

SURAL NEURO-CUTANEOUS FLAP IN THE MANAGEMENT OF FOOT AND ANKLE SOFT TISSUE DEFECTS IN A DIABETIC POPULATION

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Assi C, Fawaz W, Samaha C, Chamoun M, Yamine K. Le lambeau sural neuro-cutané dans le traitement des pertes de substance du pied et de la cheville dans une population diabétique. *J Med Liban* 2016; 64 (3): 164-167.

ABSTRACT • Background: Soft tissue defects in the foot and ankle region are challenging conditions particularly in diabetic patients. We evaluated the reliability of the sural flap in treating such defects among a diabetic population. **Material and Methods:** This is a continuous retrospective series of 14 patients with type 2 diabetes treated with an ipsilateral sural flap for soft tissue defects around the rear foot (11 cases) and over the malleolar areas (3 cases). Three patients had an open tibia fracture (Gustillo IIIb), four had chronic osteitis and seven had a chronic heel ulcer. **Results:** The mean follow-up at 28 months showed healing of the flap at a mean of 24 days, donor site healing in two weeks, one case of total flap necrosis, three cases of skin edge necrosis, two cases of temporary venous congestion and 10 cases of hypoesthesia of the lateral border of the foot. No infection or recurrence of infection was encountered. **Conclusion:** We found the sural flap useful, reproducible and reliable in treating soft tissue defects in diabetic patients with a low frequency of serious complications.

Keywords : sural flap; soft tissue defects; diabetes

RÉSUMÉ • Introduction: Les pertes de substance cutanée des régions du pied et de la cheville représentent des situations difficiles, particulièrement chez les patients diabétiques. Nous avons évalué la fiabilité du lambeau sural dans le traitement de telles pertes dans une population diabétique. **Matériel et Méthodes:** Nous présentons une série rétrospective continue de 14 patients atteints de diabète de type 2 traités par un lambeau sural homolatéral pour pertes de substance cutanée autour de l'arrière-pied (11 cas) et des zones malléolaires (3 cas). Trois patients présentaient une fracture ouverte du tibia (Gustillo IIIb), 4 une ostéite chronique et 7 un ulcère chronique au talon. **Résultats:** Le suivi moyen de 28 mois a montré la cicatrisation du lambeau en une période moyenne de 24 jours, la cicatrisation du site donneur en 2 semaines, 1 cas de nécrose totale du lambeau, 3 cas de nécrose superficielle périphérique, 2 cas de congestion veineuse temporaire et 10 cas d'hypoesthésie du bord latéral du pied. Aucune infection de novo ou récurrente n'a été rencontrée. **Conclusion:** Le lambeau sural s'est avéré utile, reproductible et fiable dans le traitement des pertes de substance cutanée chez les patients diabétiques avec une faible fréquence de complications graves.

INTRODUCTION

According to the World Health Organization, the prevalence of diabetes for all age groups worldwide was predicted to reach 4.4% in 2030 [1]. A large meta-analysis conducted recently by Lazzarini *et al.* [2], showed that the prevalence of diabetes-related foot wounds was 2.4%, diabetes-related foot infections was 3.4% and diabetes-related foot disease was 4.7%. More than half of all foot ulcers will become infected, requiring hospitalization, and one in five patients will require an amputation [3].

In the US, 80% of the non-traumatic amputations performed yearly are due to diabetes [4], and the relative 5-year mortality rate after amputation is more than 50% [5].

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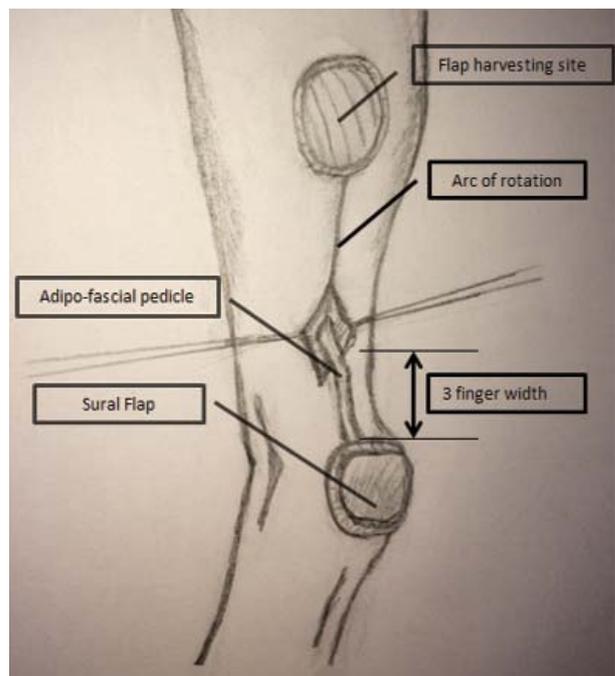


FIGURE 1. Drawing of the sural flap

Soft tissue defects in the distal lower extremities (hindfoot, malleolar and Achilles tendon areas) are always a challenging task. This is due to the tightness of the skin and the poor vascularization in this region [6]. Dealing with soft tissue defects in the diabetic population becomes more complex as a result of peripheral neuropathy and diabetic microangiopathy [7]. This situation leads to a delay or a non-healing of the wounds.

With early stages of pressure ulcers, conservative measures are used (elevation, pressure relief with crutches, walker, casts, replacing ill-fitting footwear, etc.). If necrosis is present, debridement is the mainstay of treatment [8]. Platelet-derived growth factor has been used for neuropathic diabetic foot ulcers [9]. Bioengineered skin and human dermis are new types of biologically active implants that have been proven to enhance the healing process [10]. Vascular evaluation should be done when a patient presents with an ischemic wound or ulcer showing no sign of progress despite appropriate management. Hyperbaric oxygen therapy has been used as an adjunctive therapy with some positive results [11]. Local partial foot amputation is sometimes required when all other treatment modalities fail [12].

