

### Five diagnoses you cannot afford to miss

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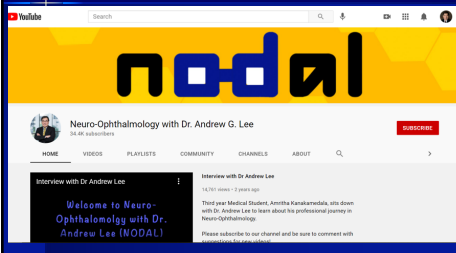


•Dr. Lee (Houston Methodist Hospital) works as a consultant for the **United States Department of Justice (DOJ)**, the **National Aeronautics and Space Administration (NASA)**, and the **National Football League (NFL)** but the views expressed here are his own and do not represent those of these organizations or the United States government.

Other consultant and speaker disclosures: Horizon therapeutics, AstraZeneca, Stoke, Bristol Myers Squibb


2

### Come visit me on YouTube at NODAL




3

### I will not be discussing any off label uses of drugs



4

### On July 20, 1969, I was 5 years old, the moon landing was on tv....



5

### Texas Medical Center



6

## Texas Medical Center

- Annual Patient Visits: 7.1 million
- Employees: 92,500 & Full-time Students: 34,000 & Volunteers: 12,000
- Residents and Fellows: 4,000
- Visiting Scientists, Researchers: 7,000
- Total Hospital Beds: 6,900 beds
- Annual Surgeries: 350,000

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## Learning Objectives

- List five potentially life threatening diagnosis in neuro-op
- Define "rule of the pupil"
- Define best imaging study for the 5 dx
- Show key clinical or radiographic features for the above 5 dx

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## Overview: Lee's "A"s: The five chances to save the life of your next neuro-ophthalmology patient

1. Arteritis (Giant cell)
2. Apoplexy (Pituitary)
3. Abscess (Mucor)
4. Aneurysm (pupil involved third nerve palsy)
5. Arterial (carotid or vertebral) dissection



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## When making your differential diagnosis...think horses



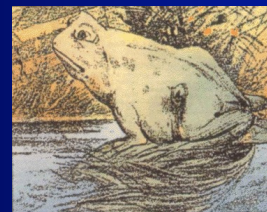
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Women in audience close your eyes....Men: What do you see (keep it to yourself for now)?



12

OK, now men cover your eyes. Women: What do you see (keep to yourself for now)?

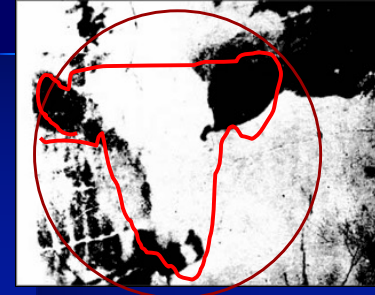


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What did you see?  
Men? Women?  
How much would you bet that the other  
person is wrong? How strongly would you  
argue the point?



14



15

### Dad's definition of a great lecture



Bad lecture: You make a list of things you  
have to pick up at the store later

16

It's ok to ask for help but you  
have to be able to read the signs



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### Five triage pearls in neuro-ophthalmology

1. Have "the triage list" in ADVANCE not ad hoc
2. Beware **red flag**: "acute painful" (insert any neuro-ophthalmic sign!)
3. "**How long** has it been there?" (this is your time clock for working it up)
4. **How bad** is your pain or visual loss? (worst HA of life, LP or NLP vision = "Come now!")
5. Are your **pupils different** sizes (Go look in the mirror now!)

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Who's fault is it if the  
resident/fellow/technician  
doesn't triage patient properly?



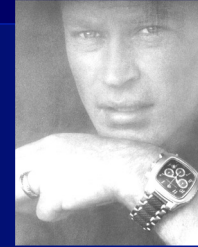
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## Five big red flags to worry about (even on Sunday AM)...

1. Acute headache in elderly especially with visual loss (also jaw claudication & scalp pain)
2. Acute painful ophthalmoplegia or orbital apex
3. Acute painful anisocoria (small or big pupil)
4. Acute no light perception
5. Acute bilateral visual loss or ophthalmoplegia

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## Pattern recognition



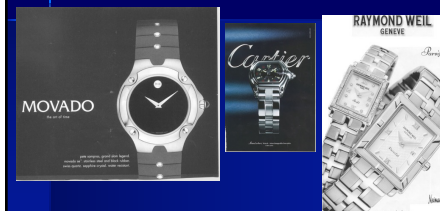
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## Pattern recognition



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## Is the pattern emerging?



23

## It is easy now....



24



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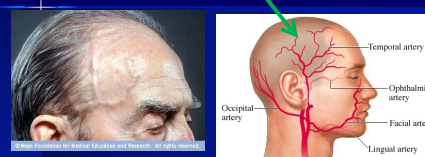


## Giant cell arteritis: What everyone knows....

- Elderly patient (often female)
- Acute onset headache, jaw claudication, temporal artery pain, neck or ear pain
- Loss of vision (typically due to ischemic optic neuropathy)
- Elevated erythrocyte sedimentation rate (ESR) & C-reactive protein

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## Yes, temple, but also neck, ear, jaw, occipital, scalp pain



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## Initial symptoms in GCA (n = 100)

