

Assessing and comparing the quality of wound healing with Vacuum-Assisted Closure and with conventional dressings using Wound Bed Score

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Abstract

BACKGROUND

Delayed wound healing is a major health issue in today's society, particularly in older population. Failure of the wound to heal causes social and financial burdens, in addition to the pain and suffering they have to undergo.

ABBREVIATIONS

SSG -Split Skin Grafting, VAC -Vacuum Assisted Closure, WBS -Wound Bed Score

OBJECTIVES

To assess and compare the quality of wound healing with Vacuum-Assisted Closure (VAC) and with conventional dressings using Wound Bed Score (WBS).

MATERIALS AND METHODS

It is a prospective observational study enrolling 80 patients, who were divided into two groups. First 40 patients were treated with conventional dressings, and the remaining patients treated with VAC dressings. Each patient was followed up for 30 days and assessed a total of 7 times with a time interval of 5 days. The quality of wound healing was assessed using WBS, which had 8 parameters. Healing edges, presence of slough, granulation tissue, amount of exudate, edema, peri-wound dermatitis, peri-wound fibrosis and pink/red wound bed were assessed in both the groups on Day0, Day5, Day10, Day15, Day20, Day25 and Day30, and were compared.

RESULTS

After analysing the granulation tissue present in the ulcers in both the groups, it was noted that at Day5, conventional group had very minimal or no granulation tissue-23(57.5%) whereas in VAC group, 26(65%) had almost half granulation tissue covered. Considering the edges of ulcers in both the groups it was noted that at Day15 and Day20, moderate healing was seen in 21(52.5%); 20(50%) subjects in conventional group and 23(57.5%) ; 22(55%)in VAC group respectively whereas at Day25 and Day30, moderate healing-17(42.5%) was seen in conventional group, but most of the subjects showed good healing in VAC group at both Day 25 20(50%) and Day30- 22(55%). 17(42.5%) patients in VAC group underwent definitive treatment during the study period, whereas, only 8(20%) patients in conventional dressings group underwent definitive treatment.

CONCLUSIONS

VAC Dressings are more efficient compared to conventional dressings, by considering the increase in granulation tissue, good healing edges and more number of people undergoing definitive treatment.

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I. Introduction

Delayed wound healing is a significant health problem in today's society, particularly in older population. Failure of the wound to heal imposes social and financial burdens, in addition to the pain and suffering they have to undergo. The prevalence of chronic wounds is 1.3 % in adult population, which is considered age dependent, increasing to 3.6% for those aged 65 years and more. There is a gradual decline in the function of sensory nerves as we age, which have an important role in tissue repair. An acute wound is defined as any interruption in the continuity of the body's surface⁽¹⁾, for example burns, crushing injuries and lacerations⁽²⁾. Whereas a chronic wound can be defined as any wound which requires prolonged time to heal, does not heal or recurs⁽¹⁾. For a chronic wound to heal it requires adequate wound bed preparation.

This mean, there needs to be control in the exudates and edema, decrease in the bacterial burden, promote healthy granulation tissue and remove necrotic tissue.⁽³⁻⁵⁾

Vacuum Assisted Closure (VAC) is a therapy which can be used on different types of acute and chronic wounds to either achieve adequate wound closure or to prepare the wound bed for further definitive management.⁽⁶⁾ It can reduce the morbidity and mortality associated with chronic ulcers.⁽⁶⁾

Adequate and careful use of this therapy has the potential to reduce length of hospital stay, decrease the risk of associated healthcare infections and improve patient's quality of life.⁽⁶⁾

In the last twenty years there have been many studies to analyse the understanding of the biological mechanisms involved in repairing wounds.⁽⁷⁾ There is at present no optimal topical therapy for non-healing ulcers.⁽⁸⁾ Saline moistened gauze has been the standard method.⁽⁸⁾ However, it is difficult to continuously maintain a moist environment. Various hydrocolloid wound gels, growth factors, enzymatic debridement compounds, hyperbaric oxygen therapy, culture skin substitutes, and other wound therapies have been advocated subsequently.⁽⁸⁾ All of these therapies are expensive and are being utilized in some situations without sufficient scientific evidence in favour of their efficacy.⁽⁸⁾ This study tends to assess and establish the efficacy and safety of VAC therapy over conventional dressings.

Vacuum-Assisted Closure

It is also called negative pressure wound closure. By applying intermittently negative pressure of -125 mmHg the wound appears to hasten debridement and formation of granulation tissue occurs.⁽⁹⁾ To fit the wound a foam dressing is cut to size. Over the foam a perforated drain is placed and wound is sealed with a transparent adhesive film. The drain is then connected to a vacuum. Negative pressure acts by decreasing oedema, removing interstitial fluids and increasing blood flow. Thereby, bacterial counts decreases and cell proliferation increases. It creates a suitable bed for flap or graft.⁽⁹⁾

It comes ready-made as branded VAC machines which can be directly applied to the wound and the machine creates negative suction pressure. Whereas, indigenously this negative pressure can be created using the sterile sponge, that must be cut to size of wound and then placed inside the wound bed. Tubes of romovac drain are passed through the sponge, which has several openings in it. I-O drapes are used to cover the entire region so as create air tight space. The tubings are connected to a suction pump in the wall of the hospital, which will deliver constant negative pressure as desired.

II. Methodology

It was a prospective observational study. The study was conducted in Justice K.S.Hegde Charitable Hospital, Mangalore during the period from October 2016 to June 2018. Patients were selected from those who got admitted for non-healing ulcers under Surgery department in Justice K.S.Hegde Charitable Hospital, Mangalore. Total of 80 cases were studied of which 40 patients received VAC application and rest 40 patients received Conventional dressings. The study was started after receiving the clearance from the Ethical Committee. All the patients taken up for the study were allotted code identifications.

All patients taken up for study were assessed upto 30 days following admission, in both the VAC dressing and conventional dressing groups. They were assessed every 5th day, that is, from Day0 till Day30. If these patients were not taken up for split skin grafting (SSG) or flap cover, their wounds were evaluated for the entire 30 days. And if any of the patients were subjected to SSG or flap cover in between the assessment period of 30 days, then wound study criteria was stopped for that patient, and instead graft uptake quality was assessed and such patients were compared in both the groups.

III. Calculations

To compute sample size, the technique of estimation of single proportion (% age of width) was used, where n is the sample size, α is the level of significance (5%), d is the precision (15%), P is the anticipated proportion (40%), and z is the constant standard normal distribution table (1.96).

$$n = \frac{z^2 (1 - \alpha/2)P(1-P)}{d^2}$$

$$n = \frac{(1.96)^2(1-5/200)0.4(1-0.4)}{(0.15)^2} = 40.977777$$

All values were compared and analysed using Chi-square test and independent sample *t* test. Significance of a variable was calculated using p value. Statistical Package for Social Sciences (SPSS) version 20 was used.

