

# A Clinical Study of Collagen Dressing in Partial Thickness Burns

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## ABSTRACT

**Introduction:** Burn injuries are very painful conditions which usually heal slowly and that too with scarring. They are common entities encountered in our daily clinical practice. Dressings play a vital role in the management of burn wounds. As burn injuries are common in developing countries, there is an urgent need for a method by which these injuries heal early with less pain, discomfort, and scarring. Current research aimed to study the effectiveness of collagen dressing in partial thickness burns by means of pain score, infection rate, the rate of healing, resultant scar and patient compliance.

**Material and methods:** : A total of 60 patients with partial thickness burn wounds were included in this study and were applied collagen dressing. The variables analyzed were pain score, infection rate, the rate of healing of the wound, resultant scar, and patient compliance.

**Results:** 34 males and 26 females, infection was present in 8.3% of the patients (5/60), the average pain score in the range of 0 to 10 was 2.85, healing was achieved on an average of 11.57days, 100% of patients in collagen dressing had good scars, patient compliance in the collagen dressing was good about 96.7%, none of the cases showed any adverse reaction to the collagen.

**Conclusion:** Collagen sheet promotes early healing, decreases the need for analgesics, reduces the incidence of associated complications like infection. The morbidity of the patients is reduced as the resultant scar is better in the majority of the patients using collagen. Because of the simple application and good tolerance of the membrane, collagen can be advocated as a temporary biological dressing material in partial thickness burns.

**Key words:** Partial Thickness Burns, Dressing, Collagen

## INTRODUCTION

Burn injuries are very painful conditions which usually heal slowly and that too with scarring. They are common entities encountered in our daily clinical practice. Dressings play a vital role in the management of burn wounds. As burn injuries are common in developing countries, there is an urgent need for a method by which these injuries heal early with less pain, discomfort and scarring. The major fibrous protein found among the extracellular connective tissues is the collagen. In the whole animal kingdom, collagen is the most plentiful and ubiquitous protein. The term collagen originated from the greek word 'kola', meaning glue plus gene. Out of the total protein in the human body, 25% is constituted by collagen and it also constitutes about 70% to 80% of skin. In the past few decades, scientists have developed remarkable interest in employing collagen for collagen. During the last decade, various new dressing materials developed, like calcium alginate, hydro-colloid membranes and fine mesh gauze.

These have a disadvantage in that they become permeable to bacteria. Biological dressings like collagen on the other hand, create the most physiological interface between the wound surface and environment, and are impermeable to bacteria.<sup>1</sup> Collagen dressings have other advantages over conventional dressings in terms of ease of application and being natural, non-immunogenic, non-pyrogenic, hypo-allergenic, and pain-free.<sup>2,3</sup>

Current research aimed to study the effectiveness of collagen dressing in partial thickness burns by means of pain score, infection rate, the rate of healing, resultant scar and patient compliance.

## MATERIAL AND METHODS

This prospective study was conducted in Department of Surgery, Tirunelveli Medical College hospital. All patients were interviewed as per the proforma and a complete history was taken.

**Inclusion criteria:** All patients with partial thickness burns, involving <40% of the total body surface area. Burn wounds not older than 24 hours.

**Exclusion criteria:** Patients with full thickness burns, Patients with burns involving >40% of the total body surface area. Patients with electrical and other non-thermal burns. Patients with burn wounds older than 24 hours. Patients with facial burns / perineal burns. Clinical examination was done, wound swab was taken for all patients before applying collagen dressing. Patients with partial thickness burns involving <40% of the total body surface area are assessed. Cases were treated with collagen dressing. Cases were assessed for healing time, pain, healing quality, infection and patient compliance.

**The results obtained using the following criteria:** Pain score is based on the own words of the patients as pain being subjective. It is on a visual analogue score of 0 to 10. Pain score is elicited after 24 hrs of application of the dressing. 0

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refers to no pain and 10 refer to maximum pain tolerable by the patient.

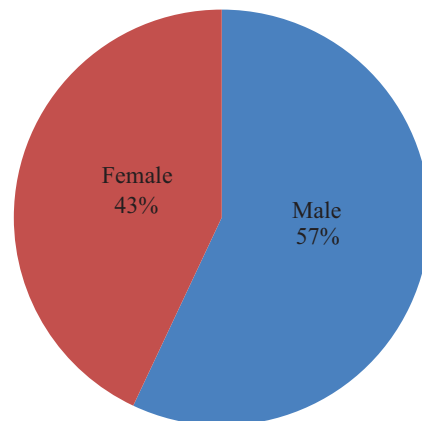
## RESULTS

There were totally 60 patients of which 34 were male and 26 were female (figure-1). Infection was absent in 55 patients (91.7%). Compliance was good in 58 patients (96.7%) and all 60 patients had good scar formation (table-1). The mean age of the patients was  $38.48 \pm 15.61$  years. The minimum and maximum age of the patients was 13 and

