CHAPTER 2

GRAFTS AND FLAPS

When a deformity needs to be reconstructed, either grafts or flaps can be employed to restore normal function and/or anatomy. For instance, when wounds cannot be closed primarily or allowed to heal by secondary intention, either grafts or flaps can be used to reconstruct an open wound.

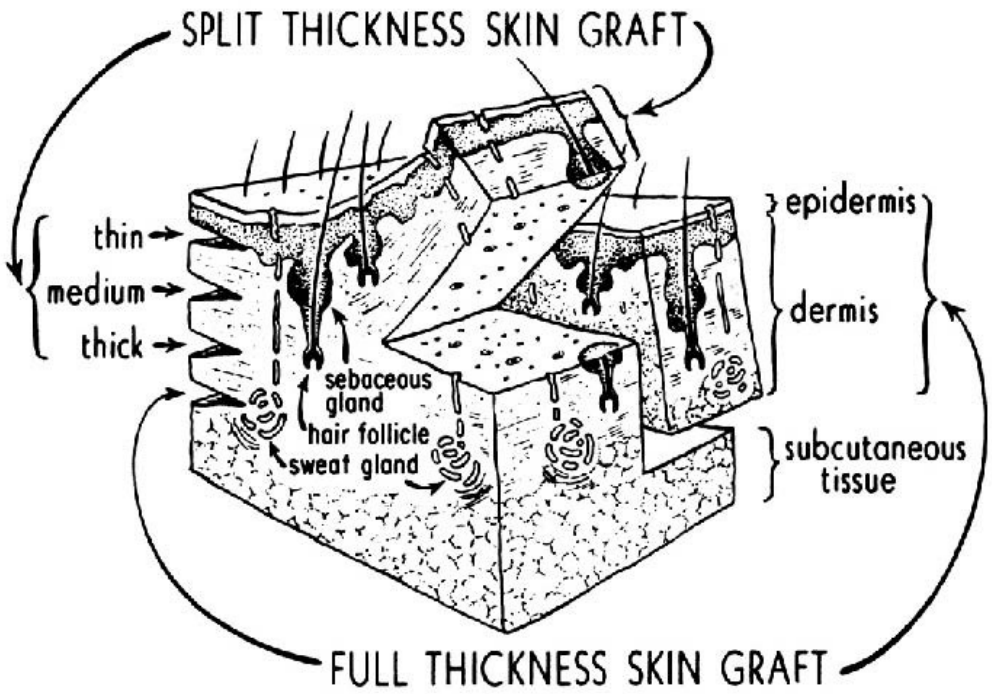
GRAFTS

Grafts are harvested from a donor site and transferred to the recipient site without carrying its own blood supply. It relies on new blood vessels from the recipient site bed to be generated (angiogenesis).

