

## Role of Alternative Therapy in Management of Partial Thickness Burn – experience with Use of Collagen Dressing Compared with Paraffin Gauze and Silver Sulfadiazine

Anupama Singh<sup>1</sup>, Ankur Bhatnagar<sup>2</sup>

**Author Affiliation:** <sup>1</sup>Assistant Professor, <sup>2</sup>Additional Professor, Department of Burns, Plastic & Burns Surgery, Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow, Uttar Pradesh 226014, India.

**Corresponding Author:** Ankur Bhatnagar, Additional Professor, Department of Burns, Plastic & Burns Surgery, Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow, Uttar Pradesh 226014, India.

**E-mail:** dranupama.plastic@gmail.com

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### Abstract

**Introduction:** Burn injury is a global problem that equally concerns under-developed, developing and developed countries. Goal in the management of burn wounds is to obtain physiological closure in the shortest period of time. An ideal dressing material has to maintain a moist environment, act as a bacterial barrier, and as a medium for free exchange of gases, while providing a barrier against toxic contaminants. Treatment of partial thickness burn wounds is directed towards promoting healing and a wide variety of dressings are currently available there effects on healing, but ease of application and removal, dressing change requirements, cost and patient comfort should also be considered.

**Materials and Methods:** 34 Patients with partial thickness burns  $\leq 20\%$  BSA were randomly assigned to Collagen dressing (Group A) and to conventional dressing Paraffin gauze (P.G) plus silver sulphadiazine (SSD) (Group B) from April 2017 to 2018 were analyzed. 22 patient received Collagen dressing and 12 patients received to conventional dressing Paraffin gauze (P.G) plus silver sulphadiazine (SSD). Patients were followed up for clinical outcome on alternate day until burns wound healed.

**Result:** A total 34 Patients with partial thickness burns  $\leq 20\%$  BSA were analyzed. Patient were divided in to two group, Group A in which Collagen dressings were used (64.70% cases) and Group B in which Paraffin gauze (P.G) plus silver sulphadiazine

(SSD) dressing were used (35.29% cases). In our study of 34 patient, 20 (58.8%) patients were male and 14 (41.7%) were female. We have included  $\leq 20\%$  partial thickness burns of which 22 (64.70%) cases were of scald burns, 10 (29.41%) cases of thermal burn, 2 (5.88%) cases of electric flash burn. 100% healing in 5-7 days of 13 cases (59%) in Group A, in 8-12 days of 8 cases (66.66%) in Group B. 21 cases (95.5%) of Group A required analgesia only for  $\leq 2$  days, 11 cases (90.90%) of group required analgesia for  $\geq 6$  days. Hospital stay in 20 cases (90.90%) of Group A were  $\leq 2$  days, in Group B no patient required hospitalisation. In Group A 20 cases (90.90%) Nil or only one single dressing change were done, in only 2 cases (9.09%) two or more dressing change needed. In Group B 6 cases (50.00%) 4-5 times dressing done, 5 cases (41.66%) 2-3 times change of dressing done, in 1 case (8.33%)  $> 6$  times dressing change done.

**Conclusion:** Collagen dressing has proven to be highly advantageous for burn patients especially for small areas of partial thickness of burns ( $<20\%$  BSA), and in paediatric age group of patient. It confer better pain relief, less analgesia is required, most of time no dressing change needed, rate of wound healing is better. However conventional dressings tend to adhere to the wound surface and their need for frequent changes traumatises newly epithelialised surfaces and delays healing.

**Keywords:** Burn; Wound; Collagen; Aesthetic.

## Introduction

Burns are a serious morbid health problem affecting adults and children. Superficial burns affect the epidermal skin layer and superficial layer of dermis. Partial thickness burns may involve damage to deeper structures of the dermis and structures such as blood vessels and nerves.<sup>1</sup> Aim of treatment of burns is controlling infection and promoting healing with good aesthetic outcomes, and to achieve this wide variety of wound care products are currently available.<sup>1</sup>

High-risk of infection often results in delayed wound healing and longer hospital stays, in addition to higher treatment costs.<sup>2</sup> Patient comfort on the potentially frequent application of dressings during wear and removal is also an important consideration in managing burn wounds.<sup>3</sup>

The antimicrobial properties of silver have been recognised since Roman times.<sup>4</sup> This heavy metal has a broad spectrum of activity against bacteria, yeasts and fungi and has been used in modern day wound healing since the early 1960s when 0.5% silver nitrate aqueous solution was used as an alternative to antibiotics in the management of major burns.<sup>5</sup>

However application frequencies could be up to 12 times per day to ensure that sufficient levels of silver ions were available to reduce the bacterial load, because of rapid inactivation by protein and chloride in the burn wound.<sup>6</sup>

