Where Has My Vision Gone?
Evaluation of Sellar Lesions

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Objectives

• Present a case highlighting the clinical presentation and evaluation of a sellar lesion

• Review the anatomy of the sella

• Discuss the differential diagnosis of sellar lesions and show radiological examples
HPI:
• M.C. is a 56 year old woman with a history of diabetes, hypertension, and glaucoma who presented to the ophthalmology clinic for interim evaluation of her of glaucoma and diabetic retinopathy

• On routine exam, new onset visual acuity loss and bitemporal field cuts were noted

• The patient was referred for imaging
• The temporal portions of the visual fields pass through the pupil and are projected onto the nasal portion of the retina.
Visual Pathways

- The temporal portions of the visual fields pass through the pupil and are projected onto the nasal portion of the retina.
- The neuronal impulses from the nasal retinas exit the eye via the optic nerve and proceed to the optic chiasm, where they cross en route to the opposite visual cortex.
Visual Pathways

- The temporal portions of the visual fields pass through the pupil and are projected onto the nasal portion of the retina.
- The neuronal impulses from the nasal retinas exit the eye via the optic nerve and proceed to the optic chiasm, where they cross en route to the opposite visual cortex.
- This crossing point, the optic chiasm, is the only point where both temporal fields can be affected simultaneously in isolation of the rest of the eye.
Visual Pathways

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- The neuronal impulses from the nasal retinas exit the eye via the optic nerve and proceed to the optic chiasm, where they cross en route to the opposite visual cortex.
- This crossing point, the optic chiasm, is the only point where both temporal fields can be affected simultaneously in isolation of the rest of the eye.
- This localizes our patient’s symptoms to the optic chiasm.
The Sella (Saddle)

- The optic nerves exit the orbit via the optic canal

Image courtesy Dr. Moonis
The Sella (Saddle)

- The optic nerves exit the orbit via the optic canal.
- The nerve fibers then cross at the optic chiasm which lies above a bony valley termed the sella (saddle).

Image courtesy Dr. Moonis
The Sella (Saddle)

- The optic nerves exit the orbit via the optic canal
- The nerve fibers then cross at the optic chiasm which lies above a bony valley termed the sella (saddle)
- The majority of pathologies that affect the optic chiasm arise from anatomic structures in and around the sella

Image courtesy Dr. Moonis
Anatomy of Sella - Sagittal

- Some important anatomical structures include:
  - Optic Chiasm
Anatomy of Sella - Sagittal

- Some important anatomical structures include:
  - Optic Chiasm
  - Hypothalamus
Anatomy of Sella - Sagittal

• Some important anatomical structures include:
  – Optic Chiasm
  – Hypothalamus
  – Infundibulum
Anatomy of Sella - Sagittal

- Some important anatomical structures include:
  - Optic Chiasm
  - Hypothalamus
  - Infundibulum
  - Adenohypophysis
Anatomy of Sella - Sagittal

- Some important anatomical structures include:
  - Optic Chiasm
  - Hypothalamus
  - Infundibulum
  - Adenohypophysis
  - Neurohypophysis
Anatomy of Sella - Sagittal

- Some important anatomical structures include:
  - Optic Chiasm
  - Hypothalamus
  - Infundibulum
  - Adenohypophysis
  - Neurohypophysis
  - Mamillary body
Anatomy of Sella - Sagittal

Some important anatomical structures include:
- Optic Chiasm
- Hypothalamus
- Infundibulum
- Adenohypophysis
- Neurohypophysis
- Mamillary body
- Frontal Lobe

Netter's Anatomy, 4th Ed.
www.netteranatomy.com
Anatomy of Sella - Coronal

- Other important structures include:
  - Internal carotids

Netter's Anatomy, 4th Ed.
www.netteranatomy.com
Anatomy of Sella - Coronal

- Other important structures include:
  - Internal carotids
  - Cavernous sinus

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- Other important structures include:
  - Internal carotids
  - Cavernous sinus
  - Cranial nerves