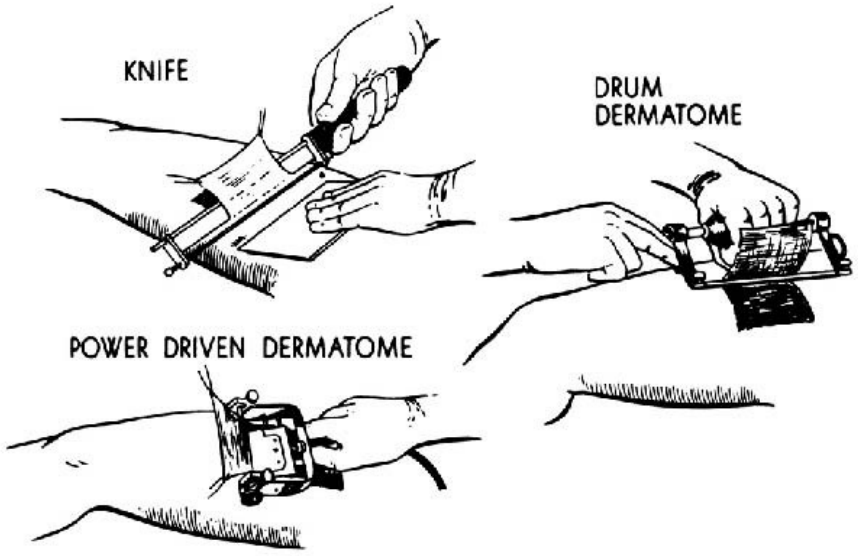
I. SKIN GRAFTS

A. Thickness (Figure 2-1)

1. Full thickness- Full thickness skin grafts (FTSGs) consist of the entire epidermis and dermis.
2. Split thickness- Split thickness skin grafts (STSGs) consist of the epidermis and varying degrees of dermis. They can be described as thin, intermediate, or thick.
3. Harvested using a dermatome or freehand. (Figure 2-2)



(FIGURE 2-1)



(FIGURE 2-2)

B. Donor site
    1. Full thickness- The full thickness skin graft leaves behind no epidermal elements in the donor site from which resurfacing can take place. Thus, the donor site of a FTSG must be closed. It must be taken from an area that has skin redundancy. It is usually harvested with a knife between the dermis and the subcutaneous fat.
    2. Split thickness- The split thickness skin graft leaves behind adnexal remnants such as hair follicles and sweat glands, foci from which epidermal cells can repopulate and resurface the donor site. It is usually harvested with either a special blade or dermatome that can be set to a desired thickness.
C. Recipient site
    1. Full thickness- Full thickness skin grafts are usually used to resurface smaller defects because they are limited in size. It is commonly used to resurface defects of the face. It provides a better color consistency, texture, and undergoes less secondary contraction.
    2. Split thickness- Split thickness grafts are usually used to resurface larger defects. Depending on how much of the dermis is included, STSGs undergo secondary contraction as it heals.
D. Survival
    1. Full thickness and split thickness skin grafts survive by the same mechanisms.
        a. Plasmatic imbibition (First 24-48 hours)- Initially, the skin grafts passively absorbs the nutrients in the wound bed by diffusion.
        b. Inosculation- By day 3, the cut ends of the vessels on the underside of the dermis begin to form connections with those of the wound bed.

c. Angiogenesis- By day 5, new blood vessels grow into the graft and the graft becomes vascularized.

2. Skin grafts fail by four main mechanisms
   a. Poor wound bed- Because skin grafts rely on the underlying vascularity of the bed, wounds that are poorly vascularized with bare tendons or bone, or because of radiation, will not support a skin graft.
   b. Sheer- Sheer forces separate the graft from the bed and prevent the contact necessary for revascularization and subsequent "take", which refers to the process of attatchment and revascularization of a skin graft in the donor site
   c. Hematoma/seroma- Hematomas and seromas prevent contact of the graft to the bed and inhibit revascularization. They must be drained by day 3 to ensure "take."
   d. Infection- Bacteria have proteolytic enzymes that lyse the protein bonds needed for revascularization. Bacterial levels greater than 105 are clinically significant.

E. Substitutes
   These usually provide temporary coverage; They require an adequately vascularized recipient bed
   1. Allograft/Alloderm- Cadaveric skin or dermis
   2. Xenograft- Skin from a different species, ie pig skin
   3. Synthetic- Biobrane, Integra

II. OTHER GRAFTS

A. Nerve
B. Fat
C. Tendon
D. Cartilage
E. Bone
F. Muscle
G. Composite-A graft that has more than one component, i.e. cartilage and skin graft, dermal-fat graft

FLAPS

Flaps are elevated from a donor site and transferred to the recipient site with an intact vascular supply. It survives by carrying its own blood supply until new blood vessels from the recipient site are generated at which time the native blood supply (pedicle) can be divided. Flaps can be used when the wound bed is unable to support a skin graft or when a more complex reconstruction is needed.

