

HEMIANOPSIA: WHEN IT'S NOT A STROKE

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COPE Course ID: 68076-NO

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Before we get started.... two new free COPE approved "live" lectures for AFOS members added!

- **Friday, June 19th at 9pm ET** Pacific University presents ["The Adaptation of the Vestibulo-Ocular Reflex and Stereocuity predicts Virtual Reality Induced Motion Sickness"](#) by Dr. Adam Preston
- **Tuesday, June 23rd at 8pm ET** AFOS Presents Part 2 of Dr. Elkins Lab Work lecture - ["Lab Work Take Two - Eye Can Test That"](#) by Dr. Meghan Elkins
- To register go to <https://www.afos2020.org>.

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A typical day at the office...

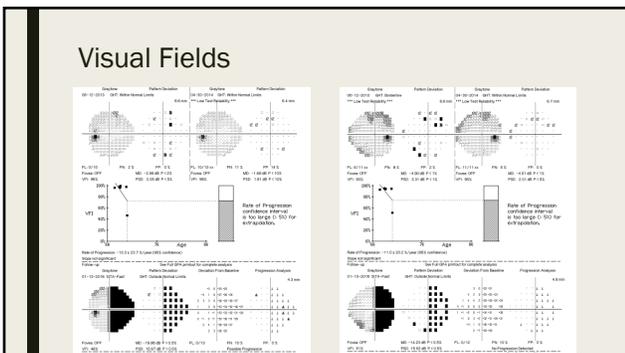


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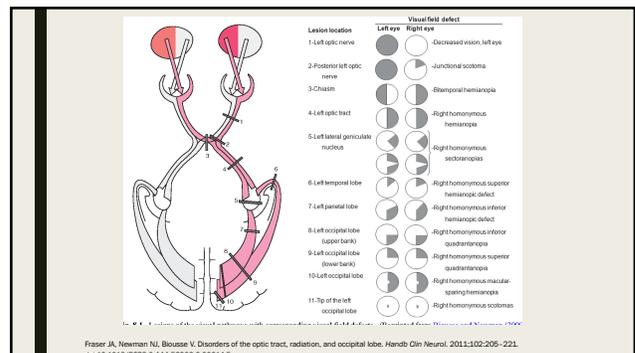
Case 1: Blurry vision in left eye

- 70 year old Native American female
- PMH: early glaucoma, DVT, and kidney transplant
- CC: Blurry vision in left eye for a month, also a little bit of a headache on that side.
- VA: 20/20 OD, 20/20 OS
- No APD
- Visual field testing?

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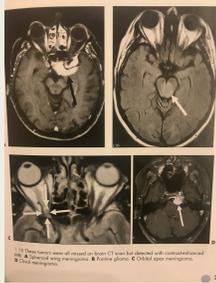
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What next?

- Imaging STAT
- MRI with contrast preferred
- CT can miss stroke or other pathology
- Special attention to where defect is expected



1. A: Thick white matter defect on both CT scan but missed with unenhanced MRI. B: Meningeal meningioma. C: Pituitary glioma. D: Old left parietal meningioma.

Image: Penn, A., Bardion, M. A., & Miller, N. R. (2007). The neuro-ophthalmology survival guide. Edinburgh: Mosby/Elsevier.

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MRI contraindications

- Intraocular metallic foreign body
- Pacemaker
- Insulin pump
- Extreme claustrophobia
- Shrapnel, other metal in body
- Most facilities will have extensive questionnaire for patients to complete
- Eventually up to radiologist to decide

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MRI Questionnaire

Premier SCHEDULING (813) 336-1999 FAX (813) 336-1111 TOLL FREE (877) 333-8899

PLEASE COMPLETE ENTIRE FORM FRONT AND BACK.

PATIENT INFORMATION

Name: _____ Date of Birth: _____ Sex: Male Female

Weight: _____

REASON FOR MRI AND/OR SYMPTOMS

Where are your symptoms?

Please mark on this drawing the location of any metal inside your body, or site of surgical operation.

