Comparative Study of Efficacy of Human Placental Extract Over Beta Glucan Collagen Sheets in Partial Thickness Burn Patients

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Abstract

Burn injuries present major public health problem worldwide especially in developing country like India in extremes of age groups. As the treatment options continue to evolve, there is need to find ideal dressing method which will result in reduction of pain, improved healing, reduced hospital stay, better scar appearance and reduced complication rate. Beta glucan collagen sheets (BGC) [KollagenR] as well as human placental extract (HPE) has been proved to be good wound healing agents according to various studies. This study is comparison of two dressing methods over period of 3 years in Govt. Medical College, Nagpur. Out of 108 patients included in study, 54 were treated with BGC sheets while other 54 were treated with HPE.

When observations are compared with literature, both BGC as well as HPE are good wound healing agents. Both the methods effectively simplify wound care. BGC dressing results in less hospital stay, reduced healing time and reduced pain score. However, HPE is cost effective when compared to BGC.

Introduction

Burn injuries present a major public health problem in our country. The estimated annual burn incidence in India is approximately 6-7 million per year.[1] In this hospital every year around 400 to 500 patients get admitted with burn injuries, of which around 20% are in paediatric age group, according to hospital statistics. Partial thickness burns can be superficial or deep and involve both the epidermis and dermis. They are characterised by blisters, redness, oedema, and pain.

A partial thickness burn has the capacity for healing if properly treated. Crucial in the care of partial thickness burns is the maintenance of moist wound bed, adequate circulation, and protection from infection to avoid conversion of a partial thickness injury into a full thickness wound.[2] Beta glucan collagen matrix combines beta glucan with collagen in a meshed reinforced wound dressing. Beta glucan, a complex carbohydrate, is known to stimulate macrophages. Collagen is natural component of the dermal matrix produced by fibroblasts that functions as protective scaffolding for the migrating epithelial cells in the regenerating skin. Human placental extract is known for its wound healing properties since ancient times. It is considered as 'treasure house' for

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biologically active compounds.

In this study we compared application of beta glucan collagen sheets and human placental extract over partial thickness burn wounds.

Material and Method

108 patients were equally divided into 2 groups. 54 patients each were randomly allotted to BGC and HPE groups with the help of block randomisation & simple random sampling was used to select blocks.

Subjects were first selected based on inclusion and exclusion criteria.

Inclusion criteria

- Superficial or partial thickness burns.
- Fresh burns (presenting within 24 hrs.).
- Age less than 50 yrs.
- Less than 50% body surface area involved.
- Non infected burn wounds.

Exclusion criteria

- Full thickness burns
- Burns presenting after 24 hrs.
- Age more than 50 yrs.
- More than 50% body surface area involved
- Previously treated, outside treated and then referred patients
- Grossly infected burn wounds at presentation, Patients with systemic diseases which are known to affect wound healing like diabetes, tuberculosis, malignancy, and cardiovascular disease.

Patients with either %TBSA more than 50% or age more than 50 were not selected since they were associated with particularly high risk of mortality. Patients were allotted to each group on alternate basis. A detailed history was obtained regarding the mode of injury, place and time of burns. A thorough physical examination was performed with emphasis on the type and extent of burns.

Method

After initial resuscitations, all the patients fulfilling the inclusion and exclusion criteria were allocated into two groups- Group BGC and Group HPE.

BGC group, - Patients dressed with Beta Glucan Collagen dressing [Kollagen^{R}].

HPE group, - Patients dressed with human placental extract dressing.

Patients and relatives were informed about the treatment given and a written consent was taken before initiation of the treatment.

Beta glucan collagen

The BGC used in this study is a purified bovine reconstituted collagen. The BGC membranes come in varying dimension of 5 x 5 cm, 10 x 10 cm, 10 x 25 cm and 15 x 30 cm, and its thickness is 0.6 cm. It is sterilized by gamma irradiation and is marketed in FFS Aluminium pouch packing containing a mixture of Isopropyl alcohol and water. It has a shelf life of over 5 years at ambient temperature under Indian conditions.[3] Once the patient is stabilised, patient is taken to the operation theatre and dressing is done under general anaesthesia. Before dressing the wound swabs were taken from the burn wound and from the surrounding normal skin. Wound was thoroughly cleaned with

normal saline.

BGC sheets (wet/dry) are then applied and secured with bandage/strips. The dressing is kept for 3 days unless there are signs of infection (soakage and foul smell). After the 3rd day if the wound is healthy it is kept open. Patient is followed up daily. The collagen sheets peels off by itself once the epithelium grows underneath.

