

CASE REPORT

DISTALLY BASED FASCIOCUTANEOUS SURAL FLAP FOR SOFT TISSUE COVERING OF AN OPEN NEGLECTED TIBIAL FRACTURE: CASE PRESENTATION

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ABSTRACT

Open fractures are orthopedic emergencies that require immediate surgical intervention in order to provide fracture stabilization and to prevent development of osteitis. We present the case of a 33-years-old patient presented in our clinic for a type IIIB neglected open fracture of the distal tibia. We used external fixation for fracture stabilization and a distal based fasciocutaneous sural flap for covering the wound. The purpose was to obtain union of the tibia and to reduce the risk of infection. The results at 6 months are good, but the patient needs to be closely followed in time.

Keywords: open tibial fracture, soft tissue defect, external fixation, sural flap.

RÉSUMÉ

Lambeau fascio-cutané sural à pédicule distal pour couvrir une fracture ouverte négligée du tibia: présentation de cas

Les fractures ouvertes représentent des urgences qui nécessitent une intervention chirurgicale rapide pour réaliser l'ostéosynthèse de la fracture et pour diminuer le risque de sepsis. On présente le cas d'un patient âgé de 33 ans qui a été admis dans notre clinique pour une fracture négligée de type IIIB du tiers distal du tibia. Nous avons utilisé le fixateur externe pour stabiliser la fracture et un lambeau neuro-cutané sural à pédicule distal pour recouvrir la perte de substance. Le but fut d'obtenir la consolidation de la fracture et de réduire le risque d'infection. Les résultats à 6 mois sont encourageants, mais le patient doit être surveillé pendant des années.

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Mots-clés: fracture ouverte de tibia, perte de substance, fixateur externe, lambeau sural.

INTRODUCTION

Open fractures are orthopedic emergencies that require immediate surgical intervention in order to provide fracture stabilization and to prevent development of osteitis. Over time, Tscherne¹ described four eras of open fracture management: era of life preservation, era of limb preservation, era of infection avoidance and era of functional preservation. The main steps that should be followed when dealing with an open fracture are appropriate antibiotic therapy, immediately debridement of the wound, repeated debridement at 24-72 hours, fracture stabilization and functional rehabilitation. Stabilization should use the method that provides adequate stability with a minimum of further damage to the vascularity and soft tissue of the zone of injury (Russell²). Regarding type IIIB Gustilo-Anderson open fracture, in order to prevent infection, it is necessary to cover the soft tissue defect as soon as possible, when local conditions are favorable. Particularly for the distal tibia, soft tissue covering can be achieved using some local, locoregional, free flaps or cross leg flaps. It should be taken into consideration that no approach is ideal and for each of these flaps there are advantages and

disadvantages; therefore, the choice of the type of the flap that best suits the injury should be correlated to the location, size, local and vascular condition of the defect.

CASE PRESENTATION

We present the case of a 60-year-old patient brought in our clinic for pain, deformity and wound of the distal tibia, extending from the antero-medial face to the lateral aspect of the leg, by a fall 12 hours before admission. Clinical and X-Ray exams revealed a type IIIB open fracture of the distal tibia and peroneum (Fig. 1). The patient was admitted for surgery consisting of wound debridement and osteosynthesis with external fixation (Fig. 2); after proper surgical removal of the affected soft tissues, a 4/5 cm defect persisted on the antero-medial side of the distal tibia. In addition, we initiated antibiotic (using Ceftriaxon 2 g/day, Metronidazolium 1 g/day and Gentamicine 80 mg/day for 5 days) and anticoagulant therapy.

However, the wound evolution was not satisfactory, therefore another two wound debridements were performed at 10 and 21 days after osteosynthesis. After these reinterventions, the defect reached 7/9

