MRS.KULANTHANIE

LECTURER

ICON

1. Introduction

Skin is the largest organ of the human body, representing approximately 16% of the total body weight. While the functions of protection and thermoregulation are well recognized, skin also has important metabolic functions in protein and vitamin D metabolism. The human body produces the greatest amount of vitamin D in the epidermal layer of the skin.In addition to providing a physical barrier to pathogenic organisms, skin functions as an active immune organ with distinctive antigenic properties that play a significant role with particular regard to composite tissue allotransplantation.

Despite its numerous beneficial properties, skin is an organ that is often abused and underappreciated by the individual until its compromise results in pain and loss of resistance to infection. Restoration of an intact barrier is of critical importance and may be achieved in numerous ways, including grafting. Among the indications for skin grafting are promotion of accelerated healing of burns and other wounds, reduction of scar contracture, enhancement of cosmesis, reduction of insensible fluid loss, and protection from bacterial invasion.

2. Complications of burns

Deep or widespread burns can lead to many complications, including:

- **Local infection.** Burns can leave skin vulnerable to bacterial infection, particularly staphylococcus infection, and increase your risk of sepsis, a serious infection that travels through your bloodstream and affects your whole body.
- **Widespread infection (sepsis).** Sepsis occurs when bacteria from an infection enter your bloodstream and spread throughout your body. Sepsis is a rapidly progressing, life-threatening condition that can cause shock and organ failure.The signs of early systemic sepsis are subtle and require a high indexof suspicion and very close monitoring of changes

in the patient'sstatus. Early signs of sepsis may include increased temperature, increasedpulse rate, widened pulse pressure, and flushed dry skin inunburned areas. As with many observations of the burn patient,one needs to look for patterns or trends in the data. Wound and blood cultures are performed as prescribed, and resultsare reported to the physician immediately. The nurse also observesfor and reports early signs of sepsis and promptly intervenes,administering prescribed IV fluids and antibiotics to prevent septicshock, a complication with a high mortality rate. Antibioticsmust be given as scheduled to maintain proper blood concentrations.

Serum antibiotic levels are monitored for evidence of maximaleffectiveness, and the patient is monitored for toxic side effects.

- **Acute Respiratory Failureand Acute Respiratory Distress Syndrome**

The patient's respiratory status is monitored closely for increaseddifficulty breathing, change in respiratory pattern, and onset ofadventitious (abnormal) sounds. Typically at this stage, signs andsymptoms of injury to the respiratory tract become apparent, respiratory failure may follow. As described previously, signs ofhypoxia (decreased O2 to the tissues), decreased breath sounds,wheezing, tachypnea, stridor, and sputum tinged with soot (or insome cases containing sloughed tracheal tissue) are among themany possible findings. Patients receiving mechanical ventilationmust be assessed for a decrease in tidal volume and lung compliance.

The key sign of the onset of ARDS is hypoxemia while receiving100% oxygen, decreased lung compliance, and significantshunting. The physician should be notified immediately of deterioratingrespiratory status.

Medical management of the patient with acute respiratory failurerequires intubation and mechanical ventilation (if not already inuse). If ARDS has developed, higher oxygen levels, positive endexpiratorypressure, and pressure support are used with mechanicalventilation to promote gas exchange across the alveolar–capillarymembrane.

- **Visceral Damage**

The nurse must be alert to signs of necrosis of visceral organs dueto electrical injury. Tissues affected are usually between the entranceand exit wounds of the electrical burn. All patients withelectrical burns should undergo electrocardiographic monitoring,with dysrhythmias being reported to the physician. Careful attentionmust also be paid to signs or reports of pain related to deep muscle ischemia. To minimize the severity of complications,visceral ischemia must be detected as early as possible. Thephysician can perform **fasciotomies**to relieve the swelling andischemia in the muscles and fascia and to

promote oxygenationof the injured tissues. Because of the deep incisions involvedwith fasciotomies, the patient must be monitored carefully forsigns of excessive blood loss and hypovolemia.

- **Low blood volume (hypovolemia).** Burns can damage blood vessels and cause fluid loss. This may result in low blood volume (hypovolemia). Severe blood and fluid loss prevents the heart from pumping enough blood to the body.
- **Dangerously low body temperature (hypothermia).** The skin helps control the body's temperature, so when a large portion of the skin is injured, you lose body heat. This increases your risk of hypothermia — when the body loses heat faster than it can produce heat, causing a dangerously low body temperature.
- **Breathing (respiratory) problems.** Breathing hot air or smoke can burn airways and cause breathing difficulties. Smoke inhalation damages the lungs and can cause respiratory failure.
- **Scarring.** Burns can cause scars and keloids — ridged areas caused by an overgrowth of scar tissue.
- **Bone and joint problems.** Deep burns can limit movement of the bones and joints. Scar tissue can form and cause contractures, when skin, muscles or tendons shorten and tighten, permanently pulling joints out of position.
- **Contractures**

With early and aggressive physical and occupational therapy,contractures are rarely a long-term complication. However, surgicalintervention is indicated if a full range of motion in the burnpatient is not achieved.

