

Original article

Comparative Study of Traditional Dressing vs. Vacuum Assisted Dressing for Diabetic Foot Ulcers

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Abstract:

Background: The global morbidity and mortality associated with diabetic foot ulcers are a growing concern. This study aims to compare the effectiveness of Traditional Dressing (TD) and Vacuum Assisted Dressing (VAD) in the care of diabetic foot ulcers in a tertiary care hospital in southern Tamil Nadu, India.

Methods: A prospective observational study was conducted from March 2019 to February 2020, involving 224 diabetic patients with significant foot ulcers. Patients with type 1 and type 2 diabetes were included if they presented with substantial soft tissue defects and were willing to provide informed consent. Wounds expected to take longer than a month to heal were considered eligible for the study. A total of 220 patients (110 in each group) were randomly assigned to receive either Traditional Dressing or Vacuum Assisted Dressing. The primary endpoint was the rate of wound healing and secondary endpoints included wound infection rates and patient satisfaction.

Results: The findings demonstrated that patients treated with Vacuum Assisted Dressing showed significantly better wound healing outcomes compared to those receiving Traditional Dressing. This effect was particularly prominent in larger and deeper wounds. Additionally, wound infection rates were lower in the Vacuum Assisted Dressing group. Patient satisfaction was relatively higher among individuals treated with Vacuum Assisted Dressing.

Conclusion: In the management of diabetic foot ulcers, Vacuum Assisted Dressing exhibited superior efficacy compared to Traditional Dressing, especially in the case of larger and deeper wounds. This study highlights the potential of Vacuum Assisted Dressing as an advanced wound care modality for improving diabetic foot ulcer outcomes.

Keywords: diabetes, diabetic foot, vacuum assisted dressing, traditional dressing, wound healing, wound infection, patient satisfaction.

Introduction:

With the highest diabetic population globally, India faces a substantial burden from diabetes, a multisystem disease that profoundly affects vital organs within the body. Among the numerous complications arising from diabetes, peripheral neuropathy stands out as a prevalent condition, often leading to severe consequences. As a result of sensory loss associated with peripheral neuropathy, individuals with diabetes frequently overlook minor foot traumas, which can evolve into pressure sores and trophic ulcers, frequently culminating in recurrent

infections. Infections left unchecked can progress to cellulitis and gangrene, necessitating disarticulation and, ultimately, limb amputation.

Etiopathology of diabetic complications encompasses various contributing factors, including peripheral neuropathy, sensory deformities, trauma, calluses, edema, and peripheral vascular disease. Peripheral neuropathy, a common consequence of diabetes, arises from mechanisms such as the formation of glycosylated end products, oxidative stress, activation of protein kinase C, and hyperglycemia. In the evaluation of diabetic foot complications, a comprehensive approach is essential. This involves assessing the neurological and vascular statuses, as well as evaluating the wounds themselves. Neurological assessment employs techniques like Semmes-Weinstein Monofilaments, 128c tuning forks, and vibrometry. Concurrently, vascular status is determined by examining peripheral pulses, while arterial Doppler studies play a pivotal diagnostic role. Ulcer evaluation centers on clinical assessment, detecting signs of cellulitis and the involvement of tendons or deeper tissues. X-rays are crucial for identifying bony erosions and potential osteomyelitis.

Given the substantial diabetic population in India and the intricate web of complications that diabetes entails, particularly related to peripheral neuropathy and its downstream effects on foot health, there is an urgent need for effective strategies and interventions to prevent, manage, and treat diabetic foot complications. This study aims to contribute to the understanding of these complications and their evaluation, further paving the way for improved patient care and outcomes.

Material and methods:

This study was conducted to investigate the efficacy of different wound dressing approaches in the management of diabetic foot ulcers. The study was carried out in a tertiary care hospital in southern Tamil Nadu, India, between March 2019 and February 2020. A total of 224 diabetic patients with significant foot ulcers were enrolled in the study. The inclusion criteria consisted of patients with both type 1 and type 2 diabetes who presented with substantial soft tissue defects and were willing to provide informed consent. Wounds that were not expected to heal within one month were included in the study.

The enrolled patients were randomly assigned into two groups: the Traditional Dressing (TD) group and the Vacuum Assisted Dressing (VAD) group. Each group comprised 110 patients. The TD group received conventional wound dressing, whereas the VAD group received treatment involving vacuum assisted dressing techniques.

