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Study Of The Efficacy, Time Taken And The Cost Of Glove Technique Versus Conventional Dressing For Split Skin Graft.

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ABSTRACT

One of the most popular plastic surgery procedures used to treat persistent, non-healing ulcers brought on by a variety of reasons is skin grafting. The traditional cotton tie-over bolster dressing for skin grafts might be labour-intensive, might not apply uniform pressure over the graft recipient bed, and can even be somewhat costly because silk sutures are needed for the tie-over dressing. The goal of this study is to show that a latex glove stretched over the cotton dressing site and secured to the skin with skin staples may be a quicker, easier, and more affordable way to achieve the same effect for skin graft recipient sites as a cotton bolster dressing. The objectives of the study were: To study the time taken for both the 'glove technique' and the cotton tie-over bolster dressing, to study the costs of the 'glove technique' in comparison to the cotton tie-over bolster technique, and to study the efficacy of the 'glove technique' compared to the cotton tie-over bolster dressing. This was an observational case control study, with a total sample size of 59, The duration of the study was from December 2020 to August 2023. There was no significant change in the outcome of the skin graft uptake when comparing the two methods ($p=0.364$), but there was significant difference in the time taken and the cost of the dressing materials ($p<0.001$ for both parameters). While there is not much of a difference in the outcome of the uptake of the split-thickness skin graft using either the glove dressing or the cotton bolster dressing, the time taken and the cost of the materials used are significantly less when compared to the bolster dressing.

Keywords: glove technique, surgery, non-healing ulcers, cotton dressing.

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INTRODUCTION

Split thickness skin grafts have played a large role in the armamentarium of the reconstruction ladder in plastic surgery. It has helped close multiple wounds and aided in closure of skin defects [1, 2]. While its application has not reduced, the cotton bolster dressings that need to be applied to the grafts can be a cumbersome, may fail to provide adequate pressure over the grafted area, can be time consuming, and the suture materials required to keep the bolster in place may increase the costs of the procedure [3, 4].

This study was done to demonstrate that there may be a more cost effective and a less time-consuming method to apply the bolster dressing to keep the skin graft in situ and reduce chances of seroma and hematoma formation. The conventional cotton bolster dressing was compared to the glove dressing method, and the time taken, cost of materials and outcome of the dressing was compared against each other.

Objectives

- To study the time taken for both the 'glove technique' and the cotton tie-over bolster dressing.
- To study the costs of the 'glove technique' in comparison to the cotton tie-over bolster technique.
- To study the efficacy of the 'glove technique' compared to the cotton tie-over bolster dressing.

METHODOLOGY

This study was conducted by the Department of General Surgery and Department of Plastic Surgery at MVJ Medical College and Research Hospital, Bangalore.

Study Design

Observational study

Sample Size

Totally, 59 members were included in the study, with 25 members in the study group, and 34 in the control group.

Duration of study

From December 2020 to August 2023.

Statistical analysis

Mean, Standard Deviation, Student's t-test, Mann Whitney test, Pearson's Chi-squared test

Inclusion criteria

- Adults
- Age group: 18-80 years undergoing split-thickness skin graft surgery
- Patients with diabetic foot
- Patients with burns requiring split-thickness skin graft surgery

Exclusion criteria

- Patients with latex allergy
- Pregnant women
- Children
- Patients undergoing full-thickness skin graft surgery
- Patients who are critically ill
- Patients with very large wounds undergoing split-thickness skin graft surgery

Materials

For the ‘glove technique’

- Bactigras ® dressing - gauze dressing impregnated with paraffin, containing 0.5% chlorhexidine acetate
- Saline
- Cotton for padding
- Sterile latex glove
- Skin stapler

For the cotton tie over bolster dressing

- Bactigras ® dressing - gauze dressing impregnated with paraffin, containing 0.5% chlorhexidine acetate
- Saline
- Cotton for padding
- 2-0 Mersilk ® sutures – 2 in number

Method

The time taken for both methods was assessed using a stopwatch. The start time for the ‘glove technique’ was taken from the time of stapling the rolled margin of the glove to one edge of the wound site. The start time for the tie-over dressing was taken from the time of taking the first bite of the silk sutures. Both types of dressings were by the same surgeon and assistant.

The cost of using sterile latex gloves was compared with the cost of using 2-0 silk sutures (two in number) for fixing the dressing. As skin staples are generally used in fixing the graft, the cost of using a skin stapler was excluded from the study, unless the fixation of the sterile glove required an additional stapler to be used.

The dressing was removed on post-operative day 5, and the take up of graft was observed by assessing areas of slough formation, raw areas present, or granulating areas present.