92 years respectively. The mean pain score was  $2.85 \pm 1.07$ . The minimum and maximum pain score was 2 and

Parameter		Frequency	Percentage
Infection	Absent	55	91.7
	Present	5	8.3
Compliance	Good	58	96.7
	Bad	2	3.3
Scar	Good	60	100

**Table-1:** Distribution of various parameters



**Figure-1:** Gender distribution

Parameter	Minimum	Maximum	Mean	Std. Deviation
Age (in years)	13	92	38.48	15.61
Pain Score	2	5	2.85	1.07
Rate of Healing (in days)	6	20	11.57	3.59

**Table-2:** Descriptive statistics of various parameters

Gender	Parameter		Frequency	Percentage
Male (N=34)	Infection	Absent	31	91.2
		Present	3	8.8
	Compliance	Good	32	94.1
		Bad	2	5.9
Female (N=26)	Infection	Absent	24	92.3
		Present	2	7.7
	Compliance	Good	26	100
		Scar	Good	26

**Table-3:** Frequency distribution of parameters according to gender

Gender	Parameter	Minimum	Maximum	Mean	Std. Deviation
Male (N=34)	Rate of Healing (in days)	6	20	11.5	3.65
	Pain Score	2	5	2.65	0.98
	Age (in years)	13	92	40.8	17.38
Female (N=26)	Rate of Healing (in days)	7	20	11.6	3.58
	Pain Score	2	5	3.12	1.14
	Age (in years)	18	65	35.4	12.62

**Table-4:** Descriptive statistics of parameters according to gender

Gender	Parameter		Percentage of burns						
			10	15	20	25	30	35	40
Male	Infection	Absent	6 (100)	4 (100)	9 (90)	(85.7) 6	1 (50)	1 (100)	(100) 4
		Present			1 (10)	1 (14.3)	1 (50)		
	Compliance	Good	6 (100)	4 (100)	9 (90)	(85.7) 6	(100) 2	1 (100)	(100) 4
		Bad			1 (10)	1 (14.3)			
Female	Infection	Absent	5 (100)	3 (100)	3 (100)	3 (100)	1 (50)	(83.3) 5	(100) 4
		Present					1 (50)	1 (16.7)	
	Compliance	Good	5 (100)	3 (100)	3 (100)	3 (100)	(100) 2	6 (100)	(100) 4
		Scar	Good	5 (100)	3 (100)	3 (100)	3 (100)	(100) 2	6 (100)

**Table-5:** Distribution of parameters according to percentage of burns and gender

5 respectively (table-2). The mean time taken for healing (rate of healing) was  $11.57 \pm 3.59$  days. The minimum and maximum time taken for healing (rate of healing) was 6 and 20 days respectively. There were 34 males and 26 females. Among male patients, 31 patients (91.2%) did not have any infection; 32 patients' (94.1%) compliance was good and in 34 patients (100%) the scar formation was good. Among female patients, infection was absent in 24 patients (92.3%); compliance and scar formation was good in all 26 (100%) patients. Among the male patients, the mean age was  $40.82 \pm 17.38$  years. The minimum and maximum age of the patients was 13 and 92 years respectively (table-3). The mean pain score was  $2.65 \pm .98$ . The minimum and maximum pain score was 2 and 5 respectively. The mean time taken for healing (rate of healing) was  $11.53 \pm 3.65$  days. The minimum and maximum time taken for healing (rate of healing) was 6 and 20 days respectively. Among the female patients, the mean age was  $35.42 \pm 12.62$  years. The minimum and maximum age of the patients was 18 and 65 years respectively. The mean pain score was  $3.12 \pm 1.14$ . The minimum and maximum pain score was 2 and 5 respectively. The mean time taken for healing (rate of healing) was  $11.62 \pm 3.58$  days. The minimum and maximum time taken for healing (rate of healing) was 7 and 20 days respectively. There were totally 11 patients with 10% burns. Their mean age was  $33.82 \pm 16.15$  years; mean pain score was 2 and the time taken for healing (rate of healing) was  $7.91 \pm 1.70$  days. Seven patients presented with 15% burns. Their mean age was  $31.86 \pm 14.21$  years; mean pain score was 2 and the time taken for healing (rate of healing) was  $8.86 \pm 1.68$  days. There were 13 patients with 20% burns. Their mean age was  $45.46 \pm 13.05$  years; mean pain score was 2 and the time taken for healing (rate of healing) was  $11.54 \pm 2.76$  days. Ten patients presented with 25% burns. Their mean age was  $31.80 \pm 21.94$  years; mean pain score was 3 and the time taken for healing (rate of healing) was  $11.4 \pm 1.84$  days. Four patients had 30% burns. Their mean age was  $50 \pm 14.9$  years; mean pain score was  $3.25 \pm 0.50$  and the time taken for healing (rate of healing) was  $13 \pm 4.83$  days. There were totally seven patients with 35% burns. Their mean age was  $40.71 \pm 13.51$  years; mean pain score was  $3.71 \pm 0.49$  and the time taken for healing (rate of healing) was  $13.71 \pm 2.50$  days. Eight patients presented with 40% burns. Their mean age was  $40 \pm 5.58$  years; mean pain score was 5 and the time taken for healing (rate of healing) was  $16.63 \pm 2.45$  days. There were totally 11 patients with 10% burns. In all the patients, infection was absent, compliance and scar formation was good. Seven patients presented with 15% burns. In all the patients, infection was absent. Compliance and scar formation was good. There were 13 patients with 20% burns. There was no infection and good compliance in 12 (92.3%) patients; scar formation was good in all 13 patients. Ten patients presented with 25% burns. There was no infection and good compliance in 9 (90%) patients; scar formation was good in all 13 patients. Four patients had 30% burns. Infection was absent in 2 (50%) patients. Compliance and scar formation was good in all 4 patients. There were

