SCALP FLAPS &
CRANIOTOMY PRINCIPLES
Scalp flaps-
Historical perspective

• Neolithic period in 2000 B.C
• 19th century- trephines
• 1889 Wagner first osteoplastic bone flap
• Gigli saw for craniotomy- Obalinski in 1897
• Electric and gas powered high speed drills
Anatomic and neurovascular considerations

- 5 layers of scalp:
  - Skin
  - Connective tissue
  - Aponeurosis
  - Loose areolar tissue
  - Pericranium
Land marks

- Nasion
- Bregma
- Lambda
- Inion
- Pterion:
  - Middle meningeal artery
- Asterion:
  - Transverse sigmoid junction
• Fronto-temporal branch:
  
  anterior branch
  middle branch
  posterior branch

• Middle division: 1 cm anterior to superficial temporal artery, subgaleal pad of fat

  _Dissect between superficial and deep layers of superficial temporalis fascia_
Blood supply

- Superficial temporal artery
- Occipital artery
- Posterior auricular artery
- Supra orbital and trochlear vessels
Principles of craniotomy

• Preoperative review of patient
• Preparation of scalp
• Positioning of patient on the table
• Scalp toilet
• Marking of the incision
• Draping
Planning

• Position of lesion
• Position of important structures
• Contingency plan for enlarging incision
• Obtain adequate closure
Principles

• General principles:
  – Surgical exposure of the lesion
  – Neuro vascular supply
  – Cosmetic effect

• Types:
  – Random pattern
  – Based on named vessel

• Length not > 1.5 times base
• Integrity of major vascular flap to be maintained
• Incision in hair containing region
• No crossed incisions
Taylor Haughton Lines

- Central sulcus
- Sylvian fissure
- 1/2
- 2 cm
- 3/4
- Frankfurt Plane
- Posterior ear line
- Condylar line
- EAM
Principles

• Skin incised with galea
• Pressure over the scalp
• Periosteum raised with scalp or separately
• Raney’s clips, bipolar, Haemostatic artery forceps
• Adequate retraction
• Inner surface protected with moistened gauze
• Roller gauze
• Dissect in interfascial fat which is encountered within 4 cm of orbital rim
Types of craniotomies

- Flap craniotomy
- Trephine craniotomy
- Flap craniotomy:
  - Osteoplastic
  - Free bone flap
Bone flaps

• Most direct access to target
• For cerebral convexity directly centered over the lesion
• Number of burr holes varies
• Separation of underlying dura
• Beveling effect
Bone flaps

• If dura is lacerated during cutting, saw should be turned off and removed backwards via entrance hole

• Air cells opened:
  – Remove the mucosa
  – Pack with betadine soaked gelfoam
  – Pack with bone wax
  – Cover it up with vascularized tissue
• Proposed bony cuts over venous sinuses should be done last-vascularity adherence
• Cut sinus can be sewn/ tamponade
• Bony bleeds stopped with bone wax
• Penfield’s dissector to separate dura
• Epidural tacking sutures to control epidural bleeding before opening dura
• Others don’t in order to protect cortical blood vessels
• Tailor to avoid dural venous channels
Opening of Dura mater

- Manually palpate the dura
- Dura opened as straight, curved or flap like incisions
- Flaps based towards sinuses
- Opened with sharp hook and knife
- Incision further opened with dural scissors
- Placement of cottonoid along the intended incision
- Suitable cuff of dura around the bone for suturing later
Closure

- Closure in layers
- Check for BP- valsalva maneuver
- Hitch suture
- Water tight but not tension
- Bone flap replacement
- Skin closed in two layers
Bicoronal/ Souttar flap

- Large exposures of anterior cranial fossa and sella
- Fronto-temporal lesions and cranial base
- Superior to zygomatic arch, 1 cm anterior to tragus- extends over the bregma to the corresponding site on the opposite side
- Reflect up to orbit rim
- Supraorbital/ trochlear vessels
Bicoronal/ Souttar flaps
Frontal/ Bifrontal bone flaps

• Suitable for frontal lobe, sub-frontal approaches to anterior skull base, and trans cortical access to ventricles
Frontal/ Bifrontal bone flaps

- An extended frontal or bi-frontal craniotomies for exposure of sella, anterior cranial base
- Supine with head extended for these
- Holes placed on either sides of sagittal sinus and intervening bone is removed with ronguers or drill
- Either removed as single piece or conversion of frontal flap to bi-frontal flap
- Combining a frontal flap with pterional flap
Frontal/ Bifrontal bone flaps

