



Comparison of Vacuum Assisted Closure Technique Versus Conventional Dressing for Management of Wounds in Term of Duration of Wound Healing

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ABSTRACT

Background: Negative pressure wound therapy in the form of vacuum assisted closure is known to be a useful adjunct in wound healing. It can downstage surgical reconstruction options from large flaps to simpler skin grafts or secondary wound closure. **Objective:** To compare mean duration of wound healing between conventional dressings and negative pressure wound therapy for management of wounds. **Study Design:** Randomized Controlled Trial. **Settings:** Allied Burn and Reconstructive Surgery Centre, Faisalabad, Pakistan. **Duration:** June 1, 2018 to November 30, 2018. **Methodology:** All the patients were randomly divided into 2 groups. Group A underwent negative pressure wound therapy while group B underwent conventional dressings. Patients in both groups were observed for a period of maximum two weeks. **Results:** Comparison of mean duration of wound healing between conventional dressings and negative pressure wound therapy for management of wounds was done. It was 9.83 ± 1.32 days in Group-A and 16.30 ± 1.37 days in Group-B, p value was 0.0001. **Conclusion:** Mean duration of wound healing was significantly higher in cases with conventional dressings compared with negative pressure wound therapy for management of wounds.

Keywords: Wounds, Wound management, Conventional dressings, Negative pressure wound therapy, Duration of wound healing.

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INTRODUCTION

Wound healing is a complex dynamic process that includes an ultimate sequence of cell migration leading to repair and closure. This sequence begins with appearance of signs of inflammation in first phase followed by deposition of collagen by fibroblasts, angiogenesis, deposition of granulation tissue, contraction and finally remodeling of the connective tissue matrix, and maturation.¹ When wounds fail to undergo this sequence of events, a chronic open wound without anatomical or functional integrity results. These wounds may be as a result of pressure, trauma, venous insufficiency, diabetes, vascular disease, or prolonged immobilization.

Traditionally moist wound dressings are used as a standard management in wound care. During last two decades a wide variety of innovations have been introduced which include polyglactin mesh, honey in diabetic wounds, skin grafting in chronic wounds and vacuum-assisted closure (VAC) therapy techniques.² Topical oxygen therapy with conventional methods has revealed significantly good results in management of infected diabetic wounds.³ Vacuum-assisted closure, sometimes referred to as Micro Deformational Wound Therapy (MDWT) or Negative Pressure Wound Therapy (NPWT), has revolutionized wound care over the last 15 years. This technology is based on mechanotransduction principles.⁴ It involves placing an open-cell foam dressing into the wound cavity and applying a sub atmospheric pressure (typically 25-125mmHg below ambient pressure). The technique removes edema fluid, leading to increased localized blood flow, and the applied forces result in the enhanced formation of controlled

granulation tissue and early wound closure. This technique was first described by Fleischmann *et al* in 1993, following the successful use of this technique in 15 patients with open fractures.⁵

The study reported that treatment resulted in “efficient cleaning and conditioning of wound with marked proliferation of granulation tissue”. Following Fleischmann, VAC has been successfully used as an adjunct therapy in the treatment of acute and chronic soft tissue defects, defects with exposed hardware, enterocutaneous fistulae, sternotomy wounds, burns and after skin graft has been applied.

Despite the evident usefulness of VAC, there is paucity of evidence to prove this therapy superior to conventional dressings for management of wounds in terms of duration of wound healing. Whereas several studies revealed that VAC therapy brings faster healing and hence improved clinical outcome when compared to moisturized saline gauze,⁶⁻¹¹ some others found no difference in days of healing when comparing both treatment options.^{12,13} Because of this controversy, study was conducted to compare the vacuum assisted closure technique with the conventional dressing in terms of mean duration of wound healing.

METHODOLOGY

Study Design: Randomized Controlled Trial.

Settings: Allied Burn and Reconstructive Surgery Centre, Faisalabad, Pakistan.

Duration: Six months from June 1, 2018 to November 30, 2018.

Sample Technique: Non-probability consecutive sampling.

