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Original Research Paper

Surgery

COMPARISON OF VACUUM ASSISTED DRESSING VERSUS CONVENTIONAL DRESSING IN WOUND HEALING

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ABSTRACT

BACKGROUND: Use of innovative dressing techniques like vacuum assisted closure (VAC) supposedly facilitates faster wound healing.

OBJECTIVE: To compare vacuum-assisted dressing and conventional dressing with regards to wound healing.

METHODOLOGY: Sixty Participants were randomized into 2 groups of 30 each [Vacuum assisted dressing (VAC)-'Group V', Conventional dressing-'Group C'] and the results were compared for wound healing.

OBSERVATIONS: On day 3, discharge from wounds was absent in 22/30 patients in group V and present in all the patients in conventional dressing group. On day 6, most of the parameters showed significant difference, except granulation. By day 9, all the parameters of wound healing were significantly better in favour of group V.

CONCLUSION: All the parameters of wound healing, i.e. contraction of the wound, bleeding and angiogenesis, discharge, slough, granulation and healing time were all in favour of VAC dressing.

KEYWORDS :

INTRODUCTION:

Delayed wound healing is a significant problem faced by surgeons, particularly among elderlies[1]. In addition to pain and suffering, mobility and work capacity tend to be restricted due to failure of the wound to heal. Ageing is associated with gradual decline in the function of sensory nerves that have an important role in tissue repair[2]. Other factors such as pressure, trauma, venous insufficiency, diabetes mellitus, vascular diseases and prolonged immobilization also influence wound healing[3,4].

Management of chronic, open wounds is challenging, requires prolonged hospitalization or home care[4]. Standard wound management consists of initial surgical debridement, followed by application of wet-to-moist gauze dressings or specialized dressings like Opsite (Smith and Nephew Inc., Columbia, SC), which need to be changed at least twice daily, to cover the wound[5]. These dressings are relatively inexpensive, readily available and easy to apply. However, there are some disadvantages: non-selective debridement with dressing removal, possible wound desiccation, and need for frequent dressing changes[5].

Use of innovative dressing techniques like vacuum assisted closure (VAC)[6] supposedly facilitates faster wound healing. A tube embedded in the foam exits to a vacuum pump suction machine providing a sub-atmospheric pressure environment on the wound bed, which removes blood and serous fluid from an operation site to provide a drier surgical field, reduces infection rates and increases localized blood flow, thereby supplying the wound with oxygen and nutrition to promote accelerated healing[7].

Objective of this study was to compare conventional dressings with vacuum-assisted dressings with regards to wound healing in terms of,

- Quality of wound healing
- Reduction of surface area of wound
- Duration of healing

METHODOLOGY:

Study type- Comparative randomized prospective study

Study setting- Department of Surgery, Govt. Medical College & KTS Hospital, Gondia

Study Period- September 2017- August 2018

Study Population- Patients admitted in Department of Surgery, Government Medical College, Gondia during study period

Study Sample- 60 participants [30- Vacuum assisted dressing (VAC)-'Group V', 30- Conventional dressing'Group C']

INCLUSION CRITERIA-

- Wounds involving the diabetic foot
- Acute traumatic wounds
- Dehisced wound
- Pressure ulcers
- Venous stasis ulcers

EXCLUSION CRITERIA-

- Fistulas from organs or body cavities
- Necrotic tissues in eschar
- Untreated osteomyelitis
- Malignancy in the wound
- Actively bleeding wound
- Histologically proven tubercular ulcers/sinuses
- Patients who are immuno-compromized e.g. HIV-positive patients, patients on immunosuppressive drugs
- Patients with anaemia, hypoproteinaemia and BMI <18.5 kg/m2

After written informed consent, subjects included in the study were enrolled as per mentioned inclusion & exclusion criteria. For randomization, coin tosses performed by the principal investigator (SA) were used for sequence generation for treatment group (VAC or Group V) and control (Conventional dressing or Group C) assignment. Sequential results (eg, participant 1 = Group V and 2 = Group C) were placed inside 60 opaque sealed envelopes numbered in advance (eg, 1–60). Once each participant was screened for eligibity (with the exception of the survey regarding expectations of treatment efficacy), he/she was randomized to group V or group C using opaque concealed envelope from within a box located with the measurement laboratory. All outcome assessors remained blinded to assignment of intervention throughout the study. By necessity for an active intervention, participants were not blinded to intervention assignment. Written informed consent was obtained from all the patients included in the study.