Symptom or complaint	Prevalent symptom	Finding at diagnosis
Headache	32	68
Polymyalgia rheumatica	25	39
Fever	15	42
Visual symptoms without loss of vision	7	30
Weakness, malaise, fatigue	5	50
Tenderness over arteries	5	27
Myalgias	4	30
Weight loss, anorexia	2	50
Jaw claudication	2	45
Permanent loss of vision	1	14
Tongue claudication	1	6
Sore throat	1	9
Vasculitis on angiogram	1	NA
Stiffness of hands and wrists	1	NA
Decreased temporal artery pulse	NA	46
Erythematous, nodular, swollen arteries	NA	23
Central nervous system abnormalities	NA	15
Synovitis	NA	NA
Dysphagia	NA	15
Limb claudication	NA	NA

Adapted with permission from Haxby GG. Temporal arteritis and polymyalgia rheumatica. In: Fisher WC, et al. Textbook of rheumatology. 4th ed. Philadelphia: Saunders, 1991:127.

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## Delay in GCA diagnosis common

- Br J Rheumatol. 1997 Feb;36(2):251-4. **Clinical features in patients with permanent visual loss due to biopsy-proven giant cell arteritis. Font et al.**
- 146 biopsy + GCA
- 23 (16%) lost vision
- GCA Sx for average of 1.3 months
- 35% PMR x 10.8 months
- 65% premonitory visual Sx for 8.5 days
- Clear delay in diagnosis in 65% (15)



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## Walking on the beach in Oahu



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## The beautiful Sunday syndrome



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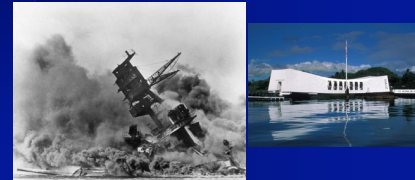
### Story of a beautiful Sunday morning at that exact spot

- Army Pvs Lockard & Elliot
- Detected aircraft at 7:02am practicing with new equipment (RADAR)
- Reported findings to Fort Shafter but staff had gone to pancake breakfast
- Lt. Tyler received message & told them that it was scheduled flight of B-17s
- Advised radar crew "not to worry"

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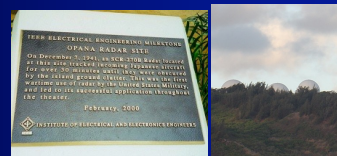
They should have worried... because...that Sunday was a date that will live in infamy December 7, 1941

- The first use of wartime radar in US



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### Beautiful Sunday....but what if it had been Monday 8 AM instead



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**Giant Cell Imperial Command is ready to launch a surprise attack...BEWARE SUNDAY 7 AM**

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### Payments for GCA

1. INDEMNITY PAYMENTS MADE TO SETTLE GCA CASES		
	GCA Claims	All OMIC Claims
Closed with a payment	44%	21%
Mean (average) payment	\$203,250	\$165,282
Median (middle) payment	\$335,000	\$81,875
Highest payment	\$450,000	\$3,375,000

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### Some things you don't know about things you know well (GCA)

- Anterior ischemic optic neuropathy
- Posterior ischemic optic neuropathy
- Transient visual loss
- Transient diplopia in the elderly
- The distinctive hx = premonitory visual symptoms & constitutional S/Sx



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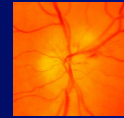
Which of the following is the most likely cause of painful anterior ischemic optic neuropathy in an elderly patient?

- A. Giant cell arteritis
- B. Carotid artery dissection
- C. Pituitary apoplexy
- D. Mucormycosis

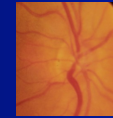
Answer A

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**Which is worse AION or PION of elderly?**



Swollen disc in anterior ischemic optic neuropathy



Normal appearing disc in posterior ischemic optic neuropathy

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Which of the following is the most likely cause of painless anterior ischemic optic neuropathy?

- A. Giant cell arteritis
- B. Carotid artery dissection
- C. Pituitary apoplexy
- D. NAION

Answer D

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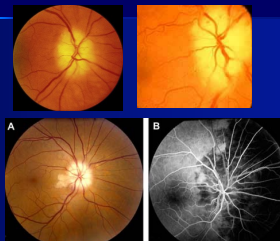
Which of the following is the most likely cause of posterior ischemic optic neuropathy?

- A. Giant cell arteritis
- B. Carotid artery dissection
- C. Pituitary apoplexy
- D. Mucormycosis

Answer A

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**Beware "pallid edema"**



<http://webeye.ophth.uiowa.edu/dept/aion/13-AION-A-AION.htm>

42

Which of the following is most likely cause of an acute, painful, pallid disc edema in an elderly female?

- A. Posterior communicating artery aneurysm
- B. Carotid artery dissection
- C. Pituitary apoplexy
- D. Giant cell arteritis

Answer D

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And the MRI of head was normal.....

■ WHY?

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## Big Red Flags in GCA

- Severe visual loss (e.g. LP or NLP)
- Bilateral simultaneous visual loss
- Transient visual loss (not seen in non-arteritic form of ischemic optic neuropathy)
- PMR with visual symptoms

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Giant cell arteritis can kill people....

- Aortitis
- Systemic vasculitis

Crow et al. J Gerontol A Biol Sci Med Sci 2009.

