Microvascular Free Flaps Used in Head and Neck Reconstruction.

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Radial Forearm Flap

- 1981 (China), 1985 (pharyngeal recon)
- Oral cavity, base of tongue, pharynx, soft palate, cutaneous defects, base of skull, small volume bone and soft tissue defects of face
- Thin, pliable skin
  - Reconstitution of contours, sulci, vestibules
  - Tongue mobility
- Fasciocutaneous flaps are highly tolerant of radiation therapy
- Composite flap with bone, tendon, brachioradialis muscle and vascularized nerve.
  - Sensory recovery reported in patients even when a neural anastomosis is not performed.
    - Fasciocutaneous flaps > musculocutaneous flaps
    - Incomplete and unpredictable
- Skin from entire forearm
- 2 team approach
Neurovascular pedicle

- Up to 20 cm long
- Vessel caliber 2 – 2.5 mm
- Radial artery
- Venae comitantes / cephalic vein
- Lateral antebrachial cutaneous nerve (sensory)
  - Anastomose to lingual nerve
  - Increased two point discrimination after inset
Technical considerations

► Tourniquet

► Flap designed with skin paddle centered over the radial artery

► Dissection in subfascial level as the pedicle is approached.

► Pedicle identified b/w medial head of the brachioradialis, and the flexor carpi radialis

► Radial artery is dissected to its origin
  ▪ Divided distal to the radial recurrent artery

► External skin monitor can be incorporated into the flap (proximal segment)

► A -plasty - reduces the potential for stricture
Technical considerations

► Osteocutaneous flap
  ▪ Monocortical
  ▪ Cuff of flexor pollicis longus
  ▪ 10 – 12 cm of radius
  ▪ Up to 40% circumference
  ▪ Limited by amount of available bone and risk for pathologic fracture.

► Pollicis longus tendon
  ▪ Suspending flap laterally in palatal and total lower lip recon
Radial Forearm Flap
Radial Forearm Flap
Radial Forearm Flap
Radial Forearm Flap

► Morbidity
  - Hand ischemia
  - Fistula rates - 42% to 67% in early series
    - Subsequent series - 15% and 38%.
    - Creation of a controlled fistula or use of a salivary bypass stent can protect the suture line from salivary soilage and decrease the potential for fistulization.
  - Stricture formation - 9% to 50%.
  - Radial nerve injury
  - Variable anesthesia over dorsum of hand.
Radial Forearm Flap

► Preoperative considerations
  ▪ Allen test
    ► Tests viability of palmar arch system
  ▪ No IVs / blood draws in donor arm.
  ▪ Skin graft (must preserve paratenon layer)
  ▪ Osteocutaneous flaps
    ► Radius fracture
    ► Weakened supination, wrist flexion, grip strength and pinch strength.
  ▪ Should not be used defect extends below the thoracic inlet

► Postoperative management
  ▪ Forearm and wrist immobilization w/volar splint
  ▪ 7-10 days
  ▪ Oral intake can generally begin within 7 to 10 days
    ► 2 weeks is best if the patient has been previously irradiated.
Lateral Arm Flap

- Described by Song in 1982
- Moderately thin fasciocutaneous flap
- Donor site skin 6-8 cm (1/3 circumference of arm)
- Fascial flap
  - Augmentation of subcutaneous defects from lateral temporal bone resection or total parotid
- Portion of humerus can be taken.
- Oropharyngeal reconstruction
  - Incorporates thin skin from the proximal forearm.
    - Pharyngeal wall
  - Thick skin from the upper arm
    - Tongue base
Neurovascular pedicle

- Terminal branch of profunda brachii artery and posterior radial collateral artery
- Venae comitantes
- Travel with radial nerve in spiral groove of humerus
  - Travels in the lateral intermuscular septum
    - Posterior - Triceps
    - Anterior - Brachialis and Brachioradialis
- Artery caliber 1.55 mm diameter (1.25 to 1.75 mm) @ deltoid insertion
- Skin blood supply – 4 to 5 septocutaneous perforators
- Sensory nerves (from proximal radial nerve)
  - Posterior cutaneous nerve of the arm (lower lateral brachial cutaneous nerve)
  - Posterior cutaneous nerve of the forearm (post antebrachial cut nerve)
Technical considerations