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Anatomy of Sella - Coronal

• Other important structures include:
  – Internal carotids
  – Cavernous sinus
  – Cranial nerves
  – Sphenoid sinus
Ddx of Sellar Lesions

• The differential diagnosis of sellar lesions is broad, but can be organized into 4 categories:
  – Congenital
  – Neoplastic
  – Vascular
  – Inflammatory/Infectious
Ddx of Sellar Lesions

- **Congenital**
  - Rathke’s cleft cyst
  - Arachnoidal cyst
  - Ectopic posterior lobe

- **Neoplasms**
  - Pituitary adenoma
  - Meningioma
  - Craniopharyngioma
  - Germ cell tumor
  - Schwannoma/Neurinoma
  - Hypothalamic hamartomas
  - Metastases

- **Vascular**
  - Aneurysm
  - Cavernous sinus thrombosis
  - Infarction/Hemorrhage

- **Inflammatory/Infectious**
  - Sarcoidosis
  - Lymphocytic hypophysitis
  - Granulomatous hypophysitis
  - Pituitary abcess
  - Dermoid and epidermoid tumors
  - Tolosa-Hunt syndrome
Presentation of Sellar Lesions

• Because the differential diagnosis of sellar lesions is broad, it is important to use clinical clues to narrow the diagnosis before imaging
• Sellar lesions typically present clinically in one of three ways:
  – Hormonal abnormalities (functional tumors)
  – Neurologic symptoms (mass effect of non-functional tumors)
  – Incidental findings
Presentation of Sellar Lesions

• **Hormonal abnormalities**: hyper or hypo hormonal states
  
  – Hyper: usually due to functional adenoma
    • Hyperprolactinemia - lactotroph neoplasia *or stalk compression leading to loss of dopamine inhibition*
    • Hyperthyroidism – thyrotroph neoplasia
    • Gigantism/Acromegaly – somatotroph neoplasia
    • Cushing’s disease – corticotroph neoplasia
  
  – Hypo: usually tumor mass effect causing glandular compression
    • Ranges from loss of single hormone – usually LH/FSH first – to panhypopituitaryism
Presentation of Sellar Lesions

- **Neurologic Symptoms:** due to mass effect of lesion
  - Visual field cuts, visual acuity loss, headaches
  - Principal presenting feature of all lesions besides functional adenomas

- **Incidental Findings**
  - Picked up on CT/MRI done for another reason
Menu of Tests

- MRI: Primary diagnostic tool
  - Multiplanar – can acquire in coronal, sagittal, and transverse planes
  - High contrast of soft tissues that lie in and surround the sella

- CT: Useful as adjunct
  - Look for calcifications, bony erosions
  - Evaluate bony structure in preparation for surgery
Today’s Focus

- Due to time constraints, I will focus my discussion to three of the most common sellar lesions:
  - Pituitary Adenomas
  - Meningiomas
  - Craniopharyngiomas

- Our index patient has one of these three diagnoses, and hopefully after our discussion, you will be able to tell which one!
Pituitary Adenoma

• Most common sellar pathology (estimated incidence of 27% at autopsy)
• Classified by
  – Size: micro <10 mm or macro >10 mm
  – Functionality: hormone producing or not
    • Functional adenomas usually present early (microadenoma) due to hormonal abnormalities
    • Non-Functional adenomas typically present late (macroadenoma) with neurologic symptoms caused by mass effect
    • Non-functional and prolactinoma most common (30% each) followed by GH, ACTH, TSH, LH, FSH (last 3 very rare)
Companion Pt #1:

Pituitary Microadenoma on MRI

- Note the round 9 mm by 9 mm pituitary microadenoma in the left side of the pituitary
- Distinguishing features of pituitary microadenomas include:
  - Hypo or isointense to rest of pituitary on $T_1$
Companion Pt #1: Pituitary Microadenoma on MRI

