

Soft tissue coverage

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Plastic surgery is divided into:

1. **Aesthetic surgery:** deals with improving the beauty of clients!
2. **Reconstructive surgery:** deals with return of lost tissues and repair of congenital and acquired defects.

In our course we deal with basic principles of reconstructive surgery.

Soft tissues that are dealt with by the reconstructive surgeon are skin, subcutaneous tissues, fascia and muscles.

Wounds are defined by pathologists as: discontinuity of epithelium, this could be due to trauma or to pathological causes, in this case they are called (ulcers). They may be **partial thickness** (involving the epidermis and part of the dermis) or **full thickness** (involving the epidermis and the whole dermis). As partial thickness wounds heal usually by regeneration (as second degree burns) they are treated conservatively.

Wounds (tissue loss or defects as called by plastic surgeons) vary in their complexity from simple to complex, the **incised skin wound** is the simplest wound. Wounds can however increase in depth and surface area to involve more soft tissues than skin. On the other extreme, is the **compound defect** is three dimensional defect which results from major loss of many tissues as that resulting from excision of malignant tumors.

Causes of soft tissue defects that are dealt with by plastic surgeon

1. **CONGENITAL:** cleft lip and palate, hypospadias, microtia and anopia, syndactely, vascular anomalies, and other soft tissue congenital anomalies.
2. **AQUIRED:**
 - A. **Inflammatory:** defects that follow soft tissue infections as abscesses, necrotizing fasciitis.
 - B. **Neoplastic:** resulting from tumours as following mastectomy and skin and soft tissue cancers.
 - C. **Metabolic:** as in diabetic foot.
 - D. **Ischemic:** following peripheral vascular diseases and pressure sores.
 - E. **Traumatic:** that follows burns, frost bites, radiation injury and soft tissue injury.
 - F. **Iatrogenic:** as in extravasation injury.

WHY DO WE NEED RECONSTRUCTIVE SURGERY?

The body can deal with Defects (tissue loss or discontinuity) by wound healing: which is simply: replacement of lost or discontinued tissue (ROLT). There are two modes of wound healing:

1. **Regeneration:** replacement of lost or discontinued tissue (ROLT) by the same lost tissue: This is the ideal mode of healing with maximal functional and cosmetic recovery.

2. **Fibrosis: replacement of lost or discontinued tissue(ROLT) by fibrous tissue: the fibrous tissue has not got the function and form of the lost tissue. So healing with fibrosis is a bad mode of healing.**

In human beings unfortunately the ability to heal by regeneration is limited to simple tissues (epithelium, hepatocytes, and bone). While some lower creatures as salamanders they can heal organs as limbs.

The role of plastic surgeon is to deal with the defects that would heal by fibrosis by tissue transfer trying to avoid the fate of fibrosis.

THE ROLE OF PLASTIC SURGEON;

In wound healing, all lost tissues would heal ultimately, however in human beings tissues heal mostly by fibrosis with its unfavorable functional and cosmetic outcome. To avoid this fate the plastic surgeon would reconstruct the defects by replacing the lost tissues by transferring tissues from donor sites of the same patient. The donor area would donate tissues to the defected area (donor gives and recipient takes). By doing this we are looking to achieve a result that is better than fibrosis but less than the ideal regeneration and not as the original lost tissues. To be optimal, the tissue transfer (graft or flap) should achieve the following criteria:

1. The transferred tissues should be as similar as possible to the lost tissues in the defect (replace like with like)
2. The tissue transfer should achieve maximum benefit to the recipient area.
3. The tissue transfer should achieve minimal harmful effect on the donor area, this is referred to as **minimal donor site morbidity.**
4. The tissue transfer should be safe to patient.

YOU RUB PETER TO PAY PAUL, PETER SHOULD BE ABLE TO AFFORD IT.