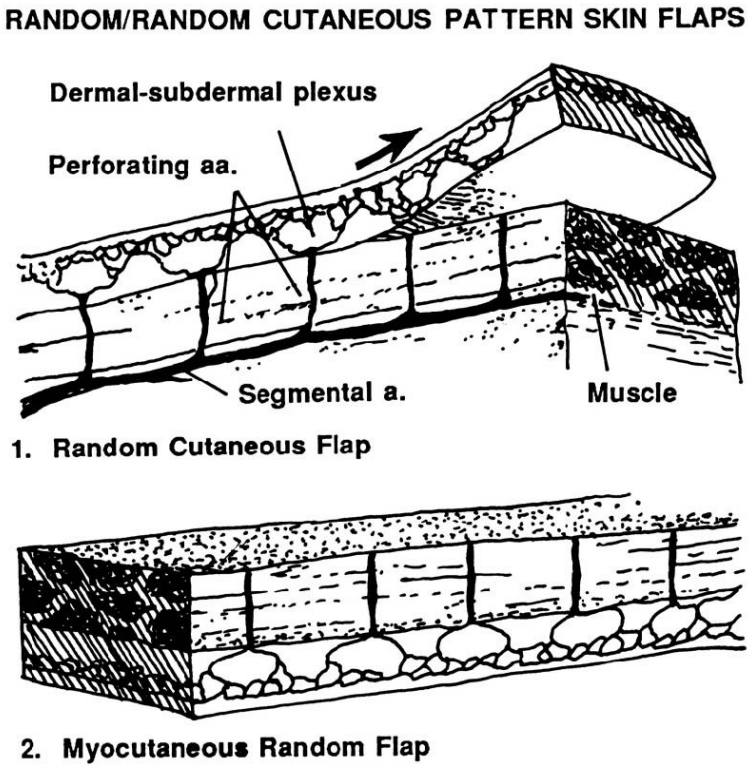
I. CLASSIFICATION

A. By composition- Flaps can be classified by the type of tissue transferred.
   1. Single component
      a. Skin flap- i.e. Parascapular flap
      b. Muscle flap- i.e. Rectus muscle flap or latissimus dorsi muscle flap
      c. Bone flap- i.e. Fibula flap
      d. Fascia flap- i.e. Serratus fascia flap
   2. Multiple components

a. Fasciocutaneous- Radial forearm flap or anterolateral thigh flap
b. Myocutaneous- Transverse rectus abdominis myocutaneous flap
c. Osseoseptocutaneous- Fibula with a skin paddle

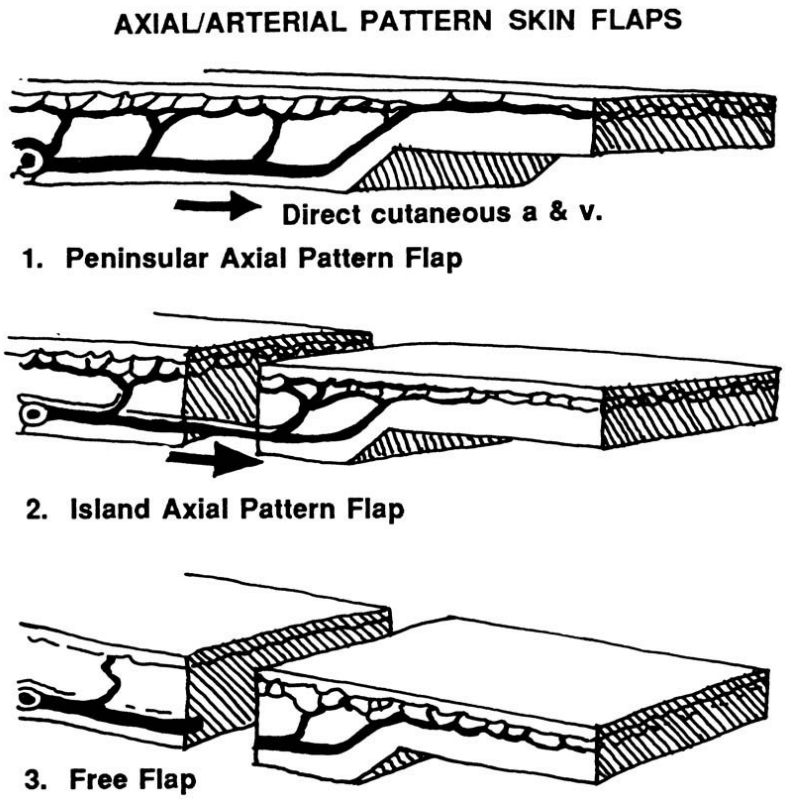
B. By location- Flaps can be described by the proximity to the primary defect that needs to be reconstructed. The harvest leaves a secondary defect that needs to be closed.
   1. Local flaps- Local flaps are raised from the tissue adjacent to the primary defect. Its movement into the defect can be described as advancement, rotation, or transposition. Specific examples of local skin flaps are the V-Y, rhomboid, and bilobed flaps.
   2. Regional- Regional flaps are raised from tissue in the vicinity but not directly adjacent to the primary defect. The movement is described as transposition or interpolation.
   3. Distant- Distant flaps are raised from tissue at a distance from the primary defect. This usually requires re-anastamosis of the blood vessels to recipient blood vessels in the primary defect. These are called microvascular ("free") flaps.

