Visual Field Rules, Exceptions, and Exceptions to the Rules

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...= how not to miss the brain tumor

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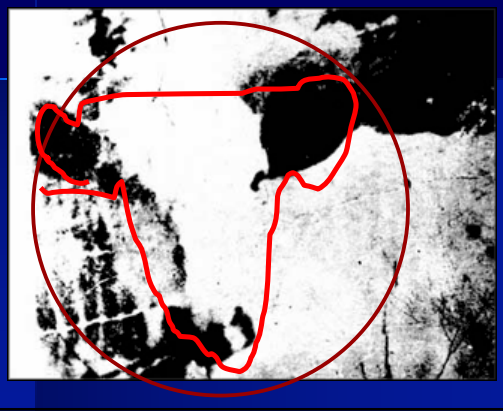
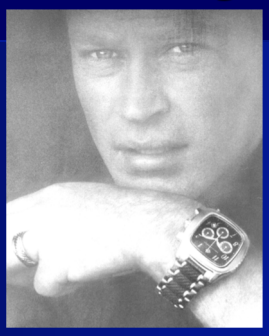
Andrew Lee, MD
I have no financial interest in the contents of this talk

I serve as a consultant for:

- NFL
- NASA
- US Department of Justice
- AstraZeneca
- Bristol Myers Squibb
- Horizon (speaker)
- All relevant financial relationships have been mitigated

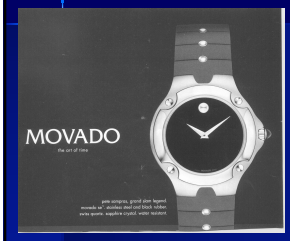


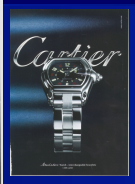
Pattern recognition



Pattern recognition

Is the pattern emerging?





It is easy now….

Five rules of visual fields

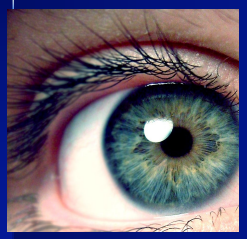
1. VF defect in one eye = Ipsilateral (beware junction)
2. Bitemporal hemianopsia = chiasm
3. Up is up & down is down (except LGN)
4. Homonymous hemianopsia (contralateral retrochiasmal, look for RAPD, band atrophy)
5. Occipital VF: Congruous = more posterior (incongruous = more anterior), macular sparing, temporal crescent

Five tips to NOT miss the brain tumor field!….

1. Always test the visual field in both eyes
2. Book fields do NOT look like real world fields (publication bias)
3. Unreliable visual field = You have no field (confrontation visual field still useful)
4. It can always be a suprasellar lesion
5. Patients can have "ticks and fleas" (don't stop just because you found something)

In July 1978: I wanted to be a doctor…
2nd NASA
3rd choice: Jedi knight


It turns out the Force is real




The Jedi superpower: NeuroOp

The reaper is coming….

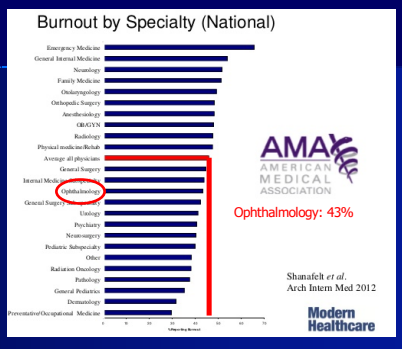
For your patient's eyes
For your patient's life

He is coming for you too…
For your very soul….

Every day we battle the reaper….your superpower is keeping him at bay

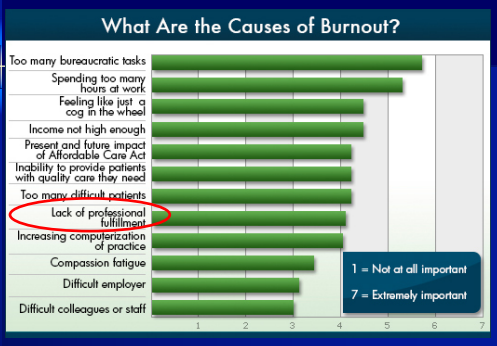
The reaper goes by many names….

He comes in many forms & one of his names is physician "burnout"



Maslach Burnout Inventory

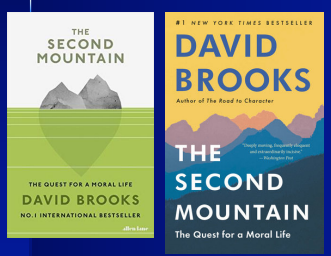
- Emotional exhaustion (EE) – feelings of being emotionally overextended by one's work; no longer able to give of themselves at a psychological level
- Depersonalization (DP) – unfeeling and impersonal response toward recipients of one's service, care, treatment, or instruction; negative, cynical attitudes and feelings about one's clients; dehumanizing perception of others that can result in viewing clients as somehow deserving of their troubles
- Personal accomplishment (PA) – feelings of competence and successful achievement in one's work with people



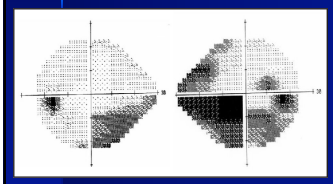
The reaper is coming and his name is Burnout

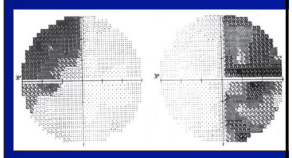
Your dream is my dream….making a difference…enabling your dream is my dream

Climbing your second mountain



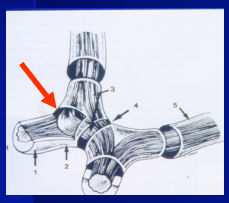
Who has a brain tumor?

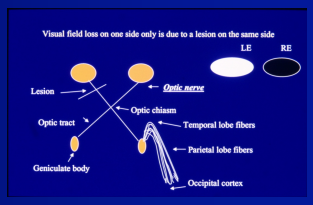




Tip #1

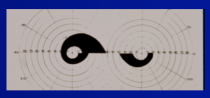
- Visual field defects affecting one retina or one optic nerve produce ipsilateral field loss
- Exception: so called "Willbrand's knee"

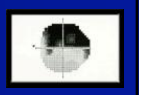


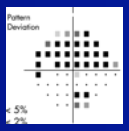


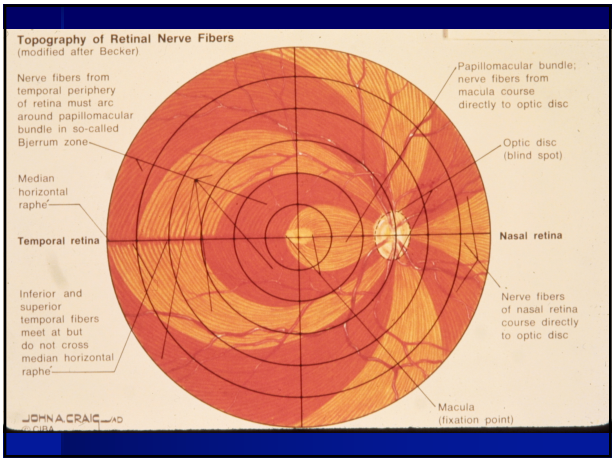
Retinal nerve fiber layer defects

- Arcuate
- Seidel
- Altitudinal





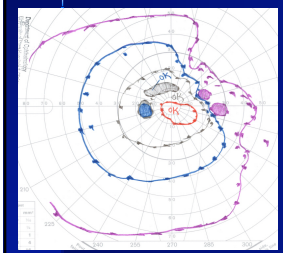


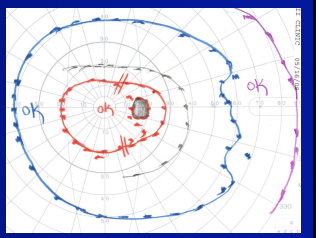


How not to miss the dx

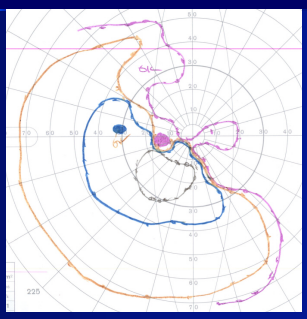
- 65 y/o female x 2 months after CE/IOL
- Radial keratotomy 15 years ago OU
- Cataract extraction/IOL OD: 5-07
- CE/IOL OS 7-07
- Gray curtain in my vision OS
- 20/20 OU
- 10 visits over one year: no diagnosis

