Aesthetic Superiority of Autologous Cell Suspension Device in Treating Deep Partial and Full Thickness Burn Compared to Skin Graft in a Single Case

Presenting Author	Jay P. Desai, MBBS, Firefighter Burn Center, Regional One Health, Memphis, TN
Co-authors	Ammar Mahmoud, MD Burn Fellow, Department of Plastic Surgery UTHSC, Memphis, TN David M. Hill, PharmD., BCPS, BCCCP, Associate Professor, Department of Clinical Pharmacy and Translational Science, UTHSC, Memphis, TN William L. Hickerson, MD, FACS, Professor of Plastic Surgery & Director of Firefighters' Burn Center UTHSC, Firefighters' Burn Center, Memphis, TN Sai R. Velamuri, MD, Associate Professor and Burn Fellowship Program Director, Department of Plastic Surgery, UTHSC, Firefighters' Burn Center, Memphis, TN
Disclosure Information	Author has no relevant financial relationships to declare. Ammar Mahmoud has no relevant financial relationships to declare. David M. Hill has no relevant financial relationships to declare. William L Hickerson – Speaker's Bureau: PermeaDerm; VeriCell Medical Advisory Board: Avadim Sai R. Velamuri – Speaker's Bureau: Medline

Abstract

Background: Today, patients sustaining deep burn injuries have improved survival outcomes when treated at the burn center, however, the majority of them face serious scarring, life-long physical disabilities, and psychological impairment. (1) The standard of care for adequate closure of full-thickness burn is the use of split-thickness skin graft (STSG).(2, 3) However, skin grafting has some limitations which include lack of donor site in case of extensive burn injuries and need for multiple surgeries by re-harvesting the same donor site after adequate healing. Additionally, the functional and cosmetic outcomes are less than ideal in most of the instances. (4, 5) Alternatively, the autologous cell harvesting device works on the principle of immediate autologous transplantation of a certain population of skin cells harvested without laboratory culture. The preparation is an autologous regenerative epidermal suspension which can be applied to a larger treatment area, with every 1 cm2 of donor skin covers up to 80 cm2 of treatment area. The device aims to minimize the amount of donor skin burden, reduce total number of operations, and enhance healing time.(6, 7). We present a case of deep partial and full thickness burns to the breast and abdomen treated with an autologous skin cell suspension technique.

Methods: Appropriate consent was taken from the patient to use her medical history and treatment photographs for educational presentation and publication. The electronic health record was utilized to collect necessary data.

Findings: A 38-year-old African American female presented to emergency room after sustaining deep partial and full-thickness burns to 28% of her body. After stabilization on the 6th day of admission, the patient underwent surgical excision of the burn wound down to fat to both upper arms and left axilla, while the rest of the burn areas involving bilateral upper

extremities, anterior trunk and part of bilateral lower extremities were excised down to the deep dermis. Preparation of the autologous skin cell suspension was started using harvesting and enzymatic process to prepare a suspension of about 24 ml to cover an area as wide as 1800 cm2. Allograft was applied on bilateral upper extremities, hands, right leg, and some part of the upper chest. The autologous skin cell suspension was sprayed to 1739 cm2 area of anterior chest (in between the interstices of allograft) and upper abdomen. Dressings to the chest and abdomen consisted of a clear, non-adherent pad, followed by petrolatum gauze, and bridal veil. The remaining areas, bilateral upper extremities and right lower leg, were dressed in petrolatum gauze, woven gauze, and elastic bandages. The postoperative course was not significant except for the development of some superficial hematoma on upper abdomen on POD 5 which was managed conservatively. The patient was transferred for inpatient burn rehabilitation on POD 19. She progressed well with inpatient physical therapy and occupational therapy, and discharge home on POD 32. She has very limited scarring as assessed by the Vancouver scale during her last follow up.

Conclusions: This case report demonstrates the successful use of this system for the treatment of extensive TBSA injury involving front of the chest and upper abdomen and compares its cosmetic superiority over STSG (allograft) use in the same patient. By using autologous regenerative epidermal suspension, we were able to cover 1739 cm2 of burn wound area with only 24 cm2 size of donor skin. The autologous cell suspension device demonstrated significantly reduced potential donor site burden and limited adverse scarring

Learning Objectives
1. Explain the use of the Cell Harvesting device and its effect on aesthetic outcomes.
2. Recognize the potential benefit of this non cultural cell graft over standard STSG.

References:
1. Klein MB, Goverman J, Hayden DL, Fagan SP, McDonald-Smith GP, Alexander AK, et al. Benchmarking outcomes in the critically injured burn patient. Ann Surg. 2014;259(5):833-41.

2. Edwards J. Management of skin grafts and donor sites. Nurs Times. 2007;103(43):52-3.

3. Chuenkongkaew T. Modification of split-thickness skin graft: cosmetic donor site and better recipient site. Ann Plast Surg. 2003;50(2):212-4.

4. Burnett LN, Carr E, Tapp D, Raffin Bouchal S, Horch JD, Biernaskie J, et al. Patient experiences living with split thickness skin grafts. Burns. 2014;40(6):1097-105.

5. Thourani VH, Ingram WL, Feliciano DV. Factors affecting success of split-thickness skin grafts in the modern burn unit. J Trauma. 2003;54(3):562-8.

6. Holmes Iv JH, Molnar JA, Carter JE, Hwang J, Cairns BA, King BT, et al. A Comparative Study of the ReCell(R) Device and Autologous Spit-Thickness Meshed Skin Graft in the Treatment of Acute Burn Injuries. J Burn Care Res. 2018;39(5):694-702.

7. Holmes JHt, Molnar JA, Shupp JW, Hickerson WL, King BT, Foster KN, et al. Demonstration of the safety and effectiveness of the RECELL((R)) System combined with split-thickness meshed autografts for the reduction of donor skin to treat mixed-depth burn injuries. Burns. 2019;45(4):772-82.