3. Management of scars and contractures

Escharotomy helps to prevent problems due to inadequate chest expansion during inspiration or peripheral ischemia in the limbs. This should be done immediately after admission to the burn unit and before the edema occurs. Edema can jeopardize the blood supply to the periphery of the areas that were burned.

Grafting the Burn Wound

If wounds are deep (full-thickness) or extensive, spontaneous reepithelialisation is not possible. Therefore, coverage of the burn wound is necessary until coverage with a graft of the patient's own skin (**autograft**) is possible. The purposes of wound coverage are to decrease the risk for infection; prevent further loss of protein, fluid, and electrolytes through

the wound; and minimize heat loss through evaporation. Several methods of wound coverage are available; some are temporary until grafting with permanent coverage is possible. Wound coverage may consist of biologic, biosynthetic, synthetic, and autologous methods or a combination of these approaches. The main areas for skin grafting include the face (for cosmetic and psychological reasons); functional areas, such as the hands and feet; and areas that involve joints.

Grafting permits earlier functional ability and reduces **contractures** (shrinkage of burn scar through collagen maturation). When burns are very extensive, the chest and abdomen may be grafted first to reduce the burn surface. Granulation tissue fills the space created by the wound, creates a barrier to bacteria, and serves as a bed for epithelial cell growth. Richly vascular granulation tissue is pink, firm, shiny, and free of exudate and debris. It should have a bacterial count of less than 100,000 per gram of tissue to optimize graft take. If the wound is not ready for skin grafting, the burn wound is excised and allowed to granulate. Once the wound is excised, a wound covering is applied to keep the wound bed moist and promote the granulation process.

Immediate Excision and Grafting:

Burn Units offers the intensive care and patient monitoring needed to help them recover. This type of care allows the burn surgeon to perform escharectomy and immediate skin grafting within a 5 to 7 days after the accident. The burn victim becomes haemodynamically stable at this time. This usually shortens the hospital stay and prevents the toxemia, which can occur due to the toxic absorption of the dead proteins and the infection, which usually present in the sub-eschar plane.

3.1 Grafts

There are two major types of Surgical Procedures that can help to conceal scarring and replace lost tissue for severe burn victims:

a. **Dermabrasion**

Definition :

Dermabrasion is a surgical procedure to improve or minimize the appearance of scars, restore function and correct disfigurement resulting from an injury.

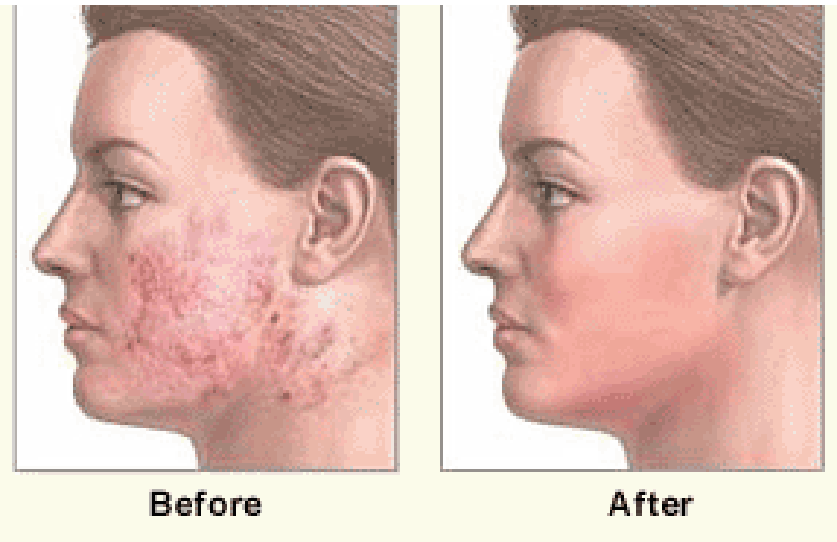
Dermabrasion is used to smooth scar tissue by shaving or scraping off the top layers or the skin. Though Dermabrasionsmoothes the surface of the scar it will not remove the scar. Scars

are permanent but their appearance will improve over time. The procedure may be performed in a dermatological surgeon's office or in an outpatient surgical facility.

Once the surgery is completed the skin will be treated with an ointment, a wet or waxy dressing, dry treatment or a combination of these. You can expect the skin to be red and swollen following surgery. The swelling will go down within 2 to 3 weeks. Patients will experience some aching, itching, tingling, or burning after surgery as new skin begins to grow. A crust will form over the area as it begins to heal, however, if ointment is applied to the area immediately following surgery, there will be little or no crust formation. As healing continues, the crust will fall away revealing a new layer of tight pink skin.

If the area remains red, swollen and itches after healing has started this may be a sign that abnormal scars are forming. Inform your surgeon if you are experiencing these symptoms.

