

PLASTIC & RECONSTRUCTIVE SURGERY

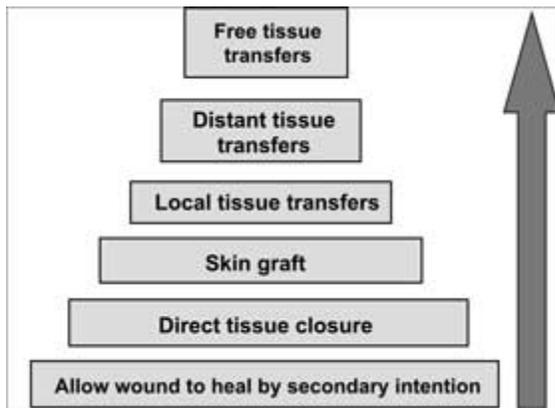
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د. محمد جاسم محمد

اختصاص الجراحة الترميمية

SKIN GRAFT AND FLAP

When analyzing a wound, the options for closure are evaluated beginning with the simplest and progressing up to the more complex option according to the “reconstructive ladder” .



Healing by secondary intention: mostly adopted for small wound by leaving the wound to heal by itself without surgical intervention apart from local wound care. It depends upon epithelialization and wound contraction provided by myofibroblast.

Direct closure: most preferable method because it use the same skin and tissue of the area with the same color and quality but this depends on the availability of the surrounding tissues.

GRAFT

A **GRAFT** is a segment of tissue that is completely detached from its original site and blood supply(donor site) and transferred to another new site(recipient site),hence its survival depends on the blood supply of the recipient site

Classifications:

1-According to the source:

- a. Autograft: taken from the same individual.
- b. Isograft: taken from genetically identical individuals (monozygotic twins).
- b. Allo(homo)graft: taken from another individual but of the same species.
- c. Xeno(hetro)graft :taken from another species(e.g. animals like pigs).

2-According to composition:

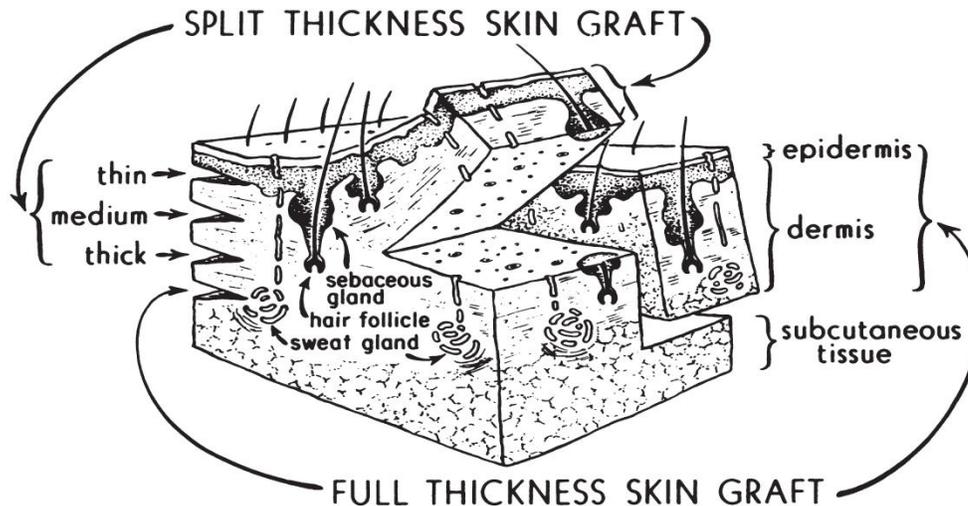
- a. Simple graft: composed of a single type of tissue e.g. skin only, tendon only, nerve only,... etc.
- b. Composite graft: composed of more than one type of tissue e.g. chondrocutaneous graft(skin and cartilage).

Skin graft:

A piece of skin of variable thickness that is completely detached from its original site and blood supply(donor site) and transferred from the donor site to resurface the recipient site when the primary wound closure cannot be achieved due to shortage of adjacent tissues for a reason or another. They could be:

1. **Full thickness (FTSGs):** consist of full thickness skin (epidermis and dermis)
2. **Split thickness (STSGs):** consist of the epidermis and varying degrees of dermis. They can be described as thin, intermediate, or thick according to the amount of dermis.

