

Application of Cost Effective Indigenous Dermal Matrix Assisted Split Skin Grafting for Post Traumatic Raw Area

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ABSTRACT

Dermal substitutes improve the quality of wound healing and quality of the scars. It acts as a scaffold in which cell migration and repair of wound takes place. Many multimodality treatment methods available to augment wound healing at various levels. A dermal substitute should be affordable, long lasting, ready-to-use, analgesic, durable, flexible, non-antigenic, stops water loss, conforms to uneven wounds, anti-microbial, and may be applied in one sitting. Skin grafting may usually result in poor skin quality and scar contracture. In this study, we attempted to use our own cost-effective dermal matrix assisted split skin grafting in a patient with post traumatic raw area.

Keywords: Cost effective; Dermal matrix; Split skin grafting; Post traumatic raw area.

INTRODUCTION

The quality of skin wound healing can be improved by the application of collagen scaffolds as biological dermal substitutes. Dermal extract helps to improve wound healing and quality of the scars. They serve as a scaffold into which cells can migrate and repair the injury. Now many biological and cellular engineering skin substitutes are available, wound management is

a multimodality treatment with use of multiple available methods to improve wound healing at various levels. Dermal substitute is defined as biomatrices which fulfil function of cutaneous dermal layer and provides matrices and scaffold for new tissue growth and thus increases rate of wound healing. The collagen scaffold helps in supporting the in growth of connective tissue cell, thus causing regeneration of tissue providing the critical physiological functions of dermis. In this article we have described dermal matrix assisted split skin grafting. The gold standard coverage for post traumatic wounds is bioengineering substitute, free flaps and autologous skin grafting.¹ However, poor skin quality and scar contracture occur frequently and are well known problems in split grafted areas. Dermal substitute is an appropriate way to minimise scar contraction and to optimise the quality of the grafted area in strained regions with loss of function and with high requirements of elasticity, pliability and stability.² In this article we highlight the role of cost effective indigenous

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dermal matrix assisted split skin grafting for post traumatic raw area.

MATERIALS AND METHODS

This study was conducted in the Department of Plastic surgery in a Tertiary care centre in South India. Departmental ethical clearance and consent from the subject were obtained. This is a non-randomised case study. The details of the patient in study are as follows: 22-year-old male with alleged history of crush injury right upper limb while working with cement mixer and underwent guillotine amputation at the level of mid arm followed by he developed post traumatic raw area in the upper limb stump. The wound bed preparation was done with autologous platelet rich plasma, low level laser therapy and scaffold dressing. Once wound bed prepared well, we planned for split skin grafting (Fig. 1).



Fig. 1: Post traumatic raw area right upper limb amputated stump wound bed

In our case we did a split skin grafting by combining dry collagen sheet with the split skin graft harvested from his right thigh (Fig. 2 & 3).



Fig. 2: Collagen sheet placed over SSG

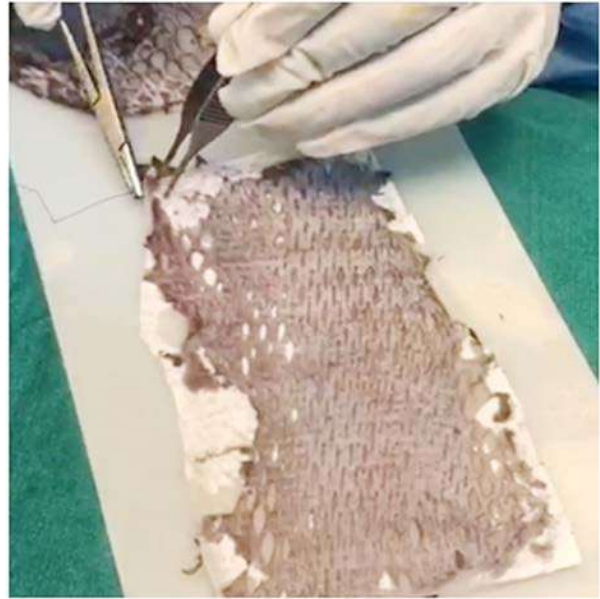


Fig. 3: Fixing collagen sheet to split skin graft to make the dermal matrix

The cost of dry collagen sheet is 1700 Indian rupees of size 10x20 cm which was used in our case. The skin graft is meshed with the help of Mesher before adding to collagen sheet. The collagen sheet is meshed. The collagen sheet is sutured to the ends of skin graft. This meshing helps prevents the exudate collecting beneath the template. This template was then applied over raw area and conventional dressing with gauze and cotton pad was done over it (Fig. 4).



