

Ophthalmology Grand Rounds

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April 5, 2012

History

- 46-yr-old woman presented to SIUH ophthalmology clinic 1/20/12 for initial visit, referred by endocrinology for routine visual field testing for pituitary adenoma
- No visual complaints or vision changes
- PMHx: As above, hypothyroidism
- POHx: Refractive error
- FamHx: No Hxglc/blindness
- Meds: No drops
- Allergies: NKDA

Examination 1/20/12

- dVAcc 20/25 OU
- EOM full OU
- CVF full OU
- Pupils 5-3 OU, no APD
- Tap: 14/14 at 10:15 AM
- SLE WNL OU
- DFE

V clear OU

M flat OU

CD 0.35/0.35, s/p OU

V WNL OU

P no evidence of detachment, hole, or tear OU

1/20/12

- MRI sella/pituitary with/without contrast 12/19/11:
Pituitary macroadenoma 1.8 x 1.7 cm
- Plan:
 - HVF 30-2 within 3 weeks
 - F/up with endocrinology as previously scheduled

3/4/12

- Consulted at SIUH ED for vision loss OD
- Pt had presented on 2/28/12 to the ED c/o severe headache, nausea, and vomiting that started the previous night after coming home from a visual field test that was normal per pt
- Head CT: sinusitis
- Pt was discharged home
- Pt's symptoms persisted, and pt awoke a couple days later with painless total vision loss OD
- Pt waited 2 days to present to the ED since onset of vision loss on 3/2/12 because she felt delirious as a result of her severe headache and vomiting
- No eye pain
- Ophthalmology service only initial consultant

Examination in ED 3/4/12

- nVAsc OD NLP all directions, OS 20/25
- EOM + esotropia OD, -4 abduction OD; full OS (right 6th nerve palsy)
- CVF full OS
- Pupils 5mm, non-reactive OD, 5-3 OS, + APD OD
- Tpalp WNL OU
- CN III, IV, V₁, V₂, V₃, VII, VIII, IX, X, XI, XII grossly intact bilaterally
- PLE WNL OU (beside non-reactive pupil OD), no proptosis, no resistance to retropulsion OU, no facial rash
- DFE

V clear OU

M flat OU

CD 0.35/0.35, s/p OU, mild fullness to disc OD, but no edema

V WNL OU

P no evidence of detachment, hole, or tear OU

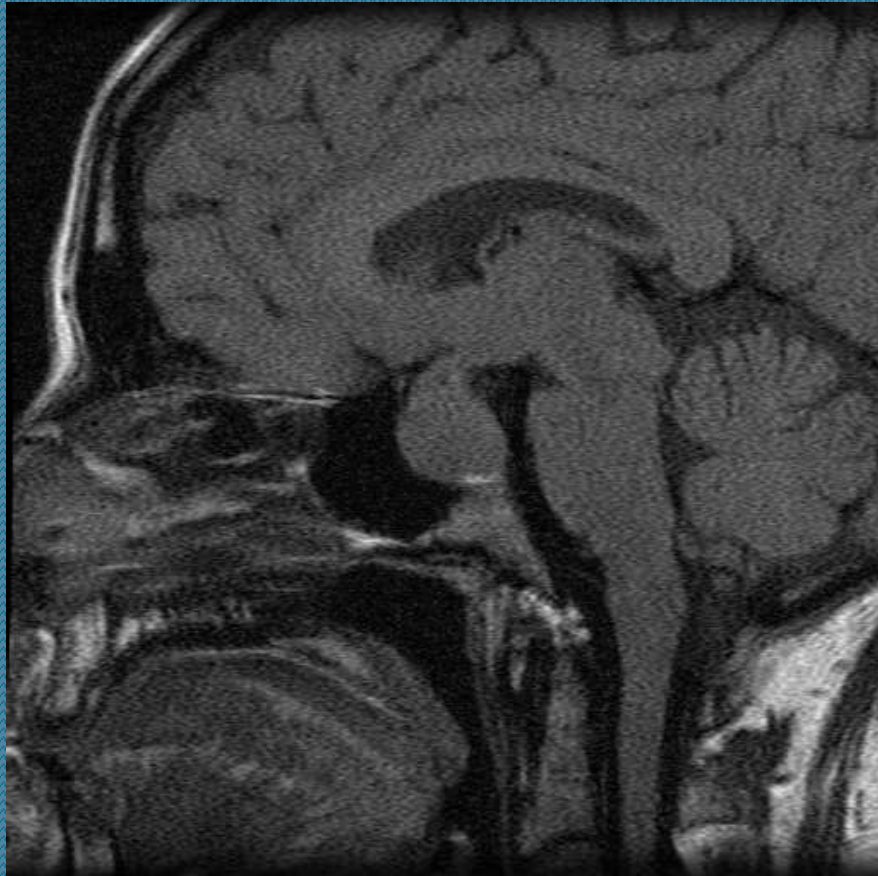
Differential Diagnosis?

