US EYE
BETTER TOGETHER

"DOCTOR, I SEE DOUBLE": DIAGNOSING AND MANAGING PATIENTS WITH NEUROGENIC DIPLOPIA

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USEYE/Center for Sight

COVD

DISCLOSURE:

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- *Joseph Sowka, OD, in the past 24-months,* has been a Consultant/ Speaker Bureau/ Advisory Board member for B&L. Dr. Sowka has no direct financial interest in any of the diseases, products or instrumentation mentioned in this presentation. All relevant relationships have been mitigated. He is a co-owner of Optometric Education Consultants (www.optometricedu.com)

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Further Disclosures

- I work in a large medical-surgical practice, not an academic referral center.
- I book 25-30 patients per day, including primary care, glaucoma, cornea, emergencies, etc.
- I function much as everyone here today.
- I don't have 2 hours to do a neuro-op evaluation.

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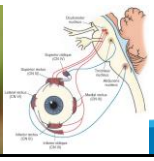
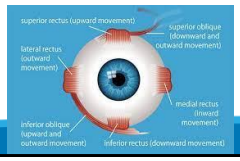
Ocular Motility Problems

- Non-paralytic strabismus
- Paralytic strabismus (CN III, IV, VI palsy)
- Brainstem disease
- Nerve, muscle, tendon, neuromuscular junction





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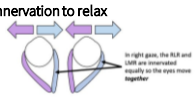
Ocular Physiology

- Ductions
- Versions
  - Ductions better than versions is characteristic of neurogenic ophthalmoparesis
- Sherrington's Law of Reciprocal Innervation
  - When one of the ocular muscles receives an innervation to contract it's direct antagonist will receive a simultaneous equal innervation to relax
- Hering's law of equal innervation
  - Yoke muscles receive equal innervation.



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The 5 Questions of Diplopia

1. Is it real?
2. Is the diplopia present monocularly?
3. Is the diplopia horizontal or vertical?
4. Does the diplopia increase in a particular direction of gaze?
5. Is the diplopia greater at distance or near?

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Is the diplopia present monocularly?

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Non-neurogenic Etiologies

- Keratoconus
- Astigmatism
- Other uncorrected refractive error
- Iridectomy
- Cataract
  - My own personal experience
- Macular edema
- Spectacle lens problems
- Ocular surface disease
- Pinhole cures monocular diplopia

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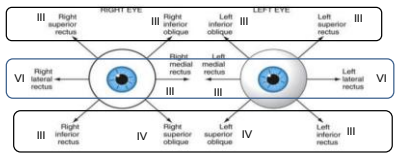
Horizontal = 4 muscles

Vertical = 8 muscles



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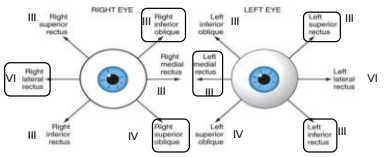
Horizontal worse to the right = 2 muscles

Vertical worse to the left = 4 muscles



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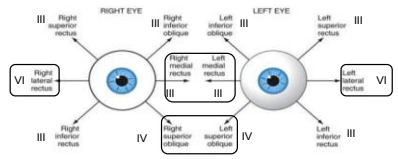
Horizontal worse at near = MR

Horizontal worse at distance - LR

Vertical Worse at near = SO



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Presentation

- Onset?
  - Acute: vasculopathic, demyelinating, aneurysm, infection, inflammation
- Course?
  - Getting better or worse or variable
- Anything else new?
  - Spatial temporality
- Isolated - Fellow travelers?
  - Pupil, ptosis, lid retraction, facial paralysis, Horner syndrome, ataxia, hemiparesis

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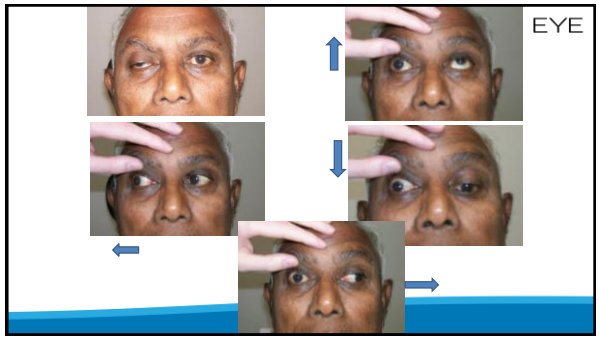
63 YOM

- Sudden onset of orbital pain x 3 days
- + DM; +HTN
- On coumadin
- Pacemaker



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5 mm
unresponsive

3 mm
responsive

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Polling question 1: What is the likely cause?

- An intracranial aneurysm
- A brain tumor
- Inflammation
- Ischemia

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Polling question 2: what is the best referral?

- Neuro-ophthalmologist
- Neurologist
- Neurosurgeon
- Hospital ER
- Internist

DX: Right pupil involved CN 3 palsy from aneurysm

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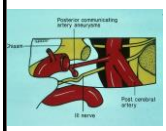
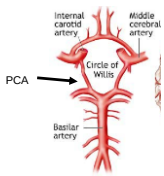
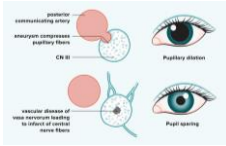
- 50% die from aneurysm rupture w/i 29 days
- 20% die within 48 hours
  - –Needs emergency care and time counts- just send to ER?

