

A Clinical Study of Collagen Dressing Over Silver Sulphadiazine Dressing in Partial Thickness Burns

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A B S T R A C T

Introduction: Burns are complex in their occurrence, pathophysiology and management. It is a painful condition and topical management of burns is a challenging task. A topical dressing which allows faster healing with reduction of pain, prevents infection, leads to a good scar formation and which is cost effective is required. Over the period of time collagen has created an interest among scientists who have extensively researched about collagen and its properties have been utilized in topical management of wounds and burns. Thus there is a need to study the effectiveness of collagen dressing in comparison with conventional silver sulphadiazine dressing in terms of pain score, healing time and cost efficiency.

Material and Methods: This prospective randomized comparative study includes patients with partial thickness burns, <40% BSA and not older than 48hrs, admitted in Burns unit of MNR Medical College and Hospital from July 2015 to October 2017. 60 patients were studied, these patients were randomized into collagen dressing or silver sulphadiazine dressing group of 30 each.

Results: The 60 patients admitted with partial thickness burns, <40% BSA were divided into two equal and comparable groups. Patients subjected to collagen dressings were classified under Group I and those who underwent 1% silver sulphadiazine dressings were classified as Group II.

Conclusion: The collagen dressing is more cost effective than SSD. SSD has disadvantage of the large number of dressings, prolonged hospital stay, amount pain, loss of time and labour of the patient and the accompanying person which makes collagen dressing more cost effective as it is most of the time a single dressing.

Key Words: Burns, Sulphadiazine, Collagen Dressing, Silver Sulphadiazine

INTRODUCTION

Burn injuries are extremely complex in their occurrence and pathophysiology and optimal treatment requires an understanding of the physiology and metabolic interactions among all the major organ systems, nutrition, immunology, psychological issues.¹ The WHO defines burns as destruction of some or all layers of the skin, when they come in contact with hot liquids (scalds), hot solids (contact) or flame (flame burns) or due to lightning and radiation injury.

The problems associated with burns management, treatment and healing have always been the main challenge. Therefore it is appropriate that the process and problems of wound healings would be considered seriously by all practitioners involved in the management to burned patients and in the development and use of new wound repair material.² Previously the management of superficial burns was by method of exposure, but with the evolution of newer techniques impetus of management is towards closed dressing with newer type of dressings.³ The ideal management of a burn is an economical, easy to apply, readily available dressings or method of coverage that will provide good pain relief, protect the wound from infection, promote healing, prevent heat and fluid loss, be elastic and non antigenic and adhere well to

the wound and waiting for spontaneous epithelization of superficial partial thickness burns.⁴

Collagen is an endogenous substance, which forms an important structural component in connective tissue and is of special importance in the skin. The importance of collagen in healing has been appreciated for many years for the simple reason that the end result of wound healing is always a scar which is composed of collagenous fibres.⁵

Biological dressings with collagen create themostphysiological interface between the wound surface and environment and are impermeable to bacteria. Collagen dressings have other advantage over conventional dressings interns of easy application and being natural, non-immunogenic, non-pyrogenic, hypo-allergic and pain free.⁶

In this study we have compared the results of collagen dressings against 1% silver sulphadiazine dressings in partial thickness burns. We have hypothesized that coverage of burn wound with collagen sheet provides a better environment for healing, thereby decreasing healing time and pain.

Objectives were to compare the wound healing time in partial thickness burns with collagen and 1% silver sulphadiazine dressings, to compare the effect on the morbidity in partial thickness burns with collagen and 1% silver sulphadiazine dressings and to compare cost-effectiveness in partial

thickness burns with collagen and 1% silver sulphadiazine dressings.

MATERIAL AND METHODS

This prospective randomized comparative study includes patients with partial thickness burns, <40% BSA and not older than 48hrs, admitted in Burns unit of MNR Medical College and Hospital from July 2015 to October 2017. 60 patients were studied, these patients were randomized into collagen dressing or silver sulphadiazine dressing group of 30 each.

Sample size: the size of the sample is 60 cases, 30 cases with collagen dressing group (group – I) and 30 cases with silver sulphadiazine dressing group (group – II).

