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Role of Non cultured Keratinocyte Graft with Sucralfate in Second Degree Scald Burns

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Abstract

Normal wound healing is a complex process involving three phases namely inflammatory, proliferating, and remodeling. Studies have shown that sucralfate has a beneficial effect on ulcers, skin lesions, and burn wounds by promoting healthy granulation thereby preparing the wound bed. Whereas non cultured keratinocyte graft has proven to promote epithelialization of the wound. In this study, we used non cultured keratinocyte graft with sucralfate in a pediatric patient with burn wounds onthe face.

Keywords: Sucralfate, Keratinocyte, Wound bed, Wound healing.

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INTRODUCTION

Wound healing is a physiological response of a living being to physical, chemical, mechanical or thermal injury. The wound healing process consists of several phases: homeostasis, inflammation, proliferation/granulation, and remodeling/maturation. Still, when the healing course deviates from the normal path, the healing does not advance past the inflammatory phase and becomes a chronic healing wound. This impairment is due to changes in one or more of the Components that aid in wound healing like growth factors, cytokines, and associated comorbidities like diabetes, infection, etc.,[1] In the case of burns, there will be a deficiency in normal healing. Therefore to aid the process of wound healing we usedsucralfate

to promote healthy granulation so that the wound bed is prepared[2-4] for grafting with noncultured keratinocytes which promotes epithelialization of the wound.[5] Therefore a synchronized beneficial effect towards better wound healing is provided.

MATERIALS AND METHODS

This study was conducted in the Tertiary Care Centre in the Department of Plastic Surgery after getting the department's ethical committee approval. Informed consent was obtained. The subject was a 1-year-old female child who had an accidental second-degree scald burn injury thatinvolvedtheleft side of the face, pinna, and retro auricular region, left arm, and forearm (Fig. 1). She was taken to a nearby hospital within 30 minutes- inadequate initial resuscitation. The child developed blistering and swelling around the left eye the next day and presented to our center after a delay of 12 hours. She was admitted tothe tertiary burn care unit and initial resuscitation with intravenous fluids, analgesics, and prophylactic antibiotics started. After tangential excision on post-burn day 5, a Noncultured keratinocyte graft with sucralfate ointment is applied over the deeper areas of burn over the side of the face and scalp. A 3cm x 1cm area of the scalp region adjacent tothe burn wound was marked (Fig. 2). The donor area was dermabraded (Fig. 3) after the application of sucralfate ointment. The paste, containing dermabraded cells, was collected, homogenized, and applied along with sucralfate ointment over the wound (Fig. 4). A non-adherent dressing was placed on it followed by a gauze dressing.The wound was inspected on the 7th day and thereafter weekly. Remnant raw area was calculated on each dressing.



Fig. 1: 2nd degree scald burns over left side of face and left arm



Fig. 2: wound wash with silver stream



Fig. 3: Dermabrasion and harvest of non cultured keratinocyte graft



Fig. 4: Application of non cultured keratinocyte suspension with sucralfate over the wound

RESULTS

Intraoperative and postoperative periods were uneventful for the patient. On post-operative day 7, the dressing was opened and it showed significant areas of re-epithelialization and healing (Fig. 5). All second-degree superficial burn wounds healed completely and islands of re-epithelization appeared in deep second-degree burns areas. No complications or side effects were noted during the entire procedure.



Fig. 5: Partially healed wound after 7 days

DISCUSSION

The normal pace of wound healing and epithelialization is at the rate of 1mm/day. Optimum recovery requires the wound bed and the patient to be fit. To assist with implementing the concept of wound bed preparation, the TIME acronym was developed in 2002 by a group of wound care experts, as a practical guide for use when managing patients with wounds.[6] The Time table summarizes the four main components of wound bed preparation:

1. Tissue management
2. Control infection and inflammation
3. Moisture imbalance
4. Advancement of the epithelial edge of the wound

Advanced wound healing therapies aim to hasten the process of wound healing by expediting the advancement of the epithelial edge of the wound. Many growth factors have been used to advance epithelialization. As sucralfate promotes healthy granulation in the wound bed and noncultured keratinocytes provide epithelialization ofthe wound, a synchronized beneficial effect is achieved in the wound healing process.

The application of cultured keratinocytes appears to promote healthy granulation tissue formation within the wound bed. The graft, when applied as a sheet, acts 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.[7] Their brief contact with the wound, however, seems sufficient to stimulate reepithelialization, 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 grafts to cover the wound. In our case, we have used autologous non-cultured, non-trypsinised keratinocytes cells to promote the healing. We observed favourable results in terms of the formation of healthy granulation tissue and rapid epithelialization of the wound from the margins.

The mechanism of action by which sucralfate helps in wound healing is multifaceted. Sucralfate increases growth factors bioavailability and prostaglandins and decreases the production of oxygen free radicals synthesis, thus potentiating angiogenesis, granulation tissue, and re-epithelialization. It increases the bioavailability of growth factors, particularly of FGF. It increases the production of prostaglandins and inhibits oxygen-free radicals[8].

In our case, we have used sucralfate cream locally and noncultured keratinocyte graft over second-degree scald burns. We have observed rapid healing in terms of reduction in necrotic tissue and faster appearance of granulation tissue along with epithelialization of the wound. The commercially

available sucralfate cream also contains xylocaine, which helps in pain relief. No adverse effect was noted with its application.

Due to the small sample size statistical analysis could not be done. A randomized control study with an adequate sample size with wounds of different etiology is desirable to substantiate the results.

CONCLUSION

The application of non cultured keratinocyte graft with sucralfate in the treatment of second-degree scald burns has been proven effective in this study. It hastens the overall healing time of second-degree superficial and deep wounds to within a week. Thus minimizing the total hospital stay and infection rates.

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