- Mortality in GCA: 5-year survival: 67% for controls vs 35% for GCA cases ( $p < .001$ )

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## Aortitis can kill you



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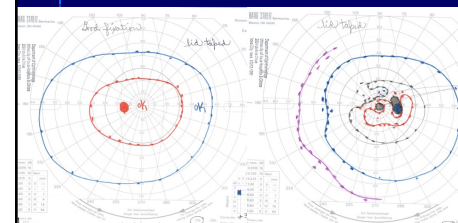
There are five things to remember about acute visual loss in the elderly

- One is GIANT CELL ARTERITIS....
- And the other four are Giant Cell Arteritis



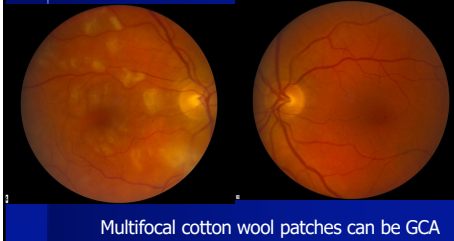
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75 year old woman with acute loss of vision OD



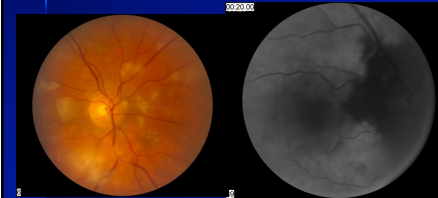
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### Beware "ischemic" loss of vision without disc edema



51

### FFA: Peripapillary choroidal perfusion delay

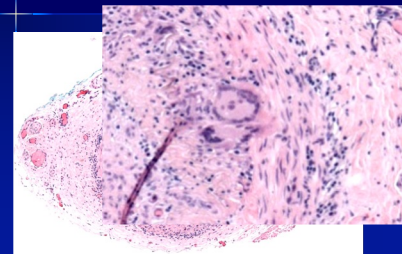


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### Biopsy proven giant cell arteritis



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### Wicked good pearl: TA Biopsy report

- Impression: No giant cells seen, no evidence for active arteritis
- READ THE BODY OF THE REPORT
  - Focal disruption of the internal elastic lamina (could still be healed arteritis)
  - Areas of fibrosis
  - A few lymphocytes seen in adventitia
  - No artery identified in specimen (vein or nerve or connective tissue)

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### Beware of Unusual Ocular Presentation of GCA

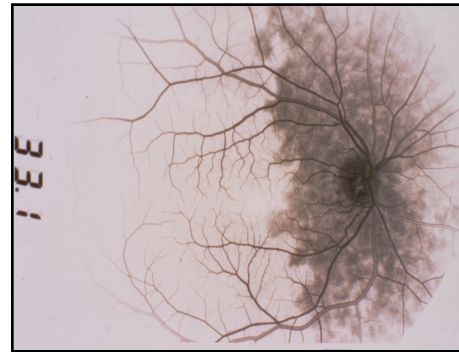
- Multifocal cotton wool patches
- Posterior ischemic optic neuropathy (normal appearing optic nerve)
- Non-embolic central retinal artery occlusion
- Transient visual loss (amaurosis fugax)
- Transient diplopia
- Simultaneous choroidal or retinal artery occlusion with AION

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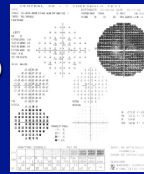
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### Holiday Headache

- 22 y/o woman
- Severe headache
- 20/50? Effort (blurred vision)
- Fundus normal OU
- HVF: "unreliable"
- Friday 4:45 PM



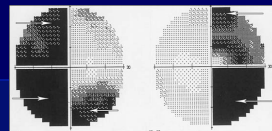
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### Perform a confrontation field

- Beware acute bitemporal field loss
- "Unreliable HVF" = "I have no visual field on this patient!"



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### Life threatening diagnosis?



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A 25 yo post-partum WF presents with acute, painful, bitemporal hemianopsia. Which of the following is the most likely diagnosis?

- Posterior communicating artery aneurysm
- Mucormycosis of sphenoid sinus
- Carotid artery dissection
- Pituitary apoplexy

Answer D

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### Life threatening diagnosis?





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Which of the following is most likely to occur after pregnancy?



- A. Giant cell arteritis
- B. Carotid artery dissection
- C. Pituitary apoplexy
- D. Mucormycosis

Answer C

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### Pituitary tumors common


- Incidence of pituitary tumors = 7 per 100K population per year
- As high as 1 in 500 > 65 years
- "The average ophthalmologist should see about one pituitary tumor per year....are you missing your quota?" ----B. Katz MD

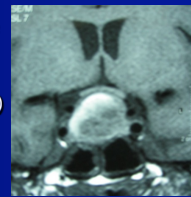

[www.chd.com/ha.colostate.edu](http://www.chd.com/ha.colostate.edu)  
[www.clinical-blood-testing.com](http://www.clinical-blood-testing.com)

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### Pituitary apoplexy



- Acute onset
- Usually severe headache
- Bitemporal hemianopsia
- Apoplexy can kill (8%)
- Hypopituitarism (cortisol)
- Emergent scan

[biocomm.stanford.edu](http://biocomm.stanford.edu)

66

### Pituitary apoplexy

- Semple et al. Neurosurgery. 56(1):65-73, 2005.
- 62 patients (Average age 51.1 years)
- Average time presentation: 14 days after ictus
- 81% **no previous history** of pituitary tumor
- Headache (87%) with diminished visual acuity in 56% (bitemporal hemianopia 34%)
- 73% hypopituitarism; 8% diabetes insipidus
- Apoplexy is a CLINICAL not radiographic dx

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Which of the following is the most likely cause of an acute, painful bitemporal hemianopsia?