Silver sulphadiazine (SSD) was introduced in the late 1960s, and this combination of silver and sulphadiazine carrier reduced the frequency of application to once/twice daily as the effective release and replenishment of bactericidal levels of ionic silver were considerably improved.<sup>7</sup> SSD is still considered the standard antimicrobial treatment for burn wounds in many parts of the world. Continued research for good functional biological dressings resulted in the evolution of collagen based dressings for burn wounds which have proven to be superior and more advantageous.<sup>8-13</sup>

Collagen based dressings for acute burn wound management have been extensively used in India. The collagens form an essential substrate for cellular adhesion and migration, In addition to providing mechanical support to the connective tissue. Therefore, collagen is considered to be an important factor in the regenerative process.<sup>14,15</sup> Collagen is haemostatic, has low antigenicity, and supports cellular growth. The importance of collagen in burn wound healing has been appreciated for a long

time. Wound healing and regeneration involves cell proliferation, cell migration, cell differentiation and interaction between the different components. Collagen may affect healing not only at the final stage but also in the very early stage of healing.<sup>14,16-19</sup>

## Material and Methods

We studied 34 patients with partial thickness burns  $\leq 20\%$  BSA which were divided into two groups on the basis of our treatment strategy of type of dressing material used Group-A Collagen dressing Group-B Conventional dressing Paraffin gauze (P.G) plus silver sulphadiazine (SSD) in our tertiary centre from April 2017 to March 2018. Out of 34 patients, 22 patient received Collagen dressing and 12 patients received to conventional dressing Paraffin gauze (P.G) plus silver sulphadiazine (SSD). The aim of our study was to assess the clinical effectiveness of collagen dressings compared with paraffin gauze & silver sulfadiazine in adults and children with  $\leq 20\%$  superficial and deep partial thickness burns in terms of infection control, length of stay (LOS) in hospital, frequency of change of dressing, time of complete healing, surgical procedures and pain reduction. Patients were followed up for clinical outcome on alternate day until burns wound healed. Commercial Kollagen (collagen of bovine origin) manufactured in the laboratory is available and this is a patented product. The collagen membrane proved satisfactory in the healing of superficial and superficial partial thickness burns.

## Results

Total of 34 Patients were divided into Group A (Collagen dressing) (64.70%) and Group B (paraffin gauze and silver sulfadiazine) (35.29%). The Patients with age  $<10$  year belong to Group A and B was 81.81 % and 58.33% respectively. The healing of burn wound was in 59% cases within 5-7 days in Group A, while 66.66% cases within 8-12 days in Group B. hospital stay in Group A patient was 90% while in Group B patient was nil. The duration of required analgesia was less in Group A (95.5% cases only for  $\leq 2$  days) than Group B (90.90% cases for  $\geq 6$  days). The numbers of dressing was single in 90.9% cases in Group A while multiple dressing (50% Cases 5 times, 41.66 % Case 3 times) needed in Group B. When applied in one site or in multiple sites there was no significance. Healing was identified in terms of number of days for healing and scar quality (Table 1 and 2).



Fig. 1A: Thermal burn



Fig. 1B: Application of collagen dressing



Fig. 1C: After removal of collagen dressing and healed wound



Fig. 2A: Thermal burn wound with collagen dressing



Fig. 2B: Healed wound after removal of collagen

**Table 1:** Demographic Profile

Sr. No.	Variables	Group A (n = 22)	Group B (n = 12)
1.	<b>Age distribution</b>		
	• 0-5 years	09 (40.90%)	03 (25.00%)
	• 6-10	09 (40.90%)	04 (33.33%)
	• 11-15	01 (04.54%)	04 (33.33%)
	• 1-20	01 (04.54%)	00
	• >20	02 (10.00%)	01 (8.3%)
2.	<b>Sex Distribution</b>		
	• Male	13 (59.09%)	07 (58.33%)
	• Female	09 (40.90%)	05 (41.66%)
3.	<b>Type of Burns</b>		
	• Scald Burns	15 (68.18%)	07 (58.33%)
	• Scald Burns	05 (22.72%)	05 (41.66%)
	• Electric Burns	02 (09.09%)	00 (00.00%)
4.	<b>Total Body Surface Area</b>		
	• 0-10%	17 (77.22%)	10 (83.33%)
	• 11-20%	05 (22.72%)	02 (16.66%)
5.	<b>Time Taken to Attend Hospital</b>		
	<1 h 11 (32%)	7 (31.81%)	4 (33.33%)
	1-3 16 (47%)	10 (45.45%)	6 (50.00%)
	>3 h 7 (20%)	5 (22.72%)	2 (16.66%)

