



(RESEARCH ARTICLE)



Surgical management of the skin defect in the lower third of the leg

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Abstract

Loss of substance from the lower third of the leg is extremely common, most often of traumatic origin.

The management of the loss of cutaneous substances from the leg is a complex procedure due in particular to the specific anatomy of the leg segment and its lack of skin reserve, venous return problems, macro/micro-angiopathic disorders related to trauma or increasingly frequent acquired comorbidities (smoking, occlusive arterial disease of the lower limbs, diabetes, etc.). It must therefore be multidisciplinary and requires close collaboration between orthopaedic and plastic surgeons. The choice of coverage will depend on the etiology of the claim, its location and the state of the area to be covered. The treatment will follow the principle: parry, fix, cover. The evolution is favourable, considered satisfactory both aesthetically and functionally.

The objective:

The objective of our study is to highlight the particularity of skin substance losses, their epidemiological and therapeutic aspects, while highlighting the difficulty of coverage

We conducted a retrospective study of a series of 56 cases of leg covers at the CHU MOHAMMED VI DE TANGIER from the year 2022 to 2024. Several parameters were studied: age, sex, etiopathological factors, location and the therapeutic methods used

Keywords: Loss of cutaneous substance; Leg; Fasciocutaneous flaps; Dermo-epidermal grafts; Directed wound healing

1. Introduction

Coverage of loss of cutaneous substances from the the lower third of leg is complicated due to the poverty of adjacent soft tissues, precarious local vascularization, and bone exposure. It is most often the result of a high-energy trauma and most often the prerogative of the young subject. The choice of coverage technique will depend on the etiology of the claim, its location and the condition of the area to be covered. The treatment will follow the principle: parry, fix, cover. The evolution is favourable, considered satisfactory both aesthetically and functionally.

2. Method

Between January 2022 and August 2024, a retrospective study was conducted on 56 cases of substance loss coverage in the leg, collected at the plastic and aesthetic surgery department of the MOHAMMED VI TANGIER UNIVERSITY

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HOSPITAL, Morocco. An exploitation sheet has been drawn up for each patient in order to facilitate the collection and analysis of the various epidemiological parameters; clinical, therapeutic and evolutionary.

3. Results

At the end of the results, we found that the loss of skin substances from the leg is the prerogative of young adults, with an average age at the time of the trauma of 29 years and extremes between 14 and 65 years.

Seventy percent of the cases in our study were male. The post-traumatic cause is the most common (69.23%). The site of loss of cutaneous substance was variable, with a predominance at the medial and anterolateral level of the lower 1/3 of the leg. The time from the initial lesion to the initial treatment is 1 day to 6 weeks.

Hedging is done through a variety of methods, including:

- Directed healing: this is a surgical method in its own right, which can be indicated when a loss of substance is not suturable but its subsoil is properly vascularized, without exposure of the noble organs. Directed healing can be used exclusively or as a preparation for a graft or flap[1]. When its subsoil is properly vascularized, spontaneous healing evolves in three successive phases: suppurative debridement, budding and epidermization. The relative duration of each of these phases varies greatly depending on the cause of the necrosis (traumatic, ischemic, thermal, etc.), its location and its extent.[2]
- Skin Grafting: Like any graft, skin grafting requires a properly vascularized subsoil to survive. A distinction is made between thin skin grafts and whole skin grafts, which differ mainly in the way they are removed[3]. To ensure the survival of a skin graft, the recipient area must have certain characteristics: be well vascularized, not be hemorrhagic, not be oozing, not present an infection, be immobilized as much as possible.[4]
- Shreddings include: [5] : The sural neurocutaneous flap with a distal pedicle consists of a fasciocutaneous palette taken from the posterior aspect of the calf in the axis of the sural nerve, it includes the following elements: 1) a fasciocutaneous palette: skin, subcutaneous cellular tissue, neurovascular pedicle and its cutaneous ramifications, fascia; 2) a pedicle: the sural nerve and its vascular plexus, accompanied by the saphenous minor vein, embedded in the subcutaneous fascio-adipose tissue. The provoked flap is classified as grade I according to the Oberlin classification [1] Given its dissection, which is done at a distance from a vascular pedicle, and the possibility of performing a prior cadaveric dissection. The patient is placed in a lateral or supine position. A tourniquet is installed at the root of the limb to free the distal third of the thigh in the event of a skin graft. The supine position is rather reserved for posterior or malleolar lesions. Pruning of the receiving site (Figure 1) . The first step is to locate the vasculo-nerve axis of the flap by a careful longitudinal incision, the saphenous vein being the easiest to locate, the location of the nerve being variable according to the height of the sample. The nerve and its vascular plexus are connected and severed separately. The fasciocutaneous palette is then raised from proximal to distal, the vasculo-nervous axis, visible by transparency, guides the dissection (Figure 2).