FTSG provide better texture and color matching. The sensation and the presence of skin appendages are also better than STSG. The graft take is decreased as thickness of graft increased.



All skin grafts undergo two types of contractions:

1-**Primary contraction:** immediately after removal from the donor site as a result of the elastin in the dermis → thick graft has more primary contraction than thin grafts.

2-**Secondary contraction:** after revascularization in the final recipient location. It involves contraction of the healed graft and is probably a result of myofibroblast activity.

Skin Graft Adherence:

There are two phases of graft adherence.

The **first** is fibrinous deposition and adhesion, begins with placement of the graft on the recipient bed, lasting about 72 hours.

The **second** involves the ingrowth of fibrous tissue and vessels into the graft.

Survival of skin grafts:

Skin grafts survive (take) by 3 mechanisms:

a. Serum imbibition: In the first 24-48 hours after grafting, skin grafts passively absorb 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 5-7, new blood vessels grow into the graft and the graft becomes vascularized.

Hence, the requirements for graft survival are:

1-well vascularized bed→ any avascular recipient site like denuded bone(without periosteum),denuded cartilage(without perichondrium),denuded tendon(without paratenon) are contraindicated for skin grafts.

2-Contact with the recipient bed→ any seroma, hematoma, pus, and loose graft application to the bed can lead to graft failure.

3-Clean non infected recipient site→ heavy infection especially with streptococci can lead to graft failure.

Harvesting skin grafts:

1-STSG→by free hand knives (e.g. Humby knife, Blair knife) or by power-driven dermatomes (electric Brown dermatome ,air Zimmer dermatome and Padgett dermatome).

2-FTSG→by a simple scalpel.

Donor Sites:

Split-thickness skin grafts can be taken from any area on the body, including the scalp. The Popular areas for split-thickness graft harvest include the thigh and trunk.

The donor site of a split-thickness skin graft generally heals by re-epithelialization in 14-21 days; so the dressing which is composed of fine mesh(tull) gauze impregnated with a lubricant (e.g antibiotic ointment) is left in place for 2-3 weeks without changing unless there are features of infection (persistent pain, bad odor, fever,...).

Full-thickness skin grafts can be taken from the upper eyelid, postauricular , preauricular, supraclavicular, antecubital, volar wrist and groin skin. The donor area is closed by primary suturing unless the area is large → closed by STSG.

Recipient Sites:

The recipient site should be vascular and clean, and the graft is secured in place using sutures or staples. the first layer of dressing should be non adherent covered by dry gauze and bandaging. On the face and trunk, the graft is better to be secured to the recipient bed by tie-over dressing. The first post-operative inspection of the skin graft is usually performed between 2–5 days postoperatively.

Meshed versus sheet skin graft:

Skin grafts can be meshed using scalpel or mesher to increase the surface area → large area can be grafted in addition to that there is no or very little chance for the hematoma or seroma to be collected underneath the meshed graft but they have pebble appearance (aesthetically less acceptable) and liable to contract on application to a joint area.

In contrast, sheet graft provide superior aesthetic appearance and has less liability for contraction on application on joint area but the risk of development of hematoma and serome beneath it is more in addition to difficulty in resurfacing large areas.

Skin graft failure is caused by:

a. 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”. It is the most common cause of graft failure.

b. Infection.

c. Poor wound bed — Because skin grafts depend 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.

d. Sheer forces separate the graft from the bed and prevent the contact necessary for revascularization and subsequent “take”.

e. Upside down application of the graft.

FLAPS:

A flap is a unit of tissue that maintains its own blood supply while being transferred from a donor site to a recipient site.

The flap is indicated for:

1. Covering recipient beds that have poor vascularity (e.g. denuded bone, denuded cartilage, denuded tendon, ... etc).
2. Covering vital structures (exposed nerves, exposed major vessels... etc).
3. Reconstructing the full thickness defects of eyelids, lips, ears, nose, and cheeks.
4. Padding body prominences.
5. When it may be necessary to operate through the wound at a later date to repair underlying structures.
6. Providing a functional motor unit using muscle flaps.
7. Providing sensation using sensate flap.
8. Controlling infection in the recipient area (e.g. in chronic O.M.).

