The View through the Nose: ENT considerations for Pituitary/Skull Base Surgery

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Pituitary and Thyroid Update
September 2015
Endonasal Pituitary/Skull Base Surgery

- Overview
- Anatomy
- History
- Case studies
- Video
Endoscopic Pituitary Surgery

- Natural extension of sinus surgery
- 1997 – Jho and Carrau
Endonasal Skull Base Surgery

- Why?
  - Visualization
    - Endoscopes vs. Headlight/Microscope
  - Access
  - Decreased Patient Morbidity
  - Improved Outcomes

- Why Not?
  - Very Steep (and long) Learning Curve
  - Need willing partner (Neurosurgeon and ENT)
  - Volume to gain greater proficiency can be difficult to get to next level
Endonasal Skull Base Surgery

• Addressing those areas outside of the sella/pituitary

• Natural progression beyond pituitary surgery
Endonasal Skull Base Surgery
Endonasal Skull Base Surgery

ENT

- Provide exposure to structures beyond the sinuses using endoscopes
- Assist in visualization and tumor removal with neurosurgery
- Reconstruct skull base defect
  - Repair CSF Leak
  - Fat graft
  - Pedicled vascularized nasal flap to reline the skull base
# Endonasal Skull Base Surgery

## Table 1: Training levels for endonasal skull base surgery

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Level I</td>
<td>Sinus Surgery</td>
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<tr>
<td>Level II</td>
<td>Advanced sinus surgery</td>
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<tr>
<td></td>
<td>Cerebrospinal fluid leak</td>
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<tr>
<td></td>
<td>Intracranial – sella, pituitary</td>
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<tr>
<td>Level III</td>
<td>Extrasellar – sella, pituitary</td>
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<tr>
<td></td>
<td>Optic nerve decompression</td>
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<td></td>
<td>Intraorbital surgery</td>
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<tr>
<td></td>
<td>Extradural skull base surgery</td>
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<tr>
<td>Level IV</td>
<td>Intradural skull base surgery</td>
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<tr>
<td></td>
<td>A. With cortical cuff</td>
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<tr>
<td></td>
<td>Transplanum</td>
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<tr>
<td></td>
<td>Transcribriform</td>
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<tr>
<td></td>
<td>Type I Craniopharyngioma</td>
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<tr>
<td></td>
<td>Intradural skull base surgery</td>
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<td></td>
<td>B. Without cortical cuff</td>
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<tr>
<td></td>
<td>Type II/III Craniopharyngioma</td>
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<td></td>
<td>Transcervical, intradural</td>
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<tr>
<td>Level V</td>
<td>Coronal plane, carotid dissection</td>
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<tr>
<td></td>
<td>Vascular surgery</td>
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</tbody>
</table>
Anatomy

Paranasal Sinuses

Frontal sinus
Ethmoid sinus
Nasal cavity
Maxillary sinus
Sphenoid sinus
Pharynx (throat)
3D Considerations

- Sinuses are a 6 sided box
  - 4 sides of the box lead to blindness and/or death
- Axial, Sagittal and Coronal Planes
Axial Plane

- Nasal Airway
  - Nostril to the sphenoid sinus
- Allergies, Chronic sinusitis, polyps
- Deviated septum, nasal trauma
- Previous nasal surgery with/without persistently deviated septum
Sagittal Plane

- Cribiform plate - Olfactory groove lesions
  - Meningioma
  - Esthesioneuroblastoma

- Planum sphenoidale
  - Meningioma

- Sella
  - Pituitary Adenoma
  - Rathke’s Cleft Cyst
  - Craniopharyngioma

- Clival lesions
Coronal Plane

- Cavernous Sinus
- Pterygopalatine Fossa
- Petrous Apex
- Meckel’s Cave
- Jugular Foramen
Endoscopic Skull Base Surgery – Immediate Risks

- Bleeding – 2.5%
  - Cavernous Sinus
  - Carotid Artery
- Neurologic deficits – 2%
  - Cavernous Sinus – ophthalmoplegia
  - Optic nerve – Blindness
- Infection – 1%
  - Meningitis
- CSF Leak – 5%
- Death - < 0.5%
Endoscopic Skull Base Surgery – Delayed Risks

- CSF Leak – 5%
- Altered/Diminished sense of smell – 2%
- Scarring/Chronic Sinusitis – 5%
Endoscopic Pituitary Surgery
Endoscopic Pituitary Surgery
Cavernous Sinus Meningioma

- 75 yo female with 3 day history of temporal HA, nausea and vomiting
- Left sided ptosis, complete ophthalmoplegia and proptosis
Cavernous Sinus Meningioma
Cavernous Sinus Meningioma
Rathke’s Cleft Cyst
Rathke’s Cleft Cyst
Rathke’s Cleft Cyst
Endoscopic Skull Base Surgery

- Ideal time for everything to come together
  - Improved Optics/Visualization
  - Computer Navigation (CT and/or MRI)
  - Development of low profile high speed drills
  - Injectable hemostatic agents to aid with visualization

- Synergistic effort
  - Combination of ENT/Neurosurgery
  - True multidisciplinary collaboration
Future

• Articulating Instruments
  • Research being done in NOTES (Natural Orifice translumenal endoscopic surgery)
  • Ability to look and manipulate tissue around corners as easily as rigid instruments

• 3-Dimensional Optics
  • Aid in depth perception (optic versus haptic)
  • Potentially speed the learning curve for newer surgeons

• Robotic Skull base surgery
  • Allow suturing at the skull base
Summary

- The past 10-15 years have had a rapid growth of improved techniques, approaches and understanding of skull base anatomy from an endoscopic perspective.
- Newer treatments allow for lower morbidity with equal if not improved outcomes.
- Endonasal skull base surgery can have significant advantages over traditional open skull base/pituitary surgery.