Inclusion Criteria

Non-healing ulcers included in the study were diabetic foot ulcers, pressure ulcers, fasciotomy wounds and venous insufficiency ulcers. Only those patients who were financially able to undergo VAC therapy were included in the Group for VAC study.

Exclusion Criteria

Patients excluded from the study were those who were less than 18 years of age, or with length of wound less than 10 cm, or having untreated osteomyelitis. Patients with incidence of malignancy or fistulae were excluded. If exposed arteries, veins or organs were found in the wound bed, then they were not included. Ulcers due to ischemic or neurological causes were excluded. Patients financially unable to undergo VAC Therapy were not included in VAC group.

Assessing quality of wound healing

The quality of wound healing was assessed by using Wound Bed Score (WBS).⁽¹²⁾ In this scoring system, 8 parameters were considered. Each of these parameters were assessed for all the patients, on all 7 observation days and were given a score of 0 to 2. So in total a minimum score of 0 and a maximum score of 16 were possible on each observation day. But if any of the patients underwent definitive treatment, then this scoring was stopped. The 8 parameters assessed were (a)healing edges, (b)presence of slough, (c)granulation tissue, (d)amount of exudate, (e)edema, (f)peri-wound dermatitis, (g)peri-wound fibrosis, (h)pink/red wound bed.

Healing edges were assessed on all the observation days and was checked if it was not healing (undermined edges) (score 0), moderately healing (minimal sloping of edges with few abnormal skin tissue present at edges) (score 1) or was having good healing edges(sloping edges) (score 2).

Presence of slough was assessed in each patient. The assessment was if the wound bed was almost fully covered by slough (score 0), or if slough covered almost half of the wound (score 1), or if there was very minimal or no slough (score 2).

The amount of granulation tissue present in the wound bed was evaluated. If very minimal or no granulation tissue was formed in the wound a score of 0 was given. If almost half of the entire wound area had granulation tissue, then a score of 1 was given. If good granulation tissue (covering about entire of wound) was present then a score of 2 was given.

Amount of exudate formed in each wound was assessed and compared. In the group with conventional dressings the amount of soaked gauze pieces were collected and analysed. If that patient

required absorptive dressing changes at least once a day, it was considered as a large volume of exudates (score 0), if dressing changes were required only every 2-3 days then it was considered moderate amount of exudate (score 1), and if no absorptive dressings were required and if feasible, dressings could stay on for up to a week it was considered as very minimal exudate (score 2). The exudate formed in the collecting container in the VAC dressings were estimated and scores given, for large volume of exudate (score 0), moderate amount of exudate (score 1), and very minimal exudate (score 2).

Edema around the wound bed was assessed. If minimal edema or no edema was present a score of 2 was given. In moderate edema which was present around the wound that was not extending beyond adjacent joints distally or proximally, then it was scored as 1. If severe edema was present which was extending far beyond the ulcer (beyond adjacent joints) then a score of 0 was given.

Presence of dermatitis around the wound was assessed on each observation day. This was calculated by observing the parameters erythema, swelling, crusting, excoriation, lichenification and dryness of the skin around the wound. If any 4 or more of these parameters were present, then it was considered as having severe peri-wound dermatitis (score 0). If 2 or more parameters were present then it was considered as moderate peri-wound dermatitis (score 1) and if any one of them or none of the parameters were present, then it was considered as no peri-wound dermatitis (score 2).

Peri-wound Fibrosis around the wound bed was analysed. This was done by using the index finger and thumb of the observer to pinch gently over the skin around the wound. On pinching, if fine wrinkles appear and no thickness was appreciated then it was graded as having no fibrosis (score 2). If mild skin thickness was noted and was able to detect thickened skin folds between two fingers then it was considered moderate fibrosis (score 1). If severe skin thickness was noted with inability to make skin folds then it was considered as having severe fibrosis (score 0).

The colour of the wound bed was analysed. If very minimal area of the wound bed was pink, a score of 0 was given. If almost half of the ulcer was pink in colour then a score of 1 was given. If almost entire of the ulcer bed was pink, a score of 2 was given.

If in any patients, good granulation was present in the wound bed, but if either tendons or bones were exposed and that region was not covered with granulation tissue, despite having good granulation tissue all around, then the wound bed will not appear entirely pink in colour. In such cases in this study, due to high quality of granulation tissue, a score of 2 was given for granulation, but since the wound bed was not entirely pink in colour, a score of 1 was given for colour of wound bed.

IV. Results

The comparison of healing edges between conventional and VAC group was done. (Table.1) The wound edges were analysed every 5th day in both the groups. At Day5, majority of the subjects had shown no healing edges- 25(62.5%) and 22(55%) in conventional and VAC group respectively. At Day5, moderate healing was seen in 20(50%) subjects in conventional group and 22(55%) in VAC group. Similarly at Day15 and Day20, moderate healing edges were seen in 21(52.5%); 20(50%) subjects in conventional group and 23(57.5%) ; 22(55%)in VAC group respectively. Whereas, at Day25 and Day30, good healing edges were seen in conventional group only in 15(37.5%) but most of the subjects showed good healing in VAC group at both Day25 -20(50%) and Day30- 22(55%). [Graph 1(a) and 1(b)] Chi-square test showed statistically significant association between conventional and VAC groups with respect to healing of the edges of ulcers ($\chi^2= 0.21.24$; $p=0.00$).

