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Original Research Article

Collagen dressing versus silver sulfadiazine dressings in partial thickness burns-prospective study

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ABSTRACT

Background: Occurrence, pathophysiology and management of burns is complex. It is a painful condition and topical management of burns is a challenging task. An ideal topical dressing which allows faster healing with reduction of pain, prevent infection, leads to a good scar formation and which is cost effective is required. Thus, there is a need to study the effectiveness of collagen dressing in comparison with conventional silver sulphadiazine dressing (SSD) in terms of pain score, healing time and cost efficiency.
Methods: This prospective randomized comparative study includes patients with partial thickness burns, <40% BSA and not older than 48 hours, admitted to department of surgery of RL Jalappa hospital and research centre Tamaka Kolar during the period December 2019 to March 2020. 34 patients were studied, these patients were randomized into collagen dressing or silver sulphadiazine dressing group of 17 each.
Results: The 34 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.
Conclusions: 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 make collagen dressing more cost effective as it is most of the time a single dressing.

Keywords: Burns, Sulphadiazine, Collagen dressing, Silver sulphadiazine

INTRODUCTION

Burns injury is a common emergency encountered by surgeons.[1] Its pathophysiology and occurrence are complex. Understanding of the physiology and metabolic interactions and involvement of major organ systems, nutrition, immunology, psychological issues is inevitable for the optimal management of these patients.[1] It is a painful condition. Topical management of burns is a challenging task. A good topical dressing should allow faster healing, pain reduction, prevents infection, better scar formation and cost effectiveness. Extensive researches on collagen and its properties favours the use of collagen dressing for burns patients. Further study is required to compare the effectiveness of collagen dressings in comparison with other conventional dressings in partial thickness burns in terms of pain, healing time, better scar formation and cost effectiveness.

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 process and problems of wound healings should be considered seriously. Development and use of new wound repair material for good outcome should be an

area of interest for the practitioners.[2] Management of superficial burns was by method of exposure previously, 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 and waiting for spontaneous epithelization of superficial partial thickness burns.[4]

The term collagen originated from the Greek word 'Kola', meaning glue plus gene. 25% of total protein in human body and about 70% to 80% of skin is constituted by collagen. Various new dressing materials like calcium alginate, hydro-colloid membranes and fine mesh gauze were developed during the last decade. Disadvantage was the easy permeability to bacteria. Biological dressings like collagen create the most physiological interface between the wound surface and environment, and are impermeable to bacteria. 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] Collagen dressings have other advantages over conventional dressings in terms of ease of application and being natural, non-immunogenic, non-pyrogenic, hypoallergenic, and pain-free.[6]

Aim of the study

Effectiveness of collagen dressings in comparison with silver sulfadiazine dressings in terms of pain, healing time, better scar formation and cost effectiveness.

METHODS

This prospective randomized comparative study includes patients with partial thickness burns, <40% BSA admitted to department of surgery of RL Jalappa hospital and research centre Tamaka Kolar during the period December 2019 to March 2020. 34 patients were studied, these patients were randomized into collagen dressing or silver sulphadiazine dressing group of 17 each. Patients were stratified into two groups by odd and even method. Patients treated with collagen dressings were classified under group I and those treated with 1% SSD were classified as group II.

Inclusion criteria

All patients who come to RLJH with superficial partial thickness burns <40% BSA and patients with burn wounds not older than 48 hours were included in the study.

Exclusion criteria

Patients with full thickness burns, patients with burns >40% BSA, patients with electrical and non-thermal burns, infected burn wounds, burnt wounds older than 48 hours were excluded from the study.

The patients thus selected were taken consent and enrolled in the study. Total patients studied were 34 out of which 17 were treated with collagen dressings and rest 17 patients were treated with conventional silver sulphadiazine ointment. The data were collected in prescribed proforma. All patients were assessed clinically as to percentage 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 group 1 and group 2 until complete epithelisation occurred. Group 2 was subjected to alternate day dressing by conventional silver sulphadiazine dressing whereas the group 1 was subjected to collagen dressings and was left undisturbed until complete epithelisation occurred. Dressings were replied if any infection of collagen dressing occurred.

Materials used

Collagen sheets (Kollagen-contains sterile reconstituted type-1 collagen sheet) and 1% silver sulphadiazine were used.

Directions of use (collagen sheets)

Clean the application site thoroughly with the povidone iodine and normal saline. Opens the pouch and directly apply the collagen on the cleaned wound after rinsing it in normal saline. Repeat dressing is not required, unless the wound is infected. Collagen wound is transparent-hence we can monitor the healing without peeling off membrane and thus avoid the disturbing epithelization. The collagen peels off as the wound heals. 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 a small piece of the collagen.

Directions of use (1% silver sulphadiazine)

Silver sulfadiazine ointment was applied over the cleaned wound and an occlusive dressing was applied with gauze pad and roller bandage. The patients were asked to take bath with soap on alternate days and the dressings were changed along the application of ointment.