DO YOU HAVE:

<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Cardiac Pacemaker or Implantable Cardiac Defibrillator (ICD)	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Insulin Pump or Insulin Infusion Set
<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Intraocular Metallic Foreign Body	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Cochlear Implant or Cochlear Processor
<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Intra-aortic Balloon Pump or Temporary Pacemaker	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Medication Patch or Patching Eyeglasses
<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Any type of Implant or Foreign Body	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Any Metallic Foreign Body or Foreign Body
<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Electronic Physically Activated Transdermal Drug System	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Any Metallic Foreign Body or Foreign Body
<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Neurostimulator or Stimulation System	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Foreign Objects, Clips, or Metallic Scars
<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Small Card Stimulator	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Bandaged To, Screw, Nail, Wire, or Prosthesis
<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Catheter, Drainage, or Filter for Angiogram	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> ICD, Implantable Cardioverter Defibrillator
<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Medication Patch or Patching System	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Contact or Intra-aortic Balloon Catheter (for heart)
<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Any type of Prosthesis (Heart, Eye, Pank, etc.)	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Tattoo or Permanent Makeup
<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Spinal Spring or Wire	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Body Piercing Jewelry
<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Artificial or Prosthetic Limb	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Hearing Aid (Please remove for exam)
<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Metallic Screen or Filter	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Any Implanted Medical Observation Device

I attest that the above information is correct to the best of my knowledge. I have read and understood the entire contents of this form. I have had the opportunity to ask questions regarding the information on the form and the MRI procedure and am able to undergo the procedure.

Signature of Patient/Completing Form: _____ Date: _____

Signature of Radiologist/Referring Form: _____ Date: _____

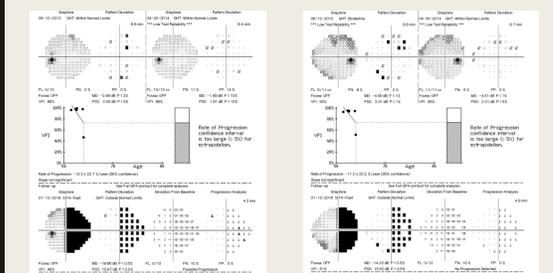
Signature of Radiologist/Referring Form: _____ Date: _____

Signature of Radiologist/Referring Form: _____ Date: _____

(See Back Page)

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Back to our patient...



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Homonymous hemianopsia

DIFFERENTIALS?

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Stroke

- Most common cause of hemianopsia
- Up to 70% of hemianopsia caused by stroke

Goodwin D. Homonymous hemianopia: challenges and solutions. Clinical Ophthalmology, September 2014;19(9):1927. doi:10.2147/ocpt.s59402.

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How do bacteria enter brain?

- Brouwer et al
 - Otitis or mastoiditis
 - Sinusitis
 - Meningitis
 - Endocarditis
 - Pulmonary infection
 - Dental infection
 - Recent neurosurgery
 - Cranial trauma

Sonneville R, Ruimy R, Benzonana N, et al. An update on bacterial brain abscess in immunocompetent patients. Clin Microbiol Infect. 2017;23(9):614-620. doi:10.1016/j.cmi.2017.05.004
 Brouwer MC, Coutinho JM, van de Beek D. Clinical characteristics and outcome of brain abscess: systematic review and meta-analysis. Neurology 2014;82: 806-13.

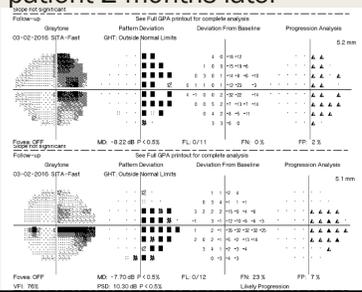
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Prognosis

- Relatively good recovery if caught quickly enough
- ~10% mortality in immunocompetent patients

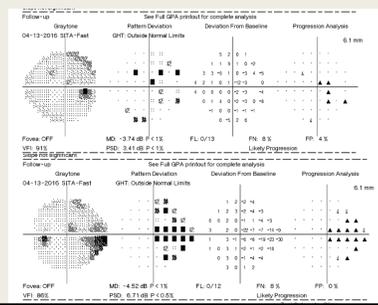
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Our patient 2 months later



