



COMPARATIVE ANALYSIS OF VACUUM-ASSISTED CLOSURE AND TRADITIONAL DRESSING FOR CHRONIC WOUNDS

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ABSTRACT

Introduction: Chronic wounds pose a significant medical challenge, characterized by prolonged healing times and resistance to conventional treatments. Effective management strategies are essential for enhancing healing outcomes and improving patients' quality of life. This study aims to compare the efficacy of Vacuum-Assisted Closure (VAC) therapy and traditional dressing methods in the healing of chronic wounds. **Material and Methods:** This prospective randomized comparative study was conducted at a tertiary care teaching hospital in Navi Mumbai, Maharashtra, from December 2020 to October 2022. Fifty patients with chronic wounds were randomly assigned to two groups: Group A received VAC therapy, while Group B received conventional dressings. Outcomes measured included hospital stay duration, healing time, and graft acceptance rates. Data were analyzed using IBM SPSS Statistics 26.0, with a p-value of less than 0.05 considered significant. **Results:** The study found that patients treated with VAC therapy had significantly shorter hospital stays (15.00 ± 6.00 days vs. 19.44 ± 7.05 days), faster healing times (16.48 ± 5.75 days vs. 26.40 ± 7.26 days), and higher graft acceptance rates ($83.72\% \pm 14.82$ vs. $74.40\% \pm 15.21$) compared to those receiving conventional dressings. These differences were statistically significant with p-values of $<.001$. **Conclusion:** VAC therapy significantly outperforms conventional dressings in treating chronic wounds, leading to shorter hospital stays, faster healing times, and higher graft acceptance rates. These findings support the adoption of VAC therapy for improved patient outcomes and more efficient chronic wound management.

KEYWORDS

Vacuum-Assisted Closure (VAC), Chronic Wounds, Wound Healing, Traditional Dressings, Graft Acceptance

INTRODUCTION

Wounds are inevitable events in life, defined by the National Cancer Institute as "a break in the skin or other body tissues caused by injury or surgical incision" (1). They compromise the integrity of biological tissues, including skin, mucous membranes, and organs. Ambrose Paré emphasized that the primary goal of wound management is to create an optimal environment for healing (2). Wound healing, a hemostatic process initiated immediately upon injury, involves clotting to close the wound.

Chronic wounds represent a significant medical challenge, affecting millions of individuals worldwide and leading to substantial morbidity and healthcare costs. These wounds, often resulting from conditions such as diabetes, vascular insufficiencies, and prolonged pressure, are characterized by their prolonged healing time and resistance to conventional treatments. Effective management strategies are essential to enhance healing outcomes, reduce complications, and improve patients' quality of life.

Over the years, a variety of treatment methods have been developed for wound care, encompassing different types of wound dressings. These include creams, ointments, and solutions, as well as occlusive and non-occlusive dressings, absorptive dressings, skin replacements, and negative pressure wound therapy. (3)

Traditional wound dressing methods, which include gauze and other standard materials, have been widely used for decades. These methods aim to protect the wound, absorb exudate, and maintain a moist environment conducive to healing. However, they often fall short in addressing the complex needs of chronic wounds, leading to prolonged healing times and increased risk of infection (4).

In recent years, Vacuum-Assisted Closure (VAC) therapy has emerged as a promising alternative for the treatment of chronic wounds. This advanced therapy involves the application of negative pressure to the wound site, promoting wound contraction, increasing local blood flow, and enhancing the formation of granulation tissue (5). VAC therapy has shown potential in accelerating the healing process and improving overall outcomes in chronic wound management (6).

This present study aims to compare the efficacy of Vacuum-Assisted Closure therapy and conventional wound dressing methods in the healing of chronic wounds. By evaluating key parameters such as healing time, infection rates, and patient satisfaction, this research

seeks to determine the relative efficacy of these two approaches.

