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Negative Pressure Wound Therapy: A Comparative Study Over Conventional Wound Care

Dr. Reshmi Raju[1], Dr. V Kunjambu Nambiar[1], Dr. Omana E K[2], Dr. Mohammed Asif[3]

[1]Department of General Surgery, Pariyaram Medical College, Kannur, Kerala – 670503, India

[2]Head of Department, General Surgery, Pariyaram Medical College, Kannur, Kerala – 670503, India

[3]Associate Professor, Department of Obstetrics and Gynaecology, Pariyaram Medical College, Kannur, Kerala – 670503, India

[4]Junior Resident, Department of General Surgery, Pariyaram Medical College, Kannur, Kerala – 670503, India

Abstract: ***To assess the efficacy of topical negative pressure moist wound dressing as compared to conventional moist wound dressing in improving the healing processof chronic wounds and to prove that negative pressure dressings can be used as a much better treatment option in the management of chronic wounds. This is a prospective study where data from 106 patients with chronic wounds were observed.Out of 106 patients, 53 underwent topical negative pressure dressings and remaining 53 underwent conventional dressings. After a period of 3 weeks, it was observed that patients who underwent topical negative pressure dressing, the mean rate of granulation tissue formation was ~ 81.47% as compared to 53.57% in those who underwent conventional moist dressing.***

Keywords: Topical Negative Pressure Moist Wound Dressing, Chronic Wounds, Rate Of Granulation Tissue Formation

1. Introduction

The concept of moist wound dressing which came into vogue in the 1960s revolutionized wound care and this led to further research in this direction leading to influx of many products like semi permeable plastic film dressing, hydrocolloids hydrogel collagen dressings into the wound care scenario, each claiming a better wound healing rate than others.

In the early 1990s, the concept of topical negative pressure moist wound dressing was introduced into the field of chronic wound care. This type of dressing involved a combination of hydrocolloid dressing with topical negative pressure dressings(6). The study was done as a prospective randomized controlled comparative study to compare the efficacy of topical negative pressure moist dressing to conventional wound dressing in management of chronic wounds.

2. Materials and Methods

Study design: Experimental trial quasi study block design.

Study included 106 patients with chronic wounds of varying etiology admitted in Academy of Medical Sciences, PariyaramMedical College,Kannur from July 2015 to January 2016.

The main **inclusion** criteria were patients with age between 15-85 years; all types of chronic wounds irrespective of aetiology (including post caesarean surgical site infection); wound size <10% of total body surface area and patients given consent for topical negative pressure dressings.The **exclusion** criteria were wounds with necrotic tissue;untreated underlying osteomyelitis;fistulas to organs or body cavities; exposed arteries or veins; malignancy within wounds; dry gangrene.

53 underwent conventional saline dressing and remaining 53 underwent topical negative pressure dressing. All patients underwent detailed clinical examination and relevant investigations were thoroughly debrided and the ulcer dimensions as well as the surface area were assessed using Verniercallipers before both types of dressings were applied. The patients were followed upon a daily basis for 3 weeks in both test and the control groups. The control group was subjected to daily dressings by conventional methods whereas the test group was subjected to topical negative pressure dressings every second day and the wound was inspected twice daily.

3. Materials Used

Synthetic sterile foam sheet, transparent semi permeable adhesive membrane sheet,vacuum suction apparatus.

Wounds were compared based on the following parameters:
1) Rate of granulation tissue formation as percentage of the ulcer surface area
2) Present dimensions and surface area of the ulcer
3) Number of days of hospitalization

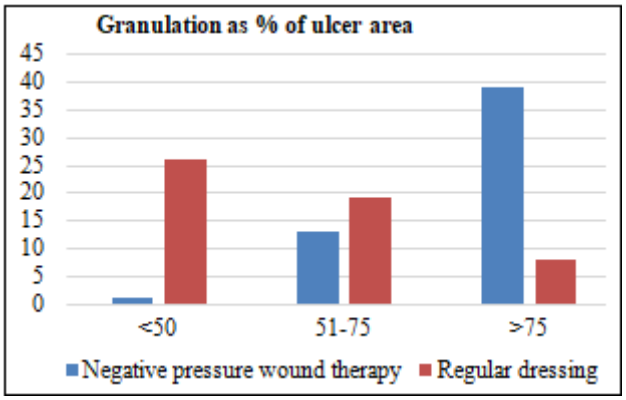
4. Results

The ulcers included in this study in both the groups have diverse etiologies but the diabetic ulcers formed the major component of each group. Both groups had comparable age and sex distribution as seen in the below depicted graphs.

The mean rate of granulation tissue formation were 81.47%(SD-12.54) for group 1 and 53.57% (SD-18.94) for group 2 .The results were analysed by unpaired students T test which showed highly significant difference in rate of granulation tissue formation ($p<0.001$).

