Sellar and Parasellar Imaging

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Outline

- Imaging techniques
- Normal anatomy
- Differential Diagnoses
  - Sella
  - Suprasellar
  - Infundibulum

Basic Pituitary MRI Protocol

**MR Imaging**
- Multiplanar:
  - Sagittal & Coronal
- Small FOV
- 3mm
- T1WI, T2WI
- Post T1WI +FS
- Dynamic enhanced

**Dynamic Imaging**
- Microadenomas
  - 3 – 4 slices
  - T1 FSE, Turbo SE
- Image continuously after contrast (5-10s)
- Increases sensitivity

Sella: Normal Anatomy

**Pituitary Gland**
- Anterior Lobe (75%)
- Pars Intermedia
- Posterior Lobe (25%)
- Infundibulum

Pituitary: Normal Anatomy
Parasellar Region: Normal Anatomy

**Parasellar Structures**
- Cavernous Sinus
- Cranial Nerves
  - III, IV, V1, V2, VI
- Cavernous ICA
- Optic Chiasm
- Hypothalamus
- Sphenoid Sinus

**Bony Structures**
- Planum sphenoidale
- Tuberculum sellae
- Sella turcica
- Dorsum sellae

Sella and Parasellar Pathology

**Differential Diagnoses**
- Sellar
- Suprasellar
- Infundibular

Sellar Pathology

**Non-neoplastic Lesions**
- Hyperplasia (physiologic, end organ failure)
- Cysts (RCC, pars intermedia cyst)

**Primary Neoplasms**
- Pituitary adenoma (Most common)
- Craniopharyngioma (Only 5% purely intrasellar)
- Meningioma (Purely intrasellar rare)
- Pituitary carcinoma (Extremely rare)

**Metastasis (1%)**
Pituitary Neoplasms

Adenoma
- Prolactinoma 30%
- Null cell 25%
- GH 20%
- ACTH 10%
- FSH/LH 10%
- PRL-GH 5%
- Mixed, TSH 1-5%
- Incidental pituitary lesions are common

Sella: Pathology

Pituitary Microadenoma
- 10 mm or less
- 10-20% of autopsies
- Micro >>> Macro
- Convex margin
- Stalk deviation
- Sella floor thin

Dynamic Imaging
- Increases sensitivity (10-30% seen only on dynamic MR)
- Enhances slower than normal gland

Pituitary Gland Hypertrophy

Maximum normal height
- 6 mm infants and children
- 8 mm males, postmenopausal females
- 10 mm young women of childbearing age
- 12 mm late pregnancy, postpartum females

Abnormal hypertrophy
- End-organ failure
- Hypothyroidism
- Ovarian failure
- Neuroendocrine tumors
Rathke Cleft Cyst

Clinical
- Intrasellar 40%
- Suprasellar extent 60%
- 3mm – 3cm
- Most incidental
- Symptomatic
  - Pituitary dysfunction
  - Visual change, HA

Rathke Cleft Cyst: CT
- 75% hypodense
- 25% iso/hyperdense
- Ca++ rare
- May be difficult to differentiate from other benign cysts or craniopharyngiomas

Rathke Cleft Cyst: MR
- Imaging Features
  - Signal varies - cyst content
  - 50-60% T1 hyperintense
  - 30-40% follow CSF
  - 75% intracystic nodule
  - +/- rim enhancement

Sellar Masses
Uncommon
- Craniopharyngioma (5% intrasellar)
- Metastasis (1% of sellar masses)
- Aneurysm (medially-projecting from cavernous ICA)
- Meningioma (rare purely intrasellar)

Suprasellar Differential Diagnosis
Adult Lesions
- Pituitary Macroadenoma
- Meningioma
- Aneurysm

Pediatric Lesions
- Craniopharyngioma
- Chiasmatic / Hypothalamic Glioma
- Hypothalamic Hamartoma
Pituitary Macroadenoma

**Clinical / Pathologic**
- Most common suprasellar mass (50%)
- Compressive symptoms
- 10% of intracranial tumors
- Rare in prepubescent children, adolescent M

**Suprasellar: Pathology**

**Pituitary Macroadenoma**
- > 10mm
- Compressive symptoms
- Enlarged sella turcica
- Cavernous sinus invasion difficult
  - Tumor between ICA & lateral dura
  - ICA not narrowed

**Pituitary Macroadenoma: CT**

**CECT**
- Enlarged sella turcica
- Moderate to strong enhancement
- May be heterogeneous (cysts, hemorrhage)

**Pituitary Macroadenoma: MR**

**Imaging Features**
- Isointense GM: T1, T2WI
- May have hemorrhage, cystic components
- Strong but heterogeneous enhancement
- Determining cavernous sinus invasion difficult

**Invasive Pituitary Macroadenoma**

**Meningioma**
- 2nd most common (adults)
- 15% of meningiomas
  - Tuberculum sellae
  - Clinoid processes
  - Cavernous sinus
- Look for pituitary gland distinct from mass

