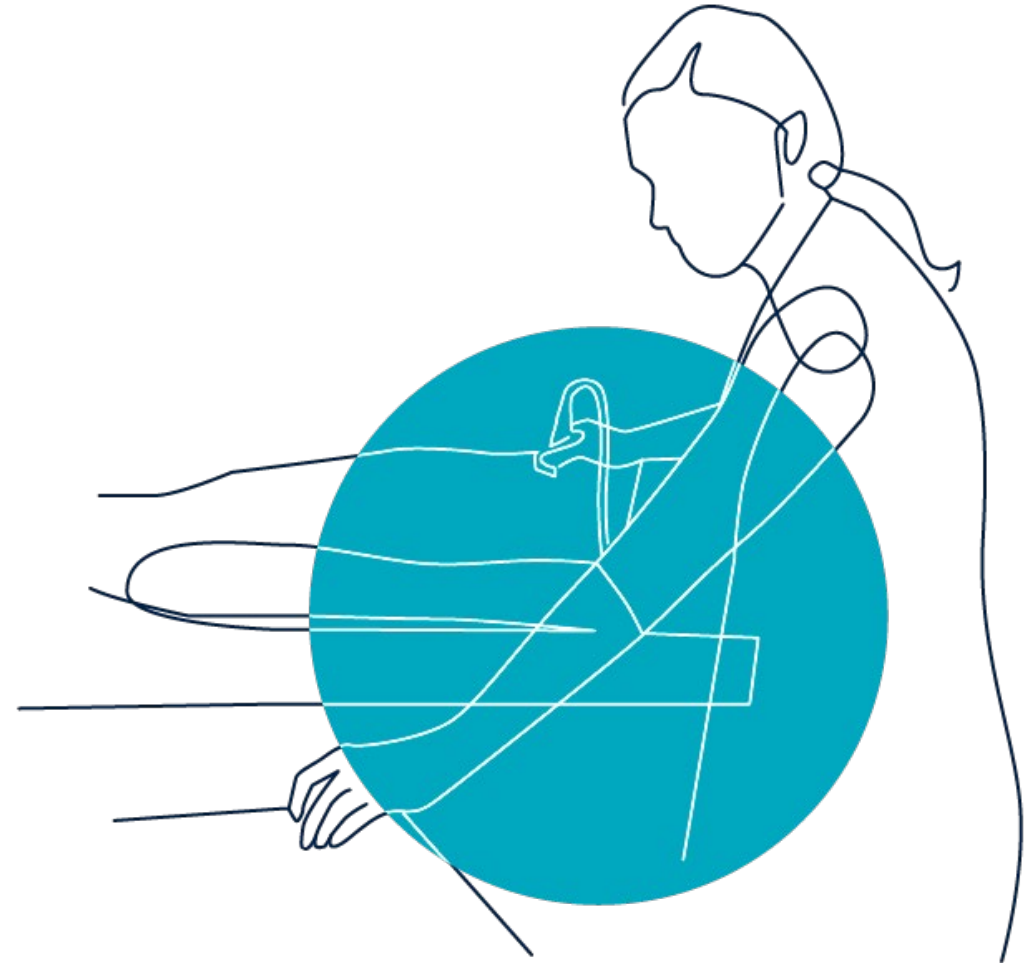


Ocular Ultrasound

Dr. Virginia Robinson

September 2024



THE UNIVERSITY OF BRITISH COLUMBIA

Continuing Professional Development

Faculty of Medicine

LAND ACKNOWLEDGMENT

We acknowledge that we work on the traditional, ancestral and unceded territory of the K'tanaxa Nation.



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PRESENTER DISCLOSURES

Name: Dr. Virginia Robinson

Relationships with commercial interests:

- Speakers Honoraria: RCCBC, Divisions, and Clarius



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MITIGATION OF BIAS

- Relationships do not affect my choices in developing content.
- Financial relationships are unrelated to presentation.
- Not speaking about any products or medications.