Differential Diagnosis

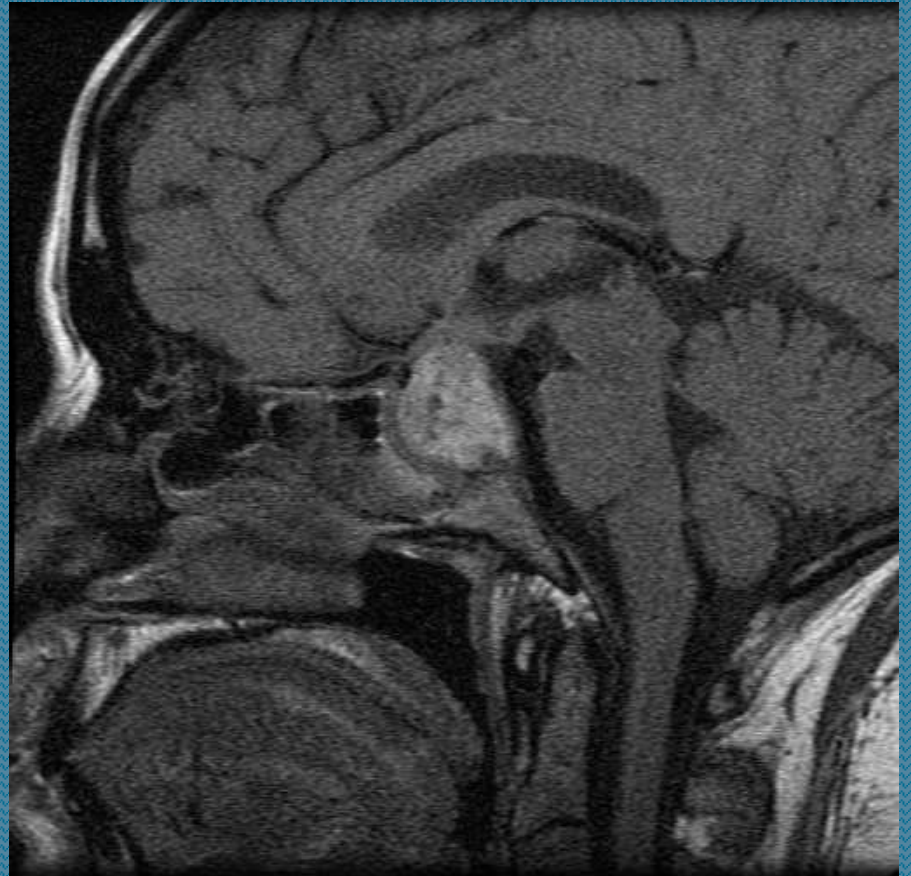
- Pituitary Apoplexy
- Vasculopathic 6th Nerve Palsy
- Lyme Disease
- Tertiary Syphilis
- Giant Cell Arteritis
- Aneurysm/Subarachnoid Hemorrhage
- Intracranial Neoplasm/Metastases
- Multiple Sclerosis
- Early Herpes Zoster
- Angle-closure glaucoma

- STAT MRI brain with/without contrast ordered
- STAT neurology/neurosurgical evaluations suggested
- Discussed findings with chief resident and attending on call

12/19/11



3/4/12

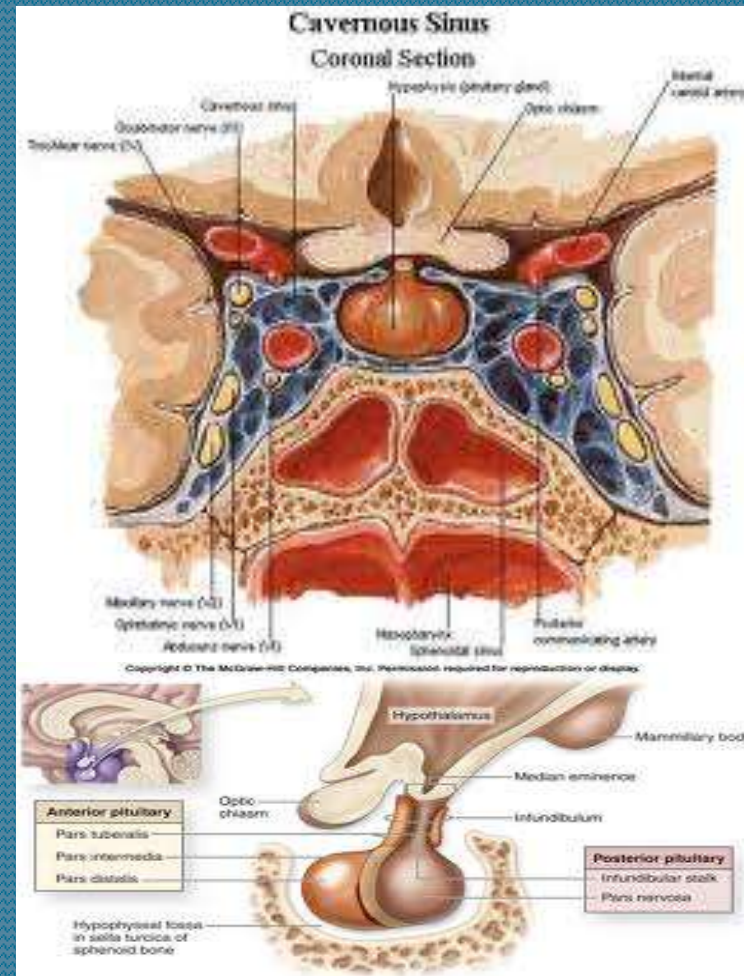


Differential Diagnosis

- **Pituitary Apoplexy**
- Vasculopathic 6th Nerve Palsy
- Giant Cell Arteritis
- Lyme Disease
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Pituitary/Optic Chiasm Anatomy

