Transplanum Approach for Suprasellar pathology

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Why Endoscopic Approach For Suprasellar Pathology

• Constant improvements in diagnostic imaging techniques
• Experience gained from CSF closure & endoscope in transsphenoidal pituitary surgery
• Use of image guidance systems led to constant surgical orientation in an anatomically complex area
• Collaboration between ES surgeons and neurosurgeons

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Why Endoscopic Approach For Suprasellar Pathology

- different areas of the midline skull base exposed through the endoscopic endonasal approach.
- to the olfactory groove;
- to the sella turcica and planum sphenoidale;
- to the clivus
- to the craniovertebral junction and foramen magnum.

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Planum Sphenoidale Suprasellar Area

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Sella Turcica

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Sella Turcica

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Sella Turcica: tuberculum sellae

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Planum Sphenoidale (PS)

• It is the roof of the anterior part of the SS
• Its bone thickness is a mean of 0.6 mm
• Laterally is marked by optic canals and the medial orbital wall
• Anteriorly it is in continuation to the cells of the posterior Ethmoidal sinus (PES)
• The junction of the PS and pituitary fossa is called the tuberculum sellae (bone thickness is 1 mm)

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Planum Sphenoidale (PS)

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Planum Sphenoidale (PS)

- Bone covering the anterior vertical segment of the carotid artery is 0.5 mm thickness in 90% of patients
- Bone covering the optic nerves is 0.5 mm thickness in 80% of patients

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Planum Sphenoidale (PS)

- a, the widest lateral length of resection area 30.53 mm
- b, the widest anteroposterior length of resection area 14.84 mm
- c, resection area

Planum Sphenoidale (PS)

- d, at the level of optic canal, the length between the medial sides of the optic nerves 13.00 mm
- e, the length between the medial aspects of both internal carotid arteries 13.33 mm
- f, the angle between optic nerves in the planum sphenoidale region 115.41
- g, the length between medial opticocarotid recess and lateral opticocarotid recess (inter- recess length)
- gR, right inter-recess length 3.75 mm
- gL, left inter-recess length 4.13 mm
Planum Sphenoidale (PS)

• A sheet of dura separating the pituitary gland in its fossa from the brain above.

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Posterior Ethmoidectomy

- Live posterior ethmoidectomy

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Sphenoidotomy

- Sphenoidotomy live

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Planum Sphenoidale (PS)

• After bony resorption wall of the sphenoid sinus walls

Suprasellar pathology

• Pituitary macroadenomas that extend high above the planum
• Midline suprasellar craniopharyngiomas
• Rathke cleft cysts
• Planum sphenoidale and tuberculum sellae meningiomas,
• Other pathologies:
  • Chiasmatic-hypothalamic glioma
  • Germ cell tumor.
  • Langerhans cell histiocytosis
  • Hypothalamic hamartoma
  • Leukemia

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Pituitary Adenomas

- Etiology is unknown
- 10-15% of all primary brain tumors
- 20-25% of pituitary glands at autopsy found to have adenomas
- Pituitary adenomas have long natural history
- Vary in size and direction of spread
- 70% of adenomas are endocrinologically secreting
- Microadenomas < 10 mm – may cause focal bulging
- Macroadenomas > 10 mm – cause problems due to mass effect

Endocrine-Active Pituitary Adenomas

- Prolactin – Amenorrhea, galactorrhea, impotence
- Growth hormone – Gigantism and acromegaly
- Corticotropin – Cushing’s disease, Nelson’s syndrome post adrenalectomy
- TSH - Hyperthyroidism
# Clinical Presentation

- Most common are endocrine abnormalities – hyper-/hyposecretion of ant. pituitary hormones
- Vision changes – bitemporal hemianopsia and superior temporal defects

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Non-functioning Adenomas

• 25-30 % of patients do not have classical hypersecretory syndromes
• May grow to a large size before they are detected
• Present due to mass effect
  • Visual deficits
  • Hormone deficiency

