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Research Article

Role of indigenous Bilaminar dermal regeneration template in the management of degloving injury.

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Abstract

Various modalities of treatment options and dressing materials are available in today's era of medical advancement. A lot of newer dressing materials and adjuncts are in use for burn wound management. Bilaminar dermal regeneration template has been in use since the 1980s but owing to its high cost, its affordability and availability in third world developing countries is questionable. Here we have described our experience with the use of an indigenously made cost effective dermal regeneration template made from available materials in degloving injury raw area.

Keywords: indigenous; bilaminar dermal regeneration template

Introduction

Modern day wound care has become very advanced and sophisticated especially in developed countries. 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. 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. The dermal regeneration templates available in the market are expensive and costs anywhere between 20,000 to 30,000 Indian Rupees. Here we describe our experience with a indigenous and innovative, low cost dermal regeneration template.

Materials and methods

This study was conducted in the department of Plastic Surgery at tertiary care center after getting the departmental ethical committee approval. Informed written consent was taken from the patient. The details of the patient in study are as follows: 37-year-old female with no known co morbidities with h/o road traffic accident 4 months back and underwent right below knee amputation due to vascular injury and degloving injury of the left lower limb for which serial debridement was done in cardiothoracic and general surgery department. Now, the patient presented to plastic surgery department with extensive raw area over the left lower limb and non-healing ulcer over the right below knee amputation stump. Multiple debridement was done and STSG was done over the raw areas in multiple settings. (Figure 1.)

Figure 1. Wound with multiple raw areas

We created a bilaminar regeneration template and which was applied over the remaining raw area and graft donor site area for preparing the site for a definitive procedure later which was split thickness skin grafting in this case. 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 x 20 cm was used and collagen sheet of the same size 10 x 20 cm was placed over the adhesive surface of the silicon sheet. (Figure 2.)

Figure 2. Bilaminar dermal regeneration template

When multiple collagen sheets are used, they are sutured over the silicone gel sheet with absorbable sutures like poliglecaprone or polyglycolic acid. This template can be used both meshed and unmeshed. This template was applied over raw areas (Figure 3.) and conventional dressing with gauze and cotton pad was done over it. The dressing was opened every 3rd day and only the outer layer of gauze and cotton pad was changed. On the 7th postoperative day, the collagen layer had completely resorbed and the silicon sheet layer was also removed. Some raw areas were healed and split thickness skin grafting was done over remaining raw area. (Figure 4.)

Figure 3. BDRT applied over raw area.

Figure 4. Post BDRT application

Results

The dermal regeneration template use in the raw areas of degloving injury helped in expediting the healing of wound. Some of the raw areas were completely healed and the remaining were prepared for STSG.

Discussion

Degloving soft-tissue injuries are serious and potentially devastating. They require early recognition and early treatment. In the management of closed injuries in particular, a high index of suspicion remains crucial. A multidisciplinary approach is usually needed. Early reconstruction and effective rehabilitation are also essential to care for such patients. There is a need for multi-disciplinary and multi-institutional studies.

The management of lower-limb degloving injuries can be complex and quite involved. In recent years, use of a vacuum assisted closure (VAC) device to prepare the wound bed for grafting has become standard practice [1]. Occasionally, lower limb degloving injuries require cryopreserved split-thickness skin grafts procured from degloved flaps, artificial dermal replacement, or VAC therapy.

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 [2]. 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 compared to other reconstruction procedures [3]. Integra dermal regenerative template has been commercialised since 1980s.Its use was initially described by Burke and colleague in 1981 [4]. It's now an important tool for the treatment of burns and scar contracture [5, 6]. Dermal regeneration template is a two-layered skin regeneration system. The outer layer of dermal regeneration template is made of thin silicone film act as the epidermis of skin. The outer layer of dermal regeneration template 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 re-growth 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 wound management in a limited setting with limited number of cases, but yet it has shown to be effective in the management of degloving injury raw area. A large multicentric, double blinded control study with statistical analysis is required to further substantiate the results.

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