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Effect of Collagen Dressing in the Treatment of Superficial Partial Thickness Burn in Children

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Abstract **Original Research Article**

Introduction: Burn is the most devastating of all injuries and a major global public health crisis. Biological dressings with collagen create the most physiological interface between the wound surface and environment and are impermeable to bacteria. Collagen dressing is easily applicable, non-immunogenic, non-pyrogenic, hypo allergic and pain free. Collagen is an endogenous substance which forms an important structural component in connective tissue. By applying it over the wound, exposed dermis and free nerve endings get covered leading to reduction in pain and infection. ***Objective:*** To assess the efficacy of collagen dressing in burn wound management. ***Methods:*** Prospective interventional study was carried out at the Department of Burn and Reconstructive Surgery, faculty of Paediatric Surgery, Bangladesh Shishu Hospital & Institute. A total 20 patients were included in this study after fulfillment of all selection criteria during the study period. ***Result:*** The mean pain relief time, wound healing and hospital stay were 2.7±0.6 days, 7.3±1.0 days and 4.5±0.6 days respectively. ***Conclusion:*** Collagen dressing is safe and effective in the treatment of superficial partial thickness burn in children.

Keywords: Collagen dressing, superficial partial thickness burn, pain.

INTRODUCTION

Burn may be defined as a tissue trauma caused by thermal application (heat and cold), absorption of physical energy (electricity, ionizing radiation and friction) and chemical contact (acid and alkali) [1]. According to the depth of injury burn is of 4 types: 1st degree (Superficial), 2nd degree (Superficial partial thickness, Deep partial thickness), 3rd degree (Full thickness) & 4th degree (Sub dermal burn) [1]. The development of collagen dressings is logical in view of its unique structural and functional characteristics. Collagens are the most abundant and ubiquitous proteins in the body of the vertebre [2]. The term collagen is generally applied to a series of related, yet chemically distinct macromolecular species. The term collagen originated from the Greek word "kola," meaning glue plus gene. The importance of collagen in wound healing has been appreciated for a long time for the simple reason that the ultimate result of most repairs in the higher vertebrates is the formation of scar tissue composed of collagenous fibers. However, since wound healing and regeneration are in principle, developmental processes involving a variety of phenomena such as cell proliferation, cell migration, cell differentiation and interactions between the different tissue components in which collagen may affect healing not only at its final stage i.e., in relation to the amount and quality of the formed scar tissue, but also in the very early stages of healing [2]. The major features of collagens that led to the development of collagen dressings are therefore a consequence of its structural and functional significance in wound repair. The hydrophilic nature of the collagen attributed by its molecular structure characterized by high content of

diamino dicarboxylic amino acids and carbohydrate moieties provides a surface geometry very suitable for cell adhesion. In addition to the surface properties a third factor promoting attraction of fibrogenic cells to collagen implants is the presence of a glycoprotein like fibronectin on the surface of the cells. These molecules have a high affinity for collagen and link specifically with definite regions on the collagen surface. All these special characteristics of collagen stimulated its use for the development of the various types of collagen wound dressings [2].

METHODOLOGY

This was a prospective interventional study carried out at the department of Burn & Reconstructive Surgery, Faculty of Paediatric Surgery. Bangladesh Shishu Hospital & Institute. Total 20 patients were included in this study from January 2021 to September 2021 after admission within 24 hours of burn upto 20% body surface area. The exclusion criteria were any comorbidity, allergy to heparin and electric and chemical burns. After admission each patient was thoroughly examined, investigated and all relevant information was noted. The guardian of the patient was informed about the treatment and informed written consent was obtained. The collagen membranes are available in various dimensions such as 5 cm × 5 cm, 10 cm × 10 cm, and 25 cm × 25 cm. The thickness of these collagen membranes is 0.6 mm. Under strict aseptic precautions, the burn wound must be first washed thoroughly with normal saline. Necrotic tissue and dead skin are removed from the burn wound. To wash off the preservative agents, collagen should be thoroughly washed with normal saline, and then, collagen dressing is applied over the wound, trimming with the scissors so as to cover the entire area. Within 1 hour, the membrane dries and becomes adherent to the wound (Singh & Bhatnagar, 2020).After discharge each patient was followed up weekly upto 4 weeks. On each followed up healing, scar and itching were monitored. The statistical analysis was conducted using SPSS (Statistical Package for Social Science) version 26 statistical software.

RESULTS

At the end of follow up, a total of 20 participants were including in the final data analysis. After completion of the data analysis, the results were organized in the tabular form and figures. Figure (3, 4) showed the effect of pre and post results of application of collagen dressing.