**Table 2:** Observation Value

Sr. No.	Variables	Group A (n = 22)	Group B (n = 12)
1.	<b>Need of Analgesia</b>		
	• < or =2 days	21 (95.49%)	00 (00.00%)
	• 3-5 days	01 (04.54%)	01 (08.33%)
	• = or >6 days	00 (00.00%)	11 (91.66%)
2.	<b>Dressing Change</b>		
	• 0-1 times	20 (90.00%)	00
	• 2-3 times	02 (10.00%)	05 (41.66%)
	• 4-5 times	00	06 (50.00%)
	• >5 times	00	01 (8.33%)
3.	<b>Period Needed for Complete Healing</b>		
	• 5-7 days	13 (59.09%)	04 (33.33%)
	• 8-12 days	09 (40.90%)	08 (66.66%)
	• >13 days	00 (00.00%)	00 (00.00%)
4.	<b>Hospital Stay</b>		
	• <2 days	20 (90.00%)	00
	• 2 or more	02 (10.00%)	00
5.	<b>Infection</b>		
	• Not infected	21 (95.45%)	11 (91.66%)
	• Infected	01 (4.50%)	01 (8.3%)
6.	<b>Aesthetic Value</b>		
	• Good	21 (95.45%)	11 (91.66%)
	• Satisfactory	01 (4.5%)	01 (8.3%)
	• Unsatisfactory	00	00

## Discussion

The ultimate goal in the management of burn wounds is to obtain complete healing in the shortest period of time. Traditional burn wound management involves cleaning, debridement and provision of a moist environment to encourage the process of natural healing. Hence, an ideal dressing material has to maintain a moist environment, to act as a barrier against bacteria and toxic contaminants and as a medium for free exchange

of gases. However, advances in technology have lead to newer silver dressings with improved forms of delivery systems, aimed at improving efficacy while minimising side effects. The unique structure of the nano crystalline silver dressing dictates activity and releases and replenishes bactericidal levels of positively charged silver ions to ensure fast and effective kill over extended time periods.<sup>20</sup> The management of burn wounds can take many forms. Now days with the benefits of multiple treatment options come challenges



for clinicians over which to choose. Research and development in the field of wound dressing has resulted in the fabrication and production of interest in the development of biological dressings. Until 1990, Human Amnion was extensively used as a temporary biological cover for superficial and deep partial thickness burns, providing good healing and epithelialisation.<sup>21-23</sup> Continued research for good functional biological dressings resulted in the evolution of collagen based dressings for burn wounds which have proven to be superior and more advantageous. The development of collagen dressings is only logical given its unique structural and functional characteristics.

Previously human amniotic membrane was only biological dressings. This membrane was efficient in wound healing but had the disadvantage of being a blood product, which could transmit HIV and hepatitis infections. Research and development into biological dressings led to the fabrication of collagen based dressings for burn wound cover. These were manufactured from bovine sources, mainly from animal skin and Achilles. Initially, these research products had gone through limited clinical trials.<sup>24</sup>

This qualitative study on the advantages of collagen membrane on partial thickness burn wounds ( $\leq 20\%$  BSA) targeted the time taken for complete epithelialisation. This study looked at the number of dressings needed, how easily it were applied or were removed, and requirement of analgesia, wound healing, as well as scar quality.

Selection of burn wounds in terms of depth (superficial and deep partial thickness burns) has been the single determinant factor in successful healing. The ease of application and removal of the dressing, painless dressing and reduced healing time compared to paraffin gauze and silver sulfadiazine- are the real advantages. Single application was done in 90% of the total number of cases and reapplication was carried out in 09% of the patients. Infection was observed as redness on the wound and purulent discharge under the adherent membrane in 4.5% of cases, who arrived at our hospital after 72 hours. 95.45% of all cases healed without any infection, the wounds healed well in 15 days and within 6 weeks epithelialisation with pigmentation was complete. The advantages of reconstituted collagen membrane over the paraffin gauze and silver sulfadiazine: ease of availability in various sizes, ease of removal, ability to remain stable at room temperature for 3 years, and, in due course the ability to incorporate drugs and growth

factors that can be delivered in a controlled manner. There are also some disadvantages of reconstituted collagen membrane: a single stretch of membrane is not advisable to be placed on flexor surfaces as it cracks when it becomes dry; and wounds visible through the membrane have given rise to apprehension amongst care givers.

## Conclusion

Collagen dressing has proven to be highly advantageous for burn patients especially for small areas of partial thickness of burns and in paediatric age group. Patient with Collagen dressing had better pain relief, so less analgesia required. Most of time no dressing change needed till the wound completely heals. Rate of wound healing is better, with better scar quality while the conventional dressings tend to adhere to the wound surface, and need for frequent changes of dressing which traumatises newly epithelised surfaces delays healing. It is painful, so more analgesia required and for longer duration.

