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RESEARCH ARTICLE
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A COMPARATIVE STUDY OF COLLAGEN SHEET DRESSING VERSUS PETROLEUM GAUZE DRESSING IN REDUCING PAIN AT SPLIT THICKNESS SKIN GRAFT DONOR SITE IN A TERTIARY CARE CENTRE IN SOUTH KERALA.

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Abstract

Split thickness skin graft harvesting results in a partial thickness injury, which takes 10-14 days for the donor-site wound to heal, after which it may be used again when more grafts are required. Proper management of the donor site is important to accelerate re-epithelialization and to prevent significant complications, out of which pain is the most frequent complaint. The primary objective was to compare collagen sheet dressing with traditional petroleum gauze dressing in controlling post-operative pain on the split thickness skin graft donor area. A longitudinal comparative study involving 62 patients was conducted at a tertiary healthcare center in Thiruvananthapuram. Patients undergoing split thickness skin grafting with comparable wound sizes were selected and were divided into two groups, among which one group was dressed with collagen sheet and the other with petroleum gauze dressing. Assessment of post-operative pain was done using NPR scale from 0 to 10, were patients verbally select a value, most in line with the intensity of pain that they have experienced in the last 24 hours. Data was coded, entered in MS Excel and was analyzed using SPSS 26.0. Chi square tests and unpaired t test were done to test the statistical association and a p value of less than 0.05 was considered significant. Both the studied groups were comparable in age and gender wise distribution. The collagen sheet dressing was found to reduce pain in the donor area post operatively, reduction in soakage at the donor site, and more area of epithelization when compared to that of petroleum gauze dressing and these associations were found to be statistically significant. This study revealed that

Collagen sheet dressing helped to achieve better reduction in pain at donor area of split thickness skin grafting compared to Petroleum gauze dressing. It was also observed that collagen sheet dressing was superior to Petroleum gauze dressing to reduce soakage and to promote epithelialization at donor area of split thickness skin grafting.

Keywords: Collagen sheet dressing, petroleum gauze dressing, split skin graft, Post-operative complications,

INTRODUCTION

Split skin grafting has been used for many years as a way which is used to treat a variety of conditions, including burns, skin ulcers, and injuries. It is often used in combination with other treatments, such as skin flaps, to repair large wounds or areas of skin loss. Skin grafts remain the most common and least invasive procedure for the closure of soft tissue defects even today. For the past decades, various new dressing materials have been developed, such as calcium alginate, hydro-colloid membranes, and fine mesh gauze. These have the disadvantage of becoming permeable to bacteria. Biological dressings, like collagen, are the most physiologically compatible with the wound surface and environment and are impermeable to bacteria (1,2). The primary objective of donor area management is to promote early epithelialization without infection, while minimizing pain, making the dressing easily accessible, and keeping costs low (3,4,5,6). Patients often find the donor site of a skin graft more painful than the recipient site. This is due to the exposure of the dermis, which causes significant problem for the patient and surgical staff. To address this, the current goal is to create an optimal environment for the donor site that encourages rapid re-epithelialization, prevents infection, reduces patient discomfort, and produces a good cosmetic result (7). Even though the donor site is very thin, patients often report a great deal of pain in the location. Usually they complain of more pain in the donor wound site than in the original recipient site. The pain in the thigh donor site may delay early ambulation of the patients (8). Thus, proper management of the donor wound is an important issue, with other studies confirming that the donor site is more uncomfortable than the recipient site (9,10). An ideal dressing for a donor wound should be capable of absorbing wound secretions and be easily removable after healing. However, petroleum gauze, which has good permeability, may cause intense pain upon removal due to its strong adhesion (11) Over the years, no ideal dressing has been discovered for STSG donor sites (12). Consequently, various skin substitutes and occlusive dressings have been created to minimize fluid loss, pain, infection and expenses, and stimulate wound healing. These skin substitutes can help facilitate re-epithelialization underneath the dressing and eliminate the need for regular dressing changes. This will significantly reduce the strain that patients, physicians, nurses, and staff (13)

The current research in the field of dressings for pain management at the donor site of split skin grafting is limited, leaving a number of gaps in our understanding of this important issue. Further research is needed to provide a comprehensive assessment of the effects of different dressings on pain management, including an evaluation of the potential benefits of newer, advanced dressings and the impact of psychological factors on pain management. This study investigates the comparative efficacy of Collagen sheet dressing versus Petroleum gauze dressing in reducing pain at Split Thickness Skin Graft donor sites.