MATERIAL AND METHODS

This prospective randomized comparative study was conducted at the Department of General Surgery in tertiary care teaching Hospital in Navi Mumbai, Maharashtra. The study period spanned from December 2020 to October 2022, and included all patients with chronic wounds attending the department. The sample size was calculated using the formula $n = pq(z_{\alpha/2}/E)^2$ and the prevalence rate (p) of 4%, resulting in a sample size of 50 patients. A random sampling method was used, to assign participants in to one of the two groups. Group A received vacuum-assisted closure therapy, while Group B received conventional dressing for chronic wounds. Ethical approval was obtained from the Institutional Ethical Committee, and all patients provided informed consent.

Patients were selected based on specific inclusion and exclusion criteria, including age above 18, all types of chronic wounds with a size less than 10% of the total body surface area, and willingness to undergo vacuum therapy. Exclusions included untreated osteomyelitis, exposed arteries or veins, malignant wounds, dry gangrene, and wounds from electrical, chemical, or radiation burns. The wounds of all patients were thoroughly debrided, photographed, and measured before treatment. Group A received VAC therapy, where sterile open-cell foam was applied to the wound, sealed with an adhesive drape, and connected to a vacuum pump providing intermittent or continuous negative pressure (50-125 mm Hg). Group B underwent conventional daily dressings. The study measured outcomes such as the number of days required for healing, percentage of ulcer surface area healed, number of unhealed ulcers at the end of the trial period, and postoperative complications. Data were analyzed using IBM SPSS STATISTICS 26.0 software. The statistical tests such as Chi-Square, Fisher's Exact test, and Mann-Whitney U test were used to test the significance of difference. A p-value of less than 0.05 was considered significant.

RESULTS

The study compared the efficacy of Vacuum-Assisted Closure (VAC) therapy and traditional dressing methods in managing chronic wounds. The key parameters analyzed included the average hospital stay, time required for healing, and graft acceptance rates across different age groups and genders. The results demonstrated significant differences favoring the VAC therapy over conventional dressings.

Table 1 gives the baseline characteristics of the study participants and it shows that the majority of participants were between the ages of 38-57 years (52%) and predominantly male (68%). Both VAC and conventional dressing groups had an equal distribution of 25 patients each.

Table 1. Distribution according to baseline characteristics

Baseline characteristics	Frequency	Percentage
Age (years)		
18-27	2	4.0%
28-37	5	10.0%
38-47	13	26.0%
48-57	13	26.0%
58-67	12	24.0%
67-77	5	10.0%
Gender		
Male	34	68.0%
Female	16	32.0%
Dressing technique		
VAC	25	50.0%
Conventional dressing	25	50.0%

Table 2 indicates that, across all age groups and genders, patients treated with VAC therapy had shorter hospital stays, faster healing times, and higher graft acceptance rates compared to those receiving conventional dressings. Specifically, males showed a significant improvement with VAC therapy in all three parameters, and younger age groups (18-27 years) had the highest graft acceptance rates.

Table 2. Average Hospital Stay, Healing Time, and Graft Acceptance by Age, Gender, and Dressing Type

		Hospital Stay		Time required for healing		Graft acceptance (%)	
		VAC	Conventional dressing	VAC	Conventional dressing	VAC	Conventional dressing
Age	18-27	14.00	15.00	11.00	12.00	89.00	85.00
	28-37	18.50±16.26	15.00±2.00	17.50±14.84	25.67±5.68	91.00±9.80	78.33±6.65
	38-47	17.29±5.96	19.67±4.22	18±4.69	21.00±4.73	81.29±23.28	73.17±14.82
	48-57	12.43±3.45	18.83±9.78	15.86±4.05	29.00±7.12	86.29±8.05	75.67±10.91
	58-67	12.67±4.80	19.83±7.33	14.00±5.96	29.33±6.53	87.17±8.01	75.67±10.91
	67-77	20.00±2.82	25.33±9.01	22.5±1.12	32.67±0.57	65.00±15.55	62.67±17.24
Gender	Male	14.39±5.07	21.63±7.09	15.94±4.78	27.38±6.38	86.67±11.44	77.88±15.52
	Female	16.57±8.18	15.56±5.31	17.86±8.03	24.67±8.74	76.14±20.35	68.22±13.23