Following the operation, we can expect the patient to return to normal activities such as work in about two weeks. Patient should any activity that could cause a bump to the treated area for about two weeks. Sports should be avoided for 4 to 6 weeks following surgery. It is important to protect the skin for 6 to 12 months until the pigment has completely returned. The skin pinkness will take about 3 months to fade. When full re-pigmentation has returned the skin should closely match the surrounding skin.



b. Skin grafts

Definition

A Skin Graft is surgical procedure in which a piece of skin from one area of the patient's body is transplanted to another area of the body.

Skin from another person or animal may be used as temporary cover for large burn areas to decease fluid loss. The skin is taken from a donor site, which has healthy skin and implanted at the damaged recipient site. Skin graft and flaps are more serious than other scar revision surgeries such as dermabrasion. They are usually performed in a hospital under general anesthesia. The treated area depending on the size of the area and severity of the injury will determine the amount of time needed for healing. This time may be 6 weeks or a few months. Within 36 hours of the surgery new blood vessels will begin to grow from the recipient area into the transplanted skin. Most grafts are successful, but some may require additional surgery if they do not heal properly.

4. Classification of grafts

a. Autografts

Skin transplanted from one location to another on the same individual is termed an autogenous graft or autograft.

Autografts remain the preferred material for definitive burn wound closure following excision. Autografts are the ideal means of covering burn wounds because the grafts are the patient's own skin and thus are not rejected by the patient's immune system. They can be split-thickness, full-thickness, pedicle flaps, or epithelial grafts. Full-thickness and pedicle flaps are commonly used for reconstructive surgery, months or years after the initial injury. Split-thickness autografts can be applied in sheets or in postage stamp–like pieces, or they can be expanded by meshing so that they can cover 1.5 to 9 times more than a given donor site.

- **Pinch grafts** - Quarter inch pieces of skin are placed on the donor site. These small pieces of skin will then grow to cover injured sites. These will grow even in areas of poor blood supply and resist infection.
- **Split-thickness grafts** - consists of sheets of superficial and some deep layers of skin. The grafts removed from the donor sites may be up to 4 inches wide and 10 to 12 inches long. The grafts are then placed at the recipient site. Once the graft is in place, the area may be covered with a compression dressing or the area maybe left exposed. Split-thickness grafts are used for non-weight-bearing parts of the body.

Skin grafts are classified as either split-thickness or full-thickness, depending on the amount of dermis included in the graft. A partial or split-thickness skin graft (STSG) contains a variable thickness of dermis, while a full-thickness skin graft (FTSG) contains the entire dermis. Split-thickness skin grafts are further categorized as thin (0.005-0.012 in),intermediate (0.012-0.018 in), or thick (0.018-0.030 in) based on the thickness of graft harvested.

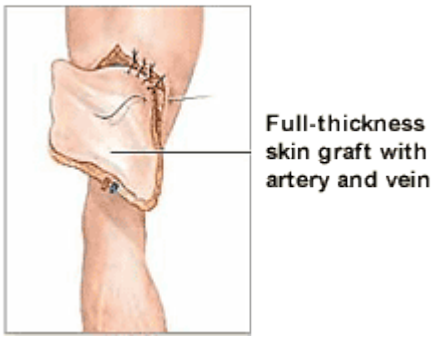
The thicker the dermal component, the more the characteristics of normal skin are maintained following grafting. This is because of the greater collagen content and the larger number of dermal vascular plexuses and epithelial appendages contained within thicker grafts. However, thicker grafts require more favorable conditions for survival because of the greater amount of tissue requiring revascularization. The choice between full- and split-thickness skin grafting depends on wound condition, location, and size, as well as aesthetic considerations.

They also are used to achieve temporary closure of wounds created by the removal of lesions that require pathologic examination prior to definitive reconstruction. Split-thickness skin graft donor sites heal spontaneously with cells supplied by the remaining epidermal appendages, and these donor sites may be reharvested once healing is complete.

Split-thickness grafts also have significant disadvantages that must be considered. Split-thickness grafts are more fragile, especially when placed over areas with little underlying soft tissue bulk for support, and usually cannot withstand subsequent radiation therapy. They contract more during healing, do not grow with the individual, and tend to be smoother and shinier than normal skin because of the absence of skin appendages in the graft. They tend to be abnormally pigmented, either pale or white, or alternatively, hyperpigmented, particularly in darker-skinned individuals. Their lack of thickness, abnormally smooth texture, lack of hair growth, and abnormal pigmentation make these grafts more functional than cosmetic. When used to resurface large burns of the face, split-thickness grafts may produce an undesirable masklike appearance. Finally, the wound created at the donor site from which the graft is harvested is often more painful than the recipient site to which the graft is applied.

- **Full-thickness grafts** - are used for weight-bearing portions of the body and friction prone areas such as, feet and joints. A full-thickness graft contains all of the layers of the skin including blood vessels. The blood vessels will begin growing from the recipient area into the transplanted skin within 36 hours. Full-thickness grafts retain

more of the characteristics of normal skin, including color, texture, and thickness, when compared with split-thickness grafts. Full-thickness grafts also undergo less contraction while healing. However, full-thickness skin grafts are limited to relatively small, uncontaminated, well-vascularized wounds and thus do not have as wide a range of application as split-thickness grafts. Donor sites must be closed primarily or, more rarely, resurfaced with a split-thickness graft from another site.