MATERIALS AND METHODS

A Longitudinal comparative cross-sectional study was conducted among 62 adult patients undergoing split thickness skin grafting in the Department of General Surgery, Dr SMCSI Medical College, Karakonam. The study population was divided into two groups based on comparable wound sizes. The First group received collagen sheet dressing at split thickness skin graft donor site and the Second group received petroleum gauze dressing for the same. Patients who underwent Split thickness skin grafting from a lateral or anterior thigh donor site with a minimum size of 5 * 5 cm donor site wound were included in the study. Those with burns whose analgesic requirements were more and

Immunocompromised patients where wound healing may be affected were excluded from the study. The sample size was scientifically calculated to be 16 in each group and convenient sampling technique was adopted to enroll patients to the study (14). A pretested predesigned proforma was used to collect the sociodemographic and clinical variables of the study participants and a 11-point Numerical Pain Rating (NPR) scale, which is sensitive, reliable and validated was used for assessing post procedure pain among the study groups. (15,16). The NPR scale ranges from 0 to 10, were 0 represents one end of the pain intensity (no pain) and 10 represents the other extreme of pain severity (unbearable pain/ worst possible pain). Patients verbally selected a value that is most in line with the intensity of pain they have experienced in the first 24 hours. A trained Staff nurse recorded the intensity of pain subsequently on the 2nd, 3rd, 4th, 5th, 10th and 14th days, using this scale. The staff nurse was not aware whether the patient had collagen or petroleum gauze dressing. On the 5th post-operative day, the treating surgeon changed the dressing and pain was recorded by staff nurse without seeing the wound.Whenever the patient developed soakage in the dressing in between, the dressing was changed immediately. Standard antibiotics and analgesics were prescribed thrice daily to all patients for 5 days. The data was collected was coded, entered in MS Excel and was analyzed using SPSS 26.0. All quantitative variables are expressed as means and standard deviations and qualitative variables as frequencies and proportions. Student t test was done to compare the post-operative pain status in the 2 groups and a p value of less than 0.05 was considered significant

RESULTS

A total of 62 subjects who underwent split skin grafting were included in the final analysis and among them, 31 patients received Petroleum gauze dressing and 31 received Collagen sheet dressing at the donor site. The mean age of the study population who received Petroleum gauze dressing were 38.45 ± 15.61 and those who received Collagen sheet dressing were 39.61 ± 14.41. Among the population who received Petroleum gauze dressing 67.7% of the participants were males and among those who received Collagen sheet dressing, 61.3% of the participants were males. More than a quarter (38.7% and 35.5%) among those who received Petroleum gauze dressing and those who received Collagen sheet dressing were diabetic.

Table 1: Distribution of donor site in study population (N=62)

DONOR SITE	**PETROLEUM GAUZE DRESSING (n=31) Frequency (%)**	**COLLAGEN SHEET DRESSING (n=31) Frequency (%)**
ANTERIOR THIGH	18 (58.1%)	17 (54.8)
LATERAL THIGH	13 (41.9%)	14 (45.2)

For majority (58.1% and 54.8%) of the study population, the donor site was Anterior aspect of the thigh. (Table No: 1)

Table 2: Distribution of etiology of wound/ulcer among the study population (N=62)

ETIOLOGY	**PETROLEUM GAUZE DRESSING (n=31) Frequency (%)**	**COLLAGEN SHEET DRESSING (n=31) Frequency (%)**
TRAUMATIC	7 (22.6)	10 (32.3)
DIABETIC	8 (25.8)	5 (16.1)
VENOUS	3 (9.7)	3 (9.7)
ARTERIAL	2 (6.5)	2 (6.5)