Inclusion Criteria: Patients with 20-60 years of age of both genders, having acute, subacute and chronic wounds with ASA grade I (patients with no other systemic diseases) and ASA grade II (with some mild illness but no functional limitation)

Exclusion Criteria: Wounds having dry eschar, malignancy in wound, untreated osteomyelitis, exposed blood vessels and organs, long term anticoagulant therapy, bleeding disorders and fistula to organ / body cavities.

Methods: This study was conducted at Department of Plastic Surgery, Allied Burn & Reconstructive Surgery Center, Faisalabad. All the patients were randomly divided into 2 groups; A and B. Group A underwent negative pressure wound therapy while group B underwent conventional dressings. Patients in both groups were observed for a period of two weeks.

All wounds were washed thoroughly with normal saline and debridement done if needed. Wounds of the patients in group A were covered with a polyurethane foam and a multi hole drain was placed over it. It was then sealed with airtight dressing. Drain was attached to a negative pressure system that provided intermittent negative pressure of -80mmhg with 45 min ON and 15 min OFF cycle. In group B, a saline soaked dressing was placed over the wound and bandage was applied. Group A underwent change of dressing after 48-72 hours, while in group B, it was changed after every 24 hours. Patients in both groups were observed for a period of maximum two weeks. Improvement in wound granulation were noted. Wounds were monitored for signs of complications including bleeding, maceration, pain, odor, skin reaction, pressure damage from tubing. VAC therapy was discontinued when aim of therapy had been met; or if there was no improvement in wound after 3-4 applications of therapy; or in case of any complication. Duration of wound healing was again documented. Wounds that did not closed spontaneously in both groups, were covered with skin graft or flap after healthy granulation.

RESULTS

Total 60 cases (30 in each group) fulfilling the selection criteria were enrolled to compare mean duration of wound healing between conventional dressings and negative pressure wound therapy. Number of patients with upper limb wounds in Group-A & B were 46.67% (n=14) each, while number of patients with wounds on lower extremity was 36.66% (n=11) in Group-A and 40% (n=12) in Group-B, patients with trunk wounds were recorded as 16.67% (n=5) in Group-A and 13.33% (n=4) in Group-B. (Table 1)

Table 1: Frequency of site of wound (n=60)

Site of wound	Group-A (n=30)		Group-B (n=30)	
	No. of patients	%	No. of patients	%
Upper limb	14	46.67	14	46.67
Lower limb	11	36.66	12	40
Trunk	5	16.67	4	13.33
Total	30	100	30	100

Frequency of patients with acute wound was recorded as 56.67%(n=17) in Group-A and 66.67%(n=20) in Group-B, whereas that of subacute wounds was 43.33%(n=13) in Group-A and 33.33%(n=10) in Group-B. (Table No.2)

Table 2: Frequency of type of wound (n=60)

Type of wound	Group-A (n=30)		Group-B (n=30)	
	No. of patients	%	No. of patients	%
Acute*	17	56.67	20	66.67
Subacute**	13	43.33	10	33.33
Total	30	100	30	100

*acute.... age of wound < 72hrs

**subacute.... age of wound < 2 weeks

Comparison of mean duration of wound healing between conventional dressings and negative pressure wound therapy was done. It showed 9.83±1.32 days in Group-A and 16.30±1.37 days in Group-B, p value was 0.0001. Effect modifiers like age, gender, diabetes mellitus, obesity, site of wound, chronicity (type) of wound were controlled by stratification. Post stratification independent sample t-test was applied. P-value turned out to be significant.

Table 3: Mean duration of wound healing (n=60)

Duration (days)	Group-A (n=30)		Group-B (n=30)	
	Mean	SD	Mean	SD
	9.83	1.32	16.30	1.37

P value=0.0001

DISCUSSION

In clinical practice one comes across a variety of wounds; acute, subacute or chronic. These wounds may be the result of trauma, surgery, diabetes, infections, pressure or immobilization. These wounds can lead to significant morbidity and mortality. Wound management is a complex task and differs according to size of wound, type of structure involved, general health and nutritional status of patient. Consequently, researchers have come across a multitude of treatment options. Negative pressure wound therapy (NPWT) or vacuum assisted closure (VAC) therapy is one of them. VAC works on the principles of mechanotransduction.⁴ Application of sub atmospheric pressure removes interstitial fluid, leading to, at times, maximum of four-fold increase in blood flow to the local tissue.¹⁴ The applied mechanical forces act as a stimulus to enhance angiogenesis and cellular reproduction. This increase in granulation tissue formation has been confirmed in studies by Joseph *et al* and Fabian *et al*.^{15,16}