Different surgical techniques were described in the literature for managing soft tissue defects in the distal lower extremities. Local and free flaps have been used to manage such defects [13-16]. Recently, the sural flap (Fig. 1) has been advocated as a reliable flap to cover

soft tissue defects in the general population [17, 18].

The aim of this study is to evaluate the results of the sural flap in treating soft tissue defects of the complicated diabetic foot.

MATERIAL AND METHODS

This is a retrospective series of 14 patients treated between 2000 and 2013 by a single surgeon (AC). There were 10 men and 4 women with a mean age of 64 years (range: 56-81 years). All patients had type 2 diabetes with a mean glucose level of 162 mg/dl and a mean HbA1c of 7.4%.

An ipsilateral sural flap has been used for each patient (14 flaps) to treat a recent open tibia fracture of the ankle with a loss of skin coverage (3 patients), a chronic open osteitis of the hind foot (4 patients) and heel ulcers (7 patients). The mean follow-up duration was 28 months (range: 3-45 months). The area of coverage was over the rear foot in 11 cases and the ankle in 3 cases (2 medial and 1 lateral malleolar regions). The mean surface area to cover was 48 cm².

Surgical technique

The surgical technique consisted of three steps (Fig. 1-3).

The first step was a thorough debridement of the receptive area till bleeding occurred from the skin edges and from the soft tissue/bone beneath.



FIGURE 2. Pre-op design of the sural flap



FIGURE 3. Coverage of the receptive site

The second step, different from the original technique [16], consisted of approaching the neurovascular pedicle on the proximal aspect of the superior arch of the flap rather than on its distal end. The skin incision goes down deeply to the fascia, opening it to locate the neurovascular pedicle, usually found in the midline of the calf. The flap is then lifted from proximal to distal including the pedicle and the fascia. The distal pedicle has to be embedded within at least a 2 cm width of fascia.

The third step consisted in covering the receptive area by rotating the flap and sliding it beneath the distal skin bridge. Primary closure of the donor site was systematically done.

RESULTS

The mean healing time of the flap was 24 days (range: 18-45 days). The wound healing of the donor site was always achieved within two weeks. No infection or recurrence of infection was noted during the follow-up period. We encountered one flap (7%) necrosis, three (21.5%) skin edge necroses where in one case (7%) a skin graft was performed. A hypoesthesia of the lateral aspect of the foot has been noted in 10 patients.

Shoe fitting was described as normal in 12 patients while the remaining two patients found it acceptable.

DISCUSSION

Many authors reported the use of local flaps to treat soft tissue defects in the ankle/foot region. Ensaf *et al.* [13] reviewed the literature in 2013 and identified 192 patients who underwent reconstruction with distally pedicled peroneus brevis flaps to cover small- to moderate-sized skin defects of the distal third of the tibia and all parts of the ankle except the medial malleolus. However, the complication rate reached 41.6%; these included total flap necrosis (4.7%), partial necrosis (13%) and other complications (14.5%) requiring re-intervention (total or partial skin graft loss, persisting osteomyelitis, etc.), and minor complications (9.4%) managed conservatively.

Kauffman and his co-workers [14] reported the use of the soleus muscle flaps for coverage of distal tibial third defects in 12 patients with a high frequency of complications and additional procedures (75%). They encountered 7 cases of wound breakdown treated with skin graft and/or fascio-cutaneous flaps, 4 cases of infection, 1 partial necrosis and 1 total flap loss.

Others reported the efficacy of the greater saphenous fascio-cutaneous perforator flap [15] to cover post-traumatic wound defects with just one single complication related to venous congestion.

Since its first description by Masquelet *et al.* [16], several authors published the results of the sural neuro-cutaneous flap with different indications and variable outcomes in nonhomogeneous populations. Dhamangaonkar and Patankar [17] shared their experience of 109 cases

(12 diabetic) reporting complete healing in 91 cases. Parrett *et al.* [18] reported another series of 58 patients (11 diabetic) with less promising results; half of the patients had complete or partial flap loss, necrosis and osteomyelitis (7%) and cellulitis (5%).

Additionally, our results are in line with those reported by Ali *et al.* (2007) in a heterogeneous population of 32 patients in terms of low frequency in serious complications [19]. However, these authors encountered three cases of local sepsis necessitating re-intervention where we encountered none. Therefore, the use of the sural flap in diabetic patients does not have the potential to increase the risk of surgical infection.

To our knowledge this is the first study evaluating the results of the sural flap in a diabetic population. Our study demonstrated that the sural flap is a reliable option in treating soft tissue losses over the ankle and foot regions in diabetic patients, as it is in the general population. Furthermore, there are many advantages to use the sural flap: a) the surgical technique doesn't require microsurgical skills; b) no muscles are harvested and therefore no motor deficit has to be expected; c) slippage ("savonnage") phenomenon does not occur in fascio-cutaneous flaps contrary to all muscle flaps used in the heel region, a complication which none of our patients did encounter. It is worthy to note that in our series, the patient who had a total flap necrosis presented the highest HbA1c level.

CONCLUSION

The low frequency of serious complications such as a total necrosis of the flap (1 out of 14) would make this flap ideal to treat skin losses, infected/noninfected ulcers with or without bone infection in diabetic patients. Moreover, the high success rate of the sural flap might lead to decrease the need for amputations in such population. Lastly, we need to emphasize the resulting patient's satisfaction related to proper footwear which is a major concern in diabetic patients.

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