

Transpositional Plantar Artery Angiosome Flap for Reconstruction of Diabetic Foot Skin Defect: A Case Report

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Abstract: Limb length preservation may have a survival advantage for diabetics and has been advocated in many studies. The development and use of transpositional skin flaps have provided a great option for otherwise non salvageable lower extremity skin defects and help preserve limb length. We present the case of a 61 year old male with uncontrolled diabetes and left foot osteomyelitis who had a medial wound defect measuring about 15 cm in length. He had undergone multiple failed debridements and was recommended for below knee amputation. The use of lateral plantar artery flap provided successful wound management and limb preservation with a post-operative course that required interdisciplinary team follow up. This case study highlights another great option for using skin flaps in limb salvage.

Key words: Septic Arthritis, 1st metatarsophalangeal joint, Joint Infection, Salvage

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Many efforts and studies have been directed at limb salvage, however these can be very challenging in the setting of extensive skin defects and infection. In the presence of significant defect and recurrent osteomyelitis, management is geared towards definitive proximal amputations in the leg. However, limb length preservation may offer a survival advantage for diabetics and has been advocated in many studies. Pinzur et al (1) reported recent trends in amputation surgery favoring amputation at the most distal level to preserve the patient's ability to walk. Stone et al (2) also reported that patients with diabetes undergoing more distal limb preservation procedures had better function and survival compared with those with below-knee amputations. With the number of complications of diabetic foot wounds, including infections and poor healing potential, it has become extremely debatable if preservation is really warranted.

Boffeli and Waverly in 2016 described a series of 4 cases in which transmetatarsal and Lisfranc amputations with compromised tissue defects were covered using medial and Lateral Plantar Artery angiosome-based rotational flaps. They reported excellent results. The use of local perforator flaps for the reconstruction of the distal leg, ankle, and foot has been reported in literature in management of traumatic wounds, chronic wounds and burns. Cigna et al also presented a case of using an island lateral plantar artery perforator flap as a minimally invasive procedure that provided a valid alternative for the repair of glabrous plantar defects. The development and use of transpositional skin flaps have provided a great option for otherwise non salvageable lower extremity skin defects and help preserve limb length.

The aim of this case study was to present the satisfactory outcome of a transpositional plantar

artery angiosome flap used to reconstruct a significant skin defect following failed extensive debridement of necrotic soft tissue and bone in the medial column of the foot in a diabetic patient.

Case

A 61-year-old patient with uncontrolled Diabetes and peripheral neuropathy having a medial foot skin defect and osteomyelitis left foot presented to the emergency department after a twisting foot injury. He reported unsteady gait with pain and bleeding through the wound dressing. He had a history of chronic non healing and necrotic ulcers to left extremity status post free latissimus dorsi muscle flap and wound debridement by the plastic surgery team. Multiple debridements of necrotic soft tissues and bones of the first ray and medial cuneiform resulted in a wound defect measuring about 15 cm. Posterior tibial and intermetatarsal arteries 3 and 4 pulses were noted as biphasic on Doppler. Dorsalis pedis pulse was not assessable due to extent of wound. X-ray imaging showed complete dislocation of Lisfranc's joint. His hemoglobin A1c was noted at 9.6%. The patient was already on community administered Zosyn via PICC line per infectious disease. Vascular surgery and Plastic surgery teams previously had a lengthy discussion with patient regarding BKA but patient adamantly refused.

Initial presentation of the patient in the emergency department is as noted in figure 1.



Initial treatment was bleeding control followed by closed reduction of the Lisfranc's joint (figure 2). The Podiatry team provided wound care recommendations and patient was to continue to follow up with plastic surgery. He was to be NWB for at least 12 weeks in CAM walker, crutches provided, and Knee scooter, and to be discharged home on IV Zosyn per ID.