CLASSIFICATION

I-ACCORDING TO BLOOD SUPPLY:

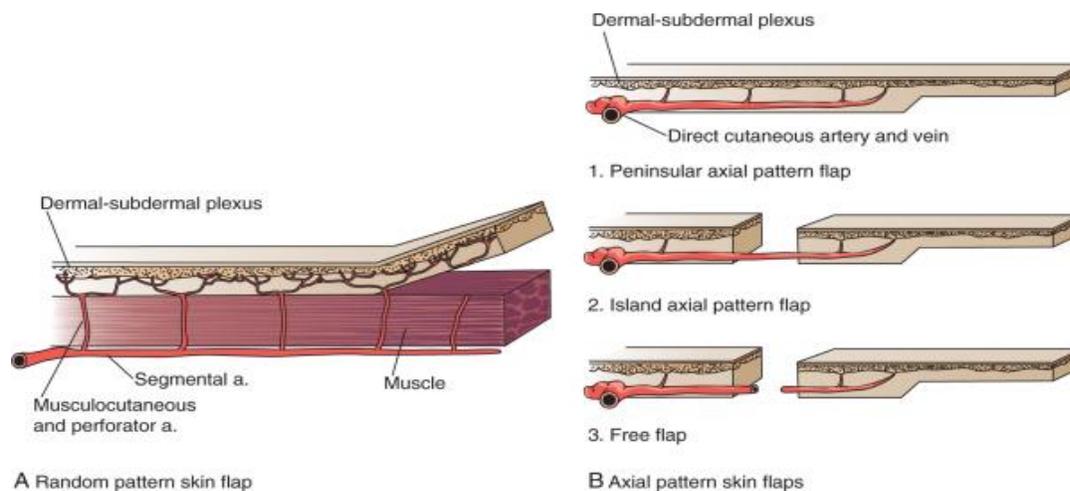
A. Random flaps: have no specific or named blood vessel incorporated in the base of the flap. They derive their blood supply from the dermal and subdermal plexus.

B. Axial flaps: have specific named vascular system that enters the base and runs along its axis. They can be sub classified into:

1. Peninsular axial flaps: that keep both the skin and vessel intact at their base.

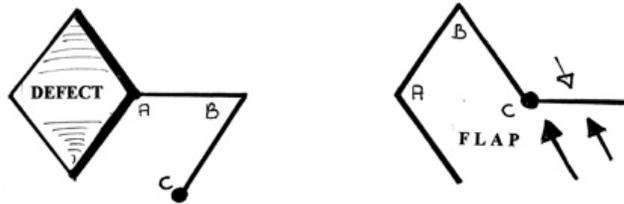
2. Island axial flaps: that keep only the vessels intact at their base.

3. Free flaps: both the skin and the vessels are transected at flap base and transferred from the donor site to the recipient site. They require reanastomosis of the artery and vein with the recipient vessels at the recipient site.

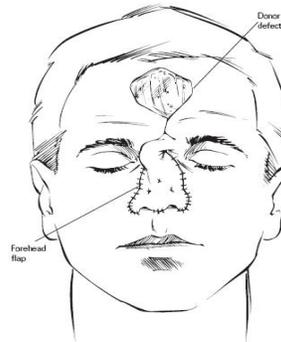


II.ACCORDING TO LOCATION (proximity to the primary defect that needs to be reconstructed)

1.Local flaps: are raised from tissues directly adjacent to the primary defect (in direct contact with the defect).



2.Regional flaps: are raised from tissue in the vicinity but not directly adjacent to the primary defect(no direct contact with the defect).