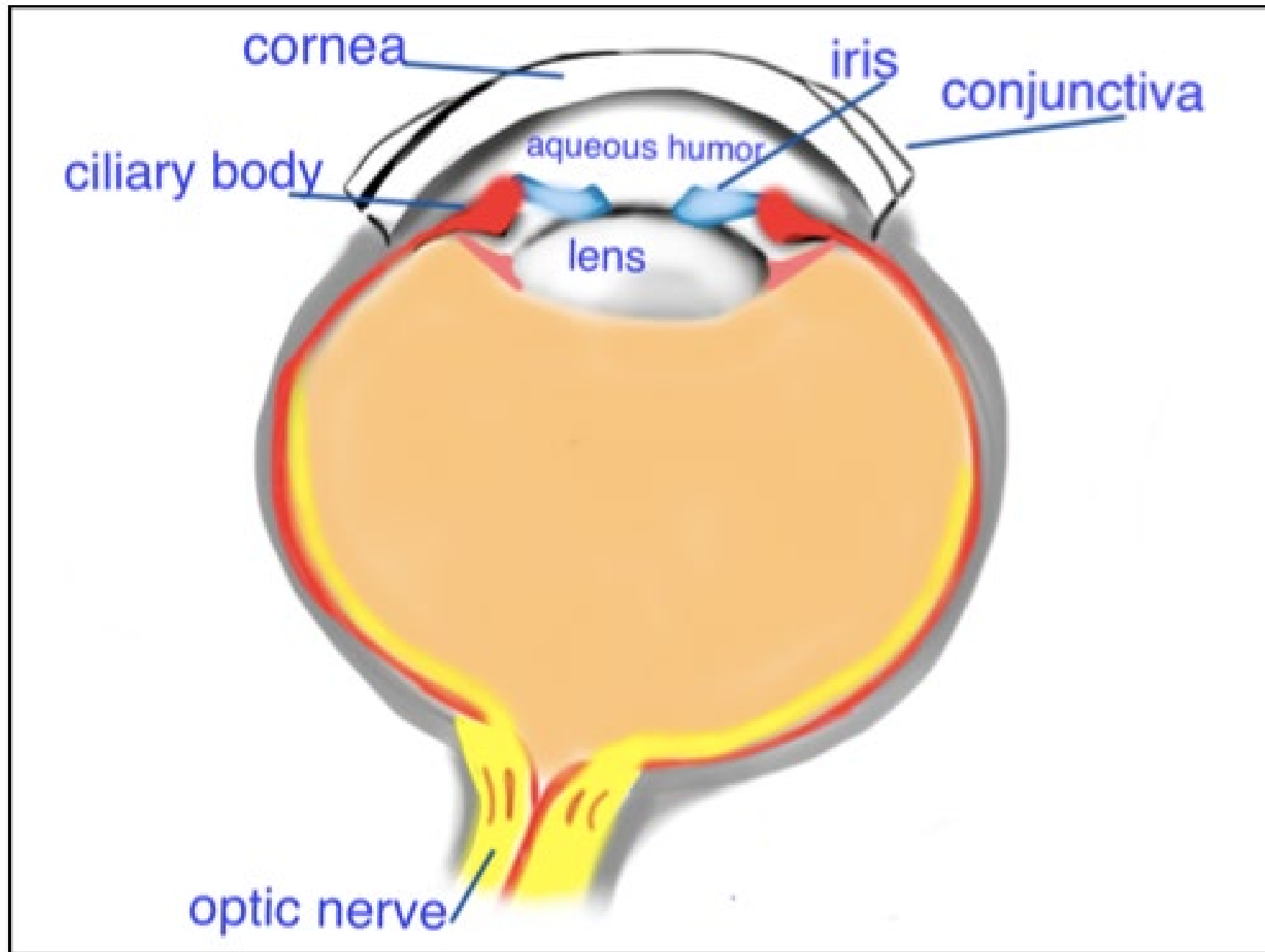


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LEARNING OBJECTIVES

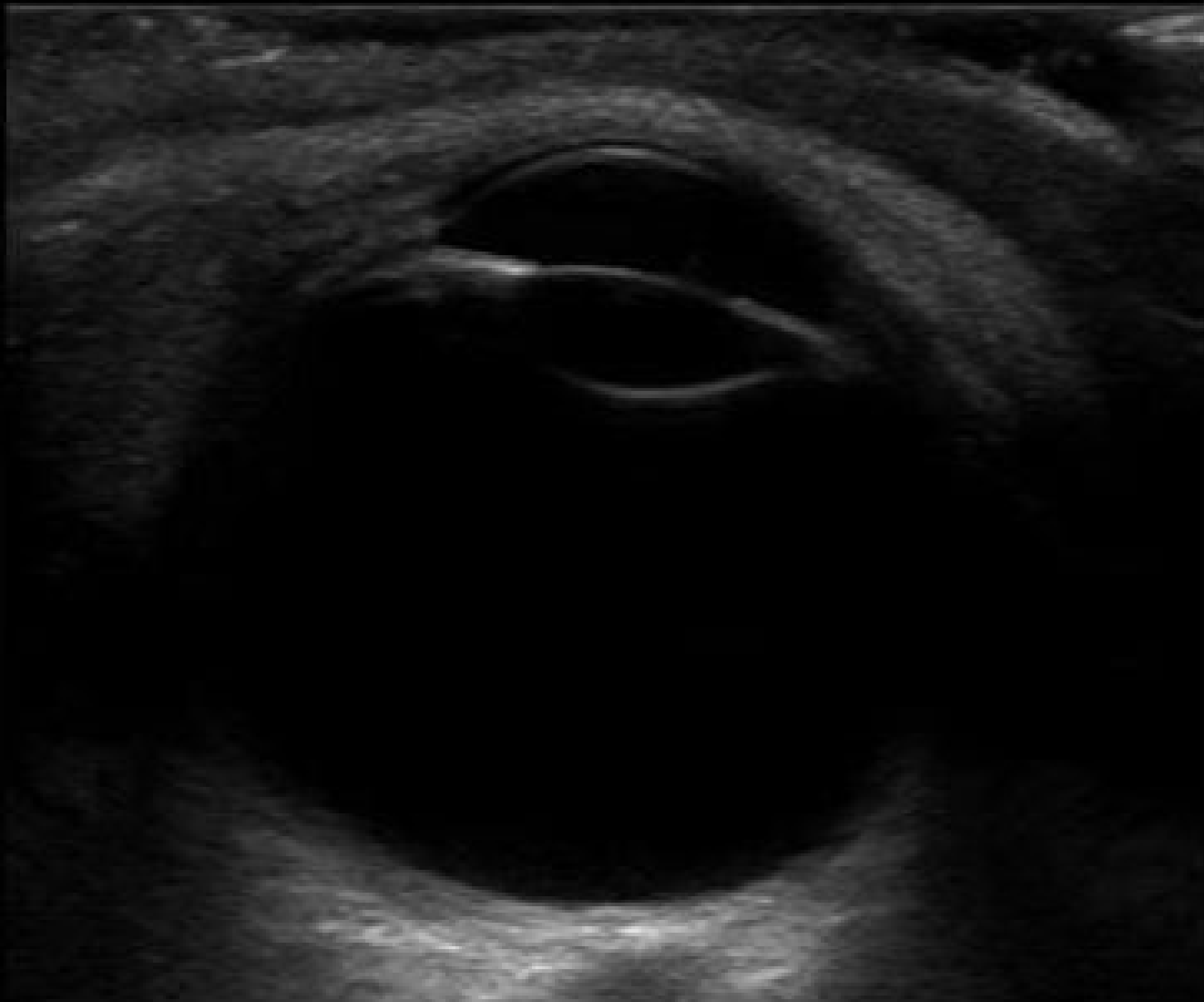
- Learn how to perform and interpret ocular ultrasound
- Understand the use of POC ocular ultrasound for headaches and raised intracranial pressure.
- Differentiate causes of painless loss of vision using US
- Explain the benefits of ocular ultrasound in the setting of trauma to the orbit





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HOW TO PERFORM OCULAR EXAM RE-CAP

Linear Probe

Make sure the preset is on OCULAR

Consider using a tegaderm

LOTS, and I mean LOTS, of gel

Complete sagittal and transverse exams AND kinetic

Compare with the other eye if you are not sure.



