Role of Non-Cultured Keratinocyte Cell Grafting (NCKG) in Management of Full Thickness Skin Graft Loss our Experience: Case Report

Nishad Kerakada[1], Neljo Thomas[2], Ravi Kumar Chittoria[3], Barath Kumar Singh[4], Jacob Antony Chakiath[5]

How to cite this article:
Nishad Kerakada, Neljo Thomas et. al./Role of Non-Cultured Keratinocyte Cell Grafting (NCKG) in Management of Full Thickness Skin Graft Loss our Experience: Case Report/RFP Journal of Dermatology 2022;8(1):123–126.

ABSTRACT

All deeper burns i.e. second degree deep dermal and full thickness heals by scarring that causes restrictions in the movements and aesthetics issues for patients. Burn reconstructive surgery requires that the defects after release should be replaced with donor tissues which have matching texture and colour like autologous skin grafting or flap surgeries. Here we are using this method to look for role in management of failure of take of FTSG in a case of post burn contracture. Full-thickness skin grafts include full thickness of the epidermis and dermis whereas split-thickness skin grafts (STSG) include the entire epidermis and only partial dermis. The main complication of this procedure is risk of graft failure. Keratinocyte cells suspension is claimed to hasten the wound healing. In this article, we share our experience of using non-cultured keratinocytegrafting (NCKG) in improving the take of pixel grafting following full thickness skin graft (FTSG).

Keywords: NCKG, FTSG, Pixel Grafting, Post Burn Contracture

INTRODUCTION

Burn trauma constitutes the second most common cause of trauma-related deaths after vehicular accidents, in both developing and developed country. An extensive burn is the most devastating injury that human being had to suffer. After immediate concern for survival in victim, restoration to pre-injury status, and return to daily activities becomes important for victim and treating team.[1] A healed burn patient may be left with contractures and scars with varying degrees of functional issues and cause social stigma among victims. The healed contractures need to be revised and raw areas covered with FTSG or STSG which may be associated with delayed wound healing of the skin grafts due to aberrant vascularity of the graft bed

Author Affiliation: [1,3,4,5] Senior Resident, Department of Plastic Surgery, [2]Professor & Registrar, Department of Plastic Surgery & Telemedicine, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Pondicherry-605006 India

Corresponding Author: **Ravi Kumar Chittoria,** Professor & Head of IT Wing and Telemedicine, Department of Plastic Surgery, Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry 605006, India.

Email: drchittoria@yahoo.com

Received on: 10.12.2022

Accepted on: 21.12.2022

Materials and Methods

This study was conducted in Plastic surgery department in a tertiary care center in the month of November-December 2021. The patient is male child a case of Post burns recurrent band like constriction of Right index and middle fingers with restriction of daily activities with USS:12/13 (figure 1). Release of

post burns contracture with FTSG with K-wire fixation was done. (Figure 2) post operative period patient there was epidermal loss of FTSG which was managed with pixel grafting and the patient was discharged, patient returned to us with epidermal loss following frictional trauma to the finger. We used non cultured keratinocyte epidermal graft(NCKEG) to manage the pixel graft loss. Under all aseptic precautions, a 3cm x 1cm area of groin region was marked(Figure 4) Local anaesthesia (2% xylocaine) was given. The donor area was derma braded (Figure-4) after the application of mupirocin ointment. The paste, containing dermabraded cells, was collected, homogenized, and was applied on the wound. A non-adherent dressing was placed on it followed by gauze dressing. The wound was inspected on the 7th day and thereafter weekly. Remnant raw area was calculated on each dressing.

Declarations

Authors' contributions

All authors made contributions to the article

Availability of data and materials

Not applicable.

Financial support and sponsorship

None.

