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Place of Negative Pressure Therapy in the Management of Delabour: Case Report

Marouane Dinia[1*], Ilyass Ahallat[1], Yassine Benbouzid[1], Monsef Boufettal[1], Rida-Allah Bassir[1], Jalal Mekkaoui[1], Mohamed Kharmaz[1], Moulay Omar Lamrani[1], Mohamed Saleh Berrada[1]

[1]Department of Orthopaedic and Trauma Surgery, Ibn Sina University Hospital, Rabat, Morocco

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***Corresponding author:** Marouane Dinia
Department of Orthopaedic and Trauma Surgery, Ibn Sina University Hospital, Rabat, Morocco

Abstract **Case Report**

Skin loss or cutaneous tissue loss (CTL) occurs when the skin is damaged and cannot be directly closed with sutures. Negative pressure therapy (NPT) has emerged as an essential therapeutic tool for promoting wound healing in high-risk surgical wounds or chronic wounds that do not heal spontaneously. NPT involves applying negative pressure to the wound using a specific dressing connected to a vacuum source. This technique can be used until adequate granulation tissue forms or conditions are met for surgical intervention. The case of a 35-year-old patient with extensive cutaneous tissue loss on the right lower limb due to a road traffic accident is presented. The patient underwent surgical debridement followed by negative pressure wound therapy, leading to satisfactory results and completes healing. Negative pressure therapy has revolutionized wound management and should be used in conjunction with conventional treatments, regularly reassessing its efficacy and discontinuing it when goals are achieved or complications arise. When used appropriately, NPT is an invaluable tool for clinicians and patients in achieving therapeutic objectives.

Keywords: Cutaneous tissue loss, negative pressure therapy, wound healing, surgical wounds, chronic wounds.

INTRODUCTION

Skin loss or cutaneous tissue loss (CTL) occurs when the skin is damaged and cannot be directly closed with sutures. These lesions are common and can have various causes. Surgeons have several repair techniques at their disposal, such as skin grafts, flaps, and more recently, negative pressure therapy (NPT). Over the years, NPT has become an essential therapeutic tool.

Negative pressure wound therapy (NPT) systems are used to promote the healing of surgical wounds at high risk of complications or chronic wounds that do not heal spontaneously [1].

NPT works by applying a pressure lower than atmospheric pressure to the surface of the tissue loss. A specific dressing is applied to the wound and connected to a vacuum source, allowing the collection of exudates. This technique can be used until adequate granulation tissue forms or conditions are met for surgical intervention [2].

Negative pressure therapy has been used since the late 1980s to accelerate the healing process. The VAC® method (vacuum-assisted closure) involves applying negative pressure to a polyurethane foam that conforms to the shape of the wound [2].

NPT can be proposed for post-traumatic or surgical wounds, burns, chronic wounds such as pressure ulcers and ulcers. It is also useful as an adjunctive treatment for infected wounds [3]. In this context, we present the case of a 35- year-old patient with no significant medical history, who suffered an extensive cutaneous tissue loss on the right lower limb due to a road traffic accident and was treated at the trauma and orthopedics department of Ibn Sina Hospital in Rabat.

CASE REPORT

A 35-year-old patient with no significant medical history was admitted following a road traffic accident. The patient was a motorcyclist who was hit by a car, resulting in trauma to the right lower limb. Upon general examination, the patient was stable hemodynamically and respiratorily. Inspection of the

right leg revealed extensive tissue damage, severe pain, and complete functional impairment of the affected limb (figure 1). Vascular and neurological examination showed palpable pulses and no evidence of nerve deficits. After pre-anesthetic preparation, the patient was taken to the emergency operating room at Ibn Sina Hospital. Surgical intervention consisting of wound debridement and cleansing was performed, followed by greasy dressing. Antibiotic prophylaxis and thromboprophylaxis were administered during the procedure. The debridement process proceeded without significant complications (figure 2). Subsequently, negative pressure wound therapy was initiated, with dressing changes every three days for a duration of two weeks (figure 3). The results were highly satisfactory, with wound drying and no signs of infection (figure 4). Complete granulation of the tissue defect was observed, leading to the decision to perform a skin graft (figure 5). The postoperative course was uneventful, and during the last follow-up one year later, no complications were detected.

Figure 1: Loss of skin substance due to a traumatic leg delabration

Figure 2: Postoperative image after surgical debridement.

Figure 3: Placement of the negative pressure therapy device

Figure 4: Appearance of the wound after negative pressure therapy

Figure 5: Image showing the performance and healing of the skin graft

DISCUSSION

Negative pressure refers to a pressure lower than normal atmospheric pressure. It can be achieved by using a suction pump to remove gas molecules from the area of interest. Its clinical application dates back thousands of years, including its use in traditional Chinese medicine as an aid to acupuncture techniques [4]. Over time, different versions of negative pressure therapy (NPT) have been developed. In 1993, Fleischmann *et al.,* applied NPT to wounds using a foam dressing to promote healing [5]. Practical issues were encountered with early devices, but further research led to the development of the vacuum-assisted closure (VAC) system, which utilizes open-pore polyurethane foam for uniform pressure distribution and wound contraction [6].

