SKIN GRAFTS
and
FLAPS

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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

- harvested from a DONOR site
- 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).
SKIN GRAFTS

- **THICKNESS**
  - Full Thickness Skin Grafts (FTSGs)
    - consist of the ENTIRE epidermis and dermis.
  - Split Thickness Skin Grafts (STSGs)
    - consist of the epidermis and VARYING degrees of dermis.
    - They can be described as thin, intermediate, or thick.
  - Harvested using a dermatome or freehand.
SKIN GRAFTS

- THICKNESS
- SSG vs. FTSG
SKIN GRAFTS

- HARVEST
SKIN GRAFTS

• DONOR SITE

  • The full thickness skin graft leaves behind
    • no epidermal elements in
    • 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.
SKIN GRAFTS

• DONOR SITE
  • 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.
SKIN GRAFTS

- DONOR SITES
SKIN GRAFTS

- RECIPIENT SITE
  - The split thickness skin graft
    - To resurface larger defects
    - STSGs undergo SECONDARY CONTRACTION as it heals
      - Depending on how much of the dermis is included,
SKIN GRAFTS

• RECIPIENT SITE

• The full thickness skin graft
  • Usually used to resurface smaller defects
  • It is commonly used to resurface defects of the face.
    • It provides a better color consistency
    • texture
    • undergoes LESS SECONDARY CONTRACTION.
    • Much PRIMARY CONTRACTION????
SKIN GRAFTS

• SURVIVAL/GRAFT INTAKE
  • Full thickness and split thickness skin grafts survive by the SAME MECHANISMS
  • Plasmatic Imbibition
    • First 24-48 hours
    • Initially, the skin grafts passively absorbs the nutrients in the wound bed by diffusion
  • 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.
  • Angiogenesis
    • By day 5
    • new blood vessels grow into the graft and the graft becomes vascularized.
1. Plasma imbibition  
2. Blood vessel connection  
3. Revascularisation
SKIN GRAFTS

• SKIN GRAFTS FAIL

• Poor wound bed
  
  • Skin grafts rely on the underlying vascularity of the bed
  
  • wounds that are poorly vascularized
    
    • with bare tendons
    
    • Deperioste bone
    
    • Radiation, etc. will not support a skin graft.
SKIN GRAFTS

- SKIN GRAFTS FAIL
  - Sheer Forces
    - separate the graft from the bed
    - prevent the contact necessary for revascularization and subsequent “TAKE”
      - which refers to the process of attachment and revascularization of a skin graft in the donor site
SKIN GRAFTS

• SKIN GRAFTS FAIL
  • Hematoma/Seroma
    • prevent contact of the graft to the bed
    • inhibit revascularization
    • must be drained by day 3 to ensure “take.”
  • Infection
    • Bacteria have proteolytic enzymes
    • lyse the protein bonds needed for revascularization
    • Bacterial levels GREATER THAN $10^5$ are clinically significant.
# SKIN GRAFTS

- **FTSG VS. STSG**

## Table 17.2

<table>
<thead>
<tr>
<th>Indications</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Thin STSG</strong></td>
<td>Debrided burn wounds</td>
<td>Fast donor site re-epithelialization</td>
</tr>
<tr>
<td></td>
<td>Chronic wounds with less vascularized wound beds</td>
<td>Multiple possibilities to reharvest the same area</td>
</tr>
<tr>
<td></td>
<td>Exposed flap areas</td>
<td>Good graft take</td>
</tr>
<tr>
<td></td>
<td>Acute well-vascularized wounds</td>
<td></td>
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<tr>
<td><strong>Thick STSG</strong></td>
<td>Same indications as thin STSG</td>
<td>Less secondary graft contraction compared to thin STSG</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Graft more stable because of thicker dermal layer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Good graft take</td>
</tr>
<tr>
<td><strong>FTSG</strong></td>
<td>Reconstruction of functional areas such as in the face or hand</td>
<td>Minimal to no secondary graft contraction</td>
</tr>
<tr>
<td></td>
<td>Noninfected, well-vascularized wound beds</td>
<td>Excellent skin quality, stability</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hair regrowth and skin appendage function</td>
</tr>
</tbody>
</table>
SKIN GRAFTS

