On behalf of Vision Expo, we sincerely thank you for being with us this year.

Vision Expo Has Gone Green!

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VISION EXPO

1

Disclosure Slide

- Dr Bozung, faculty for this educational event, has no relevant financial disclosures to disclose.

2

Do A Double Take

Do A Double Take

Alison Bozung, OD, FAAO
Bascom Palmer Eye Institute
Miami FL

3

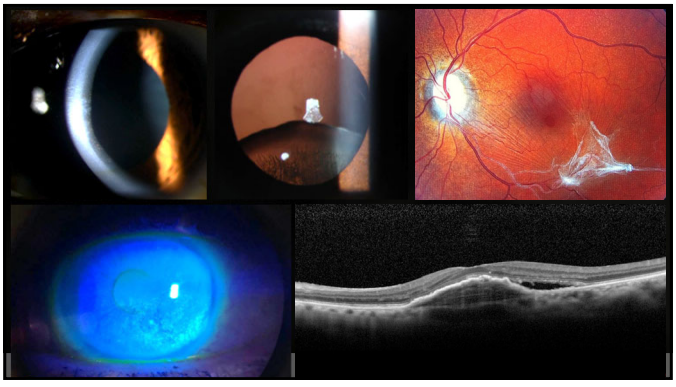
I have no financial disclosures.

4

Defining double

- Monocular vs binocular?
  - What are some conditions that can lead to monocular diplopia?

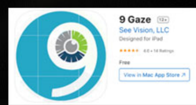
5



6

Binocular diplopia

- Qualify the diplopia
  - Horizontal vs vertical?
  - Worse when looking in any direction?
  - Worse near or far?
- Then measure
  - Check gross motilities first
  - Using 1 target on wall ahead, have the patient move or tilt their head
- Get the whole picture
  - Any facial asymmetry?
  - Lid swelling or fullness?
  - Proptosis?



7

6th Nerve Palsy (Abducens)

Innervates
- Lateral rectus

Classic presentation
- Esotropia
- Worse looking toward affected side

Special considerations
- Most common ophthalmic CN palsy
- Can be associated with elevated intracranial pressure

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4th Nerve Palsy (Trochlear)

Innervates
- Superior oblique

Classic presentation
- Vertical diplopia
- Use phrase "GOTS worse"
  - Find the hyper eye
    - Gaze
    - Opposite
    - Tilt
    - Same

Special considerations
- The only cranial nerve to leave the back of the brainstem
- "Nerve of Trauma"

Ex: R hyper will get worse on L gaze and R tilt

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3rd Nerve Palsy (Oculomotor)

Innervates
- Levator palpebral superioris
- Superior rectus
- Medial rectus
- Inferior rectus
- Inferior oblique

Classic presentation
- "Down and out"
- Ptosis
- Vertical component that alternates on up vs down gaze

Special considerations
- Pupil exam is paramount… right?
- Can have "partial third", which may affect superior or inferior divisions alone

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Does it follow a clear pattern?

Yes → Isolated nerve
- Cranial nerve palsy
  - Microvascular
  - Compressive
  - Trauma

No → Non-isolated or multiple CNs
- Orbital pathology
- Cavernous sinus pathology
- Neurogenic
- Trauma
- Etc

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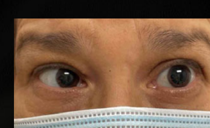
Isolated Acute Cranial Nerve Palsy

- Check the other cranial nerves!
- Review of systems
  - Cardiovascular risk factors (83.5%[1])
  - GCA symptoms if >50 years of age
  - History of cancer
  - History of head trauma
- Top three causes[2,3,4]
  1. Microvascular
  2. Compression or mass*
  3. Trauma*

  These do not hold true for children.

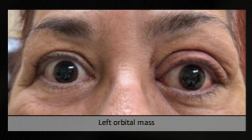

Microvascular left 6th nerve palsy

1. Tamhankar MA, Biousse V, Ying G-S, et al. Isolated third, fourth, and sixth cranial nerve palsies from presumed microvascular versus other causes: a prospective study. Ophthalmology. 2013;120(11):2264-2269. 2. Fang C, Leavitt JA, Hodge DO, Holmes JM, Mohney BG, Chen JJ. Incidence and etiologies of acquired third nerve palsy using a population-based method. JAMA Ophthalmol. 2017;135(1):23-28. 3. Oh SY, Oh SY. Clinical outcomes and aetiology of fourth cranial nerve palsy with acute vertical diplopia in adults. Eye (Lond). 2020;34(10):1842-1847. 4. Elder C, Hainline C, Galetta SL, Balcer LJ, Rucker JC. Isolated abducens nerve palsy: update on evaluation and diagnosis. Curr Neurol Neurosci Rep. 2016;16(8):69. 4.