After the split-thickness skin graft was secured to the recipient bed, Bactigras ® dressing is placed over the graft, with saline cotton padding over it. A fresh sterile latex glove packet was opened. The glove was then cut according to the size of the recipient bed, and a rolled margin of the glove was fixed to one edge using skin staples. Timing of the procedure began at this step. The other free end was stretched over the cotton padding and fixed to the opposite end with skin staples. Timing of the procedure ceased at this step. Dressing was done over the glove covered padding and kept until the fifth postoperative day, when all the layers of the dressing were removed to assess the graft. Follow up period was up to post operative day 5.

RESULTS

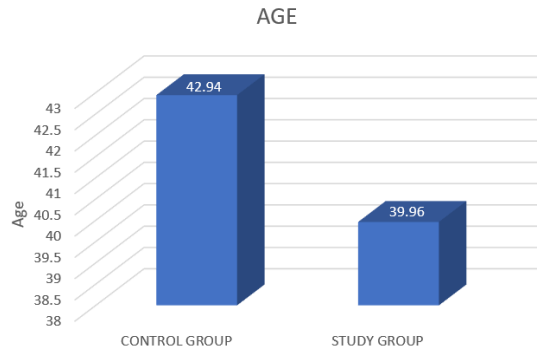
Independent T Test Used To Compare Age And Time Of Healing And Cost

	GROUP	N	Mean	Std. Deviation	t	df	P VALUE
AGE	CONTROL GROUP	34	42.940	18.368	0.622	57	0.536
	STUDY GROUP	25	39.960	17.941			
TIME TAKEN	CONTROL GROUP	34	37.650	6.305	8.841	57	<u>≤0.001</u>
	STUDY GROUP	25	22.800	6.468			
COST OF DRESSING MATERIALS	CONTROL GROUP	34	276.470	105.898	11.47	35.192	<u>≤0.001</u>
	STUDY GROUP	25	64.800	16.613			

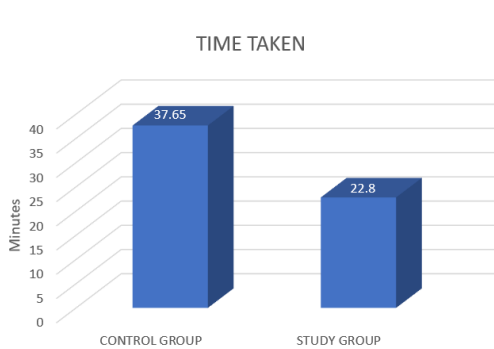
Table1: Independent T test used to compare time taken and cost of dressing materials

	GROUP	N	Mean	Std. Deviation	t	df	P VALUE
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	STUDY GROUP	25	39.960	17.941			
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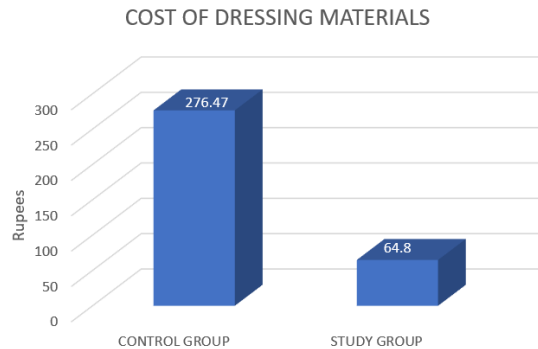
Table 2: Average time taken and cost of materials in each group



Graph 1



Graph 2



Graph 3

Comparison of the AGE between the two groups shows that AGE is higher in CONTROL GROUP with a t value of 0.622 and is statistically non-significant with a p value of 0.536.

Comparison of the TIME TAKEN between the two groups shows that TIME TAKEN is higher in CONTROL GROUP, group with a t value of 8.841 and is statistically significant with a p value of <0.001

Comparison of the COST OF DRESSING MATERIALS between the two groups shows that COST OF DRESSING MATERIALS is higher in CONTROL GROUP, group with a t value of 11.465 and is statistically significant with a p value of <0.00.

The total number of participants in this study was 59, with 34 being in the control group, and 25 being in the study group.

The average age of patients in the control group was 42 years, with the study group having a mean age of 39 years, which was not statistically significant.

The average time taken for the glove dressing was around 22 minutes, while the time taken for the cotton bolster dressing was around 37 minutes. This was shown to have a statistical significance, on applying the independent t test, creating a p value of less than 0.001 (p value is significant when it is less than 0.05).

The average cost of the dressing materials in the glove dressing group was around 64 rupees which the cost of the materials in using the cotton bolster dressing was around 276 rupees. This was also found to be statistically significant, with a p value of less than 0.001.