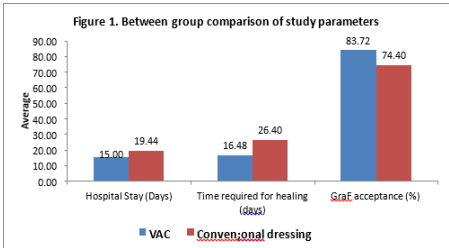
Table 3 and figure 1 indicates that the average duration of hospital stay was significantly shorter for patients treated with VAC therapy (15.00 ± 6.00 days) compared to those receiving conventional dressing (19.44 ± 7.05 days), with a p-value of <.001. Similarly, the time required for healing was markedly reduced in the VAC group (16.48 ± 5.75 days) compared to the conventional dressing group (26.40 ± 7.26 days), also with a p-value of <.001. Additionally, graft acceptance rates were higher in the VAC group (83.72% ± 14.82) versus the conventional dressing group (74.40% ± 15.21), indicating a statistically significant improvement (p-value <.001).

Table 3. Between group comparison of study parameters

	VAC		Conventional dressing		p-value
	Mean	SD	Mean	SD	
Hospital Stay (Days)	15.00	6.00	19.44	7.05	<.001**
Time required for healing	16.48	5.75	26.40	7.26	<.001**
Graft acceptance (%)	83.72	14.82	74.40	15.21	<.001**

These results suggest that VAC therapy is more effective than traditional dressings in promoting faster healing and higher graft acceptance rates, leading to a shorter hospital stay. This highlights the potential of VAC therapy as a superior treatment option for chronic wounds, providing significant benefits in terms of patient outcomes and healthcare efficiency. The findings supports for the comprehensive

adoption of VAC therapy in clinical practice, especially for patients with chronic wounds that are resistant to conventional treatment methods.



DISCUSSION

In the study "Comparison of Vacuum-Assisted Closure Therapy and Conventional Dressing in the Healing of Chronic Wounds," 50 participants were divided into two groups: 25 treated with VAC therapy and 25 with conventional dressings. Despite advancements in chronic ulcer treatments, conventional dressings remain commonly used. However, NPWT has proven critical, with its application to soft tissue damage dating back to 1993.

Most patients (52%) were between 38-57 years old. The mean ages were 51.40 ± 12.37 years for VAC therapy and 50.36 ± 13.46 years for conventional dressings. Previous studies reported higher mean ages for chronic ulcer patients, such as 62.1 years by Kucharzewski et al.(7) and 73 years by Vuerstaek et al. (8). Chronic wounds were more common in males (68%) with a male-to-female ratio of 2.1:1. Similar findings were reported by Maduba et al.(9), with a male ratio of 1.7:1. Contrarily, Kucharzewski et al. found a higher prevalence in females (3:1 ratio)(9).

VAC therapy significantly reduced hospital stays (15 ± 6 days) compared to conventional dressings (19.44 ± 7.05 days, p<0.001). Similar trends were observed in other studies (10–12). Patients treated with VAC healed faster (16.48 ± 5.75 days) compared to conventional dressing (26.40 ± 7.26 days). This aligns with findings by Vuerstaek et al. and Kucharzewski et al., who also reported quicker healing with NPWT (8,9). Saaiq et al. (13) confirmed faster wound healing and shorter hospital stays with NPWT.

Graft acceptance was higher with VAC (83.72% ± 14.82) than conventional dressings (74.40% ± 15.21, p<0.001). Scherer (14) and Vuerstaek et al. (8) also reported better graft acceptance with VAC. Higher patient satisfaction with NPWT was observed, consistent with findings by Maduba et al. and Hsiao et al.(9,15). Overall, VAC therapy offers significant advantages over conventional dressings in treating chronic wounds, supporting its broader use in clinical practice

CONCLUSION

Vacuum-Assisted Closure (VAC) therapy significantly outperforms conventional dressings in treating chronic wounds, resulting in shorter hospital stays, faster healing times, and higher graft acceptance rates. These findings support the adoption of VAC therapy for improved patient outcomes and more efficient chronic wound management.

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