



A CASE OF EFFECTIVE NEGATIVE PRESSURE WOUND THERAPY FOR DIABETIC FOOT

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ABSTRACT India is the diabetic capital of world with increasing numbers of newly diagnosed diabetes. Incidences of Diabetic foot have also been increasing with increasing numbers of diabetes. Diabetic foot has become one of the main health-related killers due to its high disability and mortality rates. Negative pressure wound therapy (NPWT) is one of the most effective techniques for the treatment of diabetic foot wounds and great progress, both in terms of research and its clinical application, has been made in the last 20 years of its development. However, due to the complex pathogenesis and management of diabetic foot, irregular application of NPWT often leads to complications, such as infection, bleeding, and necrosis, that seriously affect its treatment outcomes. When rightly used, NPWT is therapeutic and aids in faster healing and recovery and reduces the disease burden while improving quality of life.

KEYWORDS : Diabetic foot, diabetic wound, Diabetic ulcer, Vacuum-assisted closure, Vacuum assisted therapy, Negative pressure wound therapy, topical negative pressure therapy.

INTRODUCTION

Diabetes is a common condition in India with the incidence rising from 7.1% in 2009 to 8.9% in 2019. ⁽¹⁾ Diabetic foot is a serious complication in patients who have advanced diabetes. It refers to foot infections, ulcers, and/or deep tissue destruction caused by nerve abnormalities and vascular lesions in the distal lower limb(s) of these patients. Globally, more than 1 million diabetic feet undergo amputation every year. The treatment of diabetic foot requires a cross-disciplinary and systematic approach that comprises blood glucose control, surgical debridement, vascular recanalization, decompression treatment and supportive treatment. Controlling wound infection and promoting tissue repair is vital for preventing amputation or reducing the level of amputation. ^(2,3) A cure for diabetic foot ulcers is not currently available, and there is no proven prevention method. Traditionally, gauze soaked in saline is used however, maintaining the moisture of this dressing has proven challenging. Many wound treatments like hydrocolloid wound gels and growth factors, as well as enzyme debridement chemicals and hyperbaric oxygen therapy, have been developed as a result of research and development in the area of diabetic wound treatment. Today, negative pressure wound therapy (NPWT) is used and has been recognized for its remarkable effect in improving wound drainage, enhancing tissue perfusion, and promoting the growth of granulation tissue.





CASE STUDY

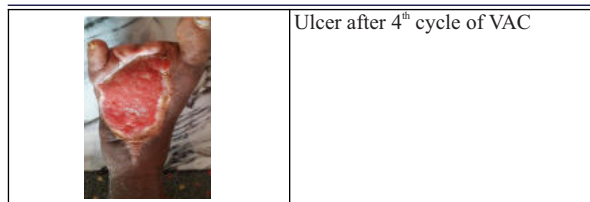
A 59-year-old male patient, came with complaint of wound over dorsum of left foot since 3 months, initially started as a bleb which ruptured to form a wound of small size, gradually progressed to size of around 12x8cm. It was associated with pus discharge from the wound. History of tingling and numbness present over both the feet. There was no history of claudication pain, fever. He was a known case of Type 2 diabetes mellitus and Hypertension, on medication. He had undergone disarticulation of 2nd, 3rd and 4th toe of left foot 3 months ago. On examination, a tender ulcer of size 12x8 cm, vertically oval in shape was present over the dorsum of left foot, extending from the distal part of metatarsals till the ankle joint. The ulcer had irregular margin, sloping edges, floor covered with slough and pale granulation tissue. No active discharge was noted. Base of ulcer was formed by underlying bones and tendons. There was local rise of temperature and severe tenderness over left calf region. Movement of knee and ankle joints were normal. Peripheral pulsations were well felt and there were no palpable regional lymph nodes. Patient was diagnosed with non-healing ulcer of left foot with Type 2 diabetes mellitus and Deep Vein Thrombosis (DVT) of left leg. Patient was treated accordingly for DVT and diabetic control. Patient also underwent routine wound dressings until most of slough was cleared off. He was then started on

Vacuum assisted closure (VAC) dressing of 4 cycles over one-month period.

