SURAL FLAP EFFECTIVENESS IN EXPOSED FRACTURES IN LOWER EXTREMITIES

Orthopaedic

Fernando Xavier Romero Prieto

M.D., Orthopaedy And Traumatology Department, Microsurgery Unit, Roosevelt Hospital, Guatemala City, Guatemala.

Carlos Raúl Reyes García*

M.D., Resident Of Orthopaedy And Traumatology Department, San Carlos University, Roosevelt Hospital, Guatemala City, Guatemala. *Corresponding Author

ABSTRACT

OBJECTIVES: To determine the effectiveness of the sural flaps when utilizing this technique as a treatment for exposed fractures in the lower limb in adult patients. **MATERIALS AND METHODS:** A prospective observational descriptive study, the evaluated patients and patient files as primary and secondary sources, respectively, and a control with observational variables. The sample consisted of 24 patients who got 4 follow-up appointments at 5 days, 2 weeks 1 month and a year. **RESULTS:** The results manifested an effectiveness of 95.8%. The area most affected was the lateral malleolus. Additionally, comorbidities, schooling and gender showed no influence on the effectiveness of the flap. **CONCLUSION:** The effectiveness of the sural flap technique in exposed fractures was 95.8%. **RECOMMENDATIONS:** Physicians ought to consider using the sural flap as the treatment of choice for skin coverage defects localized in the distal and middle third regardless of the leg and cause of the defect.

KEYWORDS

INTRODUCTION

Due to the large number of car accidents, firearm wounds and falls, the incidence of exposed fractures has increased continually, this type of fractures are susceptible to both infections and hemorrhage which are the most frequent causes of death or limb loss.

An exposed fracture is a loss of continuity of a bone segment that deviates from its natural course and contacts the external environment, whether the fracture ends are visible or not. In these lesions, the wound is in communication with the fracture site. The treatment of the fracture will be focused on the bone but also in the coverage of the bone as one cannot be without the other one.[2]

The management of fractures with loss of skin coverage can be a real challenge especially in the lower limb due to size, irrigation and the compulsory need of the limb for walking. In 1992 Masquelet et al. introduced the concept of a neurocutaneous flap and described the sural flap, named after the sural nerve. This Masquelet flap opens a new treatment option for exposed fractures in the lower limb [1 – 5].

However, with the aforementioned, we showed that lower limb fractures are the most common, and the nature of exposure increases the complexity of the treatment. This is why it is important to prove if the a treatment options for these fractures are efficient so that the treating traumatologist can make an appropriate decision with evidence-based medicine in the shortest time possible and reduce the exposure time and thus improve the result.

MATERIAL AND METHODS

The study was a prospective observational descriptive study review of 24 patients operated by the Microsurgery Unit of the Traumatology and Orthopedics Department of Roosevelt Hospital, in Guatemala, Central America. Once the procedure was approved by the Roosevelt Hospital Ethics Committee, patients signed an informed consent for the use of photos and videos of their flaps, legs and radiographs used in this publication.

The following clinical parameters will be evaluated accordingly: achievement of bone covering without dehiscence, infection, an optimal capillary filling in the part of the flap, and presence or not of underlying hematoma.

Nonetheless, comorbidities, degree of education, location of the fracture, and the patient's gender were evaluated and analyzed to determine which parameters influence the effectiveness of the flap.

The study consisted of a homogenous sample size of 24 adult patients. The study lasted for one year and the patients were followed in 4 follow-up appointments at 5 days, 2 weeks 1 month and a year. Patients selected to take part in the investigation were chosen once they arrived at the emergency department following a vehicular accident. The most

important requirement for each patient was to have an exposed fracture in either lower limb. The patients were taken for a fracture wash and debridement in the emergency. The sural flap was performed in each patient regardless of comorbidities at the third day at the same time of the osteosynthesis of the fracture, the size of the soft tissue defect was an average of 6 x 7 cm. After acquiring data, analysis was elaborated in the Microsoft Excel software.

RESULTS

Of the 24 patients evaluated, 23 had completely effective flaps and 1 patient had a 2 cm wide by 2.5 cm long flap dehiscence and thereby did not meet the objective of complete viability and was recognized as a non-effective flap.

These results display an effectiveness percentage of 95.8% and failure of 4.2% representing 23 patients and 1 patient respectively.

The patient who presented dehiscence was a 25-year-old male patient, with low socioeconomic status and no relevant medical history. The flap was elaborated on the medial malleolus region.

The age interval ranged from 18 to 74 years old, and the average age was 32 years old (Table 1).