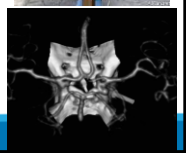






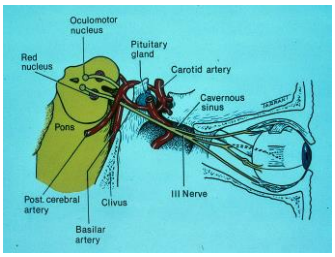
ER PHYSICIAN ENCOUNTERING A PATIENT WITH AN EYE PROBLEM

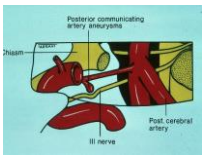
- Sent to ER with detailed notes, recommendations, and cell phone #. Called triage nurse in advance
  - Pupil involved right third nerve palsy
  - Most likely cause: intracranial *aneurysm of posterior communicating artery*
  - Needs CT/CTA/ neurosurgical consult STAT
    - Can't have MRI due to pacemaker
  - Was in scanner within 45 minutes
  - Leaking but unruptured aneurysm confirmed with CTA
  - Endovascular therapy with coils successful (2 procedures)
  - Hospitalized 23 days
  - Ptosis improved, motility and pupil didn't, but he *did* live



CN III Palsy Clinical Picture

- An eye that is down and out with a ptosis
- Adduction, elevation, depression deficits
- Isocoric or anisocoric



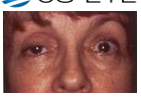


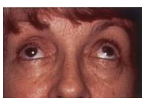
Still More Clues

- A dilated, poorly reactive pupil means compression
- Pain can be anything
  - Aneurysms are always painful
  - Ischemic vasculopathies may be painful … or not
  - Pain cannot be qualified- only helpful if *not* present
- A spared pupil does not always rule out aneurysm
  - Incomplete palsy

Still More Clues

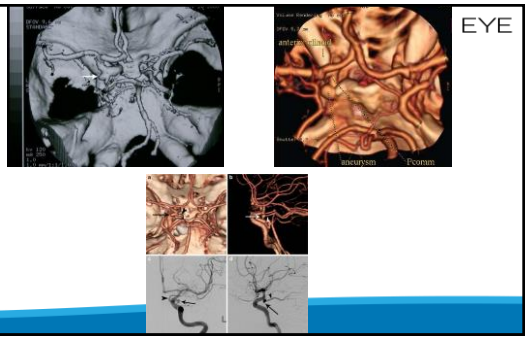
- Pupil involved CN III palsy is PCOM aneurysm until proven otherwise
- Incomplete palsy is PCOM aneurysm until proven otherwise
  - Regardless of pupil
- 30% of CN III palsy are caused by aneurysm
- Vasculopathic CN III will resolve in time
- Life threatening posterior communicating aneurysm will rupture in time





Rules for CN III palsy imaging

- CT/CTA is preferred non-invasive imaging for CN III palsy
  - CT for SAH
- CTA requires contrast- renal impairment prefers MRI/MRA
- CTA superior to MRI when patient can't have MRI
  - Pacemaker, claustrophobia
- MRI superior for non-aneurysmal causes (tumor)
  - MRA adds very little time to scan
- Recent study shows majority of CN 3 palsy patients do not get the appropriate urgent imaging.

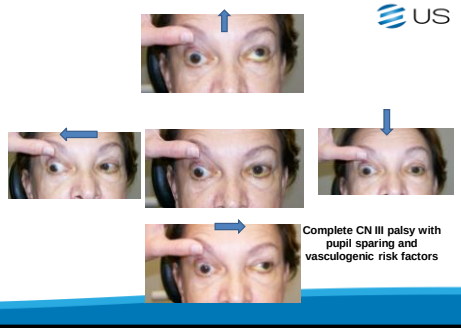


Still More Clues

- CN III palsy caused by aneurysm
  - 20% die within 48 hrs from rupture
  - 50% overall die
  - Average time from onset to rupture – 29 days
    - 80% rupture w/i 29 days
  - Many never make it to hospital

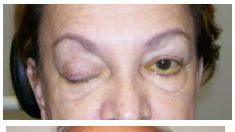
A Different patient and Prognosis

- 63 YOF
- Diabetes and HTN
- Sudden onset retro-orbital pain

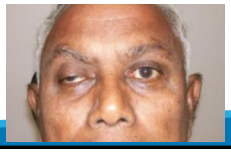


Complete CN III palsy with pupil sparing and vasculogenic risk factors

WHICH IS BETTER? ONE OR TWO?



