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ORIGINAL RESEARCH

Vacuum-assisted Closure Vs Conventional Open Treatment in Diabetic Foot Ulcer - A Comparative Study

Nirupam Nadella[1], Vinayak Kshirsagar[1]

1. Department of Surgery, Dr. D.Y Patil Medical College Hospital and Research Centre, Pune, India*

ABSTRACT

Background: Vacuum-assisted closure (VAC) therapy also called negative pressure wound therapy (NPWT) is an emerging therapeutic option for diabetic foot ulcers. So, the current study intends to compare vacuum-assisted closure therapy and conventional open therapy in diabetic foot ulcers.

Methods: A prospective case-control study was conducted and 54 patients were randomly allotted into 2 groups during the study period. The cases group includes patients undergone VAC therapy and the control group includes patients undergone conventional open therapy.

Results: Patients in Group A had fewer positive wound cultures and secondary amputations as compared to Group B. VAC therapy was found to considerably improve the meantime to complete wound healing (24.22 days vs. 32.66 days). Secondary amputations were performed on 0% of patients in group A and 11.11 percent of patients in group B. The average hospital stay for group A was 20.33 days and 26.77 days for group B.

Conclusion: When compared to standard dressing, VAC treatment considerably lowers the time to complete wound healing, accelerates granulation tissue production, and reduces ulcer area. The VAC treatment group had no significant increase in bleeding or infection, according to the research.

Keywords: Diabetic Foot Ulcer, Infections, Conventional Dressings, Vacuum-Assisted Closure, Wound Closure

*See End Note for complete author details

INTRODUCTION

Wound healing is a natural innate immune response of the body. It occurs automatically without the interference of any external stimulus. However, the presence of diabetes, a metabolic disorder, slows down or prevents this process by creating a pro-inflammatory state also favorable for the growth of various bacteria and fungi leading to secondary infections. Diabetes foot ulcers are a serious consequence of the disease. An open sore or wound develops in around 15% of diabetics and is commonly located on the bottom of the foot. Six percent of people who get a foot ulcer are hospitalized because of infection or another ulcer-related disease.[1] Amputation is then performed up to 85 percent of the time.[2] The conventional treatment for diabetic foot ulcers is wound closure with debridement of all necrotic, callus, and fibrous tissue and the use of saline-soaked gauze.

This approach was rendered ineffective due to its inability to maintain a continuous wet atmosphere for extended periods. Many alternative therapies, such as hyperbaric oxygen therapy, growth factors, enzymatic debridement chemicals, cultured skin substitutes hydrocolloid wound gels, and other wound treatments, have been promoted as a result. All of these therapies come at a high cost, and they are used in some cases despite a lack of scientific evidence supporting their usefulness.[3]

Negative pressure wound therapy (NPWT) also referred to as V.A.C. therapy, involves placing an open-cell foam dressing inside the wound cavity and application of controlled sub-atmospheric pressure to the wound. This procedure helps to speed up the healing process by draining fluid from open wounds, preparing the wound bed for closure, lowering edema, and encouraging the growth and

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Corresponding author:
Dr Vinayak Kshirsagar
Professor, Department of Surgery, Dr. D.Y Patil Medical College Hospital and Research Centre, Pune, India
E-mail ID - vinayakkshirsagar80@gmail.com

perfusion of granulation tissue. So, we aimed to compare the vacuum-assisted closure and conventional open treatment in diabetic foot ulcers.

METHODOLOGY

The research was carried out in a tertiary care teaching hospital in Pune's general surgery department. Randomized case-control research was carried out to compare the efficacy of VAC against conventional dressings in the treatment of DFU. Patients with type 2 diabetes, aged 33–71 years, and DFU stage 3 or above as defined by Wagner's classification,[4] were randomly allocated to Group A (VAC patients) or Group B (open conventional therapy patients), with an equal number of patients in each group (n=27). Patients under the age of 18 or above the age of 90, pregnant or nursing mothers, non-diabetic foot ulcers, and comorbidities involving the respiratory, cardiovascular, or other bodily systems were all excluded.

People taking corticosteroids, immunosuppressive drugs, or chemotherapy were also excluded from the study. All patients underwent a thorough medical history, physical examination, and necessary diagnostics. The study was approved by an institutional ethics subcommittee. Patients were made to comprehend the treatment and the study in their own language before it began. Informed consent was obtained before they were randomly assigned to one of two groups using statistical software. Sharp surgical debridement was used to remove necrotic tissue and slough from all of the patients' wounds at the beginning of the research and during subsequent dressing changes. After debridement in the minor operation theatre, a foam-based dressing was applied to the wounds of the Study Group A patients under all aseptic conditions. The dressing was wrapped with an adhesive drape to establish an airtight seal. A vacuum was connected to an evacuation tube implanted in the foam, and continuous sub-atmospheric (negative) pressure in the 80-125 mmHg range was applied for 72 hours.

Study Group B was administered a saline-soaked gauze bandage every day, which necessitates frequent dressing changes (two to three times a day) depending on the wound severity. Dressings should be moistened before removal to minimise any possibility of bleeding. All of the patients were given oral analgesics at the time of dressing changes. All patients were given conventional antibiotic regimens, which began with broad-spectrum antibiotics and were later modified based on culture sensitivity data. Patients in groups A and B received subcutaneous insulin for diabetes management. The data was entered and analysed using EXCEL and SPSS 24.

