Advances in Endonasal Transsphenoidal Surgery

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Endoscopic Surgery

- Laparoscopy
  - Hernia repair
  - Cholecystectomy
  - Adrenalectomy
  - Colectomy
  - Gastric surgery...
- Thoracoscopy
  - Lobectomy
  - Cardiac surgery
  - Spine surgery...
- Neuroendoscopy
  - Third ventriculostomy
  - Colloid cyst resection

Hurdles in Endoscopic Neurosurgery

- Lack of natural cavities
  - Ventricles
  - Cisterns
  - Nasal sinuses
  - Created spaces
- Need for more delicate, maneuverable instruments
- Need for smaller endoscopes
- Understanding the limitations of current technology and anatomical corridors
- Thinking “outside the box”

History of Transsphenoidal Surgery

- 1910-1925 Harvey Cushing performed 231 TS with 5.6% mortality
- 1929-1965 Transcranial approach dominated in North America
- Norman Dott in Edinburgh continued the operation with 0 deaths in 80 patients
- Gerard Guiot from 1956-1981 performed 1000 TS and introduced the semisitting position and fluoroscopy
- Jules Hardy reintroduced TS into North America
- Charles B. Wilson performed over 3500 TS
  - Curative resection possible with preservation of gland
  - Minimize need for radiotherapy
  - Improved safety of surgery

Surgical Management of Pituitary Lesions

- Understand the anatomy
  - Angle of approach
  - Septations within sinus
  - Cavernous sinus involvement
  - Carotid anatomy
  - Location of the normal gland/stalk
  - Location of optic nerves

Sublabial, transeptal transsphenoidal approach
Transnasal, transseptal transsphenoidal approach

- Griffith and Veerapen described a direct transnasal approach to the sphenoid sinus (JNS, Jan, 1987)
- No submucosal septal dissection
- Mucosal incision made along rostrum
- Allows for microdissection and use of standard equipment

Direct endonasal transsphenoidal approach

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- No submucosal septal dissection
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First Modification:
Endonasal transsphenoidal approach
Endonasal Transsphenoidal Surgery -

Exposure of Dura
Endonasal Transsphenoidal Resection of Giant Adenoma

54 yo woman with giant adenoma

Minimal vision in OD and temporal defect OS

Second Modification: Endoscopic Endonasal Transsphenoidal
Extended Transsphenoidal Approach

Extended Transsphenoidal Approach with Endoscope assist
Suprasellar Tumor

40 yo female with bitemporal hemianopsia, normal pituitary function

Extended Transsphenoidal Approach with Endoscope assist
Closure of tuberculum sella defect

3 mo Postop- normal vision, regular menses
72 yo with headaches and progressive left hearing loss, deaf in right ear
h/o presumed pituitary adenoma s/p proton beam therapy, 1972, serial images showed progressive growth of this lesion

Extended Endonasal Transsphenoidal – Clival lesion

Preoperative postcontrast, fat sat MRI

Postoperative postcontrast, fat sat MRI

54 yo with a chordoma causing marked brainstem compression

Extended endonasal transsphenoidal approach
Clival lesion

Left sided view after decompressing the brainstem

Preop

Postop
Endonasal Transsphenoidal Surgery: Personal Experience

- 698 endonasal transsphenoidal surgeries were performed from May 2001 to May 2006.
- No sublabial or alar incisions were required.
- No nasal packing used.

Endonasal Transsphenoidal Surgery - Personal Experience

- Demographics
  - Age 9-88, median 48 years
  - Mean operative time 3.5 hrs
  - Tumors measured 2-68 mm
  - EBL was <100 cc in 92% of cases (median 30cc)
  - Hospital Stay:
    - 84% were discharged on POD#1
    - 96% were discharged by POD#2

Postoperative Complications - Endonasal Approach

- Sinus infection - 8%
- Delayed hyponatremia – 2%
- New anterior pituitary deficiency – 1.4%
- Permanent DI - 2%
- Delayed epistaxis – 0.6%
- Transient VIth n palsy - 0.4%
- CSF leaks – 0.4% (0% for pituitary adenomas)
- Meningitis – 0.2% (0% for pituitary adenomas)
- Carotid injury - 0.2% (1 in first 50 cases, none in >700 cases)
- Mortality – 0%
- No tooth numbness or septal complications

Endonasal Transsphenoidal Surgery - 3 month Radiographic and Hormonal Outcome

Primary Tumors (n=467)

<table>
<thead>
<tr>
<th>Pathology</th>
<th>GTR (%)</th>
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<tbody>
<tr>
<td>EIA&lt;sup&gt;1&lt;/sup&gt;</td>
<td>88</td>
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<tr>
<td>Prolactinoma&lt;sup&gt;2&lt;/sup&gt;</td>
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<td>Acromegaly&lt;sup&gt;3&lt;/sup&gt;</td>
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<td>Cushing&lt;sup&gt;4&lt;/sup&gt;</td>
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<tr>
<td>RCC&lt;sup&gt;1&lt;/sup&gt;</td>
<td>96</td>
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</tbody>
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1. Based on postoperative MRI
2. Postoperative prolactin <5 ng/ml
3. Postoperative GH <1.0 ng/dl OGTT
4. Postoperative cortisol < 2 ng/ml and normal 24 hr UFC

Subset Analysis

- Pediatric Patients –
  - 24 pediatric patients (age 9-18) underwent endonasal transsphenoidal surgery
  - No alar or sublabial incisions required

- Elderly patients
  - 55 patients were older than 70 years
  - No mortality, 89% patients discharged <POD#2

- Giant sellar tumors (>3cm)
  - 69 patients presented with giant sellar tumors that underwent endonasal surgery (3-7 cm maximum diameter)
  - 64% had radiographic GTR
  - No CSF leaks
Endonasal Transsphenoidal surgery for skull base lesions

- Standard for almost all pituitary tumors
- With endoscope assist, can safely reach:
  - Mid planum anteriorly
  - Third ventricle superiorly (dependent on location of chiasm)
  - Cavernous sinus, petroclival junction laterally
  - Top of dens inferiorly
- Endoscope provides excellent view of optic nerve, vessels, pituitary stalk, cranial nerves
- Mucoperiosteal flap useful for repair of clival or planum defects in conjunction with fat graft
- Sharp dissection needed for fibrous/firm tumors
- Pituitary hormonal function can be preserved in majority of cases

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  - Neuroradiologists
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