Neurosurgery Update
In The Wine Country 2007

Surgical Management of Meningiomas

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Outline

- When, why to operate
- Surgical Nuances
  - Sphenoid wing
  - Tuberculum sellae
  - Convexity, falx, parasagittal
  - Falcotentorial
  - Foramen magnum
- Options for treatment
  - radiotherapy
  - radiosurgery
  - brachytherapy

Disclosure

- co-inventor medical device with Integra Neuroscience
- Patent rights signed over to University of California
- Device not related to this presentation

Materials and Methods

- UCSF departmental database
  - Meningioma Surgical cases 905
  - Acoustic Neuroma 357
  - Transphenoidal 1171
  - Gamma Knife cases 2085
  - Glioma cases 2578

When & Why to Operate

- Treat the patient and not the scan!
- symptomatic?
  - symptoms match tumor location?
- asymptomatic?
  - age
  - number of life years left to live
  - natural history
    - calcified or not?
  - Japan: 42% did not grow in first year of observation

- decision for surgery
  - real risk factors
- pre-operative
  - angio
  - angio / embo
- intra-operative
  - "experience" -> Malis said 300 cases
  - 2 surgeons for cases over 6 hours
- post-operative
  - anticonvulsants for 7 days
  - lovanox 40 mg s.c. for 7 days
  - no dehydration!
Sphenoid Wing Meningiomas

- Reinert et al. 2006
  - 201 cases
    - 102 asymptomatic
    - 99 with symptoms
  - new morbidity in 39%
  - radical removal in 80%
  - “results worse than SRS”

Sphenoid Wing Meningiomas
Surgical Technique

- Sphenoid Wing Meningiomas
  - McDermott ‘90
    - 8 patients
      - 8/8 proptosis
      - 2/8 reduced acuity
    - Results
      - Total removal 5/8
      - Improved acuity FC -> 20/50
      - Periorbital excision / graft -> 6/8
    - Complications:
      - 5/8 squint
      - 2/8 CSF leak
      - No pulsating exophthalmos
    - Cosmetic results:
      - Excellent in 7/8
**Clinoid Meningiomas**

- Most common symptoms:
  - visual loss 54%
  - headache 27%
  - diplopia 15%

- Visual deficits
  - unilateral 86%
    - chiasmatic effects of papilledema
  - fields + acuity 79%

- Results:
  - Risi '94
    - 34 pts.
    - 20/34 GTR
    - vision improved 68% worse 32%
    - mortality 6% major morbidity 9%
  - Tobias '03
    - 26 pts.
    - 20/26 GTR
    - vision improved 77%
    - mortality 0% major morbidity 0%

**Skull base approach**

- extradural removal of:
  - sphenoid wing
  - clinoid
  - roof and lateral wall of canal

- find optic nerve first
  - open sheath to find nerve
  - with landmark open dura
  - remove tumor
  - cover dural opening with collagen sponge, pericranial flap
**Tuberculum Sellae Meningiomas**

- Tuberculum meningiomas account for 4 – 10% of cases
- Displace the optic nerve posterior and slightly superiorly
- Difficult to remove
- Controversy over best approach

**Approaches**

- Pterional
- Cranio-orbital
- Subfrontal
  - unilateral
  - bilateral
- Extended bi-frontal
Extended Bifrontal Study

**Methods:**
- 1997 – 2005
- FLAIR/T2 changes
  - A no edema
  - B gyrus rectus
  - C beyond gyrus
  - D extensive bifrontal

**Results:**
- 45 patients
- 54% tumors > 4 cm.
- avg. OR time 12.3 hours
- improved vision in 74%
- edema unchanged in 87.5%
- 91% group A or B
- no infections, 2 CSF leaks

Convexity, Falx & Parasagittal Meningiomas : Clinical

**Convexity**
- classification by site:
  - precoronal
  - coronal
  - post coronal
  - paracentral
  - parietal
  - occipital
  - temporal

**Convexity**
- surgery simple
  - image guidance for skin / bone flap planning
  - Barnett et al. 1995
  - Routine avoids wrong side operations
  - positioning
    - for large occipital (prone) consider lumbar drain
  - excise margin of adjacent dura
    - Kinjo et al. “Grade Zero”
    - at deep margin pial surface denuded
    - Edema is key: more common the larger the tumor
  - pericranial graft
  - excise involved bone
  - cranioplasty
Convexity, Falx & Parasagittal Meningiomas: Clinical

