Original Article

RFP Journal of Hospital Administration
Volume 6 Number 2, July-December 2022

Role of Hybrid Reconstruction Ladder in Pediatric Thermal Burns

Jackson Nuli[1], Ravi Kumar Chittoria[2], Barath Kumar Singh[3]

How to cite this article:
Jackson Nuli, Ravi Kumar Chittoria, Barath Kumar Singh/Role of Hybrid Reconstruction Ladder in Pediatric Thermal Burns/ RFP Journal of Hospital Administration. 2022;6(2):45-48.

Abstract

Burns and related injuries are common causes of deaths and disability. The highest incidences of burn cases occur in children and adults. In children less than 2 years of age, contact with hot surfaces and scald burns are the most common presentation to the hospital. The practice of cooking at ground level or sleeping with a burning lamp are some of the causes. Early management of this type of burns results in better outcomes. In this case we describe the role of Hybrid reconstruction ladder using regenerative methods in the management of paediatric thermal burns.

Keywords: Hybrid reconstruction ladder; Paediatric; Thermal burns.

INTRODUCTION

Burns are one of the leading causes of morbidity and mortality in children. Basic knowledge about thermal injury is important in the management of children presenting with burns. A study by Davis in 1990 quoted 2 million incidences of burns per year in the Indian Subcontinent. Forty percent of burn victims are under 15 years of age. Scalds and hot liquids make up 90% of burn injuries to children. Common sites are at home around the kitchen and open fire places. The reconstructive ladder was a term coined by plasticand reconstructive surgeons to describe levels of increasinglycomplex management of soft tissue wounds.[1] Theoretically, the surgeon would utilize the lowest rung of the ladder, that is, the simplest reconstruction technique to address a clinical reconstructive problem. The hybrid reconstructive ladder can be used to augments the traditional reconstructive ladder withregenerative medicine modalities (Fig. 1). In this case report, we assess the role of hybrid reconstruction ladder in the management of pediatric thermal burns.

Authors Affiliation: [1]International Visitor, Department of Plastic Surgery, [2]Professor & Head of IT Wing and Telemedicine, Department of Plastic Surgery & Telemedicine, [3]Senior Resident, Department of Plastic Surgery, Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry 605006, India.

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

E-mail: drchittoria@yahoo.com

Received on: 12.09.2022 **Accepted on:** 03.10.2022

Fig. 1: Hybrid reconstruction ladder

MATERIAL AND METHODS

This study was conducted in the Department of Plastic Surgery in a tertiary care institute. Informed consent was obtained from the patient under study. Department scientific committee approval was obtained. It isa single center, non-randomized, non-controlled study. The patient under study was a 2-years-old female, with no other known comorbidities presented with second degree deep scald burns to the right chest, arm and forearm constituting 15% of total burn surface area (Fig. 2). The burn wound was debrided with hydro-jet (Fig. 3) and regenerative therapies like Autologous platelet rich plasma (APRP) (Fig. 4), sucralfate application (Fig. 5) and biological collagen scaffold dressing (Fig. 6) was done. APRP was applied once in a week for four weeks.Nonviable necrotic tissuein the deep burn areas were managed with tangential excision and split skin grafting was done (Fig. 7). Negative pressure wound therapy was applied to the woundpre and post skin grafting (Fig. 8). Low level laser therapy was applied once in a week for 10 min for four weeks pre and post skin grafting (Fig. 9).

Fig. 2: At the time of presentation

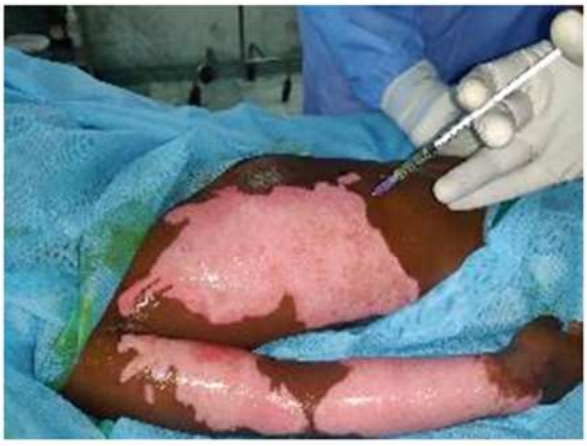

Fig. 4: Autologous platelet rich plasma applied to the burn wound.