Goldmann visual fields over time progressing

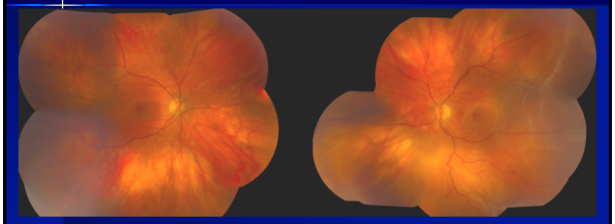


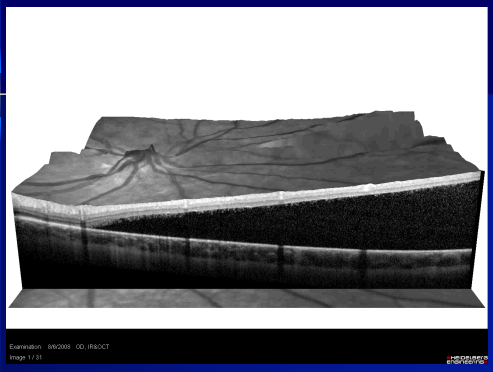


Visual field getting worse

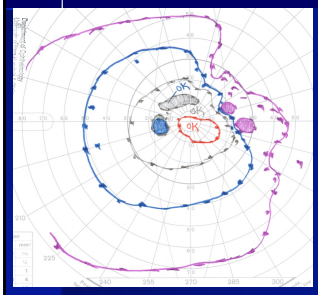


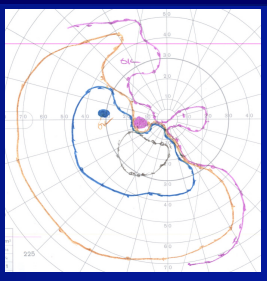
Optic nerve looked normal



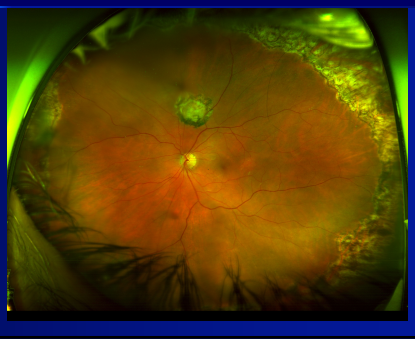


Serial GVF documentation of retinal detachment!



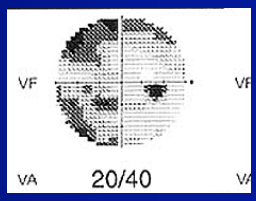


Ultrawide field imaging



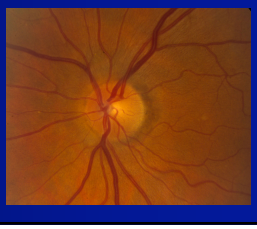
20 yo WF with acute onset unilateral loss of vision RE

- Pain with eye movement
- Right RAPD
- 20/40 OD
- Normal fundus



Optic neuritis (retrobulbar)

- "The doctor sees nothing, the patient sees nothing."



But what if we change the stem?

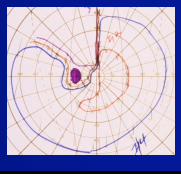
- 50 yo WM rather than 20 yo WF
- Acute awareness of visual loss
- Progression
- Bilateral rather than unilateral
- Pale rather than normal optic nerve

How you could miss the tumor….

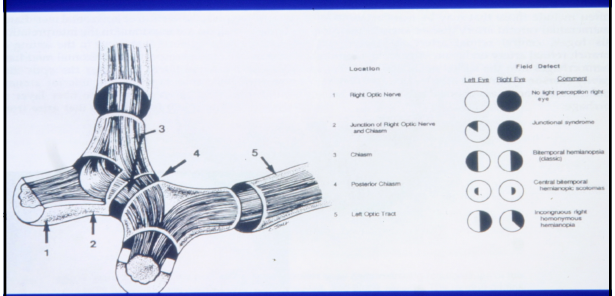
- 25 year old white female
- Acute onset loss of vision OD
- Pain (severe) ? Worse with eye movement
- Hand motions OD
- 20/20 OS
- Right RAPD
- Normal fundus
- Dx = optic neuritis

Should be "optic neuritis"

- When should the imaging be done?
- What if it is Friday afternoon?
- Would the triage decision be different if this was the visual field defect in the fellow eye?

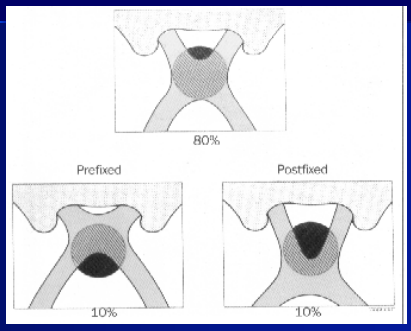


CHIASMAL SYNDROMES

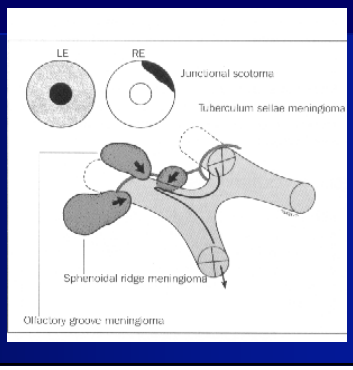


Hoyt & Luis. Arch Ophthalmol 70:69, 1963.

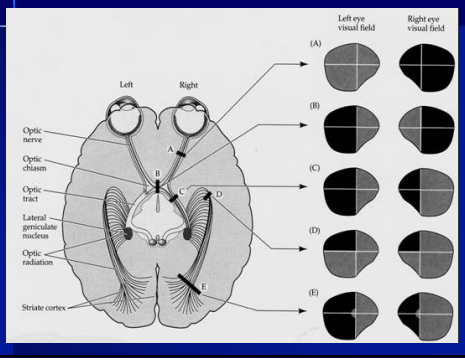
Chiasm



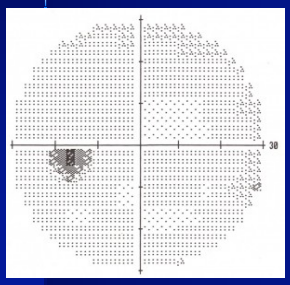
Junctional scotoma

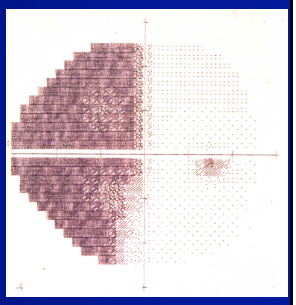


Book Visual field defects

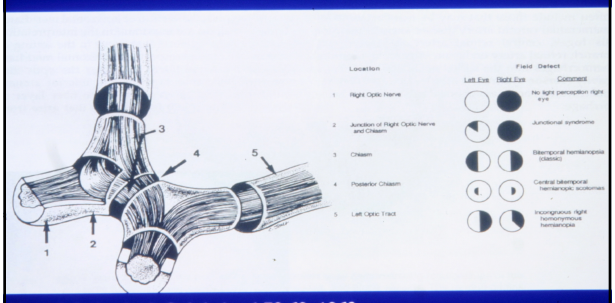


20 yo WF with acute unilateral visual loss OD but nasal monocular hemianopia and RAPD OD. OS WNL.



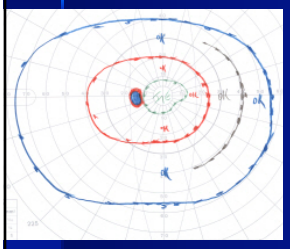


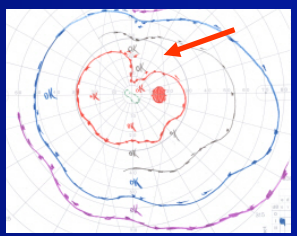
CHIASMAL SYNDROMES



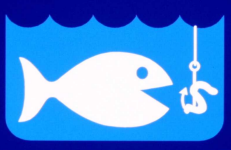
Hoyt & Luis. Arch Ophthalmol 70:69, 1963.

Junctional scotoma of Traquair



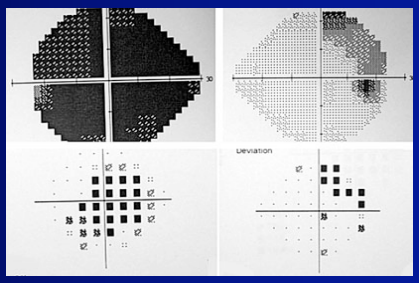


Remember to fish for the junctional scotoma in the fellow eye

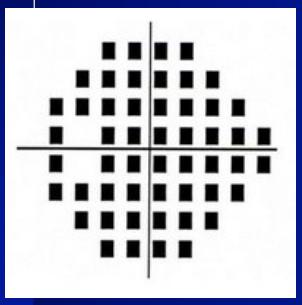


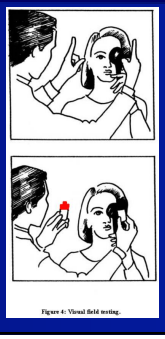
- If you don't test for it you won't find it!