Inclusion criteria: all patients with partial thickness burns. Patients who are salvageable (<40% BSA) and patients with burn wounds not older than 48 hours.

Exclusion criteria: patients with full thickness burns, patients who are not salvageable (>40% BSA), patients with electrical and non thermal burns and patients with burnt wounds older than 48 hours.

The patients thus selected were taken consent and enrolled in the study. Total patients studied were 60 out of which 30 were treated with collagen dressings as experimental group and rest 30 patients were treated with conventional silver sulphadiazine ointment as the control group. The data were collected in prescribed proforma.

All patients were assessed clinically as to % body surface area involvement – using rule of nine chart, the degree of burns and mode of treatment – collagen dressings or conventional method.

The patients were followed upon a daily basis in both test and control group until complete epithelisation occurred. The control group was subjected to alternate day dressing by conventional silver sulphadiazine dressing where as the test group was subjected to collagen dressings and was left undisturbed until complete epithelisation occurred. Dressings were replaced if any infection of collagen dressing occurred.

Materials used⁷

1. Collagen sheets (Kollagen – contains sterile reconstituted type – 1 collagen sheet)
2. 1% silver sulphadiazine
3. Dressing with cotton pads and roller gauze.

Directions of use

1. Clean the application site thoroughly with povidine iodine or any other antiseptic.
2. Peel opens the pouch and directly apply the collagen on the cleaned wound after soaking it in normal saline for 2- min.
3. Do not try to overstretch the membrane.
4. Repeat dressing is not required, unless the wound is infected.
5. Collagen wound is transparent – hence we can monitor the healing without peeling off membrane and thus avoid disturbing epithelization.
6. The collagen peels off as the wound heals. However in some circumstances it may need to be moistened with saline before removal.

7. In case of localized bulging of collagen after application due to fluid accumulation beneath, a small incision can be made at the site and exude the fluid. This incision can be sealed with additional small piece of collagen, which adheres firmly with the ready applied collagen. Alternatively, to avoid such inconvenience, meshed type of collagen is also available, where the excess fluid is released automatically.

Technique of Application

Control group: though was of the burn wound done using normal saline. Silver sulphadiazine ointment was applied over the cleaned wound occlusive dressing was applied with gauze pad and roller bandage. The patients were asked to take bath with soap once in every 2 days and the dressings were changed along the application of ointment.

Experimental group: Thorough wash of the burn wound done using normal saline. Then the collagen sheet soaked in normal saline is directly applied over the burn wound and gently spread over the wound. The collagen dressing allowed to dry. The collagen gets adherent to the skin wound in few hours. The patient was asked to move till the collagen dries off. The applied collagen was allowed to peel off by itself after the wound had fully epithelized and healed. Sometimes collagen might have been trimmed when it does not come off by itself.

Antibiotics were prescribed to the patients according to the antibiotic schedule of our hospital. Patients were followed up on days 1, 2, 7, 14, 21 and 28 or for more days in even of any adverse effects related to medication or aggravation symptoms or complications. Patients were discharged once complete epithelization occurred. Time taken for complete epithelization in both the group was noted. Pain assessment in both the group were done using 10 points visual analogue scale. Patients were advised to review after a month in order to assess and manage any late complications like hypertrophied scar, contractures and keloids.

Results obtained were calculated according to the following criteria

1. Pain was measured using visual analogue score of 0-10.0 being no pain 10 the maximum pain tolerable by the patient after 24 hours of applying the dressing.
2. Infection as being present or absent by checking for any pus under the dressing visually. And when infection is present pus is sent for culture and sensitivity.
3. Wound healing time will be measured by the number of days required for complete epithelisation of the wound.
4. Resultant scar is compared between the collagen and conventional dressing group by accessing the scar contracture at the end of 4 weeks. Contracture of the wound site is noted as being: Good (<50%), Bad (>50%)

STATISTICAL ANALYSIS

Microsoft office 2007 was used for the analysis. Student t's test was used for comparison.

RESULTS

The 60 patients admitted with partial thickness burns, <40% BSA were divided into two equal and comparable groups.

Patients subjected to collagen dressings were classified under Group I and those who underwent 1% silver sulphadiazine dressings were classified as Group II.