Resolves over several weeks



Hospitalized 23 days with 2 neurosurgical procedures

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- Aberrant regeneration
  - Pseudo-von Graefe's sign most common finding
- Secondary aberrant regeneration
  - Trauma
  - Tumor
  - Aneurysm
  - Neve diabetes or hypertension
    - Primary regeneration
      - Cavernous sinus mass

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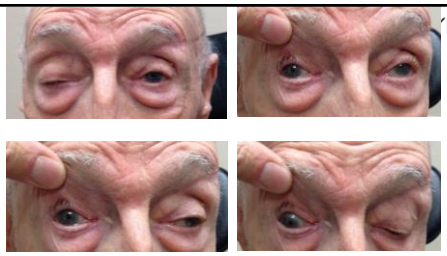
83 YOM

- Diabetic; LBS in 300s;
- A1C around 11
- Pupils normal MRI ordered through PCP
- Indication for imaging: *Brain ischemia*
- What 2 errors were made here?



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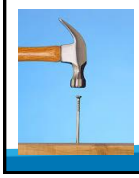
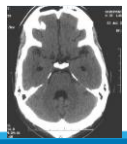
JUST BECAUSE THEY STICK THEIR HEAD IN A TUBE DOESN'T MEAN THAT THE CAUSE WILL BE FOUND





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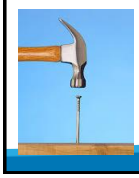
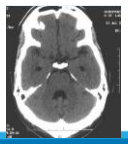
THE WORLD'S BEST NEURORADIOLOGIST CAN'T HELP YOU IF YOU DON'T ORDER THE SCAN, ORDER THE RIGHT SCAN, AND TELL THEM WHAT TO LOOK FOR.





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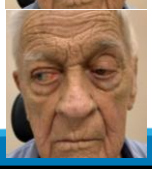
94 YOM

- Referred for partial CN 3 palsy
- Already dilated by tech in another office
  - PERRL (-) RAPD?
- No pain
  - Never had a headache in his life
- Pacemaker; HTN; kidney disease



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Polling question 3: What is the likely cause?

- An intracranial aneurysm
- A brain tumor
- Inflammation
- Ischemia

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RULE

Never dilate a patient with cranial nerve III palsy

US EYE

94 YOM

- Dx: Partial CN 3 palsy
  - with pupil sparing(?)
- Lack of pupil involvement and no head pain helpful in threat assessment
- Age 94 years
  - Male life expectancy US 2023: 80.6 years
- Needed imaging: CT/CTA or MRI/MRA
- Worked with ER
- Kidneys couldn't take contrast; Pacemaker precluded MR
- Only got brain CT- no bleed; "stroke"

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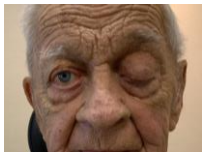
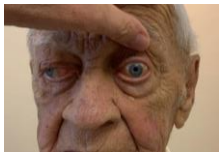
One week follow up

- Now has progressed to complete CN 3 palsy





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Polling question 4: This is now a serious problem

- Agree
- Disagree

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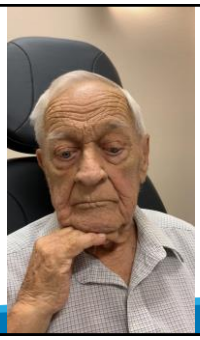
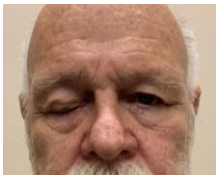
94 YOM

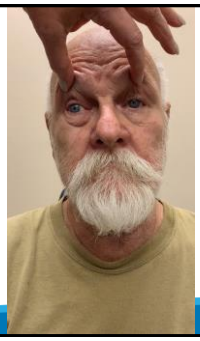
- Pt has *expectedly* progressed to complete pupil sparing CN 3 palsy
- Imaging insufficient but shows no hemorrhage
- Most likely ischemic-vascular and will be about 50% improved in 6 weeks and recovered around 12 weeks
- Will watch for aberrant regeneration



70 YOM

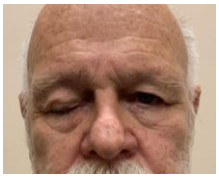
- Sudden onset of retro-orbital pain followed by double vision x 1 week
  - Getting progressively worse
- + HTN, +DM, +hypercholesterol
- 20/30 OD, 20/20 OS
- Day before hurricane Ian

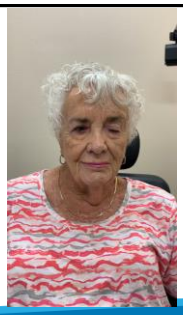




70 YOM

- Sudden onset of retro-orbital pain followed by double vision x 1 week
  - Getting progressively worse
- + HTN, +DM, +hypercholesterol
- 20/30 OD, 20/20 OS
- Day before hurricane
- Needed imaging:
- CT/CTA; MRI/MRA
- Presumptive DX: microvascular ischemia
- Imaging normal
  - 6 weeks- markedly improved; ptosis resolved; patch





Suspect the worst

- Optometrist sees patient with CN III palsy
- Referred to ophthalmologist next day
- Pt dies from SAH before consult

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Does presence of vasculopathic risk factors help?

- Arteriosclerotic risk factors in elderly favors microvascular etiology but does not rule out aneurysm
- HTN, DM, atherosclerosis, hyercholesterol all common and don't protect against aneurysm
- Answer: no, but makes me very nervous when NOT present

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Does acuteness of presentation help?