• SKIN SUBSTITUTES
  • usually provide temporary coverage
  • They require an adequately vascularized recipient bed
    • Xenograft
      • Skin from a different species, ie pig skin
    • Synthetic
      • Biobrane
      • Integra
<table>
<thead>
<tr>
<th>Graft type</th>
<th>Graft origin: donor and recipient of:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autograft</td>
<td>Same subject</td>
</tr>
<tr>
<td>Homograft</td>
<td>Same species</td>
</tr>
<tr>
<td>Isograft</td>
<td>Different subject</td>
</tr>
<tr>
<td></td>
<td>Same genetic background</td>
</tr>
<tr>
<td>Allograft</td>
<td>Different subjects Same species</td>
</tr>
<tr>
<td>Hetero- or xenograft</td>
<td>Different subjects but same species</td>
</tr>
</tbody>
</table>

OTHER GRAFTS

- Nerve
- Fat
- Tendon
- Cartilage
- Bone
- Muscle
- Composite
  - A graft that has more than one component, i.e. cartilage and skin graft, dermal-fat graft
FLAPS

- 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.

- Primary Defect vs. Secondary Defect
FLAPS

• CLASSIFICATION
  • By composition = type of tissue transferred
    • Single component
      • Skin flap- i.e. Parascapular flap
      • Muscle flap- i.e. Rectus muscle flap or latissimus dorsi muscle flap
      • Bone flap- i.e. Fibula flap
      • Fascia flap- i.e. Serratus fascia flap
    • Multiple component
      • Fasciocutaneous- Radial forearm flap or anterolateral thigh flap
      • Myocutaneous- Transverse rectus abdominis myocutaneous flap
      • Osseoseptocutaneous- Fibula with a skin paddle
FLAPS

• CLASSIFICATION
  • By location = the proximity to the primary defect
  • Local flaps
    • 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
    • V-Y
    • Rhomboid
    • Bilobed flaps
    • Z-PLASTY
FLAPS

- Local Skin Flaps

**Advancement flap**

**Rotation flap**

- **Design of V-Y flap**
- **V-Y flap advancement**
- **Rotation**
- **Inset**
FLAPS

- Spesific Local Skin Flaps

<table>
<thead>
<tr>
<th>Angles of Z-plasty (degrees)</th>
<th>Theoretical gain in length (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30–30</td>
<td>25</td>
</tr>
<tr>
<td>45–45</td>
<td>50</td>
</tr>
<tr>
<td>60–60</td>
<td>75</td>
</tr>
<tr>
<td>75–75</td>
<td>100</td>
</tr>
<tr>
<td>90–90</td>
<td>120</td>
</tr>
</tbody>
</table>
FLAPS

- Specific Local Flaps
FLAPS

• Z PLASTY
  • 2 opposite random flap in Z fashion
  • 4 fundamental function
    1. To lengthen a scar
    2. To break up a straight line
    3. To move tissue from one area to another
    4. To obliterate or create a web or cleft
FLAPS

• CLASSIFICATION
  • By location = the proximity to the primary defect
    • Regional flaps
      • raised from tissue in the vicinity but NOT DIRECTLY ADJACENT to the primary defect.
      • The movement is described as transposition or interpolation.
    • Distant flaps
      • 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
FLAPS

• CLASSIFICATION

• By vascular pattern
  • Random vs. Axial
    • RANDOM 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).
    • AXIAL FLAPS 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.
FLAPS