Standard negative pressure therapy (NPT) includes a controlled negative pressure therapy unit, a sterile porous primary dressing (foam or gauze) [6, 7], drainage material, an exudate collection reservoir, and secondary dressings. These "mandatory" medical devices can be supplemented with "optional" medical devices for specific situations. Before using VAC therapy, it is important to evaluate clinical criteria [8], such as wound vascularization, presence of healthy tissue, wound debridement, exudate quantity, and wound size. The device should not be applied in direct contact with necrotic tissue, cancerous tissue, or directly on organs without a protective interface. Similarly, it is not recommended to use the VAC system in direct contact with a digestive fistula or an unprotected anastomosis [9].

The VAC system creates a moist environment conducive to healing and provides several mechanisms to improve blood circulation, reduce edema, stimulate granulation tissue formation, promote cell proliferation, eliminate healing inhibitors, reduce bacterial load, and approximate wound edges.

The indications for VAC therapy were specified in a report by the Haute Autorité de Santé published in 2011. In the acute phase, this treatment can be used in non-saturable traumatic wounds, surgical excisions, or postoperative wound dehiscence if these situations are accompanied by extensive and/or deep tissue loss. In chronic wounds (diabetic foot ulcers, complex leg ulcers, pressure ulcers), VAC therapy should only be considered as a second-line treatment after the failure of well-conducted dressing treatments. The goal of VAC therapy is to allow for secondary suturing or skin grafting after sufficient granulation, as performed in six patients in our study, and ultimately achieve complete healing. In all cases, nutritional assessment of the patient and a hypercaloric diet to achieve satisfactory levels of albumin and pre- albumin are essential. Adequate antibiotic therapy may also be necessary. Finally, the success of this treatment depends on frequent clinical evaluation of the patient and the wound, allowing for adjustment of dressing frequency and appropriate pressure settings.

The indications for VAC therapy, as specified in a 2011 report by the Haute Autorité de Santé (HAS}, include the use of this treatment in the acute phase for non-saturable traumatic wounds, surgical excisions, or postoperative wound dehiscence with extensive and/or deep tissue loss. In chronic wounds such as diabetic foot ulcers, complex leg ulcers, and pressure ulcers, VAC therapy should only be considered as a secondary option after the failure of well- conducted dressing treatments. The goal of VAC therapy is to facilitate secondary suturing or skin grafting after sufficient granulation and ultimately achieve complete healing. In all cases, nutritional assessment of the patient and a hypercaloric diet to achieve satisfactory levels of albumin and pre-albumin are essential. Appropriate antibiotic therapy may be necessary, and the success of this treatment depends on frequent clinical evaluation of the patient and the wound to adjust dressing frequency and appropriately adjust pressure settings.

According to the recommendations of the HAS, there are specific situations in which the use of negative pressure therapy should be avoided. These include cases of active bleeding, unaddressed fistula, uncontrolled infection in the wound, tumor-related wounds, presence of necrotic tissue requiring debridement, absence of an interface between the digestive tract and the negative pressure system, and for lower limbs, unrevascularized arterial insufficiency. It is important to consider these contraindications to ensure safe and appropriate application of negative pressure therapy.

Rare serious adverse effects have been reported in the literature for negative pressure therapy (NPT), such as cases of sepsis, septic shock, hypovolemic shock, and amputation, but it has not been possible to definitively attribute these adverse effects to the technique or exclude a potential handling error [10]. In terms of medical and quality of life considerations, the main identified adverse effects and drawbacks of NPT include pain, maceration of the perilesional skin, risk of bleeding, as well as relative difficulties in implementation and follow-up, permanent reliance on the device, and noise. The conditions for using NPT involve its application until the formation of granulation tissue or the conditions necessary for surgical intervention are achieved. It should be initiated by a specialized physician (such as a plastic surgeon, visceral surgeon, vascular surgeon, thoracic surgeon, orthopedic surgeon, diabetologist, or dermatologist) in an appropriate healthcare facility. The initial prescriber is responsible for the treatment's monitoring and renewal, with the treatment being discontinued if there is no improvement after two consecutive dressing changes or one week of use. The maximum duration of treatment is 30 days, with the possibility of renewal once. Specific training on the technique is required for all caregivers, and the patient must be informed about the adverse effects and constraints associated with NPT usage.

The treatment can be administered in a home care setting, provided that weekly evaluations are conducted by the initial prescriber. The conclusion of negative pressure therapy can be considered when the wound is completely closed, when surgical closure or skin grafting becomes feasible, or in case of no improvement after two consecutive dressing changes or one week of use [2].

CONCLUSION

The recent introduction of topical negative pressure technology has brought about a significant change in the approach to many types of wounds. The decision to use this method depends on its clinical effectiveness and cost- effectiveness in achieving the defined therapeutic goals. The treatment outcomes must be regularly reassessed. TNP should only be considered as an important component of comprehensive wound management and should be introduced with specific objectives and a defined discontinuation strategy. Its use should be discontinued when the goals have been achieved, when the treatment fails to meet the defined objectives within a reasonable timeframe, or when it is not accepted by the patient or leads to complications. When used appropriately in conjunction with conventional treatments and after evaluation by professionals, TNP has now become an invaluable tool for both clinicians and patients.

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