► No tourniquet.
► Central axis of flap design based on intermuscular septum
  ▪ Lateral intermuscular septum - 1 cm posterior to line drawn from insertion of deltoid and lateral epicondyle
  ▪ Can be extended distally over the upper forearm
► Radial nerve identified along the anterior aspect of the pedicle
► Radial nerve and pedicle are followed into the spiral groove
► Must identify and preserve muscular branches from radial nerve
► Osteocutaneous flap
  ▪ Humerus segment
    ► 10 cm in length
    ► 20% of the circumference
Lateral Arm Flap

► Morbidity

- Radial nerve damage
  - Palsy 2/2 constrictive dressings or tight wound closure.
- Primary closure if less than 1/3 of arm
  - Use STSG if closure under too much tension.
Lateral Arm Flap

► Preoperative Considerations
  ▪ Easy scar camouflage
  ▪ Male patients may have less hair in this region when compared to forearm
    ▶ Consider for intraoral reconstruction
  ▪ Flap becomes thinner more distally
Lateral Thigh Flap

- Described by Baek in 1983
- Large surface area
- Expendable tissue
- Flap size up to 25 x 14 cm
- Fasciocutaneous flap – thin to moderately thick
- Intraoral and pharyngeal reconstruction
- Reinnervated via lateral femoral cutaneous nerve
Neurovascular pedicle

- Third perforator of profunda femoris
- Travels w/in intermuscular septum
- Pedicle 8 – 12 cm
- Vessel caliber 2 – 4 mm
- Lateral femoral cutaneous nerve of the thigh
  - Anterosuperior entry into flap
  - Does not travel with vascular pedicle

- Terminal cutaneous branch of second or fourth perforators are the dominant arterial supply (rare)
  - 4th perforator usually included in dissection to account for variations
  - When 2nd perforator dominant – pedicle length limited by muscular branch vessels to preserve femoral blood supply.
Lateral Thigh Flap

- Deep circumflex iliac artery
- Superficial circumflex iliac artery
- Femoral artery
- Ascending branch, Transverse branch, Descending branch of Lateral circumflex femoral artery
- Deep artery of thigh
- Perforating branches
- Femoral artery passing through adductor hiatus
- External iliac artery
- Inferior epigastric artery
- Superficial epigastric artery
- Superficial external pudendal artery
- Obturator artery
- Deep external pudendal artery
- Medial circumflex femoral artery
- Femoral artery
- Muscular branches
- Descending genicular artery
  - Articular branch
  - Saphenous branch
Lateral Thigh Flap
Technical considerations

- Centered over lateral intermuscular septum
  - Separates vastus lateralis and iliotibial tract (fascia lata) anteriorly from the biceps femoris posteriorly
- Septum located by line b/w greater trochanter and lateral epicondyle of femur
- 3rd perforator at midpoint of line
  - Terminates in the intermuscular septum between the long head of the biceps femoris and the vastus lateralis
- Lateral femoral cutaneous nerve provides sensation to the skin of the lateral thigh and may be incorporated into the flap
- Dominant perforator identified in subcutaneous plane and then traced through the biceps femoris to the main pedicle
- Release of the adductor magnus from the linea aspera facilitates dissection of the main pedicle
Lateral Thigh Flap

► Morbidity

- Atherosclerosis of profunda femoris and its branches
- Avoid in pts with h/o PVD
- Sciatic nerve injury
Lateral Thigh Flap

► Preoperative Considerations
  - Assess for PVD (palpate peripheral pulses)
  - Not advised for use in obese individuals or in those with previous surgery or trauma to the thigh

► Postoperative management
  - Primary closure of donor site
  - Early walking
Anterolateral thigh flap

► First reported by Song et al
► Subcutaneous, fasciocutaneous, myocutaneous, adipofascial
► Laryngopharynx, oral cavity, oropharynx, external skin and maxilla
► Flap may be thinned or suprafascial flaps taken for thinner flaps
► Popular in Asia
► Less popular in Europe and America
  ▪ Difficult perforator dissection (bountiful subcutaneous tissue)
  ▪ Variation in vascular anatomy
Neurovascular pedicle