- Note the round 9 mm by 9 mm pituitary microadenoma in the left side of the pituitary
- Distinguishing features of pituitary microadenomas include:
  - Hypo or isointense to rest of pituitary on T₁
  - Decreased contrast uptake relative to rest of pituitary

Image courtesy Dr. Moonis
Companion Pt #1: Pituitary Microadenoma on MRI

- Notice the beautiful nearby anatomy that is relatively unaffected by the small adenoma
  - Optic chiasm

T1 Coronal

Image courtesy Dr. Moonis
Companion Pt #1: Pituitary Microadenoma on MRI

- Notice the beautiful nearby anatomy that is relatively unaffected by the small adenoma
  - Optic chiasm
  - Internal carotids

Image courtesy Dr. Moonis
Companion Pt #2: Craniopharyngioma

- Neoplasia of squamous epithelium of Rathke’s pouch
- Bimodal distribution:
  - 5-15 years old – typically present with growth restriction due to mass effect causing panhypopituitarism
  - 60+ – typically present with neurologic symptoms due to mass effect
- Two histological sub-types:
  - Adamantinomatous
    - cholesterol rich cysts (resemble “crank oil” on pathology)
    - calcifications
  - Papillary
    - Lack calcifications or cysts

http://www.med.mun.ca/anatomyts/head/pit.htm
Companion Pt #2: Craniopharyngioma on MRI

- Note the large suprasellar mass compressing the hypothalamus above and the pituitary below
- Distinguishing features of craniopharyngiomas include:
  - Suprasellar in origin

Sagittal T₁

Image courtesy Dr. Moonis
Companion Pt #2: Craniopharyngioma on CT

- Note the large suprasellar mass compressing the hypothalamus above and the pituitary below
- Distinguishing features of craniopharyngiomas include:
  - Suprasellar in origin
  - Calcifications on CT

Axial CT

Image courtesy Dr. Moonis
Companion Pt #2: Craniopharyngioma on MRI

- Note the large supersellar mass compressing the hypothalamus above and the pituitary below.
- Distinguishing features of craniopharyngiomas include:
  - Suprasellar in origin
  - Calcifications on CT
  - Cystic and solid components
  - Enhances with contrast
Meningioma

- Typically benign neoplasm arising from meningothelial cell of arachnoid matter
- Sellar region accounts for 20-30% of all intracranial meningiomas
Companion Pt #3: Meningioma on MRI

- Note the large suprasellar mass
- Distinguishing features of meningiomas include:
  - Typically suprasellar

Sagittal T₁

Image courtesy Dr. Moonis
Companion Pt #3: Meningioma on MRI

- Note the large suprasellar mass
- Distinguishing features of meningiomas include:
  - Typically suprasellar
  - Rim of CSF

Sagittal T₁

Image courtesy Dr. Moonis
Companion Pt #3: Meningioma on MRI

- Note the large suprasellar mass
- Distinguishing features of meningiomas include:
  - Typically suprasellar
  - Rim of CSF
  - Dural tail (not seen here)
Companion Pt #3: Meningioma on MRI

- Note the large suprasellar mass
- Distinguishing features of meningiomas include:
  - Typically suprasellar
  - Rim of CSF
  - Dural tail (not seen here)
  - Sella turcica only mildly enlarged

Sagittal T₁

Image courtesy Dr. Moonis
Companion Pt #3: Meningioma on MRI

- Note the large suprasellar mass
- Distinguishing features of meningiomas include:
  - Typically suprasellar
  - Rim of CSF
  - Dural tail (not seen here)
  - Sella turcica only mildly enlarged
  - Early contrast enhancement

Transverse T₁ Post Contrast

Image courtesy Dr. Moonis
Back to Our Patient…

• Now that we’ve seen some examples of sellar neoplasms, let’s return to our patient and see if we can figure out what’s causing her visual symptoms
Our Patient: Sellar Mass on MRI

