

COLLAGEN DRESSINGS VS CONVENTIONAL DRESSINGS IN SECOND DEGREE BURNS IN A TERTIARY CARE HOSPITAL IN NORTH COASTAL ANDHRA PRADESH – A RANDOMIZED INTERVENTIONAL STUDY

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Abstract

Background: Burn injuries present a major public health problem causing mortality and morbidity in both adults and children resulting in scores of preventable deaths and disability every year.^[1] Those who are burnt require timely access to acute burns management, including definitive surgical care. The main challenge with the burn injuries is always associated with its management, treatment and healing. Hence it is appropriate that the process and complications of wound healing should be considered seriously. **Materials and Methods:** This study include 60 superficial partial thickness burns patients who are salvageable (20% BSA) admitted to burns ward of Anil Neerukonda hospital and NRI Institute of medical sciences from 15th May 2022 and 15th May 2023 were included in the study. These patients were Randomly allocated into two groups each 30 in Group A with collagen dressing and 30 in Group B with Normal Saline by using online Software. **Results:** In The Present Study, majority of the study subjects 40% belongs to the age group of 10-20 Years and 20-30 Years followed by 20% belongs to the age group of 31-40 Years. The mean age of group A is 22.86 SD 9.04 and group B is 23.8 SD 8.15. The highest number of patients with collagen dressings 19 (63.3%) were healed with in 5 to 7 days and only two members took more than three weeks to heal. More than half of the Patients 16 who had Normal Saline Dressings took three weeks to heal followed by 8 patients took less than ten days and 6 patients took more than two weeks. Patients who had collagen dressings were infected which is very less when compared to Normal Saline dressing group which is 70%. When the test of significance was applied this showed statistically significant association between the type of dressing and complications at p value less than 0.05. **Conclusion:** There are many types of dressings available in the market making the physician to address all aspects of wound care. But still there are few products like collagen that achieve complete healing. From the discussion it is evident that our study is more consistent with other studies proving collagen a good dressing to cover burn wounds in all aspects.

INTRODUCTION

Burn injuries present a major public health problem causing mortality and morbidity in both adults and children resulting in scores of preventable deaths and disability every year.^[1] Those who are burnt require timely access to acute burns management, including definitive surgical care. Every day, over 30,000 people suffer new burns worldwide, severe

enough to warrant medical attention, equating to an estimated 11 million new burns each year globally.^[2] In India alone 60-70 lakhs people sustain burns every year, among them 10 lakhs suffer moderate to severe burns. Mortality due to burns is 1.4lakhs/year. Around 70% of all burn injuries occur in the age group of 15-35 years, the most productive age group. Around 4 out of 5 burnt cases are women and children.

The main challenge with the burn injuries is always associated with its management, treatment and healing. Hence it is appropriate that the process and complications of wound healing should be considered seriously.^[3] The ideal management would include cost effectiveness, readily available dressings or method of coverage that will provide good pain relief, easy to apply, protect the wound from infection, promote healing, be elastic and non-antigenic and adhere well to the wound and with satisfactory cosmetic outcome.^[3] The timely restoration of skin protective functions is the key to the successful treatment of burn victims with various severity of damaged skin.^[3]

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.^[4,5]

Superficial burns affect the epidermal skin layer and superficial layer of dermis. Deep or full thickness burns may involve damage to deeper structures of the dermis and structures such as blood vessels and nerves. The aim of treatment in burn injury is to control infection and promote healing with good aesthetic results. To achieve these goals, a wide variety of wound care products are currently available. Secondary wound infection often results in delayed wound healing, longer hospital stays and higher treatment costs.^[6] The current trend of burn wound care has shifted to more holistic approach of improvement in the long-term form and function of the healed burn wounds and quality of life. This has demanded the emergence of various skin substitutes in the management of acute burn injury as well as post burn reconstructions.^[7]

Burn wound dressings can be broadly classified as

- Conventional dressings
- Biological dressings
- Synthetic dressings.

Conventional Dressings

- Simple- one substance serving all purpose
- Compound – more than one substance each serving a specific function.

These are the most commonly used dressings for all types of wounds. The material used is gauze which is one of the most satisfactory absorbent. Tulle gauze is a paraffin impregnated wide mesh gauze. It is made non-adherent by its greasiness but excessive greasiness will interfere with fluid absorption. Infection through open network of gauze is another disadvantage. To overcome this Wong in 1980 introduced antibiotic impregnated tulle gauze.

Biological Dressings

Consists of adherent collagenous dermal surface and keratinized epidermis.