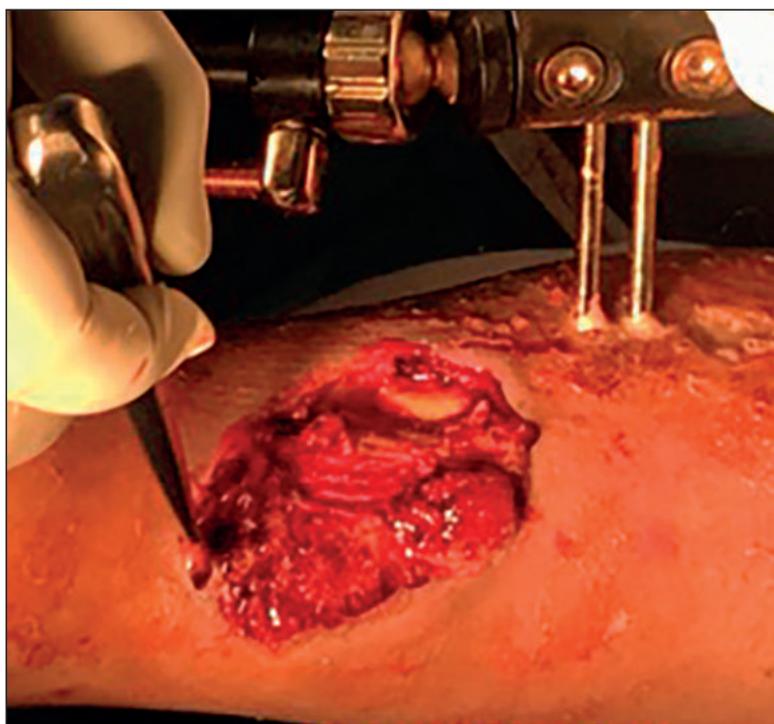


Fig. 1. Clinical aspect of the wound



Fig. 2. Osteosynthesis with external fixation

cm in size. Considering the extent and location of the defect, we took into consideration two options to cover the wound: cross-leg or homolateral fasciocutaneous sural flap. Because we believed that the patient would not have been compliant with the cross-leg technique, we have finally chosen the sural flap.

The intervention began drawing of the flap as much proximal and median as possible. Incision of the fascia was done using an offset of 1 cm in order to allow a better tensioning of the fascia at the receiving site. Flap's blood supply came from the vascularization of the sural nerve; we included in the flap the small saphenous vein and another vein parallel to the first one to allow venous return (Fig. 3). Distal pedicle of the flap was not tunnelized in the subcutaneous tissue and we took care not to twist the pedicle. After elevation of the flap, we checked its revascularization (Fig. 4).

The defect of the donor site was covered by the plastic surgeon using a split-thickness skin graft taken from the homolateral thigh. The evolution of the flap was slowly favorable, the integration being complete at 4 weeks after surgery. Because the fracture reduction was adequate, with early signs of consolidation at 2 months, we kept the external fixation in place for 3 months; after this period, we have

removed the external fixation and the patient was instructed to walk with crutches for another month; full weight-bearing was permitted at 4 months.

DISCUSSION

Soft tissue defects associated to open fractures are permanent challenges for orthopedic surgeons. The fasciocutaneous sural flap was first described by Hasegawa³ and is perfectly suited for soft tissue defects in the distal tibia, ankle and foot. Its vascularization is assured by the vessels of the sural nerve and the perforating vessels from the fibular artery. Together with the lateral supra-malleolar flap designed by Masquelet⁴, they can be used to cover almost 90% of soft tissue defects in the distal tibia. This flap sacrifices the sural nerve, but the prejudice is minor, consisting in anesthesia of the lateral border of the foot that is rarely incriminated by the patients.

Free flaps are more frequently used in cases with important, extended soft tissue defects. Fasciocutaneous flaps, such as the parascapular⁵ flap, radial or ulnar flap^{6,7}, lateral brachial flap, usually leave unaesthetic scars at the donor site or compromise an important vascular axis. Pure muscular