12

Non-Localizing Motility Defects

- More likely to be orbital, cavernous sinus, or neurogenic disorder
- Review of symptoms and systems
  - Rapid or progressive onset of symptoms
  - History of thyroid dysfunction
  - History of cancer
- Other clinical signs become very helpful!
  - Proptosis
  - Chemosis
  - Vision loss
  - Nerve edema
  - Periorbital inflammation
  - Conjunctival injection
  - Elevated intraocular pressure
  - Choroidal folds



Left orbital mass

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When to Scan?

1. Multiple CN palsies
2. Non-isolated motility deficits + any of the following
   - Pain
   - Ocular injection
   - Loss of vision
   - Proptosis
   - Preceding ocular or head trauma
   - Periorbital inflammation
3. Isolated CN palsy
   - <50 years of age
   - Positive cancer history
   - Worsening or not improving
   - Without cardiovascular risk factors

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What neuroimaging to order?

- MRI brain and orbit w/wo contrast
  - + MRA without contrast in 3rd nerve palsy
  - + MRV without contrast in 6th nerve palsy (with papilledema)
- Can do CT orbit in suspected thyroid eye disease or trauma
- No contrast → can miss subtle lesions
- No MRA → can miss subtle vascular lesions or aneurysms

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Case 1

- 69 year old female
- Presents for horizontal diplopia with headaches for 2 weeks
- Past medical history
  - Primary right breast cancer, Dx 5-6 years ago
  - Known osseous metastases
  - s/p multiple chemotherapy treatments
    - Not in remission

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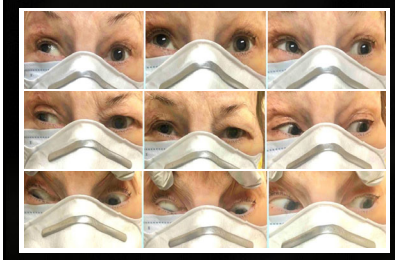

Vision
20/25 OD, 20/25 OS

Pupils
OU: 3mm → 2mm, no APD

Slit lamp exam
- Mild left upper lid fullness
- 1+ nuclear sclerosis OU
- Mild nerve edema OS

Exophthalmometry
10mm OD, 14mm OS

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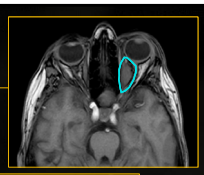
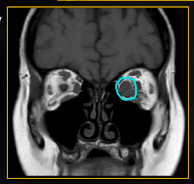
Next steps?

- Review MRI brain and orbit (1 week prior)
  - Left orbital mass
- Discussion with oculoplastics and oncology teams regarding biopsy
  - Ultimately, treated as metastasis without additional biopsy





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Orbital metastases

- Account for 1-13% of all orbital tumors reported[1]
- Most commonly
  - Older adulthood
  - Carcinomas (breast*, lung, prostate)
  - Known primary site (75-81%)
  - Proptosis*, diplopia, ptosis, pain, loss of vision
- Next steps
  - Biopsy by oculoplastic surgeon
    - Unless widespread metastatic disease already present or risk > benefit
  - Treatment varies
    - Surgery, radiotherapy, chemotherapy, or hormonal therapy

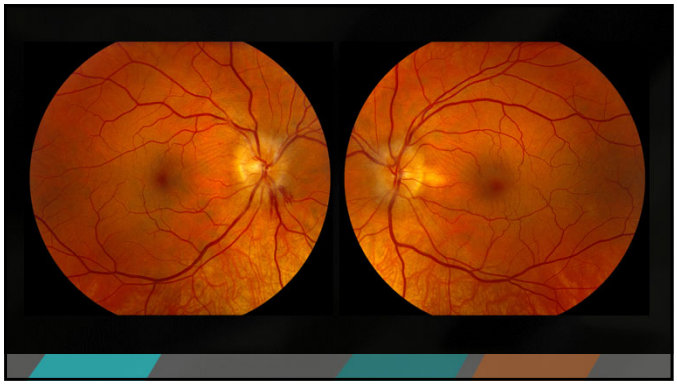
1. Ahmadi SM, Esmaeili B. Metastatic tumors of the orbit and ocular adnexa. *Curr Opin Ophthalmol*. 2007;18(5):405-413