Patients demography

Age at Presentation

In this study the age of the patients ranged between 6 years to 65 years. 36% of the patients were in 21–30 age group. This includes 30% in group I and 43% in Group II.

In this study 53% of the patients were males, as compared to females who made 47% of the total cases. Type of burns in this study in most of the cases were flame burns constituting 85%, and the rest were flame burns which were 15%. Most of burns in 3.3% of cases were accidental in nature i.e. 96.6% and suicidal. The P value being less than 0.0001 implies statistically significant reduction of pain in Collagen group as compared to those in SSD group.

Healing time

It is the time taken for more than 90% epithelialisation of the wound. The study by Gupta et al¹⁰ recorded an average healing time of 14 days in patients treated with collagen dressing while Mukund B Tayade et al¹ recorded 12.64 days in collagen group and 18.44 days in the silver sulphadiazine group. Marilyn Kwolek et al, in his study observed median time to heal was 7.2 days in the collagen group versus 14.5 days in silver sulphadiazine group.

In this study patients with burns <40% BSA only were included. Majority of the patients had 21–30% BSA burns. All patients in group I with collagen dressings required only one dressing, except in one patient who required 2 dressings, as a result of infection. Pain, Pain assessment was done using visual analogue scale, on day 1, day 2, day 7, day 14.

Pain assessment on day 1: After application of collagen dressing on day 1, 80% of patients had pain score less than 5, whereas with SSD dressings, 43.3% of patients had pain less than 5.

Type of	N	Mean	Std.	T value	df	P value
Group I	30	4.5	1.358	-3.334	58	<.0001
Group II	30	5.63	1.125			
Independent T test between Type of dressing and Visual Analogue Pain Scale on Day1						

Comparison of pain in both the groups on day 1 showed a significant difference with p value < .0001, inferring that pain in collagen dressing is significantly less compared to that in silver sulphadiazine dressings on day 1.

Pain assessment on Day 2: On day 2, in collagen dressing group, 100% of patients had pain score less than 5, whereas with SSD dressings, 80% of patients had pain less than 5.

Comparison of pain in both the groups on day 2 showed a significant difference with p Value <.0001, inferring that pain in collagen dressing is significantly less compared to that in silver sulphadiazine dressings on day 2.

Type of	N	Mean	Std.	T Value	df	P value
Group I	30	2.033	1.033	-8.2389	58	<.0001
Group II	30	4.566	1.331			
Independent T test between Type of dressing and Visual Analogue Pain Scale on Day 2						

Pain assessment on Day7: On day 7, in collagen dressing group, 100% of patients had pain less than 5.

Type of	N	Mean	Std.	T Value	df	P value
Group I	30	0.566	0.6789	-11.456	58	<.0001
Group II	30	3.033	0.9643			
Independent T test between Type of dressing and Visual Analogue Pain Scale on Day 14						

A significant difference with p value <.0001 was seen on day 14, inferring that pain in collagen dressing is significantly less compared to that in silver sulphadiazine dressings.

Type of	N	Mean	Std.	T Value	df	P value
Collagen	30	13.2	3.5467	-4.4221	58	<.0001
SSD	30	19.533	6.9962			
Independent T test between Type of dressing and Complete wound healing time:						

Wound healing time showed a significant difference with p value of 0.0001. Indicating faster healing time in collagen dressing is statistically significant. 87% of patients with collagen dressing had no infection. Infection collagen dressing is much lower than with SSD

Patients in Group I had good wound healing with healthy scar formation in 87% after 4 weeks compared to group II.

Cost analysis: During this study it was seen that the healing time of wounds dressed with collagen dressings was much lower than that with SSD dressing. Moreover collagen dressing was done only one time in comparison with the SSD dressings which were multiple. On the basis of this cost estimation was done with an example of 30% burns in each group.

	Cost in Rs	P value
Collagen	3,770.00	0.122
SSD	4410.00	
Following is the cost analysis in a patient having 30% partial thickness burns		

The cost of collagen dressing is less compared to that of silver sulphadiazine group in a patient with 30% burns but it is not statistically significant (p value > 0.05). In SSD Dressing in addition to the actual dressing cost many other costs like, the prolonged hospital stay as a result of delayed wound healing, the additional doses of analgesics and antibiotics needed with SSD group as a result of increased pain, delayed wound healing and increased infections, loss of labour and time and money spent every time for the accompanying person taking care of the patient, time spent by the doctor to perform the dressing. If all these taken in to consideration collagen dressing, is significantly more cost effective than SSD dressing.