- **Pedicle grafts** - with a pedicle graft a portion of the skin used from the donor site will remain attached to the donor area and the remainder is attached to the recipient site. The blood supply remains intact at the donor location and is not cut loose until the new blood supply has completely developed. This procedure is more likely to be used for hands, face or neck areas of the body.

The success of a skin graft can be determined within 72 hours of the surgery. If a graft survives the first 72 hours without an infection or trauma the body in most cases will not reject the graft. Before the surgery, the recipient and donor sites must be free of infection and have a stable blood supply. Following the procedure moving and stretching the recipient site must be avoided. Dressings need to be sterile and antibiotics may be prescribed to avoid infection.

Comparison of Split and Full thickness skin grafts

Characteristics	Split-Thickness Skin Graft (STSG)	Full Thickness Skin Graft (FTSG)
Structure	100% Epidermis & Part of the Dermis	100% Epidermis & Dermis. Also A Percentage of Fat
Graft Endurance	High Chance of Graft	Lower Chance of Graft Survival

	Survival	
Confronting to Trauma	Less Resistance	More Resistance
Cosmetic Appearance	Poor Cosmetic Appearance. Offers Poor Color and Texture Match. This Also Does Not Prevent Contraction.	Better-Quality Cosmetic Appearance. Thicker, and Prevents Contraction or Deformation.
When Performed	Temporarily or Permanently Performed After Excision of a Burn Injury, As Long As There Is Sufficient Blood Supply.	When Aesthetic Outcome Is Important (e.g., Facial Defects).
Donor Site Tissue	Abdomen, Buttock, Inner or Outer Arm, Inner Forearm and Thigh	Nearby Site That Offers Similar Color or Texture To The Skin Surrounding The Burned Area.
Disadvantages	Poor Cosmetic Appearance, a Greater Chance of Distortion or Contraction.	A Higher Risk of Graft Failure. The Donor Site Requires Long-drawn-out Healing Time And Has A Greater Risk Of Deformation And Hypertrophic Scar Formation.

b. Allografts and xenografts

Cadaveric grafts and porcine grafts are skin substitutes that have been used clinically for several decades. Cadaveric grafts are termed allografts, or homografts, because they are transplanted from one individual to another within the same species. Pig skin grafts are termed xenografts, or heterografts, because they are transplanted from an organism of one species to that of a different species. These may be prepared for use in several ways. They may be treated with glycerol and rapidly frozen with liquid nitrogen or they may be lyophilized and freeze-dried.

Both allografts and xenografts are biologic dressings only, are ultimately rejected by the patient's immune system, and need to be removed prior to definitive wound treatment or skin grafting. While xenografts are rejected before undergoing revascularization, allograftsinitially undergo revascularization but are typically rejected after approximately 10 days because of the strong antigenicity of skin. One notable exception occurs in immunocompromised patients, such as burn patients, whose rejection of allografts may be delayed up to several weeks.

Xenogeneic tissue such as porcine xenograft can be used as a temporary dressing for clean partial-thickness wounds, such as are incurred with toxic epidermal necrolysis (TEN), and such tissue has been shown to assist in reepithelialization of large defects such as major burns by stimulating granulation tissue formation. Products such as Permacolinclude modifications to porcine xenograft that extend the lifespan and microbial resistance of the graft..

c. Cultured skin grafts

The patient's own epithelial cells may be harvested and grown in culture for use as a larger epidermal autograft, in a technique that has been applied for over 20 years.These autografts address the epidermal layer only and are typically quite thin. Cultured epidermal autograft (CEA) such as Epiceland Laserskin use a biopsy from the patient that is expanded via culture techniques in the laboratory setting to produce a sheet of autogenous keratinocytes for grafting. The sheets of CEA are very thin (10 – 15 cells thick) and fragile; they have the strength when first applied of wet tissue paper and are easily torn. In patients with massive burns, CEA produces a better cosmetic result than if it weren't used, but CEA patients often require longer hospitalizations and more surgeries to release contractures because of the need to reduce movement to avoid damaging the delicate grafts until they are established. Products like Integra use products from animals, including collagen and condroitin, in combination with silicone to form a synthetic skin substitute as a temporary covering for massive burns

While CEA can ideally provide coverage of a large surface area defect using a small amount of donor tissue, this type of skin substitute has been associated with high rates of infection and graft loss, confirming the importance of the dermal layer in skin grafting. Cultured skin substitute (CSS) is composed of a CEA combined with a cultured autologous

dermal layer,therefore, it addresses both the dermal and epidermal skin layers. This provides a more biologically similar material for skin replacement.

d. Dermal substitutes

The production of an effective replacement material for the dermis has proved more challenging given the complexity of the dermal structure, although several materials have well-documented success in this capacity. Substitute materials are classified based on their epidermal, dermal, or composite structure, and are further categorized by composition as acellular or cellular, and living or nonliving.