19

Case 2

- 44 year old female
- Presents for acute onset horizontal diplopia
  - Associated headaches for 1 week
- Past medical history
  - S/p cerebellar (tentorial) meningioma resection via suboccipital craniotomy two weeks prior

20



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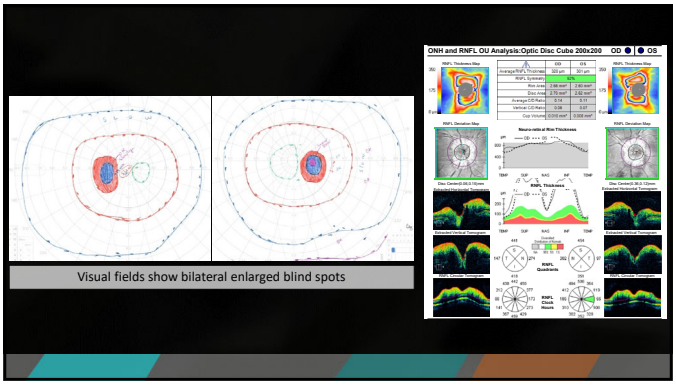

Visual fields show bilateral enlarged blind spots

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Next steps?

- Discuss with neurosurgery!
- MRI brain w/wo contrast + MRV brain
  - Post surgical changes with some residual meningioma
  - Stenosis of right transverse sinus adjacent to mass
  - Hypoplastic left transverse sinus
  - No venous sinus thrombosis
- Lumbar puncture
  - Opening pressure 32cm H_2O, normal CSF constituents
    - *Normal opening pressure 25cm H_2O*

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Next steps?

- Patient underwent angioplasty and stenting of right transverse sinus the following day
- Post surgical follow up
  - Dramatic improvement in headaches
  - Resolution of diplopia
  - Significant optic nerve edema improvement

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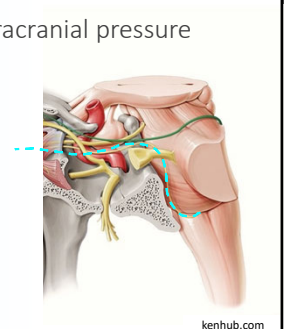
6th nerve palsy in elevated intracranial pressure

- Symptoms include
  - Diplopia
  - Nausea
  - Headaches
  - Blurred vision
  - Transient visual obscurations
- Longest intracranial course
  - Passes over the petrous ridge of the temporal bone



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Case 3

- 56 year old female
- Double vision for 2 months
  - Associated with tearing, blurred vision, redness of eyes, and headaches
- Past medical history
  - Hyperthyroidism
  - Hypertension
  - Glaucoma
  - Dry eye
- Medications
  - Methimazole, selenium, losartan, metoprolol, hydrochlorathiazide, amlodipine, latanoprost oph, cyclosporine oph

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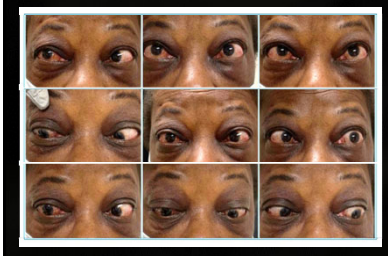

Vision
20/60 OD, 20/200E at face OS

Pupils
OU: 4mm → 3mm
OS: Trace APD

Color vision
1/14 OD, couldn't see OS

Slit lamp exam
Injection + chemosis OU

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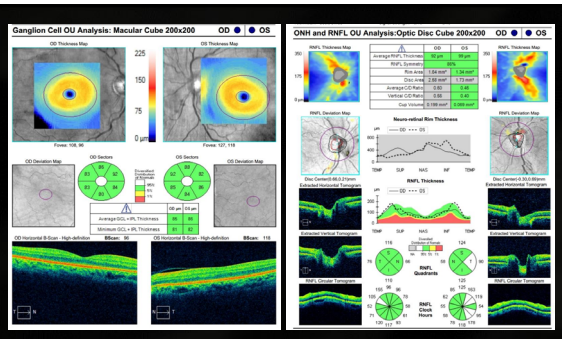

