

Coverage of Skin Substance Loss in the Lower Third of the Leg: About 36 Cases

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Abstract:

Skin substance loss in the leg refers to damage to the skin and soft tissue, sometimes associated with bone injuries. The seriousness lies in the superficial location of the bone, increasing the risk of infection, which necessitates early treatment. Numerous flap techniques are available to reduce treatment duration or improve aesthetics; the choice depends on both the patient and the surgeon. We conducted a retrospective study over five years (January 2017 – December 2021), involving 36 patients. The goal was to evaluate and compare the most commonly used methods for covering the lower third of the leg and to share the experience of the Plastic Surgery Department at Med VI University Hospital in Marrakech.

Keywords: Skin loss, Lower leg, Flap coverage, Soft tissue reconstruction, Infection risk.

Case Report

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INTRODUCTION

The management of leg substance loss has significantly benefited from advancements in flap harvesting techniques, evolving notably over the last two decades.

These coverage methods are increasingly used due to the frequency of trauma, often from road traffic accidents. When skin loss cannot be sutured, does not heal spontaneously, or is not graftable, a flap is necessary.

A flap is a tissue segment detached from a larger tissue structure. It can be single or multi-tissue, characterized by vascular autonomy through vascular connections to its donor site.

MATERIALS AND METHODS

We conducted a retrospective study over five years (January 2017 – December 2022), including all patients admitted with lower third leg skin substance loss to the Plastic Surgery Department at Med VI University Hospital in Marrakech.

A data sheet was completed for each patient, collecting epidemiological, clinical, radiological, therapeutic, and follow-up information.

RESULTS:

1. Epidemiological and Clinical Data:

- Sex:
All patients were male.
- Age:
Average age was 27.4 years (range: 21–59), with most cases between 23–29 years old.
- Causal Agent:
Road traffic accidents: 95%
Burns: 3%
Infections: 2%
- Location:
Predominantly anterior and anteromedial surface of the lower third of the leg.

2. Treatment:

A. Directed Healing by Vacuum-Assisted Closure (VAC):

Used in 9% of cases. VAC is a negative pressure system applied to the wound, promoting healing by reducing bacterial proliferation, stimulating angiogenesis, and reducing edema.



Figure 1: Healing progression of a lower third leg wound managed with VAC

B. Sural Neurocutaneous Flap:

Used in 46% of cases. It consists of a fasciocutaneous flap harvested from the posterior calf along the sural nerve axis (skin, subcutaneous tissue, neurovascular pedicle, fascia), including the sural nerve and its vascular plexus, and the small saphenous vein.

Dissection begins with identifying the neurovascular axis. The flap is elevated proximally to distally, guided by the transparent neurovascular axis.



Figure 2: (A) Substance loss (B) Neurovascular axis identification (C) Flap elevation (D) Axis visualized through the skin (E) Flap fixation on the wound

C. Cross-Leg Flap:

Used in 38% of cases. This heterologous fascio-cutaneous flap offers a favorable length-to-width ratio, making positioning easier. Harvest begins from the anterior edge and proceeds distally to proximally.

Dissection includes ligation of the saphenous nerve and vein, coagulation of muscular and posterior tibial artery branches, and continues until a sufficient rotation arc is obtained.



Figures 3: Pre-op tracing, flap dissection, and fixation on the wound site

D. Medial Hemisoleus Flap:

Used in 7% of cases. The medial hemisoleus muscle with a distal pedicle is ideal for lower third leg substance loss. Only one half (medial or lateral) is used due to muscle bulk.

It covers small wounds near the medial ankle and Achilles region. Requires young patients with good vascular status and intact posterior tissues. Technically demanding and less reliable than the proximally pedicled version.



Figure 4: A case of coverage by Hemisoleus Flap, flap dissection, and fixation on the wound site

3. Evolution:

Favorable outcome: 81%

Flap necrosis: 14% (due to poor post-op positioning or early weight-bearing)

Infection/dehiscence: 5% (required targeted antibiotics and surgical revision)

DISCUSSION

The lower third of the leg remains a complex region for reconstructive surgery. Various flap options exist to reduce healing time and improve cosmetic outcomes.

VAC therapy is common in multi-tissue contaminated trauma, sometimes avoiding flap surgery by using debrided tissue as graft or artificial dermis.

Sural flap is popular for lower limb reconstruction, with advantages like simplicity and nerve preservation, but has risks such as poor venous return and necrosis.

Cross-leg flaps, despite trends toward local/free flaps, remain useful when local tissues are compromised or previous flaps failed.