		Not applicable*		No healing edges		Moderate healing edges		Good healing edges	
		N	%	N	%	N	%	N	%
Conventional	Day0	0	0	29	72.5	11	27.5	0	0
	Day5	1	2.5	25	62.5	13	32.5	1	2.5
	Day10	2	5	18	45	20	50	0	0
	Day15	3	7.5	11	27.5	21	52.5	5	12.5
	Day20	4	10	4	10	20	50	12	30
	Day25	6	15	2	5	17	42.5	15	37.5
	Day30	8	20	0	0	17	42.5	15	37.5
VAC	Day0	0	0	33	82.5	7	17.5	0	0
	Day5	0	0	22	55	18	45	0	0
	Day10	3	7.5	9	22.5	22	55	6	15
	Day15	5	12.5	0	0	23	57.5	12	30
	Day20	12	30	0	0	16	40	12	30
	Day25	16	40	0	0	4	10	20	50
	Day30	17	42.5	0	0	1	2.5	22	55
Chi-square value		0.28		11.57		21.24		3.62	
p value		0.99		0.07		0.00**		0.72	

Table 1: .Distribution of groups based on healing edges

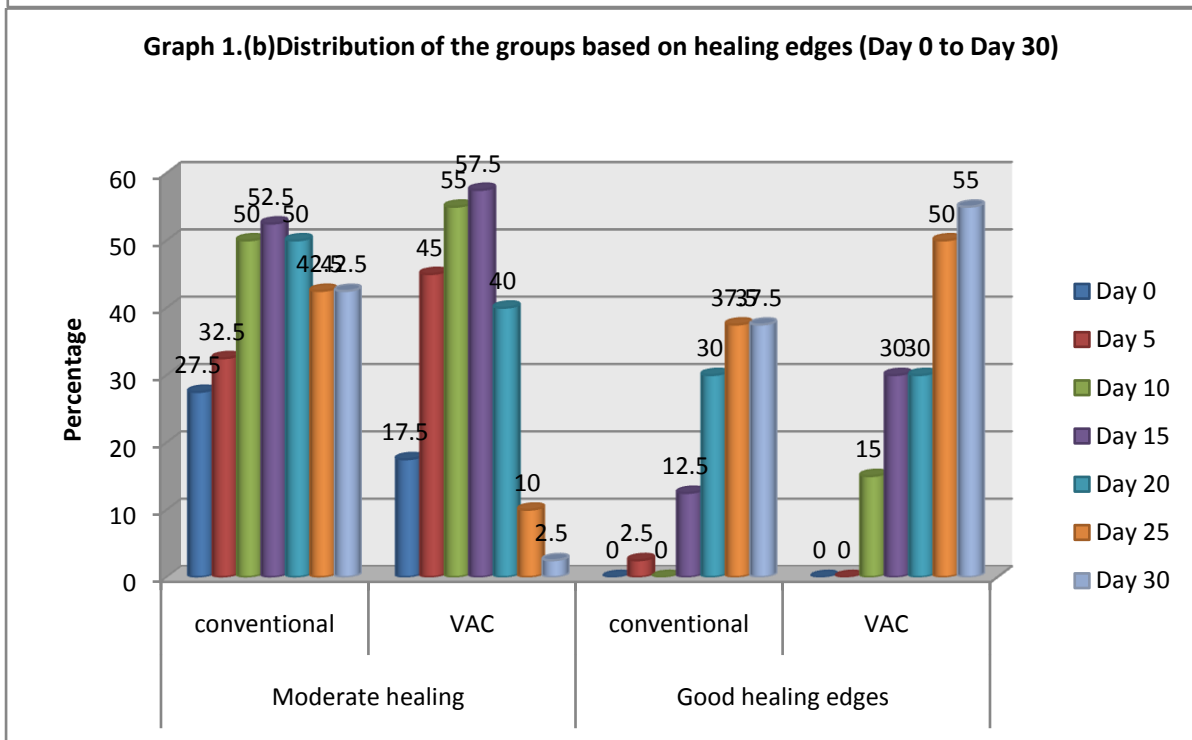
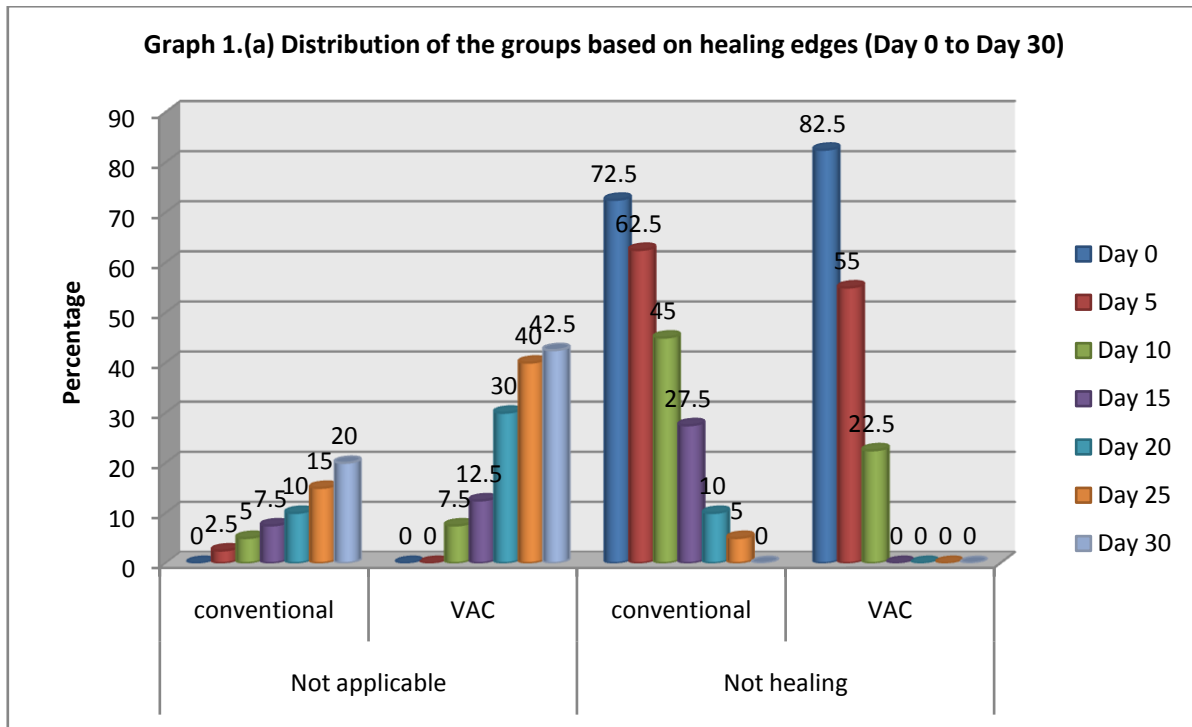
*Contains those subjects who underwent definitive management (SSG/flap) during the study period. Wound bed score could not be applied for them once they underwent definitive management.

**Significant

At Day0- 30(75%); 36(90%) and Day5- 27(67.5%); 26(65%) in both the groups, majority of the subjects had wound almost fully covered by slough. At Day10, conventional group had 18(45%) subjects who had wound almost fully covered by slough but in VAC group-20(50%) had wound half covered with slough. At Day15 and Day20, in conventional group 21(52.5%) and 23(57.5%) subjects had wound almost half covered by slough, similarly VAC had 18(45%) and 17(42.5%) subjects having wound half covered by slough. At Day25, conventional group had 19 (47.5%) subjects wound half covered with slough and in VAC group 15(37.5%) had very minimal or no slough. At Day30, both the groups had higher subjects with minimal or no slough-17(42.5%) and 18(45%) respectively. Chi-square test showed no statistically significant association between conventional and VAC groups with respect to presence of slough ($p \geq 0.00$).

