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Original Article

# Simultaneous soft tissue coverage of both medial and lateral ankle wounds: Sural and rotational flap coverage after revision fixation in an infected diabetic ankle fracture

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ABSTRACT

*Aims:* To describe a case of simultaneous medial and lateral soft tissue coverage for exposed orthopaedic implants in the setting of revision fixation of a non-united ankle fracture. This was achieved using a sural flap as well as a propeller flap.
*Methods:* Case report.
*Results:* Both the sural and posterior tibial artery based rotational propeller flap healed without incident. The underlying fracture healed successfully and the patient returned to normal shoe wear.
*Conclusions:* The sural flap in conjunction with the posterior tibial artery based rotational flap is effective in providing simultaneous medial and lateral soft tissue coverage to the ankle.



## 1. Introduction

Soft tissue coverage for ankle fractures is integral to fracture healing.[1] In the setting of revision plating of diabetic ankle fractures, it is not always possible to close the native tissue over the plate construct. Traditionally, soft tissue defects of the distal third of leg overlying tendon, bone, or metallic implants have been covered with free flap soft tissue grafts.[2] In these cases, the use of soft tissue flaps has been described to provide adequate soft tissue envelope which is mandatory for fracture healing.

Tobacco use is a known risk factor for both wound complications and delayed fracture healing.[3] In several large series of free flaps tobacco use has been shown to be a risk factor for

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superficial and deep wound infection.[4–6] In the setting of open reduction and internal fixation of ankle fractures, tobacco use is associated with increased postoperative complication, especially superficial or deep wound infection.[4,7,8] The rates of complication are increased when tobacco abuse is combined with diabetic patients.[7]

Previous options for coverage soft tissue coverage of the distal third of the leg have included free flaps, pedicle (rotational) flaps, and skin grafting.[9] The condition of the surrounding tissue and the location of the tissue defect dictate the type and size of flap available to the surgeon. Free flaps are technically demanding because of the need for microsurgery and often require anticoagulation and intensive care unit monitoring, making them a significant undertaking. Free flaps also have a significant failure rate with a recent study of free flap for lower extremity coverage having a 13% failure rate.[10]

The sural artery based flap is based on Masquelet's work on skin island flaps and the concept of the neuroskin flap.[11] By using the superficial sural artery that runs along the sural nerve in the distal leg, a fasciocutaneous flap can be raised and transferred to the distal third of the ankle with predictable success.[12] This flap has become highly utilized in ankle soft tissue coverage when a unilateral defect is present. In cases where coverage is needed both medially and laterally, an additional coverage method must be employed.

However, with improved understanding of angiosomes and the vascular supply to the skin and fascia, local fasciocutaneous flaps are becoming more common. Recently, the success of rotational flap has been described in the orthopaedic literature, based on fascial perforators.[13] These "propeller" flaps can be rotated 180° around the perforating vessel, facilitating coverage of soft tissue defects.

In this case report we describe the use of both a sural and rotational propeller flap to achieve simultaneous coverage of both the medial and lateral malleoli, leading to both successful fracture healing and soft tissue coverage.

## 2. Case report

A 51-year-old woman who sustained a right trimalleolar ankle fracture (AO/OTA classification 44-B3.1),[14] underwent open reduction and internal fixation with one third tubular plate fixation over medial, lateral and posterior malleoli. The patient was non complaint with her non-weightbearing status and smoked one pack per day of tobacco cigarettes throughout her recovery. Three weeks postoperatively she was noted to have both medial and lateral wound drainage and was started on oral antibiotics. Due to continued poor wound healing, she underwent irrigation and debridement, hardware removal and negative pressure wound therapy. Her intraoperative tissue cultures revealed two different varieties of gram positive cocci. Sixteen weeks after the original operation, revision fixation was accomplished with plating of both malleoli and placement of syndesmotic screws. However, working in a compromised soft tissue envelope (Fig. 1), this fixation resulted in a medial wound measuring 8 cm long 3 cm wide, with a lateral wound measuring 11 cm long and 2 cm wide.

This presented the challenge of covering two sizeable wounds in the distal third of the leg. The decision was made to use pedicled fasciocutaneous flaps: a propeller flap based on a perforator from the posterior tibial artery to cover the medial wound, and a sural fasciocutaneous flap for the lateral wound. Due to her age and heavy smoking history, it was decided to perform the sural flap in a staged fashion to improve flap viability. In the first stage, the patient was placed in the prone position and irrigation and debridement of the two wounds was performed. Next, a 9 cm long by 4 cm wide flap was marked on the posterior aspect of the calf, arising from the middle third, utilizing the standard reflection point of 5 cm from the tip of the lateral malleolus. The fascia was dissected circumferentially and the sural vessel and nerve were

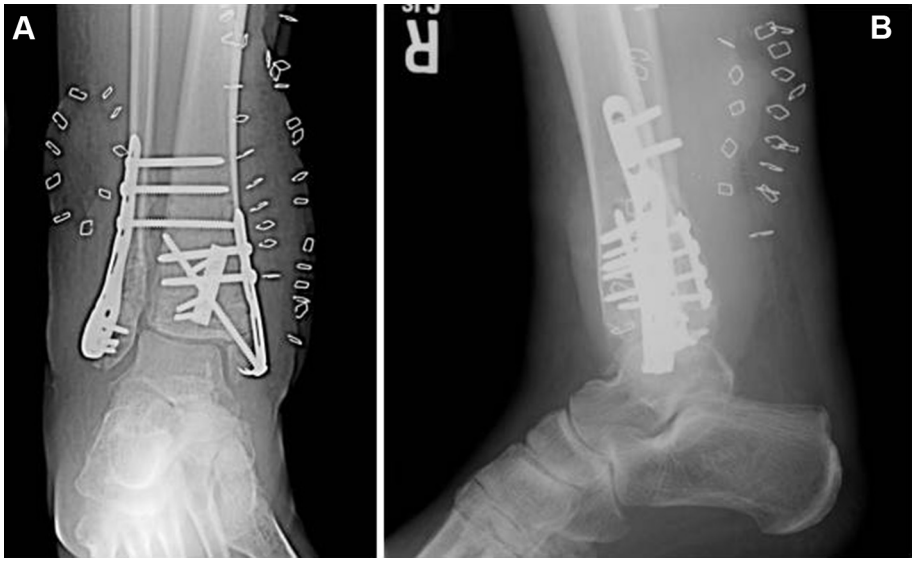


**Fig. 1 – A 51-year-old female diabetic smoker sustained a trimalleolar ankle fracture. Radiographs show mortise (A) and lateral (B) views of the definitive revision construct.**