DISCUSSION

Burn wound management is a real challenging task to the Surgeon. Wound is devoid of its keratin layer which makes it vulnerable to infections. There is continuous loss of body heat, fluid and electrolytes due to absence of the skin barrier. Burn area lacks the scaffold of collagen which makes the wound difficult to epithelialize resulting in scar and contractures.⁸ Exposed nerve endings are vulnerable to external stimuli causing pain. All these features point towards need of a barrier over the burn wound to protect the underlying tissue,

and that can act as a scaffold for epithelialization. Over the years the dressing for burns has evolved from the traditional exposure method to the biological dressings. Silver sulphadiazine dressing is being used as standard dressing in many burns unit. In this study collagen dressing was used as an alternative to SSD and a prospective comparative study was conducted.

Pain Score

The average pain score recorded by Brett D⁹ in his study was 1.2 for collagen group and 2.64 in SSD group using 0-5 visual analogue scale with 0 meaning no pain and 5 meaning maximum unbearable pain assessed in first 24 hours. In this study a 10 point visual analogue scoring system was used with 0 standing for no pain and 10 implying maximum pain. Scores were recorded on day 1,2,7, and 14. The average pain score recorded was 4.5 in collagen group and 5.63 in SSD group on Day 1, 2.033 and 4.566 on Day 2, 1.366 and 3.533 on day 7 and 0.566 and 3.033 on Day 14 in collagen and SSD group respectively.

Days	Collagen	SSD	Pvalue
1	4.5	5.63	<0.0001
2	2.033	4.566	<0.0001
7	1.366	3.533	<0.0001
14	0.566	3.033	<0.0001

Comparison of visual analogue pain score on day 1, 2, 7 and 14 in present study.

The P value being less than 0.0001 implies statistically significant reduction of pain in Collagen group as compared to those in SSD group.

Healing time

It is the time taken for more than 90% epithelialisation of the wound. The study by Gupta et al¹⁰ recorded an average healing time of 14 days in patients treated with collagen dressing while Mukund B Tayade et al¹ recorded 12.64 days in collagen group and 18.44 days in the silver sulphadiazine group. Marilyn Kwolek et al, in his study observed median time to heal was 7.2 days in the collagen group versus 14.5 days in silver sulphadiazine group.

Healing time	Gupta et al	Mukund B Tayade et al	Marilyn Kwolek et al	Current study
Collagen	14	12.64	7.2	13.2
SSD	-	18.44	14.5	19.53

Comparison of wound healing time of present study with others

In the present study collagen group had an average healing time of 13.2 days and the SSD group 19.53 days with significant p value of less than 0.0001.

Cost efficacy

In the present study the average cost borne by a patient with 30% burns treated with collagen with an average healing time of 13.2 days was Rs 3770 and those treated with SSD with average 9 dressings was Rs 4410 with a p value greater than 0.05; it is not statistically significant. But the patients treated with SSD had to spend more due to prolonged hospital stay, more analgesic, antibiotic usage, including loss of time and labour of both the patient and the person accompanying.

Considering these facts, collagen dressing can be graded as significantly more cost effective than Silver sulphadiazine dressing.

CONCLUSION

Collagen provides an ideal dressing for partial thickness burns owing to its properties. Pain was significantly reduced in patients dressed with collagen since it forms a temporary barrier preventing any external source from stimulating nerve endings to cause pain. Collagen dressings helped to form a mechanical barrier between wound and environment thus preventing infections. The rate of wound healing was significantly faster in collagen dressing than SSD. This was due to the properties of collagen providing an optimum environment for early wound healing. The morbidity of patients too is less as the scar formation is healthy in most of the patients using collagen owing to its properties of inducing granulation and epithelialisation. The collagen dressing is more cost effective than SSD. SSD has disadvantage of the large number of dressings, prolonged hospital stay, amount pain, loss of time and labour of the patient and the accompanying person which makes collagen dressing more cost effective as it is most of the time a single dressing.

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