Junctional scotoma (vs. monocular junctional scotoma of Traquair)

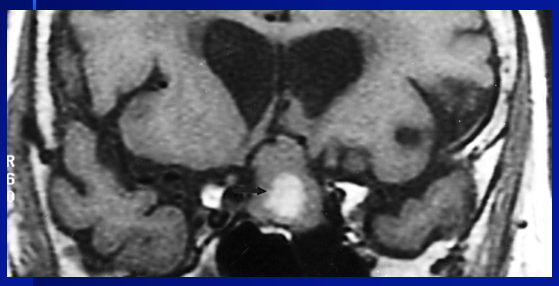


If the HVF is totally black you have no localizing info

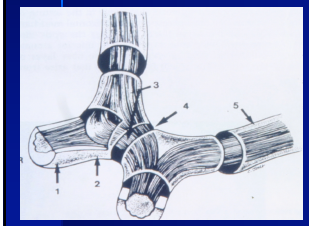


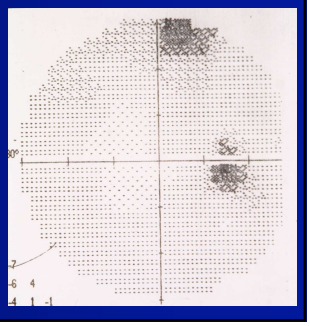


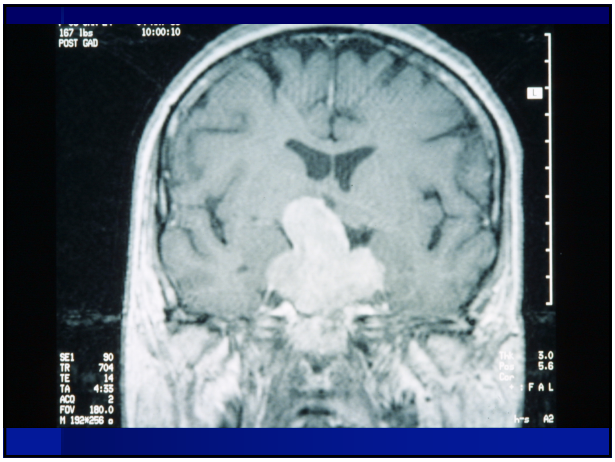
Beware pituitary apoplexy



At junction of optic nerve and chiasm. HM OS and 20/20 OD







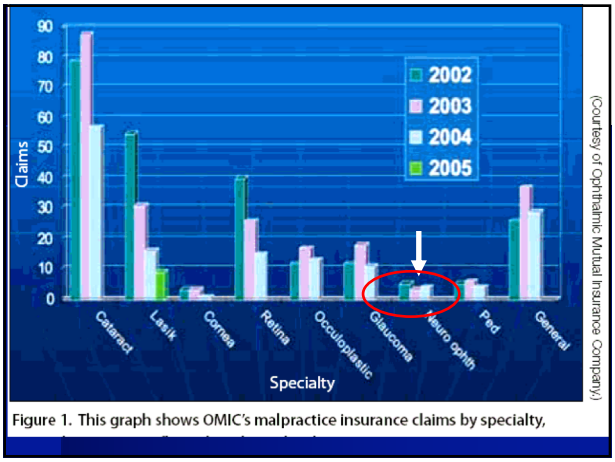


Figure 1. This graph shows OMIC's malpractice insurance claims by specialty,

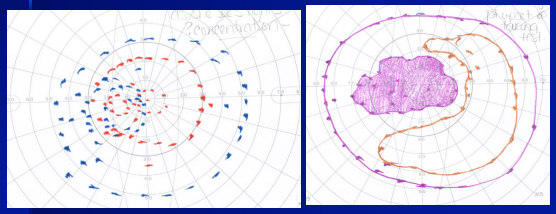
The big five causes of ophthalmic litigation

- Refractive/cataract surgery (missed endophthalmitis)
- Diabetic retinopathy
- Glaucoma
- Delayed diagnosis of brain tumor
- Retinal detachment

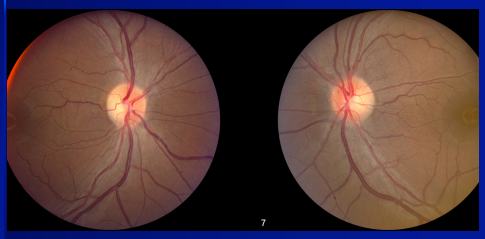
(Courtesy of Ophthalmic Mutual Insurance Company)

Figure 2. This chart shows OMIC's average malpractice settlement payment per specialty from 2001 to 2004.

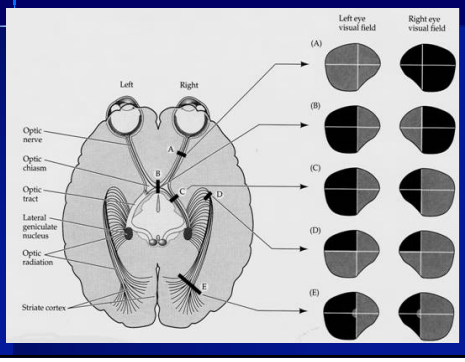
Bilateral visual loss, CF OU no RAPD, normal fundus OU



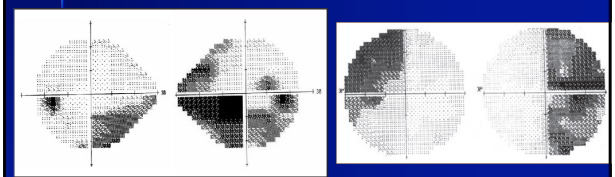
Normal fundus: Referred as a "squirrelly field"



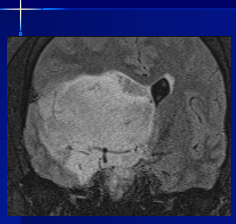
Book Visual field defects

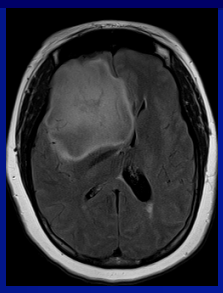


Who has a brain tumor?

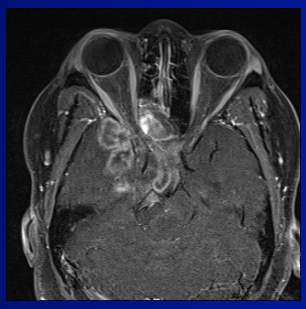


Who is the squirrel now?

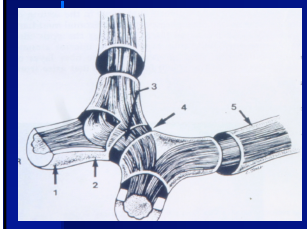


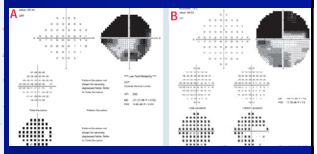


Bilateral optic neuropathy due to glioblastoma



You can have two "number 1" visual fields OU (bilateral)





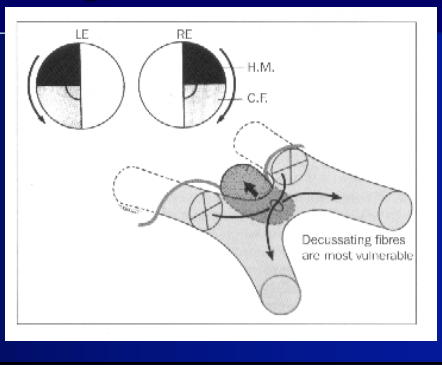
Tip 2: Up is up and down is down

- Superior fibers supply inferior visual field
- Lesion of superior visual pathway produces inferior field loss
- Exception: Lateral geniculate body

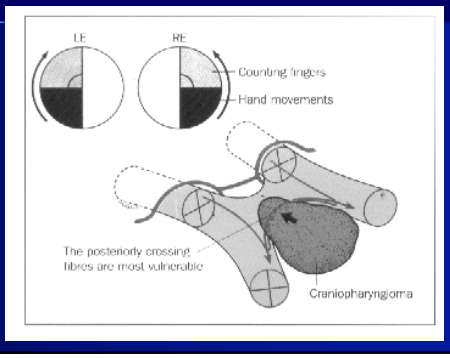
medstat.med.utah.edu

www.city.ac.uk

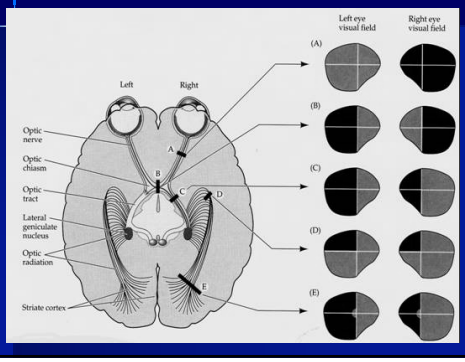
Crossing nasal fiber vulnerable

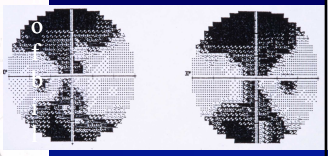


Compression from above

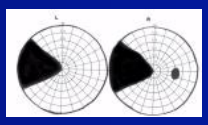


Book Visual field defects





AJO 1995:119:378-90.



