Sella: The big 4:

- Macroadenoma
- Rathke’s cleft cyst
- Craniopharyngioma
- Meningioma
OUTLINE

1. Normal anatomy & imaging
2. Adenoma and pitfalls
3. Cystic lesions
Pituitary gland - structure

- Meningeal and periosteal layers
- Continuous with dura along planum sphenoidale & clivus

DURA

www.autismpedia.org/wiki/images/e/e5/Pituitary.jpg

DURA

- Thin single layer along medial cavernous sinus
- Double layer along lateral cavernous sinus

UCSF Sella MRI protocol

- Sagittal & coronal pregad T1 - 12 minutes
  TR=600ms, TE=min, NEX=3, 2.7 mm no skip
- Coronal fatsat T2 FSE - 4 minutes
  TR=3000ms, TE=152ms, ETL=16, NEX=3, 2.0 mm no skip
- Dynamic gad T1 - 45 second intervals
  TR=600ms, TE=17 ms, ETL=8, NEX=2, 2 mm no skip (5 slices)
- Sagittal & coronal gad T1 - 12 minutes
  TR=800ms, TE=min, NEX=3, 2.7 mm no skip
- Coronal GRE - 6 minutes
  TR=787ms, TE=25ms, NEX=2, 3 mm no skip

microadenoma

hemorrhage
Adenoma: Dynamic Gad T1

- Onset: ~36 sec
- Peak signal: 1.2 - 2.2 min
- Washout: 2.7 - 5 min

Dynamic enhancement

- Higher time resolution but generally noisier
- Estimated 10% increase* in sensitivity

*Bartynski W et al, AJNR 1997; 18: 965-72
OUTLINE

1. Normal anatomy & imaging
2. Adenoma and pitfalls
3. Cystic lesions

Microadenoma

- Endocrine dysfunction or incidental
- Arise within the adenohypophysis
- < 10 mm diameter
- “Picoadenoma” (< 3 mm) diagnostic challenge
- Rarely ectopic outside of pituitary fossa
Adenoma: T1 signal

- Usually same or slightly lower signal than gland
- High T1 signal if hemorrhagic (typical of prolactinoma)
- Contour deformity +/-

Adenoma: Enhancement

- Almost all lower signal than enhanced gland
- May have higher signal after 30-45" delay
Adenoma: T2 signal

- Usually same or slightly higher than gland ("soft")
- Less commonly lower than gland ("firm")
- Higher T2 = higher secretion

80% PRL tumors have high T2 signal
40-60% GH tumors have low T2 signal

Macroadenoma

- Vision changes, hypopituitarism
- > 10 mm
- "Giant" adenoma if > 4 cm
- May grow in any of 6 directions
  - Superiorly (suprasellar) - 80% of cases
  - Laterally (cavernous sinuses)
  - Anteriorly & inferiorly (sphenoid)
  - Posteriorly (clivus)
- Important observations
  - Hemorrhage
  - Optic chiasm T2 signal
  - Cavernous sinus invasion
T1 Signal

- Heterogeneous, typically ~ gray matter
- High T1 signal implies hemorrhage or another lesion

T2 Signal

- Highly variable - often heterogeneous, cysts and necrosis
- Hemorrhage
  Can have any T2 signal
  Fluid levels helpful feature for diagnosis
  If hemorrhage suspected, confirm with GRE or CT
Enhancement

- Mild to avid enhancement typical
- Rarely hypoenhancing (thyrotropin secreting)
- Look for enhancing gland (preserved surgically)

Suprasellar extension

- Speculative role of diaphragmatic hiatus
Macroadenoma: Cavernous invasion

- 6-10% of adenomas
- Biologically more aggressive tumors
- Medial sinus has only 1 layer of dura
- Clinical symptoms late
- Suspect when prolactin > 1000 ng/mL

Best signs of involvement
- Involvement > 2/3 circumference (PPV 100%)
- Carotid sulcus venous compartment (PPV 95%)
- Lateral to lateral intercarotid line (PPV 85%)

Best signs of NO involvement (all have NPV 100%)