C. By vascular pattern
   1. Random vs. Axial (Figure 2-3)
      a. Random pattern flaps do not have a specific or named blood vessel incorporated in the base of the flap. Because of the random nature of the vascular pattern, it is limited in dimensions, specifically in the length: width ratio (3:1).



(FIGURE 2-3)

b. Axial pattern flaps (Fig. 2-4) are designed with a specific named vascular system that enters the base and runs along its axis. This allows the flap to be designed as long and as wide as the territory the axial artery supplies.
   i. Blood supply by direct artery and accompanying vein
   ii. Greater length possible than with random flap
   iii. Can be free flap (see free flap)
   iv. Peninsular – skin and vessel intact in pedicle
   v. Island – vessels intact, but no skin over pedicle



(FIGURE 2-4)

2. Pedicled vs. Free
   a. Pedicled flaps remain attached to the body at the harvest site. The pedicle is the base that remains attached and includes the blood supply. It is transferred to the defect with its vascular pedicle acting as a leash. Usually via a musculocutaneous or fasciocutaneous fashion.
   b. Free flaps are detached at the vascular pedicle and transferred from the donor site to the recipient site. They require re-anastamosis of the artery and vein to recipient vessels at the recipient site.
3. Perforator- Perforator flaps are flaps consisting of skin and/or subcutaneous fat supplied by vessels that pass through or in between deep tissues. It is harvested without the deep tissues in order to minimize donor site morbidity and to yield only

the necessary amount of skin and/or subcutaneous fat for transfer. It can be transferred either as a pedicled or free flap.

a. Deep inferior epigastric perforator flap- DIEP flap consists of the skin and fat of the lower abdomen supplied by the deep inferior epigastric artery and vein perforators without the rectus abdominis muscle.
b. Anterolateral thigh perforator flap- The ALTP consists of the skin and fat of the antero-lateral thigh supplied by the descending branch of the lateral circumflex artery and vein perforators without the vastas lateralis muscle.
c. Thoracodorsal artery perforator flap- The TAP flap consists of the skin and fat of the lateral back supplied by the thoracodorsal artery and vein perforator without the latissimus dorsi muscle.

II. CHOOSING THE RIGHT FLAP

A. The primary defect- Recipient site considerations
   1. Location and size
   2. Quality and vascularity of surrounding tissues
   3. Presence of exposed structures
   4. Functional and aesthetic considerations
B. The secondary defect- Donor site considerations
   5. Location
   6. Adhere to the concept of angiosomes, the territory that is supplied by a given vessel
   7. What type of tissues are needed
   8. Functional and aesthetic morbidity

III. SURVIVAL

A. The success of a flap depends not only on its survival but also its ability to achieve the goals of reconstruction.
B. The failure of a flap results ultimately from vascular compromise or the inability to achieve the goals of reconstruction.
   1. Tension
   2. Kinking
   3. Compression
   4. Vascular thrombosis
   5. Infection

CHAPTER 2 - BIBLIOGRAPHY

GRAFTS AND FLAPS

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