Acellular dermal allografts, such as AlloDerm, are composed of cadaveric dermis that serves as a scaffold for the ingrowth of recipient tissue. AlloDerm has been studied in the repair of skin defects but has been used in multiple other applications, including abdominal wall reconstruction and coverage of implantable prostheses. As mentioned in an earlier section, AlloDerm has also been used in combination with a split-thickness skin graft for single-stage soft tissue defect reconstruction, with excellent results reported for coverage of head and neck defects.

Newer acellular dermal allografts include Strattice, SurgiMend, GraftJacket, NeoForm, and DermaMatrix,which have been studied for applications such as lower extremity, craniofacial, and breast reconstruction.

Integra is an acellular dermal regeneration template that became commercially available in 1996. It is a bilaminate membrane consisting of a porous collagen layer (dermal analogue) bonded to a thin silicone layer (temporary epidermis). The dermal layer becomes revascularized and populated by cells from the patient's own underlying tissue over 7-21 days. Once this process is complete, an ultrathin split-thickness skin graft, or epidermal autograft, must be placed over the new dermis after removal of the silicone layer from the new dermal layer.

These dermal substitutes have been extensively studied for coverage of partial and full-thickness defects and can be permanently incorporated into the patient's new skin layers without being rejected by the patient's immune system. They also carry the advantages of immediate availability, avoidance of the risks associated with cellular allogeneic materials,

the use of thinner split-thickness skin grafts, reduced donor site morbidity, and improved overall split-thickness skin graft incorporation.

e. Biosynthetic dressings

Several synthetic skin substitutes have become available for temporary wound coverage in preparation for definitive wound coverage.

Biobrane (UDL Laboratories, Inc., Rockford, Ill) is a biosynthetic dressing composed of a silicone membrane (the epidermal layer) coated on one side with porcine collagen and imbedded with nylon mesh (the dermal layer). When used to cover partial-thickness wounds, the mesh adheres to the wound until healing occurs below. Biobrane should be removed from any full-thickness wound prior to skin grafting. Biobrane is an established biosynthetic dressing for burn wounds, particularly in the pediatric population, but also has reported applications in patients with TEN, chronic wounds, or following skin resurfacing.

Cellular dermal allografts are composed of a collagen or polymer-based scaffold that is seeded with fibroblasts from a donor cadaver.

TransCyte is a nylon mesh incubated with human fibroblasts that provides a partial dermal matrix with an outer silicone layer as a temporary epidermis. It is indicated for use in deep partial or excised full-thickness wounds prior to autogenous skin graft placement. It must be removed or excised prior to grafting full-thickness wounds.

Dermagraft consists of human neonatal fibroblasts cultured on Biobrane. The neonatal fibroblasts are seeded into the nylon mesh. Approximately two weeks after application, the silicone membrane is removed and the wound bed grafted with a split-thickness skin graft. Dermagraft is a dressing and does not provide full dermal scaffolding, thus requiring standard depth split-thickness skin grafts.

Composite allografts are bilayer products such as Apligraf, which has a dermal component comprised of bovine collagen and neonatal fibroblasts combined with an epidermal layer formed by neonatal keratinocytes, and Orcel, which consists of a bovine collagen sponge coated with neonatal allogeneic keratinocytes. As allogeneic material, however, they cannot be used as permanent skin substitutes, as they will be rejected by the patient's immune system. These materials have primarily been used in the treatment of chronic wounds and

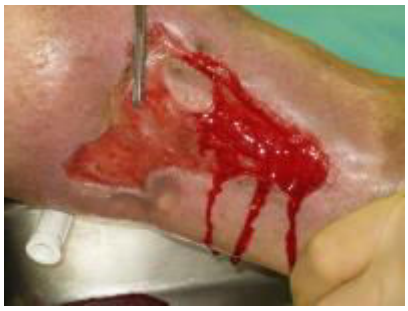
donor sites. They also have reported utility when used as an overlay dressing on split-thickness skin grafts to improve function and cosmesis.

5. Operative Technique

Wound preparation

Optimal skin graft success is influenced by several factors that should be addressed with thorough recipient site preparation prior to grafting. Clearly, a well vascularized recipient bed is of utmost importance in survival of the skin graft. With some exceptions, skin grafts rarely take when placed on bone, cartilage, or tendon without the presence of periosteum, perichondrium, or paratenon. The use of dermal substitutes such as AlloDerm has been described as a method to address such circumstances, as it provides an adequate vascular supply for subsequent split-thickness skin graft placement.

Early tangential excision of burn wounds is regarded as the standard of care for burns that are not anticipated to heal within 3 weeks.Special considerations in burn excision relate to burns of the face and hands. The aesthetic units of the face should be taken into account during excision, which can often be carried out using a hydrosurgery system such as Versajet for superficial partial thickness burns. When excising burns to the dorsum of the hand, particular care should be taken to avoid injury to the extensor tendons and peritenon to so as to provide a vascularized bed for graft take and preserve maximal postoperative function of the hand.



Recipient bed preparation using hydrosurgery system.