- Falx
  - completely concealed by overlying cortex
    - 2 - 10%
  - when combined with parasagittal
    - up to 31%
  - headaches, seizures, focal deficit
  - falcotentorial meningioma rare
    - presents with visual disturbance and elevated ICP

classification by site:
- anterior
- middle
- posterior

surgery by site
- anterior
  - bifrontal*
  - Supine, head up 10-15%, no rotation, LSAD
- middle
  - Biparietal
  - Supine, head up 30%, no rotation, LSAD
- posterior
  - Bi-occipital
  - Prone, head up 10-15%, no rotation, LSAD
* best to cross midline to assist medial exposure
- excise falx rather than just coagulating below SSS

Cross midline with flap

LSAD for larger tumors
Same approach – debulk then dissect
Convexity, Falx & Parasagittal Meningiomas: Clinical

- Parasagittal
  - fill angle between
    - convexity dura
    - lateral wall of SSS
    - falx
  - 21 - 31% of tumors
  - same classification as falx
    - anterior, middle, posterior
  - origin at arachnoid granulations in lateral wall of SSS where large veins enter
    - Sindou et al.

Surgery

- same positioning issues as for falx
- with advent of radiosurgery techniques for excision and reconstruction of SSS more or less abandoned
- one option: low activity brachytherapy implant along wall of SSS and gold foil to protect medial hemisphere

Falcotentorial Meningiomas

- Falcotentorial meningiomas
  - anatomic details
  - surgical approach
  - personal series
  - complication of visual disturbance
  - discussion

- Meningiomas 2nd most common primary tumor

- Common locations:
  - falx/parasagittal, sphenoid wing, olfactory
  - FTM less than 2% of all locations
  - fewer than 60 cases since 1974

- Personal cases:
  - 2002 Jan - Dec 58
  - 2003 Jan - Dec 85
  - over 14 years 9 FTM (1.6%)

Skin Incision

Bone Flaps
Dural Openings

Falx Incision

Aiming for free edge above confluence of veins

Tentorial Incision

Free edge of tentorium

Tentorial incision

Tentorial incision
Results

- Tumor size -> large!
  - Mean max. dimension: 5.4 cm.
  - Mean volume: 64 cc.

- Operating time -> long!
  - Mean OR time: 16 hrs.
    - Range: 12.5 – 23.5 hrs.

Results

- WHO II Grade
  - Grade I: 7/9
  - Grade II: 1/9
  - Grade III: 1/9 (post XRT)

- Simpson extent of resection
  - Grade I: 5/9
  - Grade II: 4/9
    - 3/4 required SRS for recurrence

- Surgical complications
  - Hydrocephalus: 1/9
  - Pseudomeningocele: 9/9

Results

- Transient cortical blindness or hemianopsia
  - Cortical blindness: 9/9
    - Full recovery: 8/9
    - Partial recovery: 1/9 (post XRT)
  - Visual fields
    - Worse post op: 9/9
    - Mild: 8/9
    - Severe: 1/9 (post XRT)

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Far Lateral Suboccipital Craniotomy

- pub med

- D’Ambrosia et al. Neurosurgery 2004
  - 15% CSF leak
  - 11% new 10th palsy
  - 10% PEG
  - 5% tracheotomy

Pre-Operative Considerations

- lower cranial nerve status
  - no dysfunction pre-op
    - good prognosis
  - hoarseness, dysphagia
    - pre-op neuro-otology evaluation
    - counsel patient about trach / PEG

- motor dysfunction
  - does patient have symptoms with neck turning
  - book MEPs
  - anesthesia to maintain MAP
  - baseline after positioning before incision
Options for Treatment

- Radiotherapy
  - fractionated 3D CRT
  - fractionated stereotactic radiotherapy
    - number of fractions that is ideal?
  - intensity modulated radiotherapy
  - radiosurgery
  - brachytherapy

Options for Treatment

- radiosurgery
  - Pollock et al. 2003
    - 156 resected
    - 62 irradiated
    - radiosurgery equivalent to Simpson Grade 1 resection
      - 3 & 7 year PFS
    - radiosurgery superior to Simpson Grade 2,3,4
    - complications:
      - 10% GKRS
      - 22% surgery

Options for Treatment

- radiosurgery for parasagittal meningiomas
  - Kondziolka et al. 1998
    - 203 patients from 16 centers
    - 5 yr. control rate
      - 93% radiosurgery alone
      - 60% prior surgery
    - recommended GKRS as 1st procedure for tumors < 3 cm with patent sinus
Options for Treatment

- Brachytherapy
  - Ware et al. 2004
  - 17 malignant meningioma
  - 4 atypical meningioma
  - all recurrent
  - overall survival:
    - 2.6 yrs from implant
    - 8.0 yrs from diagnosis
  - complication rate 27%

Summary

- Not all meningiomas require surgery at diagnosis
- Pre-op: angio, angio / embo
- Intra-op: 2 surgeons for > 6 hours
- Post-op: lovanox, no dehydration
- Remember: surgery one component of treatment

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