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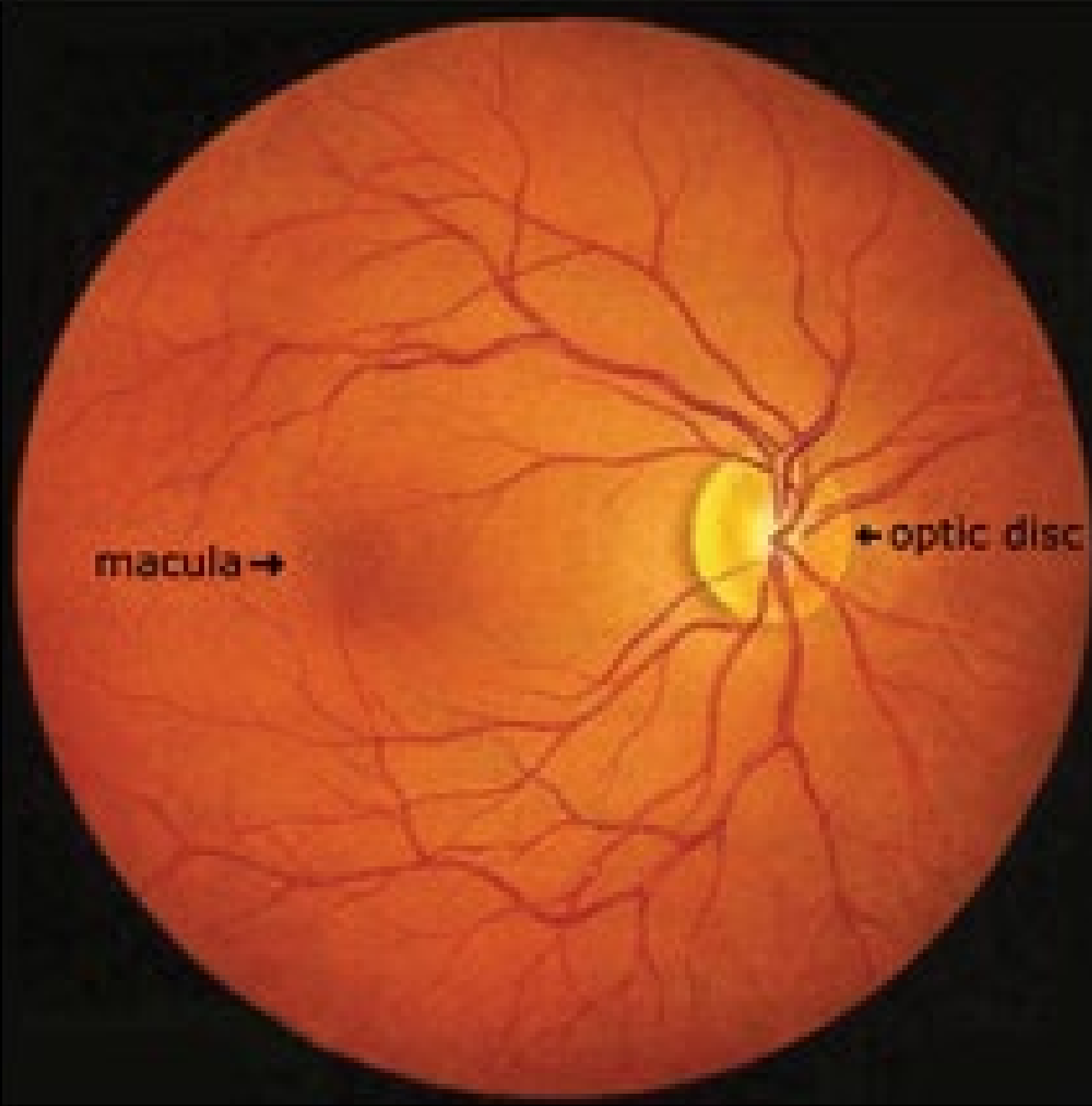
CASE #1

17 yo girl with headache x 8 days and new double vision.

On exam R 6th nerve palsy and a L eye temporal visual field defect.