Meticulous hemostasis of the recipient bed is also key in preventing hematoma formation between the graft and wound bed. Haemostasis is typically achieved through use of epinephrine and saline-soaked gauze, particularly in freshly excised burns, in combination

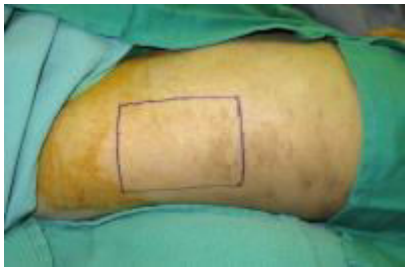
with precise electrocoagulation. Infection also compromises graft survival; therefore, careful preparation of the recipient bed is necessary. A recipient bed that contains a bacteria concentration greater than 10^5 organisms per gram of tissue will not support a skin graft.

6. Donor site selection

Donor site selection is based on multiple factors, including skin color, texture, dermal thickness, vascularity, and anticipated donor site morbidity.

Full-thickness grafts taken from the supraclavicular pre- or postauricular areas provide a suitable color match for defects of the face. The pattern for the graft should be enlarged by 3-5% to compensate for the immediate primary contraction that occurs because of the elastin fibers contained in the graft dermis, and the donor site may then be infiltrated with local anesthetic with or without epinephrine. The full-thickness skin graft is excised with a scalpel at the subdermal level of the superficial fat. The residual adipose tissue is subsequently removed with sharp curved scissors prior to placement in the recipient bed, as the fat is poorly vascularized and prevents direct contact between the graft dermis and the wound bed. Donor site defects resulting from full-thickness grafts must be closed primarily or, rarely, with a with a split-thickness graft, since no epithelial structures for regeneration remain.

Split-thickness skin grafts are commonly harvested from the thigh, buttocks, abdominal wall, or scalp. The method of harvesting the split-thickness skin graft depends primarily on the size and thickness needed for coverage of the defect. Smaller grafts can be taken using a "pinch graft" technique using a scalpel blade; slightly larger freehand grafts can be obtained with a Weck blade. Powered dermatomes such as the Zimmer are most commonly used to harvest split-thickness skin grafts, as they have a rapidly oscillating blade that can be set at an adjustable depth and width for appropriate coverage of the defect.



Donor site selection.

Procedure

Lidocaine with epinephrine may be injected subcutaneously at the donor site prior to harvesting, which aids in reducing blood loss and providing greater tissue turgor to facilitate graft harvest. The planned harvest site and dermatome can be lubricated with mineral oil, sterile saline, or Shur-Clens to enable easy gliding of the dermatome over the skin. Epinephrine-soaked gauze may be applied to the donor site immediately following harvest to achieve hemostasis.

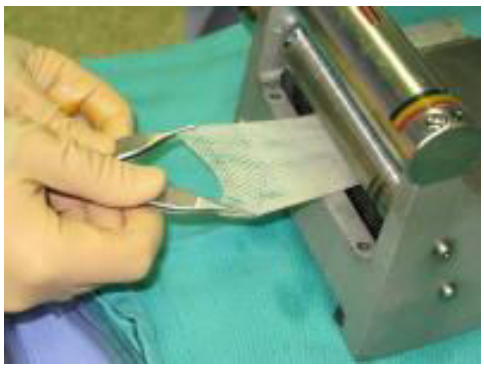
7. Skin graft meshing

A skin graft may be meshed to provide coverage of a greater surface area at the recipient site, with expansion ratios generally ranging from 1:1 to 6:1. This also allows for the egress of serous or sanguinous fluid; however, it results in a pebbled appearance upon healing that may ultimately be of poorer cosmesis.

The first reported use of skin graft mesh expansion was in 1907; modern skin graft meshers were introduced in 1964.

Types of meshes

Current meshers use one of two methods to mesh the graft. The first method is to use a smooth plastic plate, or carrier, to carry the skin graft under circular notched blades, as used in the Mesh Dermatome. The second method does not use a carrier; instead, it uses 2 opposing rollers, and the skin graft is cut as the 2 rollers meet, much like scissor blades cut paper. The Brennen Skin Graft Mesher (Brennen Med, St Paul, Minn) uses this method. Each method of skin meshing has advantages and disadvantages, and their use should be tailored to each clinical application.

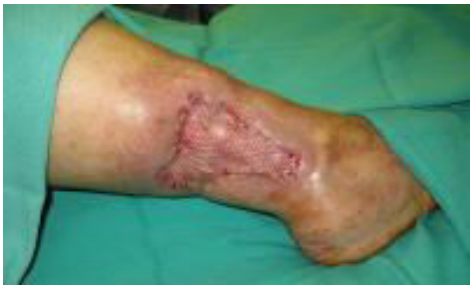


Meshing of split-thickness skin graft.

A sheet, or unmeshed, skin graft provides a continuous surface that may be more aesthetically acceptable but does not allow drainage of fluid and requires a greater surface area of harvested graft. A "piecrusting" technique is often employed in sheet or full-thickness grafts, as the creation of small incisions in the graft can allow for drainage without compromising the cosmetic appearance of the healed graft. For large surface area wounds that necessitate coverage with a full-thickness graft, such as the hands or face following burns, tissue expansion can be employed preoperatively to provide adequate surface area for coverage of the defect.