Clinical photographs

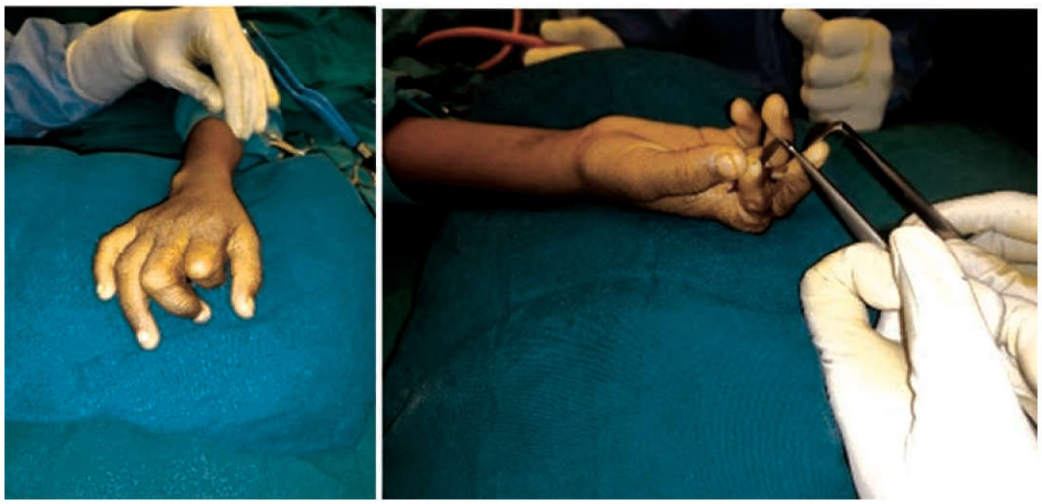

Figure 1: post burns contracture in right index and middle finger

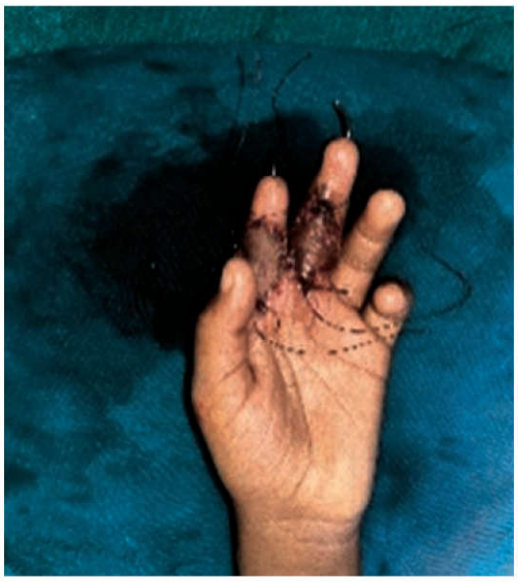

Figure 2: PBC release with FTSG and K WIRE fixation done

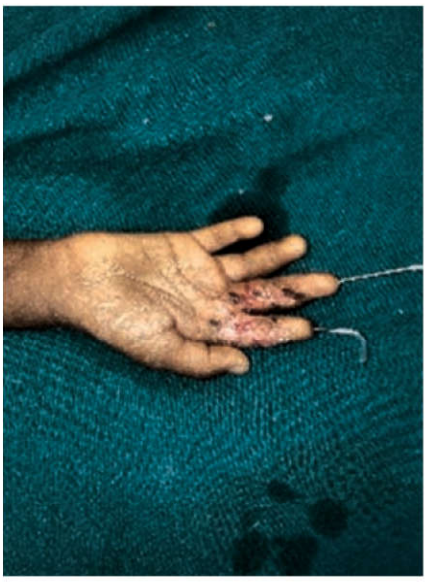

Figure 3: FTSG raw area

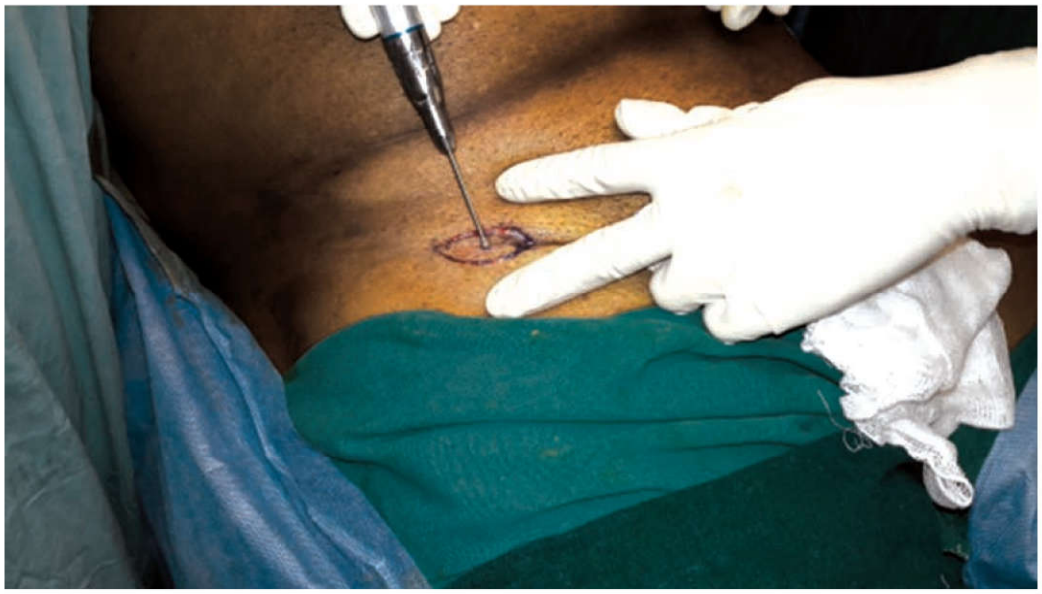

Figure 4: NCKG harvested

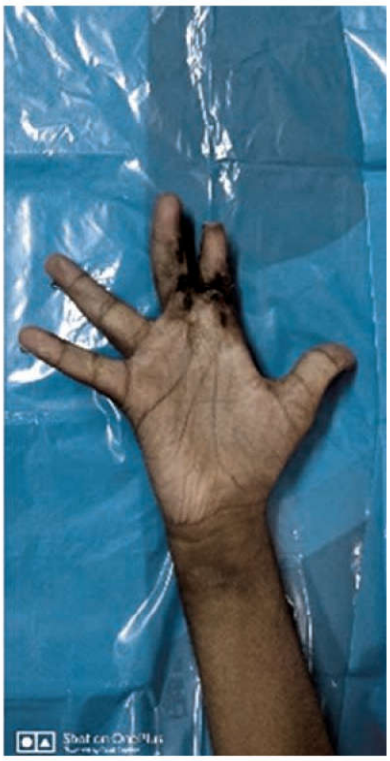

Figure 5: Healed FTSG

Results

NCKG treated wound showed accelerated wound healing (figure5). Though the grafted cells did not survive but rapid epithelialization started from the periphery of the wound.

Discussion

Wound healing is a complex process. It involves three phases- inflammation proliferation and maturation.[1] The chronic wounds are characterized by a prolonged and persistent proliferative phase due to altered local and systemic factors. The spectrum of modalities available to manage these types of wounds is very wide. Conveniently it can be grouped into four categories-conventional therapy, novel therapy, reconstructive therapy, and cell-based therapy. Conventional therapies include–conventional dressings with or without topical application of antimicrobial agents, growth factors; various biological dressings such as silver and alginate; hyperbaric oxygen, etc. Novel therapies include the use of platelet-rich plasma, negative pressure wound therapy (NPWT), and skin substitutes. These are minimally invasive with much better healing efficacy than conventional therapies. Reconstructive therapy, such as skin and flap grafting, are invasive and damage the normal tissue also. Cell-based therapy is also emerging as a part of wound management.[2,3]

Application of cultured keratinocytes appears to promote healthy granulation tissue formation within the wound bed. The graft, when applied as a sheet, act as an occlusive dressing, preventing wound dehydration and maintaining a moist environment. The majority of evidence suggests that cultured epidermal allografts do not survive