- Ans: Yes and No
- Aneurysm expansion usually produces acute manifestations, but chronic and evolving cases well known
- Acute is more worrisome
- Chronic and improving less worrisome but does not rule out aneurysm
- Resolved without recurrence reassuring

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Aneurysm Risk Assessment: Isolated CN 3 palsy

- Isolated dilated pupil — none
- Complete CN3-normal pupil — low
- Partial CN3 – normal pupil — high
- Pupil involved CN3 — emergency

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Never out of the woods

- Pt develops CN III palsy from aneurysm
  - Treatment choices: aneurysm clip or endovascular coil packing
- Successfully treated with aneurysm clip
  - All coils are inert and MRI safe; not all clips are MRI safe
- Radiologic tech doesn't verify type of clip
- Pt undergoes F/U MRI with non-MRI safe clip in major medical center
- Clip displaces during MRI
- Patient has fatal hemorrhage during procedure
- Patient survived disease…killed by follow up

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Ode to a Third Nerve

When the eye is down and out with ptosis,
You better hope for miosis.
If the palsy is total with pupil sparing,
In an Oldie it's vascular and not too daring.
A partial palsy calls for double duty,
Because it's probably an aneurysm going through puberty.
But if the pupil is dilated,
An aneurysm has violated.
No time for deferral and no time for referral.
Send to the ER without debate.
Remember, twenty percent will die within the first forty-eight

Joseph Sowka, OD

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35 year Old Male

- Patient referred by GP for emergency evaluation for vertical double vision for past 2 days
- BVA: 20/20 OD, OS
- Pupils: normal (-) RAPD
- Perimetry: normal OD, OS
- Motility: Right hyper deviation which worsens in left gaze and right head tilt.
- Medical Hx: Normal, but has worst case of sinusitis ever – began 1 week before double vision.
- DX: Right CN IV palsy

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Case

- A 25-year-old woman was involved in a minor automobile accident where she was hit by another driver. The accident was reportedly minor, with no initial injury to either driver, and both cars were able to be driven away. She felt that she experienced only a mild-to-moderate bump during the accident with no head trauma or loss of consciousness. However, immediately upon waking the next morning, though she had no physical pain, she experienced profound double vision.

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Case

- She described the diplopia as vertical and worse at near. She had a distinct right hyper deviation which, on alternate cover test, worsened in left gaze and right head tilt. This was a signature motility of a cranial IV (trochlear) palsy.

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CN IV Palsy: Three cardinal questions:

- Which eye is higher in primary gaze?
- Does the hyper deviation worsen in right or left gaze?
- Does the hyper deviation worsen with right or left head tilt?
- CN IV Palsy: A hyper deviation in primary gaze which is greater in opposite gaze and ipsilateral head tilt
- Vertical diplopia is CN IV palsy until proven otherwise
  - And if it isn't CN IV palsy, then it is a skew deviation- supination testing

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Polling question 5: What is the most common cause of CN IV palsy?

- Trauma
- Idiopathic
- Ischemic vascular
- Tumor

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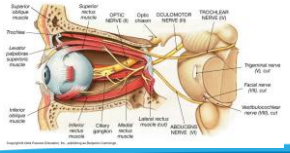
CN IV Anatomy

- Exits the midbrain posteriorly and decussates
- Longest course
- Travels around tentorium, through cavernous sinus, through SOF
- Most prone to trauma



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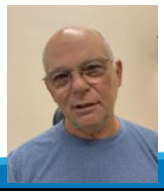
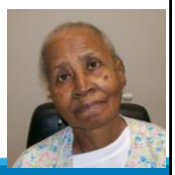
CN IV Palsy

- Longstanding CN IV palsy may present with diplopia from decompensation
  - Observe old photos for head tilt (*Facebook Tomography*)
- Rule of 40-30-20-10
  - 40% traumatic
  - 30% idiopathic
  - 20% ischemic
  - 10% CNS lesions





US EYE

CN IV Management

- Isolated, non-traumatic:
  - Evaluate for ischemic diseases
  - Non-ischemic causes of non-traumatic, isolated CN IV palsy rare
  - Look for longstanding decompensation
    - Increased vertical vergences
    - Old photos

US EYE

35 year Old Black Male

- What are the possible etiologies?
  - MG, MS, ischemia, syphilis, Lyme, Sarcoid, tumor
- What is the likely etiology?
  - Erosion of inflammation from adjacent sinus
- Outcome?
  - Resolution commensurate with sinus infection

US EYE

A different patient with a different prognosis

- 73 YOM: New onset vertical diplopia
  - Left 4th nerve palsy
  - Relieved by 2 PD BD
- *"Doc, I also noticed that my gripper is off"*
  - Mild left-handed weakness
- Medical history: Treated lung cancer
  - Currently on maintenance chemotherapy
- Approach and outcome?

US EYE

NEVER DIAGNOSE IDIOPATHIC (OR ISCHEMIC) ANYTHING IN A PATIENT WITH A HISTORY OF CANCER

US EYE

Motility Madness- Diagnosing at 65 MPH

- 36 YOM with sudden onset non-fourth nerve palsy vertical diplopia and exo deviation- no ptosis
- Normal at exam 3 weeks ago
- Raging blizzard- can't get to neuro-ophthalmologist
- What is it?
- What is the most likely cause?
- What do we do about it?