8. Graft application

One of the more common and expeditious methods of affixing a graft to the recipient site is with surgical staples, particularly to large recipient areas. In children or in sensitive areas of adults, sewing the graft into place using absorbable sutures may be more prudent.

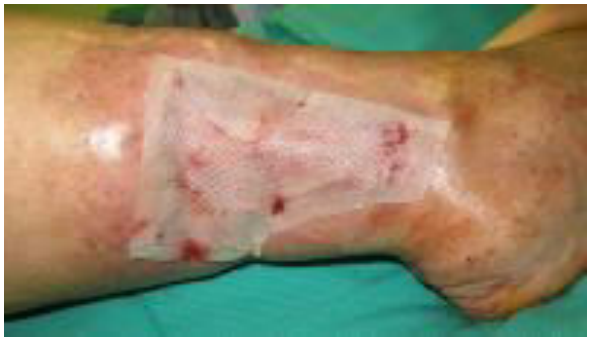


Skin graft affixed to recipient bed using surgical staples

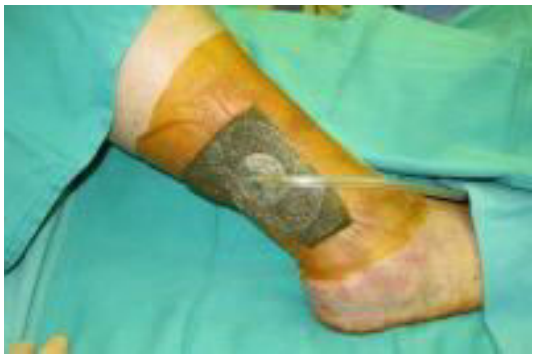
In selection of the final dressing, the prevention of shearing forces, seroma, or hematoma formation between the graft and recipient site is essential. Meshing or "piecrusting" the graft minimizes the risk of graft loss secondary to hematoma or seroma formation. The prevention of shearing forces that may disrupt graft take is accomplished by properly securing the graft to the site, which typically involves use of a bolster dressing or a negative pressure dressing. A bolster dressing typically is composed of moistened cotton balls wrapped in a petroleum gauze such as Xeroform (Kendall Healthcare, Mansfield, Mass), which is secured by placing sutures radially around the wound and tying them to each other over the bolster dressing to provide constant, light pressure to the graft. For skin grafts

to the lower extremity, an Unna boot dressing may be applied, as it performs the necessary action of maintaining graft integrity but also allows for early mobilization.

Alternatively, negative pressure dressings prevent shearing forces and reduce fluid collection between the graft and recipient bed, thereby facilitating plasmatic imbibition and revascularization, leading to a significant improvement in overall split-thickness skin graft survival.A nonadherent material such as Adaptic,must be placed as an interface between the skin graft and the VAC sponge to prevent disruption of the graft when removing the dressing. The initial dressing should be left in place for approximately 5 days (3-7 days) unless pain, odor, discharge, or another sign of a complication develops. A hematoma or seroma encountered at the dressing change should be addressed by making a small incision directly over the collection and expressing the underlying contents in order to minimize disruption of graft adherence.



Application of nonadherent dressing to skin graft prior to VAC placement.



VAC negative pressure dressing.

9. Care of the Patient with an Autograft.

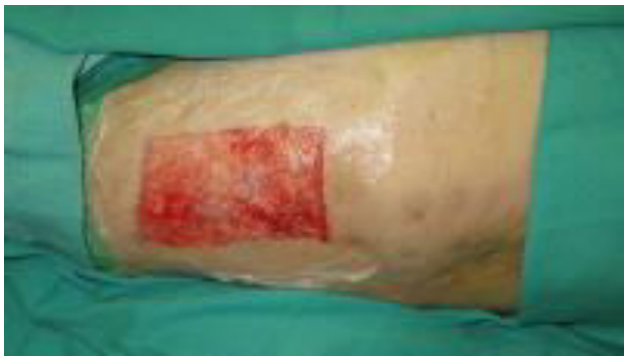
Occlusive dressings arecommonly used initially after grafting to immobilize the graft.Occupational therapists may be helpful in constructing splints toimmobilize newly grafted areas to prevent dislodging the graft.Homografts, heterografts, or synthetic dressings

may also be usedto protect grafts. The graft may be left open with skin staples toimmobilize it, which allows close observation of progress.The first dressing change is usually performed 3 to 5 days aftersurgery, or earlier in the case of purulent drainage or a foul odor.If the graft is dislodged, sterile saline compresses will help preventdrying of the graft until the physician reapplies it. The patient is positioned and turned carefully to avoid disturbingthe graft or putting pressure on the graft site. If an extremityhas been grafted, it is elevated to minimize edema. Thepatient begins exercising the grafted area 5 to 7 days after grafting.