totally seven patients with 35% burns. Six (85.7%) patients did not have any infection. Compliance and scar formation was good in all patients. Eight patients presented with 40% burns. In all 8 patients, infection was absent, compliance and scar formation was good. Among 11 patients with 10% burns, 6 were male. In patients with 15% burns, 4 were male. Ten out of 13 were male in patients with 20% burns. Seven out of 10 were male in patients with 25% burns. Totally 4 patients had 30% burns of which, 2 were male. Only one out of 7 was male in patients with 35% burns. Out of 8, four were male in patients with 40% burns. In males with 10 (6 patients), 15 (4 patients), 35 (1 patient) and 40 (4 patients) percent burns, none of the patients had any infection. In patients with 20, 25 and 30 percent burns 9, 6 and 1 patient did not have infection out of 10, 7 and 2 patients respectively. Compliance was good in all patients with 10, 15, 30, 35 and 40 percent burns. In patients with 20 and 25 percent burns 9 and 6 patients out of 10 and 7 patients respectively had good compliance. Scar formation was good in all the patients across all the burns patient. Among female gender, in patients with 10, 15, 20, 25 and 40 percent burns all (5, 3, 3, 3, and 4 respectively) did not have any infection. In patients with 30 and 35 percent burns, 1 and 5 patients out of 2 and 6 respectively did not have any infection. Compliance and scar formation was good across all the patients with different percentage of burns (table 4,5).

## DISCUSSION

Denuded areas are devoid of this protection thereby delaying wound healing by exposing vulnerable areas of subcutaneous tissues to infection. The orderly ingrowth of epithelium needs a layer of collagen to act as the scaffold on which it grows and arranges itself. Denuded areas are unable to provide this effectively, leading to formation of extensive scars and even keloids. The intact epithelium provides a protective layer over cutaneous nerves otherwise these areas expose the nerves and cause pain and tenderness. Wounds that are left uncovered are prone to infection and scarring with additional clinical problems. It has been well documented that the incidence of infection and degree of contraction are considerably reduced when wounds are dressed with biologic materials rather than left exposed or dressed with non-biologic material during healing. It was observed that xenogenous collagen membrane had good conformability in lining mucosa and skin i.e. it was supple and adapted to the wound no matter what the contour was.<sup>4-7</sup> In my study, infection was present in 8.3% of the patients (5/60), which indicates lower rate of infection with collagen dressing. None of the cases showed any adverse reaction to the collagen, proving its safety as a biological dressing. This result is in accordance with Gupta RL.<sup>8</sup> In my study, infection was present in 8.3% of the patients (5/60), which indicates lower rate of infection with collagen dressing. None of the cases showed any adverse reaction to the collagen, proving its safety as a biological dressing. This result is in accordance with Gupta RL.<sup>8</sup> Healing was achieved on an average of 11.57 days, in collagen dressing. This shows that collagen dressing helps in decreasing healing time. This

was consistent with the study of Gupta RL, which shows a healing time of range from 10 to 14 days. In my study, 100% of patients in collagen dressing had good scars. Hence collagen helps in tissue remodeling and gives a better scar when compared to other dressing. This is in concurrence with the study done by Demling RH.<sup>9</sup> Patient compliance in the collagen dressing was good about 96.7%. Hence there was better compliance rate observed with collagen dressing. This result was in accordance with the study conducted by Gerding RL.<sup>10</sup>

## CONCLUSION

To conclude, collagen sheet decreases pain, reduces the need for analgesics, aids in early healing, limits the associated complications such as infection of the burn wounds. As the resultant scar is better in majority of the patients using collagen, the morbidity of the patients is also reduced to some extent. In view of the excellent tolerance and simple application of the collagen membrane, it can be recommended as an effective temporary biological dressing material in the management of partial thickness burns.

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