US EYE

Pertinent Information

- Known to be normal 3 weeks earlier
- 36 years old- few things happen at that age
  - Demyelination
  - Neuromuscular disease
- No evidence of CN III palsy
  - Not aneurysm
- Doesn't fit pattern of CN IV
  - That would be too easy
- CN VI would be horizontal
  - Small vertical dissociation can allow underlying eso/exophoria to manifest
  - Skew often accompanies CN VI palsy

US EYE

Managing this Patient

- Suspect skew deviation
- Not an emergency, but ER is good place to assist
- Needs MRI brain with and without contrast looking for infarct (unlikely) and demyelination (likely)
- Order anti-ACH antibodies
  - Binding, Blocking, Modulating

US EYE

Outcome

- Serology negative for MG
- MRI- mesencephalic white matter lesions consistent with MS.

US EYE

Skew Deviation

- The vertical dissociation of the eyes may be comitant, non-comitant, intermittently comitant, or alternating with the hypertropia reversing in lateral gaze positions
- Can result from any insult within the midbrain including multiple sclerosis, ischemic infarct, tumor, trauma, hemorrhage
- Should the 3-Step test fail to identify CN IV palsy, skew deviation must be strongly considered as the likely alternate diagnosis.
- After performing the 3-Step test, recline the patient and recheck the vertical imbalance. If there is more than 50% improvement upon supination, then skew deviation is present and the patient should be referred for an MRI including the posterior cranial fossa.
  - otolithic projections from the vestibular nuclei cross the midline at the level of the pons to ascend along the medial longitudinal fasciculus
  - skew deviation is caused by disruption of the utriculo-ocular reflex which detects changes in head position

US EYE

Ode to Vertical Diplopia

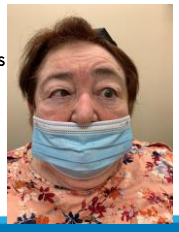
When your patient sees double up and down,
Its rarely a cause to frown.
Look for a tilt and prove its old,
And remember vertical vergences will be bold.
It's a fourth until proven otherwise.
Trauma, congenital, and idiopathic you should surmise.
But if its not a fourth and its new,
Lay them back because its probably a skew.

Joseph Sowka, OD

US EYE

75 YOF

- Sudden onset painless double vision
  - Worse at distance and left gaze
- Denies headache, jaw claudication, TIA, weightloss
- NIIDM; HTN
- No vision change
  - 20/30 OD, OS with cataracts
- Fundus exam normal
  - No disc edema



US EYE

CN VI Palsy

- Hallmark sign is horizontal diplopia, greater at distance, with an abduction deficit from lateral rectus underaction

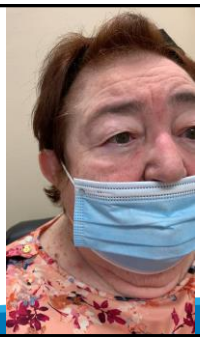
US EYE

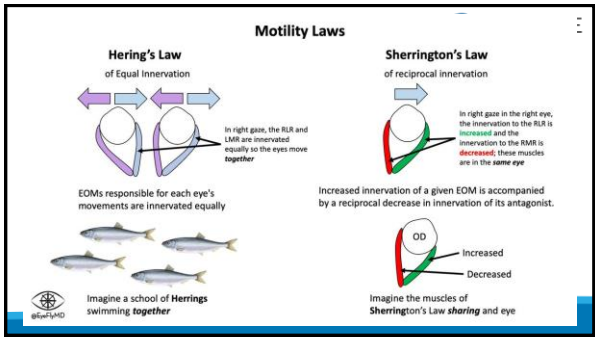
CN VI Palsy

- Check motilities at distance
- Forced duction testing
- Asymmetric refixation

US EYE

US EYE



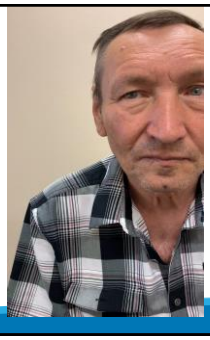


US EYE

Polling question 6: Should she be neuroimaged?

- Yes
- No

US EYE



US EYE

US EYE

CN VI Management

- Each case of CN VI palsy should be classified as traumatic or non-traumatic.
- Non-traumatic cases should be subdivided as neurologically isolated (just CN VI palsy) or non-neurologically isolated (something else).
- Additionally, patients should be ascribed to one of 3 groups: children, young adults, and older adults

US EYE

CN VI Demographic Groups

- Older adults (usually not bad)
  - Vascular disease common- resolves-3mos
    - Consider GCA over 60 yrs
- Children (may be bad)
  - Presumed viral illness, trauma, malignancy (50%)
- Young adults (usually bad)
  - Vascular disease (4%) and idiopathic (13%) uncommon
  - Usually complicated CN VI palsy (hemiparesis, Horner syndrome, facial paresis)
    - Cerebrovascular accidents involving the pons, aneurysm (typically within the cavernous sinus) or neoplasm (33%-cavernous sinus, pons), MS (24%).