indefinitely after transplantation.[4] Their brief contact with the wound, however, seems sufficient to stimulate reepithelialisation, particularly when dermal tissue is present in the wound bed. This may be due to the release of growth factors by keratinocytes which may favourably influence wound healing. In addition to this, there is a release of several growth factors by keratinocytes that promote wound healing. It is known that cultured keratinocytes release various factors that enhance the growth of other cells in vitro including keratinocytes, fibroblasts, and melanocytes. Identified factors include interleukin-1, other interleukins, and transforming growth factor-alpha.

These keratinocytes may be autologous or allogenic in origin. These cells are separated from skin graft by using trypsin or other methods. After separation, these are cultured in appropriate media to form a sheet. These sheets are used as graft to cover the wound. In our case, we have used autologous non-cultured, non trypsinised keratinocytes cells to promote the healing. We observed favourable result in terms of formation of healthy granulation tissue and rapid epithelialization of the wound from the margins.

Conclusion

In this study we found that non-cultured keratinocyte grafting has role in healing of the wound and the wound heals at faster rate. But since it is a single case study, definite conclusion cannot be made. Large randomized control trials are required to confirm the efficacy of NCKG in wound healing.

References

1. Deng C, Wang L, Feng J, Lu F. Treatment of human chronic wounds with autologous extracellular matrix/stromal vascular fraction gel: A STROBE-compliant study. Medicine (Baltimore). 2018;97(32)
2. Shankaran V, Brooks M, Mostow E. Advanced therapies for chronic wounds: NPWT, engineered skin, growth factors, extracellular matrices. Dermatol Ther 2013;26:215–21
3. Han G, Ceilley R. Chronic wound healing: a review of current management and treatments. Adv Ther 2017;34:599–610
4. Shukla VK, Tiwary SK, Barnwal S, Gulati AK, Pandey SS. Effect of autologous epidermal cell suspension transplantation in chronic nonhealing wounds: a pilot study. Can J Surg. 2010;53(1):6–10.
5. Gauthier Y, Benzekri L. Non-cultured epidermal suspension in vitiligo: From laboratory to clinic. Indian J Dermatol Venereol Leprol 2012;78:59-63