- Descending branch of lateral circumflex femoral artery
  - Septocutaneous
    - Traverse the fascia lata
  - Musculocutaneous perforators
    - Traverse the vastus lateralis muscle and the deep fascia
- Venae comitantes
- Descending branch travels inferiorly in intramuscular space b/w rectus femoris and vastus lateralis
- Caliber – 2.1 mm artery, 2.6 mm vein
- Vascular pedicle up to 16 cm

- Lateral femoral cutaneous nerve – sensory nerve
  - Branch of lumbar plexus
  - Enters thigh deep to lateral aspect of inguinal ligament near ASIS
  - Runs with deep circumflex iliac artery and vein
  - Runs anterior, posterior or through sartorius, continuing through fascia lata
Neurovascular pedicle

- **Musculocutaneous variations**
  - Vertical musculocutaneous perforators (descending lateral circumflex femoral artery)
    - Pass through vastus lateralis perpendicularly into fascia lata
  - Horizontal musculocutaneous perforators (transverse branch of lateral circumflex femoral artery)
    - Pass through vastus lateralis horizontally

- **Skin blood supply**
  - Septocutaneous perforators – 10.7%
  - Musculocutaneous perforators from descending branch – 89%
  - Musculocutaneous perforator from transverse branch – 3.5%
Anterolateral thigh flap

Deep circumflex iliac artery

Superficial circumflex iliac artery

Femoral artery

Ascending branch,
Transverse branch,
Descending branch of
Lateral circumflex
femoral artery

Deep artery
of thigh

Perforating branches

Femoral artery passing
trough adductor hiatus

External iliac artery

Inferior epigastric artery

Superficial epigastric artery

Superficial external pudendal artery

Obturator artery

Deep external pudendal artery

Medial circumflex femoral artery

Femoral artery

Muscular branches

Descending genicular artery
Articular branch
Saphenous branch
Anterolateral thigh flap
Technical considerations

- Draw line from ASIS to lateral patellar border
- Cutaneous perforator exit point from intermuscular septum or from vastus lateralis
  - 2 cm lateral to and 2 cm inferior to midpoint of line from ASIS and lateral border of patella
- Use Doppler to mark perforators
- Dissect (medial to lateral) to intermuscular septum b/w rectus femoris and vastus lateralis.
- Retract rectus femoris medially exposing perforators
  - Leave muscle cuff around myocutaneous perforators
- Fasciocutaneous flap, suprafascial flap, cutaneous flap (up 5 mm thickness), adipofascial flap
- May include lateral cutaneous nerve of thigh
- Max size – horizontal line from greater trochanter down to a parallel line 3 cm above patella
  - 25 x 18 cm
  - 20 x 26 cm
- Close donor site primarily if less than 8 cm wide
Anterolateral thigh flap
Anterolateral thigh flap

► Morbidity

- Possible STSG
- Depends on extent of injury to vastus lateralis
- Thinned flaps with more complications in intraoral defects
Anterolateral thigh flap

Preoperative Considerations

- Reduced donor site morbidity compared to RFF
- Can be as thin as RFF
- Contraindicated in pts with prior upper thigh surgery, vascular procedures, big eaters...
Rectus abdominis

- Easy to harvest
- Long pedicle
- Skin from abdomen and lower chest
- Myocutaneous flap or muscle only flap
- Not used for functional motor reconstruction
- Can include entire muscle or only small portion in paraumbilical region
- Plentiful people – thinner flap created by skin grafting the muscle
- Skinny people
  - Flap used for moderately volume defects
- Poor color match
- Tends to become ptotic
- Skull base defects
  - Muscular component used to seal subarachnoid space
- Able to fill large tissue deficits
- Total glossectomy defects
Neurovascular pedicle

- Two dominant pedicles
  - Deep superior epigastric artery/vein
  - Deep inferior epigastric artery and vein
- Based on inferior epigastrics when used for h/n recon because of larger pedicle size
- Inferior epigastric diameter – 3 to 4 mm
- Reinnervated with any of the lower six intercostal nerves.
- Pedicle may travel along lateral aspect of muscle before taking intramuscular route
Technical considerations

► Cutaneous blood supply
  ▪ Harvest anterior rectus sheath in paraumbilical region (dominant perforators located here)
  ▪ Skin paddle designed with epicenter above the umbilicus

