Nursing management of skin graft sites

This article describes the use of skin grafts as a skin closure technique and identifies the common types of grafts, indications for use and their nursing management.

Date of acceptance: March 20, 1998.

As the largest organ of the body, intact skin is vital for life. The functions of the integumentary system include protection, excretion, body temperature regulation, cutaneous sensation, vitamin D synthesis and blood reservoir (Marieb 1989). Total skin loss is incompatible with life, as with large percentage surface area burns. Skin defects due to trauma may require surgery, the options varying according to the defect, causation, availability of resources and the individual.

This article will concentrate on the use of skin grafts as a closure technique and will identify the common types, their indications and nursing management.

DEFINITION OF SKIN GRAFTS
A skin graft is a segment of epidermis and dermis which has been completely separated from its blood supply and donor site attachment before being transplanted to another area of the body, its recipient site (Grabb and Smith 1991). A skin graft consists of epidermis and dermis and the thickness of the dermis constitutes the thickness of the graft. In 1869, Reverdin (Settle 1996) described reproducible skin grafting methods based on the principle that increasing the line of epithelialisation would lead to faster wound healing. Further clinical experiments suggested that certain characteristics determined graft 'take' including the condition of the wound bed and thickness of the graft. Complete coverage of the wound with the graft was found to result in a reduction in scarring.

Pinch grafts were developed as a method of coverage. Skin coverage using this technique results in ugly scarring, although it is still used where resources are minimal, such as in developing countries. A more detailed historical account can be found in McCarthy (1990).

From the 1930s onwards, developments in anaesthesia, instrumentation and microbiology increased the development of the split-skin graft. The Second World War accelerated further development and refinement of the science of plastic surgery. Little has changed in the way skin grafts are taken, though much experience has been gained in their use and knowledge about the ideal conditions for successful 'take'. Skin grafting is one of the most invaluable techniques available for reconstruction and one of the most frequently used type of skin coverage.

INDICATIONS
Skin grafts are indicated where skin loss has occurred due to burns or for reconstructive purposes, following trauma, infection (such as necrotising fasciitis), malformation, deformity, congenitally deformed tissue, removal of malignant lesions and plastic surgery where direct closure by suturing is not possible. The choice of skin graft, depth and donor site are of significant importance as is the knowledge of the factors influencing the 'take' of a graft.

TYPES OF SKIN GRAFT
Two classifications of free skin graft exist and are identified by the donor type or thickness of the graft harvested.

Those identified by the donor type are described as:
- Isograft is a graft donated between genetically identical individuals. These may also be called syngenic (McCarthy 1990)
- Allograft is a graft donated between genetically disparate individuals of the same species. The allograft can appear to survive for between five and 21 days but then is rejected due to a complex series of immune responses which remain unclear. Immunosuppression lengthens the rejection time. The graft then becomes necrotic. Non-vascular transfers survive for indefinite periods as in the case of corneal transplants. Allografts are useful to provide temporary protection by acting as a biological dressing reducing the bacterial exposure and fluid loss. The recently developed sandwich technique, described by Clarke (1992), can be used when the patient's own skin is harvested, meshed and applied to a suitable recipient site over which is then placed a meshed allograft. The allograft is then rejected after several days leaving the autograft in place. This technique is particularly useful in treating major burns in children when parental skin is used as an allograft.
Cultured keratonocytes are occasionally used but are delicate and rely on the presence of a dermal base to facilitate ‘take’. Cadaveric skin can be frozen and thawed for use as soon as possible, thus acting like a freshly harvested graft. Donors are screened for HIV and hepatitis B.

- Zenograft is a graft between members of a different species. Porcine skin may be utilised by humans to provide a temporary biological dressing, though this type of graft does not ‘take’.
- Autograft is the most common type of graft, transferred from one place to another on the same individual. A free graft is totally detached from the nerve and blood supply of the donor site. The remainder of this article will discuss the features of autografts.

Skin grafts can also be specified by the thickness of the dermis contained in the skin graft. They are broadly classified into full thickness and split skin graft:

- Full thickness skin (Wolfe) grafts consist of epidermis and the full thickness of dermis. These grafts contract less than split thickness skin grafts, although the size of the graft is limited as attached vessels or nerves remain in the donor area to bring about spontaneous healing. General or local anaesthetic is necessary and a tie over dressing (Table 1) is applied which is inspected and removed after ten days. The ‘take’ is slower than a split skin graft.
- Split thickness skin grafts are the most common and are further subdivided into:
  - Thin skin grafts (Thiersh)
  - Intermediate skin grafts
  - Thick skin grafts.