At Day0, majority of the patients had very minimal or no granulation tissue in both conventional-30(75%) and VAC-35(87.5%) group. (Table 2) At Day5, conventional group had very minimal or no granulation tissue-23(57.5%) whereas in VAC group at Day5, 26(65%) had almost half granulation tissue covered. At Day10 and Day15, both the groups had higher subjects having almost half the granulation tissue. At Day20, 17(42.5%) subjects in conventional group had almost half the granulation tissue whereas in VAC group, 16(40%) subjects at Day20 had good granulation tissue. At Day30, both the groups had good granulation tissue - 21(52.5%) and 17(42.5%) respectively.[graph 2(a) and 2(b)]. Even though, chi-square test showed no statistically significant association between conventional and VAC groups with respect to granulation tissue ($p \geq 0.00$), from Day0 to Day5, there was an increase in number of patients with almost half the area with granulation tissue, in conventional group from 10 to 16, whereas in VAC group from 5 to 26, which is significant.

At Day0, Day5 and Day10, both the groups had very large volume of exudate- 35(87.5%); 29(72.5%); 23(57.5%) and 36(90%) ;28(70%); 18(45%) respectively. At Day15 and Day20, majority of the subjects had moderate amount of exudate in conventional [18(45%); 26(65%)] and VAC [(22(55%);



Not applicable: Contains those subjects who underwent definitive management (SSG/flap) during the study period. Wound bed score could not be applied for them once they underwent definitive management.

14(35%)] groups. At Day25, very minimal exudate was seen in most of the cases-15(37.5%) in VAC group whereas moderate amount of exudate was seen at Day25 in conventional group- 22(55%). Similarly, at Day30, very minimal exudate was seen in most of the cases 15(37.5%) in VAC group and moderate amount of exudate was seen at Day25 in conventional group-17(42.5%). Chi-square test showed no statistically significant association between conventional and VAC groups with respect to amount of exudate ($p \geq 0.00$).

		Not applicable*		Very minimal/No granulation tissue		Almost 1/2 area granulation tissue		Good granulation tissue	
		N	%	N	%	N	%	N	%
Conventional	Day0	0	0	30	75	10	25	0	0
	Day5	1	2.5	23	57.5	16	40	0	0
	Day10	2	5	16	40	18	45	4	10
	Day15	3	7.5	8	20	18	45	11	27.5
	Day20	4	10	6	15	17	42.5	13	32.5
	Day25	6	15	1	2.5	14	35	19	47.5
	Day30	8	20	2	5	9	22.5	21	52.5
VAC	Day0	0	0	35	87.5	5	12.5	0	0
	Day5	0	0	12	30	26	65	2	5
	Day10	3	7.5	4	10	22	55	11	27.5
	Day15	5	12.5	3	7.5	18	45	14	35
	Day20	12	30	0	0	12	30	16	40
	Day25	16	40	0	0	8	20	16	40
	Day30	17	42.5	0	0	6	15	17	42.5
Chi-square value		0.28		10.81		7.43		3.34	
p value		0.99		0.09		0.28		0.77	

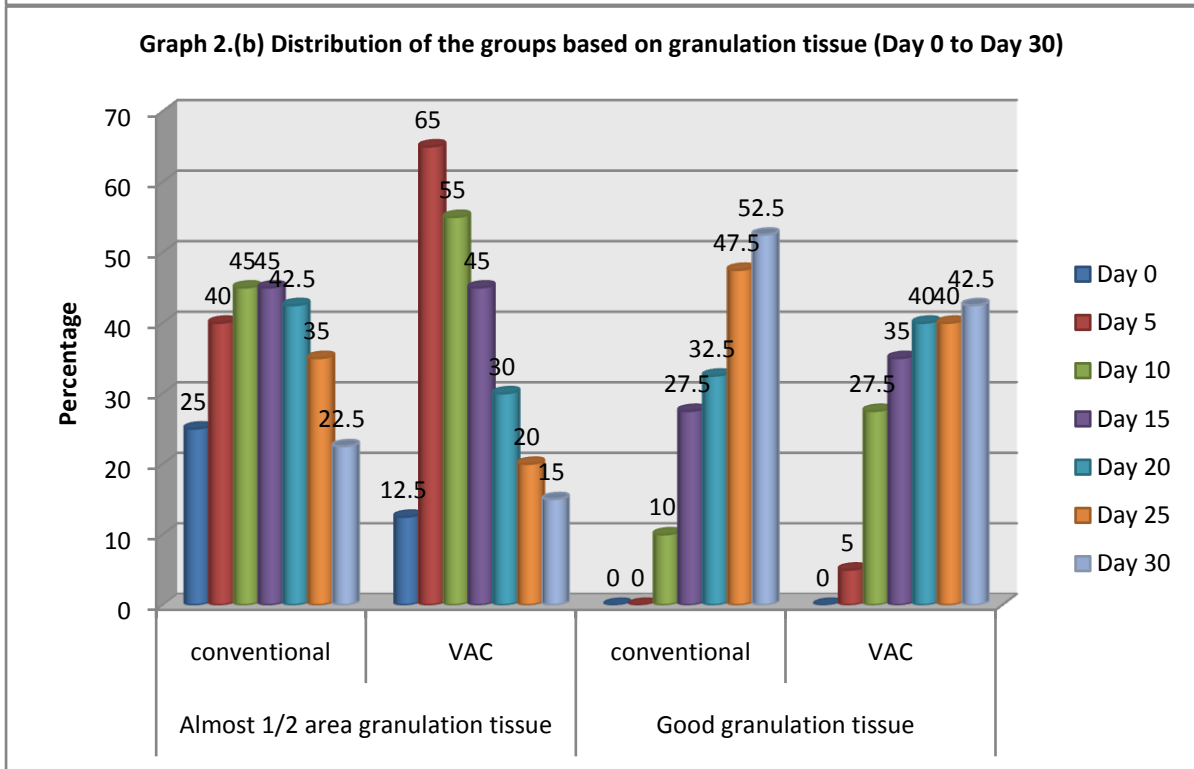
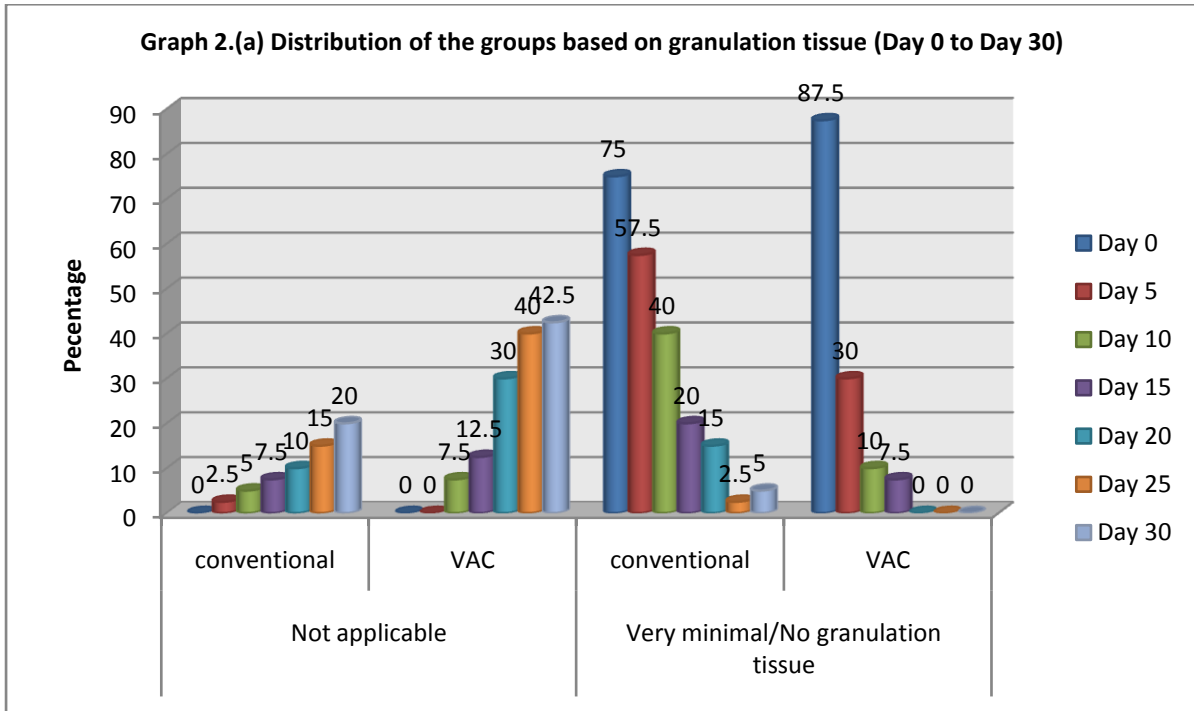
Table 2: Distribution of the groups based on granulation tissue