US EYE

WHEN LOOKING FOR MASS CAUSE OF CN VI PALSY, THE BASE OF THE PONS AND CAVERNOUS SINUS ARE TWO COMMON HIDING SPOTS

US EYE

BILATERAL CRANIAL NERVE 6 PALSY LIKELY INDICATED INCREASED INTRACRANIAL PRESSURE

US EYE

IF YOU ARE WATCHING A PRESUMPTIVE ISCHEMIC CN VI PALSY AND YOU ARE WRONG, YOU LIKELY HAVE NOT HURT THE PATIENT.

US EYE

Ode to a Sixth

When the double is side by side,
And abduction does not abide.
Prove it's a sixth with a forced duction test,
Eliminate muscle, thyroid and all the rest.
In kids and young adults it's a worry.
Get a scan and you better hurry.
But in an Oldie you're practically free.
Prescribe a patch and check to see its better in three.

Joseph Sowka, OD

US EYE

78 YOWM

- Undergoes premium cataract surgery
- 20/25 OD, OD; J1-J2 OU
- Develops intermittent horizontal diplopia at distance
- Worse when driving at night and watching baseball and basketball on TV
- Exophoric at near; eso posture at distance
  - Commitant in right and left gaze

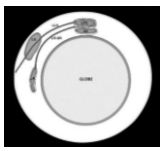
US EYE

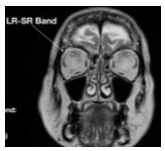
NOW FOR SOME NEURO-OP NONSENSE THAT IS REALLY HELPFUL:
THE SAGGING (SAGGY?) EYE SYNDROME

US EYE

Sagging (Saggy?) Eye Syndrome

- Age-related orbital connective tissue tendon degeneration
  - Baggy eyelids, superior sulcus deformity, aponeurotic blepharoptosis, previous blepharoplasty or similar cosmetic surgery.

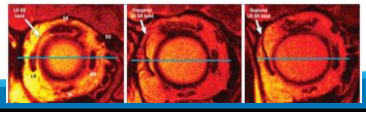




US EYE

Sagging (Saggy?) Eye Syndrome

- The LR-SR band ligament interconnects the SR and LR pulleys, suspending the LR vertically within the orbit
- SES is a manifestation of age-related, orbital connective tissue degeneration.
- Downward displacement, termed *sag*, of the LR pulley may symptomatically cause "divergence paralysis" esotropia for distant targets.
- SES represents a mechanical cause of acquired, adult horizontal and vertical strabismus.



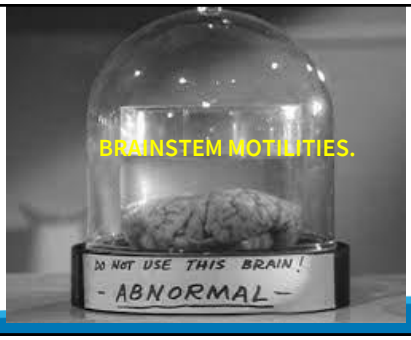
Chaudhuri Z, Demer JL. Sagging eye syndrome: connective tissue involution as a cause of horizontal and vertical strabismus in older patients. *JAMA Ophthalmol*. 2013;131(5):619-25.

US EYE

Sagging (Saggy?) Eye Syndrome

- Widespread rectus pulley displacement and EOM elongation, associated with LR-SR band rupture
  - causes acquired vertical and horizontal strabismus.
  - Small-angle esotropia or hypertropia may result from common involutional changes in EOMs and orbital connective tissues that may be suspected from features evident on external examination.
- Common Findings and complaints:
  - Horizontal diplopia (tends to be worse when tired), most noticed driving (at night) when turning to look at side view mirrors. Also when watching TV at distance (with fatigue).
  - Eso posture at distance and exo or ortho at near
  - MRI is confirmatory, not diagnostic
  - Treated with prism- wow factor

US EYE



US EYE

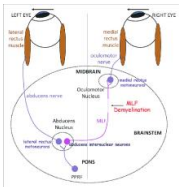
Brainstem Disease

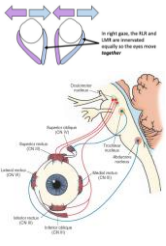
- INO
- BINO
- WEBINO
- 1 ½ syndrome
- Skew deviation

US EYE

Brainstem Anatomy

- Parapontine Reticular Formation (PPRF)
  - Supranuclear control center of horizontal eye movements
- Medial Longitudinal Fasciculus
  - A neural highway
  - Connects pons with mesencephalon

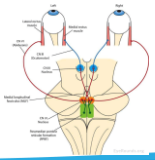


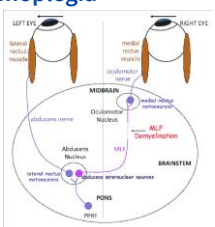


US EYE

Internuclear Ophthalmoplegia

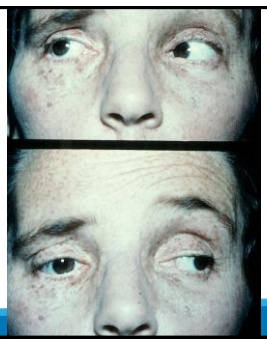
- INO: Anterior or posterior lesions in MLF
- Adduction deficit and abducting nystagmus
  - Named for eye with adduction deficit