In total the surgical technique was elaborated in 6 areas. These areas showed no difference when evaluating the effectiveness of the flap. This observation is consistent with scientific evidence, and the location justified by means of irrigation and the mechanism of survival of the flap. In all these flaps, the neurovascular complex was the same and only the place of coverage varied (Table 2).

Comorbidities, such as diabetes mellitus, arterial hypertension, vasculitis, and obesity are known predisposing factors for failure using the sural flap in other studies. For this reason, the patient's comorbidities were taken into account. However, in this study, no comorbidity negatively impacted the outcome of the flap.

In this investigation, eight patients had at least 1 comorbidity, which represent 33% of the sample size. From the sample studied, 6 patients had 1 comorbidity (25%), 1 patient presented 2 comorbidities (4.16%) and 1 patient had 3 comorbidities (4.16%) (Table 3). All of these patients with comorbidities had an effective flap. This supports the notion that comorbidities are not a contraindication to perform sural flap surgery.

Along with comorbidities, previous reports have shown that the size of the flap correlates with effectiveness, explaining that the larger the flap the more prone to suffer a degree of necrosis. However, in our study flaps were average in size and did not contribute to failure.

One of the discoveries we made with this study is that there is no proof

that degree of education affects flap outcome. Nonetheless, due to public health knowledge, it is evident that most health problems are found in habitants of low socioeconomic status.

Based on the premise that the level of education of the patients would effect on the flap efficiency, we took our patients scholar degree. Of the 24 patients evaluated, 4 (16.5%) had only gone to elementary school, 8 (33.3%) went to middle school, 9 (37.5%) went to high school, and 3 (12.5%) had a college level education. The patient with dehiscence had only reached 3rd grade in elementary school (Table 4).

A difference in gender impact was observed with 17 men (71%) and 7 women (29%) of the total sample (Table 5).

CONCLUSIONS

During this investigation, the results obtained were consistent with other studies regarding the effectiveness of sural flaps. In this study sural flap treatment effectiveness was 95.8% which approached the results demonstrated in previous studies. The area of coverage did not influence flap effectiveness. However, it is worth emphasizing that the most affected area was the lateral malleolus and the least affected area was the plantar region of the foot.

Evidently, comorbidities worsen any situation regarding health and wound repair. However, sural flaps for skin coverage remain the best option despite patient comorbidities since other wound management options such as VAC system or gauzes for second intention closure in patients with diabetic foot or bone exposure (osteomyelitis, tumor, exposed fracture, etc) take much longer time to heal and tend to generate more hospital related expenses due to longer hospital stay. The present study manifested a 100% effectiveness when treating patients with comorbidities implying an optimal management method in patients with lower limb defects.

The majority of the sample was male which was compatible with other studies. This can be explained by the simple fact that men are most associated with accidents and fractures.

Complications are infrequent and most cases are due to patient nonadherence to proposed flap care, such as reduced mobility and bed rest. In this study one patient suffered from dehiscence and the cause was investigated. This patient did not attend the initial follow-up appointments in the outpatient clinic due to long travel distance. However, the patient sought medical attention and the dehiscence was treated accordingly with the appropriate medical care and resolved completely.

Therefore the authors recommend

1. Consider using the sural flap as the treatment of choice for lower limb coverage defects regardless of the cause of the defect or patient comorbidities.
2. Increase awareness of the importance of learning this procedure to students in training to provide better care and better treatment to the patients cared for.
3. Provide adequate post-operative follow-up to patients to achieve a satisfactory effectiveness when performing a sural flap.

Table 1: Age of patients

N=24

Age	Patients	Percentage
18-25 years	10	42%
26-30	3	12.5%
31-40	4	17%
41-50	3	12.5%
51-100	4	17%

Table 2: Location of the flap

Place	Number	Percentage
Anterior ankle region	5	21%
Back of Foot	3	12.5%
Posterior region of the leg	4	17%
Medial malleolus	4	17%
Posterior ankle region	1	4.2%
Lateral malleolus	7	29%
Plantar Region	0	0%

Table 3 Population with Comorbidity

N = 24

Number of comorbidities	Frequency	Percentage
1	6	25%
2	1	4.16%
3	1	4.16%

Table 4: Level of education

N = 24

School grade	Frequency	Percentage
Elementary	4	16.6%
High school	8	33.3%
Secondary	9	37.5%
University	3	12.5%

Table 5: Distribution by sex

N = 24

Gender	Patients	Percentage
Men	17	71%
Women	7	29%

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