



## Coverage of Exposed Bone of the Lateral Malleolus With a Proximally Based Lateral Malleolar Perforator Flap



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### ARTICLE INFO

Level of Clinical Evidence: 4

#### Keywords:

ankle  
infection  
reconstruction  
pedicled flap

### ABSTRACT

The treatment of soft tissue defects of the ankle, combined with an implant-related infection, remains a challenge. The present case report illustrates the use of a pedicled perforator flap for soft tissue reconstruction to cover a postoperative defect at the lateral malleolus after an ankle fracture.

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Soft tissue defects of the lateral malleolar region can occur after trauma or can be secondary to surgery in the case of open reduction and internal fixation of an ankle fracture. An exposed plate resulting from a secondary wound infection will frequently lead to a chronic soft tissue defect. The superficial position of the fibula and the lack of proper soft tissue coverage are contributing factors to the development of a wound complication and the subsequent defect. Deep infection after operative treatment of ankle fractures can occur, with an incidence of up to 5% (1–3). Several factors have been identified in ankle fracture surgery that contribute to a greater rate of surgical site infections. An open fracture, diabetes mellitus, peripheral vascular disease, and a delay in surgical treatment have shown to be risk factors for wound infections (4,5). In addition, smoking increases the risk of infection up to fivefold after ankle fracture surgery (6). Smoking has also been related to poor fracture healing in the presence of an infection (7). Additionally, the presence of osteosynthesis material has been shown to significantly increase the infection rate (8). Finally in the after treatment care, early motion has been associated with an increased risk of wound infection (2).

Different surgical techniques have been described for the reconstruction of chronic soft tissue defects in the lateral malleolar area,

including skin grafts, cross leg flaps, pedicled island flaps, perforator flaps, local muscle flaps, and free flaps.

The aim of the present case report was to describe our experience with the proximally based lateral malleolar perforator flap to cover soft tissue defects with an exposed distal fibula and osteosynthesis material.

### Anatomic Considerations

The peroneal artery, or fibular artery, branches off the posterior tibial artery in the upper part of the lower leg. It courses along the medial aspect of the fibula in the deep compartment to supply the posterolateral lower leg, ankle, and heel. The artery divides into many different arteries, resulting in cutaneous perforators. The anatomic blocks of tissue supplied by these cutaneous perforators are called angiosomes. These angiosomes are linked together by anatomic vessels (9). Distally, the perforator artery joins with the posterior tibial artery by the communicating branches deep to the Achilles tendon (10).

The perforator flap we used is called the pedicled peroneal artery perforator flap and can be dissected using many different methods. The flap has 5 different types: propeller flap, peninsular flap, advancement flap, proximally based island flap, and distally based island flap.

The peninsular flap is based on the perforator plus concept, with a dual arterial supply from a perforator and random supply from its base, plus dual venous drainage. Of the different types of pedicled peroneal flaps, the peninsular flap has often been the flap of choice owing to the lower risk of venous congestion and preservation of the peroneal artery (11).

**Financial Disclosure:** None reported.

**Conflict of Interest:** None reported.

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**Fig. 1.** Radiographs of our patient. (A) Radiograph of the initial ankle fracture. (B) Radiograph showing the osteosynthesis. (C) Radiographic view after wide resection. (D) Radiograph showing final reconstruction to stabilize the mortise.

### Surgical Technique

Preoperatively, the perforators are verified using handheld ultrasound Doppler flowmetry. The flap size required to cover the defect is marked on the skin. The operation is performed with the patient under general anesthesia. The chronic wound is debrided, and the trauma surgeon removes the plate. The nonviable edges and scar tissue are removed. The flap is harvested in the deep subcutaneous plane, with care taken to identify and preserve the perforators. Occasionally, the perforator will be dissected for several centimeters to allow easier rotation or advancement. The flap is closed subcutaneously with Vicryl® 3-0 suture (Ethicon Endo-Surgery, Blue Ash, OH) and the skin with Ethilon® 4-0 suture (Ethicon Endo-Surgery). The donor site is covered with a meshed, split-thickness skin graft (1:1.5) of the same leg and sutured with MONOCRYL™ 5-0 suture (Ethicon Endo-Surgery).

Postoperatively, splinting is performed without pressure on the flap. Because of the limited mobilization, the patient receives daily low-molecular-weight heparin during the hospital stay. The patient is

advised to keep the leg raised to prevent venous congestion for the first 2 weeks postoperatively.

### Case Report

A 46-year-old female presented 2 days after inversion trauma of the right ankle that had resulted in a Weber B (supination exorotation 4 on the Lauge-Hansen classification) ankle fracture. She was a nondiabetic, active smoker, with a body mass index of 27.5 kg/m<sup>2</sup>. One week after the trauma, she underwent open reduction and internal fixation of the ankle fracture without the use of a tourniquet (Fig. 1). The fibula was fixed using a titanium one-third tubular plate and a syndesmosis screw. Postoperatively, the leg was immobilized in a cast. Eight days after surgery, the patient presented with a *Staphylococcus aureus* surgical site infection, for which antibiotics, multiple debridements, and gentamicin beads were needed. The plastic surgeon eventually designed a proximally based perforator plus flap to cover the large defect at the lateral malleolar region (Fig. 2). The secondary

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