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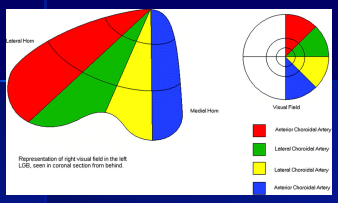
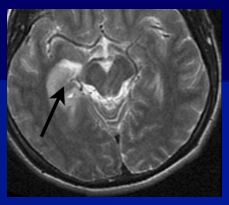
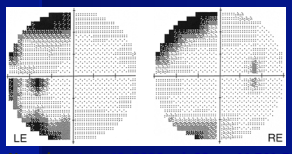
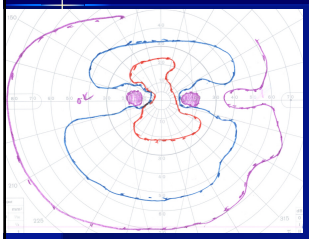


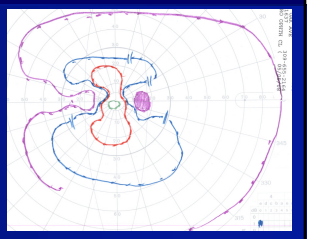


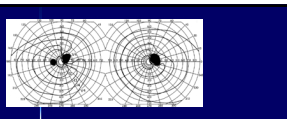


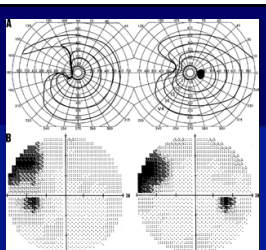
Neurology

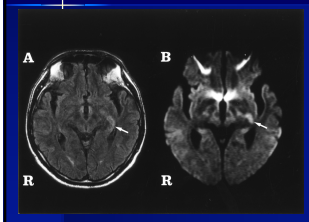
Goldmann visual field testing

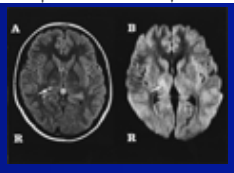






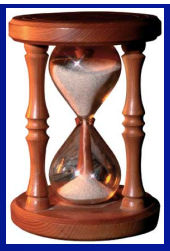






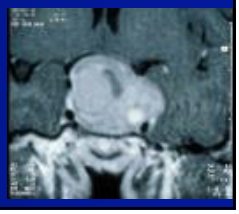
Neuro-Ophthalmology 2005;**29; 43 - 47**

Homonymous Hemianopia Due to Cerebral Infarction of the Lateral Geniculate Body

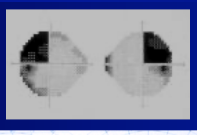


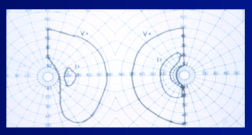
Tip 3: Bitemporal hemianopsia = chiasm

- Remember anterior chiasmal lesion can produce optic neuropathy
- Posterior chiasmal lesion can produce homonymous hemianopsia



Bitemporal hemianopsia





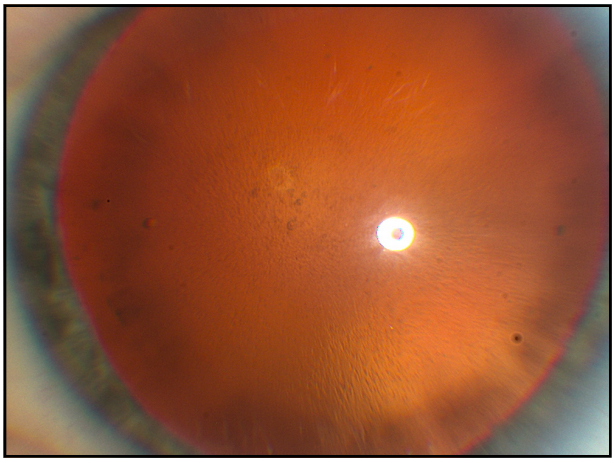
drjho.com/ pituitary_surgery

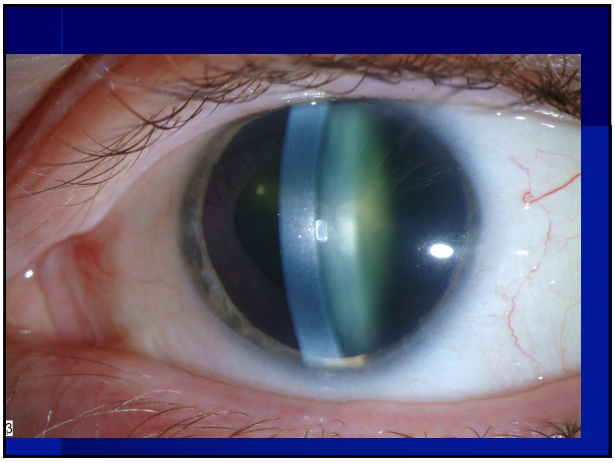
One caveat with book fields

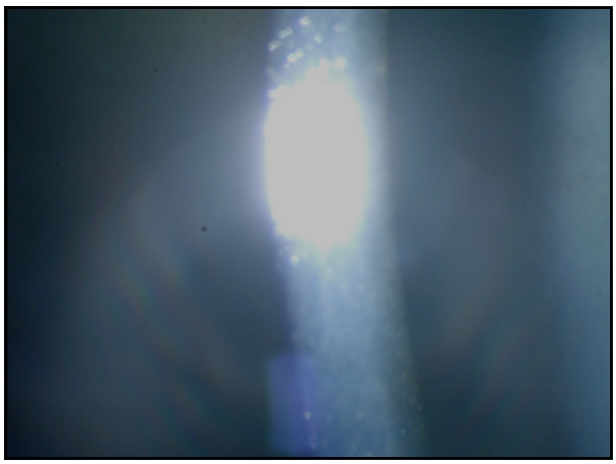
- Book fields do NOT look like REAL WORLD fields
- Book fields
  - Always best example
  - Always fully respect the vertical meridian
  - Only show one topographic location at a time (eg bitemporal hemianopsia)
  - Never drift across vertical
  - Always look like classic examples (otherwise they wouldn't be in the book!)

HPI

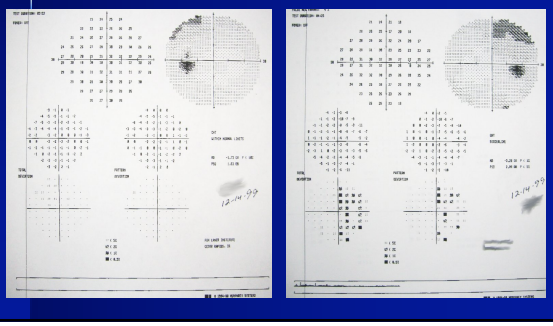
- 57 y/o WM
- Painless progressive loss of vision OU
- Multiple serial visual fields
- PERRLA each exam
- Multiple eye exams
- Dx: Fuchs and cataract OU