Table 3: Distribution of patients based on Granulation formation

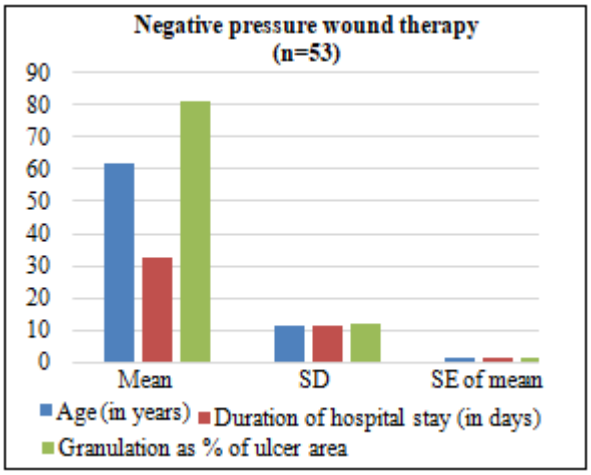
Granulation as % of ulcer area	Negative pressure wound therapy	Regular dressing	P value
<50	1	26	<0.001
51-75	13	19	
>75	39	8	

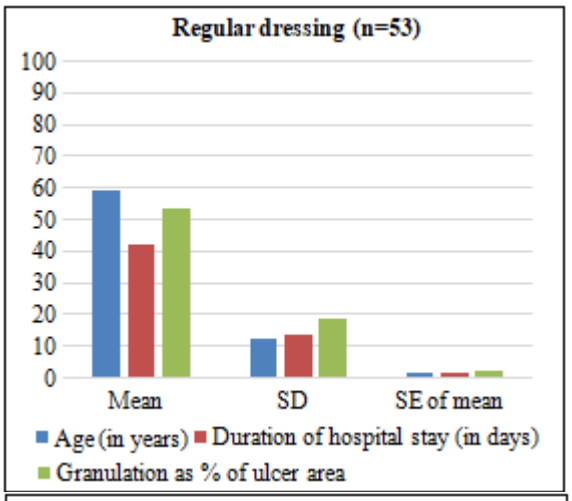


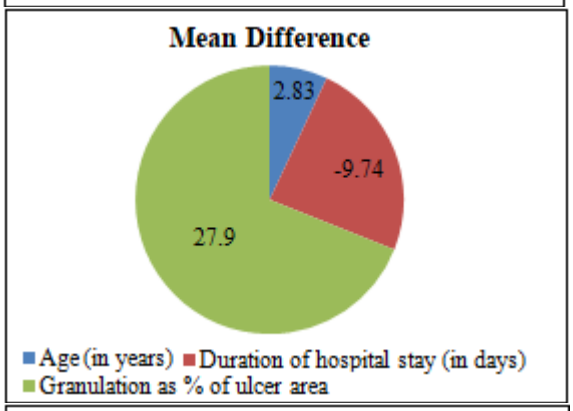
The total days of hospital stay was also compared. The mean number of hospital stay days was 32.64(SD-11.49) for group 1 and 42.38 days (SD-13.94) for group 2. Analysis of data showed highly significant difference in the hospital stay in both groups with negligibly low p value (0.001) obtained in unpaired students T test.

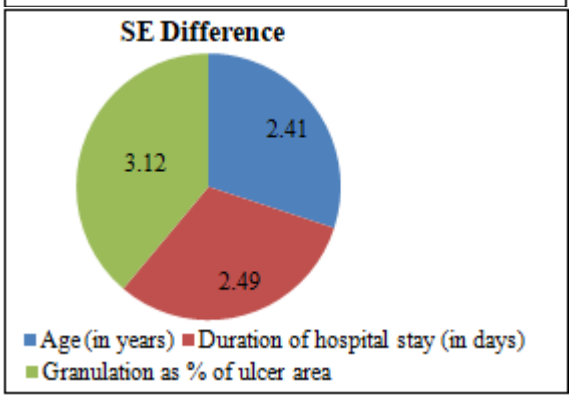
Table 4: Mean Difference Negative pressure wound therapy Vs Regular dressing patients

		Age (in years)	Duration of hospital stay (in days)	Granulation as % of ulcer area
Negative pressure wound therapy (n=53)	Mean	62.36	32.64	81.47
	SD	12.01	11.59	12.54
	SE of Mean	1.65	1.59	1.72
Regular dressing (n=53)	Mean	59.53	42.38	53.57
	SD	12.84	13.94	18.94
	SE of Mean	1.76	1.91	2.60
Mean difference		2.83	-9.74	27.90
SE difference		2.41	2.49	3.12
P value		0.244	<0.001	<0.001









5. Discussion

In this millennium, where mankind has succeeded in deciphering the human genetic code, the issue of chronic wound management still remains an enigmatic challenge. Chronic wounds especially non healing types are one of the most common surgical conditions a surgeon comes across[(1).] The peculiarity of a chronic wound is that they refuse to heal irrespective of the management given, especially the pressure ulcers or bed sores.

Following are some of the studies discussed to show how topical negative pressure wound therapy has evolved over years in management of chronic wounds:

(i) In a prospective randomized study by Eginton M T, Brown K R, Seabrrok G R, Towne J B and Cambria R A, the rate of wound healing of large diabetic ulcers with topical negative pressure moist dressing and conventional moist dressings was compared. Ten patients were included in the

study and were randomized to get any one type of dressing. The dressings were done for two weeks and the serial wound photographs were analysed for percentage of change in wound dimensions. The results of study are as follows[2].