METHODS OF SOFT TISSUE CLOSURE (RECONSTRUCTION)

There are different methods of closure of wounds, which vary in complexity, depending on the defect, and whether there is tissue loss or not. The hierarchy of methods includes:

1. Direct closure.
2. Healing by secondary intention.
3. Skin grafting; split thickness, or full thickness.
4. Flaps. Local or distant.

WHEN AND HOW TO CLOSE A DEFECT?

When we face a wound, we should answer two questions:

When do we close the wound? The answer to this question is: We close it when it is **clean** to be closed! This means that the wound should be free of **contamination** and **dead tissue** and the second question to be answered is **how to close it?** The answer is that we choose the appropriate method depending on the need and the condition of the defect .

When there is no tissue loss, or little skin loss , so that the edges of the wound could be approximated to each other without tension, then we close it by direct closure, but if the tissue loss is beyond the ability to directly approximate the wound edges , then we need to choose another method (i.e. Healing by secondary intention , skin graft , or a flap).

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MANAGEMENT OF DEFECTS

- 1. WHEN** **NOW: When the wound is clean .
 **LATER OR DELAYED: when the wound is not clean .

****Clean:** means **minimal bacterial load (contamination and infection)** , and **minimal necrotic tissue** , this depends on two factors:

1. MECHANISM OF INJURY , AND INSTRUMENT USED: Crushing injuries , and injuries inflicted by blunt instruments are usually associated with a degree of contamination and tissue damage .
2. TIME ELAPSED FROM INJURY TO PRESENTATION: if this time is more than 6 hours , then the wound is considered contaminated , an exception to this rule is the face , in which primary closure could be done within 24 hours , this is due to the excellent vascularity of the face .

HOW: Wounds are closed by one one of 5 methods :

1. Direct closure.
 2. Healing by secondary intention.
 3. Skin grafting; split thickness, or full thickness.
 4. Flaps. Local or distant.
 5. Prosthesis
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Classification of wounds:

Depending on the degree of tissue necrosis and contamination, wounds are classified into:

1. **Incised wound:** caused with sharp, relatively clean instruments, like kitchen knife, these wounds have minimal necrosis and contamination. These wounds are closed primarily if patient arrives within six hours.
2. **Lacerated wounds:** characterized by jagged edges, caused with blunt instruments, they are associated with moderate degree of necrosis and contamination, if patient arrives within six hours, these wounds are managed by wound excision, (to transform it into an incised wound) and then direct closure.
3. **Crushed wounds:** seen in industrial and severe road traffic accidents, associated with heavy contamination and severe tissue revitalization.

These wounds are managed by wound opening, cleaning, irrigation and adequate debridement, which means excision of the devitalized tissue.

This procedure is repeated daily till the wound is clean with no dead tissue, when it could be closed.

Primary closure is contra-indicated in these crushed wounds, as the dead tissue, contamination, and the tissue tension due to inflammatory edema will predispose to infection, especially gas gangrene and tetanus.

Direct closure :

This method is used when there is no or minimal tissue loss so we can approximate the wound edges without tension.

Edges of the wound are approximated usually with suture materials, however other methods may be used as, staplers, tissue glue, or adhesive tape (steristrips)

Wounds with tissue loss.

When there is tissue loss, so the wound could not be closed directly without tension, other alternatives should be considered to deal with the wound;

- Healing by secondary intention.
- Skin grafting; split thickness, or full thickness.
- Flaps. Local or distant.

Healing by secondary intention.

We may let the wound to heal by secondary intention, this option is good for, small defects, when the area is of no functional or cosmetic value, or when other operative methods like grafts or flaps are not safe.

Skin grafts:

In this method skin (EPIDERMIS AND DERMIS) or part of the skin(Epidermis and part of the Dermis) is harvested from a donor area and applied on the defected area (recipient area).

Flaps;

A **FLAP** is a piece of tissue carries its own blood supplies that is moved from its original site, to cover a defect.