Table I: Characteristics of the participants (n=20)

Characteristics	Mean±SD	Rang
Age (in months)	28.0±22.2	6-96
Weight (in kilograms)	14.1±7.3	6.5- 39.0
Percentage of burn	9.9±3.4	5.0 – 18.0

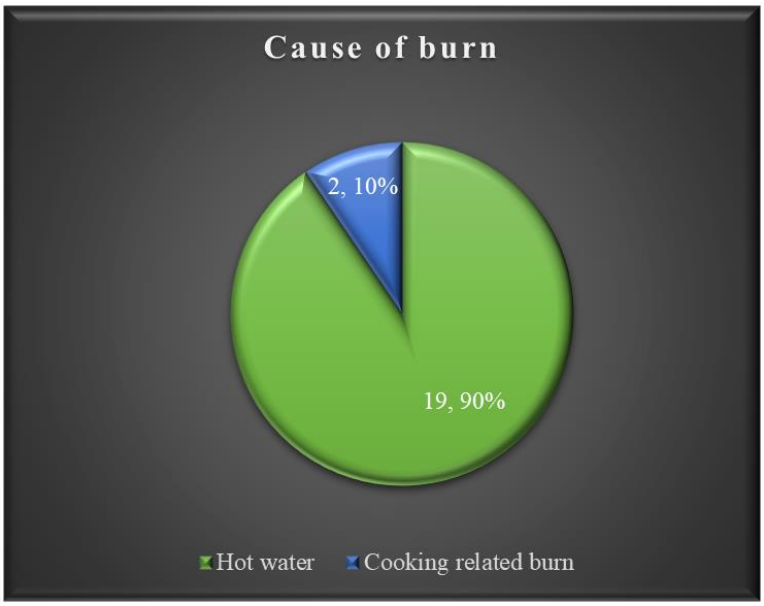

Fig. 1: Causes of the burn (n=20)

Table II: Outcome of variables (n=20)

Variables	Mean±SD	Range
Pain relief time (days)	2.7±0.6	2.0 -5.0
Wound healing time (days)	7.3±1.0	6.0-9.0
Hospital stay (days) Range	4.5±0.6	3.0 – 6.0

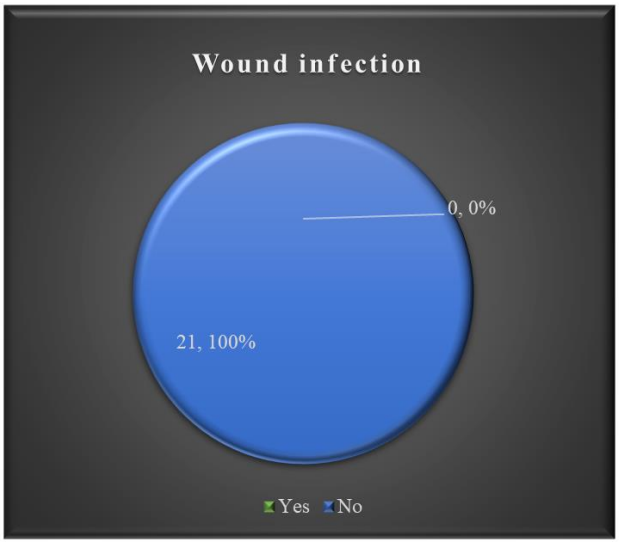

Fig. 2: Wound infection of the participants (n=20)

Fig. 3: Superficial partial thickness burn with collagen dressing

Fig. 4: After 10 days of collagen dressing application

DISCUSSION

Pain relief effect: In our study, the mean pain relief time was 2.7±0.6 days. In this study, the mean pain relief time was statistically significant. Tayade, *et al.,* and Singh & Bhatnagar showed same result [3, 4]. Collagen used over the raw area provides the coverage for sensitive nerve endings & it also anti-inflammatory properties, so it produces a dramatic reduction in pain. Wound healing time: In this study the mean wound healing time was 7.3±1 days which indicate faster healing. 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 the 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. It is for these purposes that denuded areas need a temporary cover until such times that the body is able to manufacture a cover of its [5]. Wound infection: In current study observed that no patients were found wound infection. The present study, injectable antibiotics were given for 3 to 5 days in all patients. Moreover, standard wound dressing protocol was followed in all patients. So, infection rate is low. In the studies of Masoodu, *et al.,* and Mathew, *et al.,* infection rate was similar to the present study [5, 6]. Hospital stay: In this study, the mean hospital stay was 4.5±0.6 day. Shorter admission in the hospital was recorded by several authors in the collagen dressing [3, 5-7]. The reduced requirement for change of dressing, early pain alleviation and faster wound healing all are attributed to shorter hospital admission in collagen dressing. The study sample was small since it was undertaken during the COVID-19 pandemic. After discharge from the hospital, patients were followed up on weekly basis up to 4 weeks. No patient had any sign of abnormal scar formation, itching, wound contracture or cosmetic disfiguration.

Limitations of the Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

Collagen dressing is safe and effective in the treatment of superficial partial thickness burn in children.

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Conflict of Interest: None declared.

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