► Primary closure
► Hernia prevention depends on restoring abdominal wall.
► Arcuate line (level of ASIS)
  ▪ Superior – posterior sheath with transversalis fascia, internal oblique and transversus abdominis
    ► Closure of posterior sheath prevents herniation
  ▪ Inferior – only transversalis fascia posterior to muscle
    ► Must close anterior sheath to prevent herniation
Technical considerations

1. Dissect superiorly first
2. Dissect down to underlying muscle
3. Split fascia to the costal margin
4. Lateral and inferior portions of skin paddle incised next
5. Small cuff of anterior rectus fascia preserved medially and laterally, to preserve cutaneous perforators
6. Split fascia vertically down to the public region
7. Divide rectus superiorly and free from posterior rectus sheath
8. Dissection below the arcuate line
9. Vascular pedicle identified below arcuate line along the lateral deep aspect of the muscle.
10. Divide rectus inferiorly
11. Pedicle dissected inferiorly to origin off the external iliac system
Rectus abdominis
Rectus abdominis

Arcuate Line
Rectus abdominis
Rectus abdominis

► Morbidity
  ▪ Abdominal weakness
  ▪ Hernia
Rectus abdominis

► Preoperative Considerations
  - Prior abdominal surgery
  - Prior inguinal herniorrhaphy may compromise pedicle dissection 2/2 scarring
  - Hernia
  - Diastasis recti

► Postoperative management
  - Ileus
  - Avoid abdominal strain for 6 weeks.
Pedicle or free flap

Free flaps
- Better flap positioning
- Cutaneous portion can be centered over pedicle
- Less risk of pedicle kinking

Musculocutaneous
- Large volume defects of large cutaneous neck defects

Muscle-only flap
- Broad and thin
- Atrophies to about 4 mm
- Ideal for scalp reconstruction
- Poor for large volume defects

Massive scalp defects

STSG for final resurfacing

Non sensate

Motor reconstruction possible

Useful after total glossectomy
Neurovascular pedicle

- Thoracodorsal artery
- Arise from subscapular vessels off of third portion of axillary artery and vein
- Vessel diameter at origin – 2.7 mm (1.5 to 4.0)
- Vein diameter – 3.4 mm (1.5 to 4.5)
- Pedicle length 9.3 cm (6 to 16.5)
  - Can be lengthened by sacrificing branch to serratus anterior
- Numerous variations
  - Most common: independent origin of thoracodorsal vein/artery
Technical considerations

- Lateral decubitis position
  - If at 15 degrees, flap may be harvested simultaneously with primary lesion resection
  - Anterior muscle border along line b/w midpoint of axilla and point midway b/w ASIS and PSIS
- Vessels enter undersurface of muscle 8 to 10 cm below midpoint of axilla
- Serratus vessels ligated during harvest
- Can design two paddle flap based on medial and lateral branches of thoracodorsal vessels

- Total glossectomy insetting.
  - Muscle inset as a sling on undersurface of mandible
  - Sutured to pterygoid, masseter, or superior constrictor...
  - Thoracodorsal nerve anastomosed to a hypoglossal nerve
    - Gives reconstructed tongue the ability to elevate superiorly toward the palate
Latissimus dorsi
Latissimus dorsi

► Morbidity
  - Marginal flap necrosis
  - Pedicled flaps pass b/w pec major and minor
    - Changes in arm position may occlude pedicle
    - Should immobilize arm in flexed position
Latissimus dorsi

► Preoperative Considerations
- Relative contraindications - prior axillary LN dissection
- Preop angiography advocated to assess vessel patency

► Postoperative management
- Suction drains
- High incidence of seroma
Gracilis flap

- 1976
- Thin muscle flap
- Dynamic facial reanimation
- Muscle revasularized and reinnervated
- Long vascular pedicle
- Easy dissection
Neurovascular pedicle

- Terminal branch of adductor artery from profunda femoris
- Runs b/w adductor longus (anterior) and adductor brevis and magnus (posterior)
  - Enters gracilis at junction of upper third and lower two thirds
  - 8 – 10 cm inferior to pubic tubercle
- 2 venae comitantes – drain into profunda femoris
- Artery caliber – 2 mm
- Vein caliber 1.5 – 2.5 mm
- Motor innervation – anterior branch of obturator nerve
  - 2 – 3 cm cephalic to vascular pedicle.
- Blood supply to skin variable
  - Skin supplied mostly by septocutaneous perforators
Technical considerations