- A. Posterior communicating artery aneurysm
- B. Carotid artery dissection
- C. Pituitary apoplexy
- D. Giant cell arteritis

Answer C

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## Unreliable visual field

- Wicked good pearl: Do a confrontation visual field especially in patients with an "unreliable" HVF (same as saying I have no visual field and it could be a brain tumor and I aint doin' a damn thing about it)

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## Acute ophthalmoplegia in a diabetic

- 35 y/o WM with diabetes
- History of diabetic ketoacidosis
- Complete left ptosis
- Acute onset almost complete left sided ophthalmoplegia
- What should be the evaluation?

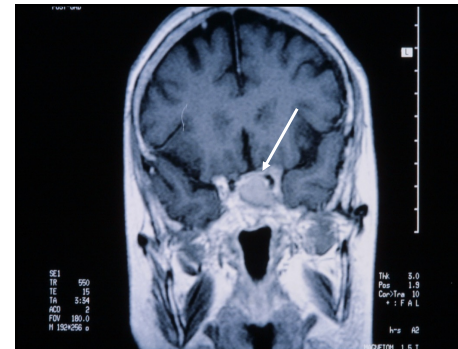


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## Life threatening diagnosis?



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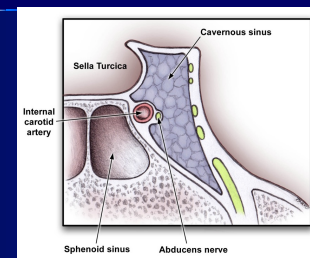
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## Yes, DKA is book answer but don't procrastinate on seeing ophthalmoplegia if...

- Acute painful ophthalmoplegia
- The ICU or post-surgical cases
- Cancer patients on chemotherapy
- Long term immunosuppression or corticosteroid use
- Chronic renal dialysis
- Chronic antibiotic treatment
- Bone marrow or organ transplant

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## Cavernous sinus lives close to other structures



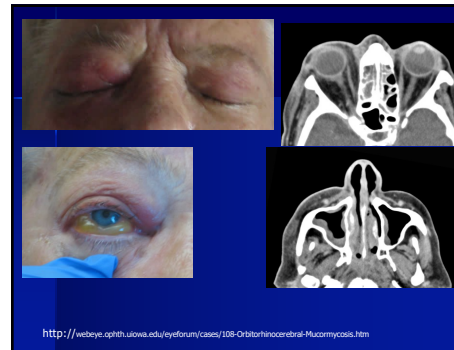
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### Case from Iowa

- 76-year-old woman with acute myelogenous leukemia (AML)
- Induction chemotherapy (day 13)
- Two day history of worsening right-sided periorbital swelling & erythema

<http://webeye.ophth.uiowa.edu/eyeforum/cases/108-Orbitorhinocerebral-Mucormycosis.htm>

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<http://webeye.ophth.uiowa.edu/eyeforum/cases/108-Orbitorhinocerebral-Mucormycosis.htm>

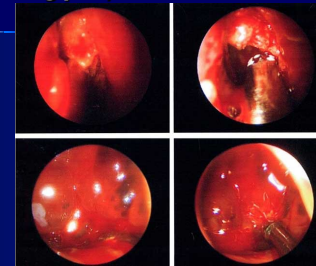
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### Is this orbital inflammatory pseudotumor? Tolosa Hunt?

- Wicked good pearl: Don't give patients who are immunosuppressed the diagnosis of autoimmune disease!

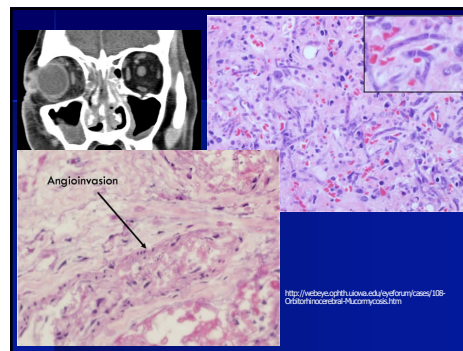
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### Intraoperative endoscopic photos showing pale, necrotic tissue



<http://webeye.ophth.uiowa.edu/eyeforum/cases/108-Orbitorhinocerebral-Mucormycosis.htm>

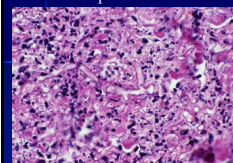
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<http://webeye.ophth.uiowa.edu/eyeforum/cases/108-Orbitorhinocerebral-Mucormycosis.htm>

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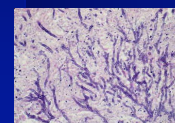
From: <http://medic.med.uth.tmc.edu/edprog/Path/InfDis.htm>



Mucor



Does not have to show black eschar



Can be Aspergillus too!

80

Which of the following is the most likely cause of an acute, painful, orbital apex syndrome and sinusitis in a diabetic patient in diabetic ketoacidosis?

- A. Posterior communicating artery aneurysm
- B. Carotid artery dissection
- C. Pituitary apoplexy
- D. Mucormycosis

Answer D

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### How could a fungal orbital apex lesion be missed on MRI?