Chi square test for age, percentage graft etc. categorical variables

GENDER * GROUP

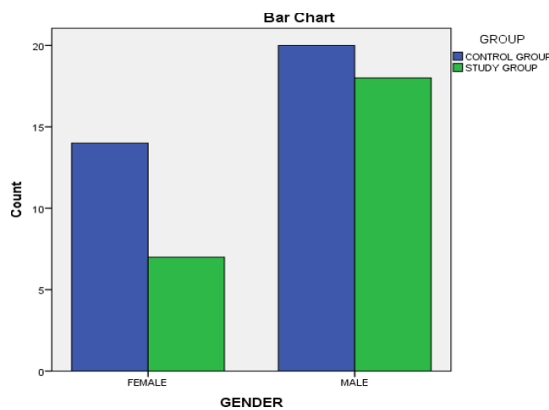
Crosstab					
		GROUP			Total
		CONTROL GROUP	STUDY GROUP		
GENDER	FEMALE	Count	14	7	21
	% within GROUP	41.2%	28.0%	35.6%	
	MALE	Count	20	18	38
	% within GROUP	58.8%	72.0%	64.4%	
Total		Count	34	25	59
		% within GROUP	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	P value(<0.05 is significant)
Pearson Chi-Square	1.091	1	.296

Table 3: Gender of participants in each group

The number of men who took part in the study were 38, with 20 men in the control group, and 18 in the study group.

The number of women who took part in the study, were 21, with 14 in the control group, and 7 in the study group.



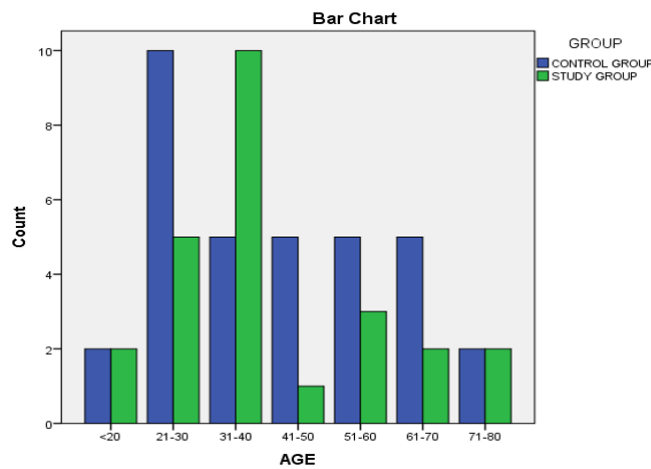
Graph 4: Participants' gender in each group

AGE * GROUP

Crosstab					
		GROUP			Total
		CONTROL GROUP	STUDY GROUP		
AGE	<20	Count	2	2	4
		% within GROUP	5.9%	8.0%	6.8%
	21-30	Count	10	5	15
		% within GROUP	29.4%	20.0%	25.4%
	31-40	Count	5	10	15
		% within GROUP	14.7%	40.0%	25.4%

41-50	Count	5	1	6
	% within GROUP	14.7%	4.0%	10.2%
51-60	Count	5	3	8
	% within GROUP	14.7%	12.0%	13.6%
61-70	Count	5	2	7
	% within GROUP	14.7%	8.0%	11.9%
71-80	Count	2	2	4
	% within GROUP	5.9%	8.0%	6.8%
Total	Count	34	25	59
	% within GROUP	100.0%	100.0%	100.0%
Chi-Square Tests				
	Value	df	P value (<0.05 is significant)	
Pearson Chi-Square	6.566	6	.363	