*Contains those subjects who underwent definitive management (SSG/flap) during the study period. Wound bed score could not be applied for them once they underwent definitive management.

The change in edema in both the groups from Day0 to Day30 was analysed. At Day0, severe edema was seen in 25(62.5%) and 35(87.5%) in conventional and VAC groups respectively. At Day5, moderate edema was seen in conventional group-20(50%) and severe edema was seen in majority of the subjects-22(55%) in VAC group. At Day10, Day15 and Day20 majority of the subjects in both the groups conventional [(21(52.5%); 24(60%);23(57.5%)] and VAC- [(22(55%); 23(57.5%); 15(37.5%)] had moderate edema respectively. Conventional group had 17(42.5%) and 16(40%) subjects with moderate edema at Day25 and Day30 respectively whereas VAC group had minimal edema at Day25-15(37.5%) and Day30 19(47.5%). Chi-square test showed no statistically significant association between conventional and VAC groups with respect to edema ($p \geq 0.00$).

Peri-wound dermatitis in both the groups from Day0 to Day30 were analysed. At Day0, Day5 and Day10 both the groups- conventional-[(31(77.5%); 29(72.5%); 21(52.5%)] and VAC-36(90%); 27(67.5%); 17(42.5%)] groups had severe peri-wound dermatitis. At Day15 and Day20, majority of the subjects in conventional- [19(47.5%); 20(50%)] and VAC group-[19(47.5%); 16(40%)] had moderate peri-wound dermatitis respectively. At Day25 and Day30, conventional group- [22(55%); 21(52.5%)] had moderate peri-wound dermatitis whereas at Day25 and Day30, VAC group had no peri-wound dermatitis-[12(30%); 15(37.5%)]. Chi square test showed no statistically significant association between conventional and VAC groups with respect to peri-wound dermatitis ($p \geq 0.00$).

In conventional group and VAC group at Day0- majority of the subjects had severe peri-wound fibrosis- 31(77.5%) and 35(87.5%) respectively. At Day5, 26(65%) subjects had severe peri-wound fibrosis in conventional group whereas in VAC group 24(60%) had moderate peri-wound fibrosis. From Day10 to Day30, majority of the subjects in both the groups had moderate peri-wound fibrosis. Chi square test showed no statistically significant association between conventional and VAC groups with respect to peri-wound fibrosis ($p \geq 0.00$).



Not applicable: Contains those subjects who underwent definitive management (SSG/flap) during the study period. Wound bed score could not be applied for them once they underwent definitive management.

