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A Comparative Study between Collagen Sheet Application and Normal Saline Dressing for Donor Site Healing Following Split Skin Graft

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Abstract **Original Research Article**

Background: Split skin grafting is one of the commonest procedures performed in surgical theatres. Though lots of options are available for donor site dressing, the ideal dressing is still unknown. The efficacy of collagen for donor site dressing is evaluated in our study. ***Methods:*** During January 2018 to march 2018, 30 patients in surgical wards of KIMS, Hubli, were selected. 15 patients received normal saline dressings and the other 15 received collagen sheets 24 hours after surgery to the donor site. The two groups were compared for pain, epithelialization, infection and dressing changes using appropriate statistical methods. ***Results:*** Mean VAS on days 5, 10, 14, 21 for collagen vs saline dressing groups were 4.33±1.05 vs 5.00±0.65 (p value 0.046), 2.93±0.96 vs 3.73±0.59 (p value0.011), 1.80±1.08 vs 2.53±0.83 (p value 0.047), 0.60±0.63 vs 1.00±0.85 (p value 0.153) respectively. Collagen group patients had less pain on days 5, 10 and 14.The number of infections on days 5, 10, 14, 21 for collagen vs saline dressing groups were 2 vs 1 (p value 1), 1 vs 1 (p value 1), 0 vs 1 (p value 1), 0 vs 0 (p value 1) respectively. Infection rate was similar in both groups.The number of patients with 70-80%, 80-90%, >90% epithelialization on day 10 for collagen vs saline dressing groups were 7 vs 11, 6 vs 4, 2 vs 0 with a p value 0.23. The epithelialization rate was comparable in both groups.Mean number of dressings required till 14 days for collagen vs saline dressing groups was 1.2 vs 3.2 (p value 0.001) suggesting collagen group patients required less dressing. ***Conclusion***: In affordable patients, if applied after adequate hemostasis, collagen sheets have better outcome in terms of patient comfort, pain and mean number of dressings compared to normal saline dressings in the management of donor site healing.

Keywords: Split skin grafting, donor site healing, collagen, saline dressings.

INTRODUCTION

Split skin grafting is one of the commonest procedures performed in surgical theatres. Donor site from which the graft is harvested is often the last priority in the post operative period. Often it is the cause for pain in post operative period and in the long run, can lead to ugly hyperpigmentation and scarring (Figure 1). Though lots of options are available for donor site dressing, the ideal dressing is still unknown.

Collagen is an effective epidermal substitute that supports epidermal cell attachment and migration [1].Collagen has long been used for burns wound dressing. But the efficacy of collagen for donor site dressing is not extensively studied.

There are few studies which have compared efficacy of different modalities of treatment for donor site healing. Indian studies are very scares in this regard. This study helps to us to compare few commonly used modalities and helps us in deciding the patient friendly and cost effective measure.

AIMS

- To evaluate the efficacy of collagen for donor site dressing
- To compare collagen with normal saline dressing in terms of pain, epithelialization, infection and number of dressings required

METHODS

The study was conducted in Karnataka institute of medical sciences, Hubli, Karnataka during the period January 2018 to march 2018. 30 patients from the surgical wards who were planned for split skin grafting were selected. 15 patients received normal saline dressings for the donor site once graft was harvested. Every alternate patient received collagen

sheets for the donor site and was applied 24 hours after surgery. We observed that by applying collagen immediately after the surgery (Figure 2A), there was increased rate of collagen loss due to infection. The reason is probably the minute hemorrhages underneath the collagen which acted as a nidus for infection and eventually led to collagen loss. By applying collagen 24 hours after the surgery, adequate hemostasis was achieved and resulted in decreased collagen loss (Figure 2B).

Post operatively all patients received intravenous antibiotics and analgesics for 2 days, followed by oral analgesics as and when required. Pain was assessed on post-operative days 5, 10, 14 and 21 using visual analog scale.[2] Donor site was inspected on 5, 10, 14, 21 days for evidence of infection. For normal saline dressings; features like fever, foul smelling discharge and wound soakage were considered for evidence of infection. For collagen dressings, features of fever and pus pocket underneath collagen were considered for evidence of infection (Figure 3). Percentage of epithelialization was assessed by a single examiner on day 10 and graded as 70-80%, 80-90%and >90% for all patients (Figure 4A, 4B). Mean number of dressings required for 14 post operative days were assessed in both the groups. Age groups affected and gender difference was compared between the two groups.

STATISTICAL METHODS

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance. The following assumptions on data is made, **Assumptions: 1.**Dependent variables should be normally distributed, 2.Samples drawn from the population should be random, Cases of the samples should be independent Student t test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups (Inter group analysis) on metric parameters. Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups.