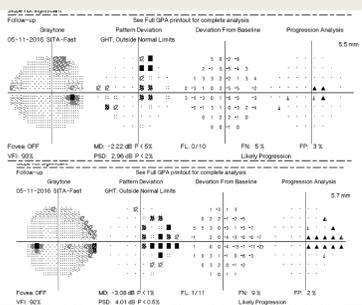
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3 months later



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4 months later

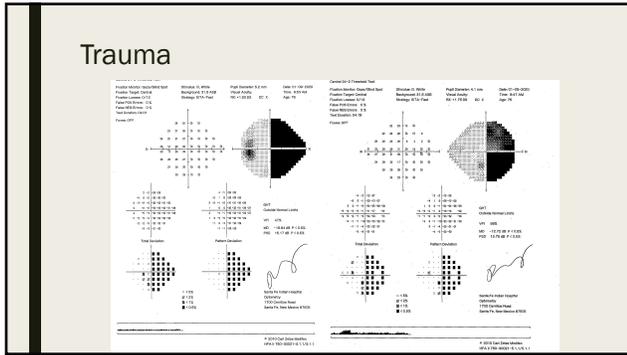


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Case 2: Longstanding hemianopsia

- 76 year old patient coming in for annual eye exam
- History of hemianopsia s/p MVA in 1976
- BCVA 20/20 OD, OS
- Stable for years

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Trauma

- 10-12% of homonymous hemianopia caused by trauma
- Blunt trauma causes TBI
- Lesions can be occipital, associated with optic radiations or tract.
- Majority of HH patients with TBI have multiple brain lesions (54%)

Zhang X, Kedar S, Lynn MJ, Newman NJ, Biouesse V. Homonymous hemianopia: Clinical-anatomic correlations in 904 cases. *Neurology*. 2006;66(6):906-910. doi:10.1212/01.wnl.0000203913.12088.93
Bruce BB. Traumatic homonymous hemianopia. *Journal of Neurology, Neurosurgery & Psychiatry*. 2006;77(8):985-988. doi:10.1136/jnnp.2006.088799.

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Trauma

- Traumatic homonymous hemianopia
 - Bruce et al
 - ~72% male, 28% female
 - ~62% did not have improved VF
 - Most with multiple lesions

Types of visual field defects of baseline	
Complete HH	44 (39.3%)
Incomplete HH	68 (60.7%)
Homonymous quadrantanopia	36 (32.1%)
Partial HH	16 (14.3%)
HH with macular sparing	3 (2.7%)
Homonymous scotomatous defects	11 (9.8%)
Homonymous isoptericopia	1 (0.9%)
Unilateral temporal crescent	1 (0.9%)
Congruity of visual field defects	
Congruous	33 (31.2%)
Incongruous	29 (25.9%)
Not available (including two one-eyed cases and one ULTC case)	47 (42.9%)
Location of lesion	
Occipital	14 (12.5%)
Optic radiation	26 (23.2%)
Optic tract	12 (10.7%)
Multiple	60 (53.6%)
Time from injury to initial visual field test (median [SD])	5 (60.1) (range 0.5-300) months
Associated neurological deficits	
Isolated HH	22 (20.2%)
Non-isolated HH	87 (79.8%)
Not available	5
Follow-up	
Improved	8 (38.1%)
Not improved	13 (61.9%)
Not available	91

Bruce BB, Zhang X, Kedar S, et al. Traumatic homonymous hemianopia. *J Neurol Neurosurg Psychiatry* 2006;77:986-988. doi: 10.1136/jnnp.2006.088799

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Recovery of VF in trauma

- "All patients with spontaneous improvement were first evaluated within 3 months of their initial injury, suggesting that a narrow window may also exist for maximal recovery after trauma"

Bruce BB, Zhang X, Kedar S, et al. Traumatic homonymous hemianopia. *J Neurol Neurosurg Psychiatry* 2006;77:986-988. doi: 10.1136/jnnp.2006.088799

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Case 3:

- El Youssef et al
 - 48 year old woman presented with blurred vision x 2 weeks
 - Slowly worsening
 - Homonymous hemianopia on VF testing
 - No other neuro symptoms
 - MRI ordered

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Case 3

- Multiple CNS lesions on initial MRI
- ESR, ANA, ACE unremarkable
- CSF analysis
 - Protein level 42 mg/dL
 - Positive oligoclonal bands
- Visual field defects resolved after 1 month

Image and case: Youssef N, Khoury M, Saade J, Mourad A, Maslouf N. *ACNR* 2018;18(2):28-29.