- Allograft

- Xenograft

In areas where the biological dressings get adhered to the wound bed the bacterial load decreases. In areas where the dressing is non adherent sub-membrane suppuration occurs. They prevent evaporative water and heat loss and prevent contamination of wound bed. They also prevent drying of burn wounds. They decrease wound pain facilitating early ambulation. Biological dressings should not be applied to superficial or deep burns prior to removal of debris and to full thickness burns prior to eschar separation and debridement. It should not be applied to wound having bacterial population more than 1 lakh organisms per gram of tissue.

Synthetic Dressings

Research in the field of wound dressing has resulted in the invention of synthetic dressings. Synthetic Dressings which are man-made and Continued research in the field of burn dressing has led to the invention of collagen based dressings.^[8-10]

Collagen Films

The tensile strength of collagen is improved by physical and chemical methods thereby preventing fragmentation. It has low antigenicity and has haemostatic property. It is available in various forms such as powders, foams, films are bound to other materials as part of composite dressings. Initial adherence of collagen to the wound is fibrin dependent process. Adherence of particular membrane to the skin is measured using a device which exerted tension to the membrane at right angles to the skin surface from the weights required to loosen the graft.^[8-14]

Collagen is the most abundant and widely distributed functional protein in the body and contributes to wound healing. Collagen has low antigenicity and has haemostatic property. In the haemorrhagic coagulation phase, collagen has the role of haemostat due to three-dimensional scaffolds. After interacting with fibronectin and growth factors, collagen stimulates the chemotaxis of monocytes and fibroblasts, and then granulation tissue is produced. As a potential treatment, collagen dressings are applied in many fields such as chronic wounds, and reconstructive, separately or together with other materials.^[15]

Collagen is an attractive skin substitute for two reasons:

1. It can be isolated from other species.
2. It can be manufactured in large amount.

Collagen sheet is considered as an ideal topical dressing agent in management of partial thickness burns because it forms a barrier over the wound helping in faster healing, lesser pain, decreasing infection rate and good scar formation. It's one time application and reduced hospital stay makes it more compliant and cost effective to the patients.^[15] 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.^[5,16,17]

The present study was conducted to assess the clinical effectiveness of collagen dressings when compared with conventional dressing in superficial partial thickness burns patients.

Aims & Objectives

1. This study aims to evaluate the clinical efficacy of the Collagen Dressing over Conventional Dressing.
2. To compare the wound healing time in partial thickness burns with Collagen Dressing and Conventional Dressing.
3. To compare the cost-effectiveness in partial thickness burns with Collagen Dressing and Conventional Dressing.

MATERIALS AND METHODS

Study Setting: Burns Ward, Anil Neerukonda hospital and NRI Institute of medical sciences.

Study design: A Hospital-based Randomized Interventional Study.

Study period: 15th May 2022 and 15th May 2023

Sample size calculation & technique: This study include 60 superficial partial thickness burns patients who are salvageable (20% BSA) admitted to burns ward of Anil Neerukonda hospital and NRI Institute of medical sciences from 15th May 2022 and 15th May 2023 were included in the study. These patients were Randomly allocated into two groups each 30 in Group A with collagen dressing and 30 in Group B with Normal Saline by using online Software.

Data collection: By using pre designed, pretested, semi-structured questionnaire.

Data analysis: MS EXCEL 2020 and SPSS 20.

Descriptive Statistics, Independent test (p-value <0.05 was taken as significant)

Ethical Issues: Institutional Ethics Committee approval was obtained before data collection.

Inclusion Criteria

- Age group of 10 years to 40 years with second degree burns
- Superficial partial thickness burns patients (20% BSA).
- Patient's with Fresh wounds (No Contamination).

Exclusion Criteria

- Patients who are with extreme age groups.
 - Patients with first- and third-degree burns.
 - Patients who are not salvageable >20% BSA.
 - Patients with significant co-morbidities (diabetes mellitus, hypertension, chronic renal disease, immunocompromised status etc.)
- Patients with contaminated Wounds

RESULTS

Sixty patients with superficial partial thickness burns who are salvageable (20% BSA) admitted to burns ward of Anil Neerukonda hospital and NRI Institute of medical sciences from 15th May 2022 and 15th May 2023 were included in the study. The 30 patients who are subjected to collagen dressing are allocated to Group A and 30 patients who received Normal Saline dressing are allocated to Group B.

Table 1: Distribution of study subjects based on AGE (n=60)

| AGE (Years) | Group A | Group B | Total |
|-------------|---------|---------|----------|
| 10- 20 | 14 | 10 | 24(40%) |
| 21- 30 | 9 | 15 | 24(40%) |
| 31- 40 | 7 | 5 | 12(20%) |
| Total | 30 | 30 | 60(100%) |

In The Present Study, majority of the study subjects 40% belongs to the age group of 10-20 Years and 20-30 Years followed by 20% belongs to the age group of 31-40 Years. The mean age of group A is 22.86 SD 9.04 and group B is 23.8 SD 8.15.