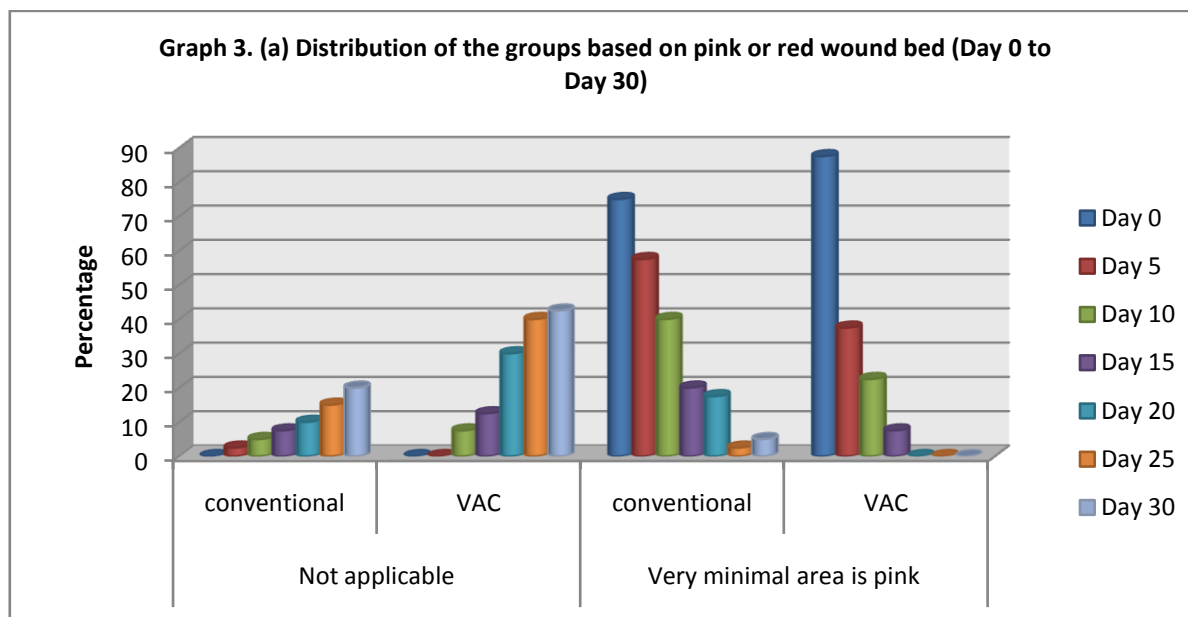
At Day0, both the groups had higher number of subjects having very minimal area of the wound that was pink in colour- 30(75%) and 35(87.5%) respectively.(Table 3) At Day5, 23(57.5%) subjects had very minimal area pink in colour in conventional group whereas 23(57.5%) had almost half of the area pink in colour in VAC group. At Day10 and Day15, similar-18(45%) group of subjects in both the groups had almost half of the area pink in colour. At Day20, 16(40%) subjects in conventional group had almost half of the area pink in colour whereas in VAC group, similar number of subjects-

		Not applicable*		Very minimal area is pink		Almost 1/2 of ulcer is pink		Almost entire of ulcer is pink	
		N	%	N	%	N	%	N	%
Conventional	Day0	0	0	30	75	10	25	0	0
	Day5	1	2.5	23	57.5	16	40	0	0
	Day10	2	5	16	40	18	45	4	10
	Day15	3	7.5	8	20	18	45	11	27.5
	Day20	4	10	7	17.5	16	40	13	32.5
	Day25	6	15	1	2.5	16	40	17	42.5
	Day30	8	20	2	5	13	32.5	17	42.5
VAC	Day0	0	0	35	87.5	5	12.5	0	0
	Day5	0	0	15	37.5	23	57.5	2	5
	Day10	3	7.5	9	22.5	18	45	10	25
	Day15	5	12.5	3	7.5	18	45	14	35
	Day20	12	30	0	0	12	30	16	40
	Day25	16	40	0	0	12	30	12	30
	Day30	17	42.5	0	0	5	12.5	18	45
Chi-square value		0.28		7.78		4.6		2.82	
p value		0.99		0.26		0.6		0.83	

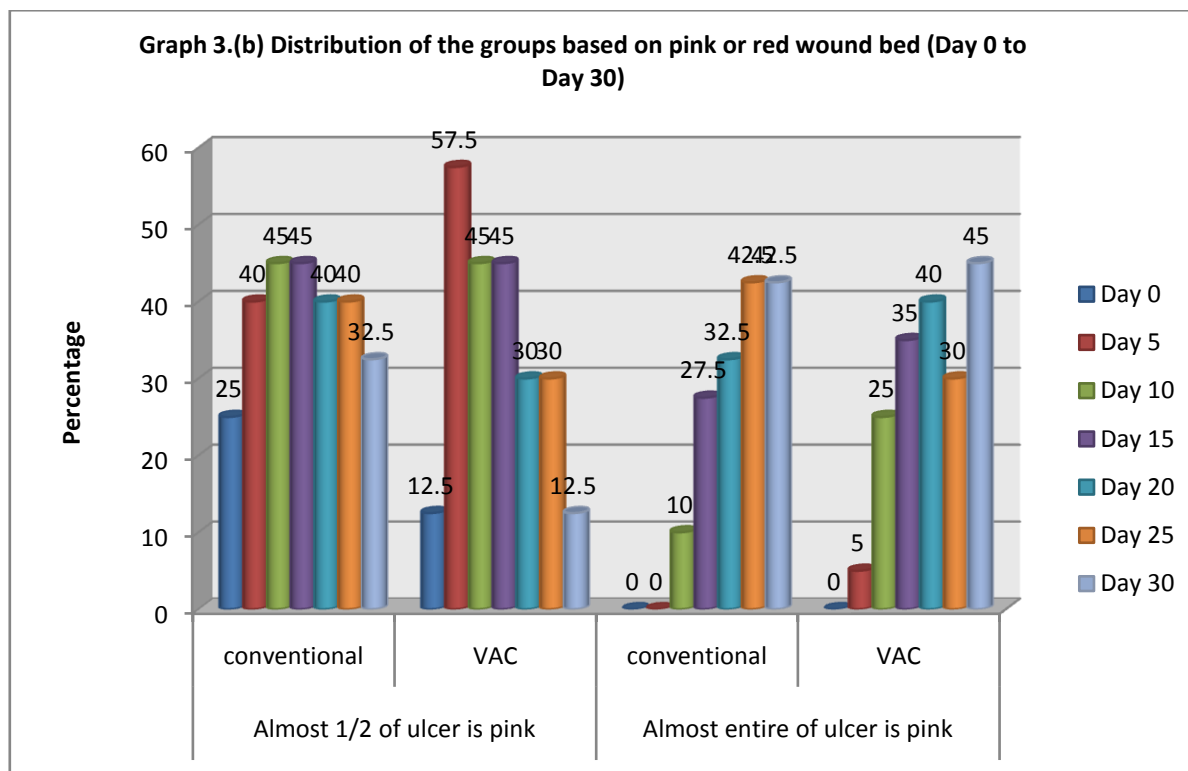
Table 3: Distribution of groups based on pink or red wound bed

*Contains those subjects who underwent definitive management (SSG/flap) during the study period. Wound bed score could not be applied for them once they underwent definitive management.

16(40%) had almost entire wound pink in colour. At Day25 and Day30, majority of the subjects in both the groups had almost entire area of ulcer pink in colour [Graph 3(a) and 3(b)]. Chi-square test showed no statistically significant association between conventional and VAC groups with respect to colour of the wound ($p \geq 0.00$).



Not applicable: Contains those subjects who underwent definitive management (SSG/flap) during the study period. Wound bed score could not be applied for them once they underwent definitive management.