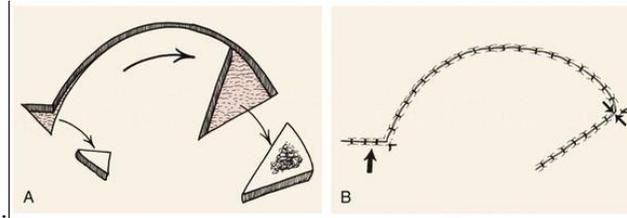
3.Distant flaps: are raised from tissue at a distance from the primary defect. The free flaps considered distant flaps.



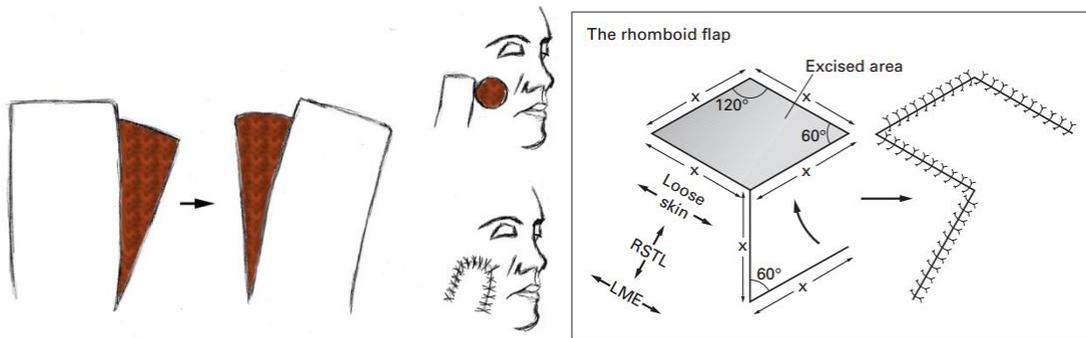
III.ACCORDING TO THE WAY OF MOVEMENT:

A. **Pivotal flaps:** flaps that rotate about a pivot point and subdivided into:

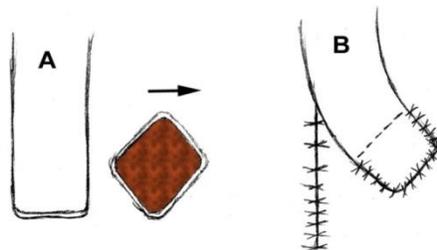
1. *Rotational flaps:* The flap is rotated into the defect .



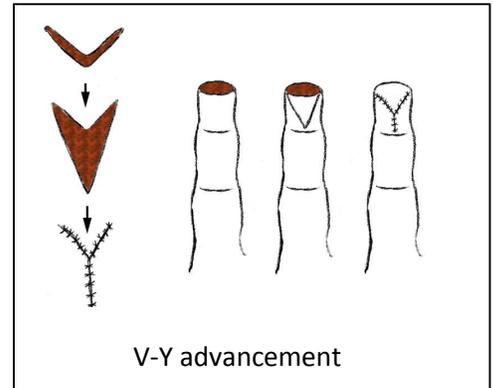
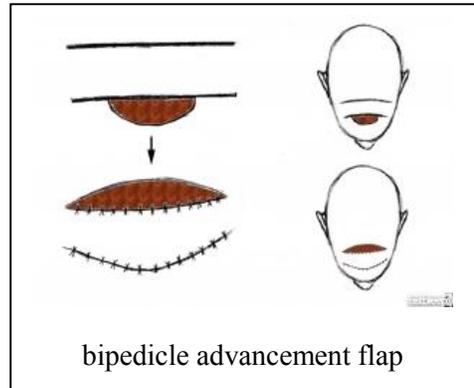
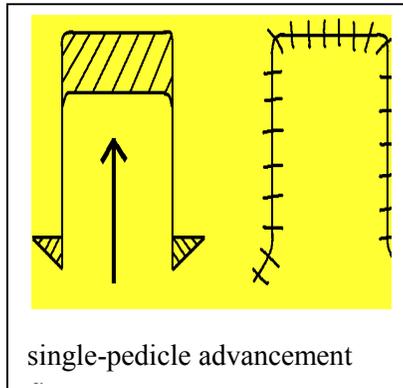
2. *Transpositional flaps:* triangular or rectangular flaps that move laterally to cover the directly adjacent defect (its movement is not in an arc manner).