Fig. 3: Hydro jet debridement

Fig. 5: Sucralfate therapy applied to the wound.

Fig. 6: Collagen scaffold dressing

Fig. 7: Split thickness skin graft

Fig. 8: Negative pressure wound therapy

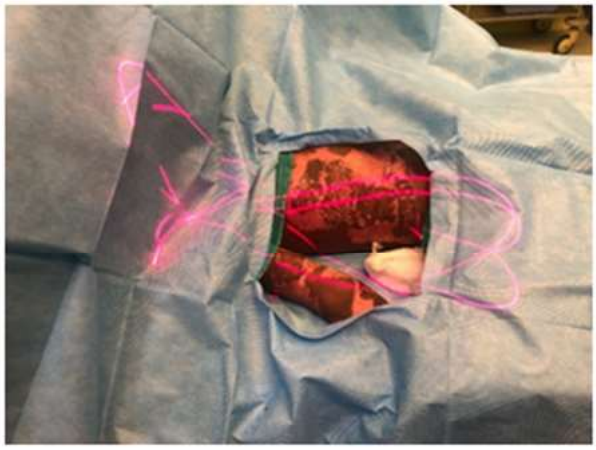

Fig. 9: Low level laser therapy

RESULTS

The second degree superficial burn wounds healed well. The graft uptake was good at the site of second degree deep burns after tangential excision. Patient was discharged successfully with all burn wounds healed well (Fig. 10). Intraoperative and postoperative period was uneventful.

Fig. 10: Healed burn wounds at the time of discharge

DISCUSSION

Hybrid reconstructions have transformed the management of complex injuries and have offered the extension of indications for techniques available to manage composite tissue loss. Continued research and the development of strategies to address complex tissue loss are of continued interest. The utilization of biologic scaffolds may enhance the wound healing process.[1] APRP is known to induce collagen, blood vessel and adipose tissue formation and also aid in tissue moulding.[2,3] This not only helps in the taking up of the skin grafts applied but also in ensuring more cosmetically appealing scar formation.[4,5]

Studies and rare case reports all show that topical sucralfate therapy is effective for treating wounds. Sucralfate suppresses the release of interleukin-2 and interferon gamma damaged skin cells while promoting the growth of dermal fibroblasts and keratinocytes in vitro.[6,7] Sucralfate has a physical barrier effect that reduces inflammatory response and promotes mucosal repair. Additionally, sucralfate promotes angiogenesis, which speeds up wound healing. Sucralfate raises the levels of basic fibroblast growth factor (bFGF) and epidermal growth factor in the wound.[8] Additionally, sucralfate promoted the release of IL-6 and PGE2 from skin cells, which aided in the healing process.[9]

LLLT has analgesic and anti-inflammatory properties in addition to stimulatory effects on tissue regeneration, wound healing, and repair.[10] At the cellular level, the LLLT stimulates cell growth, increases fibroblast proliferation, decreases the formation of fibrous tissue, promotes cell regeneration, increases the production of collagen, decreases the formation of oedema, increases the synthesis of growth factors, decreases the number of inflammatory cells, decreases the synthesis

of inflammatory mediators like substance P, bradykinin, histamine, and acetylcholine, and stimulates the production of nitric oxide. The power, wavelength, and duration of LLLT treatment all affect the photobiological effects. Gallium Arsenide Ga-As, Gallium Aluminum Arsenide, Krypton, Helium Neon He-Ne, Ruby, and argon are among the regularly utilized LLLT lasers. It has been utilized to manage burn wounds as well as acute and chronic pain, wrinkles, scars, hair loss, and photo rejuvenation of photodamaged skin. Due to its bio stimulatory qualities, LLLT has been demonstrated to be beneficial as an adjuvant therapy in the care of wounds. Burn wounds treatment using low-level laser therapy (LLLT) can enhance and hasten the healing process and also in scar modulation.[11]

