitis or any bony involvement. There was no obvious fracture seen, no acute osseous changes, no osteolytic or osteoblastic lesions appreciated. There was no soft tissue gas in the tissues noted. There is a soft tissue deficit noted at the areas of the pedal wounds of toes 1 and 2 (Figure 2).



Figure 2: AP, MO, Lateral toe radiographs taken at initial visit.

Due to the relatively benign PMHx and state of the wounds, the plan was for excision of the wound with a rotational skin flap of both plantar foot wounds. After extensive thought and planning it was decided that we would perform a double lobed flap (Figure 3) for the hallux and a single lobed flap (Figure 3a) for the 2nd toe (Figure 3b).

In the OR attention was directed to the 2nd toe where the tissue flap was marked from the medial proximal healthy skin. The existing wound was excised making sure to have full thickness removal of all the non-viable tissue. Care was taken to make sure the



Figure 1: Plantar right foot wounds at initial encounter

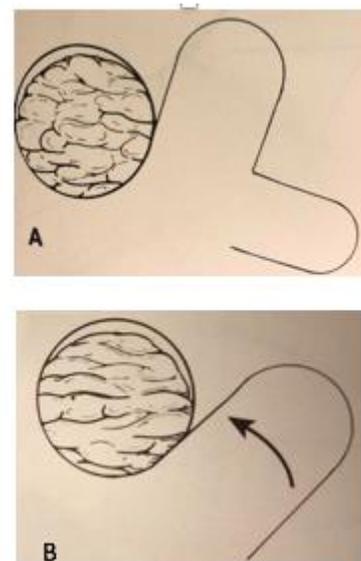


Figure 3: (a) Double Lobe flap¹; (b) Single lobe flap

excision of the wound was perpendicular to the skin at a full thickness level. Once the tissue was removed, the flap was created using a #15 blade, also making sure the cut was perpendicular to the skin and making sure to encompass the subcutaneous layer. Next, the flap was sutured in place using 4-0 Prolene (figure 4).



Figure 4: closure of 2nd toe flap and Intra op images of hallucal flap creation

Next attention was directed to the hallux of the right foot where the double lobed flap was planned with a marking pen. The first lobe of the flap was about 75% of the original wound and planned about 60 degrees medial proximal. The second lobe of the flap was then planned and was about 50% of the size of the original wound. The wound was then excised entirely to reveal healthy underlying tissue. Care was taken to excise the wound full thickness and perpendicular to the skin. Next, the double lobed flap



Figure 5: Intra op completion of rotational flaps

was created making sure to stay perpendicular to the skin and the encompass the subcutaneous layer (Figure 4). Again, it is important to include the subcutaneous layer to increase the vascularity of the flap Next the first lobe was tagged at the apex using 4-0 Prolene. It was then noted that the rotation of the flap was in good alignment and the rest of the rotational flap was sutured in place. (Figure 5).



Figure 6: post op day 3

Patient was brought to the office at post op day 3 (figure 6) and the second toe rotational flap was viable and healthy. However, the distal aspect of the



Figure 7 : (a) Post op day 21 with sutures intact (b) Post op day 21 with sutures removed

plantar hallux flap was dusky in appearance but still viable. The dressing was then changed and patient was seen back at 3 weeks from the date of surgery (figure 7a) and the stitches were removed (figure 7b).



Figure 8: (a) post op day 36 (b) post op day 66

The 2nd toe was healed but there was some mild dehiscence at the primary flap of the hallux operative site. It was then discussed that the patient would be seen weekly and place antibiotic ointment and a band aid to the site daily after washing the area with soap and water. At post op day 36 (Figure 8a), there remained a small area of dehiscence at the distal aspect of the primary flap of the hallux, but the wound bed was healthy and granular. It was decided that the same regimen would be continued. At post op day 66 the wound was noted to be completely healed. (Figure 8b). This patient was seen one more time on post op day 94 where there was improvement in the scar formation and patient is successfully going about his daily life without issues from the operative site (Figure 9).



Figure 9: Post op day 94. Improved appearance of scar.

Discussion:

Local rotational flaps are viable option to cover soft tissue lesions in the plantar foot, Especially in the healthy patient. In this specific case a single lobed and double lobed flap were utilized and proven successful for a chemical burn ulceration. Our subject was a healthy 48-year-old male without comorbidities, which is not always the case when dealing with wounds in the foot and ankle. It is important that the patient has adequate vascularity and is without signs of infection before attempting a reconstructive skin procedure.

It is important to note that there are wound qualifications in order to perform these flaps on the plantar foot. Bilobed flaps can cover defects that measure 1-3 cm in diameter which is more surface area than a single lobed flap can cover². However, a single lobe flap tends to have an advantage in healing due to the large base providing good vascularity². When planning for a plantar foot flap, many authors suggest that the lobe created should not have an angle from the defect more than 60 degrees². When rotating these flaps, the first lobe covers the original defect, the second lobe covers the donor site and the second lobe donor site can be primarily closed². This is why it is important to plan the size of each lobe correctly. It is suggested that the first lobe is 75% the size of the initial

wound, and the second lobe is 50% of the size of the original wound².

In conclusion, these flaps are patient-specific, and each patient needs to be chosen carefully to allow for optimal healing and decrease donor site morbidity. However, local rotational flaps in the foot and ankle are a great way to cover a soft tissue deficit and close wounds faster than local wound care alone. These skills can decrease infection rates, hospital and operative time, and amputations.

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