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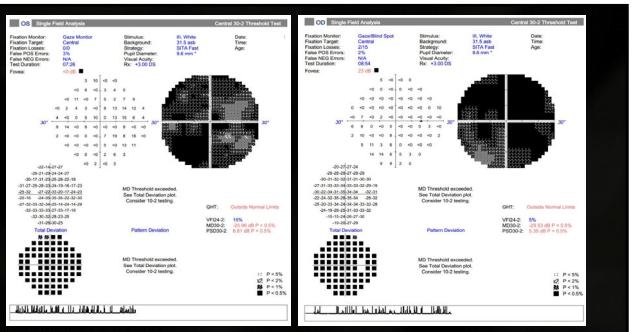

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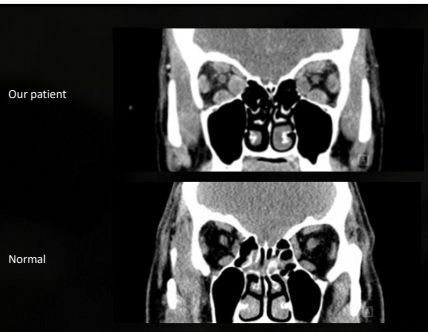

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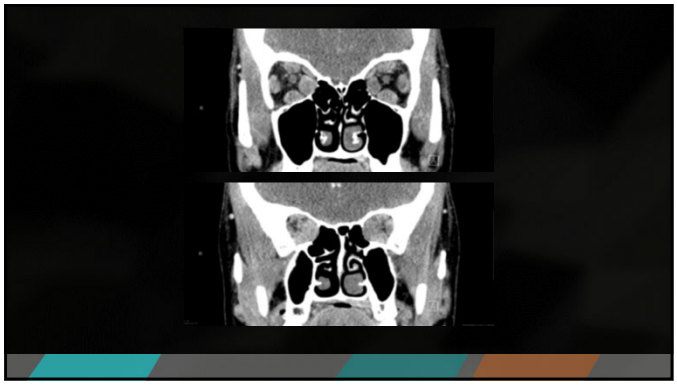

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Compressive optic neuropathy in thyroid eye disease

- Affects 1-8% of patients with thyroid eye disease[1,2]
- Vision loss can be reversible if treated expeditiously
- Risk factors for worsening TED
  - Smoking
  - Radioactive iodine
  - Hypercholesterolemia

1. Gold KG, Scofield S, Isaacson SR, Stewart MW, Kazim M. Orbital radiotherapy combined with corticosteroid treatment for thyroid eye disease-compressive optic neuropathy. *Ophthalmic Plast Reconstr Surg*. 2018;34(2):172-177. 2. Gold KG, Scofield S, Isaacson SR, Stewart MW, Kazim M. Orbital radiotherapy combined with corticosteroid treatment for thyroid eye disease-compressive optic neuropathy. *Ophthalmic Plast Reconstr Surg*. 2018;34(2):172-177.

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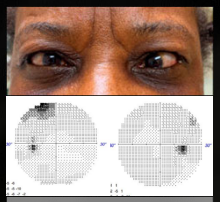
Compressive optic neuropathy in thyroid eye disease

- Now:
  - IV or PO corticosteroids[1,2*]
  - Orbital radiotherapy[3]
  - Orbital decompression[4]
  - Teprotumumab[5,6,7]
- Later:
  - Strabismus surgery
  - Eyelid surgery



s/p IV methylprednisolone x 3 days and decompression OU

1. Kahaly GJ, Pitz S, Hommel G, Dittmar M. Randomized, single-blind trial of intravenous versus oral steroid monotherapy in Graves' orbitopathy. *J Clin Endocrinol Metab*. 2005;90(9):5234-5240. 2. Marcocci C, Bartalena L, Tanda ML, et al. Comparison of retrobulbar and intravenous or oral glucocorticoids associated with orbital radiotherapy in the management of severe Graves' ophthalmopathy: results of a prospective, single-blind, randomized study. *J Clin Endocrinol Metab*. 2001;86(8):3562-3567. 3. Gold KG, Scofield S, Isaacson SR, Stewart MW, Kazim M. Orbital radiotherapy combined with corticosteroid treatment for thyroid eye disease-compressive optic neuropathy. *Ophthalmic Plast Reconstr Surg*. 2018;34(2):172-177. 4. Tooley AA, Godfrey KJ, Kazim M. Evolution of thyroid eye disease: decompression-dysthyroid optic neuropathy. *Eye (Lond)*. 2019;33(2):208-213. Smith TJ, Kahaly GJ, Ezra DG, et al. Teprotumumab for thyroid-associated ophthalmopathy. *N Engl J Med*. 2017;376(18):1748-1761. 6. Hwang CJ, Nichols EE, Choo BH, Perry JD. Bilateral dysthyroid compressive optic neuropathy responsive to teprotumumab.