Table4: Age ranges of participants in each group



Graph5: Age ranges of participants in each group

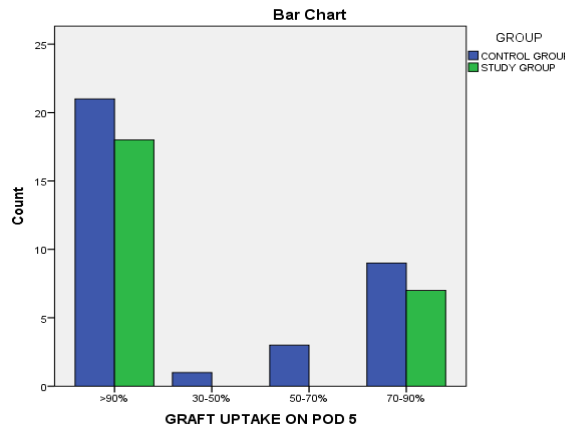
GRAFT UPTAKE ON POD 5 * GROUP

Crosstab					
		GROUP			Total
		CONTROL GROUP	STUDY GROUP		
GRAFT UPTAKE ON POD 5	>90%	Count	21	18	39
		% within GROUP	61.8%	72.0%	66.1%
	30-50%	Count	1	0	1
		% within GROUP	2.9%	0.0%	1.7%
	50-70%	Count	3	0	3
		% within GROUP	8.8%	0.0%	5.1%
	70-90%	Count	9	7	16
		% within GROUP	26.5%	28.0%	27.1%
Total		Count	34	25	59
		% within GROUP	100.0%	100.0%	100.0%
Chi-Square Tests					
	Value	Df	P value (<0.05 is significant)		
Pearson Chi-Square	3.182	3	.364		

Table5: Graft uptake on the 5th post operative day and its significance

The graft uptake was compared on the fifth post operative day, with 66% of all cases having an uptake of more than 90%. 21 cases in the control group and 18 in the study group had more than 90% uptake. 9 patients had 70-90% uptake in the control group, and 7 patients had 70-90% uptake in the study group. 3 patients in the control group had 50-70% uptake, and 1 person had 30-50% uptake in the control group.

Using the Pearson Chi-squared test, the results showed that there was not much of a statistical significance in terms of the graft uptake in both types of dressing (p value was 0.364).



Graph6: Graft uptake in both groups on the 5th post operative day

DISCUSSION

Once the split thickness graft was fixed to the recipient bed and Bactigras was applied to the graft, it was then decided whether patient should have a cotton bolster dressing or the glove dressing. The time taken was measured from when the graft was placed and fixed.

Patients who underwent the glove dressing had dry cotton padding placed over the Bactigras, and it was then fixed into place with the help of Mersilk 2-0 sutures, with bites taken on the skin around the cotton padding.

Patients who underwent the glove dressing had the cotton padding placed on the Bactigras, and the sterile latex gloves were then cut into the appropriate shape and size, with ends long enough to be stapled in place with the skin stapler.

The dressings were then opened on the fifth post operative day, and the graft was then inspected. The outcome was assessed based on the surface area taken up by the graft.



The results demonstrated that there was a significant difference in the time taken and the cost of the materials used for the dressing. The outcome of the graft uptake for either type of dressing did not have much of a statistical significance.

It was noticed that the surrounding skin developed maceration, due to the moisture being locked in when using the glove dressing. Studies done by Eroglu et al stated that meshing the glove dressing can overcome the issue of maceration of the surrounding skin.

Due to the ease of stretching a glove over the grafted site, the time taken for the glove dressing was less. However, the glove could only be stretched for a certain distance, and could not be used in larger areas, where the cotton bolster could be used with ease, as the graft was held in place and compressing was provided by the silk sutures holding the dressing in place, an example of which is shown in the picture above [5-9].

CONCLUSION

This study was aimed to demonstrate a possible option to the classical cotton bolster dressing for split thickness skin graft recipient areas, which could be more efficient, less time consuming and cost effective. The glove technique for dressing the graft recipient areas has demonstrated, in our study, a cheaper and quicker modality to provide adequate compression and covering to the recipient bed, without altering the outcome of the graft uptake.

This dressing technique could be utilised as an alternative to the cotton bolster dressing. While there are other techniques that have shown to aid in better uptake of the graft, the time taken for those methods, or the costs involved were not assessed.

However, the limitations to the dressing itself remains that it alone cannot be used in very large areas, and in areas of cosmetic concern, such as the face. The problem of maceration of the surrounding skin does persist, and modification of the technique may be required to produce better results.

More studies are to be done to ascertain the surface area allowed by the glove technique, and its ease of use in regular surgical practice.

Summary

Split thickness skin grafts have aided in the closure of various skin defects, caused by various aetiologies. The classical cotton bolster dressing, held together with silk sutures, can be a cumbersome dressing and may also incur higher cost of surgical materials used. In an attempt to bring forth an alternative to this, the glove technique was developed.

This study demonstrates the comparison between both the cotton bolster dressing and the glove dressing, assessing the outcome of the graft, the time taken, and the cost of the materials used in both techniques. Results showed that while the outcome of the graft did not vary significantly with both methods, the time taken and the cost of materials were reduced in using the glove method, hence making it a sustainable option for split thickness skin graft recipient bed dressings, while considering the limitations of the glove dressing itself, that it alone cannot be utilised in very large areas and in areas of cosmetic concern.

More studies are to be done to demonstrate the surface area it can cover, and its acceptability in regular practice.

ACKNOWLEDGEMENTS

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