- Muscle can be split into at least two functional muscular units
- Single neuromuscular unit can be transferred to decrease bulk
- Orient skin paddle longitudinally
  - Must be centered over dominant musculocutaneous perforator
- For synchronous mimetic movement when proximal facial nerve not available.
  - 2 stage procedure with cross face sural nerve graft
  - Tinel sign used to monitor axonal growth across the face – 9-12 months
  - After adequate axonal regrowth – muscle transferred
Gracilis flap
Temperoparietal Fascia Flap

- More commonly transferred as a pedicled flap but can be used as a free flap when arc of rotation is inadequate
- Ultra thin – 2 to 4 mm thick
- Highly vascular, pliable and durable
- Fascial, fasciocutaneous
- Up to 17 x 14 cm with extensive scalp undermining
- Oral cavity, hemilaryngectomy defects, middle and upper regions of face w/split calvarial bone graft
Neurovascular pedicle

- 5 layers – scalp
- Temperoparietal fascia (TPF) deep to skin and subcutaneous tissue.
- Superficial to temporalis muscular fascia
- Above superior temporal line it’s continuous with galea aponeurotica
- Base centered over helix

- Superficial temporal artery and vein – travel in TPF layer
  - 3 cm superior to root of helix
  - Vessels branch into frontal and temporal divisions
  - Most commonly based on parietal branch
  - Ligation of frontal artery 3 – 4 cm distal to branching point to avoid frontal nerve injury
  - Venous pedicle may course with arteries or 2 to 3 cm posteriorly

- Middle temporal artery – proximal superficial temporal artery at zygomatic arch (supplies temporalis muscular fascia)
- Including middle temporal artery enables a two-layered fascial flap on a single pedicle.
Temperoparietal Fascia Flap
Technical considerations

- Vertical incision over root of helix to superior temporal line
- V-shaped extension at superior limit of incision
- Scalp elevation ant and post
- Dissect deep to flap
- Loose areolar tissue deep to flap
Temperoparietal Fascia Flap
Temperoparietal Fascia Flap

► Morbidity

- Frontal branch weakness (travels in TPF)
- Secondary alopecia – damage to hair follicles due to superficial dissection
Temperoparietal Fascia Flap

Preoperative Considerations

- Relative contraindications - prior XRT, neck surgery, bicoronal incision or external carotid embolization.
- Doppler assessment of pedicle
Fibular osteocutaneous flap

- 1975
- Hidalgo – mandibular recon
- 1989
- Longest possible segment of revascularized bone (25 cm)
- Ideal for osseointegrated implant placement
- Mandible reconstruction (near total), maxillary reconstruction
Neurovascular pedicle

- Peroneal artery and vein
- Sensate restoration with lateral sural cutaneous nerve
- Peroneal communicating branch vascularized nerve graft for lower lip sensation
- Skin perforators
  - Posterior intermuscular septum (septocutaneous or musculocutaneous through flexor hallucis longus and soleus)
  - Should always include cuff of flexor hallucis longus and soleus in flap harvest
  - 5-10% of cases blood supply to skin paddle is inadequate
Technical considerations

► Choose leg based on ease of insetting
  ▪ Intraoral skin paddle
    ▶ Harvest flap from contralateral side of recipient vessels
► 8 cm segment preserved proximally and distally to protect common peroneal nerve and ensure ankle stability
► Center flap over posterior intermuscular septum
  ▪ Anterior to soleus and posterior to peroneus
► Doppler cutaneous perforators
► Greatest number of perforators present in the 15 to 25 cm range

► Distal skin paddle increases pedicle length
► Thigh tourniquet to 350 mm Hg
► Vascularity to skin running through the septocutaneous perforators may be enhanced by harvesting a segment of soleus to capture additional musculocutaneous perforators
Fibular osteocutaneous flap
Fibular osteocutaneous flap
Fibular osteocutaneous flap
Fibular osteocutaneous flap