- Need contrast to see enhancement
- Fungi are dark on MRI
- No fat suppression can miss lesion
- Super-dangerous because tempting to give steroids to...
  - Presumed retrobulbar optic neuritis
  - Presumed Tolosa Hunt syndrome

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### Which of the following is the first line imaging to evaluate Mucor?

- A) CT orbit
- B) MR head
- C) MRA
- D) CTA

Answer A

83

Which of the following is most likely to occur in an immunocompromised host?

- A. Giant cell arteritis
- B. Carotid artery dissection
- C. Pituitary apoplexy
- D. Mucormycosis

Answer D

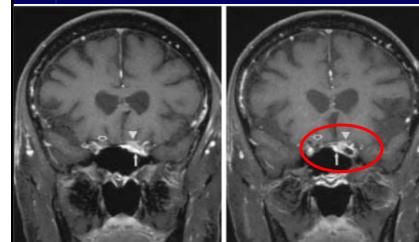
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And the MRI of head was normal.....

■ WHY?

85

YOU NEED CONTRAST.  
DISTINCTIVE SIGN = SINUS ENHANCEMENT!

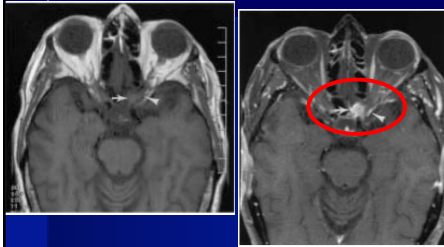


<http://www.mayoclinicproceedings.com/inside.asp?AID=230&UID=>

86



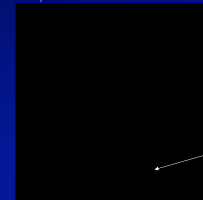
### Aspergillosis of orbital apex



<http://www.mayoclinicproceedings.com/inside.asp?AID=230&UID=>

87

### What happens if you don't give contrast?....

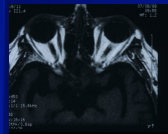


My house at NIGHT!!!

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### What is Fat suppression ("fat-sat")? technique

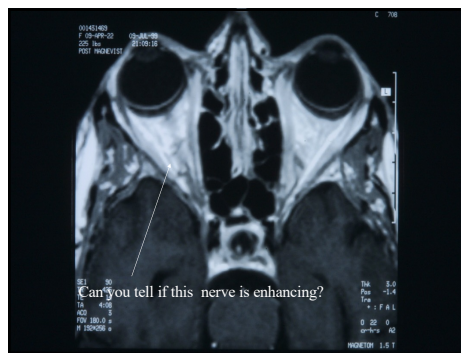
- T1 weighted signal
- Increase contrast (light and dark) between structures
- Fat is "too bright" on T1



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90



91

### And the MRI of head was normal.....

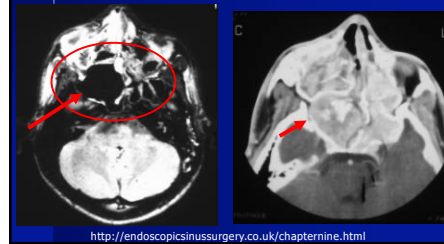
■ WHY?

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### Polar bear in a snowstorm

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### Complementary roles for CT & MR in fungal orbital apex disease (T2 dark)



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### What's wrong with this picture?

- 60 y/o diabetic man
- New onset ptosis right
- Right adduction, elevation, & depression deficit
- 45 exotropia (XT)
- Diagnosis: "Ischemic third nerve palsy"
- Plan: "Return 6 weeks"



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### Tell your technicians....

- If the patient's complaint is diplopia or ptosis or....
- If you have to lift a ptotic lid to put in the dilating drops then....
- STOP, come get the doctor before dilating



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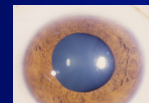
### Acute pupil involved third n. palsy Life threatening diagnosis?



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### Rule of the pupil

- A pupil involved third nerve palsy
- Aneurysm of posterior communicating artery until proven otherwise



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Which of the following is the life threatening cause of an acute painful third nerve palsy?

- A) Aneurysm
- B) Adenoma
- C) Allergic aspergillosis
- D) Amyloid

Answer A

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And the MRI of head was normal.....

■ WHY?

100

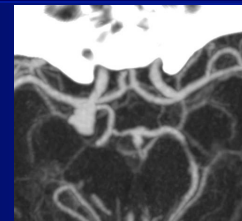
Which of the following is the most likely cause of an acute, painful, pupil involved third nerve palsy?