- *Chiasm* derived from Greek letter chi (χ)
- Optic chiasm is a flattened structure situated approx 10mm above pituitary gland, angled about 45°
- Pituitary gland rests in sellaturcica of sphenoid bone
- Chiasm and pituitary are separated by suprasellar or inferior chiasmatic cistern
- Chiasm may be in normal, prefixed (5-12%), or postfixed (4%) orientation relative to sellar structures
- Chiasm is flanked by supraclinoid segments of the carotid arteries (ICA) and is contiguous with antero-inferior floor of 3rd ventricle



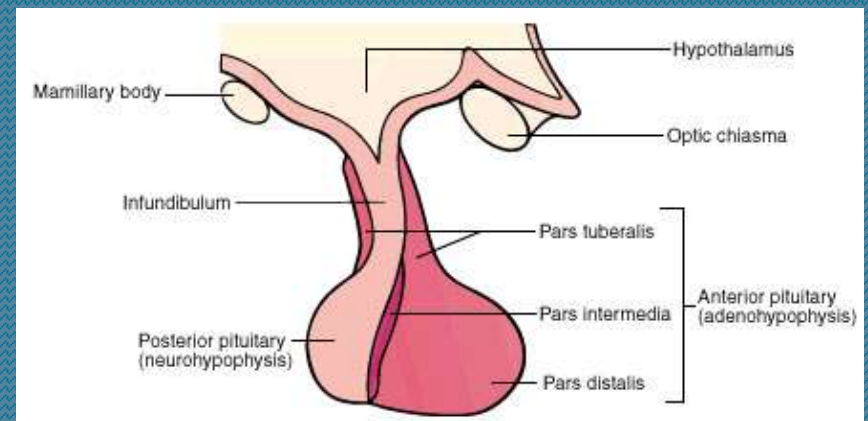
Wilbrand's Knee

- Originally noted by Michael as early as 1887, described by Wilbrand starting in 1904
- Group of crossing, inferior nasal quadrant, extramacular ganglion cell axons that loop anteriorly to posterior contralateral optic nerve before looping posteriorly and laterally to the optic tract
- However, more recently Horton suggested that it may only be an artifact of previously studied preparations



Anatomy

- Pituitary infundibulum arises from hypothalamus behind the chiasm, extends to posterior lobe of pituitary (neurohypophysis)
- Anterior lobe (adenohypophysis) forms embryologically from Rathke's pouch



Homones Released by the Pituitary Gland

Homone	Site of Action	Effects
Posterior Pituitary		
Oxytocin	uterus breast	stimulates contraction during labor stimulates contraction to express milk
Antidiuretic homone (ADH)	kidney	stimulates retention of water
Anterior Pituitary		
Corticotrophin (adrenocorticotrophic homone, ACTH)	adrenal cortex	stimulates release of cortisol
Thyroid-stimulating homone (TSH)	thyroid	stimulates release of thyroxine
Growth homone (GH)	bone	stimulates growth
Follicle-stimulating homone (FSH)	female ovaries male testes	stimulates follicle to mature an egg; estrogen production stimulates sperm production
Luteinizing homone (LH)	female ovaries male testes	stimulates ovulation, progesterone production stimulates testosterone production
beta-Endorphin	brain	reduces pain

Pituitary Adenoma

- 12-15% of symptomatic intracranial neoplasms
- Most common lesion causing chiasmal dysfunction
- Uncommon before age 20, incidence increases after 4th decade
- Autopsies revealed that prevalence of asymptomatic adenomas may be as high as 20-27%, and adenomatous hyperplasia may be found in almost every pituitary gland



Pituitary Adenoma

Classified according to size:

Microadenoma: $< 10\text{mm}$ in largest diameter

Macroadenoma: $\geq 10\text{mm}$ in largest diameter

Functional vs. non-functional

May also be distinguished anatomically/radiologically:

Intrapituitary, intrasellar, diffuse, or invasive

Invasive adenomas: Approx 35% of all pituitary neoplasms, may invade dura mater, cranial bone, cavernous sinus, or sphenoid bone

Pituitary Adenoma

- Separation of chiasm from pituitary by suprasellar (or inferior chiasmatic) cistern enables mild-moderate suprasellar extension of tumors to occur without chiasmal visual field loss
- If visual field loss present, advanced enlargement with expansion beyond diaphragm sella is expected
- May be endocrine inactive or active; active tumors likely cause systemic signs and symptoms before affecting visual pathways
- Symptoms include infertility, unexplained breast milk production, impotence, oligomenorrhea, acromegaly, weight loss, increased appetite, tachycardia, tremors, frequent bowel movements, backache, thin skin, flushed face, weak and fragile muscles and bones, wrinkles and stretch marks, excessive hair growth, mood swings, osteoporosis of the rib and vertebrae, hyperglycemia/diabetes, and/or fat build up in the face, back, and chest
- Important to consider work up for all patients with non-specific headaches and/or endocrine abnormalities

Progression of Visual Field Defects

- Both superotemporal fields are usually affected first as tumor grows upwards and splays anterior chiasmal notch, compressing crossing inferonasal fibers
- Progress to lower temporal fields, usually asymmetric given irregularity of tumor shape/growth
- Progression to macular fibers with central vision loss (usually first in eye with greater field deficits)
- Remember: differential for bitemporal deficits include dermatochalasis of upper lids, tilted discs, optic nerve colobomas, nasal retinoschisis, and nasal retinitis pigmentosa