Table 2: Distribution of study subjects based on GENDER (n=60)

| Gender | Group A | Group B | Total |
|--------|---------|---------|-----------|
| Male | 11 | 13 | 24 (40%) |
| Female | 19 | 17 | 36(60%) |
| Total | 30 | 30 | 60 (100%) |

Among the study subjects, majority are female which constitutes 60% followed by 40% male.

Table 3: Distribution of study subjects based on TBSA (n=60)

| TBSA | Group A | Group B | Total |
|--------|---------|---------|-----------|
| 0-10% | 14 | 15 | 29(48.3%) |
| 11-20% | 16 | 15 | 31(51.6%) |
| Total | 30 | 30 | 60(100%) |

In the present study, study subjects are with Total Burn Surface Area of burns upto10% are 48.3% and 11-20% are 51.6% which is almost equal.

Table 4: Distribution of study subjects based on Number Of Dressings (n=60)

| Number of Dressings | Group A | Group B |
|---------------------|---------|---------|
| 1-3 | 30 | 2 |
| 4-6 | | 7 |
| 7-9 | | 8 |
| 10-12 | | 9 |
| >13 | | 4 |

All the study subjects with collagen dressings had less than four dressings whereas study subjects with Normal Saline dressings most of them had dressings more than four to fifteen.

Table 5: Distribution of study subjects based on VISUAL ANALOUGE PAIN SCORE (n=60)

| Pain score | Mean | SD | Independent t test | P - value |
|------------|------|------|--------------------|-----------|
| Group A | 4 | 1.48 | -5.541 | <0.001 |
| Group B | 6.4 | 1.8 | | |

According to VAP, the mean pain score in collagen group is less when compared to normal saline dressing group. When the statistical test of significance was applied this showed a significant association at p value less than 0.05.

Table 6: Distribution of study subjects based on WOUND HEALING TIME (n=60)

| Wound Healing Time (Days) | Group A | Group B | Total |
|---------------------------|---------|---------|----------|
| < 10 | 19 | 8 | 27(45%) |
| 11-20 | 9 | 6 | 15(%) |
| >= 21 | 2 | 16 | 18(%) |
| Total | 30 | 30 | 60(100%) |

In the present study, highest number of patients with collagen dressings 19 (63.3%) were healed with in 5 to 7 days and only two members took more than three weeks to heal. More than half of the Patients 16 who had Normal Saline Dressings took three weeks to heal followed by 8 patients took less than ten days and 6 patients took more than two weeks.

Table 7: Mean and standard values of Wound Healing time in Group A and Group B subjects.

| Wound Healing Time | Mean | SD | Independent T Test | P -Value |
|--------------------|------|------|--------------------|----------|
| GROUP A | 7.76 | 2.56 | - 2.740 | 0.008 |
| GROUP B | 10.3 | 4.2 | | |

Table 8: Distribution of study subjects based on COMPLICATIONS (n=60)

| Complications | Infected | Not Infected | Total | Chi Square Value | P- Value |
|---------------|----------|--------------|-------|------------------|----------|
| GROUP A | 3 | 27 | 30 | 22.5 | 0.0001 |
| GROUP B | 21 | 9 | 30 | | |

Only 10% (3) Patients who had collagen dressings were infected which is very less when compared to Normal Saline dressing group which is 70%. When the test of significance was applied this showed statistically significant association between the type of dressing and complications at p value less than 0.05.

Table 9: Distribution of study subjects based on COST EFFECTIVENESS (n=60)

| Cost Effectiveness | Effective | Not Effective | Total | Chi Square Value | P- Value |
|--------------------|-----------|---------------|----------|------------------|----------|
| GROUP A | 21 (70%) | 9 (30%) | 30(100%) | 6.69 | 0.0009 |
| GROUP B | 11(36.6%) | 19 (63.4%) | 30(100%) | | |

In the present study, 70% of study subjects in Group A(Collagen Dressings) had good cost effectiveness but it is only 36.6% when compared with study subjects in Group B (Normal Saline dressings). When Chi- square test of significance was applied its showed statistically significant association between type of dressing and Cost Effectiveness at p value less than 0.05.