► Morbidity

  ▪ Donor site complications
    ► Edema
    ► Weakness in dorsiflexion of great toe
  ▪ Skin loss in 5 – 10% of flaps
    ► reliability of the skin is questionable, and both the surgeon and the patient should be prepared for the possible need for a second soft tissue flap, either free or pedicled, when reconstructing composite defects with a fibular osteocutaneous flap
  ▪ May need STSG over donor site closure
Fibular osteocutaneous flap

► Preoperative Considerations
- Angiography
- MRA
- h/o distal lower extremity fracture
- Look for varicose veins, edema

► Postoperative management
- Distal pulses monitored
- Posterior splint for 10 days
Iliac crest flaps

- Osteocutaneous, osteomusculocutaneous
- Segmental mandibular defects
- Up to 16 cm bone
- Oromandibular reconstruction
- No motor or sensate reconstruction
- Only vascularized bone used extensively with simultaneous or delayed endosteal dental implant placement
- Skin paddle was not ideal for relining the oral cavity
  - Too thick for accurate restoration of the 3D anatomy
- Inclusion of internal oblique flap
  - Denervated muscle undergoes atrophy that leaves a thin, fixed, soft tissue coverage over the bone.
Neurovascular pedicle

- Deep circumflex iliac artery from lateral aspect of external iliac artery
  - 1 – 2 cm cephalic to inguinal ligament
- Ascending branch of deep circumflex iliac artery supplies internal oblique muscle
- Deep circumflex iliac vein – 2 venae comitantes
  - Can pass either superficial to deep to artery
- Artery caliber – 2 to 3 mm
- Vein caliber – 3 to 5 mm
- Pedicle to internal oblique can arise separately from deep circumflex iliac artery
Iliac crest flaps
Technical considerations

- Skin paddle centered on axis from ASIS to inferior tip of scapula
- Cutaneous perforators
  - 9 cm posterior to ASIS and 2.5 cm medial to iliac crest
- Generous cuff of external oblique, internal oblique and transversus abdominis layers must be preserved to maintain cutaneous perforators
  - Internal oblique muscle
    - axial-pattern blood supply
- Skin paddle bulky and immobile
- Do not rotate skin in order to prevent sheer injury
Iliac crest flaps
Iliac crest flaps
Iliac crest flaps

► Morbidity
  ▪ Hernia
    ► Need to approximate cut edge of iliacus muscle to transversus abdominis
    ► Can be reinforced by drilling holes into cut edge of iliac bone
    ► Approximate external obliques and aponeurosis to tensor fascia lata and gluteus muscles
    ► Keep inferior oblique inferior and anterior to ASIS
  ▪ Skin loss from perforator sheer injury
  ▪ poor color match
Iliac crest flaps

Preoperative Considerations

- h/o hernias, prior iliac bypass graft
- Severe PVD,
- Preop angio
Scapular flaps

- Fasciocutaneous, osteofasciocutaneous, cutaneous flap, parascapular cutaneous flap, latissimus dorsi myocutaneous flap, and serratus anterior flap
- Thin, hairless skin
- Two cutaneous flaps may be harvested
  - Horizontally oriented flap – transverse cutaneous branch
  - Vertically oriented flap parascapular flap – descending cutaneous branch
- Long pedicle length
- Large surface area
- Complex composite midfacial or oromandibular defects
- Up to 10 cm bone
- Osseointegrated implants possible
- Single team approach
Neurovascular pedicle

- **Subscapular artery and vein**
  - Circumflex scapular artery and vein emerge from triangular space (teres major, teres minor and long head of triceps)
  - Paired venae comitantes
  - Artery caliber – 4 mm at takeoff from subscapular
    - Subscapular caliber – 6 mm at takeoff from axillary artery
  - Pedicle length – 7 to 10 cm, 11 to 14 cm (from axillary artery)
  - Preservation of thoracodorsal vessels allows simultaneous transfer of latissimus and portion of serratus flap
    - Largest amount of tissue available for transfer

- **Thoracodorsal artery and circumflex scapular artery** can have separate origins from axillary artery.