Color Desaturation

- May occur across vertical midline of monocular visual field
- Each eye tested separately, patient is asked to compare color of red top as it is brought from nasal to temporal visual field
- Alternatively, place red tops at symmetric points in nasal and temporal visual fields, ask patient to compare intensity
- Patient may also miss temporal number on Ishihara testing

Pregnancy

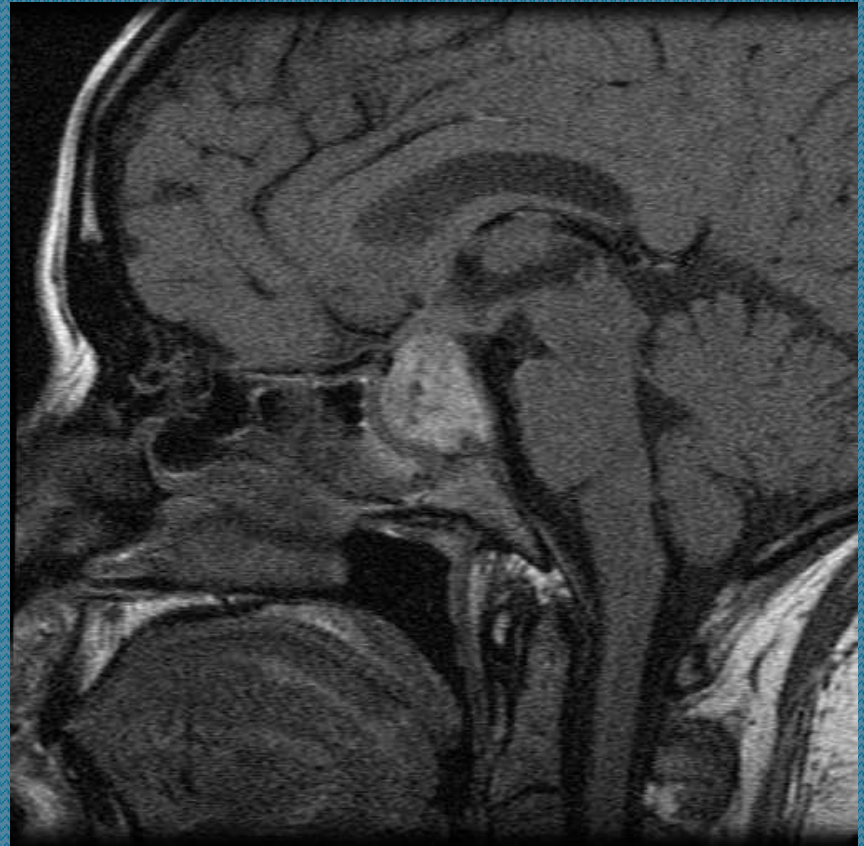
- Pituitary adenomas (especially prolactinomas) are sensitive to increased levels of estrogen and progesterone
- May enlarge during pregnancy causing visual symptoms—may abate after delivery

Other Causes of Chiasmal Dysfunction

- Meningioma (also enlarge during pregnancy)
- Craniopharyngioma
- Optic glioma
- Lymphocytic adenohypophysitis—rare, immune-mediated diffuse lymphocytic infiltration of pituitary gland that may cause chiasmal compression from suprasellar extension; reported in women only, over 50% of cases in perinatal period
- Other tumors/metastases/cysts (chordoma, dysgerminoma, nasopharyngeal tumors, Rathke's pouch cyst, sphenoid mucocele)
- Cavernous hemangioma/AV malformation
- Hydrocephalus/enlarged 3rd ventricle
- Infectious/inflammatory/demyelinating etiologies
- Trauma
- Toxins
- Rarely congenital chiasmal dysplasia

Pituitary Apoplexy

- *Apoplexy* originates from Latin word meaning stroke or struck
- Acute, unpredictable, life-threatening
- Sudden enlargement of pituitary gland, usually in setting of adenoma, although no increased risk depending on histological subtype of tumor
- May be caused by hemorrhage or infarction
- Acute headache, visual loss, ophthalmoplegia, and/or facial pain or numbness
- Tumor of any size can undergo hemorrhagic necrosis



Pituitary Apoplexy

- Thought to occur in 0.6-9.1% of all surgically-managed cases of pituitary adenoma
- Age range is broad, from 1st to 9th decade, estimated to peak in 5th decade
- No gender predilection
- Ocular manifestations: usually painful ophthalmoplegia and vision loss
- Vision loss is variable, may not always produce an APD
- Visual field defects common
- Degree of ophthalmoplegia variable, depending on involvement of each cavernous sinus

Pituitary Apoplexy

- Predisposing factors include
 - pregnancy,
 - estrogen therapy,
 - obstetrical hemorrhage (Sheehan syndrome),
 - diabetes,
 - bleeding disorders,
 - long-term anticoagulation,
 - blood dyscrasias,
 - radiation therapy,
 - hypotension
 - trauma,
 - angiography,
 - atheromatous emboli,
 - cardiac surgery,
 - coughing,
 - positive pressure ventilation, and
 - vasoconstrictive agents