Review of literature shows some controversy regarding usefulness of VAC therapy. Several studies reflect evidence that VAC therapy brings faster healing and hence improved clinical outcome when compared to moisturized saline gauze.^{6-11,17,18} In

a study carried out for diabetic foot ulcers mean duration of wound healing in days was found to be 11.366 with SD of ± 3.488 with VAC dressings while with conventional dressings, it was 16.41 with a SD of ± 3.104 and P-value of 0.000 which was highly significant.⁶ In contrast, there are some studies which did not yield statistically significant results.^{12,13,19} Wanner and colleagues studied the effectiveness of vacuum dressing and compared it with conventional dressing in patients with bed sores. They found no difference in days of healing in two groups¹² i.e., the vacuum assisted group took a mean of 27 ± 10 days and the traditional group 28 ± 7 days. Moues CM compared VAC therapy and moist gauze dressing. Patients receiving VAC were ready for surgery in an average of 7 days (SD ± 4) and those dressed with gauze after an average of 10 days (SD ± 7). Study too did not observe significant difference in time needed to reach "ready for surgical therapy".¹³ Another study conducted by Page JC and colleagues found statistically insignificant results while treating open foot wounds with significant soft tissue defects.¹⁹

In present study, all consecutive patients with acute, subacute and chronic wounds were included and comparison of mean duration of wound healing between negative pressure wound therapy (group A) and conventional dressings (group B) was done. Patient age and gender were comparable in both groups. Antibiotics were started after culture and sensitivity report of each wound. It showed the mean duration of healing 9.83 ± 1.32 days in Group-A and 16.30 ± 1.37 days in Group-B, P value was 0.0001 which was highly significant. It was observed that mean duration of wound healing in Group A was significantly less than that in Group B. Patients approaching the end point of wound healing were ultimately covered with skin graft or flap and discharged to home. A decrease in mean time of healing of the wounds also helps in decreasing the patient's morbidity and hospital stay which ultimately leads to improved quality of life. Thus, VAC therapy appears to be an effective modality for management of variety of wounds, achieving faster recovery, decreasing morbidity and hospital cost when compared with the conventional dressing.

CONCLUSION

Mean duration of wound healing was significantly higher in cases with conventional dressings when compared with negative pressure wound therapy for management of wounds.

LIMITATIONS

Study was carried out on sixty patients and each group included thirty patients. Number of the cases included in study may be increased to make the findings more elaborate. Only one variable, i.e., mean duration of wound healing was studied. Further studies to compare various other parameters like, cost effectiveness, ease of use from both the patient and doctors' perspectives, quality of scar, functional and cosmetic outcomes will definitely help the readership to utilize this wound management system.

SUGGESTIONS / RECOMMENDATIONS

Vacuum assisted closure technique may be quite a simple option to prepare the chronic wounds for ultimate closure and at same time helps reducing the size of the wound. It may be utilized for management of variety of chronic wounds for faster closure and soft tissue coverage.

CONFLICT OF INTEREST / DISCLOSURE




No conflict of interest to be declared.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

AUTHORS	Contribution to The Paper	Signatures
Prof. Dr. Saeed Ashraf Cheema Professor & Head of Burn & Reconstructive Surgery Center, FMU / Allied Hospital, Faisalabad Pakistan	Substantial contributions to the conception and design of the work; the acquisition, analysis, and interpretation of data for the work; *revising it critically for important intellectual content; *Final approval of the version to be published	
Dr. Hafsa Nasir Post Graduate Resident, Burn & Reconstructive Surgery Center, Allied Hospital, Faisalabad Pakistan	The acquisition, analysis, and interpretation of data for work; *Drafting the work *Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.	
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Dr. Urwa Tanveer Ahmad Post Graduate Resident, Burn & Reconstructive Surgery Center, Allied Hospital, Faisalabad Pakistan	*The acquisition, analysis, and interpretation of data for work; *Drafting the work *Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.	