

# Staged Treatment of a Plantar Midfoot Ulceration with Use of a Hemisoleus Muscle Flap, Application of External Fixation and Split Thickness Skin Graft



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## Case Study

A case is presented of a 57 year old male who underwent a plantar fasciotomy with subsequent postoperative soft tissue infection. This resulted in a chronic painful wound to the plantar medial left foot after the infection resolved. Non-invasive vascular studies and clinical vascular examination were normal. He failed conservative therapy including local wound care and offloading and elected to undergo primary closure 8 months later. A fissure developed along the incision 6 weeks postoperatively and persisted for 9 months despite continued wound care. A second attempt at primary closure was made and approximately three weeks later the incision partially dehisced. Progressive healing was achieved for three months, but the patient fell at this time which resulted in the wound reopening. An MRI was obtained and ruled out osteomyelitis or presence of a foreign body. The patient then elected to undergo scar excision with placement of an abductor hallucis muscle flap. The patient had an uneventful postoperative course and was transitioned to heel weight bearing at 12 weeks postoperatively. At four months postoperatively, the incision partially dehisced and became a chronic ulcer (Fig.1(A)). At this time, the patient was given the option of a below knee amputation and he declined. After 5 months of additional conservative therapy with no improvement in appearance

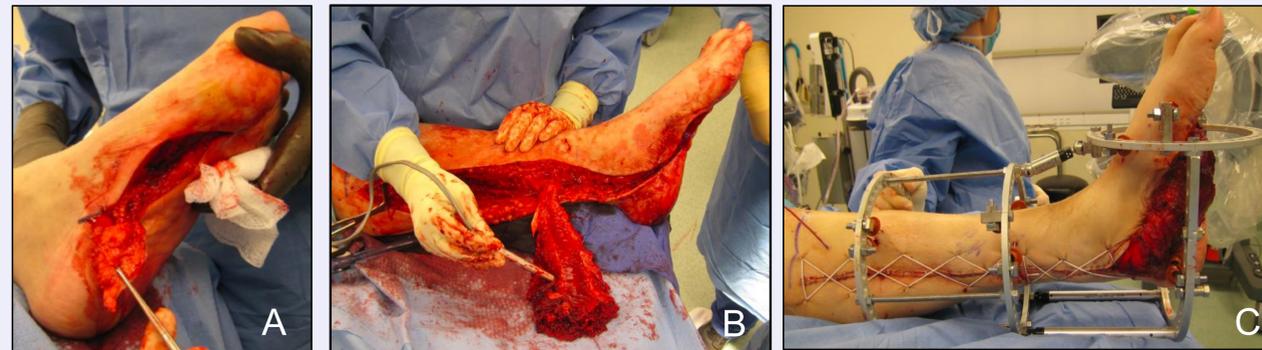


Figure 2. Intraoperative (A) Excision of Chronic Wound (B) Incision and dissection of medial soleus (C) Closure with application of External Fixation for ankle motion and flap protection.

## Surgical Technique

An ellipsoid incision was made surrounding the wound and carried deep to the level of the plantar musculature. The wound was irrigated with normal saline and nonviable soft tissue was excised, creating a large defect (Fig.2 (A)). The incision was continued proximally through the tarsal tunnel and along the medial aspect of the calf. The incision was carried deep and the crural fascia was incised longitudinally allowing exposure of the gastroc-soleus complex. The medial portion of the soleus muscle belly was transected proximally and freed from the lateral muscle belly along the central raphe. An intraoperative doppler was utilized during this dissection to identify perforators of the muscle (B). The most distal perforator was identified approximately 6 cm above the tip of the medial malleolus. The muscle was transposed distally for coverage of the soft tissue defect. An external fixator was also applied (C).

Three weeks later the external fixator was removed and the muscle flap was debrided to bleeding, granular tissue (Fig.3(A)). A STSG was harvested from the proximal left thigh with a dermatome and applied after being fenestrated (B). Harvest and skin graft sites were covered with sterile dressing and negative pressure wound therapy was applied.

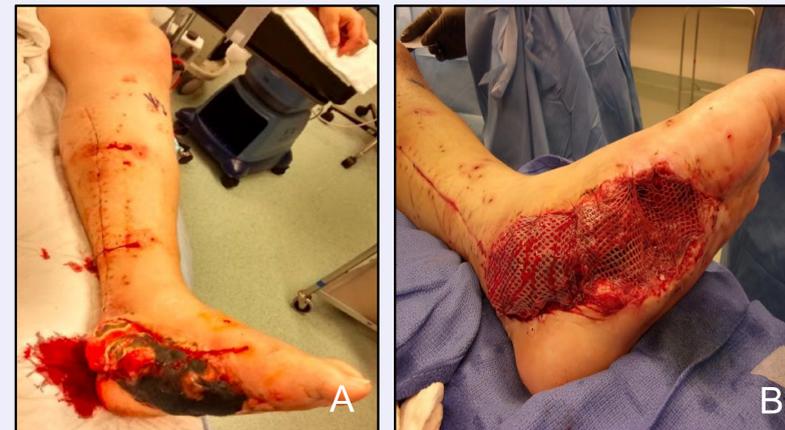


Figure 3. Intraoperative (A) status post 3 weeks from muscle flap (B) Fenestrated STSG applied to debrided muscle flap.

## Statement of Purpose

This case study presents our treatment of a chronic wound that failed to heal despite local wound care and several attempts at primary closure. We present our surgical technique for mobilizing this flap and recommend concomitant use of external fixation to decrease motion of the flap on the wound bed, allowing for neovascularization and full incorporation.



Figure 1. Preoperative (A) Chronic ulceration to plantar medial left foot (B) Ellipsoid excision of ulcer.

## Literature Review

MHS flap reliability has been questioned due to variability in vascularity, but successful coverage of distal lower extremity defects have been reported.<sup>1-5</sup> The use of a MHS flap for plantar foot defects is a novel application. The medial soleus belly averages 25.4 cm in length, 6.9 cm in width with mean surface area of 87.5 cm<sup>2</sup>.<sup>1</sup> The medial soleus vascular supply is mainly from the posterior tibial artery (PTA) via multiple minor pedicles. The medial soleus has perforators from the PTA extending the length of the muscle.<sup>1-3,5,7</sup> Raveendran *et al.* reported the distal perforators of the PTA averaged 6.5 cm, 11.6 cm, and 16.8 cm from the medial malleolus.<sup>5</sup> The flap's pivot point is based off the muscle's distal perforator. Bourdais-Sallot *et al.* reported the pivot point for MHS is 38.2% of the tibial length.<sup>1</sup> The MHS has an extended arc of rotation compared to a full soleal flap, which allows a greater area of coverage while maintaining plantar-flexion at the ankle.<sup>4,6-8</sup> Techniques, such as excising the epimysium, can increase the flap's range by 20%.<sup>2</sup>

## Discussion

To our knowledge, the use of a MHS flap for coverage of a plantar foot soft tissue defect has not been previously described. MHS flaps have been used to cover defects in the proximal and distal lower extremity. Techniques can be used to extend the range of coverage of the medial soleus in order to reach the plantar foot. With careful and proper planning, the MHS flap is an option for coverage of soft tissue defects of the plantar foot.

The goal of our staged procedure was to heal the chronic ulceration and provide a functional lower extremity for ambulation. Within 10 weeks of MHS flap with external fixator and STSG, the patient was able to ambulate with a well adhered and fully incorporated graft. No dehiscence has occurred in 17 months.



Figure 4. Clinical images (A) healing STSG five weeks postoperatively and (B) fully incorporated split thickness skin 10 weeks graft.

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