

New Skin for Old: The Use of Skin Substitute for Acute & Chronic Wounds

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Speaker:	Dr. T. J. Philips
Organizer:	Joint function of HKU, HKSDV, HKSPRS, HKOA

In this lecture the speaker gave an overview of various skin substitutes for wound management. Skin is the largest organ in human beings, with complex structure. The best substitute for skin is one's own skin-autograft. Nevertheless, it is a traumatic procedure and has to be done under general anaesthesia and requires post-operative hospitalization. Therefore different skin substitutes have been designed to minimize the need of using human skin.

Three skin substitutes were outlined as follows:

Epidermal type skin graft

It is a kind of cultured epidermal grafting of human keratinocytes. The cells are taken in skin biopsy. It usually takes three to four weeks for culture. This type of skin graft is commonly used in burn patients. The epidermal graft is fragile and thus difficult to handle, and it is also susceptible to trauma.

Dermagraft

In this method, human foreskin fibroblasts are used to seed onto polyglactin mesh scaffolding. The fibroblasts secrete collagen in the mixture and no epidermal cells are involved. Since the product can be cryopreserved, the graft can be saved for later use and make transportation possible. Good result has been shown for foot ulcer healing in patients with diabetes mellitus.

Composite skin substitute

This skin substitute consists of both a dermal and epidermal layer. The dermis is made from human cultured fibroblasts (from donated neonatal foreskin) and purified bovine collagen. The epidermis consists of keratinocytes that are also derived from the neonatal foreskin. The composite skin substitute mimics the structure of skin. Apigraft is the most experienced used graft of this type in the United State. It is approved by FDA for the treatment of diabetic foot ulcer and venous leg ulcer. It had been shown in studies that there was a high rate of complete healing and higher closure rate in chronic ulcers in diabetic foot ulcers. Uses in other area such as in decubitus ulcer, burn and epidermolysis bullosa had also been reported.

From the speaker's experience, Apigraft can be meshed to apply for a large wound and draining wound. It is easily handled, durable, and can be trimmed to different sizes. Compared to normal skin, the graft is devoid of Langerhans cells, resulting in a lack of immunological response and rejection reaction when applied in human wounds. Application of the skin equivalent may stimulate healing through the action of cytokines and other matrix components that stimulate epithelialization from the edge of the wound and promote the formation of new skin at the applied area.

The artificial skin substitute provides a physical and biological barrier against wound infection, and a physiological microenvironment for wound healing. The speaker stressed that extensive debridement of the ulcer area, eradication of infection, reduction of the trauma related to weight-bearing at the ulcer area, adequate blood supply are essential factors to the success of wound healing.

Learning points

Various skin substitutes are available for skin grafting. However, debridement, successful treatment of infection, adequate blood supply and off-loading are absolute prerequisites for wound healing.