• ANGIOZOME
  • defined as a composite block of tissue supplied by a main source artery
  • The source arteries (segmental or distributing arteries) that supply these blocks of tissue are responsible for the supply of the skin and the underlying deep structures.
  • When pieced together like a jigsaw puzzle, they constitute the three-dimensional vascular territories of the body
Fig. 23.11 Schematic illustration of direct and indirect cutaneous vessels. DC, direct cutaneous; SC, septocutaneous; MC, musculocutaneous; D, dermis; SF, superficial dermis; DF, deep fascia; SA, source artery; M, muscle. (From Geddes CR. MSc Thesis, Dalhousie University, Halifax, Nova Scotia, Canada.)
Fig. 23.23 The angiosomes of the source arteries of the body shaded to correspond to Figure 23.9. The angiosomes are: (1) thyroid; (2) facial; (3) buccal (internal maxillary); (4) ophthalmic; (5) superficial temporal; (6) occipital; (7) deep cervical; (8) transverse cervical; (9) acromiothoracic; (10) suprascapular; (11) posterior circumflex humeral; (12) circumflex scapular; (13) profunda brachii; (14) brachial; (15) ulnar; (16) radial; (17) posterior intercostals; (18) lumbar; (19) superior gluteal; (20) inferior gluteal; (21) profunda femoris; (22) popliteal; (22a) descending genicular (saphenous); (23) sural; (24) peroneal; (25) lateral plantar; (26) anterior tibial; (27) lateral femoral circumflex; (28) adductor (profunda); (29) medial plantar; (30) posterior tibial; (31) superficial femoral; (32) common femoral; (33) deep circumflex iliac; (34) deep inferior epigastric; (35) internal thoracic; (36) lateral thoracic; (37) thoracodorsal; (38) posterior interosseous; (39) anterior interosseous; and (40) internal pudendal.
Fig. 24.3 Axial pattern flap. (A) Based on the superficial temporal artery. (B) Arc of rotation of tempoparietal flap.
FLAPS

- Random vs. Axial

RANDOM/RANDOM CUTANEOUS PATTERN SKIN FLAPS

- Dermal-subdermal plexus
- Perforating aa.
- Segmental a.

1. Random Cutaneous Flap

2. Myocutaneous Random Flap

AXIAL/ARTERIAL PATTERN SKIN FLAPS

- Direct cutaneous a & v.
- Peninsular Axial Pattern Flap
- Island Axial Pattern Flap

3. Free Flap
FLAPS

• CLASSIFICATION

• By vascular pattern
  • Pedicled vs. Free
    • PEDICLED FLAPS REMAIN ATTACHED to the body at the harvest site.
    • The pedicle is the base that remains attached and includes the blood supply.
    • Usually via a musculocutaneous or fasciocutaneous fashion.
    • 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.
FLAPS

• CLASSIFICATION
  • By vascular pattern
    • Perforator Flaps
      • flaps consisting of skin and/or subcutaneous fat supplied by vessels that pass through or in between deep tissues.
      • harvested **without the deep tissues**
        • to *minimize donor site morbidity*
        • 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.
FLAPS

• CHOOSING THE RIGHT FLAP

• The Primary Defect (Recipient Site)
  1. Location and size
  2. Quality and vascularity of surrounding tissues
  3. Presence of exposed structures
  4. Functional and aesthetic considerations

• The Secondary Defect (Donor Site)
  1. Location
  2. Adhere to the concept of angiosomes, the territory that is supplied by a given vessel
  3. What type of tissues are needed
  4. Functional and aesthetic morbidity
FLAPS

- SURVIVAL
  - The success of a flap depends
    - NOT ONLY ON its survival but also its ability to ACHIEVE THE GOALS of reconstruction.
  - 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
FLAPS

• Monitorization of flap viability
  • Capillary Filling
  • Colour
  • Temperature
  • Turgor-Tonus
FLAPS

- Muscle and Musculocyticaneous flap

- Type I

- Type II

- Type III

- Type IV

- Type V

Tensor fascia lata
Gracilis
Gluteus maximus
Sartorius
Latissimus dorsi