Fig. 4: Application of dermal matrix assisted split skin grafting

RESULTS

Dermal matrix assisted skin graft was well taken on day 10 (Fig. 5). No graft loss noted with this procedure. No complication observed in the patient. Patient discharged successfully.



Fig. 5: Post-operative day 10

DISCUSSIONS

Collagen scaffolds, synthetic polymers, and cadaveric skin are some of the dermal substitutes available.² They provide temporary wound coverage until donor sites are ready to be collected for autograft, or may provide permanent wound closure if they contain autologous cells. There are now just a few permanent skins substitutes accessible, but advances in human skin tissue engineering are likely to soon produce improved models for expanded availability and wound healing.³

Collagen is well known for its benefits, which include simplicity of removal, low cost, painless application, hypoallergenic properties, a wide range of sizes, the ability to store for three years, and the ability to combine medications and growth factors that are delivered in a regulated manner.⁵

An ideal dermal substitute should be affordable, long-lasting, ready-to-use, analgesic, durable, flexible, non-antigenic, stops water loss, conforms to uneven wounds, anti-microbial, and may be applied in one sitting.⁶

MatriDerm is a single use three dimensional matrix composed of native, structurally intact collagen fibrils and elastin for supporting dermal regeneration. The collagen is obtained from bovine dermis and contains the dermal collagen types I, III and V. The elastin is obtained from bovine nuchal ligament by hydrolysis. MatriDerm serves as a scaffold in the skin reconstitution and modulates scar tissue formation. MatriDerm, applied using a single stage, is immediately covered with split skin through the 1mm thick matrix by diffusion. MatriDerm is supplied in sterile double bagged packs, and these may only be opened under sterile conditions. Before the use, MatriDerm must be rehydrated in ample physiological saline solution, and to avoid trapped pockets of air (air pockets can hinder the diffusion and thus jeopardise the attached graft), MatriDerm should be laid on the surface of the water and not immersed. The matrix is ready for use as soon as the appearance of the entire surface has changed from white to translucent.^{7,8}

Classic skin grafting was performed with a dermatome using a thin split thickness depth, meshing all grafts (1:2 ratio) and fixing to the wounds by 3/0 nylon sutures. A compressive dressing is used to cover the surgical wound.

We attempted to mimic the same technique in our dermal matrix assisted SSG, which is created locally and is cost-effective. The indigenous dermal regeneration template, which is made of dried collagen sheets, is inexpensive and simple to make.

CONCLUSION

The adoption of an indigenous, cost-effective dermal matrix assisted SSG showed better take of graft in case of post traumatic raw area. Large randomised control trials are required to assess the advantages and disadvantages of this procedure.

REFERENCES

1. Wetzing T, Gebhardt C, Simon JC. New Indication for artificial collagen elastin matrices? Covering tendons. *Dermatology*

- 2009;219:272-73.
2. Yannas IV, Burke JF. Design of an artificial skin I. Basic design principles. J Biomed Mater Res 1980;14:65-81.
 3. Cervelli V, Brinci L, Spallone D, Tati E, Palla L, Lucarini L, De Angelis B. The use of MatriDerm® and skin grafting in post-traumatic wounds. Int Wound J. 2011 Aug;8(4):400-5.
 4. Yannas IV, Burke JF. Design of an artificial skin. I. Basic design principles. J Biomed Mater Res. 1980;14(1):65-81.
 5. Cervelli V, Lucarini L, Cerretani C, Spallone D, Palla L, Brinci L, De Angelis B. The use of MatriDerm® and autologous skin grafting in the treatment of diabetic ulcers: a case report. Int Wound J 2010;7:291-6.
 6. Ryssel H, Gazyakan E, Germann G, Ohlbauer M. The use of MatriDerm in early excision and simultaneous autologous skin grafting in burns- a pilot study. Burns 2008 Feb;34(1):93-7.
 7. Supp M.D. (2011) Skin substitutes for burn wound healing: Current and future approaches. Expert review of dermatology. 6(2):217-227.
 8. Shahrokhi S, Anna A, Jeschke M. The use of dermal substitutes in burn surgery: Acute phase. Wound Repair Regen. 2014 Jan-Feb;22(1):14-22.
 9. DivyaSree D, Saranya D. Artificial skin scaffold to treat burn scars and its other applications. IJPBS 2015 Apr-Jun;5(2):11-24.