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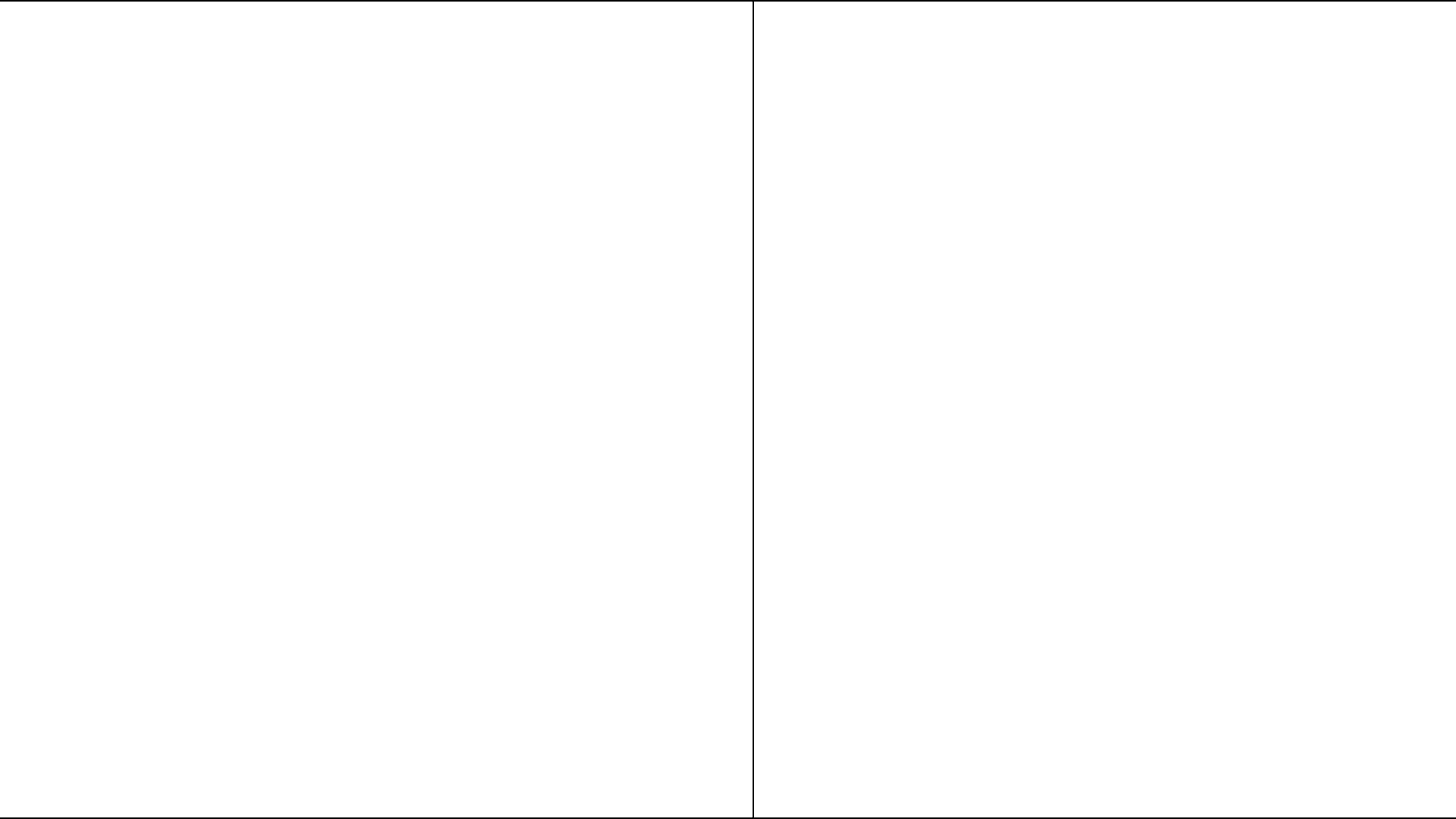
macula →

← optic disc









OPTIC NERVE SHEATH DIAMETER

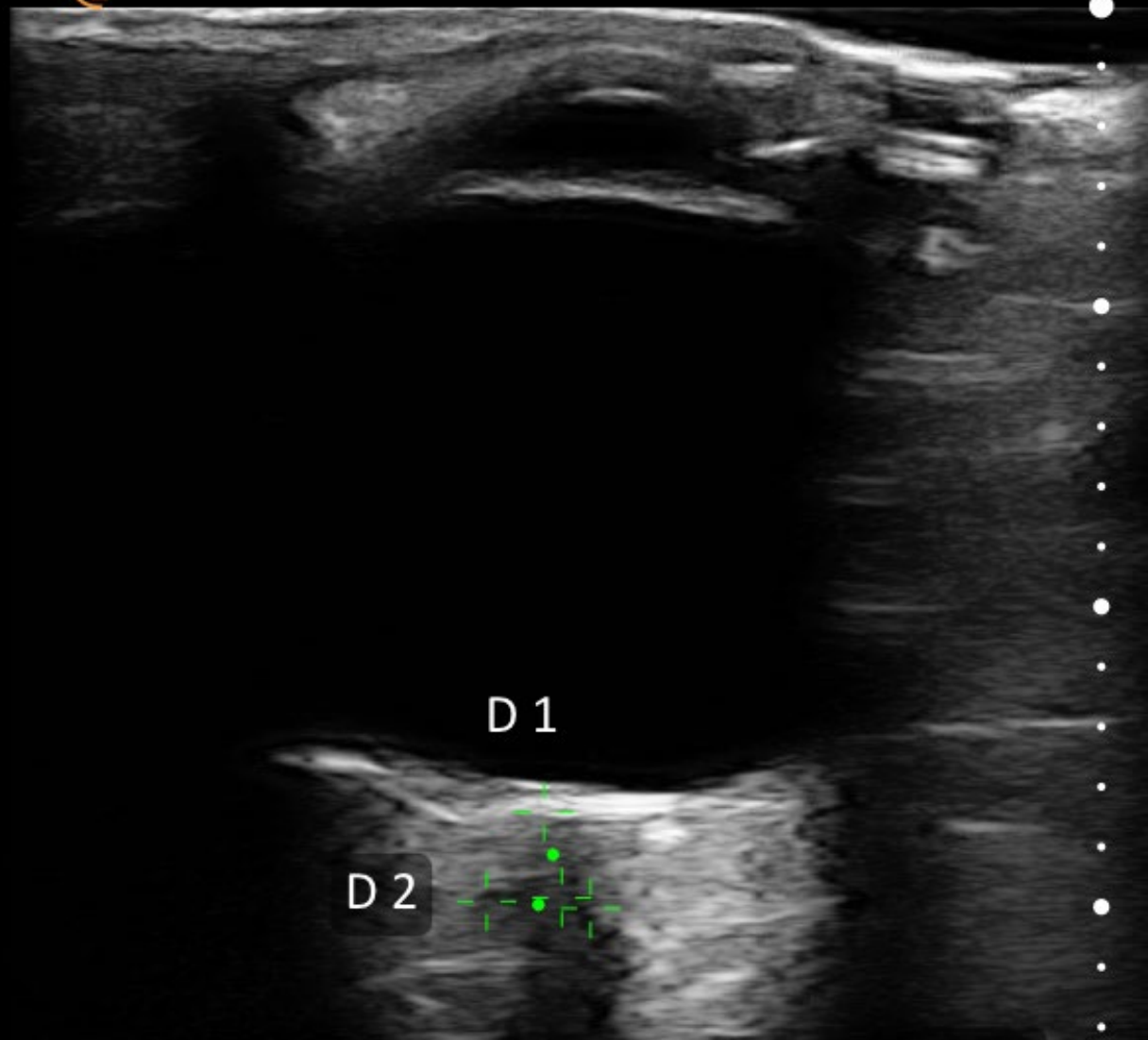
Measurement of increased intracranial pressure