Figure 1 Loss of skin substance on the inner side of the lower third of the leg after cutting



Figure 2 Fasciocutaneous flap lift

To reach the distal end of the leg, the pedicle is rotated 180°. The fasciocutaneous palette is placed on the receiving site, on which it can be perfectly applied thanks to prior programming. Tension sutures are not acceptable, as they are a source of ischemia and necrosis. The confrontation of the slopes is done dermis by dermis, the tips are simply placed without excessive tension (Figure 3). Example of a case in our series where the flap was weaned 3 weeks after the operation. The hetero-legged fasciocutaneous flaps are flaps that allow a very interesting length/width ratio, thus facilitating placement on the recipient site. They can be reared with a proximal or distal pedicle. The aforementioned flap removal technique is also classified as grade I according to Oberlin. The patient is placed in a supine position with the knee bent; The medial aspect of the leg is exposed. A tourniquet is installed at the root of the thigh. The flap lift usually begins with its anterior edge, it is performed from distal to proximal. The incision is frank, from the skin to the fascia included. Distally, the saphenous nerve and the great saphenous vein are localized, ligated and severed. The musculocutaneous arteries and those coming from the posterior tibial artery are coagulated. The dissection is prolonged proximally until a sufficient arc of rotation is obtained. Example from our series showing a loss of substance from the lower third of the leg covered by a cross-flap hetero-leg fasciocutaneous flap (Figure 4).



Figure 3 Flap placement in case of skin loss



Figure 4 Coverage of skin loss by a hetero-leg cross-fasciocutaneous flap

Medial hemisolium flap with distal pedicle: this is the reference muscle in the loss of substance of the lower third of the leg. Because the soleus is large, only the medial hemisolateus, or sometimes the lateral hemisolateus, is used. This muscle flap covers small losses of substance up to the distal quarter of the leg, in the medial perimalleolar and retroaxlear regions. The difficulty of making this flap requires a selection of young patients with good vascular axes and without crushing the posterior masses. However, it is difficult and its reliability is not as certain as that of its proximal pedicle counterpart.

4. Discussion

The flap is intended to close a loss of skin substance or to reconstruct an amputated structure. Many flaps are also indicated to shorten the treatment time or for aesthetic reasons[6]. We conducted a comparative study of the different roofing techniques used in the literature and in our series, according to several criteria including: age, sex, defects, mechanism and extent of the defect.

Age: the average age, in the different series, varies between 35 and 45 years.

Table 1 Distribution of cases by age and sex

Authors	Male	Female	Average age
Vaienti[7]	80%	20%	20-35
Voche[8]	66.66%	33.33%	52-77
Belmahi[9]	100%	0%	22-61
Sheepish[10]	80%	20%	48
Sengezer[11]	100%	0%	20
Bous[12]	50%	50%	62-78
Our Series	70%	30%	14-65

Sex: In our patient series, as in several articles, we find an attack on both sexes, although there is a predominance of men.

The defects: the choice of a precise surgical technique was made according to the terrain and the defects among others.

Table 2 Frequency of defects in patients from different series

Authors	% of patients with abnormalities	Darnel
Vaienti[13]	50%	Obesity, Diabetes
Voice[14]	80%	Diabète, Hypertension
Sheepish[10]	14%	Diabetes
Our Series	18.7%	Diabetes

Mechanism of loss of skin substance: as seen in these series, the post-traumatic cause is the most recovered, whether it is high-energy trauma or road accidents, or burns.