TROPHIC ULCER	2 (6.5)	1 (3.2)
BURNS	8 (25.8)	7 (22.6)
OTHER WOUNDS	1 (3.2)	3 (9.7)

Among the indications for split skin grafting, the majority (22.6% and 32.3%) had a traumatic history in both groups, followed by burns (25.85 and 22.6%).(Table No:2)

Table 3: Distribution of Post-operative complications at donor site in the study population (N=62)

Post-operative complications	**PETROLEUM GAUZE DRESSING (n=31) Frequency (%)**	**COLLAGEN SHEET DRESSING (n=31) Frequency (%)**	**P value**
Soakage at donor site			
Soakage	8 (25.8)	2 (6.5)	
No soakage	23 (74.2)	29 (93.5)	0.038
Infection			
Culture Positive infection	3 (9.7)	0 (0)	0.238
No infection	28 (90.3)	31 (100)	

Chi square test was done to find out the association between post-operative complications like soakage and infection status in the wound and the type of dressing. It was observed that majority (93.5%) of participants who received Collagen sheet dressing didn't get any wound soakage while 25.8 % of participants who received Petroleum gauze dressing found to have soakage of dressing which demanded a change of dressing during the post-operative day and this association was found to be statistically significant. It was also found that, none of them among those who received collagen sheet dressing had any culture positive infection at the donor site while 9.7% among those who received Petroleum gauze dressing developed a culture positive infection. (Table No: 3)

Table No: 4 Descriptive analysis of area of epithelialization (cm^2) & percentage of area of epithelialization among the study population (N=62)

Variable	**Petroleum Gauze Dressing (n=31)**		**Collagen Sheet Dressing (n=31)**		p value
	Mean	**SD**	**Mean**	**SD**	
Area of Epithelialization	23.12	4.01	24.45	4.39	0.221
Percentage of Epithelialization	83%	5.75	88%	5.73	**<0.001**

Unpaired t test was done, to compare the 2 groups with regard to area and percentage of Epithelialization and a p value less than 0.05 was considered to be statistically significant. It was found that, the mean percentage of epithelialization was 88± 5.73 among those who received Collagen sheet dressing and 83± 5.75among those whose received petroleum gauze dressing and this association was found to be statistically significant. (Table No:4)

COMPARISON OF COLLAGEN SHEET DRESSING VERSUS PETROLEUM GAUZE DRESSING IN REDUCING PAIN AT SPLIT THICKNESS SKIN GRAFT DONOR SITE

Table No:5 Comparison of collagen sheet dressing versus petroleum gauze dressing in reducing pain at split thickness skin graft donor site during post-operative days

POST OPERATIVE DAY	PETROLEUM GAUZE DRESSING (n=31)		COLLAGEN SHEET DRESSING (n=31)		p value
	MEAN	SD	MEAN	SD	
ONE	8.90	0.53	7.45	0.76	**<0.001**
TWO	7.87	0.61	5.58	0.76	**<0.001**
THREE	7.12	0.71	4.03	1.07	**<0.001**
FOUR	6.25	0.81	1.96	0.83	**<0.001**
FIVE	5.74	0.68	1.09	0.83	**<0.001**
TEN	4.74	0.68	0.58	0.50	**<0.001**
FOURTEEN	4.03	0.60	0.32	0.47	**<0.001**

Independent t- test were used to compare the reduction of pain between two groups. Mean pain score of the population who received Collagen sheet dressing during post-operative days were less compared to those received Petroleum gauze dressing and this association was found to be statistically significant ($p < 0.001$).

DISCUSSION

Collagen sheet dressing is a semi-permeable sheet that allows moisture to pass through, while petroleum gauze dressing is a more occlusive dressing that helps to maintain a moist environment in the wound. There are several potential reasons for comparing collagen sheet dressings and petroleum gauze dressings in terms of their ability to reduce pain at the donor site after split thickness skin grafting. First, both collagen sheet dressings and petroleum gauze dressings are commonly used to cover the donor site after split thickness skin grafting. It is important to determine which type of dressing is more effective at reducing pain, as this can impact the patient's comfort level and overall satisfaction with the treatment. Second, the choice of dressing can have an impact on the healing process. Some dressings may be more effective at promoting healing than others, and this could potentially affect pain levels. By comparing collagen sheet dressings and petroleum gauze dressings, it may be possible to determine which type of dressing is more effective at promoting healing and reducing pain.