Human placental extract

Human placental extract used in this study is a tropical preparation containing Peptides (FNP-III), Nucleotides (PDRN, NADPH) and is derived from an extract of fresh term, healthy, human placenta.

Only commercial preparations of human placental extract are manufactured by Albert David ltd. Kolkata.[4]

Before dressing the wound, swabs were taken from the burn wound and surrounding normal skin. Wound was thoroughly cleaned with normal saline. Human placental extract was applied on to the burn surface and then the wound was covered with dry sterile gauze, sterile pads were placed and bandaging was done.

Dressing was done after every 24 hours till the soakage is minimal (single layer pad). Thereafter dressings were done daily. In case of increased soakage, dressings were repeated. In case of foul smelling discharge, wound was exposed, swab taken, debrided and dressing was done.

Results

Most common age group involved in both groups was 21-30, which was followed by paediatric age group. Males and females were roughly equally distributed in both Beta Glucan Collagen group and in Human Placental Extract group. Flame burns were more common than scald burns in both the groups. Mean TBSA% Beta Glucan Collagen group was 21.46% whereas it was 19.70% in Human Placental Extract group. Most of the patients in both the groups presented between 12-24 hours after initial burn injury. Most common site involved in both groups was anterior trunk followed by face. Both the groups were comparable as far as Hb% and serum total protein levels were concerned. Pain due to burn injury on the day of admission was similar in both groups. But subsequently the pain was highly decreased in BGC group as compared to HPE group. The difference was highly significant with P value of < 0.001.

The mean healing time in BGC group was 17.4 days whereas it was 18.27 days in HPE group. The mean duration of hospital stay was 11.59 days in BGC group and 13.35 days in HPE group. The difference was highly significant ($p \leq 0.001$). The infection rate was similar in both the groups. The infection rate was 13 (24.07%) in BGC group, and 14(25.59%) in HPE group. The difference was not found to be statistically significant (P= 0.824). Pseudomonas aeruginosa was the most commonly involved organism in both the groups. Majority of the patients in both the groups had good scar, 81.48% in BGC group and 75.92% in HPE group. Average number of collagen sheets

required per patient in BGC group was 4.24 whereas on an average every patient in HPE group required 4 to 5 tubes of 20 gram human placental extract. Cost treatment material required per patient in collagen group was around Rs. 3200 while it was around Rs 350 in HPE group. Thus BGC was 8 to 9 times costlier than HPE.

Discussion

Outcome parameters studied and compared with literature were pain score, hospital stay, healing time, infection rate, scar appearance and cost effectiveness of the treatment.

It is observed in the present study that the youngest age was 3 years in both the groups and oldest was 47 years in BGC group and 43 years in HPE group. The mean age was 21.27 years in BGC group and 19.05 years in HPE group. 21-30 age group was the most commonly affected. This can be explained as young people are more exposed to fire in accordance to their work. High incidence in children is attributable to lack of awareness of potential dangers and a limited ability of the child to respond in a prompt, appropriate manner. Most of the burn injuries in children occur in kitchen due to proximity of child to their mother. Males outnumbered females in both the groups. This shows male population is more exposed to fire related hazards. Majority of the patients in both the groups presented between 12 and 24 hours and then between 6 and 12 hours, only few presented within 6 hours of initial injury. The patients presented early to the hospital were in the vicinity of hospital and the patients who presented late were far away, lacked access to means of transportation, from the rural place who took primary treatment in the form of intravenous fluids and referred to our hospital for further management. The patients presented early to the hospital showed less incidence of wound infection.

The mode of burn injury in majority of the patients was found to be flame (63.88%) followed by scald (31.48%). This is consistent with manner of most of the accidental burn injuries due to stove blast or being caught in fire.

The minimum TBSA% of burns was found to be 10% and maximum being 42% with mean of 21.46% in BGC group and minimum of 10% and maximum of 32% with mean of 19.60% in HPE group. The patients with high percentage of burns have high chances of wound infection, increased hospital stay and bad post burn scar.

Mean pain score was 4.18 in BGC group and 4.66 in HPE group. Difference was highly significant with p value < 0.001. Reduction in pain in BGC group can be explained as BGC sheets cover exposed nerve endings.

13 out of 54 patients in BGC group and 14 out of 54 patients in HPE group had positive bacterial cultures. Pseudomonas aureginosa was most commonly isolated organism in both the groups followed by Klebsiella. Most of the infected patients had positive cultures on 3rd day and by first week most of the wounds were sterile.