However, they have limitations:

High necrosis rate

Difficult bilateral immobilization

Joint stiffness, thromboembolism, and donor site aesthetics.

Distally pedicled fasciocutaneous flaps are sensitive to post-trauma edema, affecting venous return. Early use is preferable.

Flap weaning occurs after 3 weeks. Close post-op monitoring is crucial to detect early complications like necrosis or infection.

CONCLUSION

Covering skin substance loss in the lower third of the leg is challenging due to

poor soft tissue availability, fragile local vascularization, and bone exposure.

The choice depends on the patient's overall condition and local limb status. Sural neurocutaneous flap is reliable and technically accessible.

Cross-leg flap is suitable for large wounds or unusable limbs; it provides robust coverage despite the need for immobilization. Postoperative surveillance is essential for detecting early complications like necrosis or infection.

REFERENCES

- Marc Revol, & Jean-Marie Servant. Les lambeaux (Manuel de chirurgie plastique reconstructrice et esthétique. Paris: Editions Pradel; 1993.
- INTERET DU SYSTEME VAC DANS LA DIMINUTION DE LAMBEAU libre dans la chirurgie reconstructrice des membres inférieurs plaies et cicatrisations 2003 2004.
- Isenberg, J. S. (2000). The reversal sural artery neurocutaneous island flap in composite lower extremity wound reconstruction. *The Journal of foot and ankle surgery*, 39(1), 44-48.
- Ali, M., Hamoui, M., Hebrard, W., Faline, A., Roussanne, Y., Fauré, F., ... & Bonnel, F. (2007). La couverture des pertes de substance cutanée de la cheville et du pied par lambeau neuro-cutané et musculaire. A propos de 32 cas. *REVUE DE CHIRURGIE ORTHOPEDIQUE ET REPARATRICE DE L APPAREIL MOTEUR*, 93(7), 61.
- Servant, J. M., & Revol, M. (1990). Les lambeaux musculo-cutanés. *Encycl Chir. Techniques chirurgicales-chirurgie plastique reconstructrice et esthétique*, 45-085, Éditions scientifiques et médicales.

- Place du lambeau saphène médial hétéro jambier (cross-leg) dans la couverture des pertes de substance de la jambe et du pied - 16/04/08. Doi: RCO-11-2002-88-7-0035-1040-101019
- Swartz, W. M., & Mears, D. C. (1985). The role of free-tissue transfers in lower-extremity reconstruction. *Plastic and reconstructive surgery*, 76(3), 364-373.
- Stannard, J. P., Volgas, D. A., Stewart, R., McGwin Jr, G., & Alonso, J. E. (2009). Negative pressure wound therapy after severe open fractures: a prospective randomized study. *Journal of orthopaedic trauma*, 23(8), 552-557.
- Belmahi, A., Oufkir, A. A., & Fejjal, N. (2006). Sécurisation des lambeaux fasciocutanés de jambe à pédicule distal par l'anastomose saphène externe saphène interne. À propos de 15 cas cliniques. *Chirurgie plastique esthétique*. juin 2006.
- Kansal, S., Goil, P., Agarwal, V., Agarwal, S., Mishra, S., Agarwal, D., & Singh, P. (2014). Reverse pedicle-based greater saphenous neuro-veno-fasciocutaneous flap for reconstruction of lower leg and foot. *European Journal of Orthopaedic Surgery & Traumatology*, 24(1), 67-72.
- Bensassi, A., Elghadraoui, R., Zahraoui, A., Elidrissi, M., Elibrahimi, A., & Elmrini, A. (2019). La couverture des pertes de substances cutanées du tiers inférieur de la jambe: à propos de 09 cas. *The Pan African Medical Journal*, 33, 243.
- Belmahi, A., El Mazouz, S., Gharib, N., Oufkir, A., & Benazzou, S. (2003, June). The fasciomusculocutaneous flap at the leg. About 9 clinical cases. In *Annales de Chirurgie Plastique et Esthétique* (Vol. 48, No. 3, pp. 173-179).
- Belfkira, F., Forli, A., Pradel, P., Guinard, D., & Moutet, F. (2005). Expérience clinique et adaptations techniques du lambeau neurocutané sural à pédicule distal. À propos de 60 cas. *Annales de la chirurgie plastique esthétique*, 2005.
- Lee, Y. H., Rah, S. K., Choi, S. J., Chung, M. S., & Baek, G. H. (2004). Distally based lateral supramalleolar adipofascial flap for reconstruction of the dorsum of the foot and ankle. *Plastic and reconstructive surgery*, 114(6), 1478-1485.