- Involvement of < 1/4 circumference
- Gland between tumor, cavernous sinus
- Medial venous compartment preserved
- Medial to medial intercarotid line


Pitfalls…

- 22 year-old woman, severely hypothyroid
- Diagnosis: pituitary hyperplasia
- 58 year-old woman, hyperprolactinemia
- Diagnosis: Tuberculum sellae meningioma

Pitfalls…

Optic/ hypothalamic glioma
OUTLINE

1. Normal anatomy & imaging
2. Adenoma and pitfalls
3. Cystic lesions

RATHKE CLEFT CYST

- Incidental (13-22% of autopsy and MRI) or symptomatic
- Non-neoplastic, single cell layered cyst arising from remnants of embryonic Rathke’s cleft
- Natural history also slow enlargement with time
RATHKE CLEFT CYST

- Well-defined round or ovoid, thin rim enhancement
- Intrasellar (40%) and/or suprasellar (60%)
- Between anterior and intermediate lobes (pars intermedia)
- Stalk typically midline

Two types

- T1 bright, T2 variable
  - “Machine oil” cyst
  - More often symptomatic
- T1 dark, T2 bright
  - Fluid like CSF

RCC
RCC: Useful Diagnostic Features

- Arise out of pars intermedia
- Midline or near midline
- No displacement of stalk
- Anterior to stalk if suprasellar
- “Simple” single intensity

Case: 37F panhypopit, polydipsia, vision changes
ABSCESS

- Primary (in normal gland) or secondary (in pre-existing adenoma or Rathke’s cyst)
- Present like other cystic tumors, fever & meningismus rare
- Source of infection hematogenous or via sphenoid sinus
- Only 50% grow organisms, gram+ & gram- equally common

The big third- Craniopharyngioma

- Histologic continuum with RCC
- Childhood type
  Adamantinomatous histology
  Poor prognosis (frequently recur)
- Adult type
  Papillary squamous epithelium
  Good prognosis (rarely recur)
- Mixed type
  Behave like adamantinomatous
Adamantinomatous Craniopharynioma

- **Locations:**
  - 75% suprasellar
  - 21% supra- and intrasellar
  - 4% intrasellar only

- Intrinsic T1 & T2 signal varies with contents of cysts (bright T1 cysts are typical)

- “Complex” signal typical

- **Rule of 9’s**
  - 90% mixed solid & cystic
  - 90% enhance
  - 90% calcify
Case: 9 year-old with visual disturbances

Diagnosis: Craniopharyngioma
Papillary Craniopharynioma

- Predominantly solid
- Cysts (if present) hypointense
- Spherical geometry typical

CYSTIC ADENOMA

- Surrounding by pituitary gland
- More frequently off midline (PRL)
- Variable signal intensity
- Evolve over time if hemorrhagic
- May bloom on GRE
**Question #1:** Which of the following pineal tumors has the lowest rate of spinal metastases?

A. Endodermal sinus tumor  
B. Germinoma  
C. Pineocytoma  
D. Pineoblastoma

---

Ito et al. *Pathol Int* 1995 45(6): 463  
Onesti et al. *Clin Neurol Neurosurg* 2012 114(7): 1081-5.
Question #2: Which of the following has been reported in conjunction with NF1?

A. Tectal glioma
B. Craniopharyngioma
C. Hypothalamic hamartoma
D. Pineoblastoma

Chen et al. *Oncogene* 2013 (epub ahead of print)
Question #3: Which of the following are common treatments for hypothalamic hamartoma?

A. Chemotherapy
B. Stereotactic radiosurgery
C. Endoscopic surgery
D. B and C
E. A and B

Question #4: Which of the following cell markers is 100% sensitive for choriocarcinoma?

A. AFP  
B. hCG  
C. LDH  
D. CA-125  
E. CEA

Question #5: The following statement about papillary craniopharyngioma is correct:

A. Seen almost exclusively in adults
B. Calcification in 90%
C. Higher incidence in females
D. Commonly cystic
E. Consists of reticular endothelial cells

Sartoretti-Schefer et al. AJNR 1997 18(1): 77-87
Eldevik et al. AJNR 1996 17(8): 1427-39