Antibiotics were prescribed to the patients according to the antibiotic policy of our hospital. Patients were followed up on regular basis till epithelization occurred. 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 visual analogue scale (VAS). Patients were advised to review after a month in order to assess and manage any late complications like hypertrophied scar, contractures and keloids.

Statistical analysis

Microsoft office 2007 was used for the analysis. Student T test was used for comparison.

RESULTS

The 34 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% SSD were classified as group II.

Age at presentation

In this study the age of the patients ranged between 4 years to 68 years. In this study 64% of the patients were males, as compared to females who made 35% of the total cases. Type of burns in this study in most of the cases were scald burns constituting 85%, And the rest were flame burns which were 15%. 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 al recorded an average healing time of 14 days in patients treated with collagen dressing while Tayade et al recorded 12.64 days in collagen group and 18.44 days in the silver sulphadiazine group.[1,10] 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. Patients in group 1 had good wound healing time (mean 12.94 days) with healthy scar formation compared with group 2 with a delayed wound healing lime (mean 17.17 days) with poor scar formation.

Pain assessment

Pain assessment was done using visual analogue scale, on day 1, day 3 and day 7.

Table 1: At day 1.

Groups	N	Mean
Group 1	17	4.8
Group 2	17	7.4

Table 2: At day 3.

Groups	N	Mean
Group 1	17	3.7
Group 2	17	5.1

Table 3: At day 7.

Groups	N	Mean
Group 1	17	2
Group 2	17	3.5

The mean pain score of groups 1 on day 1 (4.8) was significantly lower than group 2 (7.4), The mean pain score of groups 1 on day 3 (3.7) was significantly lower than group 2 (5.1). The mean pain score of groups 1 on day 7 (2) was significantly lower than group 2 (3.5)

A significant difference with $p<0.0001$ was seen on day 7, inferring that pain in collagen dressing is significantly less compared to that in silver sulphadiazine dressings.

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.

Table 4: Cost analysis.

Variables	Cost in Rs.
Collagen	2700
SSD	3400

The cost of collagen dressing is less compared that of silver sulphadiazine group in a patient with 30% burns but it is not statistically significant ($p>0.05$). In SSD Dressing in addition to the actual dressing cost many other costs like, the prolonged hospital stays 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

Management of burns wound is a real challenging task to the surgeon. Wound is devoid of its keratin layer which makes it vulnerable to infections. Absence of skin barrier leads to continuous loss of body heat, fluid and electrolytes. Burn area lacks the scaffold of collagen. This makes the wound difficult to epithelialize which results in scar and contractures.[8] Exposed nerve endings are vulnerable to external stimuli causing pain. Therefore, a barrier is required over the burn wound to protect the underlying tissue, and that can act as a scaffold for epithelialization.

Pain score

The average pain score recorded by Brett in his study was 1.2 for collagen group and 2.64 in SSD group using 0-5 visual an analogue scale with 0 meaning no pain and 5 meaning maximum unbearable pain assessed in first 24 hours. In this study a 10-point VAS system was used with 0 standing for no pain and 10 implying maximum pain. Scores were recorded on day 1, 3 and 7.

The mean pain score of groups 1 on day 1 (4.8) was significantly lower than group 2 (7.4). The mean pain score of groups 1 on day 3 (3.7) was significantly lower than group 2 (5.1). The mean pain score of groups 1 on day 7 (2) was significantly lower than group 2 (3.5).

Table 5: Pain score.

Days	Collagen	SSD
1	4.8	7.4
3	3.7	5.1
7	2	3.5

Healing time

It is the time taken for more than 90% epithelialisation of the wound. The study by Gupta et al recorded an average healing time of 14 days in patients treated with collagen dressing while Tayade et al recorded 12.64 days in collagen group and 18.44 days in the silver sulphadiazine group.[1,10] In the present study collagen group had an average healing time of 12.94 days and the SSD group 17.17 days with significant p value of less than 0.0001.

Table 6: Healing time.

Healing time	Gupta et al[10]	Tayade et al[1]	Current study
Collagen	14	12.64	12.94
SSD	-	18.44	17.7

Cost efficacy

In the present study the average cost beard by a patient with 30% burns treated with collagen with an average healing time of 12.94 days was Rs. 2700 and those treated with SSD with average 9 dressings were Rs. 3400 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.

Limitations

The sample size included in this study, though enough to compare the results in terms of pain, healing time and cost efficacy a larger sample size would have been better for comparing the outcomes and complications. The follow up period was shorter, thus limiting the study of long-term complications. Further studies with larger populations are advocated.

CONCLUSION

Collagen provides an ideal dressing for partial thickness burns. Pain was significantly reduced in patients dressed with collagen since it forms a temporary barrier preventing any external source from stimulating nerve endings. It also acts as 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 proving 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. An SSD has disadvantage of the large number of dressings, prolonged hospital stays, 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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