All study patients underwent detailed history-taking and clinical examination. Duration, etiology and present status of the wound,

present nutritional status, presence of associated chronic/metabolic disorders and ongoing immunosuppressive medications were also noted. Conventional wound management in patients of group 'C' included daily serial debridement of slough and debris, wound lavage with hydrogen peroxide and dilute povidone-iodine solution with saline and dressing with paraffin gauze closed dressings. Patients of group 'V' underwent vacuum-assisted dressings as per standard protocol6. During change of dressings, every time the existing dressing was removed and wound was inspected to note the presence of pain, foul odour, erythema, oedema and granulation tissue. Length, width and depth of the wound were measured using paper scale/gauze piece and measurements recorded.

The wound healing for both groups was evaluated in terms of:

1. Status of the wound: It included assessment at the interval of every 2 days and scoring on bleeding to touch (present-1, absent-0), slough (absent-1, present-0), edges (healing-1, non-healing-0) and discharge (serous-1, purulent-0).
2. Size of the wound: The wound was measured in surface area of the wound (in cm2) and maximum depth (in mm) at the interval of every 2 days and observations were tabulated.
3. Total duration (in days) taken by the wound to heal.

Each variable used in evaluation of wound healing was compared for the two groups 'V' and 'C' using appropriate statistical tests (mainly chi-square and student 't' test). P-value <0.05 was considered to be significant (CI = 95%). The data was analysed using STATA (version 10.0) software.

The protocol of project was submitted to institutional ethics committee and the project was started after approval.

RESULTS:

The present study was conducted on 60 patients admitted in department of General Surgery, Government Medical College, Gondia. Participants were randomized into 2 groups of 30 patients each [Vacuum assisted dressing (VAC)-'Group V', Conventional dressing-'Group C'] and the results were compared w.r.t. wound healing as assessed by parameters as mentioned.

Mean age of participants in Group V and Group C were 29.42 and 28.97 years respectively. The male:female gender ratio was 23/7 in Group V and 16/14 in Group C.

The distribution of type of wounds is described in **Table 1.**

Table 1: Distribution of type of wounds

Type of Wounds	Group V	Group C
Diabetic Foot	12	14
Dehiscence	07	05
Acute Traumatic	03	04
Venous Stasis Ulcers	05	03
Pressure Ulcers	03	04

Diabetic foot related wounds were the predominant type in the study followed by wound dehiscence. Acute traumatic, venous stasis ulcers and pressure ulcers made the remaining numbers. Out of 26 patients of diabetic foot, VAC dressing was done in 12 patients and conventional dressing was done in 14 patients. 12 Patients had dehisced wounds, out of which in 7 patients VAC dressing was done and in 5 patients conventional dressing was done. Seven Patients had acute traumatic wound, out of which VAC dressing was done in 3 patients and conventional dressing was done in 04 patients. Seven patients had pressure ulcers, out of which in 3 patients VAC dressing was done and in 4 patients conventional dressing was done. Eight patients had venous stasis ulcers, out of which in 5 patients VAC dressing was done and in 3 patients conventional dressing was done.

Comparison of VAC Vs Conventional dressing with reference to pertinent wound parameters as assessed on day 0, day 3, day 6 and day 9 is as detailed in **Table 2**.

Table 2: Comparison of VAC Vs Conventional dressing with reference to pertinent wound parameters