3. *Interpositional flaps:* as the transposition flaps but there is a bridge of tissue between the flap and the defect (i.e. the flap is not in a direct contact with the defect), so interpolation flaps are either tunneled under or passed over intervening tissue to close a defect



B.Advancement flaps: All advancement flaps are moved directly forward or to one side into a defect without any rotation or lateral movement about a pivot point like the single-pedicle advancement, bipedicle advancement, and the V-Y advancement flaps.



IV.ACCORDING TO TISSUE CONTAINED(COMPOSITION):

- Skin flap (skin+superficial fascia).
- Fascia flap e.g. Serratus fascia flap
- Fasciocutaneous(skin +superficial fascia+deep investing fascia)
- Muscle flap e.g.temporalis muscle flap.
- Bone flap e.g. Fibula flap
- Myocutaneousflap(skin+fascia+muscle).
- Osseomyocutaneous(skin+fascia+muscle+bone).

Monitoring of flaps

1. Clinical evaluation is the best method of flap assessment:

- a. Temperature: Should be body temperature. Differential thermometry exceeding 3° C is considered significant.
- b. Color: Should be pink, neither white nor blue/purple.
- c. Capillary refill: Should be approximately 2 seconds.
- d. Point bleeding: Upon introduction of a fine-gauge needle, bleeding should be present. Blood should be red, not purple/blue.
- e. Firmness (turgor) : Should be soft.

Signs of insufficient arterial supply: Cold ,Pale, capillary refill slower than 2 seconds ,slow or absent point bleeding and turgor decreased (softer than normal).

Signs of insufficient venous return (venous congestion):Warmer than expected , blue to purple hue , capillary refill faster than 2 seconds (blood pooled in venous system returns rapidly) , brisk point bleeding, with dark blood , tense and swollen (turgor increased).

2.Doppler studies.

3.Fluorescein dye.

4.Sensors for O₂, pH, temperature.

Factors leading to flap necrosis:

1. Haematoma collection beneath the flap.
2. Tight suturing.
3. Tight dressing.
4. Kinking of flap pedicle.
5. Cool ambient.
6. Nicotine, caffeine & other vasoconstrictive agents.
7. Technical errors.

Z-PLASTY

This technique involves the transposition of two triangular-shaped flaps.

A Z-plasty can be used to:

- Increase the length of an area of tissue or a scar
- Break up a straight-line scar
- Realign a scar.

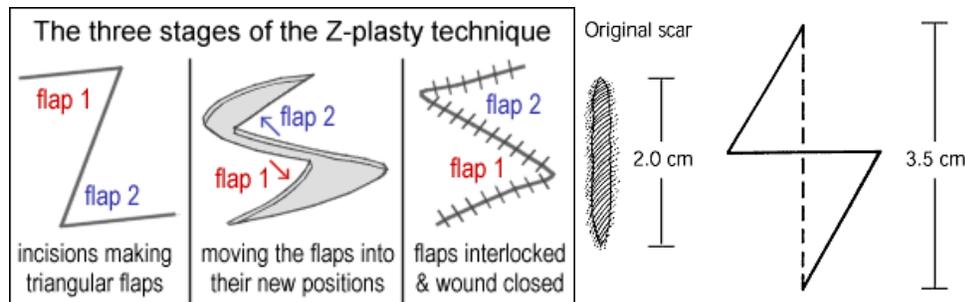
The degree of elongation of the longitudinal axis of the Z-plasty is directly related to the angles of its constituent flaps.

- $30^\circ \rightarrow 25\%$ elongation; □ $45^\circ \rightarrow 50\%$ elongation; □ $60^\circ \rightarrow 75\%$ elongation ;
- $75^\circ \rightarrow 100\%$ elongation; □ $90^\circ \rightarrow 125\%$ elongation.

Flaps of 60° angulation are most commonly used clinically as they provide sufficient lengthening without undue tension.

The angles of the two flaps do not need to be equal.

All three limbs should be of the same length.



W-plasty

This technique is used to break up the line of a scar and improve its aesthetics.

Unlike the Z-plasty, it does not lengthen tissue

