

Innovative Indigenous Cost-effective Bilaminar Dermal Regeneration Template

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Abstract

Context: In today's era of medical advancement, various modalities of treatment options and dressing materials are available for burn wound management. Bilaminar dermal regeneration template is doubtful in developing countries because of its high cost availability and affordability. **Aims and Objectives:** The aim of this research was to study the use of innovative indigenous cost-effective bilaminar dermal regeneration template in burn raw area. **Settings and Design:** This study was conducted in the department of plastic surgery in a tertiary care centre from April 2019 to May 2019. Study design is experimental study.

Keywords: Bilaminar dermal regeneration template, indigenous, innovative

INTRODUCTION

Modern-day burn care has become very advanced and sophisticated especially in developed countries. An increasing number of expensive adjuncts are being used such as dermal templates, cultured keratinocytes, biological, and silver impregnated dressings. In developing countries such as ours, it becomes imperative that we provide the best possible care to our patients with possible and available resources. In the acute burn scenario, to enhance success and decrease complication rates, any dermal template needs to be applied early ideally within the first 24–48 h.^[1] The reality is that many patients in a low-resource environment arrive late with contaminated or infected wounds, and the workload and general resources are such that early surgery is not possible. In developing countries, various indigenous materials are used to treat burn wound such as banana leaf or topical application of honey.^[2,3] The dermal regeneration templates available in the market are expensive and cost around between 20,000 and 30,000 Indian rupees. Here in this article, we describe our experience regarding the use of indigenous and innovative low-cost dermal regeneration template for burn wound.

MATERIALS AND METHODS

Informed consent was taken before enrolling in the study. The study was conducted in a 2-year-old girl who presented to us with alleged history of accidental 20% scald burns. We created a bilaminar regeneration template, which was applied over the burn area for preparing the site for split thickness skin graft later. The bilaminar regeneration template was prepared from silicone sheet and collagen. The silicone gel sheet and dry collagen sheet used were of hospital supply. The total cost of the template prepared from these materials was about 2500–3500 Indian rupees. A silicone sheet of size 10 cm × 20 cm was used and collagen sheet of the same size 10 cm × 20 cm was placed over the adhesive surface of the silicon sheet. When multiple collagen sheets are used, they are sutured over the silicone gel sheet with absorbable sutures such as polyglycaprone or polyglycolic acid. This template can be used both meshed and unmeshed. This template was

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applied over deep burns and conventional dressing with gauze and cotton pad was done over it. The dressing was opened every third day and only the outer layer of gauze and cotton pad was changed. On the 10th postoperative day, the collagen layer had completely resorbed and the silicon sheet layer was also removed and split thickness skin grafting was done. The child was discharged with advice to wear pressure garments and to apply silicone gel ointment and was kept under regular follow-up.

SUBJECTS AND METHODS

This study was conducted in the plastic surgery department in a tertiary care centre in the month of April–May 2019. Informed consent was taken before enrolling in the study. The study was conducted in a 2-year-old girl who presented to us with alleged history of accidental 20% scald burns [Figure 1].

We created a bilaminar regeneration template, which was applied over the burn area for preparing the site for split thickness skin graft later [Figure 2]. The bilaminar regeneration template was prepared from silicone sheet and collagen. The silicone gel sheet and dry collagen sheet used were of hospital supply. The total cost of the template prepared from these materials was about 2500–3500 Indian rupees. A silicone sheet of size 10 cm × 20 cm was used and collagen sheet of the same size 10 cm × 20 cm was placed over the adhesive surface of the silicon sheet. When multiple collagen sheets are used, they are sutured over the silicone gel sheet with absorbable sutures such as polyglecaprone or polyglycolic acid. This template can

be used both meshed and unmeshed. This template was applied over deep burns and conventional dressing with gauze and cotton pad was done over it. The dressing was opened every third day and only the outer layer of gauze and cotton pad was changed. On the 10th postoperative day, the collagen layer had completely resorbed and the silicon sheet layer was also removed and split thickness skin grafting was done. The child was discharged with advice to wear pressure garments and to apply silicone gel ointment and was kept under regular follow-up.

STATISTICAL ANALYSIS USED

No statistical analysis was done.

RESULTS

The use of dermal regeneration template in the area of deep burns helped in expediting the healing of burns. The burn raw area healed completely and was made ready for split thickness skin grafting. Split thickness skin grafting was done with the donor site as right buttock and the take of the graft was 100% [Figure 3].

DISCUSSION

Partial-thickness burn wounds can heal spontaneously, whereas full-thickness burn wounds require skin grafting for definitive wound closure. Historically, the gold standard for closure of excised full-thickness burn wounds is split-thickness skin autograft. Patients with very large burn wounds have limited donor sites for harvesting of autograft and may benefit from the use of



Figure 1: Preoperative burn wound area



Figure 2: Bilaminar dermal regenerative template application



Figure 3: Postoperative image at discharge

skin substitutes. Engineered skin substitutes that may provide temporary wound coverage until donor sites are ready to be reharvested for autograft, or if they contain

autologous cells, may provide permanent wound closure. Relatively few permanent skin substitutes are currently available, but developments in tissue engineering of human skin are expected to soon provide improved models for increased availability and enhanced healing of burn wounds.^[4] INTEGRA Dermal Regeneration Template is a well-known and widely used acellular dermal matrix. Although it helps to solve many challenging problems in reconstructive surgery, the product cost may make it an expensive alternative as compared to other reconstruction procedures.^[5] INTEGRA Dermal Regeneration Template has been commercialized since 1980s. Its use was initially described by Burke *et al.*^[6] It is now an important tool for the treatment of burns and scar contracture.^[7,8] Dermal Regeneration Template is a two-layered skin regeneration system. The outer layer of this system is made of thin silicone film act as the epidermis of skin. This layer helps in protecting wound from infection and controls in loss of both heat and moisture. The outer collagen glycosaminoglycan (GAG) thermal layer functions as a biodegradable template that helps in regeneration of dermal tissue neodermis by the body. The inner layer of dermal regeneration template is made of complex matrix of cross-linked fibers. The porous material of the template helps in regeneration of skin. The cross-linked fiber material of dermal regeneration template acts a scaffold for the regrowth of skin layer. Once the dermal skin layer is regenerated, the outer layer of template is removed and is replaced with a thin epidermal skin graft. This procedure leaves the wound to a flexible, growing and allows permanent regeneration of skin. It allows

faster healing of wound with minimum scarring. Here we have tried to replicate the same mechanism in our indigenously made dermal regeneration template. One of the main drawbacks is the cost of the template. The indigenous dermal regeneration template prepared from silicone sheet and dry collagen sheets is cost-effective and can be easily prepared and used on wounds. Thus, it can be used in hospital settings in developing countries where the affordability of commercial regeneration template is doubtful.

CONCLUSION

This is a preliminary study to assess the use of indigenous, cost-effective dermal regeneration template in burn wound management in a limited setting with limited number of cases, but yet it has shown to be effective in the management of burn wound raw area. A large multicentric, double-blinded control study with statistical analysis is required to further substantiate the results.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and

due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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