

## A Comparative Study between Collagen Dressing and Conventional Dressing in Case of Superficial and Second Degree Superficial Burns

\*Dr. K. Srinivasa Rao<sup>1</sup>, Dr. K. Ravi<sup>2</sup>, Dr. K. Ravi Chandra<sup>3</sup>

<sup>1</sup>First Author M.S. [General Surgery] Associate Professor in Dept. of General Surgery, GGH, Vijayawada, A.P., India

<sup>2</sup>Corresponding Author M.S. [General Surgery] Assistant Professor in Dept. of General Surgery, GGH, Vijayawada, A.P., India

<sup>3</sup>Post Graduate, Dept. of General Surgery, GGH, Vijayawada, A.P., India

\*Corresponding author: \*Dr. K. Srinivasa Rao 1

---

**Abstract:** The aim of study is to evaluate the efficacy of collagen dressing over conventional dressings in superficial burns and second degree burns, in terms of pain, Infection, Rate of Healing and Resultant scar. Patients and methods :This randomized comparative study includes 60 patients with partial thickness burns who are salvageable (40% BSA) admitted in Burns unit of SiddharthaMedicalcollege/ Govt general hospital VijayawadafromSeptember 2015toSeptember 2017. They were randomised into equal groups of collagen and conventional dressings. Results : Mean Pain scores on day 1 was 4.53 and 5.87 for collagen and conventional dressings respectively. On day 7, the mean pain scores were 1.3 and 3.73 respectively. Mean rate of healing (in days) was 13.07 in collagen dressings, whereas in conventional dressings, it was 18.13 days. Mean Infection control rate in weeks was 1.33 and 2.07 respectively in collagen and conventional groups. Healthy scar was obtained in 83.34 % of collagen group, while only 63.33% of conventional group patients had a healthy scar. Conclusion: Collagen dressings showed faster healing rates, lesser infection, lesser pain scores and had healthy scar formation, compared to conventional dressings and hence found to be more efficacious for use in burns patients.

**Keywords:** Superficial burns, Collagen Dressings, Silver Sulphadiazine

---

Date of Submission: 01-12-2017

Date of acceptance: 14-12-2017

---

### I. Introduction

Superficial and Second degree deep burns are painful conditions which heal slowly. These are common entities found in clinical practice and dressings play a major role in treatment of Superficial and Second degree deep burns. 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 burns. Collagen is an endogenous substance, which forms an important structural component in connective tissue. It is also the most ubiquitous and plentiful protein in the animal kingdom. Biological dressings with collagen 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 easy application and being natural, non-immunogenic, non-pyrogenic, hypoallergic and pain free.<sup>2</sup>

### II. Aim of Study

The aim of study is to evaluate the efficacy of collagen dressing over conventional dressings in superficial burns and second degree burns.

### III. Objectives

To know the effectiveness of collagen dressing when compared to that of conventional (Silver sulphadiazine) dressing in Superficial and Second degree deep burns, regarding Pain, Infection, Rate of healing and resultant scar.

### IV. Materials And Methods

#### 4.1 Source Of Data:

This prospective randomized comparative study includes patients with partial thickness burns who are salvageable (40% BSA) admitted in Burns unit of SiddharthaMedicalcollege/ Govt general hospital

vijayawadafromsep2015toSeptember 2017 who were taken for study considering the inclusion and exclusion criteria, after the clearance from the ethical committee was obtained.

**4.2 Method Of Collection Of Data**

1. Sample size: The size of the sample is 60 patients of superficial burns.
2. 30 cases with collagen dressing group
3. 30 cases with silver sulphadiazine dressing group

**4.3 Inclusion Criteria**

1. Superficial burns less than 24hrs old
2. Second degree burns due to flame or hot liquids less than 24 hours old
3. Patientswillingtogiveinformedconsent

**4.4 Exclusion Criteria**

1. Critically ill patients
2. Patient refusal
3. Any evidence of underlying bone osteomyelitis, bone, tendon or joint
4. Malignancy
5. 3<sup>rd</sup> degree and 4<sup>th</sup> degree burns
6. Old burns
7. Patients hypersensitive to collagen
8. Infected burns

**4.5 Materials Used**

1. Collagen sheets (contains sterile reconstituted type-1 collagen sheet)
2. 1% silver sulphadiazine
3. Dressings with cotton pads and roller guaze. Xenogenous collagen membrane was used for the study.
4. The collagen used in this study is a purified reconstituted collagen. This reconstituted collagen is then cross-linked with tanning agents like gluteraldehyde or chromium sulphate; to improve its tensile strength, to make it insoluble, to decrease its rate of resorption and to lower its antigenicity.
5. The collagen membranes come in varying dimension of 5 x 5cms, 10 x 10cms and 25 x 25 cms, and its thickness is 0.6mm. It is sterilized by gamma irradiation.