• Goals of surgery dictate the craniotomy
• Bilateral orbital craniotomies may be added to minimize frontal lobe retraction
• Dural openings for a unilateral frontal craniotomy usually consist of flap reflected towards sagittal sinus
• Superior sagittal sinus may have to be ligated
Frontal flap

- Exposes anterior frontal lobe
- Begins along coronal suture and curves anteriorly along the midline preferably ending at hair line

[Diagram of the head showing the sagittal suture, Bregma, Coronal suture, Bicoronal flap, Frontal flap, Soutar flap, Frontal temporal flap, and the scalp markings for flap harvesting.]
Temporal flap

- Anterior temporal lobe and subtemporal access
- Based on zygoma
- Goes behind the ear
- Extends anteriorly just behind the superior temporal line to the hairline
• Link to video –

Fronto-temporal (pterional) bone flap

• Popularized by Yasargil
• Most useful for aneurysms of anterior circulation, basilar top, also tumors of retro orbital, parasellar and subfrontal areas
• Supine position with head end elevated to 30 degrees and rotated by the same to opposite side
Fronto- temporal (pterional) bone flap

Link to video -
http://www.aiimsnets.org/NeurosurgeryAnimationVideoPterionalCraniotomy.html
Fronto-temporal flap

- Used for most pterional craniotomies
- Combines frontal and temporal skin flaps
- Extends from zygoma to 1-2 cm off the frontal midline following a curve behind the natural hair line
- Temporalis muscle either dissected or reflected as a separate layer
- In the later instance a cuff is left superiorly so as to suture it
Fronto-temporal (pterional) bone flap

- Temporalis muscle dissected or reflected
- Bone flap centered over the pterion
- Key burr hole, frontal burr hole, posterior burr hole, last burr hole just above the zygoma
- Further bone may be removed from the inferior temporal squama
- To improve vision, drill the sphenoid ridge
- Dural flap based on the orbit
FTOZ

- Addition of orbito-zygomatic craniotomy will allow for a more lower and anterior approach
- Suited for para-sellar, inter-peduncular lesions,
- Basilar top aneurysm,
- Carotico-ophthalmic aneurysms.
FTOZ

Link to video -

http://www.aiimsnets.org/NeurosurgeryAnimationVideoFrontotemporalOrbitozygomaticFTOZApproach.html
Question mark skin flap

- Cranial trauma
- Exposure to whole hemisphere
- Based on zygoma
- Blood supply from superior temporal and supra orbital vessels
- Curves around 3.5 cm posterior to external auditory meatus
- Anterior limb extends to hair line
Horse shoe skin flap

- Expose any portion of cerebral convexity
- Inverted “U” shaped with base directed towards vascular supply
- Subtemporal exposure: anterior limb 1 cm anterior to the tragus
- For anterior transcallosal approaches: over coronal suture
Mitre skin flap

- Mitre hats worn by bishops
- Occipital lobe, posterior falx and superior tentorial surface
- Inion to vertex: vertical limb
- Upper limb then falls over posterior parietal region towards the ear
- Blood supply from the occipital artery
Linear and curvilinear incisions

- Limited exposures
- Simplicity
- E.g.: MLSOC
  - RMSOC
  - Hockey stick incisions
  - Linear incisions for temporal lobe
  - & subtemporal access
CP angle tumors

- Lateral
- Prone
- Three quarters prone
- Sitting
Retromastoid suboccipital transmeatal approach
Retromastoid suboccipital transmeatal approach

- Incision –
  - Vertical linear (1 cm medial to the mastoid process)
  - ‘S’ / Lazy ‘S’
  - Inverted ‘J’-shaped/ Hockey-stick
- Anatomical variants-
  - Dolichoectatic VA/Occipital artery
  - Hypoplastic VA (20%)- Avoid extreme flexion

Link to video - http://www.aiimsnets.org/NeurosurgeryAnimationVideoRetromastoidSuboccipitalCraniotomy.html
MLSOC

Link to video -
http://www.aiimsnets.org/
NeurosurgeryAnimationVideoMidlineSuboccipitalCraniotomy.html
Poppens-Suboccipital Transtentorial Approach

Link to video -
Thank you