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Supra sellar Pituitary Adenomas

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MRI with contrast showing large pituitary tumor (arrows)

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Suprasellar pathology

• **Midline suprasellar craniopharyngiomas**
• Rathke cleft cysts
• planum sphenoidale and tuberculum sellae meningiomas,
• other pathologies:
  • chiasmatic-hypothalamic glioma
  • germ cell tumor.
  • Langerhans cell histiocytosis
  • hypothalamic hamartoma
  • Leukemia

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Craniopharyngioma

• It is a low-grade extra-axial, epithelial-squamous calcified, and cystic tumor
• It arising from remnants of the craniopharyngeal duct and/or Rathke cleft
• The most common sellar/suprasellar tumor in children
• Accounting for approximately 6-9 % of CNS tumors.
• Two main hypotheses—embryogenetic and metaplastic—explain the origin of craniopharyngioma.

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Craniopharyngioma

• There are two pathologic variants determine the age of presentation (bimodal)

• **The adamantinomatous**
  • In children peak between 10 and 14 years
  • It presents as a cystic and solid sellar/suprasellar mass
  • Peripheral calcifications (>90% of cases).

• **The papillary variant**
  • Middle-aged and older adults
  • Typically a solid enhancing sellar/suprasellar mass
  • Cystic changes and calcifications are less common.

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Craniopharyngioma

• Symptoms frequently develops after the tumor attains a diameter of about 3cm.
• The time interval between the onset of symptoms and diagnosis usually ranges from 1-2 years.
  • The most common presenting symptoms are
    • Dull headache slowly progressive, (55-86%)
    • endocrine dysfunction (66-90%)
    • visual disturbances (37-68%)

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Supra sellar Craniopharyngioma

• In the anatomic location of the craniopharyngioma
• Prechiasmal localization – visual problems
• Retrochiasmal location - Commonly is associated with hydrocephalus
• Intrasellar craniopharyngioma - as headache and/or endocrinopathy

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Craniopharyngioma

Presents

- In children with endocrine dysfunction
- In adults with visual field defects

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Suprasellar pathology

- Rathke cleft cysts
- planum sphenoidale and tuberculum sellae meningiomas,
- other pathologies:
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  - Langerhans cell histiocytosis
  - hypothalamic hamartoma
  - Leukemia

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Rathke cleft cyst

- Rathke’s cleft describes the region that forms between the adenohypophysis and neurohypophysis during the third or fourth week of gestation.
- RCC arise when the Rathke’s cleft does not regress fully and remains patent.
- The cyst wall is formed by an epithelial membrane.
- The inside is filled with a mucinous, gelatinous, or caseous cystic fluid.

Most RCC are asymptomatic.
- Common symptoms are:
  - headache
  - visual
  - endocrine disturbances
- RCC, surgical decompression through a transsphenoidal approach is commonly performed.
- Complex cases of RCC may necessitate an open transcranial approach.

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Suprasellar pathology

- other pathologies:
  - tuberculum sellae meningiomas
  - chiasmatic-hypothalamic glioma
  - germ cell tumor.
  - Langerhans cell histiocytosis
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  - Leukemia

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Suprasellar pathology

Tuberculum sellae meningiomas
Transplanum Approach for Suprasellar pathology

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Transplanum Approach for Suprasellar pathology

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**Transplanum Approach**

- Endoscopic view obtained in a cadaver showing the removal of the superior portion of the nasal septum and the anterior sphenoidotomy. SphS Sphenoidal sinus, ST superior turbinate, IT inferior turbinate, V vomer, EB ethmoid bulla, NS nasal septum, UP uncinate process, CO choana, CP carotid protuberance, OCR optocarotid recess, SF sellar floor, SphA sphenopalatine artery

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**Transplanum Approach**

- **Removal of sella floor and planum**

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Transplanum Approach

A 28 years old male c/o:
- Sever headache in the last 10 months
- Bilateral watery rhinorrhea that was confirmed as CSF by β2-transferrin test
- Nasal endoscopy NAD
- Radiology
CT

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MRI

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An Approach for Suprasellar pathology

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Follow up
Follow up

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Thank You
Chiasmatic-Hypothalamic Glioma.