**V. Observations And Results**

The 60 patients admitted with partial thickness burns, <40% BSA were randomly divided into two equal and comparable groups, as collagen and conventional group

**Table 1:** Comparison of Mean Pain Scores(Visual Analogue Scale) on Day 1, 2, 7, 14

	COLLAGEN	CONVENTIONAL	P VALUE
DAY 1	4.53	5.87	< 0.0001
DAY 2	2.1	4.6	< 0.0001
DAY 7	1.3	3.73	< 0.0001
DAY 14	0.5	2.9	< 0.0001

**Table2:** Rate of Healing Between Collagen and Conventional Dressings

Ate Of Healing In Days	COLLAGEN	CONVENTIONAL	Total
7	1	0	1
8	1	0	1
10	2	0	2
11	4	1	5
12	4	2	6
13	6	2	8
14	6	4	10
15	1	2	3
16	2	5	7
17	1	2	3
19	1	4	5
20	1	2	3
21	0	2	2
23	0	1	1
27	0	1	1
35	0	1	1
40	0	1	1
Total	30	30	60

**Table 3:** Calculation of P Value of Wound Healing between Collagen and Conventional Dressings

Type of Dressing	Mean	SD	T Value	df	95% C.I.	P value
COLLAGEN	13.07	2.8	3.9780	58	-7.62 to -2.52	<0.0001
CONVENTIONAL	18.13	6.39				

**Table 4:** Rate of Infection Control Rate between Collagen and Conventional Dressings

	COLLAGEN		CONVENTIONAL	
	sterile	unsterile	Sterile	unsterile
1 week	24	6	16	14
3 weeks	28	2	22	8
4 weeks	30	0	28	2
5 weeks	30	0	30	0

**Table5:** Calculation of P Value based on Infection Rate between Collagen and Conventional Dressing

INFECTION RATE	COLLAGEN	CONVENTIONAL	P value	t value	df
SD	0.8	1.41	0.0164	2.4725	58
mean	1.33	2.07			

**Table 6 :** Scar Formation in Collagen and Conventional dressings

	Wound Contracture	Hypertrophic scar	Keloid	Marjolins ulcer	HEALTHY SCAR
COLLAGEN	4	1	0	0	25
CONVENTIONAL	7	3	1	0	19

**Table7 :** Summary of results in collagen and conventional dressings

	Collagen dressing	Conventional dressing
Pain score mean on day 7	1.3	3.37
Rate of wound healing	13.07	18.13
Infection	80% sterile swab at end of 1 <sup>st</sup> week	53.37% sterile swab at end of 1 <sup>st</sup> week
Scar formation	Healthy scar in 83.34%	Healthy scar in 63.33%
Compliance	Good in 93.33%	Good in 53.33% of patients

## VI. Discussion

Wound healing is a complex process that involves the timely expression of numerous growth factors that promote cellular migration and proliferation, production of new connective tissue matrix, and collagen deposition. A common characteristic of all chronic wounds is the elevation of levels of matrix metallo proteinases, which results in increased proteolytic activity and inactivation of the growth factors involved in the wound – healing process.<sup>3</sup> The use of collagen has been shown to specifically inhibit the action of these proteases without affecting the activity of the growth factors. Thus, Collagen is an advantageous alternative to the moistened gauze, which is the current standard of care. On the basis of work carried out in department, summarized the physical properties of collagen sheet as follows:

### 6.1 Biological

1. Collagen sheet is non-inflammatory
2. Collagen sheet facilitates migration of fibro-blasts and microvascular cells
3. Collagen sheet helps in the synthesis of neodermal collagen matrices
4. Collagen sheet has low antigenicity
5. Collagen sheet has minimal biodegradation
6. Collagen sheet is non-toxic
7. Collagen sheet helps in minimizing scarring

### 6.2 Physiological

1. Collagen sheet is impermeable to bacterial migration
2. Collagen sheet modulates fluid flux from the wound
3. Collagen sheet is elastic, soft, and supple
4. Collagen sheet has good tear strength
5. Collagen sheet has good suturing characteristics
6. Collagen sheet has enough strength to be peeled off the wound
7. c. Advantages
8. Cost of treatment comes down
9. Pain associated with dressing can be avoided

10. Protects against infection
11. Avoids evaporative water loss
12. No threat of HIV or Hepatitis infection as bovine material is obtained from countries free of bovine spongiform encephalopathy(BSE)
13. Long shelf-life(5 years) under normal storage conditions
14. Low antigenicity
15. Ensures non-toxicity to the biological environment where it is applied.