Pituitary Apoplexy

- Rapid expansion into structures such as
 - optic chiasm
 - hypothalamus
 - cavernous sinus

may occur not uncommonly. This condition is a **neurosurgical emergency**

- Most patients experience meningeal irritation
- Hypofunction of gland common afterward

Diagnosis

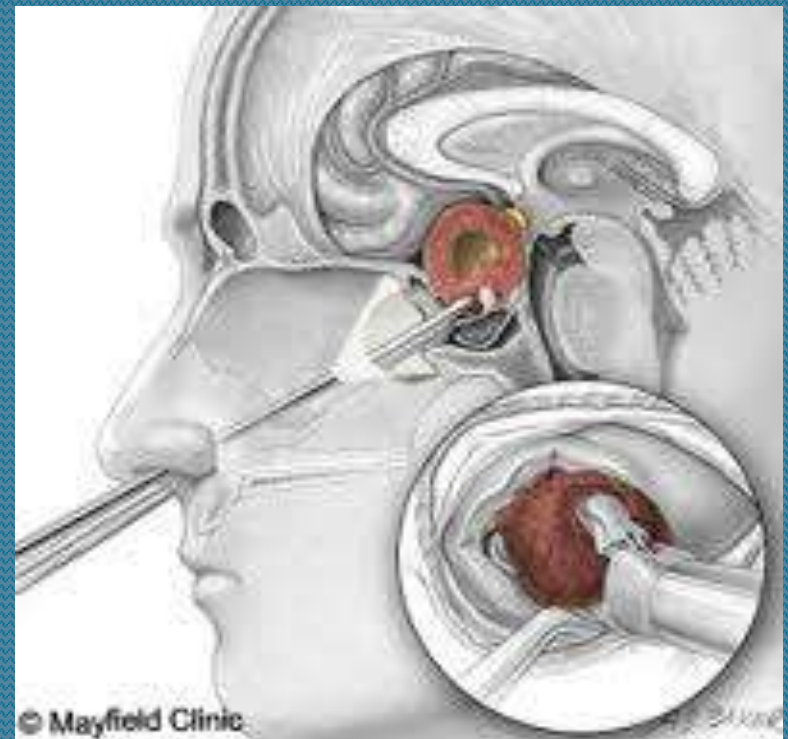
- MRI is gold standard for neuroimaging
- Will delineate tumor and hemorrhage
- Much more sensitive than CT scan (estimated CT only diagnoses apoplexy 46% of the time)
- If pituitary apoplexy not found on MRI, MRA or CTA should be performed to rule out expanding or ruptured aneurysm



Patient Care, Medical Knowledge, Practice-based
Learning and Improvement

Treatment

- Trans-sphenoidal decompression of sella in patients with neuro-ophthalmic abnormality
- Bromocriptine (dopamine agonist) has been advocated in cases with little or no deficit
- Supplementation of pituitary hormones often necessary for prolonged period after apoplectic event



Course/Outcome

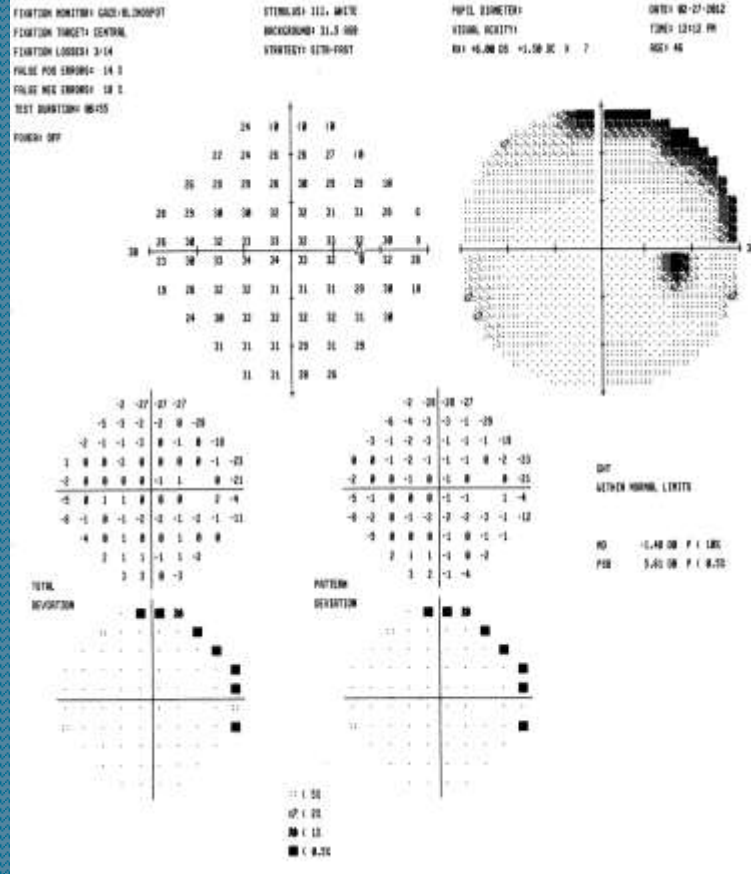
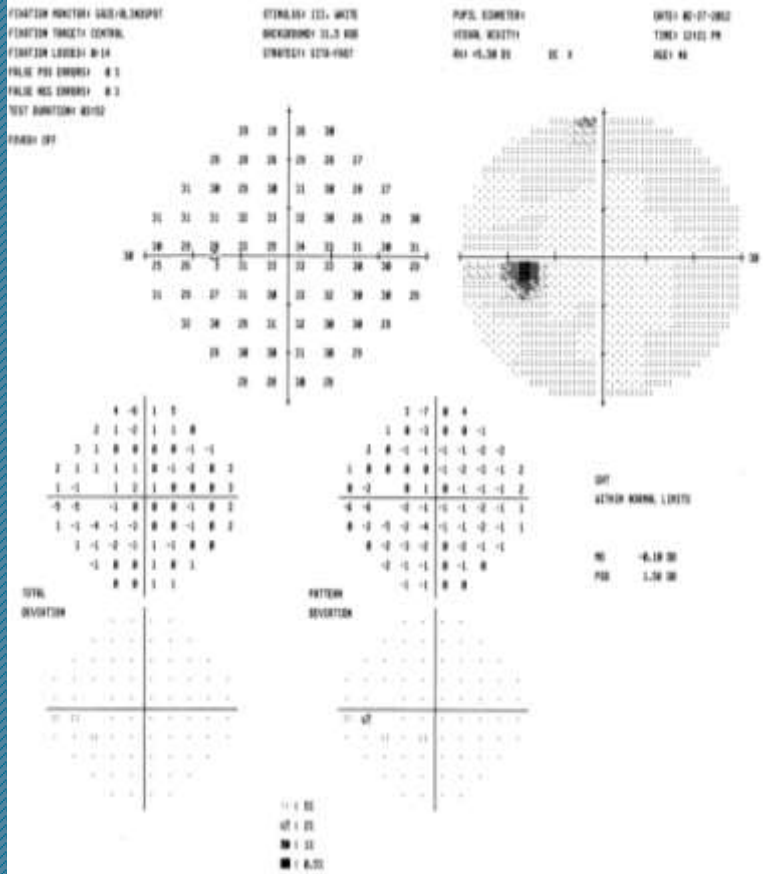
- Good prognosis with surgical decompression
- Improvement of visual acuity, field deficits, and ophthalmoplegia reported to be as high as 76-91% of cases
- Endocrine abnormalities, however, remain high with 43-58% requiring some form of hormonal supplementation
- Mortality with surgical management low