Significant figures

+ Suggestive significance (P value: $0.05<P<0.10$)
* Moderately significant (P value: $0.01<P \leq 0.05$)
** Strongly significant (P value: $P \leq 0.01$)

Statistical software: The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1 ,Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

RESULTS

Both the groups are age and gender matched (Table 1). On comparing the mean visual analog scores on days 5, 10, 14 and 20; collagen group patients had significantly less pain than normal saline group on all days except day 21 by which wound might have healed (Table 2). Infection rate is more in collagen group compared to normal saline group (Table 3). But in both groups, infection subsided with conservative management by evacuation of pus pocket and antibiotics use. None of the patients had complete loss of collagen because of infection. Epithelialization rate on day 10 is better in collagen group but it was not significant (Table 4). Collagen group patients had faster epithelialization and wound healing. Most of the patients in the collagen group required only one dressing till post-operative day 14, whereas normal saline group needed frequent dressing changes(Table 5).

DISCUSSION

Ideal dressing is an enigma for the surgeon. Dressing preferences vary from individual to individual and none is virtually acceptable to all. Hence there is a need to study various options and conclude a dressing which is near-ideal. But the studies regarding these are few and are mostly influenced by the company's marketing the products for producing results which favor them. We tried to shed light into collagen sheet as an alternative for donor site dressing.

Collagen is a component of the extracellular matrix, which has found established utility as a biomaterial in cell therapies and tissue engineering [3]. In the treatment of wounds, collagen promotes epidermal cell attachments and migration [4, 5].Collagen facilitate rapid revascularization, re-epithelialization, immediate pain-relief and healing of wound beds [3,6].

Few studies in the past have tried to compare different dressings for donor site [7, 8]. Most of them have concluded that collagen dressing is associated with substantial pain reduction [9]. But few of them were funded by the marketing companies which might have influenced the results [10]. So we tried to analyze the efficacy of collagen dressing by comparing it with normal saline dressing which is frequently followed in India.

Frequent dressing changes required in normal saline group results in pain during dressing and is also the cause for decreased epithelialization. Delicate epithelium during the regenerative process are injured by dressing changes. Collagen sheets on the other hand require once application, and results in better epithelialization and pain control. Infection rate was more if hemostasis is not adequately achieved. Hence we decided to apply collagen after 24 hours. Most of the previous studies have applied collagen immediately

after surgery. The patient can be discharged with collagen in situ and he can resume his activities. The collagen peels off by itself and requires minimal nursing care during follow up.

One might speculate the cost effectiveness of collagen dressings. But, practically, collagen dressing is much more cost effective than frequent saline dressings which not only increases the cost but also the patient's discomfort.

Based on above observations, we conclude that, if applied after adequate hemostasis, collagen sheets have better outcome with respect to patient comfort, pain and mean number of dressings compared to normal saline dressings in the management of donor site healing.

Table-1: Age and gender distribution of patients studied

	Collagen	Normal saline	P value
Mean age in yrs.	47.00±14.20	49.67±16.99	0.644
Male : female	11 : 5	11 : 5	1

Both the groups are matched

Table-2: VAS Score: An assessment in different study period

VAS Score	Collagen	Normal	P value
Day 5	4.33±1.05	5.00±0.65	0.046*
Day 10	2.93±0.96	3.73±0.59	0.011*
Day 14	1.80±1.08	2.53±0.83	0.047*
Day 21	0.60±0.63	1.00±0.85	0.153

P<0.05*, Significant, Fisher Exact test

Table-3: Infection: An assessment in different study period

Infection	Day 5	Day 10	Day 14	Day 21
Collagen (n=15)				
No	13(86.7%)	14(93.3%)	15(100%)	15(100%)
Yes	2(13.3%)	1(6.7%)	0(0%)	0(0%)
Normal (n=15)				
No	14(93.3%)	14(93.3%)	14(93.3%)	15(100%)
Yes	1(6.7%)	1(6.7%)	1(6.7%)	0(0%)
P value	1.000	1.000	1.000	1.000

Table-4: Epithelialisation % @ Day 10 in two groups studied

Epithelialisation % @ Day 10	Collagen		Normal	
	No	%	No	%
70-80 %	7	46.7	11	73.3
80-90 %	6	40.0	4	26.7
90 %	2	13.3	0	0.0
Total	15	100.0	15	100.0

P=0.233, Not Significant, Fisher Exact test

Table-5: No. of Dressings in two groups studied

No. of Dressings	Collagen		Normal	
	No	%	No	%
1	13	86.7	0	0.0
2	1	6.7	0	0.0
3+	1	6.7	15	100.0
Total	15	100.0	15	100.0

P<0.001**, Significant, Fisher Exact test

Fig-1: Shows poor healing of donor site, with ugly hyperpigmentation. Often this may be due to poor choice of dressing and less care given to donor site

Fig-2:Collagen sheets if applied before achieving hemostasis (A) results in formation of a layer between collagen and raw area which inhibits epithelialization. Ideally it should be applied after achieving complete hemostasis as shown in (B), usually after 24 hours

Fig-3: Poor hemostasis results in clot formation beneath collagen layer, which may act as nidus for infection and pus formation. This will result in loss of collagen sheath. There lies the importance of achieving complete hemostasis

Fig-4: Epithelialization after 10 days as shown is better with collagen sheath application compared to normal saline dressing

CONCLUSION

In affordable patients, if applied after adequate hemostasis, collagen sheets have better outcome in terms of patient comfort, pain and mean number of dressings compared to normal saline dressings in the management of donor site healing.

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