**Box 1. Full thickness donor sites**

- Postauricular
- Preauricular
- Supraclavicular
- Upper eyelid
- Antecubital and inguinal skin
- Hand skin
- Scalp
- Prepuce and labia majora
- Areola

**Box 2. Split thickness graft donor sites**

- Thigh and buttock
- Scalp
- Back
- Abdominal wall
- Upper arm
- Forearm

These vary depending on the thickness of dermis, the age, sex, health of the individual and body site where skin is harvested.

Skin grafts can be taken under local anaesthetic using a topical anaesthetic or nerve block depending on the sites involved. The recipient site may require debridement and, therefore, general anaesthesia.

**DONOR SITES**

The nearer the donor site to the recipient site, the more closely matched the skin colour. Sites for harvesting are identified in Boxes 1 and 2. The site chosen depends on the thickness of skin required. Factors to be considered when selecting the thickness of the graft include the size of the graft, site of the defect, colour, texture and re-epithelialisation of donor sites and hair growth.

**Sequence of skin graft healing**

Plasma-like fluid is absorbed by the graft. Blood then begins to flow in to the graft. Shearing of the graft should be avoided at this stage and immobilisation is necessary sometimes requiring anti-embolic therapy, if the leg is the recipient site. Early mobilisation is routine for most patients 24-48 hours post-operatively.

Vascular buds grow, connecting the graft to the recipient site. Lymphatic drainage occurs approximately five days post-operatively. Newly formed capillaries grow actively into the graft from the recipient bed within five days. Excessive friction at this stage can cause the graft to be separated from the recipient bed.

**Application**

The thicker the skin graft the longer the graft takes to heal. That is, a split skin graft heals more readily than a full thickness skin graft. McGregor and McGregor (1995) stated that the surface which granulates rapidly and well will take a graft readily; one which granulates only slowly takes a graft slowly. Paratenon, periosteum and pericondrium provide suitable recipient sites. Fascia and muscle provide the best recipients.

**Split skin rafts**

Skin may be applied in the form of sheets, stamps (approximately 2cm²) or can be meshed. Each has its own indication:

- Sheet grafts give the better aesthetic appearance and some clinicians feel that making perforations in the skin graft facilitates drainage of blood serous fluid and pus from beneath the skin graft allowing direct contact between the skin graft and recipient site.
- Stamp grafts have declined in use since the mesh graft has been developed. They allow drainage of fluid from beneath the graft as they cover a smaller surface area than the sheet graft. Harvested skin can be passed through a mesher which fenestrates the graft allowing the expanded skin to increase the surface area of the coverage. This can be useful when large...
surface areas require covering. The ratio of meshed skin can vary (Clarke 1992) but is not suitable for some areas as it retains its meshed appearance. The technique is avoided on skin used for the hands, face and neck where aesthetics are a consideration. The raw areas then epithelialise leading to complete wound closure.

**Harvesting the skin graft** Skin is taken from the donor site using a Humby/Watson knife or a hand-held dermatome. The graft’s removal is performed and the site is under general or local anaesthetic and dressed with a haemostatic dressing (usually an alginate), followed by a secondary dressing and bandaged or taped in position. Skin can be stored in a clinical refrigerator at 4°C for between two and three weeks and applied at a later date or to the donor site immediately if necessary. When skin grafting large areas, surgeons usually apply the better quality skin on the key areas, such as over flexor surfaces of joints. Tulle gras and silicon-based products are used as a primary dressing on the recipient site with the choice of secondary dressing depending on the amount of exudate and the position of the recipient site.

**NURSING CARE OF GRAFT SITES**

Split skin grafts contract and often give poor cosmetic results and so are unsuitable for some areas, for example following the removal of lesions on the face and neck and for grafting to the eyelid or flexor surfaces. In these cases and if the recipient site is small, full thickness grafts are used. They are also used following trauma, removal of lesions and during reconstructive procedures.

Nerve supply is sometimes re-established but this may occur in only part. Various requirements are necessary for the survival of free skin grafts.