Back to Our Patient

- Pt was placed on IV steroids (dosed per neurosurgery) and was prepared for emergent trans-sphenoidal resection of tumor which was performed urgently
- Postoperatively in ICU pt reported some vision present in right eye (HM), and 6th nerve palsy had resolved

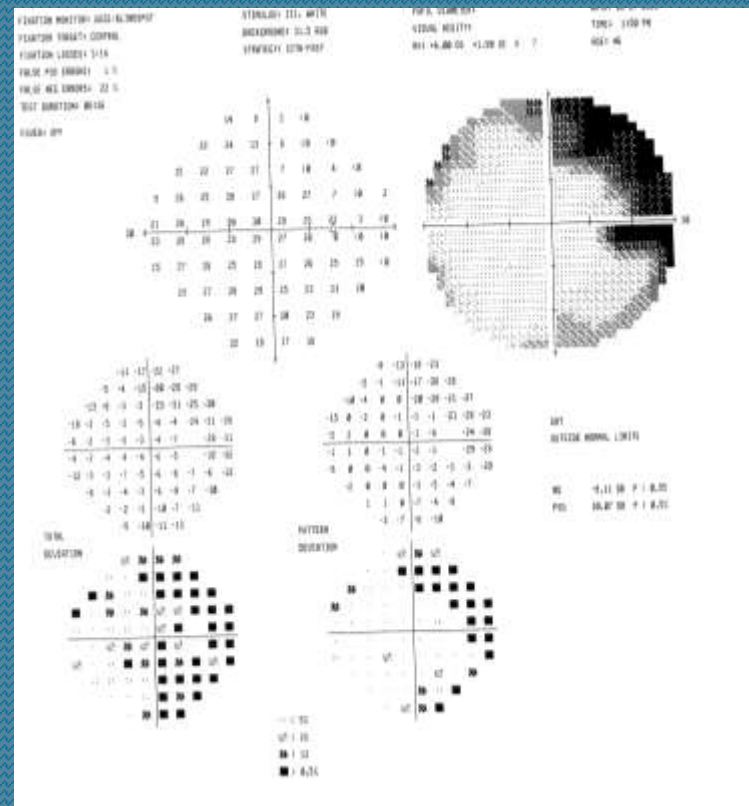
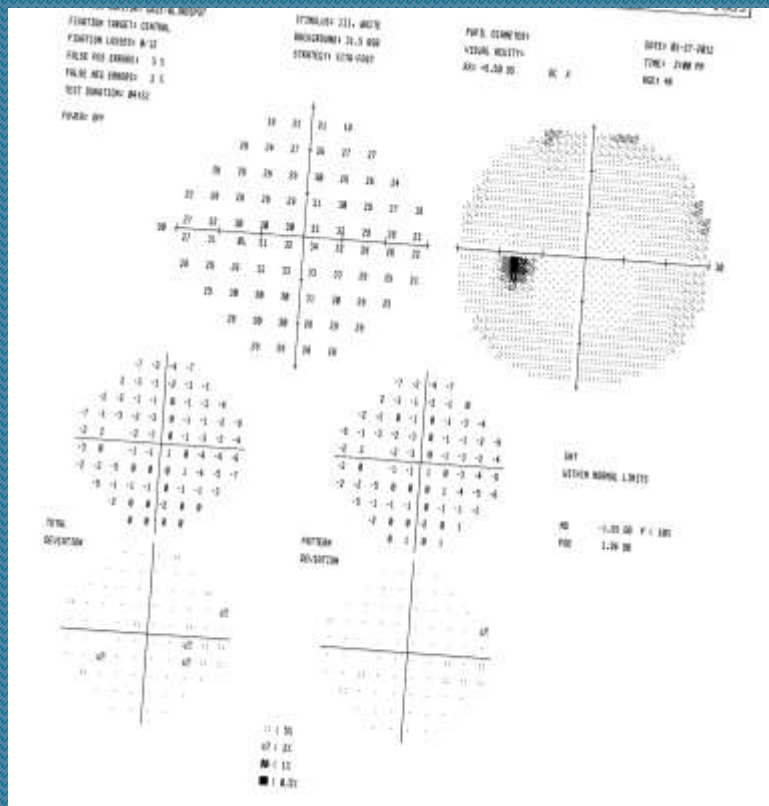
D Agrawal, A Mahapatra. Visual outcome of blind eyes in pituitary apoplexy after transsphenoidal surgery: a series of 14 eyes. *Surgical Neurology* Volume 63—Issue 1, Pages 42-46, January 2005