According to the literature, negative pressure wound therapy is thought to have four main mechanisms of action: contraction of the wound, stabilization of the wound environment, removal of extracellular fluids, and micro deformation at the foam wound interface.[12,13] It has been useful in the healing of burn wounds and scar modulation.

CONCLUSION

The hybrid reconstruction ladder with regenerative modalities can be used to manage cases of pediatric scald burns with satisfactory results.

Conflicts of interest: None.

DECLARATIONS

Authors' contributions: All authors made contributions to the article

Availability of data and materials: Not applicable.

Financial support and sponsorship: None.

Consent for publication: Not applicable

REFERENCES

1. Turner NJ, Badylak SF. Biologic scaffolds forMusculo tendinous tissue repair. Eur. CellMater. 25, 130–143(2013).
2. Tenenhaus M, Rennekampff HO. Surgical advances in burn and reconstructive plastic surgery: new and emerging technologies. Clin. Plast. Surg. 39(4), 435–443 (2012).
3. Salazar-Álvarez AE, Riera-del-Moral LF, García-Arranz M, Alvarez-García J, Concepción-Rodriguez NA, Riera-de-Cubas L: Use of platelet-rich plasma in the healing of chronic ulcers of the lower extremity. ActasDermosifiliogr 2014; 105:597-604.
4. Picard F, Hersant B, Bosc R, Meningaud JP: Should we use platelet-rich plasma as an adjunct therapy to treat "acute wounds", "burns", and "laser therapies": a review and a proposal of a quality criteria checklist for further studies. Wound Repair Regen 2015; 23:163-170.
5. Cobos R, Aizpuru F, Parraza N, Anitua E, Orive G: Effectiveness and efficiency of platelet rich plasma in the treatment of diabetic ulcers. Curr Pharm Biotechnol 2015; 16:630-634.
6. Tumino G, Masuelli L, Bei R, et al. Topical treatment of chronic venous ulcers with sucralfate: a placebo con-trolled randomized study. Int J Mol Med. 2008; 22:17.
7. Gupta PJ, Heda PS, Shrirao SA, et al. Topical sucralfate treatment of anal fistulotomy wounds: a randomized placebo-controlled trial. Dis Colon Rectum. 2011; 54:699–704.
8. Burch R, McMillan B. Sucralfate induces proliferation of dermal fibroblasts and keratinocytes in culture and granulation tissue formation in full-thickness skin wounds. Agents Actions. 1991; 34:229–231.
9. Folkman J, Szabo S, Shing Y. Sucralfate affinity for fibro-blast growth factor. J Cell Biol. 1990;111: A223.
10. Farivar S, Malekshahabi T, Shiari R. Biological Effects of LowLevel Laser Therapy. J Lasers Med Sci 2014; 5 (2):58-62.
11. Andrade F, Rosana C, Manoel F. Effects of low-level laser therapy on wound healing. Rev. Col. Bras. Cir. 2014 Apr; 41(2):129-133.
12. Avci P, Gupta A, Sadasivam M, Vecchio D, Pam Z, Pam N, et al. Low-level laser (light) therapy (LLLT) in skin: stimulating, healing, restoring. SeminCutan Med Surg. Panayi AC, Leavitt T, Orgill DP. Evidence based review of negative pressure wound therapy. World J Dermatol. 2017;6 :1–16.
13. Wynn M, Freeman S. The efficacy of negative pressure wound therapy for diabetic foot ulcers: a systematised review. J Tissue Viability. 2019;28 :152–160.2013; 32(1):41–510.