A vascular infection-free recipient bed with good contact between graft and recipient allows skin to ‘take’. Serum, blood, pus and necrotic tissue present a barrier which does not facilitate contact and growth of blood supply. Friction should be minimised, with the need for 24-48 hours bedrest and gradual mobilisation if the lower limbs are affected. Pressure dressings may reduce friction. Surgical glue can be applied to prevent slippage.

The first post-operative dressing may be carried out between three and ten days post-skin graft at which time fluid may be expressed. At times, it is necessary to delay the application of the harvested skin to the recipient site due to the position, infection or unsuitability of the recipient bed. Donor sites from split skin grafts take eight to 14 days to re-epithelialise and are dependent on the factors affecting the intrinsic and extrinsic rate of healing, the age of the individual and thickness of the skin harvested (Cutting 1994). Dressings are usually left intact until ten to 14 days after the graft. The donor site of the graft heals by secondary intention. The thicker the dermis, the longer the healing period.

Donor sites are very painful though this can be minimised by soaking the area in local anaesthetic post-operatively. Pain can be minimised on removal of the dressing by soaking the site in saline or bathing water.

Various authors have identified the characteristics of the ideal dressing (Pruit and Levine 1984) though at present the ideal dressing does not exist. In practice, alginates, hydrocolloids and gels are used as primary dressings on donor sites and these should ideally remain intact until healed. Donor sites are frequently colonised by bacteria and topical antimicrobial wound products may be indicated.

**Full thickness skin grafts** Full thickness skin grafts ‘take’ less easily as ideal conditions are necessary, such as infection-free recipient site and good vascularity. Grafts are secured using a tie over dressing which are removed after five to ten days.

Infected skin grafts result in low grade fever, pain, odour, itching and redness around the margins of the graft and occur two to four days post-operatively. Infection of the site may necessitate early inspection though this is normally done five or more days post-operatively. Infected skin grafts may require daily changes of topical antimicrobial dressings.

The presence of infection also prevents split skin grafts from taking and it is thought to interfere with the normal fibrin attachment of the graft by the fibrinolysin which it produces (McGregor and McGregor 1995). Prophylactic systemic antibiotics are not generally given except in the case of Haemolytic streptococcus Group A infection when patients are barrier nurses to prevent cross infection and dressings are often changed daily.

Smoking should be discouraged as it causes peripheral vasoconstriction thus reducing capillary contact.

**CONTINUING CARE**

The healing process continues long after the initial skin coverage. Skin which has been grafted often develops a hypertrophic scar, that is a reddened, raised and itchy scar. Keloid scars extend beyond the original site of injury, are thicker than hypertrophic scars and do not respond to the same treatment as hypertrophic scars. This can cause alterations of body image for the individual and various treatments are offered which aim to minimise the scarring. These can include silicon gel, pressure therapy, steroid injections and tape and occasionally surgery. The success of the treatment varies with individuals and may speed up the maturation process. Function can be limited by the use of splints particularly around the joints. Patients
experience anxiety, pain and depression following trauma or surgery and require support from the multi-disciplinary team including the clinical psychologist. Cosmetic camouflage may be required by some individuals once complete skin coverage has been attained.

Patients often experience itching sensations at both donor and recipient sites. This can begin a few days after the injury or intervention and continue for approximately 18 months. Itching can be minimised by systemic antihistamines and keeping the area and ambient environment cool. As the skin graft is deficient in nerves and the secreting glands function less effectively, the skin graft requires lubrication with moisturising cream once skin coverage has been achieved. This is best done by massaging an unperfumed cream, such as aqueous cream, into the graft areas. The area needs to be washed using an unperfumed soap. Grafted skin is vulnerable and needs to be protected from the sun by a total sun block. Chlorine needs to be showered off after swimming as some chemicals can cause local irritation.

CONCLUSION
Nursing care of people who have had skin grafts can be complex and each case must be considered individually. Specialists working in the area of burns and plastic surgery have gained experience in caring for individuals requiring skin grafts and although the ideal dressing does not exist, expertise has been developed in managing such wounds.

Following a skin graft, the nursing care a patient requires is dependent on various factors including the primary reason for the graft, the age and health of the patient and the condition of the donor and recipient site. The technique of skin grafting has been utilised for many years and practitioners have become more experienced in caring for individuals who require skin coverage. Developments in flap surgery and the introduction of dermal substitutes have not necessarily replaced the need for skin grafts but have allowed surgeons to offer the most appropriate treatment for the individual.

REFERENCES