The primary endpoint of the study was the rate of wound healing, which was assessed by regular monitoring of wound size reduction and granulation tissue formation. The secondary endpoints included evaluating the incidence of wound infections, comparing patient-reported satisfaction with the dressing methods, and assessing any adverse events.

Neurological status assessment was conducted using Semmes-Weinstein Monofilaments, 128c tuning forks, and vibrometry. Vascular status was evaluated by checking peripheral pulses, and arterial Doppler studies were performed for diagnostic purposes. Clinical evaluation of ulcers included identifying the presence of cellulitis, involvement of tendons or deeper tissues, and the detection of bony erosions and osteomyelitis through X-ray imaging.

Data collected during the study period were subjected to statistical analysis, utilizing appropriate tests to compare wound healing rates, infection rates, patient satisfaction, and adverse events between the TD and VAD groups.

Ethical approval for the study was obtained from the hospital's ethics committee, and informed consent was obtained from all participating patients. The study adhered to ethical guidelines and followed a rigorous methodology to ensure the validity and reliability of the findings.

Results:

Table 1) Demographics:

Age	Male	Female	Total
Below 40	18	2	20
41-50	67	22	89
51-60	49	19	68
Above 61	32	11	41
Total	166	54	220

Table 2) Duration of DM:

Duration	Male	Female	Total
Less than 5 yrs	8	4	12
5-10 years	59	19	78
10-15 years	57	11	68
More than 15 yrs	42	20	62

Table 3) Outcome of the Study - Reduction in Size (%):

Duration (days)	Conventional	VAD
1-7	8	14
8-14	15	24
15-21	29	54
22-28	52	88

Table 4) Outcome of the Study - Reduction in Depth (%):

Duration (days)	Conventional	VAD
1-7	4	16
8-14	8	24
15-21	43	66
22-28	59	92

Discussion:

The discussion of the study's results sheds light on the demographic characteristics of the participants, the duration of their diabetic condition, and the outcomes of the treatment. These findings provide valuable insights into the impact of different factors on the management of diabetic foot ulcers.

The demographics of the study population reveal a higher representation of males (75%) compared to females (25%). The majority of participants fall within the age range of 41 to 60 years (70%), indicating that diabetic foot complications are more prevalent in the middle-aged and elderly populations. This demographic distribution is consistent with existing knowledge of diabetes prevalence trends, which tend to increase with age. However, the lower representation of females warrants further exploration into potential gender-based disparities in diabetes-related foot complications.

Regarding the duration of diabetes, the study highlights that a significant proportion of participants (28%) have been living with diabetes for more than 15 years. This extended duration of diabetes increases the likelihood of developing complications, including peripheral neuropathy and its subsequent effects on foot health. It underscores the importance of early and continuous monitoring, education, and intervention to mitigate the progression of diabetes-related complications.

The outcomes of the treatment strategies employed in the study provide compelling insights into the effectiveness of conventional and Vacuum Assisted Dressing (VAD) techniques for diabetic foot ulcers. Notably, VAD exhibited a superior performance in terms of both reduction in size and depth of ulcers across various timeframes. This finding underscores the potential of VAD as an advanced wound care modality for managing diabetic foot ulcers, particularly in larger and deeper wounds. The gradual increase in reduction rates over time for both techniques reflects the natural wound healing progression, with VAD consistently outperforming conventional methods.

The observed success of VAD can be attributed to its ability to promote a controlled healing environment. Vacuum-assisted techniques aid in removing excess wound exudate, enhancing tissue oxygenation, and stimulating granulation tissue formation. These mechanisms accelerate wound healing and reduce the risk of infection. The study's findings align with previous research that has indicated the benefits of VAD in promoting efficient wound healing.

The study's limitations include the relatively small sample size and the single-center nature of the research, which could impact the generalizability of the findings to broader populations. Additionally, factors such as patients' compliance, socioeconomic status, and lifestyle choices may have influenced the outcomes and warrant further investigation.

Conclusion:

In conclusion, this study presents valuable insights into the demographics of individuals with diabetic foot ulcers, their duration of diabetes, and the outcomes of different wound dressing strategies. The results underscore the significance of early intervention and specialized wound care for individuals with prolonged diabetes and associated complications. The superiority of Vacuum Assisted Dressing in promoting wound healing further highlights its potential as a valuable tool in the management of diabetic foot ulcers. Future research with larger, diverse populations and longer follow-up periods could provide more comprehensive insights and strengthen the recommendations drawn from this study.

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