10. Donor site care

The split-thickness skin graft donor site epidermis regenerates by secondary epithelialization from the wound edges and from immigration of dermal cells originating in the shafts of hair follicles as well as adnexal structures remaining in the dermis. Although the dermis never regenerates, the same site may be harvested again for subsequent grafts because only a portion is removed in a split-thickness graft.

The donor site is not without impaired cosmesis, however, as hypertrophic scar formation or changes in skin pigmentation can occur upon healing. Split-thickness graft donor sites generally heal within 7 days and can be dressed in various ways. An occlusive, semipermeable, polyurethane dressing such as OpSite, can be applied to the donor site and has the advantage of significantly reducing pain of the donor site in many patients while keeping the wound moist and thereby enabling it to heal faster (see image below). Should the serous fluid production preclude the use of an OpSite dressing, materials such as Xeroform(Kendall, Mansfield, MA) or Acticoat, may be applied to the donor site and left in place until healed.



Donor site dressing with OpSite.

11. Graft Survival and Healing

The ultimate success of a skin graft, or its "take," depends on nutrient uptake and vascular ingrowth from the recipient bed, which occurs in 3 phases. The first phase takes place during the first 24-48 hours. The graft is initially bound to the recipient site through formation of a fibrin layer and undergoes diffusion of nutrients by capillary action from the recipient bed by a process called plasmatic imbibition. The second phase involves the process of inosculation, in which the donor and recipient end capillaries are aligned and establish a vascular network.Revascularization of the graft is accomplished through those capillaries as well as by ingrowth of new vessels through neovascularization in the third and final phase, which is generally complete within 4-7 days. Reinnervation of skin grafts begins approximately 2-4 weeks after grafting and occurs by ingrowth of nerve fibers from the recipient bed and surrounding tissue. Sensory return is greater in full-thickness grafts because they contain a higher content of neurilemmal sheaths. Similarly, hair follicles may be transferred with a full-thickness graft, which allows the graft to demonstrate the hair growth of the donor site. Split-thickness grafts are ultimately hairless.

The amount of dermis present in the graft determines the degree of contraction immediately after harvest from the donor site and following placement and revascularization in the recipient bed. Freshly harvested grafts undergo immediate recoil as a result of elastin in the dermis in a phenomenon termed primary contraction. Therefore, a full-thickness skin graft contracts more initially following harvest as it contains the dermis in its entirety. Secondary contraction is likely due to myofibroblast activity and is defined as the contraction of a healed graft. The degree of secondary contraction is inversely related to the thickness of the skin graft.

Accordingly, split-thickness skin grafts contract more than full-thickness grafts following placement in the recipient bed. For that reason, full-thickness grafts are preferably used in areas that would be significantly impacted functionally or aesthetically by scarring or scar contracture, such as the head and neck, hands, genitals, or breast. Current investigations into methods to reduce initial contraction and subsequent need for contracture release include early mechanical restraint immediately following grafting as well as application of topical agents to delay keratinocyte differentiation or prevent crosslink formation.

12. Skin banks

Skin banks are similar to blood banks. They test for communicable diseases and store skin from individuals who agreed to be organ donors before dying. The donor skin (called an allograft) is preserved in a solution or frozen. Grafts from skin banks are used as a temporary covering to protect against infection, reduce pain, reduce fluid loss, and allow the tissues underneath to heal. However, because the body's immune system recognizes an allograft as being foreign, it rejects the graft in 1 to 3 weeks. It is then removed.

13. Skin Flaps

In some areas of the body release and skin graft procedures are not the best type of surgery to be used. This is due to either darker pigmentation or re-contracture especially in the neck or over the joints e.g.: in front of the elbow and the back of the knee. Because of that, the skin flap is the ideal choice. It will never contract and keep the same color match.

The skin flap is an area of the skin with the subcutaneous tissue to protect its blood supply. It is to be moved to the skin defect either locally or from a distance. Of course it is not always available, but with experience the burn surgeon can choose what is the best for every situation.

Over the last 30 years I corrected many thousands of cases of Post Burn Contracture (PBC) allover the body without exceptions. I have special interest PBC neck and PB in a deformed hand. This interested is because occur frequent in my area.

14. Conclusion

Skin grafting remains an important step on the surgeon's reconstructive ladder. While the basic premises have remained the same for many years, the development of new techniques and devices have contributed to significantly improved functional and aesthetic results. Advances in the production of skin substitutes have provided better options with which to treat patients and will continue to be an essential and dynamic component of this field in the future.

15. References

- Black.M.J&Hawks.H.J, *"medical surgical nursing",* 7th ed, vol 2, Elseiver, Pp1433-1455
- Lewis.M.S.,Heitkemper.M.M, &Dirksen.R.S., *"Medical surgical nursing"*, 6th ed, U.S.A, Mosby,pp: 515-524.

- Nettina. S.M.(1996), *"The Lippincott manual of nursing practice"*, 6th edition, Philadelphia, Lippincott Williams and Wilkins,Pp367-371.
- Weatherall .D.J.,Leadingham.J.G.G., Warell.D.A, *"Oxford textbook of medicine"*, vol I, 2nded,ELBS,Pp 6.127-6.129.