- Gliomas are common CNS tumors in children, the majority of which are low grade. Common locations in pediatric patients include the posterior fossa and optic pathways. Gliomas may occur sporadically or in association with neurofibromatosis type 1 (NF-1). Chiasmatic-hypothalamic gliomas have no sex predilection and are typically seen in children; they rarely occur in adults. Presenting symptoms include painless proptosis, visual impairment, diabetes insipidus, diencephalic syndrome, and precocious puberty. Radiographs demonstrate a classic J-shaped sella turcica, as well as enlarged optic canals. On MRI, gliomas are typically T1 isointense to mildly hypointense, T2 hyperintense, and show variable degrees of enhancement.

**Meningioma**

- Typically affect middle-aged women
Classification of intracranial germ cell tumor

- **Benign:**
  - Mature teratoma

- **Malignant:**
  - Germinoma (60%)
  - Embryonal carcinoma/endodermal sinus tumor
  - Choriocarcinoma
  - Immature teratoma

Anatomy of chiasm and pituitary gland
Pathology - histogenesis

Primordial germ cells become disseminated widely throughout the embryo.

Failure of the normal involution of these migrated totipotent cells leaves rests of cells that are susceptible to neoplastic transformation.

optic chiasm
• the widest lateral length of resection area 30.53
• b, the widest anteroposterior length of resection area (mm); c, resection area (mm²);
• d, the distance between medial sides of optic nerves at the level of proximal aperture of optic canal (mm);
• e, the distance between medial aspects of both internal carotid arteries next to the medial opticocarotid recess (mm);
• f, the angle between optic nerves in the planum sphenoidale region (degree); gR, right inter-recess length (mm); gL, left inter-recess length (mm); SD, standard deviation.
Endoscopic view obtained in a cadaver showing the removal of the superior portion of the nasal septum and the anterior sphenoidotomy. SphS Sphenoidal sinus, ST superior turbinate, IT inferior turbinate, V vomer, EB ethmoid bulla, NS nasal septum, UP uncinate process, CO choana, CP carotid protuberance, OCR optocarotid recess, SF sellar floor, SphA sphenopalatine artery.

The wide anterior sphenoidotomy provide a full view of the sella, cavernous sinus, and optic and carotid protuberances.

Using the Kerrison punch, the sellar floor is resected to the limits of the cavernous sinus laterally and to the intercavernous sinus superiorly.

The bony removal proceeds along the planum sphenoidale and anterior cranial fossa floor.
• removing only the bone necessary to expose the tumor to avoid risk of a postoperative CSF leak.

• the width of bone removal along the planum sphenoidale is approximately 1.5 cm

• After the intracapsular removal is complete, the dura of the anterior cranial fossa is opened widely to expose the chiasmal and suprasellar compartments if needed.

After the intracapsular removal is complete, the dura of the anterior cranial fossa is opened widely
Introduction

Facts About This Surgery

- Tumors can now be resected through a patient’s nostril using an endoscope without any skin incisions.
- Less invasive because they bypass potentially extensive face-disfiguring surgical approaches.
- These methods are innovative because they evolitionalize the known frontier of skull base surgery by incorporating new technologies.

- These techniques over good visibility and accessibility for completion of lesion resection
- These procedures reduce duration of surgery and hospital stay and allow quicker to return to work by eliminating extensive bone resection or skin incisions.
Sagittal section of a fresh anatomical preparation showing the lateral wall of the right nasal fossa and the rhinobase. Using the transsphenoid route, the different inclination of the endoscope and surgical instruments, together with removal of the nasosinusal structures located in the foreground, permits reaching the skull base at the ethmoidosphenoid planum (yellow), the sella and the lateral parasellar regions (green) and the clivus and petrous-occipital clival areas (blue).