- A. Posterior communicating artery aneurysm
- B. Carotid artery dissection
- C. Pituitary apoplexy
- D. Giant cell arteritis

E. Answer A

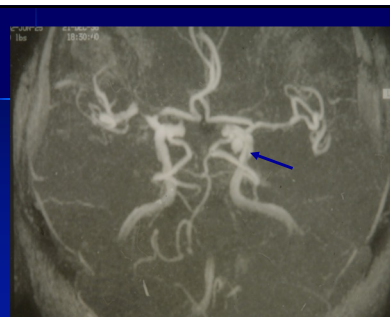
101

CTA: R posterior communicating a. aneurysm



<http://www.cedars-sinai.edu>

102



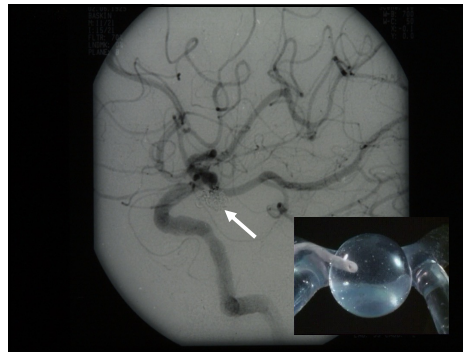
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A 65 yo WF presents with acute, painful, pupil involved third nerve palsy. A noncontrast CT head was normal. Which of the following is the next most appropriate imaging study?

- A. CT orbit
- B. CT head with contrast
- C. CT angiography (CTA)
- D. MRI head with contrast

Answer C

104

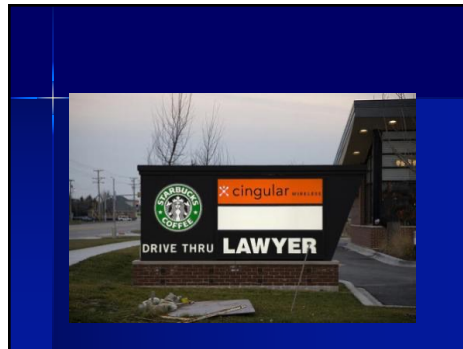


105

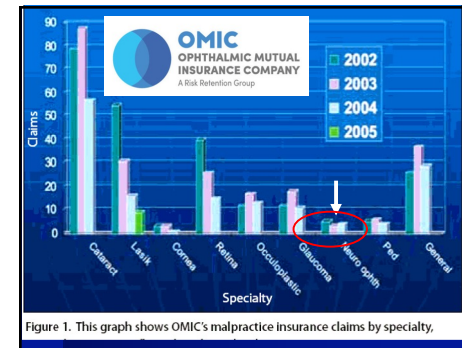
### Choice of imaging strategy in third nerve palsy

- CT/CTA first to look for SAH/aneurysm in pupil involved third nerve palsy
- MRI/MRA first to look for non-aneurysmal etiologies or do MRI second if CTA negative first
- Catheter angiography if MRI/MRA and CTA not of sufficient quality or insufficient confidence level to rule out aneurysm

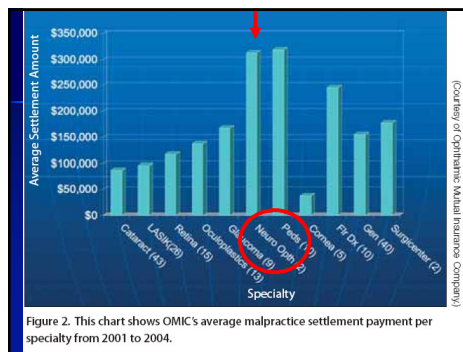
106



107



108



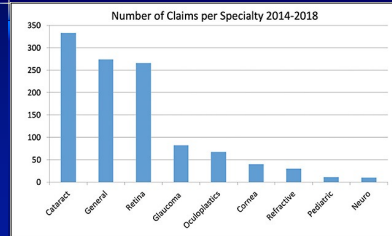
109

### As if death weren't enough....

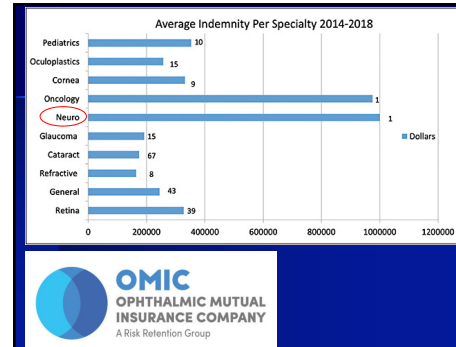


110

### Neuro-Op claims are low by quantity...(OMIC)



111



112

### Acute painful anisocoria after car accident



113

Which of the following is most likely to occur after trauma?

- A. Giant cell arteritis
- B. Carotid artery dissection
- C. Pituitary apoplexy
- D. Mucormycosis

Answer B

114

### Life threatening diagnosis?



115

Which of the following is the most likely cause of an acute, painful, Horner syndrome?

- A. Posterior communicating artery aneurysm
- B. Carotid artery dissection
- C. Pituitary apoplexy
- D. Giant cell arteritis

Answer B

116



## Horner syndrome

- Wicked good pearl: In acute setting just image sympathetic axis for Horner syndrome

117

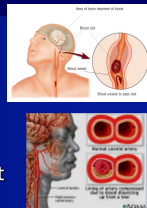
And the MRI of head was normal.....

■ WHY?

118

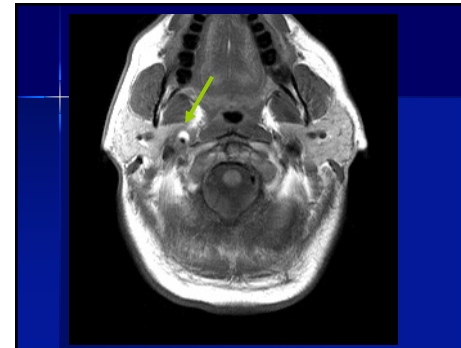
## Carotid dissection

- History of trauma
- Neck pain
- Ipsilateral Horner syndrome
- Transient visual loss
- Branch or central retinal artery occlusion
- Don't waste time localizing...just image (drops not available anyway)



www.nlm.nih.gov

119



120



121

## Amaurosis fugax

- 70 year old woman judge
- Curtain over vision RE x 10" resolved
- Normal eye exam
- Dx: "ocular migraine"



122

Which of the following is the most likely to produce acute, transient, unilateral loss of vision?