Should be measured 3mm distal to the optic disk

Abnormal is a measurement greater than 5 mm

Think of the 3x5 cue card

D 1 2.927 mm
D 2 3.47 mm



D 1

D 2

3.4 cm



Measure diameter 3 mm posterior to where optic nerve sheath engages retina





CASE #1

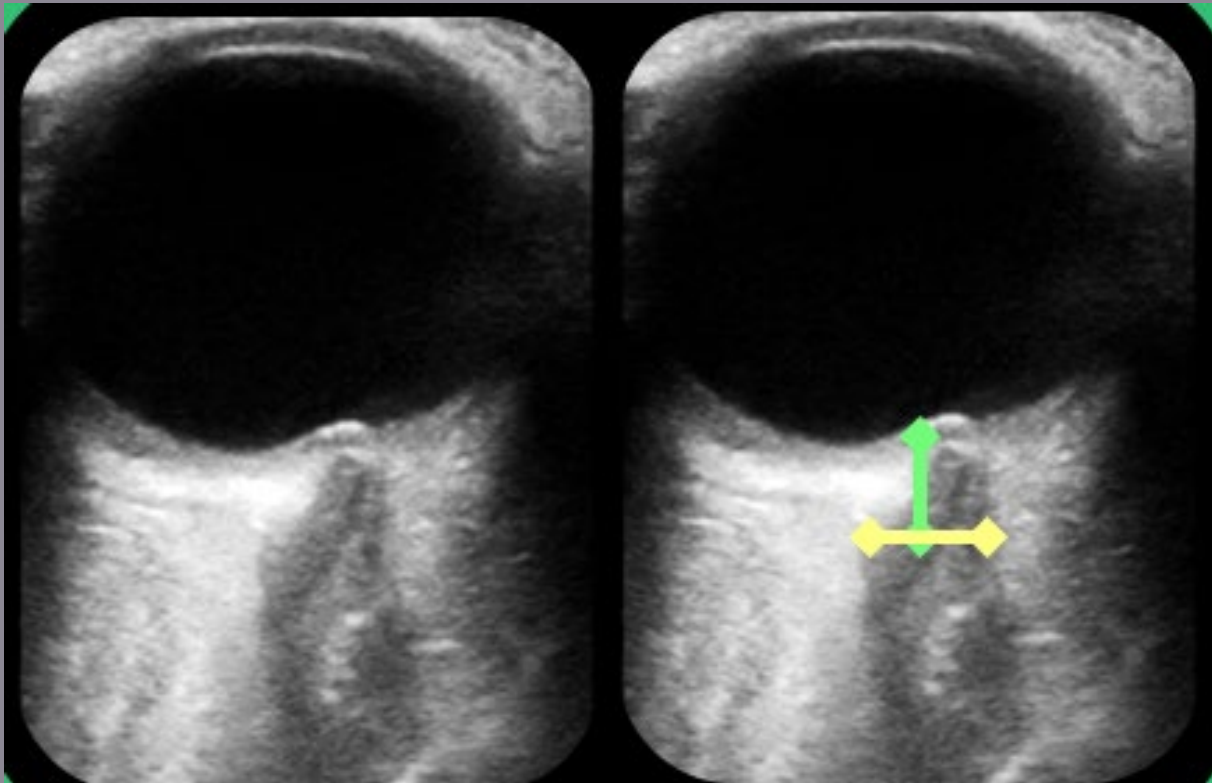
CT was negative. CT venogram negative

Opening pressure=56 with improvement of headache following removal of 40cc cerebrospinal fluid.



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HOW GOOD IS OPTIC NERVE SHEATH DIAMETER FOR DIAGNOSING INCREASED INTRACRANIAL PRESSURE?



J American College of EP: 2021

Results

Sens	46.9%
Spec	87%

REVIEW ARTICLE

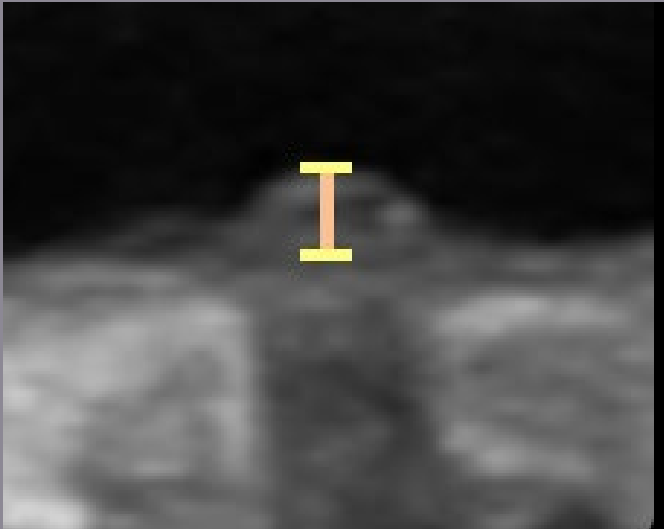
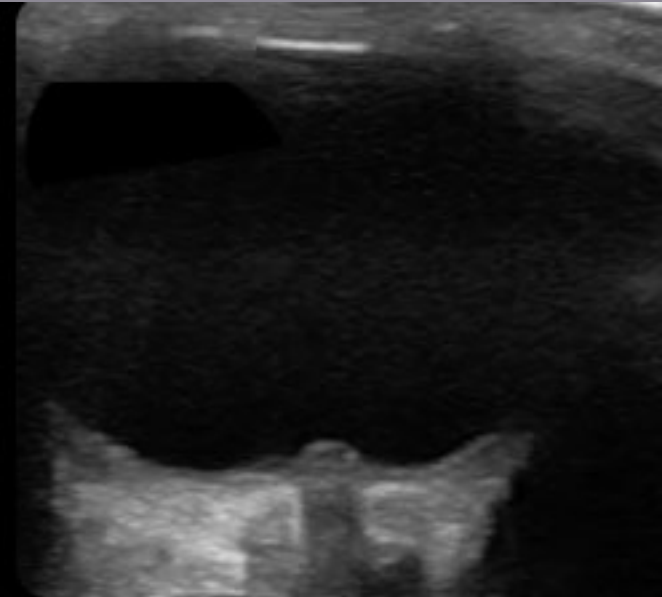
Using Optic Nerve Sheath Diameter for Intracranial Pressure (ICP) Monitoring in Traumatic Brain Injury: A Scoping Review