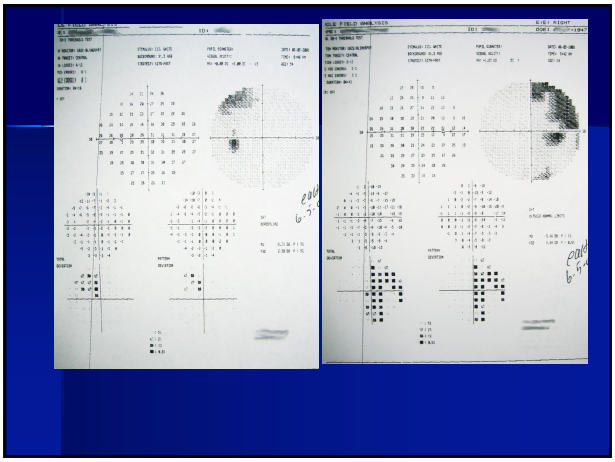




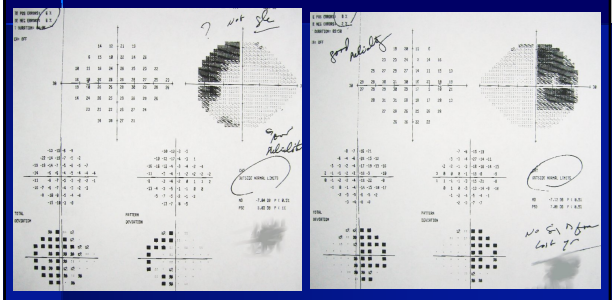


Beware temporal, superior, and hemianopic

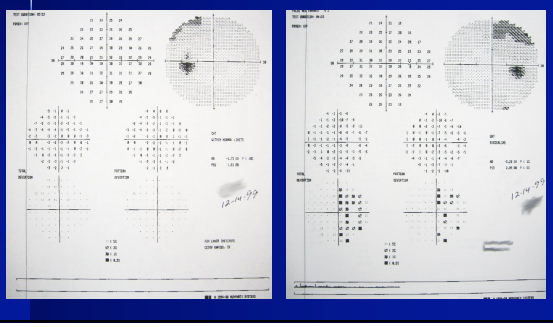




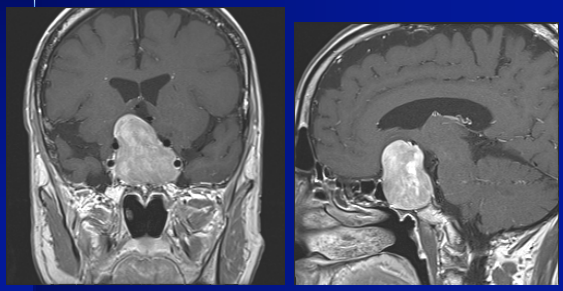
Don't write on your HVF



Beware temporal, superior, and hemianopic

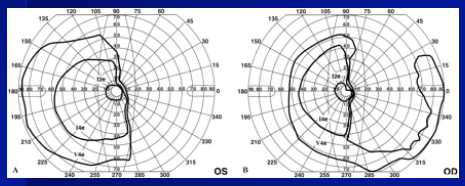


Yes, suprasellar but pointing to the right side



General Tip #4

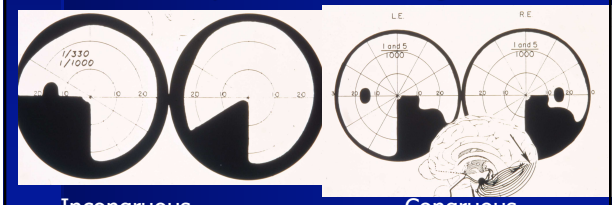
- Retrochiasmal lesions produce contralateral homonymous hemianopsia
- Exception: Monocular temporal crescent



Neurology 2001;57:1918-1921

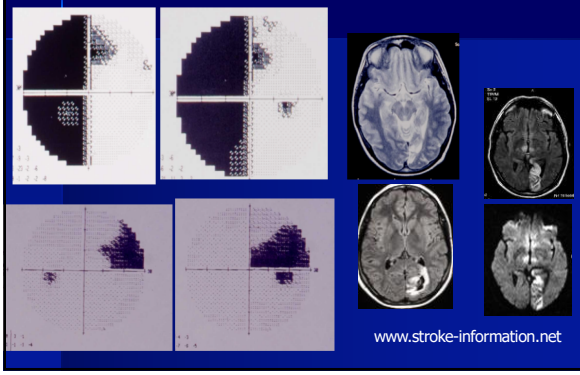
Tip #5: Congruity is more posterior

- The more anterior the retrochiasmal lesion the more incongruous homonymous hemianopsia
- The more posterior = more congruous



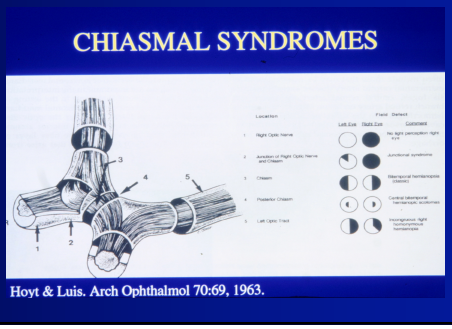
Incongruous Congruous

Congruity = more posterior= Think occipital



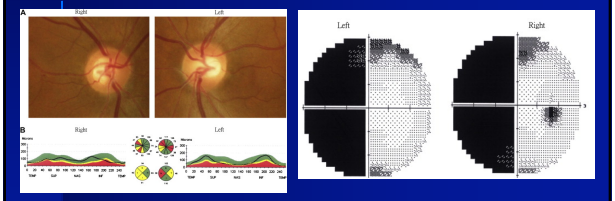
www.stroke-information.net

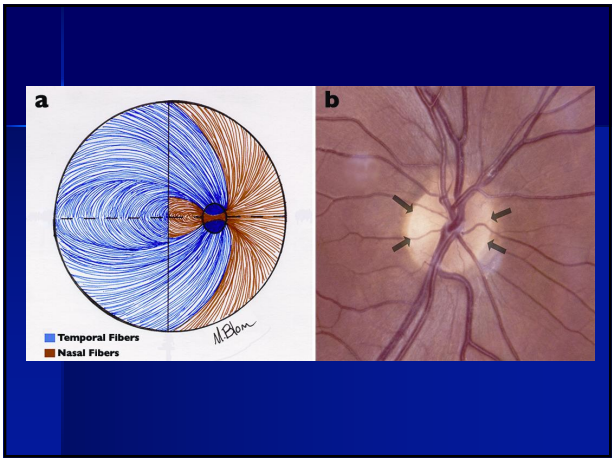
If you are behind chiasm you get a contralateral homonymous hemianopsia

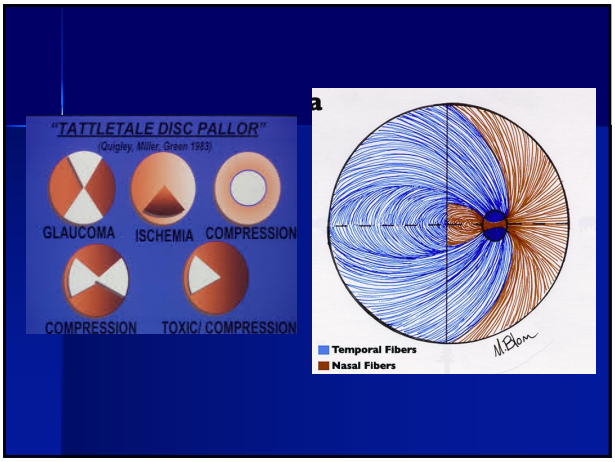


Hoyt & Luis. Arch Ophthalmol 70:69, 1963.

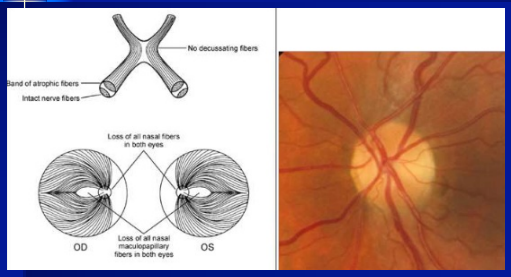
Look for RAPD and optic atrophy in optic tract lesions



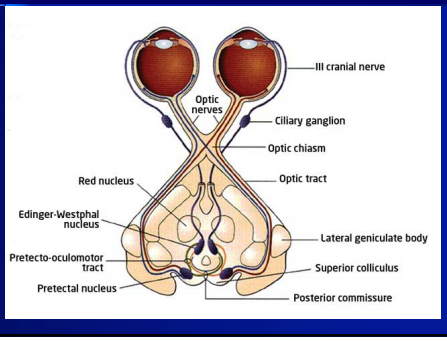




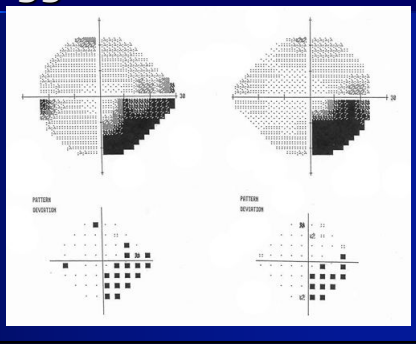
Band atrophy of optic nerve



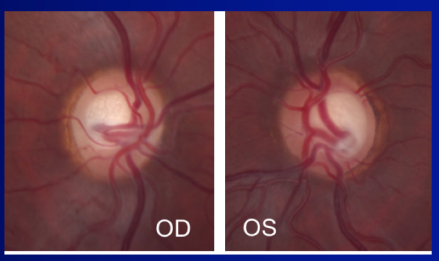
RAPD can be from optic tract lesion



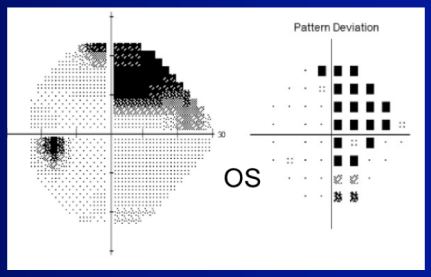
Temporal visual field is bigger NOT nasal HVF

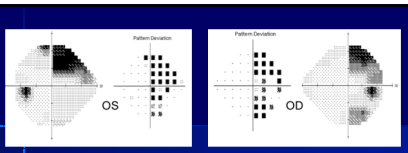


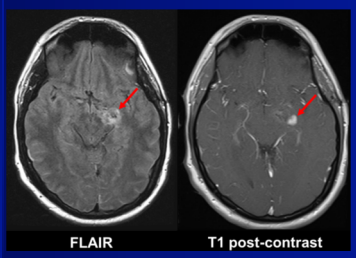
45 yo WF referred as "glaucoma suspect": IOP 22 mm Hg OU



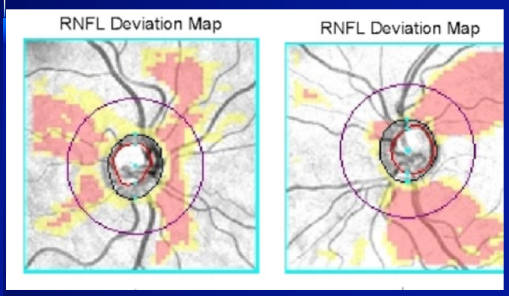
The most common cause of a nasal step/arcuate defect is glaucoma





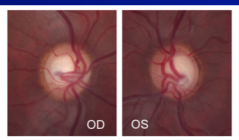


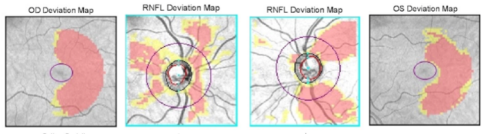
What about this RNFL deviation map?