33

Case 4

- 80 year old male
- Referred in for "abnormal extraocular motilities and ptosis"
- Past medical history
  - Hypertension, prostate cancer

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What's so abnormal?

January 13	January 21	February 3	March 3	March 19
Right ptosis 6^ OD hypotropia Full EOMs Dx partial pupil-sparing CN3 palsy. MRI and MRA ordered.	MRI brain w/wo contrast + MRA normal	Ptosis slightly improved 6^ OD hypotropia Full EOMs	Ptosis stable 6^ OD hypotropia Full EOMs Small Fresnel prism placed to relieve diplopia	New OS Ptosis

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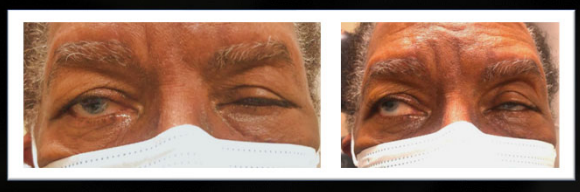

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Let's get a little better history

You will never find what you're not looking for!

- Mild general fatigue
- Trouble swallowing food
- Feels ptosis is better in the morning and gets worse as the day goes on
- Diplopia is somewhat variable

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Myasthenia gravis[1]

- 15% have ocular symptoms only
- Laboratory studies
  - Acetylcholine receptor antibodies (85-90%)
  - Muscle specific kinase antibodies (MuSK) (1-10%)
  - Lipoprotein receptor-related protein 4 antibodies (LRP4) (1-3%)
- Comorbid conditions
  - Thymoma in 10%, autoimmune disease (SLE, RA), thyroid disorder, others
- Treatment
  - Corticosteroids, pyridostigmine, immunosuppressants, thymectomy*

Gilhus NE. Myasthenia gravis. N Engl J Med. 2016;375(26):2570-2581.

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Case 5

- 87 year old male
- Presents for acute onset double vision and eyelid droop two weeks prior
- Past medical history
  - Hypertension
  - Mitral valve disease
  - Hypercholesterolemia
  - Congestive heart failure
- Medications
  - Apixaban, bumetanide, metoprolol, amiodarone, atorvastatin

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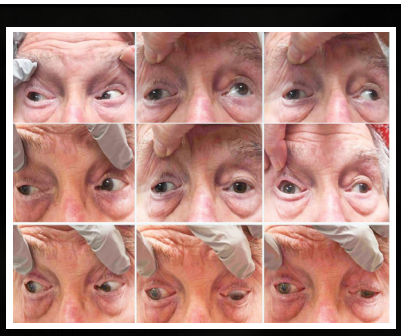

Vision
20/100 OD
20/70 OS

Pupils
OD: 3mm → 2mm
OS: 2mm → 1mm
No APD

Slit lamp exam
3+ nuclear sclerosis OU
No optic nerve edema or pallor
No retinal findings

40

Next steps?

- Watch and wait?
- Neuroimaging?

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3.4 cm sellar/suprasellar mass which displaces and compresses the optic chiasm. There is invasion of the right > left cavernous sinus, with likely mass effect on the nerves in the right cavernous sinus... There is frank encasement of the right cavernous internal carotid artery. ...overall appearance is favored to represent a pituitary macroadenoma. There are multifocal fusiform aneurysms of both anterior and posterior intracranial arterial circulations including the bilateral internal carotid artery termini, proximal M1 middle cerebral arteries, both V4 vertebral arteries; the worst dilation involves the basilar artery.

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Follow up?

- Emergent referral to neurosurgery colleagues
- Patient and his daughter declined transfer, leaving against medical advice (AMA)
- Patient was evaluated by neurosurgery at outside hospital with plans for resection of mass
  - Patient and daughter declined treatment due to risks

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In summary..

- Attempt to isolate the affected cranial nerve(s) affected
- If you cannot isolate a single neve, consider orbital, cavernous sinus, or neurogenic disorders
- Always complete a review of systems and medical history
- Neuro-imaging is indicated in many cases

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Wkdqn#|rx%

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