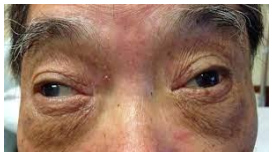


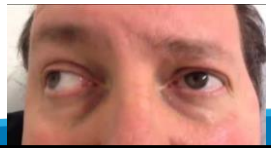
US EYE

- There are no medial rectus palsies



US EYE

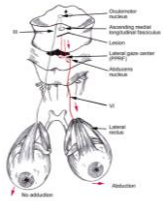




US EYE

Internuclear Ophthalmoplegia

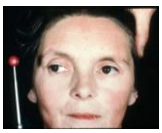
- Medial longitudinal fasciculus (MLF) lesion
  - Disrupts neural pathway connecting ipsilateral CN III & contralateral CN VI nuclei
  - Usually located in the pons (eyes are aligned in primary gaze and can converge) or caudal midbrain (exo deviation and cannot converge)
- Etiologies:
  - Younger patients - demyelinating disease (e.g. MS), MG
  - Older patients - ischemic vascular infarction, MG
  - Others include neoplasm, trauma, infection, hydrocephalus and drug intoxication

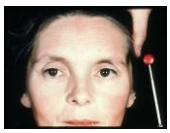


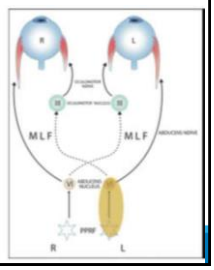
US EYE

The 1 ½ Syndrome

- Acute paralytic pontine exotropia
- Gaze paresis with an INO



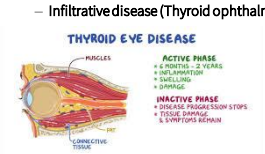




US EYE

Assessment

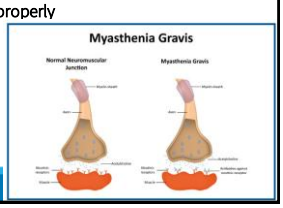
- When assessing ophthalmoplegia, don't forget the imposters:
  - Neuromuscular disease (MG)
  - Infiltrative disease (Thyroid ophthalmopathy or lymphoma/ cancer)



US EYE

MG Mechanisms

- Maverick antibodies
- Antagonism and inhibition
- Nerve impulses do not affect muscle properly
  - Muscle weakness



US EYE

Myasthenia Gravis

- Systemic disease of the thymus (?) gland
- Young women (15-20) and older men (50-60)
  - Occurs in older women and younger men as well
  - Can occur at any age
- Ocular form (15%-30%) and systemic form (70%-85%)
  - Presenting ocularly alone for 2-4 years, will remain only ocular
- 90% of systemic/ general MG pts will develop eye signs
- 70% will develop life-threatening disease
- Affects EOMs, orbicularis oculi, levator (not pupil)
- Painless variable diplopia and ptosis

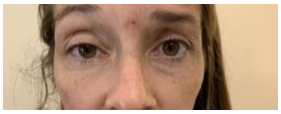
US EYE

MG: Ocular Signs

- Isolated muscle weakness (IO, MR, SR)
- Ptosis or contralateral lid retraction
- Pupil sparing CN III palsy
- CN IV, VI palsy
- Skew
- Multiple cranial neuropathy
- Pseudo-INO or BINO

US EYE

MG: Ocular Signs



- Variability in presentation
- Worsening throughout day
- Improvement with rest
- Apparent contralateral lid retraction
- Oscher's peek sign
- Cogan's eyelid twitch
- Eyelid fatigue phenomenon
- Weak orbicularis oculi
- Ice pack test

US EYE

Other Signs of MG

- Orofacial weakness (myasthenic snarl)
- Swallowing, regurgitation of liquids, choking
- Hoarseness, slurred speech
- Dyspnea
- Proximal limb weakness; unstable gait

US EYE

Diagnosing MG

- Tensilon (Edrophonium chloride)
- Ice pack test (Heat?)
- Negative results for either do not rule out the disease
- Anticholinesterase antibody assay
  - Binding, blocking, modulating
  - Seropositive- pt has the disease and shows up on serology
  - Seronegative- pt has the disease but doesn't show on serology
    - Becomes a clinical diagnosis/ suspicion
    - Up to 12% MG patients are seronegative- most are OMG
    - OMG more likely to be seronegative than GMG

US EYE

Diagnosing MG

- Anticholinesterase antibody assay
  - Binding, blocking, modulating
  - Binding most sensitive and specific for OMG
  - ACH-R binding antibodies present in 85% of GMG and 40-70% OMG
    - Seronegative may become seropositive later
- Chest CT or MRI
  - 70% have thymic hyperplasia
  - 20% have thymoma
    - 23% with thymoma have other autoimmune diseases

