

A Comparative Study of Vacuum Assisted Closure Versus Normal Saline Dressing in the Healing of Diabetic Wounds in PMCH Patna

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Abstract

Background: The purpose of this study was to evaluate the clinical efficacy of Vacuum assisted closure compared with conventional normal saline dressing in healing of the diabetic wounds in the form of the rate of granulation tissue formation, duration and cost effectiveness. **Material and Methods:** This is a prospective comparative study done in Patna Medical College and Hospital, Patna from Jan 2025- Dec 2025. In this study 45 randomly selected patients were assigned to the study group (VAC-Vacuum assisted closure dressings) and 45 patients to the control group using normal saline dressings all patients were studied and clinical findings were recorded, necessary investigations ordered and appropriate treatment given. All cases were followed up to discharge and subsequently for a follow up on 1st week. All the data were analyzed using the Chi- square test and The Student's T test and the results were tabulated. A “p” value of <0.05 was considered statistically significant. **Results:** The efficacy of the dressings was compared as the percent of ulcer surface area covered by granulation tissue. The Split Skin Graft uptake was much better in the Vacuum assisted closure dressing group $92.5\% \pm 2.3$ than the normal saline Dressing group $78.15\% \pm 3.9$ which was statistically significant. The mean hospital stay was also significantly lesser in the study group than the control group. **Conclusion:** The application of vacuum-assisted closure dressings significantly improved the speed of granulation tissue creation and portrayed superior graft absorption compared to patients treated with traditional normal saline dressings for their diabetic wounds.

Keywords: Vacuum Assisted Closure (VAC). Normal Saline Dressings, Diabetic Wounds, Negative pressure wound therapy (NPWT).

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INTRODUCTION

The diabetic foot is characterized as a constellation of syndromes encompassing neuropathy, ischemia, and infection, which culminate in tissue degeneration, thereby resulting in morbidity and a potential need for amputation. Infection in the context of the diabetic foot represents the most severe complication, imposing a significant burden both on society and the affected individual. Globally, over 150 million individuals diagnosed with diabetes mellitus reside in developing nations. The lifetime incidence of ulcers among individuals with diabetes has been approximated at 15%.^[1] India holds the distinction of being the diabetes capital of the world, with approximately 41 million individuals affected by diabetes. One in every five diabetics globally is of Indian descent.^[2] Projections indicate that this number may escalate to approximately 79.4 million by the year 2030.^[3] The prevalence of diabetes is on the rise, becoming a predominant contributor to morbidity and mortality rates. In the year 2015 alone, there were one million fatalities attributed to diabetes mellitus.^[4] More than 80% of diabetes-related deaths transpire in low- and middle-income nations.^[5] The annual incidence of foot ulcers in individuals with diabetes mellitus is estimated to be around 2%, with a lifetime risk ranging from 15% to 20%. Furthermore, a lower limb is lost due to diabetes every 30 seconds, marking it as the foremost risk factor for non-traumatic foot amputations. Numerous methodologies have been explored throughout the centuries to facilitate the healing of diabetic foot ulcers.

Currently, there exists no optimal wound dressing for the management of chronic diabetic foot ulcers. Traditional moist dressings have historically been augmented with hydrocolloid dressings, gels, foams, and an array of advanced wound therapies, including hyperbaric oxygen, topical growth factors, electrical stimulation, and various offloading techniques.

Recent investigations have underscored that the application of vacuum-assisted closure (VAC) therapy, utilizing sub-atmospheric pressure in a controlled manner at the wound site, has gained prominence in the realm of wound healing. The current study was undertaken to evaluate the efficacy of vacuum-assisted closure (VAC) therapy dressings in comparison to conventional normal saline dressings, with the objective of enhancing the healing process in diabetic foot wounds and substantiating that vacuum-assisted closure wound dressings represent a superior treatment modality in the management of these wounds.

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MATERIALS AND METHODS

This prospective study was conducted among the patients admitted in the ward with diabetic foot wound for the period from January 2025 to December 2025. In this study 45 randomly selected patients were assigned to the study group (VAC dressings) and 45 patients to the control group using normal saline dressings. All patients clinical findings were recorded as per the Performa case sheet and necessary investigations ordered and appropriate treatment was given. All cases were followed up to discharge and subsequently for one week thereafter.

Inclusion Criteria: Patients admitted with diabetic foot wounds below the knee during the study period

1. Age 30- 80 years
2. Ulcer area ranging between 10 sq.cm and 100 sq.cm
3. Diabetes mellitus made by American diabetes association criteria.

Exclusion criteria:

1. Patients with age 80 yrs.
2. Patients with evidence of an obvious septicaemia / osteomyelitis Patients with wounds resulting from venous insufficiency / malignancy Patients with corticosteroids / immune suppressive drugs /
3. chemotherapy Patients with other serious co morbid illness –cardio vascular / pulmonary / immunological diseases
4. Patients with ischemic ulcer
5. Wounds sites other than lower limb

Sample size 90 cases were studied during this scheduled period. They were divided into Group A and Group B. The patients were allocated randomly into 2 groups. Study group(A) Received vacuum assisted closure dressing, Control group (B) Received daily dressing changes with saline-moistened gauze. Wounds of the subjects included in this study underwent initial sharp debridement to remove necrotic tissue and slough as much as possible.