- A. Posterior communicating artery aneurysm
- B. Carotid artery dissection
- C. Pituitary apoplexy
- D. Mucormycosis

Answer B

123

Which of the following is the most likely to produce acute, transient, unilateral loss of vision after motor vehicle accident?

- A. Posterior communicating artery aneurysm
- B. Carotid artery dissection
- C. Pituitary apoplexy
- D. Mucormycosis

Answer B

124

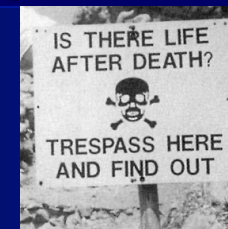
Which of the following is the most likely to produce painful, acute, transient, unilateral loss of vision in elderly patient?

- A. Posterior communicating artery aneurysm
- B. Giant cell arteritis
- C. Pituitary apoplexy
- D. Mucormycosis

Answer B

125

**Life threatening diagnosis?**



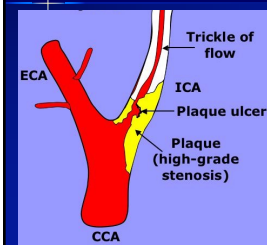
126

**And the MRI of head was normal.....**

**WHY?**

127

**High grade stenosis ICA**



128

### Vertebral dissection & top of the basilar syndrome

- Acute onset homonymous hemianopsia
- Acute onset bilateral progressive ophthalmoplegia
- Initial structural MRI may be normal but DWI might show evolving acute infarct
- May be spontaneous dissection: no trauma
- Dissection can propagate or embolize

129

### Which of the following is the most likely cause of an acute homonymous hemianopsia and neck pain after MVA?

- A. Vertebral artery dissection
  - B. Posterior communicating aneurysm
  - C. Mucormycosis
  - D. Pituitary apoplexy
- Answer A

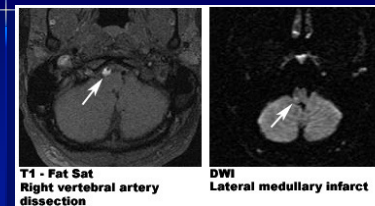
130

### Which of the following is the most likely cause of an acute bilateral ophthalmoplegia and neck pain after MVA?

- A. Vertebral artery dissection
  - B. Posterior communicating aneurysm
  - C. Mucormycosis
  - D. Pituitary apoplexy
- Answer A

131

### Vertebral artery dissection



WWW.Uwo.ca

132

### Summary

- List five potentially life threatening diagnosis in neuro-op
- Define "rule of the pupil"
- Define best imaging study for the 5 dx
- Show key clinical or radiographic features for the above 5 dx

133

### Take home lessons: What does your "list" look like?

1. Acute HA in elderly with visual loss: Arteritis
2. Acute orbital apex syndrome in DM: Abscess
3. Acute painful anisocoria (big pupil): Aneurysm or (small pupil: Horner syndrome) Arterial dissection
4. Acute painful bitemporal: Apoplexy
5. Acute painful homonymous: Arterial dissection

134

## Bottom line: Its your job



135

## Thanks for your time & attention

- Andrew G. Lee, MD
- Chair Ophthalmology, **Houston Methodist Hospital**, Professor of Ophthalmology, Neurology, & Neurosurgery, **Weill Cornell Medical College**; Adjunct Professor: **Baylor College of Medicine**, **U. Iowa** & Clinical Professor, **UTMB Galveston**, **UT MD Anderson Cancer Center**, **U. Buffalo**, **SUNY**



136

End with a philosophical question & two really quick cases  
Why are you here... because you believe as we all do that you can....?



137

On July 20, 1969, I was 5 years old,  
the moon landing was on tv....



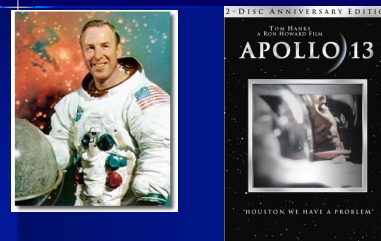
138

"Houston" was the first  
word spoken from the moon



139

April 1970:  
"Houston, we've had a problem"—Jim Lovell



140

### Jim Lovell



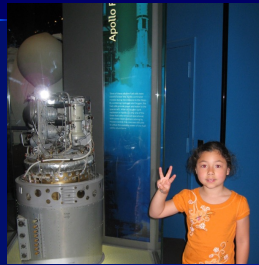
141

### Half the spacecraft panel lost



142

### Apollo fuel cell



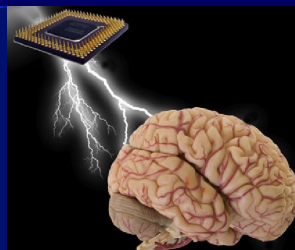
143

### Most of the computing power was human brains at NASA



144

### It was human brain power that brought Apollo 13 home....



145

*Today I get to fulfill my childhood dreams & work with real rocket scientists at NASA JSC Houston*



