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Research Article

USE OF CADAVERIC SKIN ALLOGRAFT IN MANAGEMENT OF DEEP BURN WOUNDS: OUR EXPERIENCE

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ABSTRACT
The use of cadaveric skin graft for deep burns is a newer concept in burn wound management. Our aims of this study was to establish the importance of early cover of burns wound with cadaveric graft. 15 patients with second degree burns were debrided and cadaveric allografting was done. Results shows improved general condition of the patients in terms of decreased mortality and decreased hospital stay. So, it can be concluded that cadaveric skin graft is a very good and safe biological dressing for deep burns.

Key Words: *Cadaveric Skin Allograft, Second Degree Burn, Biological Dressing*

INTRODUCTION
Cadaveric skin bank has been established in our Department of Plastic Surgery under Burn unit to provide a ready source of cadaveric skin for patients with severe burns. The concept of skin donation after death is not new and USA stands as pioneer for establishing such idea. In the event of death, the skin graft can be procured from a donor with shortest delay after death, though it can be procured up to 24 hrs if the body is kept in a cold storage. The grafts are lifted under aseptic precautions and if serology and microbiology reports are satisfactory, the grafts are shifted to -20 degree C with 85 % glycerol as cryoprotectant. These grafts can be preserved up to 3 yrs.
Skin banking in our hospital started with the purpose of providing a ready source of skin allografts for severely burnt patients to enable expedient wound coverage after early excisions of burn wounds. Many major burn centers use cadaveric skin as temporary biological dressings in cases of massive thermal injury. The relatively low cost and availability allow to cover early, complete excision of the burn wound, which improves the general condition of the patient, reduces mortality (Tompkins *et al.* 1989), length of hospital stay (Herndon *et al.* 1986), and even blood loss (Desai *et al* 1990). In addition, cadaveric skin mitigates pain and aids wound-bed preparation before the placement of autografts and research demonstrates that many other applications in wound healing support the use of cadaveric skin as a true biological dressing (Spence *et al*. 1997).

MATERIALS & METHODS
This case series was performed in The Department of Plastic Surgery, during the time period August 2012 to July 2013. The role of using human cadaveric skin in the treatment of deep burns wounds, and the improvement in general condition of the patients (indicated by Hb% and serum total protein/albumin), number of debridements, degree of pain, duration of hospital stay and histological features of the interface between the patient's skin and the cadaveric skin were analyzed.
Inclusion criteria: All indoor patients between 10 – 60 yrs of age, with second degree deep burns were considered for the series. ***Exclusion criteria:*** All patients with exposed bones and tendons were excluded.
Harvesting of cadaveric skin: Cadaveric skin was harvested, processed, and frozen at the Skin bank of our Institution in accordance with the guidelines of the American Association of Tissue

Banks. All potential donors were screened for positive serology to Hepatitis B surface antigen, Hepatitis C, HIV, HTLV-1, and VDRL. Each donor body was scrubbed, rinsed with sterile water, tinted with povidone iodine and again rinsed with sterile water. This was wiped off and with sterile gauzes and 70% isopropyl alcohol which was allowed to air dry. The skin, 0.38 mm thick, was harvested and placed in sterile containers containing transport medium at 4 degree C.

Preparation*:* all pieces of skin were kept in 85% glycerol and shaked for 3 hrs at 33 degree C, in shaking incubator. After 3 hrs, the skin immersed in 85% glycerol was stored in freezer at - 20 degree C.

Final preservation*:* The skin was taken out from freezer into biosafety cabinet, cut into symmetrical strips, put in sterile vials containing 85% glycerol and stored in freezer at -20 degree C. Harvested skin samples were also sent for microbiological analysis and were released for use only if there was no evidence of infection with pathogenic organisms.

Application of Allograft: The average number of days for each wound type to be ready for allografting was 14 days. All wounds were debrided, followed by application of the cadaveric skin. The cadaveric skin was meshed prior to application. All wounds were resurfaced with a skin autograft after cadaveric skin allografting. No breakdown of the autografted skin grafts was found during the average 3 months followup.

RESULTS & DISCUSSIONS

Results

All wounds were resurfaced with a skin autograft after cadaveric skin allografting. No breakdown of the autografted skin grafts was found during the average 3 months followup. The average number of days for each wound type to be ready for allografting was 14 days. After clinical determination of engraftment 2 weeks after cadaveric skin allograft, skin samples (1 cm x 2 cm x 1 cm) harvested for histology revealed neovascularization beneath the surface of cadaver skin and the presence of granulation tissue in the base of the cadaver skin. All wounds exhibited good wound-bed preparation after cadaveric skin transplantation, and could eventually be resurfaced with a skin autograft. Patients treated with cadaveric skin grafting after early massive excision also needed lesser number of debridements, lesser duration of hospital stay, complained of less pain and an overall improvement of general condition.

Discussion

Even though new materials (ie, Hyalomatrix®, Terudermis®, Integra®) were used over time at the Tri-Service General Hospital for wound bed preperation (Caravaggi *et al.* 2011), cadaveric skin has long been the standard biomaterial for temporary skin replacement in patients with extensive burns (Greenleaf *et al.* 1994). To date, there is no better alternative to the biological properties of cadaveric skin (Kreis *et al* 1992). Many studies have reported that cadaveric skin has dermal elements that modulate the nature of the wound bed to create a milieu that is ideal for keratinocyte growth and skin reconstitution (Langdon *et al.* 1988 & Livesey *et al.* 1995). Although cadaveric skin traditionally offers temporary coverage for large wounds in burn patients, recent investigations suggest a host of additional applications (Spence *et al.* 1997). Snyder (2005) treated nonhealing ulcers with cadaveric skin, which appeared advantageous in preventing wound desiccation, controlling infection, and substantially reducing pain. Carucci *et al.* (2002) suggested that cadaveric skin may be useful in stimulating granulation tissue after Mohs microscopic surgery for the treatment of skin cancers involving the nose. In the current study, human cadaveric skin was used as temporary biological coverage after adequate debridement in deep burns wounds.

Histological studies postulate that cadaveric skin does not actually "take" in the traditional sense. It is hypothesized that granulation tissue actually replaces the cadaveric skin, which provides an

appropriate matrix for epithelial relining. Studies performed by Oliver *et al.* (1991) are in agreement with this hypothesis; their results indicate that, although cultured allografts do not survive, they may modulate the proliferation and differentiation of spontaneously regenerating epithelium. In this study, we found the presence of granulation tissue at the base of the cadaveric skin, in all the patients with good histological adhesion of the cadaveric skin. All wounds were eventually covered using a skin autograft because of the presence of adequate granulation in the wound bed. Dermal or bi-layered skin substitutes, hydrocolloids, and composite dressings are typically used by clinicians as temporary skin coverage (Snyder 2005), however, our perspective of performance and clinical outcomes showed cadaveric skin can achieve the same purpose. The cadaveric skin yielded good wound-bed preparation and led to the covering of all burns wounds with a skin autograft at an affordable price.

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