In this research, the effectiveness of collagen sheet dressing is compared to conventional petroleum gauze dressing was assessed with regard to Post-operative pain at the donor site of Split-Thickness Skin Graft (STSG) using NPR scale. The donor site wound is usually not taken care of properly and is often associated with delayed wound healing with significant pain and discomfort. It was observed that pain at the donor site is often more severe than the recipient site after STSG and patients experience a great deal of discomfort during the post-operative period. In a study conducted by Ramesh BA et al, sterile collagen film was employed as a dressing for 20 donor areas and pain postoperatively was measured using the Numerical Pain Rating (NPR) scale (7). The results revealed that collagen sheet dressing provided superior pain relief compared to petroleum gauze dressing. Similarly, the present study found that patients who utilized collagen sheet as a dressing experienced less pain than those who received petroleum gauze. Sreekumar et al, in their comparative study compared collagen dressing with paraffin gauze dressing at donor site and collagen dressing was found to be more effective than paraffin gauze dressing in terms of epithelialization time and exudate. (17)

Serebrakian et al, performed a systematic review and meta-analysis of skin graft donor-site dressings to identify which dressing is most effective for donor-site wound healing. They searched the PubMed,

EMBASE, and Cochrane databases for randomized controlled trials and observational studies that evaluated the effectiveness of skin graft donor-site dressings. Outcomes of interest included time to complete wound epithelialization, rate of wound infection, and adverse events. They found Hydrocolloids to be the most effective dressing for skin graft donor-site wound healing. (18)

The current research in the field of dressings for pain management at the donor site of split skin grafting is limited, leaving a number of gaps in our understanding of this important issue.

Dressings are important adjuncts to wound healing, providing a physical barrier to prevent entry of microorganisms and affording protection against disruption of the healing wound. When deciding on a suitable dressing for a specific wound, characteristics that need consideration include, Permeability to microorganisms, Effect on wound bed moisture, Hemostatic activity, Adherence, Absorption, Antimicrobial activity and Debriding activity. (19) For the past decades, various new dressing materials have been developed, such as calcium alginate, hydro-colloid membranes, and fine mesh gauze. These have the disadvantage of becoming permeable to bacteria. Biological dressings, like collagen, are the most physiologically compatible with the wound surface and environment and are impermeable to bacteria (1,2). There is a statistically significant difference between the two groups in case of distribution of soakage of dressing (P=0.038) in the current study, and also it was observed that among participants who received Petroleum gauze dressing, culture positive infection at donor site were encountered while in participants who received Collagen sheet dressing none had culture positive infection at donor site, even though there was no statistically significant difference between the two groups (P=0.238).

Biological dressings, which are natural, non-immunogenic, non-pyrogenic and hypoallergenic, are the most effective way to cover a wound (7,14 15). These dressings create a barrier between the wound and its environment, allowing the body's healing and immune systems to work effectively. Collagen sheet is one type of dressing material used since it promotes cellular growth, pain relief, and infection prevention. Collagen displays ability to support cellular growth and minimal bio degradation. (16) Additionally, it helps to maintain local heat, moderate fluid flux, and act as a scaffolding for epithelialization, as well as stimulating healthy granulation and tissue remodeling (20,21). Even though both groups had comparable area of epithelialization at donor site, when the percentage of area of epithelialization was considered collagen sheet dressing had a statistically significant advantage in epithelialization of donor site($p<0.001$).

CONCLUSION

This study concludes that pain relief was superior with collagen sheet dressing when compared with petroleum gauze dressing and was statistically significant. Collagen sheet dressing has been found to be the superior option in terms of clinical efficiency, and offers multiple advantages when used as a donor site dressing. Not only is it easy to apply and cause less pain, but it also has a lower rate of soakage and better percentage re-epithelialization than petroleum gauze dressing. Further investigation from a larger scale study, preferably an RCT is needed to generalize the results in the population.

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