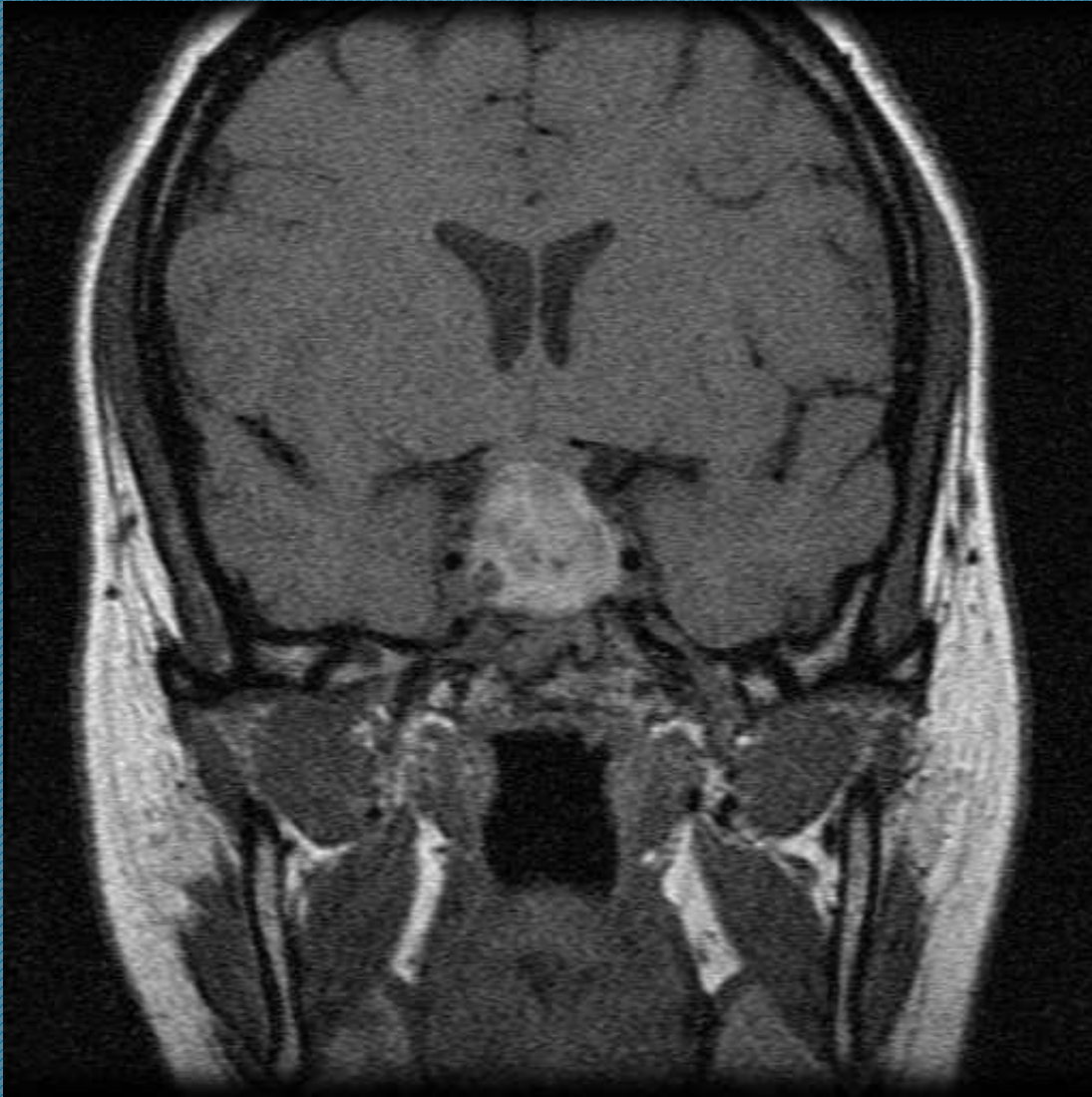
- 14 blind eyes secondary to pituitary apoplexy, now s/p trans-sphenoidal surgery
- Average delay to neurosurgical consultation 10 days, total range 4 to 30 days
- 4 eyes improved to greater than 20/60
- 2 eyes improved to 20/20
- All patients with improvement of vision had undergone operation within 1 week of apoplectic episode