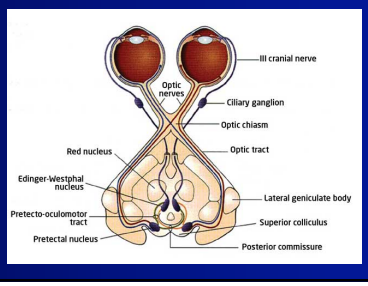
Left optic tract

Nasal and temporal optic disc "bow-tie" pallor corresponding to the nasal and temporal OCT RNFL loss OD

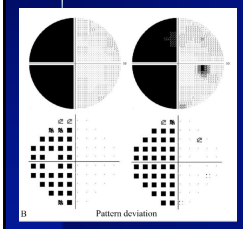


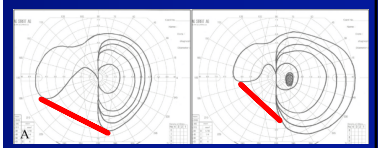


RAPD can be on either side in optic tract lesion

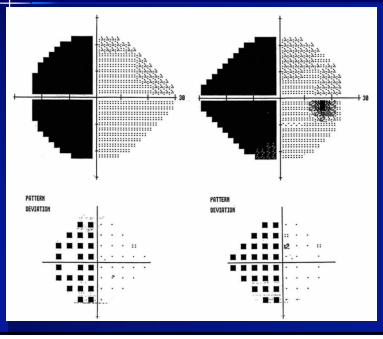


Eye (OS) has more (temporal field loss)

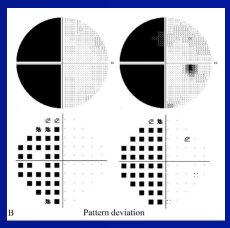




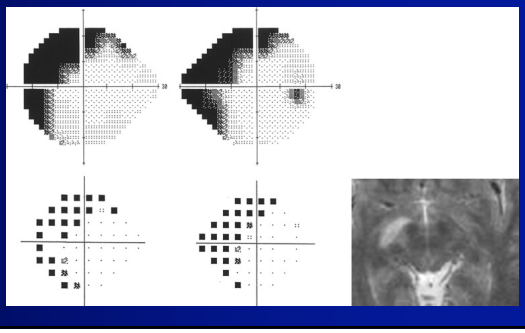
Which eye has more VF loss (OD or OS) on 24-2?



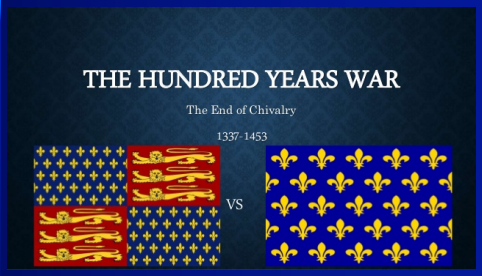
How many years long was the 30 years war?
How many degrees is a 30-2 HVF?



How many degrees is a 24-2 HVF?



How long did the 100 years war last? …116 years

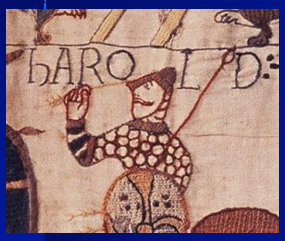


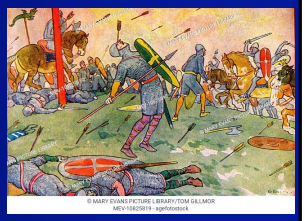
The real beginnings of the Hundred Years War: 271 years before….in 1066

King Edward the Confessor

William of Normandy

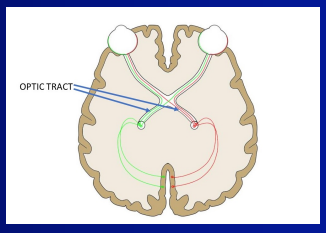
Harold was shot through the eye at the Battle of Hastings 1066



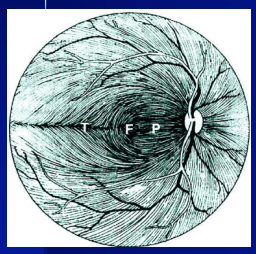


William the Conqueror

Optic tract



Nerve fiber layer defects



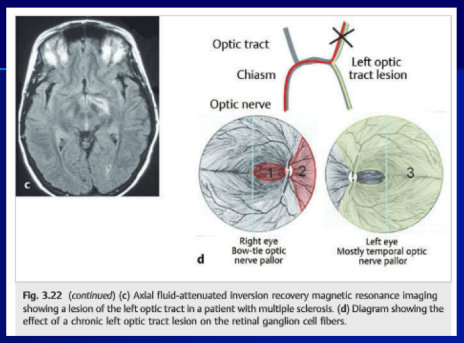
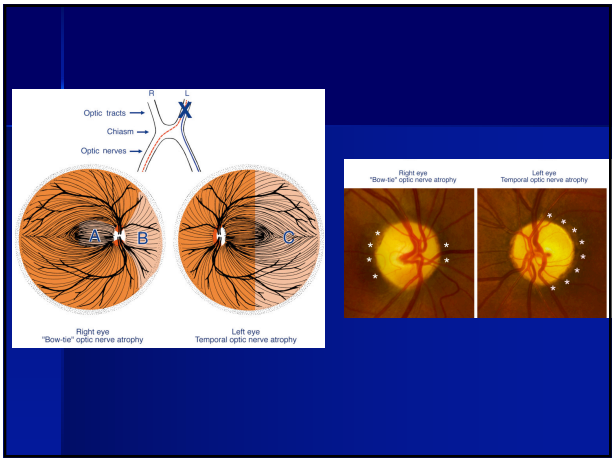
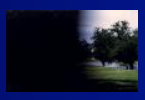
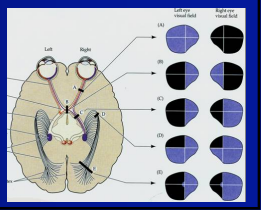


Fig. 3.22 (*continued*) (c) Axial fluid-attenuated inversion recovery magnetic resonance imaging showing a lesion of the left optic tract in a patient with multiple sclerosis. (d) Diagram showing the effect of a chronic left optic tract lesion on the retinal ganglion cell fibers.



Tip 6: Optic tract lesions

- Incongruous homonymous hemianopsia
- Contralateral band atrophy of optic nerve
- Contralateral afferent pupillary defect

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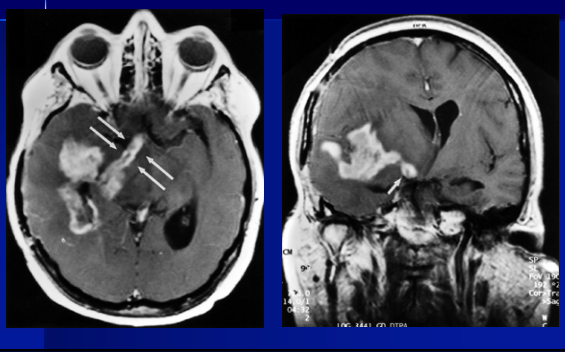
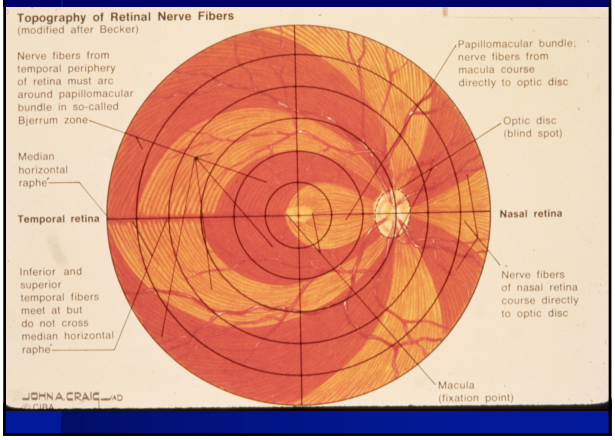
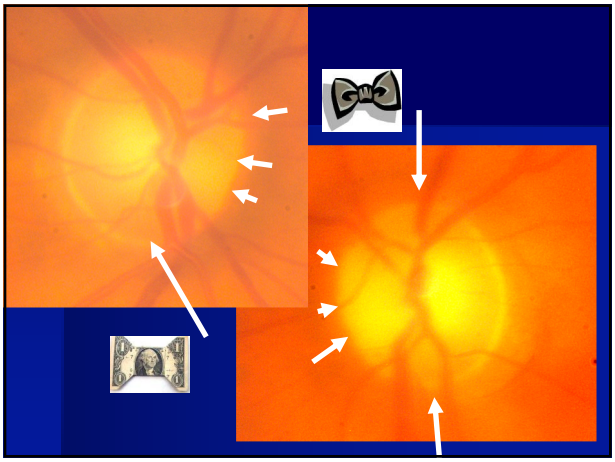
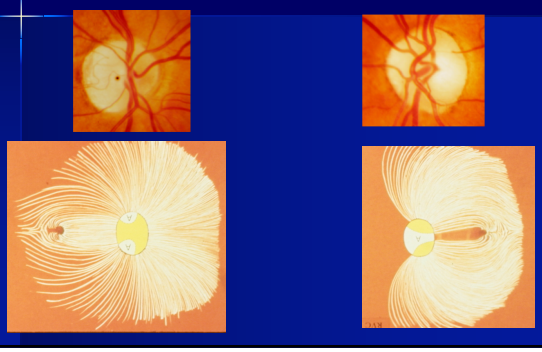
GBM: Optic tract syndrome