Karol Martínez-Palacios^{1,2} , Sebastián Vásquez-García^{2,3} , Olubunmi A. Fariyike^{2,4} , Chiara Robba⁵ 
and Andrés M. Rubiano^{1,2*}  on behalf of the noninvasive ICP monitoring international consensus group

Conclusion: Overall, ONSD exhibits great test accuracy and has a strong, almost linear correlation with invasive methods. Thus, ONSD should be considered one of the most effective noninvasive techniques for ICP estimation in TBI patients.

HOW GOOD IS ELEVATED DISK HEIGHT FOR DIAGNOSING INCREASED INTRACRANIAL PRESSURE?



RESULTS

[mean of both eyes]	AUC
ODE	.962
ODWAMH	.876
ONSD	.778

Cutoff of 0.66mm for ODE yielded 96% sens 93% spec





CASE #2

35 yo male with a history of myopia presents with ***Painless Loss of Vision.***

Started earlier in the day with some flashes of light and now he has “floaters” in one eye.



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DDX: PAINLESS LOSS OF VISION

Stroke Syndromes including ischemic optic neuritis

CRAO

CRVO

Retinal Detachment

Vitreous Detachment

Vitreous Hemorrhage

(Optic Neuritis)



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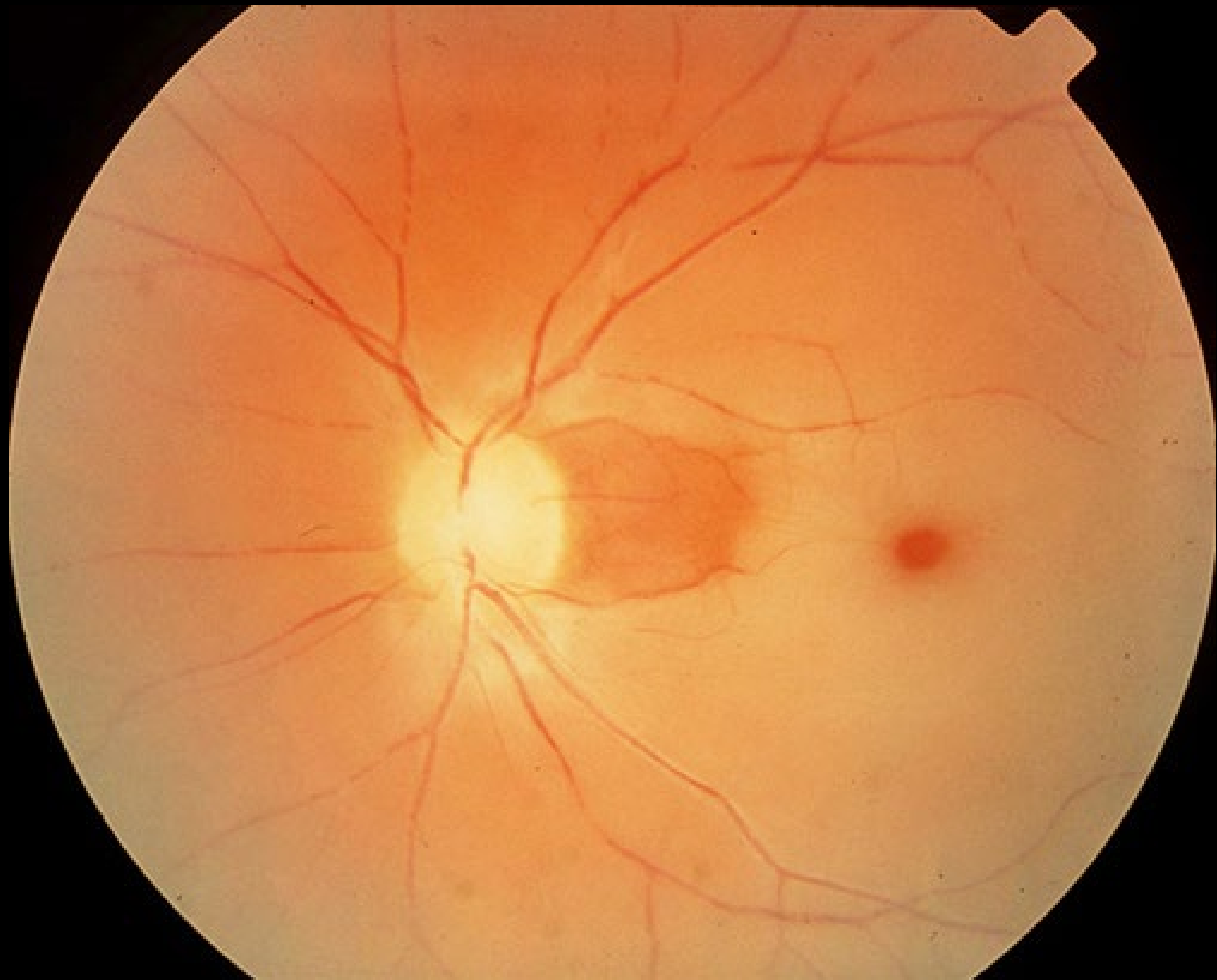
POLL QUESTION