**Suprasellar: Pathology**
Suprasellar: Aneurysm

- Noncalcified central suprasellar mass
- Can be difficult to distinguish from adenoma, meningioma

Parasellar: Aneurysm

- MRI
  - Flow void or complex mass separate from pituitary
  - Phase artifact

Suprasellar Mass: Adult

- Macroadenoma
  - Pituitary is mass
  - T2 intermediate
  - Enhancement
- Meningioma
  - Pit separate
  - Marked C+
  - Dural tail
- Aneurysm
  - Pit separate
  - Flow void
  - Complex

Suprasellar: Craniopharyngioma

- Clinical
  - Most common suprasellar mass in children
  - Peak incidence 5-15 yrs
  - Second peak 50-60 yrs
  - Visual changes
  - Endocrine dysfunction
  - Mass effect
  - H/A, N, V, papilledema

Craniopharyngioma: CT

- NECT scan
  - Adamantinomatous
    - 90% Ca++ (rim)
    - 90% Cystic
  - May enlarge sella
  - Papillary type
  - 50% Ca++
  - Majority solid
Craniopharyngioma: CT

- CECT scan
  - 90% enhance
  - Solid nodular
  - Rim

Craniopharyngioma: MR

- Variable signal
- Often heterogeneous
- Ca++ difficult to detect
- Nodular & rim enhancement

Chiasmatic-hypothalamic glioma

**Clinical**

- Second most common suprasellar mass in children
- Presentation-often large
- H/A, visual, endocrine abnormalities common
- M = F
- 15-30% have NF-1

Chiasmatic-hypothalamic glioma: MR

- Variable signal
- Iso-, hypointense on T1WI
- Hyperintense on T2WI
- Variable enhancement
- Spread along optic tracts common
Hypothalamic Hamartoma

**Clinical**
- Precocious puberty
- Usually < 2 yrs
- Gelastic seizures
- M > F

**Hypothalamic Hamartoma: MR**
- Signal follows GM
- Isointense on T1WI
- May be slightly T2 hyperintense
- Pedunculated or sessile
- May project into 3rd ventricle
- Do not enhance

Suprasellar Mass: Child

**Cranio**
- Complex mass
- 90% cystic
- 90% calcified

**Glioma**
- Chiasm/Hypoth
- T2 hyperintense
- Variable C+

**Hamartoma**
- Hypothalamus
- GM signal
- No C+

Infundibulum Differential Diagnosis

**Common Lesions**
- Germinoma
- LCH
- Sarcoid
- Lymphoma, Metastasis

**Rare Lesions**
- Hypophysitis
- Pituicytoma

Germinoma

**Clinical**
- Suprasellar region is second most common site
- 90% present < 20 yrs
- Endocrine dysfunction
  - Diabetes insipidus
  - Panhypopituitarism
- Radiosensitive
- Up to 90% 10 survival

**Germinoma: Imaging**
- Combined lesion typical but may affect only infundibular stalk
- May be hyperdense (CT)
- Isointense T1WI
- Hyper- to isointense T2WI
- Enhances homogeneously
- CSF dissemination common
**Langerhans Cell Histiocytosis**

**Clinical**
- First decade
- M > F
- Diabetes insipidus
- High signal of neurohypophysis is commonly absent
- Thickening of stalk

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**Infundibular Mass: Child**

**LCH**
- Thickened Stalk
- “Bright spot” gone
- Enhancement

**Germinoma**
- Stalk +/- pineal
- T2 hyperintense
- CSF spread

**Meningitis**
- Meningeal dz
- Diffuse
- Enhancement

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**Sarcoid**

**Clinical**
- Chronic, multisystem, inflammatory disease
- Noncaseating granulomas
- Neurologic findings 5%
- Diabetes insipidus or hormone deficiency
- Steroid responsive

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**Lymphoma**

**Clinical**
- NHL (B-cell)
- 90% supratentorial
- Pituitary gland, hypothalamus, stalk
- 6th-7th decade
- AIDS: 4th decade

**Imaging**
- Pituitary gland, hypothalamus, stalk
- Hyperdense on CT
- T1 Iso- to hypointense
- T2 hypointense
- Homogeneous enhancement

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**Lymphocytic hypophysitis**

**Clinical/Imaging**
- Occurs during late PG or shortly after delivery
- F >>> M
- Pituitary insufficiency
- H/A & visual changes
- Amenorrhea or inability to lactate
- May result from immune therapies
- Diffuse enlargement of adenohypophysis
- May mimic hyperplasia or adenoma

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**Infundibular Mass: Adult**

**Sarcoid**
- Systemic dz
- Thickened stalk
- Enhancement

**Hypophysitis**
- Clinical info
- Stalk or gland
- Enhancement

**Lymphoma**
- +/- Systemic dz
- Stalk or gland
- Enhancement

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**Presentation Summary**

**Intrasellar Mass**
- Microadenoma, Rathke cleft cyst

**Suprasellar Mass**
- Craniopharyngioma, Macroadenoma, Meningioma, Aneurysm

**Infundibular Lesion**
- Germinoma, LCH
- Granulomatous disease, LH