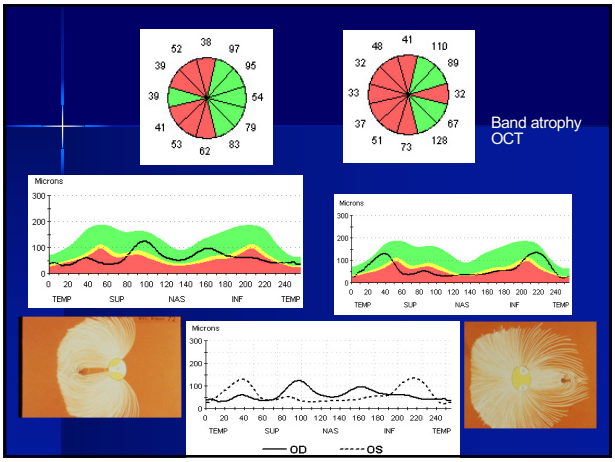


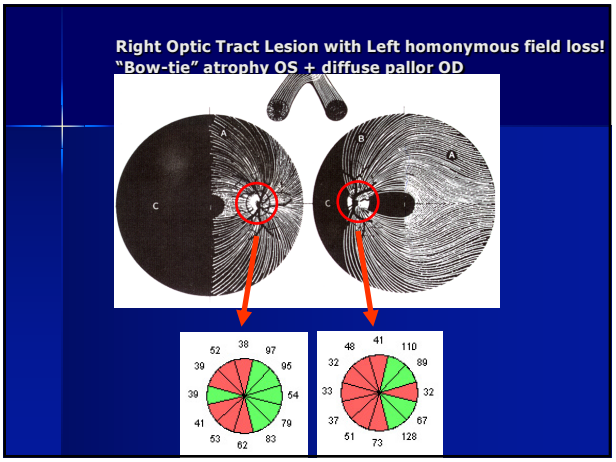




Band atrophy

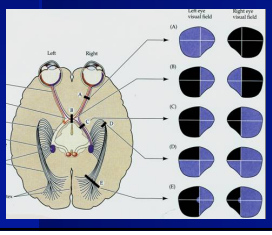


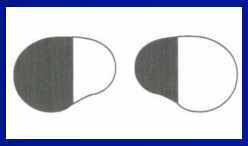


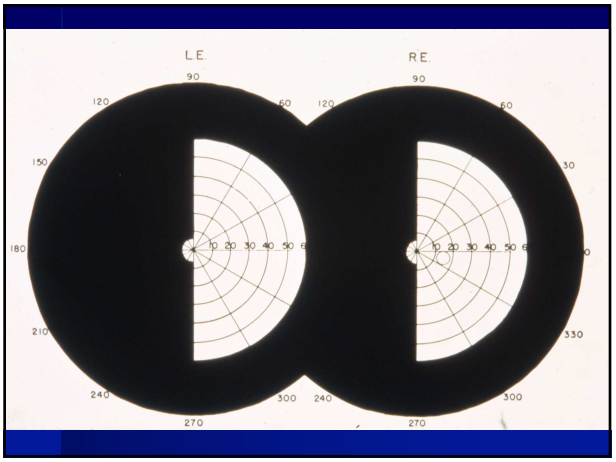


Tip #7

- A complete homonymous hemianopsia is only lateralizing (contralateral retrochiasmal pathway)
- Does not localize further

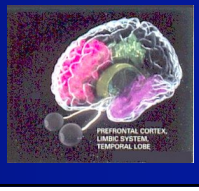


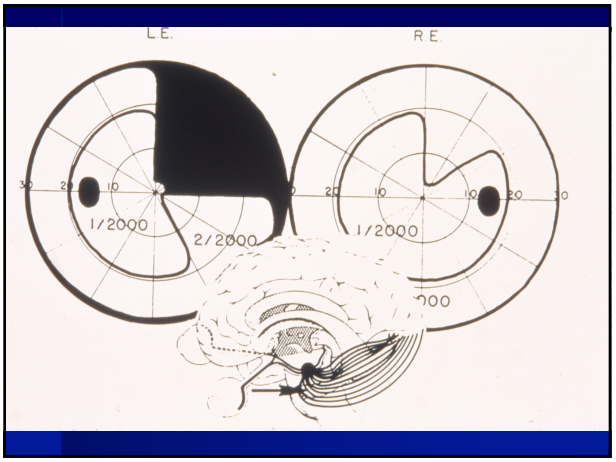


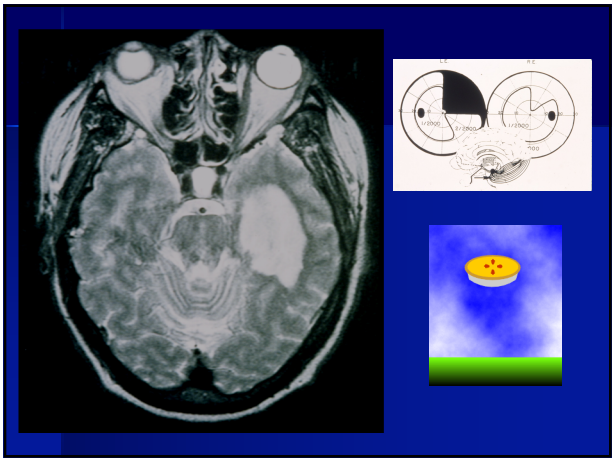


Tip 8: Temporal lobe lesion produces "pie in the sky"

- Temporal lobe
- Inferior radiations (Meyer's loop)
- Superior homonymous hemianopsia
- Tends to be incongruous

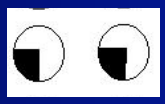


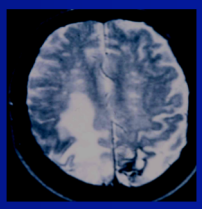


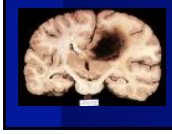


Tip 9: Parietal lesions produce "pie on the floor"

- Superior radiations
- Inferior visual field loss



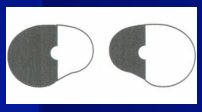


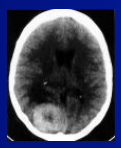


www.neuropat.dote.hu

Tip 10 Occipital lobe lesions

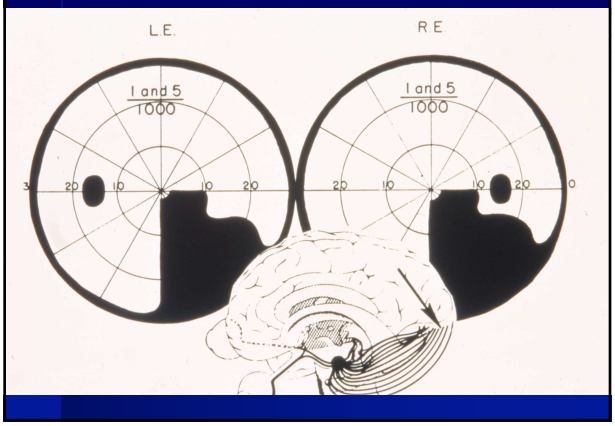
- Tend to be very congruous
- Tend to be macular sparing
- May spare or involve temporal crescent
- Tend to be neurologically isolated