After the debridement, foam-based dressing was done over the wounds of the study group under aseptic conditions. The dressing was covered with an adhesive airtight seal. A drain tube embedded in the foam was connected to a fluid collection canister contained within a portable vacuum/suction machine or wall mound suction. Negative pressure was applied with a range of 50mmHg-125mmHg continuously for 48 hrs, then intermittently (5 min on and 2 min off), then dressing changed once in two to three days. Subsequently the control group received daily saline-moistened gauze dressing. Weekly cultures were taken from the ulcers. Broad spectrum antibiotic regimens were administered to all the patients initially and later changed according to the culture sensitivity. Ulcer was treated until the wound ready for skin cover or spontaneous closure. The amount of granulation tissue as percent of the ulcer floor 7th, 14th, 21st, 28th day. Once the ulcer showed evidence of healing / good granulation tissue skin grafting was done. Upon discharge the patient was advised regarding diabetic diet to be followed, diabetic medication insulin/OHA's, foot care and followed for 1 week immediate post discharge. The mean rate of granulation tissue formation, graft survival and

hospital stay were calculated and compared for both groups.

RESULTS

In our study the discharge from the ulcers on admission was analyzed to determine the most common organism causing the infection. Staphylococcus aureus was the most common organism to be found on culture. In this above study, wound cultures taken from base of the wound after 14 days of the dressing. In VAC study group there was significant reduction of bacterial count and negative culture on compared with control saline group and p value <0.001 is statistically significant.

Percentage of granulation tissue formation on the wound on 7th, 14th, 21st and 28th day. On the 7th day the patients in the VAC study group had mean granulation tissue over the wound 43.5% in comparison with 23.3% of the patients in the control saline group. On day14, the patients in the VAC study group had 64.17% mean granulation tissue their ulcer floors when compared with 38% mean granulation tissues in the control saline group. A similar result was seen on day 21 with 12 patients in the study group already having some form of surgical therapy for skin closure and of the remaining 32 patient's had 73.86% mean granulation tissue their ulcer. The control group had 59.1% mean granulation tissues.

By the 28th day of the study 18 patients had already undergone treatment for their diabetic foot like split skin grafting, secondary suturing. The control group still having 61.15% means granulation tissue on the ulcers. In this above study there is significant difference between two groups and P value <0.001 and statistically significant. The mean graft up take in VAC Group was 92.5 % \pm 2.3 (standard deviation) and in SALINE Group was 78.15 % \pm 3.9 (standard deviation). In VAC Group 38 (84.4%) of the patients had a GOOD uneventful recovery, 7 (16.6%) had a satisfactory recovery. Where as in SALINE Group 30 (66.67 %) had a GOOD recovery, 15 (33.33%) had a satisfactory recovery.

DISCUSSION

The modern dressings are designed to promote and to maintain a moist wound environment in the different phase of the wound healing. The traditional dressing has several disadvantages compared with newer dressings. The modern dressing not only provides moist environment and also reduces the contamination, minimises the trauma to delicate wound tissues and reduces the treatment cost for which the newer dressing designed to be left for several days over the wound. This study is in agreement with multiple other studies that state that VAC therapy is superior to conventional dressings for the management of Chronic diabetic foot ulcers.^[6-9] The explanation of the success of the use of the VAC is found in the work of Argenta and Morykwas, that postulated that this new treatment technique removes excess interstitial liquid, increases angiogenesis, decreases bacterial colonization, and increases the formation of granulated tissues as a response to the stimulus of the mechanical forces created by the negative pressure transmitted through the sponge.

Our study compared with the existing similar study conducted by Joseph et al., and Peter A Blume et al. In our study the rate of granulation was faster in VAC therapy group observed on the 7th, 14th, 21st, and the 28th day, the ulcers in the study group

showed evidence of granulation tissue on an earlier date than the control group. On the 7th day the patients in the VAC study group had mean granulation tissue of about 43.5% in comparison with 23.3% of the patients in the control saline group. On day 14, the patients in the VAC study group had 64.17% mean granulation tissue on their ulcer floors when compared with 38.0% mean granulation tissues in the control saline group. A similar result was seen on day 21 with 12 patients in the study group already having some form of surgical therapy for skin closure and of the remaining 32 patients had 73.86% mean granulation tissue over their ulcer. The control group had 49.1% mean granulation tissues. By 28th day of the study 18 patients had already undergone treatment for their diabetic foot like split skin grafting or secondary suturing. The control group still having 61.15% mean granulation tissue on the ulcers needing further treatment. A mean duration of hospital stay in the vacuum assisted closures study group was 22.73 ± 3.2 days as compared to 34.70 ± 6.5 in the saline control group. Thus indicating a shorter duration of hospital stay in VAC therapy when compared to the latter group. This above study revealed that application of Vacuum Assisted Closure dressing over the ulcer surface can reduce the ulcer size and depth and promote ulcer healing to a greater extent than conventional normal saline moist wound dressings. In our study, the percentage of successful graft up take was $92.5 \% \pm 2.3$ in the Vacuum Assisted Closure groups compared to $78.15 \% \pm 3.9$ in the control saline group.

CONCLUSION

In our study, we found that using Vacuum Assisted Closure (VAC) dressing increased the rate of granulation tissue formation and led to better graft uptake compared to patients who received a conventional normal saline dressing for their diabetic foot ulcers. Patients in the study group showed better compliance, shorter hospital stays, and lower costs than those in the control group. This VAC wound dressing can be seen as a better option for managing diabetic foot ulcers, especially complex wounds involving exposed bones and tendons. It can also reduce the need for reconstructive

surgeries, like flap covers, in favour of simple skin grafts, and decrease the amputation rate. However, larger studies will be needed in the future before we can widely adopt the VAC dressing in the treatment of diabetic foot.

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Conflicts of interest

There are no conflicts of interest.

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