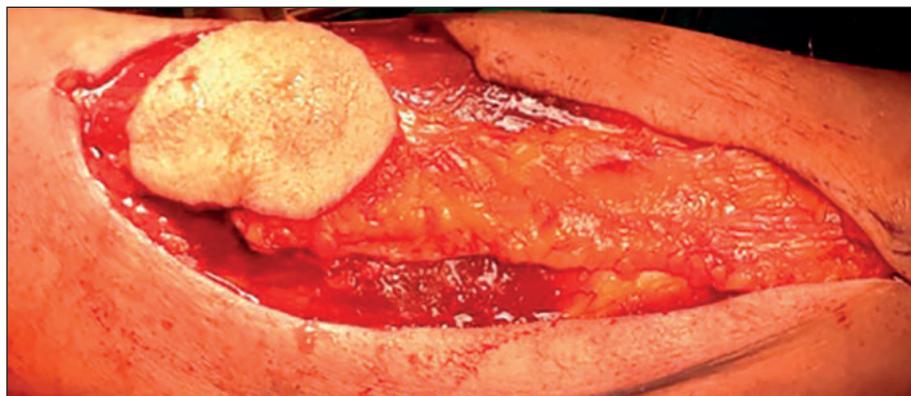


Fig. 3. Sural flap elevated with good vascularity

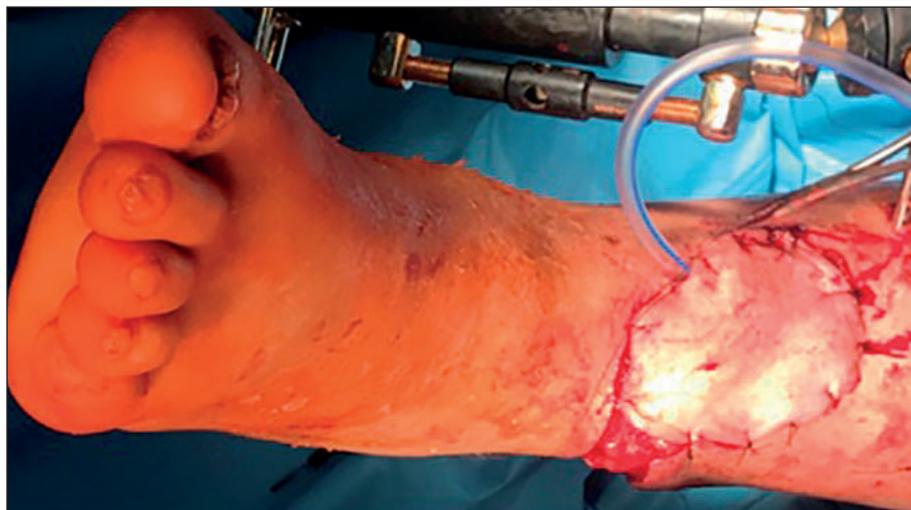


Fig. 4. Sural flap covering soft tissue defect

(gracilis, serratus) or musculocutaneous (latissimus dorsi) flaps are reserved for greater soft tissue defects, vascular lesions or failure of locoregional flaps⁸.

Cross-leg has an important role in solving soft tissue complications associated with open fractures, especially when the local vascular status is uncertain^{9,10}. However, the main issue regarding this technique consists in the difficulty of convincing the patients to accept it.

Open fractures are surgical emergencies and the best results are obtained when surgery is performed in the first 6 hours after trauma; after 12 hours, the wound is considered infected; the delay in appropriate treatment, the degree of contamination, the degree of soft tissue devascularization influence the outcome². Even when surgical treatment is immediate and adequate, the rate of infection in type IIIB open fractures is 10%-50% (Gustilo^{11,12}). In this case, there were 12 hours of delay before arrival in our clinic, therefore the risk of infection is still very high and the patient should be under careful surveillance over the years; we should also mention that this is one of the reasons that we kept the external fixation for fracture stabilization.

CONCLUSIONS

Different flaps are available for covering soft tissue defects in the distal tibia. The right flap for every injury can be chosen depending on location, gravity, local terrain and surgeon experience, but almost 90% of cases can be solved using the locoregional flaps. The distal based fasciocutaneous sural flap is easy to perform and has good results over time; it can be used independently of the patient local status. The success of any flap relies on a very instructed and dedicated team, including the orthopedic surgeon, the plastic surgeon, the nurses and especially the patient himself.

Author contributions:

F.G., R.M., C.B., B.S., G.S., and S.C. were responsible for the diagnostic procedures, clinical diagnosis, and treatment decisions. F.G., R.M., C.B., and S.C. performed

the surgery. F.G., G.S., and R.M. wrote the manuscript. All authors have read and agreed to the published version of the manuscript.

Compliance with Ethics Requirements:

„The authors declare no conflict of interest regarding this article“

„The authors declare that all the procedures and experiments of this study respect the ethical standards in the Helsinki Declaration of 1975, as revised in 2008(5), as well as the national law. Informed consent was obtained from the patient included in the study“

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