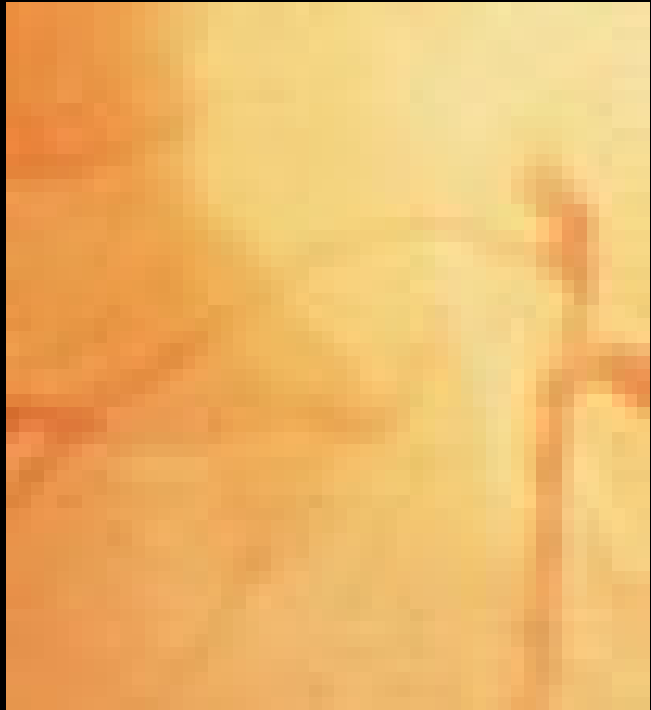
Which of the following CANNOT be diagnosed with POCUS?

- CRAO
- Retinal Detachment
- CRVO
- Vitreous Hemorrhage

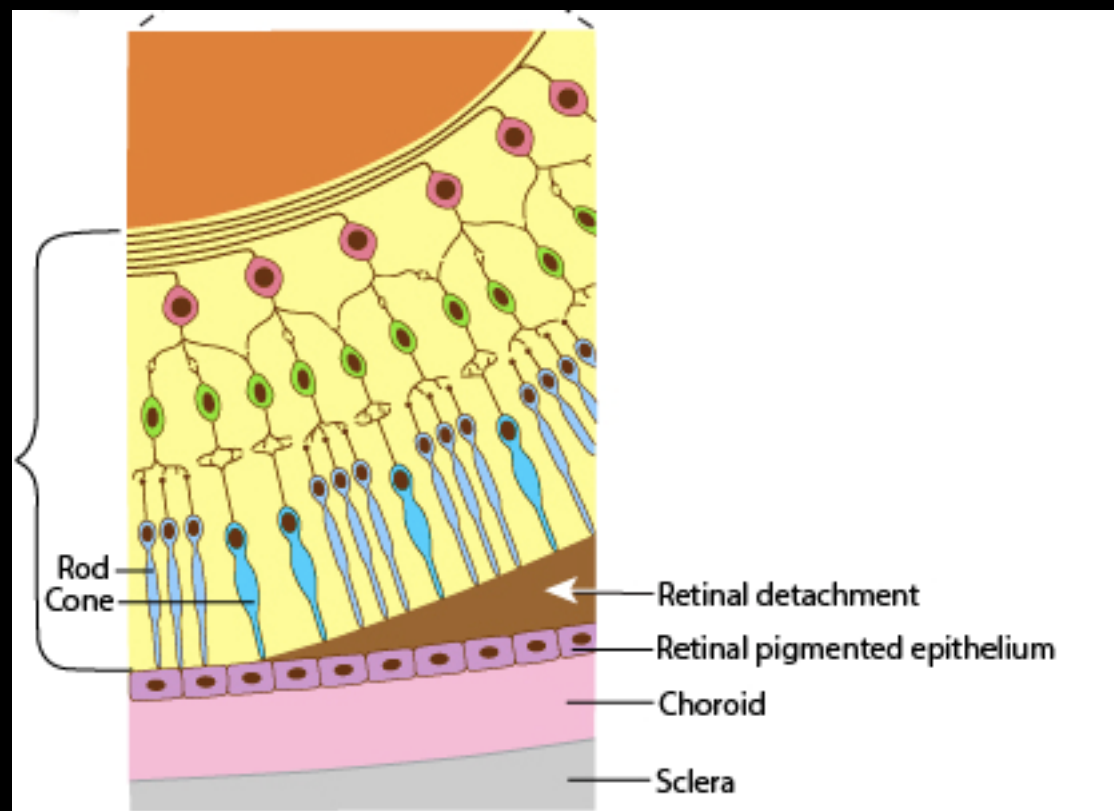
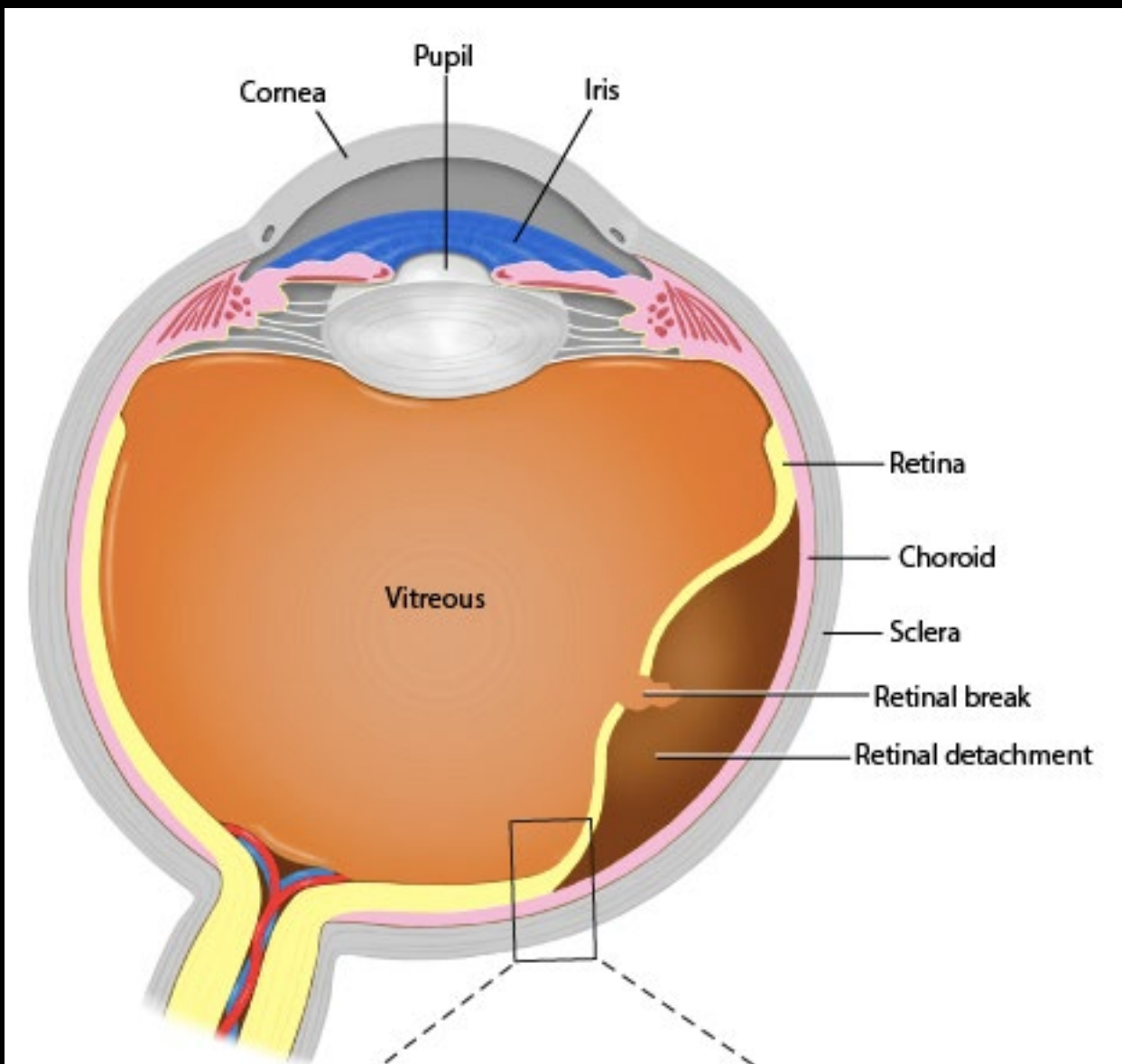


