Indications for cadaver skin in burns and complex wound care

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Abstract

Best outcomes are achieved with the application of early excision and grafting, but availability limits this in the major burn. Cadaver skin is undoubtedly the best alternative to autograft, but ready supply is unreliable, and legislative and cultural restrictions have significantly influenced availability. This review summarises the indications for cadaver skin in burn surgery and complex wound care. The South African Burn Society prioritises the establishment of a deceased donor skin bank in South Africa, whose mandate it would be to procure and store allograft for distribution to burns units when required.

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Background

Patients with large deep burns suffer a cascade of sequelae as a consequence of the disruption of the skin’s temperature and fluid homeostatic function, as well as its protective function against physical and biological trauma. Major burns impose a significant catabolic stress on the body, and patients are profoundly immunocompromised, frequently suffering from derangements of electrolytes, nutritional markers and fluid balance.

A number of advances have been made over the last two decades, which have reduced mortality and morbidity rates significantly in the management of the major burn victim. Their success reinforces the prominent role that each member of the burn team plays in a patient’s successful outcome, which is now no longer just measured in terms of survival, but also in terms of functional outcomes, and the return to a quality of life that is deemed acceptable.

Despite these measures, and the widespread use of early excision and autografting, in the case of the very extensive burn, delayed definitive cover (using staged autografting) exposes the patient to a variety of virulent infections.1-3 In the context of the burn’s profound immunosuppression, this is now the leading cause of mortality.

There is much evidence that early complete excision of the burn wound and cover is the optimal strategy, but alternatives to autograft for cover have been required, and options include various manufactured skin substitutes and cadaver skin. These are not definitive therapies in deep burns, and autografting will still be required when available.4,5

Recent media attention in South Africa has detracted from the principles of ideal definitive wound cover. Whenever possible and certainly where full thickness wounds have been debrided, the definitive cover used should contain at least some dermis, or else the resulting wound breakdown and contracture will subject the patient not only to functional disability, but also to the need for endless reconstructive surgery. Epidermis-only options are needlessly expensive and suboptimal and are to be avoided.

Indications for cadaver skin

Superficial, partial thickness burns involve the epithelial and papillary dermis with blistering as a characteristic feature. Clinically, these wounds are sensate, blanch when examined, and their potential for healing depends on spared dermal elements and its appendages for regeneration. This is typical of scald injuries and a conservative approach for two weeks is usually applied.

Allograft may be useful as a temporary biological dressing in a freshly debrided partial thickness burn, as it has been shown to promote epithelialisation.6-8 This may also be applied in the management of exfoliative disorders such as Stevens-Johnson Syndrome/toxic epidermal necrolysis and staphylococcal scalded skin syndrome.

Deeper injuries, involving the reticular dermis or the full thickness of the skin, remove the potential for regeneration. These are non-blanching, fixed-staining or leathery wounds that are characterised by disorganised scarring if not addressed surgically; complete excision of the eschar to bleeding or to the next fascial layer (tangential or fascial excision) is imperative. If donor sites are inadequate, as in severe major burns, prompt coverage of the excised burn wound with allograft will protect the debrided area and promote vascular ingrowth that will optimise future healing.
Cadaver skin has improved survival rates by reducing the heat and fluid loss after excision, as well as the susceptibility to infection during the acute period. Figure 1 demonstrates the appearance of the wound bed on removal of cadaver skin.

If limited autograft is available by means of meshing and over-expansion of the autograft, then a sandwich technique may be applied. In this technique, referred to as the Alexander technique, widely meshed autograft is covered by unmeshed or non-expanded allograft, protecting the underlying tissue from desiccation, infection, and improves the quality of repair. Both the autograft and allograft adhere to the wound bed and as autologous epithelium grows across the interstices of the mesh graft, the allograft separates off the wound bed (creeping substitution).

Another indication for allograft use in burns surgery may be in the context of infected burns, when the risk of losing autograft loss may be significant. Cadaver skin “take” following debridement will suggest that the wound is prepared for autografting. This same principle has also been used for a variety of wounds from other causes, particularly if chronic or complex, as in the setting of malnutrition or peripheral arterial or venous diseases. In any setting where the allograft “takes”, it undergoes inosculation and angiogenesis, and when removed, leaves a wound bed ideally primed for autograft. If the allograft does not take, strategies are considered to address underlying causes, local factors such as infection and biofilm, and systemic factors that may be at play.

Deceased donor skin may also be de-epithelialised and rendered acellular, leaving a dermal scaffold that can be used as a dermal substitute in reconstructive surgery, for soft tissue augmentation, breast reconstruction, dural repair, hernia repair, and eyelid reconstruction.

**Conclusion**

The use of cadaver skin after early excision is an integral part of the management of major burns victims. There are a number of other indications for its use in the context of chronic or complex wound care. The South African Burn Society faces a number of challenges to improve the quality of burns care in South Africa: it has prioritised the establishment of a cryo-preserved skin bank as soon as possible.

**References**


**Figure 1:** Removal of cadaver skin applied after tangential excision in a full thickness burn. The wound bed is now prepared for autografting.