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Multiple Sclerosis

- In large cohort of homonymous hemianopsia, 1.4% due to MS
- Hemianopsia from multiple sclerosis uncommon, usually optic neuritis is ocular manifestation of MS
 - 40-70% of MS patients will have at least one episode of optic neuritis in lifetime
- Visual field defects in MS usually have good prognosis, resolve over months

Zhang X, Kedar S, Lynn MJ, Newman NJ, Biousse V. Homonymous hemianopsia: Clinical-anatomic correlations in 904 cases. *Neurology*. 2006;66(6):906-910. doi:10.1212/01.wnl.0000209913.32088.93

Law SW, Lee AW, Chen CS. Multiple sclerosis presenting with homonymous hemianopia. *Aust Fam Physician*. 2009;38(10):795-796.

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Multiple Sclerosis

- Chronic disorder where immune system attacks CNS
- Demyelinating disorder
- Brain imaging will show lesions
- Four types
 - Relapsing remitting
 - Secondary progressive
 - Primary progressive
 - Progressive relapsing

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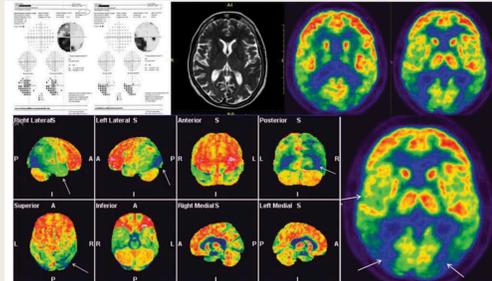
Case 4

- Pellegrini et al
 - 63 year old female
 - Complaint of reading problems for 2 years
 - Prescribed multiple pairs of glasses with no relief
 - Husband reported increased difficulty with some ADLs, less interest in wearing make up in the past few months
 - Visual field testing: left homonymous visual field defect

Pellegrini F, Lee AG, Zucchetto P. Homonymous Hemianopsia Due to Posterior Cortical Atrophy. *Neuroophthalmology*. 2017;41(3):154-158. Published 2017 Feb 15. doi:10.1080/01658107.2016.1278556

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Case 4



Pellegrini F, Lee AG, Zucchetto P. Homonymous Hemianopsia Due to Posterior Cortical Atrophy. *Neuroophthalmology*. 2017;41(3):154-158. Published 2017 Feb 15. doi:10.1080/01658107.2016.1278556

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Alzheimer's/Posterior cortical atrophy

- Visual variant of Alzheimer's can cause homonymous hemianopsia
 - Posterior cortical atrophy
 - Tang-Wai et al
 - 78% of patients with PCA had Alzheimer's pathology
 - 22% had corticobasilar degeneration
- Patients may not experience other Alzheimer's symptoms
- MRI/CT may be normal or may show cerebellar atrophy
- PET scans will usually show parieto-occipital dysfunction

Lee AG, Martin CO. Neuro-ophthalmic findings in the visual variant of Alzheimer's disease. *Ophthalmology*. 2004;111(2):376-381. doi:10.1016/j.ophtha.2003.07.022

Tang Wai DF, Grafh-Radford NR, Boeve BF, et al. Clinical, genetic, and neuropathologic characteristics of posterior cortical atrophy. *Neurology* 2004; 63:1168-1174

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Posterior cortical atrophy (PCA)

- Unknown if this is on the spectrum of Alzheimer's or a separate disease entity
- Typical Alzheimer's
 - Hippocampus damaged first
 - Memory, emotion, etc
- PCA
 - Posterior cortex affected
 - Visual information processing