Figure 2: XR images show realignment of deformity

On day 22 following closed reduction in ED, patient presented to the outpatient podiatry clinic with new left Lisfranc's dislocation with residual extensive wound/ulceration over the medial ankle and foot (See figure 3). There was also exposed 2nd metatarsal, intermediate and lateral cuneiforms and navicular bones. Wound culture was positive for rare *Enterobacter cloacae* complex, and rare *Stenotrophomonas maltophilia*. MRI findings were consistent with osteomyelitis involving the cuboid, lateral cuneiform, middle cuneiform, 2nd through 4th metatarsal bases, and 2nd metatarsal head as well as midfoot Charcot arthropathy. Patient expressed repeated intense desire to save his foot.

start Meropenem, oral Levaquin and fluconazole. Patient returned to the OR for the second stage of the procedure after noting adequate vascular supply to lateral left foot (Figure 5A). Left Chopart

Amputation was performed with tendon balancing. Lateral plantar artery skin flap was brought from the lateral side of the foot to the medial side and was remodeled to fit the area. This created a well approximated skin flap that provided wound closure primarily. (See figure 5). There was also application of Amniox skin grafting in a cross hatching technique to the proximal leg skin ulceration.



Figure 3

Intervention

Planned surgical intervention was a staged procedure with initial wound debridement, excision of metatarsals 2 and 3. On the initial debridement, there was also excision of both remaining intermediate and lateral cuneiforms, navicular and cuboid. Intraoperative specimens were obtained. Negative pressure wound therapy was applied and patient was admitted inpatient and adequate assessment of soft tissue viability maintained.



Figure 4: Wound debridement using Misonix pulse lavage with 10L LR, then Irrisept applied and rinsed with saline

On postoperative day 3 after initial debridement, the previous intra-operative culture results were positive for *Enterobacter Cloacae*, *Stenotrophomonas Maltophilia* and *Candida*. Infectious disease recommendations were to



Figure 5.

On day 3 after the second staged procedure, clean margin of wound culture remained positive for *Enterobacter*, *stenotrophomonas*, and *candida*. After consultation with infectious disease, the plan was to discharge patient on oral fluconazole and Levaquin and additional 6 weeks of intravenous Tigecycline. Prior to discharge, the patient was placed in a total contact cast with windowing for twice daily dressing changes. The patient was followed weekly at podiatry wound clinic and TTC was transitioned to CAM walking boot. Patient was also referred to hyperbaric oxygen therapy during this period. After 6 weeks, the patient received a prescription for a chopart prosthesis and was allowed to bear weight on the extremity. He also received a patellar tendon-bearing brace. The postoperative course was uncomplicated and the flap survived with complete wound healing by 6 months. He had some residual leg wounds that were managed conservatively.



Discussion

Limb salvage remains controversial when it comes to the level of amputation. While the level of the amputation should be dictated by the extent of soft tissue damage, healing potential of the stump, and rehabilitation potential of the patient, many surgeons suggest more proximal amputations like below knee or above knee amputations that are more definitive and more effective than distal limb salvage. They advocate that distal amputations in a chronic non healing diabetic foot infections simply buy time and expose patients to multiple surgeries and repeated anesthesia.

Dillingham et al in 2005 showed in their study that patients with an initial foot or ankle amputation were 20% more likely to incur additional amputation surgeries on the same limb. However many studies have shown satisfactory limb salvage achieved by the motivated patients and knowledgeable surgeon (8,9). Also recent evidence suggests that more proximal amputations have greater the risk of perioperative death. Study by Schofield et al (7) demonstrated survival rates of 8.4% post-amputation in patients with diabetes at 10 years.

In addition, it is not unrealistic to consider the psychological importance of limb preservation to the patient. Depression following amputation has been reported in literature resulting from an adjustment reaction and sudden disability.

The lateral plantar artery angiosome transpositional flap provides a great option for the repair of otherwise non-salvageable limbs and, in this case, the medial column wound defect. Prior studies by Boffeli and Waverly showed effectiveness plantar flaps. Our study advocates for aggressive limb salvage despite the presence

of significant defect with appropriate consideration for patient factors.

There was multidisciplinary management of this patient including nutritionist, endocrinology, infectious disease, and hyperbaric oxygen therapy.

The patient eventually received a chopart prosthesis and was able to ambulate on the affected limb. This was a successful outcome for the patient.

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