PROCEDURE:

Pressure was maintained between -60 to -80mmHg, each cycle lasting for 5-6 days with an interval period of 1-2 days between each cycle. Wound was evaluated regularly to assess risk of infection and bleeding. Following 2 cycles of VAC therapy, patient complained of pain at wound site. Hence, pressure was altered accordingly. The wound healed well after 1 month of VAC therapy after which patient underwent split skin grafting over the healthy granulation tissue.

	Ulcer after serial debridement and before VAC therapy
	Ulcer after 1st cycle of VAC
	Ulcer after 2 nd cycle of VAC
	Ulcer after 3 rd cycle of VAC



DISCUSSION:

Diabetes Mellitus and its consequences i.e., delayed wound healing is a serious health issue, especially in the elderly. Failure to heal a wound not only causes pain and suffering, but it also has social and economic consequences. Foot problems are a leading cause of hospitalisation in diabetic patients, who spend an excessive amount of time in the hospital due to various surgical operations and a protracted stay.⁽⁴⁾ Patients with diabetes mellitus have a 25% lifetime risk of getting a foot ulcer, which in up to 85% of instances leads to amputation. The treatment of diabetic foot wounds requires a multi-disciplinary and systematic approach.^(5,6) For diabetic foot wounds, the fundamental therapeutic principles are the control of wound infection, improvement of local tissue perfusion and promotion of tissue repair. Due to its excellent effects of enhancing local perfusion, promoting granulation tissue growth and improving wound healing, Negative pressure wound therapy (NPWT) has become an important adjuvant treatment in the management of diabetic foot wounds. The prerequisites for NPWT include well controlled wound infection with minimal/no necrotic material after debridement, well controlled risk of bleeding and well controlled risk of ischemia. The same modality of treatment was followed in our case too with serial debridement of the wound and turning an unhealthy wound into a healing wound. This was also in parallel to treatment of DVT of the same limb. Once DVT was treated and wound showed signs of healing, VAC therapy was initiated. VAC may be applied in a continuous, intermittent, or variable mode.

In clinical practice, continuous mode is most commonly used. Intermittent pressure therapy (IPT) is a relatively newer mode in which the negative pressure device switches on and off at preset time intervals. Many studies have shown that IPT mode is better than continuous mode with respect to achieving blood flow and growth of granulation tissue but can cause significant pain due to tissue deformation with each cycle.⁽⁷⁻¹⁰⁾ The variable pressure therapy (VPT) mode causes less pain and is more easily accepted by patients. The biggest difference between the VPT and IPT modes is that the minimum negative pressure value of the VPT mode is a certain negative pressure value (e.g., 10 mmHg), rather than 0 mmHg. The VPT mode has the same advantages as the IPT mode but leads to better granulation tissue growth, wound contraction, and wound epithelialization. Similarly, in our case since patient had already undergone amputation of toes previously, VPT mode of VAC therapy was applied for four cycles over a period of 1 month and pressure was maintained between -60 to -80mmHg, each cycle lasting 3-6 days according to wound exudation with an interval period of 1-2 days between each cycle. Ravari, observed that after two weeks, majority of the VAC group's patients showed considerable improvement in wound diameter and depth, as well as increased granulation tissue proliferation. Wagner's Score decreased in both study groups, albeit the decrease in the moist dressing group was not significant. According to a Singapore study, all wounds healed completely. Split-skin grafting was used to close nine wounds and secondary closure was used on two others. Similar results were observed in our case too.⁽¹¹⁾

CONFLICTS OF INTEREST:

The authors declare that they have no conflicts of interest.

ACKNOWLEDGEMENTS:

The authors declare that they have no competing interests.

CONCLUSIONS

The treatment of diabetic foot requires a cross-disciplinary and systematic approach, within which NPWT is an important adjunct treatment for diabetic foot wounds. The standardized management and application of NPWT may improve wound exudate drainage, enhance blood perfusion, and promote wound healing at a faster pace. NPWT was tailored according to pre-existing comorbidities. However, it is necessary to point out that the levels of evidence in this consensus are not very high; therefore, more high-quality randomized controlled trials are needed to determine the most appropriate application methods and potential effects of NPWT for diabetic foot wounds.

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