SKIN GRAFTS

SKIN GRAFTS ARE DIVIDED INTO:

1.Split thickness skin grafts: are thin grafts formed of epidermis and a thin part of the dermis, the donor site heals by regeneration (similar to the healing of superficial second degree burn) within two weeks, and the same donor area can be re-harvested after this period. Almost any area of the body may be used as a donor site, so large areas of skin defects may be covered with STSG.

Full thickness skin grafts: consists of the whole skin (epidermis and dermis), it is taken from areas of loose skin as the donor area is closed by approximation of the edges (direct closure), due to this fact, only small areas could be covered by FTSG.

FTSG is superior to STSG from functional and cosmetic aspects: Better texture, better color matching with less pigmentation problems, more durable, less wound contraction; they have better sweat and sebaceous glands function, it grows with the child, and they have better final innervation.

Although FTSG are better they have 2 drawbacks: they are less available to cover large areas, and they are more difficult to take.

Graft take:

The process by which the graft is integrated in the recipient site and acquires new blood supply.

HOW DOES (SKIN GRAFT TAKE) OCCURE

Skin graft take passes through two stages:

1. PLASMATIC CIRCULATION: in the first 1-2 days, the graft is nourished from the underlying recipient site by the process of imbibition or diffusion (plasmatic circulation).

2. NEOVASCULARIZATION: within 2-3 days, the graft blood vessels are joined with the recipient site vessels, the latter process is called Neovascularization.

SIGNS OF SKIN GRAFT TAKE

1. The graft is adherent to the recipient site.
2. The graft is pink in color.
3. The graft blanches with pressure, denoting vasularity.

Factors affecting take:

1. Vascularity of the recipient site, this is the most important factor. Skin graft take is poor on avascular areas, such as **cortical bone bared of its periosteum, cartilage devoid of its perichondrium, tendons bared of its paratenon, and over irradiated areas, graft take does not take place on prosthesis.**
2. Bacterial load(contamination and infection), especially that is caused by streptococcus, group A.
3. Presence of barriers between the graft and the recipient area, as hematoma, seroma, debris, or foreign materials.
4. Immobilization, the graft should be fixed to the recipient site, as graft mobility hinders imbibition and neovascularization.

What type of skin graft to use, STSG or FTSG?

When the area to be covered, needs good quality of skin, i.e. good cosmesis, as on the face, or good durable skin as on the hand, FTSG is used, but if we are to cover large areas, as in major burns, then STSG is the logic choice.

Remember:

The thicker the graft, the better. But: less available, and more difficult to take!!!!!!

FLAPS

A **FLAP** is a piece of tissue carries its own blood supplies that is moved from its original site, to cover a defect.

Flap composition

Flaps vary in their composition, to suit the need of the recipient area, it may be composed of; skin and subcutaneous tissue (skin flaps), skin and muscle (myocutaneous flaps), muscle alone (muscle flaps), skin, fascia and bone (Osseofasciocutaneous flaps)

Difference between skin grafts and flaps, and indications of their use:

1. Skin graft is thin as it is composed of skin (FTSG), or part of skin (STSG), while flaps are formed of more bulky tissue as mentioned above, so the complexity of the defect and its requirements dictates whether to use a skin graft or a flap, and also the type of flap to be used, to give an example: A facial defect following excision of basal cell carcinoma, may be closed by FTSG, but the defect that follows excision of infiltrating oral tumor will require a flap.

2. Skin grafts depend on the vascularity of the recipient site for their survival, so they can not be used on vascular beds or over prosthesis, flaps on the other hand are used in these situations as they bring their blood supply with them.

In summery, flaps rather than grafts, are used when the latter are insufficient to cover the defect, or they would not be taken.

Flaps may be raised locally to cover nearby defects, or may be brought from distant sites as free flaps, in the case of free flaps the flap with its vascular pedicle (its supplying artery and vein) are taken from the donor area to the recipient site where the artery and vein are connected by microvascular anastomosis to an artery and vein in the vicinity of the recipient site.