3/27/12

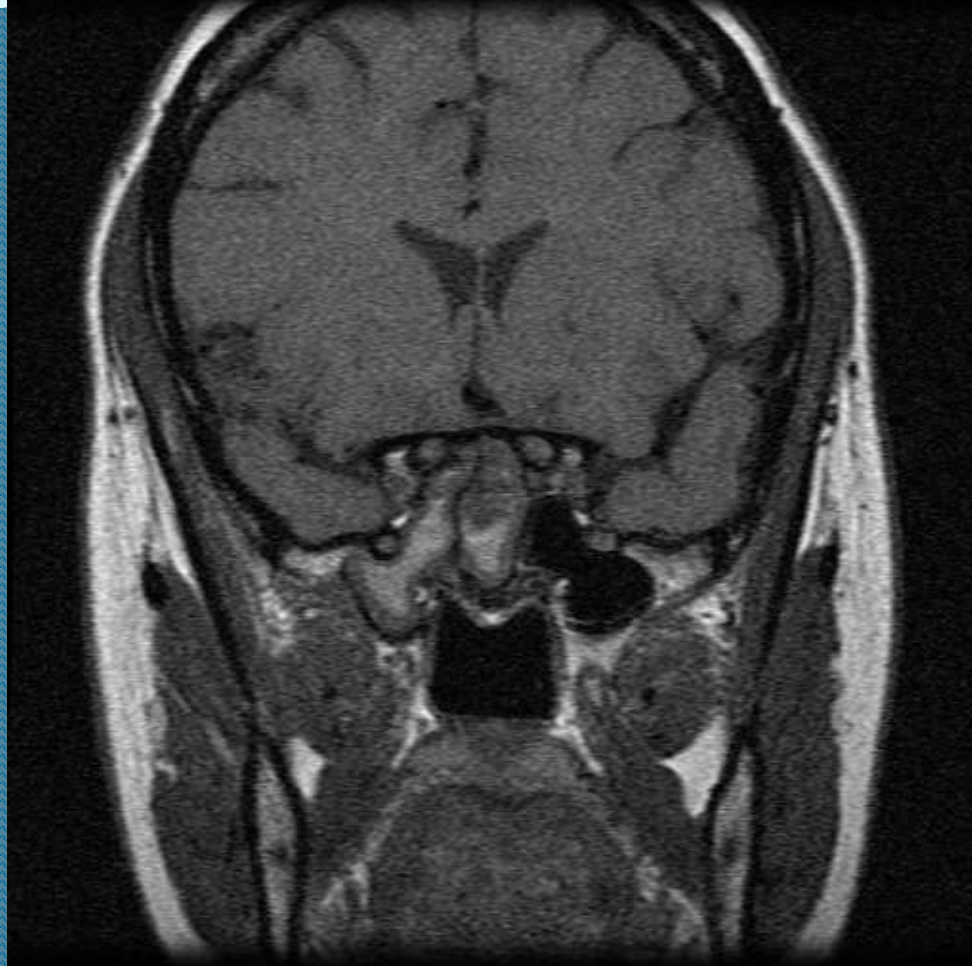
- dVAcc OD 20/40 +2, OS 20/20
- EOM full OU
- Complaint of residual superotemporal field defect OD
- + APD OD





Patient Care, Medical Knowledge

Etiology of 6th nerve palsy?



Patient Care, Medical Knowledge, Practice-based
Learning and Improvement

Reflective Practice

- Pt was treated in a timely manner in life-threatening situation with improvement of symptoms
- **NLP is not always NLP**
- Patients do not always “read the textbooks;” this presentation reflects importance of a differential diagnosis, in this case ranging from pituitary apoplexy to angle-closure glaucoma, for a consult with chief complaint of vision loss and pain

Core Competencies

- Patient Care—compassionate, appropriate, and effective in the evaluation and treatment of this patient.
- Medical Knowledge—comprehensive literature search was performed to better understand the evaluation and treatment of this condition. A better understanding of both basic and clinical science of this condition was attained, and relevant topics were discussed among residents and attending physicians
- Practice-based learning and improvement—Care of patient was discussed among residents and faculty. Scientific studies were reviewed to ensure the highest level of evidence-based practice. Suggested protocols in the literature were analyzed and discussed to refine treatment plan for our patient and future patients
- Interpersonal and communication skills—all questions of the patient and family were answered in a complete and caring manner to allay the fears of the patient and family. A professional relationship based on compassion and trust was established for the patient's wellbeing. Pt was followed adequately for consistently excellent medical care and to maintain this relationship.
- Professionalism—Responsibility of potential complications of medical and surgical treatment regimen was accepted by the entire team and communicated to the patient and family. Professional relationships were established and maintained with physicians from other fields.
- Systems-based Practice—communication with physicians from other fields was emphasized in this case to provide multi-specialty care in the best fashion possible. Acute care was provided, follow up appointments were scheduled, contact information was exchanged, and reports to primary care physician given to ensure a successful long-term outcome.

Thank you

- Dr. Nejat
- Dr. Ferri
- Dr. Mostafavi
- Dr. Oren Herman
- Dr. Adam Bernheim