Posterior Circulation Aneurysms: Surgical Management

Speaker

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Introduction

- Account for 15% of all intracranial aneurysms.
- Common in females
- Occur in fifth to sixth decade
- Most commonly occur at basilar apex followed by origins of SCA, PICA
- PCA and AICA aneurysms are very rare.
Clinical Presentation

- Subarachnoid hemorrhage.
- Intraventricular hemorrhage
- Single or multiple cranial nerves palsy
- Local mass effect
- Hydrocephalus.
- Long tract signs
Diagnosis

- **NCCT**
  - Location of SAH
  - Bony details of posterior fossa

- **Four vessel DSA**
  - Vessel of origin and relation to other vessels
  - Particulars of aneurysm
  - Presence and location of vasospasm
  - Other aneurysms or abnormalities

- **Magnetic resonance imaging**
Need for treatment

• Re-bleeding rate 10% (thrice that of ant circulation aneurysms)

• Mortality of untreated patients 63% against 11% of surgical treated patients

• Improved surgical outcome
Management Options

- Clipping
- Endovascular
- Bypass procedures
- Others
Surgical indications

- Complex aneurysms
- Vasospasm of parent vessel
- Aberrant anatomy of vessels making negotiations difficult
- Patients choice
Surgery: A technical challenge

- Ultimate vicinity to vital structures like brainstem, cranial nerves
- Complex bony anatomy
- Narrow surgical corridors
- Complex perforator and vessel anatomy
- Difficult surgical exposures
Surgical Management

"Exposure is everything"
Approaches

- Three vascular territories - trajectories
  - Basilar apex - antero superior trajectory
  - Basilar trunk - lateral
  - Vertebral trunk - posteroinferior
Basilar apex territory

- Aneurysms
  - Basilar top
  - PCA
  - SCA
  - Upper basilar artery

- Approaches
  - Subtemporal
  - Pterional
  - Orbitozygomatic
  - Extended OZ
Subtemporal approach

- Supine position with head tilted to facilitate temporal lobe retraction.
- Temporal craniotomy
- Temporal lobe retracted upwards till cerebral peduncles
- Field centered on third nerve
- Temporal lobe resection indicated if required
Merits
  - Proximal control is easy
  - Excellent visualization and easy dissection of perforators
  - Anteriorly and Posteriorly directed aneurysms can be tackled easily.
  - Fenestrated clips can be placed well
• Demerits

  ▪ Field is narrow

  ▪ Access to contralateral P1 is difficult

  ▪ Temporal lobe damage

  ▪ Intraoperative bleeding is difficult to control

  ▪ III nerve palsy is very common
Indications

- Low lying basilar top
- Large anteriorly directed aneurysms
- Posteriorly directed aneurysms
Trans sylvian approach

- Pterional craniotomy
- OZ osteotomy to improve superior view
- Bone removal (if required)
  - sphenoid ridge
  - anterior clinoids
  - dorsum sellae
  - clivus
  - medial petrous apex
- Wide opening of sylvian fissure
Trans-sylvian approach

- Merits
  - Familiarity with approach
  - Proximal control is straightforward
  - Wide exposure is possible
  - Both P1 can be exposed for temporary trapping
cont'd

- Demerits
  - Exposure of posteriorly located perforators is difficult
  - Distal clip blade is difficult to visualize
  - Anteriorly or posteriorly directed aneurysms difficult to tackle
Indications

- Most favoured approach
- Laterally tilted aneurysm
- High located basilar top
PAVEL-Pterional approach via extended lateral corridor

- Key features
  - performed from surgeons dominant side
  - sylvian fissure dissected thoroughly
  - field centered on Cr III.
  - mesial temporal lobe elevated up
  - posterior dissection performed behind and below ipsilateral P1
  - first fenestrated clip and second normal clip used.
Basilar trunk aneurysms

- Operative approaches
  - Transpetrosal approach
    - retrolabyrinthine
    - translabyrinthine
    - transcochlear
  - Combined supra and infratentorial
  - Extended middle fossa approach
  - Transoral approach
Transpetrosal approaches

• Approach the basilar trunk from lateral side

• ENT surgeon's assistance is required for temporal bone drilling.
• Retrolabyrinthine exposure
  o bone posterior to semicircular canals is removed.
  o hearing is preserved

• Translabyrinthine exposure
  o semicircular canals are removed
  o hearing is sacrificed
  o seventh nerve is preserved

• Transcochlear
  o hearing and seventh nerve both are sacrificed
  o maximum bone is removed
Extended middle fossa approach

- Popularized by Kawase
- Temporal craniotomy
- Extradural mobilization of temporal lobe
- Anterior petrous apex drilling of KAWASE'S triangle
- Approach the aneurysm from superior and anterior trajectory
- Hearing preservation
Combined supra-infra tentorial app.

- Two maneuvers
  - posterior mobilization of sigmoid sinus
  - division of tentorium

- superior petrosal sinus divided

- Vein of Labbe preserved

- Provides access from foramen magnum to dorsum sellae

- Minimal brain retraction
Trans oral approaches

- Obsolete these days
- High incidence of complications like CSF leak and meningitis
Vertebral trunk territory

- Aneurysms
  - Vertebral artery
  - PICA
  - Vertebra-basilar junction

- Exposures
  - Midline suboccipital
  - Far lateral
  - Extended far lateral
  - Combined combined
Far lateral approach

- Most commonly utilized for
  - PICA aneurysms
  - Distal vertebral aneurysms
  - PICA- Vertebral junction aneurysms
- **Position**
  - lateral decubitus
  - neck flexion
  - neck rotation
  - ipsilateral lateral flexion

- **Hockey stick or S shaped incision**

- **Bone removal**
  - paramedian suboccipital craniotomy
  - half to two third of condyle
  - posterior arch of C1
  - rim of foramen magnum
Advantages offered

• Extra lateral angle of visualization
• Minimal brainstem retraction
• Vertebral artery is visible early in the exposure
Extended far lateral approach

- Superior occipital bone is removed
- Transverse- sigmoid junction is exposed
- CPA is entered
combined-combined app.

- Supra and infratemporal combined approach for basilar trunk is combined with far lateral approach

- Bone removal
  - suboccipital craniotomy
  - Temporal and parietal bone
  - medial and inferior condyle
  - C1 arch

- Obsolete these days with availability of endovascular methods
Midline Suboccipital craniotomy

- Indications
  - bilateral vertebral aneurysm
  - distal PICA aneurysms
  - bypass procedures

- Routine MLSOC

- Does not provide good access to anteriorly located aneurysms
Ligation

- When both Pcom are large in size,
- When balloon occlusion suggests good collateral circulation
- Gradual compression can be used
- Vertebral artery tolerate ligation very well if opposite vertebral is not aberrant.
Revascularization procedures

• When ligation is not feasible so also the endovascular management

• High morbidity and mortality associate with the procedure

• Team approach including endovascular surgeon and neurosurgeon
Hypothermic cardiac arrest

- Last resort
- Aneurysm shrinks and become amenable to manipulations
- High morbidity and mortality.
- Complexity due to hyalinization
Outcome

• Excellent or good outcome in 60-70%

• Moderate disabilities in 10-16%

• Mortality in 8-12%

• Complications rate up to 20%
Timing of surgery

• Early surgery
  – Advantages
    • Reduces the risk of rebleed
    • Better management of vasospasm
    • Mortality is decreased (8%)
  – Disadvantages
    • More friable aneurysm
    • More intraoperative rupture
    • More damage to vital structures
Thank you