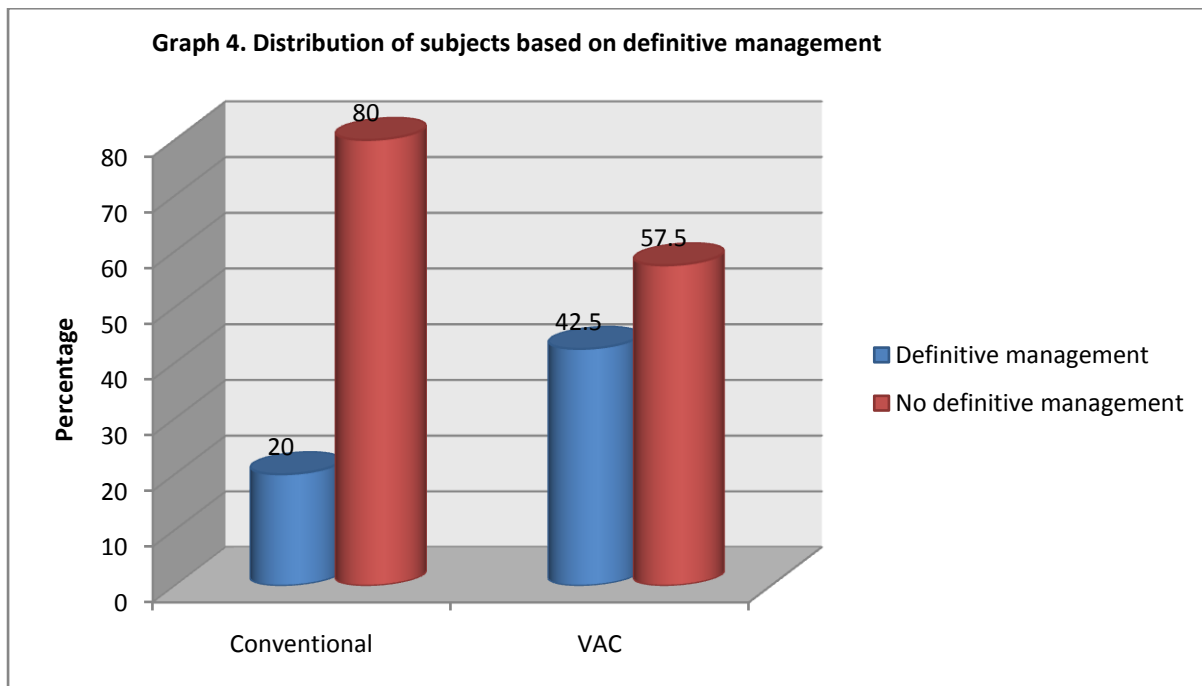


Out of 40(100%) subjects, 32(80%) had no definitive management in conventional group where as in VAC group, 23(57.5%) had no definitive management. Chi-square test showed significant association with definitive management between the groups ($\chi^2=4.71$; $p=0.02$) (Table4)(graph 4). 5(12.5%) had flap cover in conventional and 6(15%) had flap cover in VAC group. 3(7.5%) had SSG in conventional and 11(27.5%) had SSG in VAC group. Chi-square test showed no significant association with respect to definitive management between the groups ($\chi^2=4.66$; $p=0.09$). (table 8) (graph 5). In conventional group, 6(75%) had graft or flap taken up as compared to 16(94.1%) in VAC group. Chi-square test showed significant association with graft or flap taken up between the groups ($\chi^2=12.01$; $p=0.00$)

Groups		Frequency	Percent
Conventional	Definitive management	8	20.0
	No definitive management	32	80.0
	Total	40	100.0
VAC	Definitive management	17	42.5
	No definitive management	23	57.5
	Total	40	100.0

Table 4: Distribution of groups based on definitive management

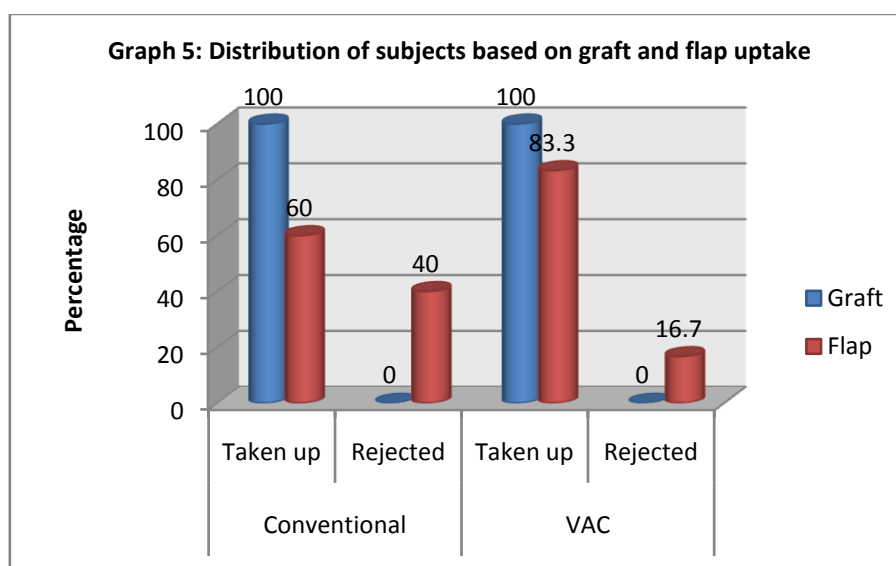
The number of grafts and flaps the subjects have undergone in both, conventional dressings and VAC group were analysed. (Table 5) 3 subjects in the conventional group and 11 subjects in VAC group underwent SSG. All these grafts in both the groups were taken up well.



There were no rejections in either group. 5 patients in the conventional group underwent flap cover of which 2(40%) flaps did not take up well. Only 3(60%) flaps in this group has taken up well. In VAC group, a total of 6 patients underwent flap cover, of which 5(83.5%) flaps have taken up well. 1(16.7%) flap which was done in VAC group did not take up well. (Graph 5)

	Conventional			VAC		
	Taken up	Rejected	Total	Taken up	Rejected	Total
Graft	3(100%)	0	3(100%)	11(100%)	0	11(100%)
Flap	3 (60%)	2 (40%)	5(100%)	5(83.3%)	1(16.7%)	6(100%)
Chi-square value	0.17			0.10		
p value	0.67			0.75		

Table 5: Distribution of subjects based on graft and flap uptake



V. Discussion

In this present study, at Day10 and Day15, both the Conventional dressings and VAC groups had higher subjects having almost half the granulation tissue. At Day20, 17(42.5%) subjects in conventional group had almost half the granulation tissue whereas in VAC group, 16(40%) subjects at Day20 had good granulation tissue. At Day30, both the groups had good granulation tissue in 21(52.5%) and 17(42.5%) subjects respectively. Lone et al⁽¹⁶⁾, studied a total of 56 patients and divided them randomly into 2 groups, that is, patients treated with VAC and those treated with conventional dressings. Granulation tissue appeared by the end of 2nd week in 26(92.85%) patients in VAC group, while only in 15(53.57%) patients in conventional dressings group. 100% granulation occurred by end of 5th week in VAC group, while only in 10(40%) patients in conventional group.