Table 3 Distribution of cases according to the mechanism of loss of skin substances

Authors	Traumatic	Osteitis	Other (excision,... etc.)
Vaienti[13]	+++		+
Voche[14]	+++		+
Belmahi[9]	+++	+	
Sheepish[10]	+++	+	+
Our Series	++++		+

(+) : Frequency

Results and complications: we can see the success of the different techniques used in these series with a success rate varying between 90% and 100%. In our series, only one case was complicated by partial necrosis with persistent loss of substance.

5. Conclusion

The lower third of the leg remains an anatomical region where reconstructive surgery is particularly complicated. Each step of the treatment is essential, remembering that pruning must be done early and must be complete. The choice of cover flap will be made according to the patient but also to the operator. The results remain favorable for the majority of patients who have benefited from different types of flaps, even in the case of significant defects.

- Covering the loss of cutaneous substances from the lower third of the leg is complicated, due to the poverty of the adjacent soft tissues, the precariousness of the local vascularization and the bone exposure;
- The choice of a precise surgical technique was made according to the terrain and the defects among others
- Unlike the rest of the series in the literature, we were able to study several topographies of substance loss with a large defect size;
- We have quite a significant hindsight.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval

Ethical approval was done.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

- [1] J. Monaco et W. Lawrence, « Acute wound healing. An overview. *Clin Plast Surg* 2003;30;1-2 ».
- [2] M. Revol et M. Servant, « Surgical techniques - Reconstructive and aesthetic plastic surgery »
- [3] R. Santoni et S. P., « A history of plastic surgery. Berlin: Springer-Verlag; 2007 (395p) ».
- [4] Revol M., Servant J, « Skin grafts EMC (Elsevier Masson SAS, Paris), Surgical techniques Reconstructive and aesthetic plastic surgery, 45-070, 2010. ».
- [5] « Pedicled limb coverage flaps. *Exp Scie Fr.* 1994;XI. ».
- [6] Servant JM, Revol M, « skin flaps, Surgical techniques: reconstructive and aesthetic plastic surgery. *EM consult.* 1990;45-080. »
- [7] Luca Vaienti, « Our experience in leg injuries reconstruction with complex loss of substance. e-mémoires de l'Académie Nationale de Chirurgie. 2008;7(3):29-33. ».
- [8] Voche P, « Interest in using local muscles to cover small defects in the ankle and distal quarter of the leg. *Annals of Aesthetic Plastic Surgery.* 2007;52(6):600-60. doi: 10.1016/j.anplas.2007.03.001. ».
- [9] Belmahi A, Oufkir AA, Fejjal N., « Securing fasciocutaneous leg flaps with distal pedicle by the external saphenous-internal saphenous anastomosis: about 15 clinical cases. *Annals of Aesthetic Plastic Surgery.* 2007;52(2):8995. doi: 10.1016/j.anplas.2006.06.002. ».
- [10] Penaud A, Besset M, Quignon R, Bahe L, Danin A, Fouquet B, Brilhault J, « The free gracilis muscle flap in reconstructive surgery of the foot, ankle and distal third of the leg. *Annals of Aesthetic Plastic Surgery.* 2014;59(1):42-52. doi »:.
- [11] Sengezer M, Celikoz B, Duman H, Isik S., « The use of cross-leg free muscle flaps in the reconstruction of lower extremity injuries. *Eur J Plast Surg.* 1997;20(1):37-39. ».
- [12] Bous A, Ronsmans C, Nizet JL, Jacquemin D, Nardella D, « Coverage of defects in the distal tibia with a helical perforator pedicled flap: two clinical cases. *Annals of Aesthetic Plastic Surgery.* 2011;56(6):562-567. doi: 10.1016/j.anplas.2010.10.008. ».
- [13] Vaienti L, Di Matteo A, Gazzola R, Randelli P, Lonigro J, « Distally based sural fasciomusculocutaneous flap for treatment of wounds of the distal third of the leg and ankle with exposed internal hardware. *Journal of Orthopaedics and Traumatology.* 2012;13(1):35-39. doi: 10.1007/s10195-011-0175-6. ».
- [14] Voche P., « Interest in using local muscles to cover small defects in the ankle and distal quarter of the leg. *Annals of Aesthetic Plastic Surgery.* 2007;52(6):600-60. doi: 10.1016/j.anplas.2007.03.001. ».