- Note the **sellar mass** with the following distinguishing features:
Our Patient: Sellar Mass on MRI

- Note the sellar mass with the following distinguishing features:
  - Sellar enlargement
Our Patient: Sellar Mass on CT

- Note the sellar mass with the following distinguishing features:
  - Sellar enlargement
Our Patient: Sellar Mass on MRI

- Note the sellar mass with the following distinguishing features:
  - Sellar enlargement
  - Isointense to brain
  - No cysts
Our Patient: Sellar Mass on MRI

- Note the sellar mass with the following distinguishing features:
  - Sellar enlargement
  - Isointense to brain
  - No cysts
  - Heterogenous uptake of contrast

Sagittal T₁ Post Contrast
Our Patient: Pituitary Mass on MRI

• These findings are classic for a pituitary macroadenoma, here’s why:
  – Sellar enlargement – suggests sellar origin of mass that has caused remodeling of the bony sella due to chronic pressure
  – Isointense to brain – suggests soft tissue pathology
  – No cysts – suggests against craniopharyngiomas or rathke’s cleft cysts
  – Heterogenous uptake of contrast – suggests intermixing of neoplastic hypovascular tissue with normal vascular pituitary parenchyma
Our Patient: What Next?

• Now that we have a preliminary diagnosis, we can move to laboratory studies to assess functionality of the pituitary adenoma

• Labs:
  – Prolactin – 182 (nl <25)
  – TSH nl
  – Free T4 low
  – GH, ACTH, IGF-1 nl

• Our patient’s laboratory abnormalities are relatively non-specific
  – Prolactin >200 is usually functional adenoma
  – Prolactin < 200 can be functional or due to stalk compression
  – Subclinical hypothyroidism (nl TSH, low T4 could be advancing age or due to compression of pituitary)
Our Patient: Treatment Course

• Considering the possibility of a functional prolactinoma, the pt was placed on Bromocriptine for 3 weeks
  – Repeat prolactin – 1.4
  – Substantial improvement in vision noticed
• However, a repeat MRI 4 months later showed no change in the size of the adenoma
• Trans-sphenoidal resection was offered and accepted
• After surgery, the patient remarkably reported complete return of vision and no longer needed to wear glasses
• She also reported cessation of headaches that she had long attributed to something else
Our Patient: Post-Surgery MRI

- Note the following findings after surgery:
  - Hypointense mass in the left pituitary
Our Patient: Post-Surgery MRI

- Note the following findings:
  - Hypointense mass in the left pituitary
  - Decompression of the cavernous sinus and optic chiasm
Our Patient: Post-Surgery MRI

- Note the following findings:
  - Hypointense mass in the left pituitary
  - Decompression of the cavernous sinus and optic chiasm
  - Hypointense post contrast due to decreased vascularity

Coronal T₁ Post Contrast

PACS, BIDMC
Summary

• Sellar lesions are common and typically present with:
  – **hormonal abnormalities** due to functional adenomas or stalk compression
  – **neurological symptoms** due to mass effect
Summary

• Sellar lesions are common and typically present with:
  – hormonal abnormalities due to functional adenomas or stalk compression
  – neurological symptoms due to mass effect

• The differential diagnosis of sellar lesions include:
  – congenital
  – neoplastic
  – vascular
  – inflammatory/infectious pathologies
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  – neoplastic
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• MRI imaging coupled with laboratory studies can help differentiate sellar pathology
Summary

• Sellar lesions are common and typically present with:
  – hormonal abnormalities due to functional adenomas or stalk compression
  – neurological symptoms due to mass effect
• The differential diagnosis of sellar lesions include:
  – congenital
  – neoplastic
  – vascular
  – inflammatory/infectious pathologies
• MRI imaging coupled with laboratory studies can help differentiate sellar pathology
• Medical treatment can be successful in select cases (prolactinomas), but surgery is often required for lesions causing symptoms by mass effect
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References