Scalp flaps & Craniotomy principles
Scalp flaps -
Historical perspective

- Neolithic period in 2000 B.C
- 19\textsuperscript{th} 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
  – Neurovascular 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
- Frankfurt Plane
- Posterior ear line
- Condylar line
- 1/2
- 2 cm
- 3/4
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 roneguers 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
Temporal flap

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

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

Link to video -
Thank you