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Posterior cortical atrophy

- Visual variant of Alzheimer's is relatively rare
 - Estimated 5-15% of Alzheimer's patients
- Typically presents in mid 50's-60's
- Right hemisphere often affected more than left
- PET will reveal abnormalities better than MRI

Characteristics of posterior cortical atrophy

Core features of PCA:

- Insidious onset and gradual progression
- Prominent visuospatial and visuospatial impairments but no significant impairment of vision itself
- Relative preservation of memory and insight
- Evidence of complex visual disorders (e.g., elements of Balint's syndrome or Gerstmann's syndrome, visual field defects, visual agnosia, environmental disorientation)
- Absence of stroke or tumor

Other supportive features:

- Proximal onset
- Alexia
- Idiosyncratic or dressing apraxia
- Prognostic
- Prolonged color after-images

Crotch SI, Schott JM, Rabonovic GD, et al. Shining a light on posterior cortical atrophy. *Alzheimers Dement*. 2013;9(4):463-465. doi:10.1016/j.jalz.2012.11.004
 Pellegrini F, Lee AG, Zucchetto P. Homonymous Hemianopsia Due to Posterior Cortical Atrophy. *Neurophthalmology*. 2017;41(3):154-158. Published 2017 Feb 15. doi:10.1080/01658107.2016.1278556

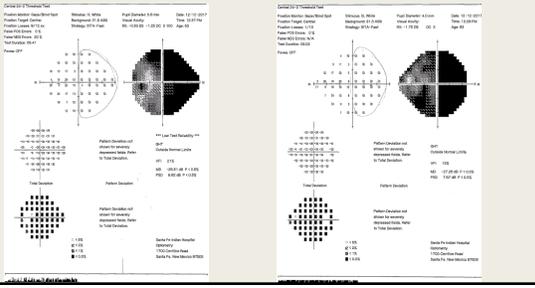
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Case 5

- 63 year old male
 - Poorly controlled hypertension and DM 2
 - Patient is poor historian
- Chief complaint
 - Right sided vision loss, headache, nausea, vomiting for 4 days
- Fundus exam
 - Moderate NPDR both eyes, no CSME
 - No papilledema

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Visual Fields

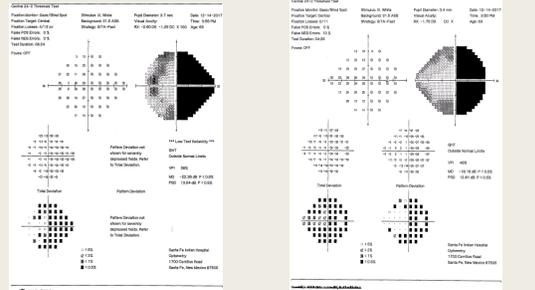


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Case

- Patient sent to ER for suspected stroke
- MRI without contrast "clear" per report
- Admitted for two days, released with diagnosis of "complicated migraine"
- Per hospital, symptoms resolved before patient released
- Patient returned to our clinic the same day as release with same complaints as before and slurred speech
- Repeated visual field

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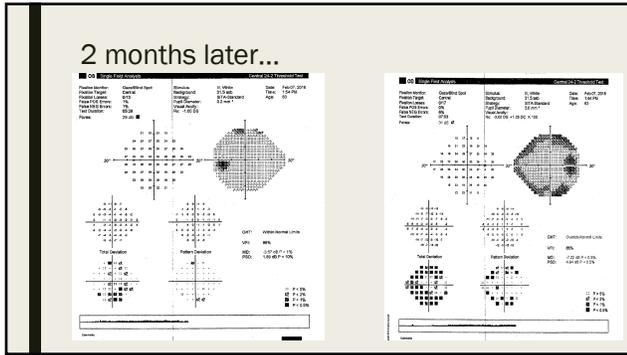


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Case

- Patient sent back to the ER
- Recommended MRI with and without contrast
- Patient readmitted to hospital
 - CT and MRI clean again
 - Neurology consult
 - "Complex migraine syndrome"
- Neurology recommended neuro-ophthalmology consult

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Migraines

- Typically a unilateral, throbbing headache lasting up to 72 hours
- Moderate to severe intensity
- High percentage of patients experience visual aura
- Females > males
- Visual disturbances usually transient in nature