Variable	Day 0		p-value	Day 3		p-value	Day 6		p-value	Day 9		p-value
	Grp V	Grp C		Grp V	GrpC		Grp V	Grp C		Grp V	Grp C	
Area												
0-10 cm^2	03	02	0.37	08	07	0.28	13	04	0.03*	00	00	0.01*
10-20 cm^2	04	05		05	10		08	15		15	09	
20-30 cm^2	05	10		10	13		09	11		08	21	
30-40 cm^2	07	08		07	00		00	00		07	00	
40-50 cm^2	11	05		00	00		00	00		00	00	
Depth												
1-2 mm	08	05	0.16	08	07	0.24	08	07	0.03*	08	00	0.01*
2-3 mm	02	08		15	10		03	03		17	17	
3-4 mm	13	13		07	13		12	20		05	13	
4-5 mm	07	04		00	00		07	00		00	00	
Bleeding												
Present	10	10	1.0	13	12	0.79	21	13	0.04*	24	17	0.05
Absent	20	20		17	18		09	17		06	13	
Granulation												
Present	15	10	0.19	12	12	1.00	18	13	0.2	23	14	0.02*
Absent	15	20		18	18		12	17		07	16	
Discharge												
Purulent	15	20	0.10	08	20	<0.01**	08	13	0.009**	5	10	0.03*
Serous	07	10		00	10		14	17		5	10	
Absent	08	00		22	00		08	00		20	10	
Slough												
Present	24	21	0.37	21	20	0.78	16	18	0.6	08	17	0.02*
Absent	06	09		09	10		14	12		22	13	

*p<0.05 is statistically significant, **p< 0.01 indicated high statistical significance

All the variables related to wound healing process were statistically comparable between group V and group C at the start of the study (day 0). On day 3, discharge from the wound showed statistical significant difference between the two groups, with it being absent

in as many as 22/30 patients in group V. Rest of the parameters were statistically similar by day 3. On day 6, most of the parameters showed significant difference in favour of group V, except formation of granulation tissue in which the difference was not statistical significant. But by day 9, all the parameters of wound healing were significantly better in favour of group V, i.e. the vacuum assisted dressing group, as compared to the conventional dressing group (group C).

The mean total time taken in healing of the wound in group V was 28.03 days and in Group C was 40.33 day, with the difference being statistically significant, illustrating faster wound healing in vaccum assisted dressing patients.

DISCUSSION:

The present study was conducted on 60 patients admitted in department of General Surgery, Government Medical College, Gondia. Participants were randomized into 2 groups of 30 patients each [Vacuum assisted dressing (VAC)-'Group V', Conventional dressing-'Group C'] and the results were compared w.r.t. wound healing.

Mean age of participants in Group V and Group C were 29.42 and 28.97 years respectively, which were comparable. The male:female gender ratio was 23/7 in Group V and 16/14 in Group C. The difference in gender ration had much to do with the consent for VAC dressing not being provided by many (7) female patients. Diabetic foot related wounds were the predominant type in the study, which were treated with vacuum assisted (12) or conventional dressing (14) in almost equal numbers.

The purported mechanism of action that has been attributed to vacuum assisted dressing are increase in blood flow, promotion of angiogenesis, reduction of wound surface area in certain types of wounds, modulation of the inhibitory contents in wound fluid and induction of cell proliferation[8].

Both the groups were statistically comparable for all the parameters of wound healing on day 0, indicating minimal bias. Observations regarding area of the wound in both the groups revealed statistically insignificant difference between the groups on day 3, which became progressively significant on day 6 & day 9. This indicates superiority of vacuum assisted dressing over conventional dressing w.r.t. contraction of the wound. Vacuum Assisted Dressing was found very effective in reducing the area of the wound after application at regular intervals which is consistent with the findings of Hassan et al[9]. Similarly, vacuum assisted dressing was observed to be very effective in reducing the depth of the wound after application at regular intervals which is also in line with the findings of Hassan et al[9].

VAC dressing was found to be clearly more effective in improved bleeding and vasularization of the wound than conventional dressings on day 6 and day 9. This finding sits well with the observations of Nagraj et al[10].

Vacuum Assisted Dressing was observed to be effective in hastening the granulation of the wound after application at regular intervals. The VAC group showed better wound granulation on day 9, as compared to conventional dressing group. This observation is also consistent with the findings of Hassan et al[9] & Nagraj et al[10]. Discharge from the wound was also found significantly reduced with VAC, which is consistent with the findings of Ford et al[11]. We also report that VAC was very effective in reducing the slough from the wound. Despite best of efforts, no previous similar study could be found studying this.

Vacuum Assisted Dressing also led to faster healing of the wound after application at regular intervals; a finding which is consistent with two different studies conducted by Hassan[9] & Sinha[12].

Further research is needed to establish the relationship between negative pressure and blood flow and the optimal pressure for wound healing[13] and to further augment understanding of the therapeutic effects of VAC therapy to give clinicians stronger arguments to support its use[14,15].

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