- **Non-sensate flaps**

- **Scapular vessels** - very rarely affected by atherosclerosis
Scapular flaps
Technical considerations

► Decubitis positioning
  ▪ 15 degree angle
  ▪ Separate axillary incision helpful in dissecting pedicle to axillary artery and vein
  ▪ Bone harvest
  ▶ Teres major, subscapularis and latissimus dorsi need to be reattached to scapula

► Flap harvest opposite side of modified or radical neck dissection
Scapular flaps
Scapular flaps

► Morbidity

- Brachial plexus injury 2/2 lateral decubitis positioning
  - Use axillary roll
- Stay 1 cm inferior to glenoid fossa
- Detach teres major and minor to harvest bone
  - Can cause shoulder weakness and limit range of motion.
Scapular flaps

- **Preoperative Considerations**
  - Prior axillary node dissection – contraindication

- **Postoperative management**
  - Immobilize for 3 to 4 days
  - Early ambulation
  - 5 days for bone harvest
  - PT
Rib flap

► First vascularized bone to be used in mandibular reconstruction. (osteocutaneous)
► Blood supply to the rib
  - Internal mammary artery
  - Posteriorly or posterolaterally on the posterior intercostal vessels
  - Transferred with the pectoralis major, serratus anterior, or latissimus dorsi muscle
► Poor bone stock except for condylar reconstruction
► Not commonly used
Neurovascular pedicle
Metatarsus flap

- Osteocutaneous flap based on the first dorsal metatarsal artery
- Thin sensate skin with the second metatarsal
- Limited bone volume
- Not commonly used
Neurovascular pedicle
Jejunal flap

- 1959
- Circumferential pharyngoesophageal defects
- Patch graft
- Diameter of jejunum – good match to cervical esophagus
- Ideal mucosal surface
- Two team approach
- Advantages
  - Better superior positioning
- Disadvantage
  - Inferior positioning limited by thoracic inlet
  - 3 anastomoses
Neurovascular pedicle

- **Mesenteric arcade vessels**
  - Usually 2\textsuperscript{nd} arcade is best for pharyngeal reconstruction
Technical considerations

- Harvest distal to Ligament of Treitz
- Up to 20 cm
- Laparoscopic harvest has been reported
- Mark proximal graft with suture – isoperistaltic placement
- Proximal end divided along antimesenteric border to facilitate tongue base closure
- Distal end – end to end anastomosis
  - Lock and key closure
- Exteriorize a monitoring segment
Jejunal flap
Jejunal flap

► Morbidity
  - Most susceptible to primary ischemia
  - Fistula formation – 18%
  - 11% rate of anastomotic stricture
    - Higher rate if cervical anastomosis stapled
  - Wet voice (TEP)
  - Functional obstruction 2/2 peristalsis
  - Dysgeusia
  - Harvest site complications
Jejunal flap

► Preoperative Considerations
  ▪ Absolute contraindications
    ► Disease extension into proximal thoracic esophagus
    ► Ascites
    ► Crohn’s disease
  ▪ Relative contraindications
    ► Chronic intestinal diseases
    ► h/o abdominal surgery
      ▪ Consider angio
    ► Intraperitoneal sepsis
  ▪ Do not use in laryngeal sparing procedures

► Postoperative management
  ▪ Remove monitoring segment pod 7.
  ▪ Jejunostomy tube
Gastroomental flap

- 1961, 1979
- Greater omentum – double layer of peritoneum
  - Hangs from greater curvature of stomach and transverse colon
- Omentum - thin and well vascularized
  - Excellent coverage for great vessels
  - Plasticity allows for variable placement
  - Form adhesions to inflamed, ischemic, or necrotic tissues
    - Separates them from surrounding tissues
  - Promotes healing in previously radiated fields
- Large scalp defects,
- Extensive midfacial defects w/coverage of split rib or calvarial grafts
- Facial contouring
- Management of osteoradionecrosis or osteomyelitis in head and neck
- Pharyngoesophageal reconstruction
Neurovascular pedicle

- Right gastroepiploic artery
  - Caliber – 1.5 to 3.0 mm
Gastroomental flap

► Morbidity
  ▪ Intraabdominal complications
    ► Gastric leak
    ► Peritonitis
    ► Intraabdominal abscess
    ► Volvulus
    ► Gastric outlet obstruction
      ▪ If mucosal flap too large or if placed too close to pylorus
  ▪ Fistula

► Preoperative Considerations
  ▪ h/o GOO
  ▪ h/o PUD
Gastroomental flap