<https://migrainepal.com/migraine-with-aura/>

McKendrick AM, Vingrys AJ, Badcock DR, Heywood JT. Visual field losses in subjects with migraine headaches. Investigative ophthalmology & visual science. Apr 2000;41(5):1239-1247.
Lipton RB, Stewart WF, Diamond M, Reed M. Prevalence and burden of migraine in the United States: data from the American Migraine Study II. Headache. Jul-Aug 2001;41(7):646-657.
Goodwin D. The visual complex: homonymous hemianopia associated with migraine. Optometry (UK). May 2011;82(5):298-300.

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Migraine Classification

ICHD-3 code	Diagnosis
1.	Migraine
1.1	Migraine without aura
1.2	Migraine with aura
1.2.1	Migraine with typical aura
1.2.1.1	Typical aura with headache
1.2.1.2	Typical aura without headache
1.2.2	Migraine with brainstem aura
1.2.3	Hemiplegic migraine
1.2.3.1	Familial hemiplegic migraine (FHM)
1.2.3.1.1	Familial hemiplegic migraine type 1 (FHM1)
1.2.3.1.2	Familial hemiplegic migraine type 2 (FHM2)
1.2.3.1.3	Familial hemiplegic migraine type 3 (FHM3)
1.2.3.1.4	Familial hemiplegic migraine, other loci
1.2.3.2	Sporadic hemiplegic migraine
1.2.4	Retinal migraine
1.3	Chronic migraine
1.4	Complications of migraine
1.4.1	Status migrainosus
1.4.2	Persistent aura without infarction
1.4.3	Migrainous infarction
1.4.4	Migraine aura-triggered seizure

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Migraines do crazy things!

- Migraine may present with many different symptoms besides headache alone
- MRI should be relatively normal
 - Sometimes migraine patients will have white matter lesions
- Migraine is associated with higher risk of stroke

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Tumor

- In one study, ~10% homonymous hemianopia caused by brain tumor
 - Higher incidence in children, 27-39%
- Imaging will reveal tumor
- Location of tumor will determine visual field defect

Goodwin D. Homonymous hemianopic: challenges and solutions. Clinical Ophthalmology, September 2014;1919-1927. doi:10.2147/oph.s59452.
Zhang X, Kester S, Lynn M, Newman NJ, Biousse V. Homonymous hemianopias: Clinical anatomic correlations in 904 cases. Neurology. 2006;66(8):906-910. doi:10.1212/01.wnl.0000203913.12088.93.

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Other causes

Table 1 Causes of homonymous hemianopia
Alzheimer's disease ¹
Aneurysmal malformation ²
Cortical basal ganglion degeneration ³
Creutzfeldt-jakob disease ⁴
Epilepsy ⁵
Lymphoma ⁶
Mitochondrial encephalomyopathy, lactic acidosis, and stroke-like episodes ⁷
Metastasis of hepatocellular carcinoma ⁸
Multiple sclerosis ⁹
Neuromyelitis optica ¹⁰
Neurosurgical procedures ¹¹
Neurosphilis ¹²
Progressive multifocal leukoencephalopathy ¹³
Shaken baby syndrome ¹⁴
Stroke ¹⁵
Traumatic brain injury ¹⁶
Tumors ¹⁷
Vertebral basilar dolichoectasia ¹⁸

Goodwin D. Homonymous hemianopia: challenges and solutions. Clinical Ophthalmology, September 2014;1919-1927. doi:10.2147/oph.s59452.

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Non-stroke causes of hemianopsia

- Infection*
- Trauma*
- Multiple Sclerosis*
- Alzheimer's/Posterior Cortical Atrophy*
- Migraine*
- Tumor*
- Other

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Wrapping up

- While stroke accounts for the majority of hemianopsia cases, keep other causes in mind
- Imaging necessary to determine cause
 - MRI preferred
- Pattern of defect will show where to focus imaging
- MRI may be clear!
- Keep an open mind with diagnoses

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Thank you for your time!

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paulalynnjohns@gmail.com

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