Large difference in percentage of subjects acquiring good granulation tissue in VAC group compared to conventional group was not found in this present study, unlike in the study by Lone et al⁽¹⁶⁾. But there was significant increase in granulation tissue in VAC group, in this study also.

In this present study, at Day25 and Day30, moderate healing was seen in 17(42.5%) patients in conventional group but most of the subjects showed good healing in VAC group at both Day25 -20(50%) and Day30- 22(55%). In a study by MaCallon et al⁽¹⁷⁾, 5 patients were assessed in VAC group, and 5 patients in conventional dressings. In patients who were managed with VAC, foot ulcers achieved satisfactory healing more quickly (22.8 days), while with conventional dressings it took longer duration (42.8 days).

In this study, in VAC group majority of the subjects have achieved good healing by Day 30, whereas majority of subjects in conventional group have attained only moderate healing. In the study by MaCallon et al⁽¹⁷⁾ also, the subjects in the Conventional group took almost twice the time to heal than the VAC group.

In the present study, out of 40(100%) subjects, 32(80%) had no definitive management in conventional group where as in VAC group, 23(57.5%) had no definitive management. 5(12.5%) in conventional dressings and 6(15%) in VAC group had flap cover. 3(7.5%) subjects had SSG in conventional dressings group, while 11(27.5%) had SSG in VAC group. In conventional group, 6(75%) had graft or flap taken up as compared to 16(94.1%) in VAC group.

MaCallon et al⁽¹⁷⁾, found that in VAC group 80% of the patients received definitive management during the study period while only 40% in conventional dressings group received definitive management. Greer et al⁽¹³⁾, found that 12.5% of patients in VAC group successfully underwent SSG. According to the study of Song et al⁽¹⁵⁾, where they observed 17 patients in VAC group and 18 patients in conventional dressings group for 8 days, 14 patients (82%) in VAC group and 17(94%) in conventional dressings group underwent definitive management. Similar to other studies, the present study also shows higher number of subjects undergoing definitive management after VAC therapy, compared to conventional methods. Most of these definitive managements were successfully taken up in VAC group.

VI. Conclusions

VAC therapy is more efficient compared to conventional dressings. The increase in the amount of granulation tissue, development of good healing edges and the increased number of people undergoing definitive treatment at the earliest is by VAC therapy than by conventional dressings.

References

- [1]. Kranke P, Bennett M, Roedel-Wiedmann I, Debus S. Hyperbaric oxygen for chronic wounds. The Cochrane Library, 2003; Issue 2:2
- [2]. MacLellan DG. Chronic Wound Management. *Australian Prescriber*. 2000;23(1): 6-9.
- [3]. Phillips TJ, Ouahes N. Leg ulcers. *Curr Probl Dermatol*1995;7: 4 109-142.
- [4]. Falanga V. Classifications for wound bed preparation and stimulation of chronic wounds. *Wound Repair Regen* 2000;8: 347-352.
- [5]. Brem H, Balledux J, Sukkarieh T, Carson P, Falanga V. Healing of venous ulcers of long duration with a bilayered living skin substitute: results from a general surgery and dermatology department. *Dermatol Surg* 2001;27: 915-919.
- [6]. Raghupathy, Sabrena, Vaithiswaran A, et al. A prospective randomized trial of vacuum-assisted closure versus standard therapy of chronic non-healing wounds. *J. Evolution Med. Dent. Sci*. 2016;5(49):3162-3167, DOI:10.14260/jemds/2016/733
- [7]. Chase SK, Melloni M, Savage A (1997) A forever healing: the lived experience of venous ulcer disease. *J Vasc Nurs* 15(2): 73-78.
- [8]. White R, McIntosh C. Topical therapies for diabetic foot ulcers: standard treatments. *J Wound Care* 2008; 17: 426_32.
- [9]. O'Connell PR, Williams NS, Mc Caskie A. Bailey and Love's Short Practice of Surgery. 27th Ed. New York: CRC Press; 2018 Volume 1; 24-32
- [10]. Joseph E, Hamori CA, Bergman S, Roaf E, Swann NF, Anastasi GW. A prospective randomized trial of vacuum-assisted closure versus standard therapy of chronic non healing wounds. *Wounds*. 2000; 12(3):60-67.
- [11]. Bowler PG. Wound pathophysiology, infection and therapeutic options. *Annals of Medicine*. 2002;34(6):419-427.
- [12]. Falanga V. Classifications for wound bed preparation and stimulation of chronic wounds. *Wound Rep Reg* 2000;8 : 347-352.
- [13]. Greer SE, Longaker MT, Margiotta M. Preliminary results from a multicentre randomised controlled study of the use of subatmospheric pressure dressing for pressure ulcer healing. *Wound Repair and Regeneration*. 1999;7(4):A255.
- [14]. Doss M, Martens S, Wood JP, Wolff JD, Baier C, Moritz A. Vacuum-assisted suction drainage versus conventional treatment in the management of post sternotomy osteomyelitis. *European Journal of Cardio-Thoracic Surgery*. 2002;22(6):934-938.
- [15]. Song DH, Wu LC, Lohman RF, Gottlieb LJ, Franczyk M. Vacuum assisted closure for the treatment of sternal wounds: the bridge between debridement and definitive closure. *Plastic & Reconstructive Surgery*. 2003;111(1):92-97.

- [16]. Ali ML, Mohd IZ, Bashir AL, Nazir AP, Sheikh AB, Altaf R. Vacuum-assisted closure versus conventional dressings in the management of diabetic foot ulcers: a prospective case-control study. *Diabetic Foot & Ankle* 2014, 5:23345:1-5
- [17]. McCallon SK, Knight CA, Valiulus JP, Cunningham MW, McCulloch JM, Farinas LP. Vacuum-assisted closure versus saline-moistened gauze in the healing of postoperative diabetic foot wounds. *Ostomy/Wound Management*. 2000;**46**(8):28-32.

Sajith Sreekumar. "Assessing and comparing the quality of wound healing with Vacuum-Assisted Closure and with conventional dressings using Wound Bed Score." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, vol. 18, no. 3, 2019, pp 10-21.