Antibiotics were given according to culture sensitivity.

Wounds were considered healed after complete epithelialisation. Healing time in BGC group was 17.4 days and 18.7 days in HPE group. The reason for early healing of burn injuries in BGC was that BGC acts as protective layers preventing water and heat loss and provides skin substitute. Better healing in HPE group was due to various bioactive peptides and due to tissue regeneration potential. Most of the patients in both groups had good scar.

Hospital stay was significantly reduced in BGC group as compared to HPE group (11.59 days and 13.35 days respectively). Increased hospital stay in both the groups was attributed to,

- Increased TBSA%
- Infection
- Requirement of daily dressing in HPE group
- Increased healing time

At the end of study BGC was cost effective as compared to HPE. It was calculated by comparing cost of treatment material required per patient. Cost of treatment in BGC group was 8-9 times higher as compared to HPE group.

Mukund B Tayade et al[5] conducted a study in Department of Surgery, Grant Medical College and Sir J. J group of Hospitals, Mumbai. It was a comparative study of Collagen sheet cover versus 1% Silver sulphadiazine in partial thickness burns of 50 patients, 25 patients in each group. Male: female ratio was 18: 7 in study group and 16 : 9 in control group. The common cause of burn injury was flame in age group of 11-20 years and included patients of less than 10% burns. The average pain score was 1.2 and 2.64 out of 5 in collagen and SSD group respectively. Positive cultures were identified in 1 patient in collagen group and 2 patients in SSD group out of 50 patients. The average healing time of 12.64 days in collagen group and 18.44 days SSD group was noticed. Study showed bad prominent scars in 2 patients each in both the groups out of 50 patients. Average hospital stay of 2.48 days in collagen group and 9.56 days in SSD group was noticed.

M. P. Pote et al[6] conducted a study in Department of surgery, S. R. T. R. government medical college, Ambajogai. It was comparative study of burn wound management with povidone iodine, silver sulphadiazine and placentrex. Most affected age group was 31-40 years, 14 cases followed by 2-10 years, 13 cases. Staphylococci being most common organism grown (4 cases) followed by Pseudomonas (3 cases).

Ongom P et al[7] conducted a study in Makerere University, Kampala-Uganda by comparing collagen dressing with honey-ghee dressing in superficial burns in children. He conducted the study in 52 patients out of which 26 patients each were dressed with collagen and SSD. The age of the patients ranged from 1-5 years with mean of 2.96 years, males were 35 (67%) and females were 17 (33%). He included upto 30% TBSA burns. 4 of 26

patients dressed with collagen developed wound infection while 5 of the 26 patients dressed with honey ghee dressing developed wound infection. The organism causing the infections were Staphylococcus aureus (33.3%), Pseudomonas aeruginosa (33.3%), Citrobacter freundii (22.2%) and E.coli (11.1%).

Summary of results : Age, Sex, Mode of burns and TBSA of burns

Studies	No. of pts	Sex		Age (years)		Mode of Burns		TBSA %	
		male	female	Study	control	Study	control	study	control
M. P. Pote et al (2001)	60	26	34						
Ongom P et al 2004	52	35	17	2.96	2.96			Upto 30%	Upto 30%
Mukund B Tayade et al 2006	50	34	16			Flame	Flame	Upto 10%	Upto 10%
Present study 2013	108	61	47	21.27	19.05 (HPE)	Flame (70.37%)	Flame (57.4%)	21.46%	19.70% (HPE)

	Pain score		Healing time(days)		Hospital stay(days)	
	BGC	CONTROL	BGC	CONTROL	BGC	CONTROL
Mukund B Tayade et al 2006	1.2	2.64	12.64	18.44	2.48	9.56
M. P. Pote et al (2001)				2-3 weeks (HPE)	3 weeks	
Present study	4.18	4.66	17.4	18.2	11.5	13.3

Conclusions

Beta glucan collagen sheets are good skin substitute with decreased hospital stay, healing time and reduced pain score. However BGC is 8-9 times costlier as compared to HPE.

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Sulphonylureas raise risk of CHD in women

The use of sulphonylureas in women with type 2 diabetes is associated with a significant increase in the risk of coronary heart disease (CHD), but not stroke, a large prospective cohort study has shown. The longer the drugs were used the higher the risk.

One of the arguments offered to support this is that newer agents have no long-term outcome data. However, the long-term outcome data suggesting a worsening of cardiovascular outcomes with sulphonylureas is likely to spark further debate about the optimum treatment of type 2 diabetes.

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