RESULTS

Following eligibility screening, 54 patients satisfied the inclusion criteria and were randomly allocated to one of two groups of nine patients each. VAC treatment was given to Study Group A, whereas conventional dressing was given to Control Group B. At the trial's conclusion, 27 patients from each group were assessed.

Patients in Group A ranged in age from 33 to 70 years, with a mean age of 51.8 years. In contrast, patients in Group B ranged in age from 42 to 71 years, with a mean age of 54.33 years. Men made up 77.77 percent of each category, while women made up roughly 22.22 percent. All of the patients required insulin to control their diabetes and were initially treated with a series of subcutaneous insulin injections. Secondary amputations were performed on 0% of patients in group A and 11.11 percent of patients in group B. VAC therapy was found to significantly reduce the time to complete wound healing (24.22 days vs. 32.66 days). The average hospital stay for group A was 20.33 days. This was followed by 26.77 days for group B. Staphylococcus aureus was the most common bacteria cultured from wounds in group B patients. E Coli and Staphylococcus aureus were identified at comparable levels in group A patients.

Table 1. Safety and efficacy of VAC over conventional dressings in the treatment of diabetic foot ulcers AQ1

	Group A (Case)	Group B (Control)
Age (in years)	51.8 ± 9.58	54.33 ± 9.39
Secondary amputation required (number of patients)	0	3 (11.11%)
Mean hospital stay (Days)	20.33 ± 1.58	26.77 ± 4.35
Meantime for wound healing (Days) (Time for granulation tissue development)	24.22 ± 4.96	32.66 ± 7.33
Split skin graft required (number of patients)	12 (44.44%)	9 (33.33%)
Spontaneous wound closure (number of patients)	15 (55.55%)	15 (55.55%)
Average ulcer area (cm^2)	19.88 ± 13.4	21.55 ± 16.7

DISCUSSION

A newly granulating wound surface denotes good wound healing because granulation tissue development is a component of the wound healing proliferative stage. The interval from the beginning of VAC treatment to the achievement of a fresh & continuous bed of granulation in the wound was used to quantify the amount of time needed

for wound bed preparation prior to surgical intervention. Prior to secondary closure or split-skin grafting, this was accomplished in all 54 of the cases in our study. According to Armstrong et al., NPWT delivered through a VAC device was a safe and effective treatment for difficult diabetic foot wounds, potentially leading to a higher proportion of healed wounds, faster healing rates, and maybe fewer re-amputations than standard care.[5]

Negative pressure applied to the wound bed dilates the arterioles, enhancing the efficacy of local circulation and encouraging angiogenesis, which aids in the proliferation of granulation tissue.[6] Moreover, wound volume and depth were dramatically reduced with VAC dressings compared to wet gauze dressings., according to Mark et al.[7] While evaluating the safety of the treatment, we found that those who received VAC had fewer future amputations than those who received gauze dressings.[8] In Group A vs Group B, we discovered that VAC was safer than saline-moistened gauze dressings in terms of fewer future amputations, which was consistent with what Blume et al reported. Wounds in Group A were treated with a split-thickness skin transplant in 44.44 percent of cases, whereas wounds in Group B were treated with a split-thickness skin graft in 33.33 percent of cases. The patient's other wounds healed on their own. Our findings contrast those of Ali M. Lone et al., who reported split-thickness skin transplantation as the most common wound closure procedure.[9] Group A had a greater success rate in terms of complete granulation and readiness for closure with split-thickness skin grafting or secondary intention, but Group B required amputation more frequently. In our study, the length of time taken to complete VAC therapy ranged from 18 to 30 days, with an average of 24.22 days. This was much shorter than the average time taken by Armstrong et al of 32.9 days.[5] Another advantage noticed was the propensity of VAC treatment to reduce bacterial infection in a wound according to Morykwas et al.[6] All the wounds tested positive for bacteria at the start of the study, but by the end of the trial, all wounds undergoing VAC treatment showed clearance of bacterial infection, which confirms the findings of Aziz Nather et al.[10]

Analyzing the cost efficiency of the VAC over conventional techniques will be made easier with further study. But until then, the facts from the scientific literature point that VAC is a cost-effective therapy that produces comparable or occasionally superior wound healing with few major side effects.

CONCLUSION

According to the current randomized case-control study, VAC treatment is efficacious and safe in DFUs. When compared to standard dressing, it greatly accelerates the time taken to complete wound healing. It hastens the production of granulation tissue without increasing the incidence of complications such as infections and bleeding. It also reduces the ulcer area and the VAC treatment group had no significant increase in bleeding or infection

END NOTE

Author Information

1. Dr. Nirupam Nadella, Research Fellow, Department of Surgery, Dr. D.Y Patil Medical College Hospital and Research Centre, Pune, India

2. Dr. Vinayak Kshirsagar, Professor, Department of Surgery, Dr. D.Y Patil Medical College Hospital and Research Centre, Pune, India

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Author Queries???
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