Minimally Invasive Surgery for Brain Tumors

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Goals of Brain Tumor Surgery

- Tissue Diagnosis
- Alleviate Mass effect
- Reduce Swelling
- Restore CSF pathways
- “Cure”
Disadvantages of Traditional BT surgery

- Large exposures of cortex
  - Higher risk non-involved brain injury
  - Higher risk subdural and epidural hematoma
  - Higher risk osteomyelitis
  - More disfiguring
  - Greater blood loss
  - Longer recovery times

Goals of MIS Surgery for Brain Tumors

- Same end goals of traditional BT surgery PLUS:
  - Reduced morbidity from smaller openings
  - Reduced pain
  - Better cosmesis
  - Shorter hospital stays
Guiding Principles of MIS

- Accurate localization
- “Keyhole” access
- Natural working space
  - Cisterns
  - CSF pathways
  - Bony caves
- MIS not applicable to every case
Results: Accurate localization so can rely on small craniotomy

Endoscopy: Minimize the needed working space and maximize field of view
**Field of view: Endoscope v. Microscope**

- Ethmoid
- Columellar
- Sublabial

Spencer et al, Laryngoscope, 1999

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**See It Better**

**A High-Definition Exoscope System for Neurosurgery and Other Microsurgical Disciplines: Preliminary Report**

Adam N. Mamelak, MD, Moise Danielpour, MD,
Keith L. Black, MD, Masanobu Hagih, MD, and George Berci, MD
### Applications: Common MIS Approaches

- Supra-orbital eyebrow approach
- Intraventricular Endoscopy
- Endonasal Endoscopy

### Supra-orbital Eyebrow Craniotomy

- Very small opening
- Eyebrow Incision
- Access to CSF cisterns
- Improved cosmesis
- Less post-op pain and craniotomy related complications
- Uses- Tumors of subfrontal and suprasellar area
Intraventricular Endoscopy

- Hydrocephalus
- Intraventricular tumors
- Pineal gland biopsies

Limits:
- Bleeding
- “In-line” instruments only
- Limiting ability to angle
Endonasal Transsphenoidal

- Developed by ENT surgeons in 80s but not widely adapted by neurosurgeons
  - Lack of visualization
  - Fear of infection
  - Narrow working space
- Less tissue destruction
- Direct access
- Easier healing
- Less pain

Endoscopic Transsphenoidal

- Utilize a rigid endoscope to illuminate and magnify in place of microscope
- Minimal disruption of nasal tissues
- Larger working room compared with traditional methods
Endoscopic Endonasal Surgery

- Utilize a rigid endoscope in place of microscope
- Minimal disruption of nasal tissues
- Larger field of view
- Shorter hospital stay
- Greater patient comfort
- Safe and maximal tumor removal

Caveat: Requires comfort with endoscope

Extended Transsphenoidal Surgery: The Next Horizon

Pre-Op

Post-Op
Limits of MIS for the Brain

- Lack of Potential working Cavity
- Poor tolerance of brain to manipulation
- Functional Anatomy
- Limited number of “keyholes”
- Vascular control

Near Future Advances

- MRI Guided ablations
  - Visualase™
- 3D Endoscopy
  - VisionSense™
- Robotic Surgery
  - DaVinci™
- “Port” surgery via brain dialators
THANK YOU