146





147

## Churchill Downs (Kentucky Derby)



148

## United flight 232



- United flight 232 Denver to Chicago
- July 19, 1989
- Captain Al Haynes: 30,000 hour pilot
- First Officer Records & Engineer Dvorak
- Eight flight attendants
- 285 passengers on board DC-10



149

## Uh Oh



- Somewhere over Iowa
- Fan broke apart, lost #2 engine
- No hydraulics
- Plane can not fly without hydraulics
- Sioux City had an open runway
- Capt. Haynes kept his cool
- Capt. Haynes formed a team

150

## Team building

Passenger on board: Dennis Fitch, a United training & check pilot  
3,000 hours on DC-10

---

They could only turn right

---

They had no controls

---

They used the engine thrust to steer

---

This had been done once before in Japan (Fitch had studied it)

151

## Capt Fitch meet Capt Haynes

- Transcript of meeting of Captains in cockpit
- Haynes: "My name's Al Haynes"
- Fitch: "Hi, Al. Denny Fitch"
- Haynes: "How do you do, Denny?"
- Fitch: "I'll tell you what. We'll have a beer when this is all done"
- Haynes: "Well, I don't drink, but I'll sure as hell have one."

152

## Transcript for the approach

- Sioux City Approach:  
United two thirty-two  
... You're cleared to  
land on any runway..
- Haynes: [Laughter]  
Roger. [Laughter] You  
want to be particular  
and make it a runway,  
huh?



153

## Initially pointed to Des Moines then Sioux City, Iowa



154

## The plane crash landed but landed

- 111 died
- But 185 survived
- Including Captain Haynes



155

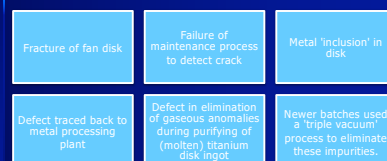
## After the accident...

- 57 flight crews could not replicate the  
landing in the simulator



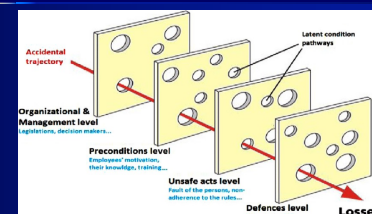
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## Root cause analysis



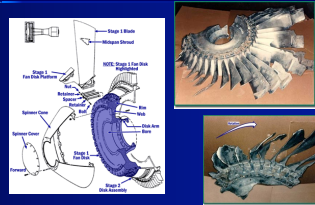
157

## Reason Swiss cheese model



158

## The fan failed



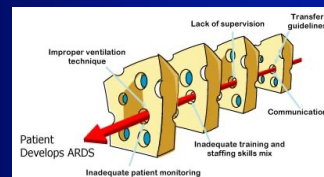
159

## Fan reconstructed



160

## Reason's Swiss cheese



161

## The rest of the story: United 232...why are we doing this?



163

## Mike Matz was on United 232 in 1989

- He pulled three young children and a baby from the wreckage (ages 14, 12, 9—unaccompanied minors)
- He stayed & played cards with the kids at the Sioux City airport, keeping them calm
- He tracked down children's grandmother to tell her they were safe

164

## Mike Matz is a horse trainer

- 132<sup>nd</sup> Kentucky Derby
- Barbaro was winner of the Derby 2006
- Mike was the trainer



165

## In the Grandstand at the Kentucky Derby...

- Two brothers & their sister were in grandstand at Churchill Downs cheering just a little bit louder (thanks to Captain Haynes & Mike & SBP)

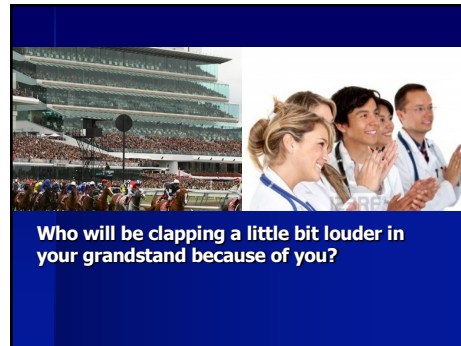


166

## Sadly, there was no Triple Crown for Barbaro who broke his leg at the Preakness 2006 and was euthanized



167



Who will be clapping a little bit louder in your grandstand because of you?

168

## Churchill Downs: Barbaro



169

ONE PERSON  
CAN MAKE A  
DIFFERENCE,  
AND EVERYONE  
SHOULD TRY

-JOHN F. KENNEDY-

170

## Thanks for your time & attention

- Andrew G. Lee, MD
- Chair Ophthalmology, Houston Methodist Hospital, Professor of Ophthalmology, Neurology, & Neurosurgery, Weill Cornell Medical College; Adjunct Professor: Baylor College of Medicine, U. Iowa & Clinical Professor, UTMB Galveston, UT MD Anderson Cancer Center, U. Buffalo, SUNY



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## References

- **Emergencies in Neuro-Ophthalmology: A Case Based Approach 1st Edition** by [Andrew G. Lee, Paul W. Brazis, Mansoor Mughal](#), 2010.
- **Big red flags in neuro-ophthalmology.** Jeanie D. Ling, Diana Chao, Nagham AlZubidi, Andrew G. Lee. CJO. Jan 2013.

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