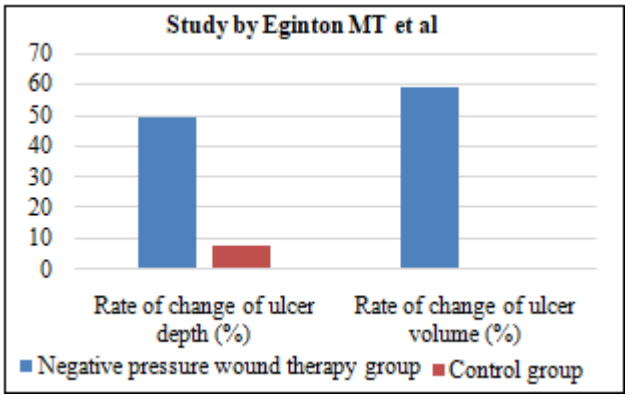
Table 5: Result of Study by Eginton M T et al

Variables	Negative pressure wound therapy group	Control group
Rate of change of ulcer depth	49 %	8%
Rate of change of ulcer volume	59%	0%

The above study revealed that application of topical negative pressure over the ulcer surface can achieve significant reduction in ulcer size and depth and thus has shown to promote ulcer healing to a greater extent than conventional moist dressings.

Table 6: Comparison of present study to study by Joseph et al

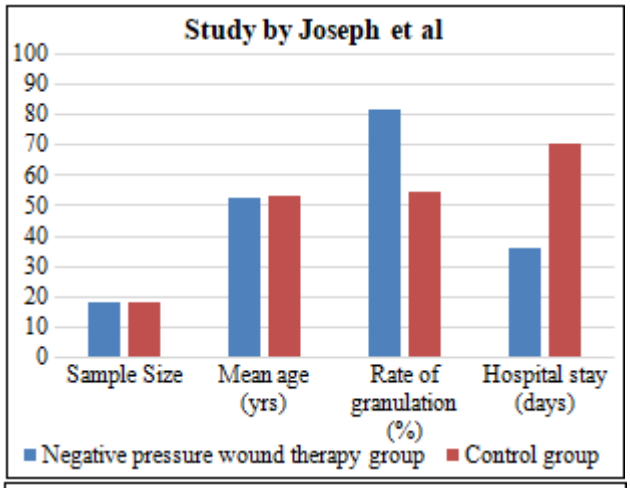
Valuables	Joseph et al		Present study	
	Negative pressure wound therapy group	Control group	Negative pressure wound therapy group	Control group
Sample size	18	18	53	53
Mean age (yrs)	52.41	53.2	62.36	59.53
Rate of granulation	81.56%	54.3%	81.47%	53.57%
Hospitalstay(days)	36.24	70.4	32.64	42.38

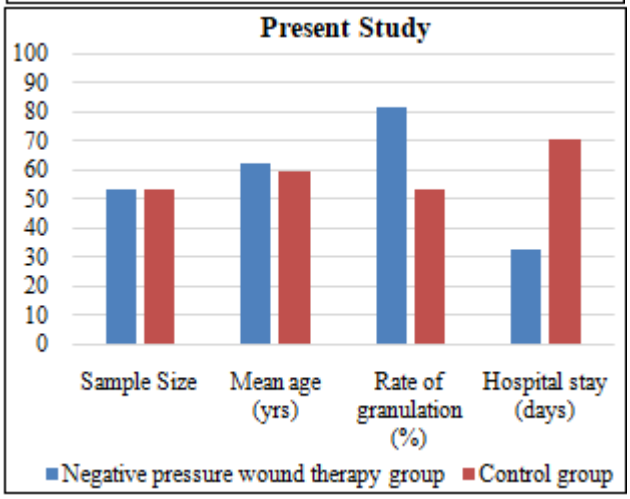


The above table shows a comparison of present study to a similar study conducted by Joseph Et Al. The important difference between the present study and Joseph Et Al study is that the present study has a higher sample size over Joseph Et Al study and also Joseph Et Al study used local irrigation of wound with iodine solution in the topical negative pressure group which was not followed in the present study[3].

(iii) In another study conducted by Isago T, Nozaki M, Kikuchi Y, Honda T and Nakozawa, the efficacy of topical negative pressure moist dressings was assessed in pressure ulcers by comparing the mean rate of reduction of ulcer area and depth before and after application of the dressing. The mean reduction in ulcer depth and surface area were 61.2% and 55.1% respectively.

This study clearly shows the efficacy of topical negative pressure dressings in the management of pressure ulcers which are usually resistant to healing by conventional type of wound dressings[4].





6. Conclusion

Many modalities, techniques and innovative methods of wound care have come up in decades to assist a surgeon, but problems of chronic wound still remain[2]. This need for an effective remedy, paves way for the scope of negative pressure wound therapy which can bring a revolution in healing process in patients.

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