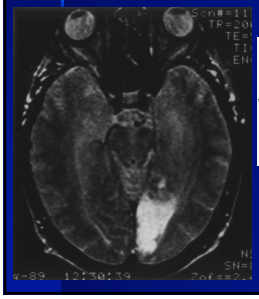


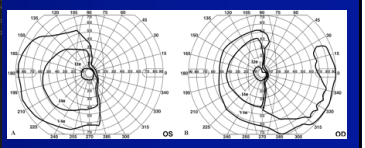
path.upmc.edu

medstat.med.utah.edu

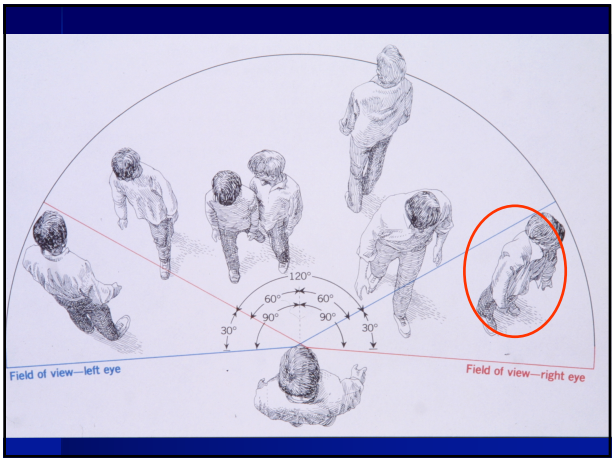


Temporal crescent

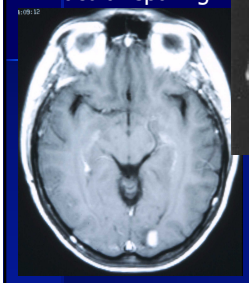


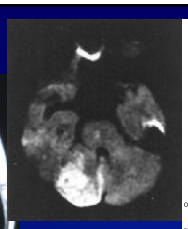


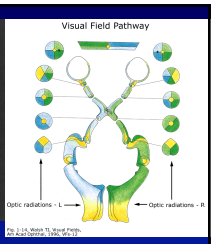
Neurology 2001;57:1918-1921



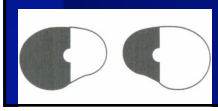
Macular sparing







Paracentral homonymous hemianopsia



Five pearls to NOT miss the brain tumor field!....

- Always test the visual field in both eyes
- Book fields do NOT look like real world fields (publication bias)
- Unreliable visual field = You have no field (confrontation visual field still useful)
- It can always be a suprasellar lesion
- Patients can have "ticks and fleas" (don't stop just because you found something)

Five rules of visual fields

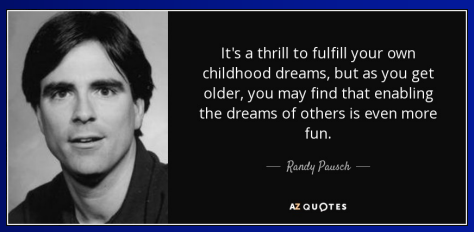
1. VF defect in one eye = lesion of that eye (retina or optic nerve) but beware junctional VF loss
2. Bitemporal = chiasm but beware other chiasmal VF loss patterns
3. Up is up & down is down (except geniculate body)
4. Homonymous hemianopsia (contralateral retrochiasmal, look for RAPD, band atrophy)
5. Occipital VF: Congruous = more posterior (incongruous = more anterior), macular sparing, temporal crescent

A behavior change

In our last two minutes

- I care about feedback
- But I care more about you and your patients
- The next time you see me at ICO or AAO....
- Tell me that you learned something
- That you made a difference

The late, Randy Pausch: The last lecture



Chief complaint: NONE

- Chief complaint: NONE now (2010)
- 73-year-old WF
- PMH: Paraneoplastic optic neuropathy, recovered
- CXR: Small cell carcinoma of lung
- Resected, chemotherapy, radiation in 1997

Wrote it up in 1997….

J Neuroophthalmol. 1998 Sep;18(3):178-81.

Paraneoplastic optic neuropathy and autoantibody production in small-cell carcinoma of the lung.

Luiz JE[1], Lee AG, Keltner JL, Thirkill CE, Lai EC.

Author information

Abstract

A 59-year-old woman presented with acute-onset, bilateral, painless loss of vision, dysarthria, and ataxia. Ophthalmoscopy showed bilateral optic disc edema. A magnetic resonance scan of the head was normal. Chest radiography showed mediastinal adenopathy. Mediastinoscopy and biopsy identified small-cell carcinoma of the lung. An autoantibody to optic nerve and retina was demonstrated in the patient's serum. An electroretinogram was normal. The patient was diagnosed with a paraneoplastic optic neuropathy and paraneoplastic cerebellar syndrome. After treatment for her lung cancer, the patient remains stable from a visual and neurologic standpoint.

Follow up 2010

- Pt: "You don't remember me do you Dr. Lee?"
- Me: "Well,…I um….sure…maybe"
- Pt: "I had lung cancer & you found it thru my eye"
- Me: "Really"
- Pt: "Yeah, you wrote it up in a journal"
- Me: "Oh, yeah, sure, now I remember. How are you, why are you coming today?"
- Pt: "I just wanted to tell you that I was still alive and it has been 14 years, so thanks."

Wrote it up: She is longest known survivor of PON

Long-Term Survivor of Paraneoplastic Optic Neuropathy

Small cell lung cancer carries a very poor long-term prognosis. In a survey performed at the Mayo Clinic from 1997 to 2003, the 5-year survival rate was only 9% (1). In addition, to our knowledge, the longest published survival duration for paraneoplastic optic neuropathy secondary to small cell lung cancer has been 8 years (2). We wish to provide an update on a patient previously reported by one of us (A.G.L.) in this Journal in 1998 (3) who returned 14 years later without evidence of tumor recurrence and believed to be in clinical remission. The earlier detection of the tumor from her neuro-ophthalmologic examination followed by timely systemic treatment may have contributed to her favorable outcome. To the best of our knowledge, she is the longest survivor of paraneoplastic optic neuropathy secondary to small cell lung cancer. At the time of her diagnosis, she underwent surgery, chemotherapy, and radiation therapy and was believed to be in remission at the last follow-up.

The patient, a 73-year-old white woman, was last seen in the neuro-ophthalmology clinic on July 20, 2010. She was complaining of blurred vision in the left eye that had worsened since sustaining a fall on March 1, 2010. She was seen by her neurologist who obtained a brain MRI that showed no focal lesions.

in March 2010 showed no evidence of recurrent or metastatic disease. The patient returned to The Methodist Hospital after 10 years of follow-up to specifically report on her progress and survival from small cell carcinoma of the lung.

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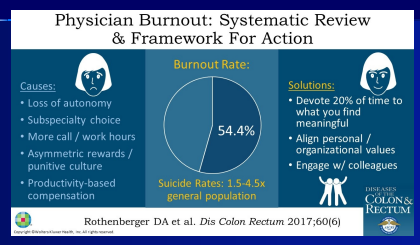
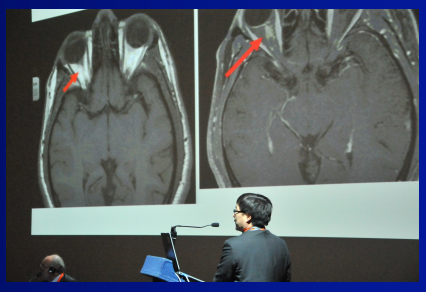


How my Mom thinks I teach residents…

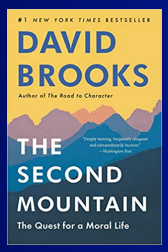


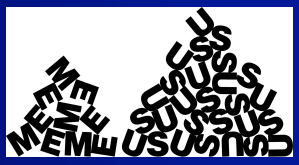
How I think I am teaching

How my residents think I teach them….

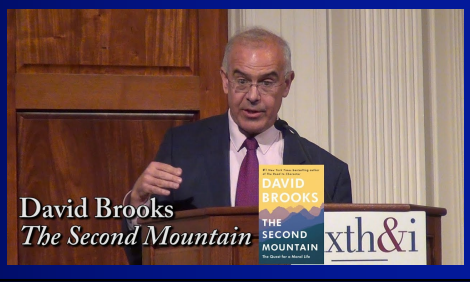
How residents really learn

Defeating burnout by climbing my "second mountain"

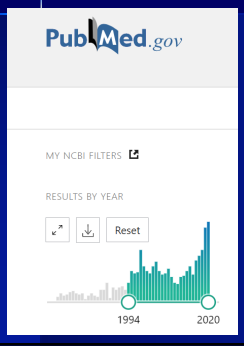


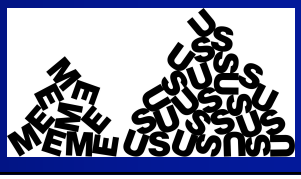


I am done climbing my first mountain…I am on my second mountain….

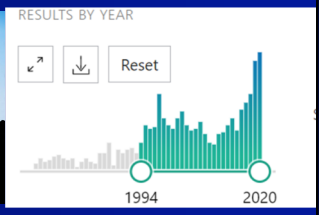


My second PubMed mountain is higher

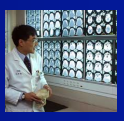




Let's climb together!



Not today, not on my watch



…and when the god of death comes your patient…what shall we say?

Not today…

Thanks for your time and attention

Andrew G. Lee, MD
Blanton Eye Institute
Houston Methodist Hospital

BCM Baylor College of Medicine
University of Iowa Health Care
Methodist

A&M College of Medicine
UTMB The University of Texas Medical Branch
Cornell University Joan and Sanford I. Weill Medical College