**Table8** :Comparison of Pain Scores with Various Studies

	COLLAGEN	CONVENTIONAL
Present Study	1.3	3.37
Mukund B Tayade Et Al <sup>4</sup>	1.2	2.64
Demling Et Al <sup>5</sup>	2.0	4.0
Barret Et Al <sup>6</sup>	2.4	3.7

**Table9** : Comparison of Healing Times between Collagen and Conventional Dressings with Various Studies

Healing time	COLLAGEN	CONVENTIONAL
Present study	13.07	18.13
Malic et al <sup>7</sup>	14.9	17.2
Rakesh rai <sup>8</sup>	17.36	21.26
Klein <sup>9</sup>	9.5	15.15
Demling <sup>5</sup>	7.5	13.4
Barret <sup>6</sup>	9.5	13.4

## VII. Conclusion

Collagen by its properties acts like a second skin to the burn wound and provides the ideal dressing in 2nd degree deep Burns and Superficial Burns. Pain was drastically reduced after application of collagen dressing. Collagen dressing also controlled the infection rate by forming a temporary barrier between the wound and the environment. Majority of the patients healed with complete epithelisation at a rate faster than conventional dressing. The difference in the collagen group was accounted by the fact that collagen sheet provided an optimum environment for early healing. Thus, Collagen sheet promotes early healing, reduces pain and decrease the need of analgesics and decreases associated complications like infection as compared to the conventional dressing. The morbidity of the affected patients is reduced as the resultant scar is better in majority of the patients using collagen. Because of the simple application and good tolerance of the membrane, collagen membrane can be advocated as a temporary biological dressing material in 2nd degree Burns and Superficial Burns.

## VIII. Summary

### 8.1 The following observations was made in the present study

1. The material was readily available and easily reconstituted for simple and easy application.
2. The collagen membrane remained moist, supple and intact when grafted.
3. It was effective in promoting haemostasis.
4. It acted as a temporary covering material on the sensitive nerve endings of raw burn wounds, which reduced pain.
5. e. It acted as a mechanical barrier preventing wound contamination hence reduced infection
6. It appeared to be sufficiently robust to withstand trauma.
7. The collagen membrane did not evoke any antigenic reactions.
8. h. It was useful in inducing granulation and epithelisation and in preventing the degree of scarring and tissue contracture.
9. i. Good patient compliance was noted as a result of the comfortability of the dressing as it significantly reduced pain and its added value of giving a cosmetically better scar.
10. By considering the above points, Collagen membrane was found to be every suitable alternative to conventional dressing methods & when used judiciously in controlled clinical situations, collagen membrane is biologically acceptable and is from the clinical point of view, an excellent wound graft material.

## References

- [1]. Singh O, Gupta SS, Soni M, Moses S, Shukla S, Mathur RK. Collagen dressing versus conventional dressings in burn and chronic wounds: A retrospective study. *J Cutan Aesthet Surg* 2011;4:12-6
- [2]. Shani Shilo, Sigal Roth, Tal Amzel, Tamar Harel-Adar, Eran Tamir, Frida Grynspan, and Oded Shoseyov. *Tissue Engineering Part A*. February 2013, 19(13-14): 1519-1526.

- [3]. Choudhary D, Insen SG, Goyal S, et al. A comparative study of collagen dressings versus conventional dressings in wound healing in chronic ulcer. *J. Evolution Med. Dent. Sci.* 2017;6(5):361-363, DOI: 10.14260/Jemds/2017/82
- [4]. Mukund B Tayade, Girish D Bakhshi, NabakishorHaobijam. A Comparative Study of Collagen Sheet Cover Versus 1% Silver Sulphadiazine in Partial Thickness Burns. *Bombay hospital journal* 2006; 48;2
- [5]. DemlingRH, Desanti L. Managementof partial thickness facial burns (comparison of topical antibiotics and bioengineered skin substitutes). *J Burn care and Rehabilitation* 1999; 25: 256.
- [6]. Juan P Barret, et al. Biobrane versus 1% silver sulphadiazine in second degree pediatric burns. *Plastic and Reconstructive Surgery* 1999;105(1):62-65.
- [7]. Malic C, Verchere C, Arneja JS. Inpatient silver sulphadiazine versus outpatient nanocrystalline silver models of care for pediatric scald burns: A value analysis. *Plastic Surgery.* 2014;22(2):99-102.
- [8]. Rakesh Rai, Sunil H. Sudarshan, Reshmina Dsouza, Elroy Saldhana, P.S. Aithal. Collagen Dressing Versus Heparin Dressing in Burn Wound Management. *Journal of Evolution of Medical and Dental Sciences* 2013; Vol 2, Issue 47, November 25; Page: 9124-9130, DOI: 10.14260/jemds/1582
- [9]. Klein Robert L, Rothman BF, et al. Biobrane a useful adjunct in the therapy of outpatient burns. *J Pediatric Surgery* 1984; 19: 846-7.

\*Dr. K. Srinivasa Rao. "A Comparative Study between Collagen Dressing and Conventional Dressing in Case of Superficial and Second Degree Superficial Burns." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)* 16.12 (2017): 11-15