US EYE

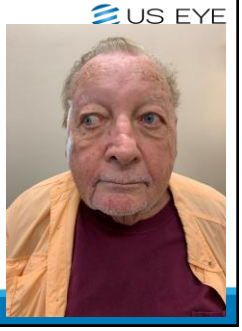
Managing MG

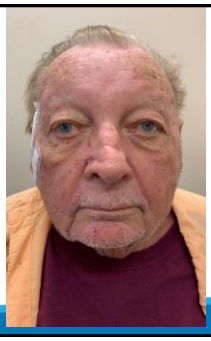
- Medical evaluation
- Immunosuppression to reduce antibodies
  - Acetylcholinesterase inhibitors
  - Steroids
  - Plasma exchange
  - Intravenous Immunoglobulin
- Thymectomy
  - Only 50% effective
  - Causes remissions

MG: Take-home

- Always a differential diagnosis of ophthalmoplegia

- 84 YOM
- 2 day hx of dizziness
- Scan and serology at ER normal
- Sudden onset horizontal and vertical double vision





- Suspect left INO
- Contrast MRI normal
- f/u 1 week- diplopia resolved and motility normal
- Test for MG
  - AChR Abs binding normal
  - AChR Abs blocking elevated- normal but close to borderline
  - AChR Abs modulating not done/ reported by lab
- Dx: Likely seronegative OMG

69 YOM

- 2 week hx vertical diplopia
- Left vertical hyperphoria
  - Remainder of 3 step test negative
  - Possible 4th palsy or Sagging Eye Syndrome
    - Not consistent in office
    - Relieved by 1 PD BD OS
    - Apply Fresnel prism to current rx
    - 20/30 OD OS with PC IOL and mild PCO

69 YOM- 1 month f/u

- Prism only "helps a little"
- Refractive results
  - Complains of less diplopia when prism increased to 2 BD OS over current rx but blurred vision.
  - Subsequent refraction improved acuity, but phoropter prism doesn't relieve diplopia
- "I'm getting a little concerned here"
- Translation: Are you sure you know what you're doing?
- Inconsistency and variability necessitate MG testing

US EYE

69 YOM

- AChR Abs binding, blocking, modulating all normal
  - Not even close
- Inform pt of results by phone
  - When asked, says he is fine
- 1 month f/u- pt very happy with prism, no diplopia when wearing prism, wants recent refraction and prism ground into glasses.

US EYE

MORAL OF THE STORY: SOMETIMES ITS JUST DOUBLE VISION

US EYE

ENCORE

(NOW FOR THE THREE SONGS YOU WAITED ALL SHOW FOR)

US EYE

How much evaluation should be done?

- Older, vasculopathic patients with acute isolated ocular motor nerve palsies can have other causes, including neoplasm, GCA, and brain stem infarction.
- Contrast enhanced brain MRI has an important role in the evaluation of patients with acute isolated ocular motor mononeuropathies, even in patients over age 50 with vasculopathic risk factors.
- ESR, CRP and acetylcholine receptor antibody assay should also be considered

Tamhankar MA, Biousse V, Ying GS, et al. Isolated Third, Fourth, and Sixth Cranial Nerve Palsies from Presumed Microvascular versus Other Causes: A Prospective Study. Ophthalmology. 2013 Jun 6

US EYE

How much evaluation should be done?

- Most of the cases involved CN 3 palsy*
  - Taking those out of the equation, the likelihood that isolated CN 4 and 6 in the elderly are something other than microvascular is around 5%
- Contrast enhanced brain MRI, CRP, ESR, platelets, anti-AChr antibodies makes you squeaky clean
  - Very hard pressed to do that for CN 4 palsy alone
  - History of cancer or unusual behavior should prompt more testing
- Virtually all CN 3 palsies should be imaged with CT/CTA or MRI/MRA
  - Possible exception: Complete CN 3 palsy with pupil sparing in the microvascular elderly (without pain)

*Tamhankar MA, Biousse V, Ying GS, et al. Isolated Third, Fourth, and Sixth Cranial Nerve Palsies from Presumed Microvascular versus Other Causes: A Prospective Study. Ophthalmology. 2013 Jun 6

US EYE

Important Considerations

- Microvascular palsies are typically painful
- Patients can have only 1 microvascular palsy at a time
  - Multiple palsies require more evaluation
  - Complicated palsies require evaluation
- Ischemic microvascular palsies are allowed to get worse over 1 week and be no better at 2 weeks, but are not allowed to get worse over 2 weeks.
  - Generally they don't do anything for a month
  - Should have some significant improvement at 6 weeks
  - Improvement in less time warrants second thoughts
    - Don't consider a shorter course a "gift"
    - CN VI case

US EYE

Important Considerations

- GCA is the most common *chronic* vasculitis in the elderly
  - Improvements can occur and it can self-limit
  - All cranial nerve palsies in patients over age 50 should prompt the specific history
    - Follow up with serology if indicated
- Inflammations, cancers, and aneurysms can improve spontaneously
  - Beware of improvements and recurrences
  - Anything that doesn't follow the microvascular course of short-term worsening, stabilization for a month, and steady improvement beginning at 6 weeks should raise suspicion.

US EYE

May all your palsies be isolated

LIVE LONG AND PROSPER