Table 10: Distribution of study subjects based on COSMETIC OUT LOOK (n=60)

| Cosmetic Outlook | Satisfactory | Not Satisfactory | Total | Chi Square Value | P- Value |
|------------------|--------------|------------------|----------|------------------|----------|
| GROUP A | 22 (73.3%) | 8(26.7%) | 30(100%) | 8.14 | 0.004 |
| GROUP B | 11 (36.7%) | 19 (63.3%) | 30(100%) | | |



Figure 1: Conventional Dressing



Figure 2: Collagen Dressing

In the present study, majority of study subjects 22(73.3%) in Group A (Collagen Dressings) had satisfactory Cosmetic outlook which is more when compared with study subjects in Group B (Normal Saline dressings) where it is 36.6%. When Chi-square test of significance was applied its showed statistically significant association between type of dressing and cosmetic outlook at P value less than 0.05.

DISCUSSION

Burns continued to be the global burden in terms of mortality and morbidity till date. Every intervention from burn to healing has an impact on the eventual outcome. By managing all burn injuries effectively at every step, we can reduce burn injury morbidity as a community. The first dressing ever used might have been a leaf of a herb or tree. All burns in the early phase of healing require moisturiser and sun protection. The first 48hours are crucial in burns

wound as they are dynamic and change in appearance.^[18] Continued research for good functional biological dressings resulted in the evolution of collagen-based dressings for burns have proven to be superior and more advantageous.

Wound Healing Time

In a study by Singh A et al, patients with fresh acute superficial partial thickness burns $\leq 15\%$ BSA, registered in two tertiary care teaching hospitals in North India between January 2015 to October 2019 showed among 68 collagen group 59% patient's took 5 to 7 days followed by 41% 8 to 12 days where as in group b 33.33% took 5 to 7 days and 66.66% took 8 to 12 days.^[6]

In a study by Mohan et al titled Burns – Comparative study between conventional and collagen dressing in K.R. Hospitals attached to MMC& RI in 2012-2013, the average healing time of collagen group is 13.2days and SSD group is 19.53 days. This showed a statistically significant association at p value less than 0.0001.^[3]

Cosmetic Out Look

Singh A et al in their study with patients with fresh acute superficial partial thickness burns $\leq 15\%$ BSA, registered in two tertiary care teaching hospitals in North India between January 2015 to October 2019 showed Cosmetic outlook was good in 95.5% in collagen dressing group and its is 62.5% in group B.^[6]

Wound Infection

In the study by Singh A et al with 68 patients with fresh acute superficial partial thickness registered in two tertiary care teaching hospitals in North India between January 2015 to October 2019 showed Collagen group 95.5% not infected and 4.5% are not infected and in group B 91.6% are not infected and 8.3% are infected.^[6]

Mukta Waghmare et al among one hundred children less than twelve years of age were included in a retrospective study from January 2013 to 2016 by the Department of Paediatric Surgery, TNMC and BYL Nair Hospital, Mumbai, Maharashtra, India showed 90% of the study subjects had no infections.^[1]

Onkar singh et al in their retrospective study on collagen dressing versus conventional dressings in Burns showed the wound infection in collagen group is 22% where as in conventional dressing it is 27%.^[5]

Cost Effectiveness

In the study by Singh A et al with 68 patients with fresh acute superficial partial thickness registered in two tertiary care teaching hospitals in North India between January 2015 to October 2019 showed satisfactory cosmetic effectiveness in collagen dressing group which is same in the present study.^[6]

In a study by Mohan et al titled Burns – Comparative study between conventional and collagen dressing in K.R. Hospitals attached to MMC& RI in 2012-2013, 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 which is same in the present study.^[3]

Pain Score

In a study by Mohan et al titled Burns – Comparative study between conventional and collagen dressing in K.R. Hospitals attached to MMC& RI in 2012-2013, the average pain score recorded in collagen group is 4.5 and 5.63 in SSD group. And also, there is statistically significant reduction of pain in collagen group when compared to SSD group.^[3]

BA Ramesh et al in their comparative study of collagen dressing versus petrolatum gauze dressing among November 2014 to May 2016 in a tertiary care centre. Average Pain score was found to be less in collagen group when compared to petrolatum gauze dressing group.^[21]

Tiago et al. also demonstrated that collagen was the most efficient treatment for skin wounds.^[22]

Limitations: Results cannot be generalized due to small sample size.

CONCLUSION

The greater burden of burn Incidence, Mortality and Morbidity is preventable. Burn care is unquestionably a component of emergency and essential surgical care Patient with burns require timely access to acute burns management and definitive surgical care. There are many types of dressings available in the market making the physician to address all aspects of wound care. But still there are few products like collagen that achieve complete healing. From the discussion it is evident that our study is more consistent with other studies proving collagen a good dressing to cover burn wounds in all aspects.

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