Reverse Sural Artery Flap For Complex Lower Extremity Wounds: A Case Series

Michael Kateman, DPM Alexus Cox, DPM Thomas Paulick, DPM, FACFAS

Ascension Wisconsin – Milwaukee, WI, Foot & Ankle Specialists - Racine, WI

Statement of Purpose

Large posterior heel wounds present a difficult challenge to foot and ankle surgeons. Regardless of the etiology, it is their unique location, which significantly limits the possible salvage options. Despite attempts to provide local wound care, many patients succumb to more proximal amputations. There are few proven salvage options for these complex wounds. One option is the reverse sural artery flap (RSAF). The purpose of this study is to evaluate the treatment and outcomes of five case reports using the reverse sural artery flap.

Literature Review

Distal lower extremity reconstruction of soft tissue defects in the lower leg and foot after traumatic injury or due to chronic wounds is a challenging and crucial issue[1,2]. The reverse sural artery flap was first described by Masquelet et al in 1992 as a sural neurocutaneous island flap and later changed to reverse sural artery flap by Hasegawa et al. Since this has gained popularity of the sural flap over the mainstay microsurgical free flap for the treatment of lower limb wounds[2,3].

The advantages of a reverse sural artery flap are the wide arc of rotation, full thickness skin coverage with its own blood supply, relatively easy elevation and minimal donor site morbidity[1,4]. Donegan etal published a case report with thirteen year follow up on a patient that underwent reverse sural artery flap to the plantar calcaneus due to a traumatic injury. The flap was noted to provide soft tissue coverage with long term durability and functionality[1]. The disadvantage of the reverse sural artery flap in the lower extremity is flap necrosis typically due to venous congestion. However, can result from excessive rotation of narrow flap pedicle or high pivot point with complications ranging from 5% to 59%[1]. In a study by Perumal et al it was found that flap necrosis was higher in defects distal to the ankle joint with a reverse sural artery flap and surgeons should be aware of this[3].

Recent literature has shown that the reverse sural artery flap does remain a safe salvage option for a variety of patient's. In 2018, Dar et al. found that there was no significant difference associated with flap loss based on patient age, diabetes mellitus or peripheral vascular disease[2].

Case Study

Case #1: 48 year old female presented to the hospital s/p motorcycle accident with left foot pain and left heel degloving injury. Radiographs demonstrated fractures of metatarsals 2-4. Initial reduction of metatarsal fractures was performed with kirschner wire fixation. The left heel skin was reapposed and sutured. At the initial post operative appointment, there was noted to be necrosis of portions of the posterior heel. Surgery was scheduled as a staged procedure.

Case 1 - Image A: Immediately post injury, Image B: Intraoperative RSAF turndown

Stage one was to remove all necrotic tissue from the posterior and plantar aspects of the left heel. Debridement was carried out until healthy appearing and bleeding tissue was encountered. She progressed throughout the postoperative period well and the second stage was carried out 2 weeks later.
During the second stage, the soft tissue deficits on the left heel were covered with a RSAF. The flap harvest site was covered with a STSG obtained from the ipsilateral calf. The left lower extremity was placed into a ring external fixator. Serial post operative appointments showed excellent flap incorporation. The external fixator was removed at 4 weeks and she was placed into a cast for 1 week. She was then transitioned to a NWB Cam boot for 4 weeks. She did go on to heal all sites and is walking in normal shoe gear with no pain.

Case #2: 80 year old minimally ambulatory male with right heel decubitus ulceration presented to the clinic. Conservative measures including offloading and local wound care was attempted and failed. Patient was consented for surgical debridement of the heel eschar with reverse sural artery flap and split thickness skin graft harvest. Adjuvant wound vac therapy was initiated for two weeks for optimization of flap vascular ingrowth. The patient was placed into a splint and was non-weightbearing for 8 weeks. At final follow up the patient is able to ambulate in normal shoes. The flap exhibited excellent incorporation with no signs of necrosis.

Case #3: 55 year old female with a history of diabetes, peripheral neuropathy and peripheral arterial disease presented to the clinic with a chronic diabetic heel wound. The patient underwent reverse sural artery flap for initial surgical treatment of her heel wound.

Image C: Immediate post op with external fixator, Image D: 12-week follow up appointment

At day three post operatively, the patient began to show signs of venous congestion surrounding the flap. Despite attempts to relieve congestion, the flap necrosed. The patient underwent a second, medial plantar artery flap procedure. Her initial RSAF incision and graft sites healed uneventfully.

Case #4: 37 year old male with history of type 1 diabetes mellitus, coronary artery disease, end stage renal disease and right heel pressure ulcer who had failed conservative wound care underwent a reverse sural artery flap. Postoperatively patient was placed into a splint and was instructed to be non-weightbearing. Patient healed uneventfully despite noncompliance with weightbearing, he reports no pain and is back into normal shoes.

Case #5: 79 year old male with history of diabetes mellitus, end stage renal disease and peripheral vascular disease presented with infected bilateral heel ulcerations. Patient completed course of antibiotics. He was scheduled for bilateral heel debridements along with RSAF to the left heel. Despite several comorbidities, the patient exhibited good incorporation of his flap with full healing of skin graft donor sites. He was able to return to normal shoe gear with no compromise of his RSAF.

Results

4 out of 5 patients had satisfactory results with the sural artery flap. One patient experienced necrosis of their flap secondary to venous congestion which resulted an additional flap procedure. Four patients who healed the reverse sural artery flap successfully, had minimal complications and all returned to normal shoe gear.

Analysis and Discussion

Heel wounds, especially those originating from trauma or those that are chronic in nature can be a challenge to treat surgically. This can be further complicated by patient comorbidities. Current research supports the use of a reverse sural artery flap as a limb salvage option[1-4]. The reverse sural artery flap has been proven to be a robust solution when soft tissue coverage is needed[4]. In addition, in patients with comorbidities that may ordinarily preclude them from attempted limb salvage, RSAF is a proven viable option[1,2,4].

We describe 5 separate cases of the use of a reverse sural artery flap for a complicated traumatic heel injury as well as chronic heel wounds. All cases presented with heel wounds that were resistant to conservative treatments and that were limiting the foot function of the patient. In general, all patients did well with the flap with minimal complications.

Our case reports align well with previous studies of the reverse sural artery flap. Four out of five patients had excellent surgical outcomes. One patient required a staged procedure for debridement of necrotic tissue following a degloving type injury. All patients were followed post operatively for over 12 months reporting excellent improvement in function.

In conclusion, with proper surgical technique and post-operative management, the reverse sural artery is a suitable salvage option for patients with complex heel wounds, regardless of etiology. In our series patients had minimal complications, which included previously reported venous congestion, and good post-operative outcomes.

Case 4: Image A: PreOp Ulceration, Image B: Intraop sural artery pedicle, Image C: 5 mo. post op

Conflicts of Interest

None

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