## References

1. Wasiak J, Cleland H, Campbell F, *et al.* Dressings for superficial and partial thickness burns. *Cochrane Database Syst Rev*, 2013;3:CD002106.
2. Rowan MP, Cancio LC, Elster EA, *et al.* Burn wound healing and treatment: review and advancements. *Crit Care*. 2015;19:243.
3. Norman AT, Judkins KC. Pain in the patient with burns. *Contin Educ Anaesth Crit Care Pain*. 2004;4:57-61.
4. White RJ. An historical view of the use of silver in wound management. *Brit J Nurs*. 2001;10:3-8.
5. Polk Jr. HC. Treatment of severe burns with aqueous silver nitrate (0.5 percent). *Ann Surg*. 1966;164:753-70
6. Murphy PS, Evans GR. Advances in wound healing: a review of current wound healing products. *Plast Surg Int*. 2012;2012:190436.
7. Gillett AP. Antibiotic prophylaxis and therapy in burns. *J Hosp Infect*. 1985;6 (Suppl. B):59-66.
8. Bose B: Burn wound dressing with human amniotic membrane. *Ann R Coll Surg*. 1979;61:444-7.
9. Purna Sai K, Babu M: Collagen based dressings: A review. *Burns*. 2000;26:54-62.
10. Balasubramani M, Kumar TR, Babu, M: Skin substitutes: A review. *Burns*. 2001;27:534-44.
11. Singh O, Gupta SS, Soni M, *et al.* Collagen dressing versus conventional dressings in burn and chronic wounds: A retrospective study. *J Cutan Aesthet Surg*. 2011;4:12-16.

12. Lazovic G, Colic M, Grubor M, *et al.* The wounds and ulcers: A multicenter pilot study. *Ann Plast Surg.* 2002;48:226-7.
13. Atiyeh BS, Dham R, Kadry M, *et al.* Benefit-cost analysis of moist exposed burn ointment. *Burns.* 2002;28:659-63.
14. Ang E, Lee ST, Gan CS, *et al.* Pain control in a randomized, controlled, clinical trial comparing moist exposed burn ointment and conventional methods in Patients with partial-thickness burns. *J Burn Care Rehabil* 2003 Application oXu RX. A great historical turn in the burn medical science. *Chinese J Burns Wounds Surf Ulcers.* 1989;1:62.
15. Xu RX. Moist exposed burn therapy (MEBT). Textbook for technological training. Beijing Guangming Chinese Medicine Institute for Burns. Beijing: Wounds and Ulcers. 1989a. p. 160-8.
16. Ang ES, Lee ST, Gan CS, *et al.* The role of alternative therapy in the management of partial thickness burns of the face-experience with the use of moist exposed burn ointment (MEBO) compared with silver sulphadiazine. *Ann Acad Med Singapore.* 2000;29:7-10.
17. Iovanovich J, Tsati E, Tsoutsos D, *et al.* Moist exposed burn therapy: Evaluation of the epithelial repair process (an experimental model). *Ann Burns Fire Disast.* 2000;13:3-9.
18. Ali Al-Numairy. Clinical use of MEBO in wounds management in U.A.E. *Int J Cosm Surg Aesthet Dermatol.* 2000;2:27-33.
19. Ang ES, Lee ST, Gan CS, *et al.* Evaluating the role of alternative therapy in burn wound management: Randomized trial comparing moist exposed burn ointment with conventional methods in the management of patients with second-degree burns. *MedGenMed.* 2001;3:3.
20. Atiyeh BS, Ioannovich J, Magliacani G, *et al.* Efficacy of moist exposed burn ointment in the management of cutaneous. 24:289-96
21. Nadworny PL, Burrell RE. A review of assessment techniques for silver technology in wound care. *J Wound Technol.* 2008;2:6-22.
22. Ramakrishnan KM, Jayaraman V: Management of partial-thickness burn wounds by amniotic membrane: A cost effective treatment in developing countries. *Burns.* 1997;23:33-6.
23. Hadjiiski O, Anatasov N: Amniotic membranes for temporary burn coverage. *Ann Burns Fire Disasters.* 1996;9:88-92.
24. Gruss JS, Jirsch DW: Human amniotic membrane: A versatile wound dressing. *Can Med Assoc J.* 1978;118:1237-46.
25. Mathangi Ramakrishnan K, Babu M, Mathivanan, *et al.* Advantages of collagen based biological dressings In the management of superficial and superficial partial thickness burns in children; *Annals of Burns and Fire Disasters.* 2013 June;26(2):98-104.