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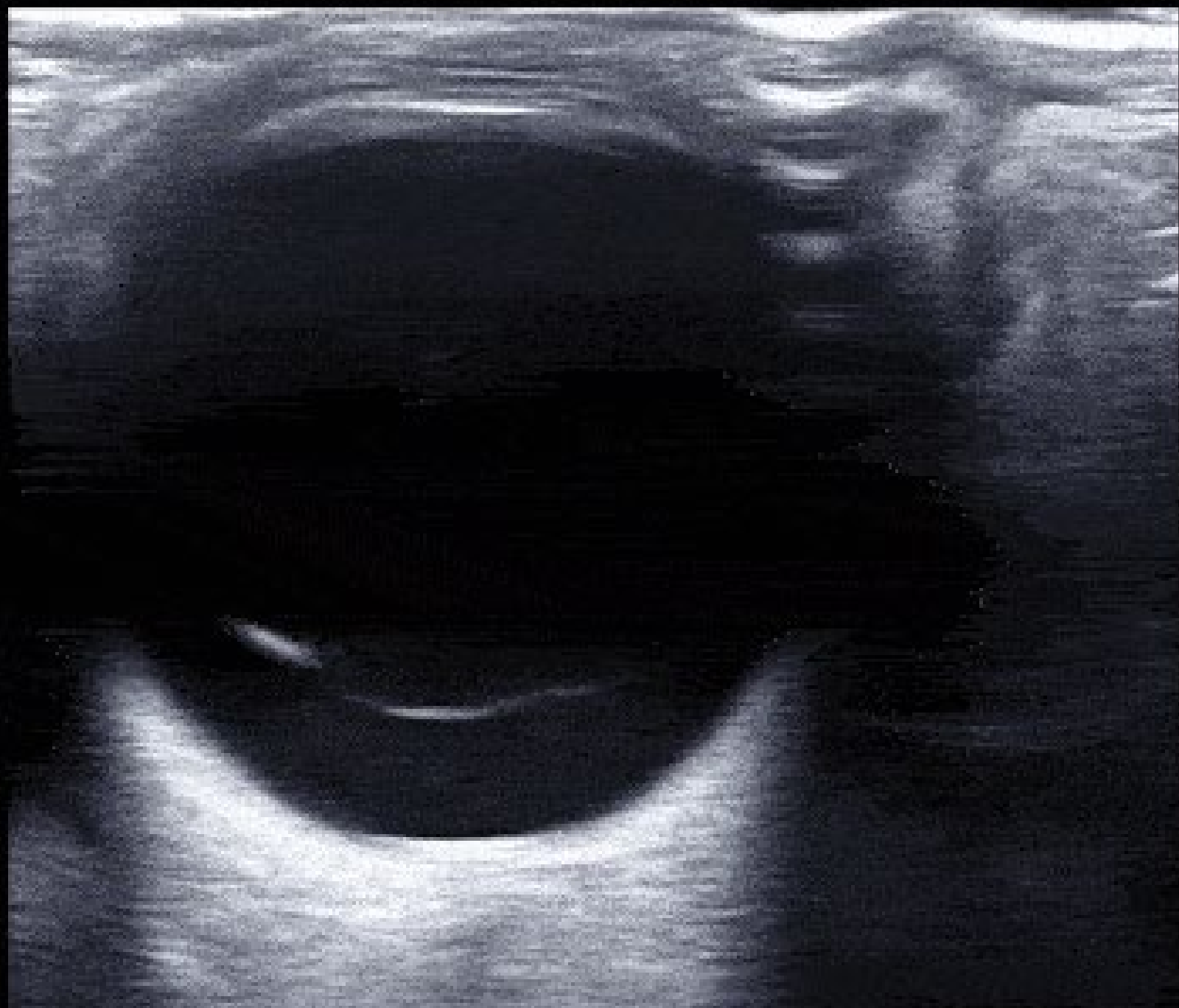
LOGIQ
E9



- B
- Frq
- Gn
- S/A
- ▼ Map
- D
- DR
- 1▼ AO%
-
-
- ▼
- 2-
-
-
- ▼
-
- 3-
-







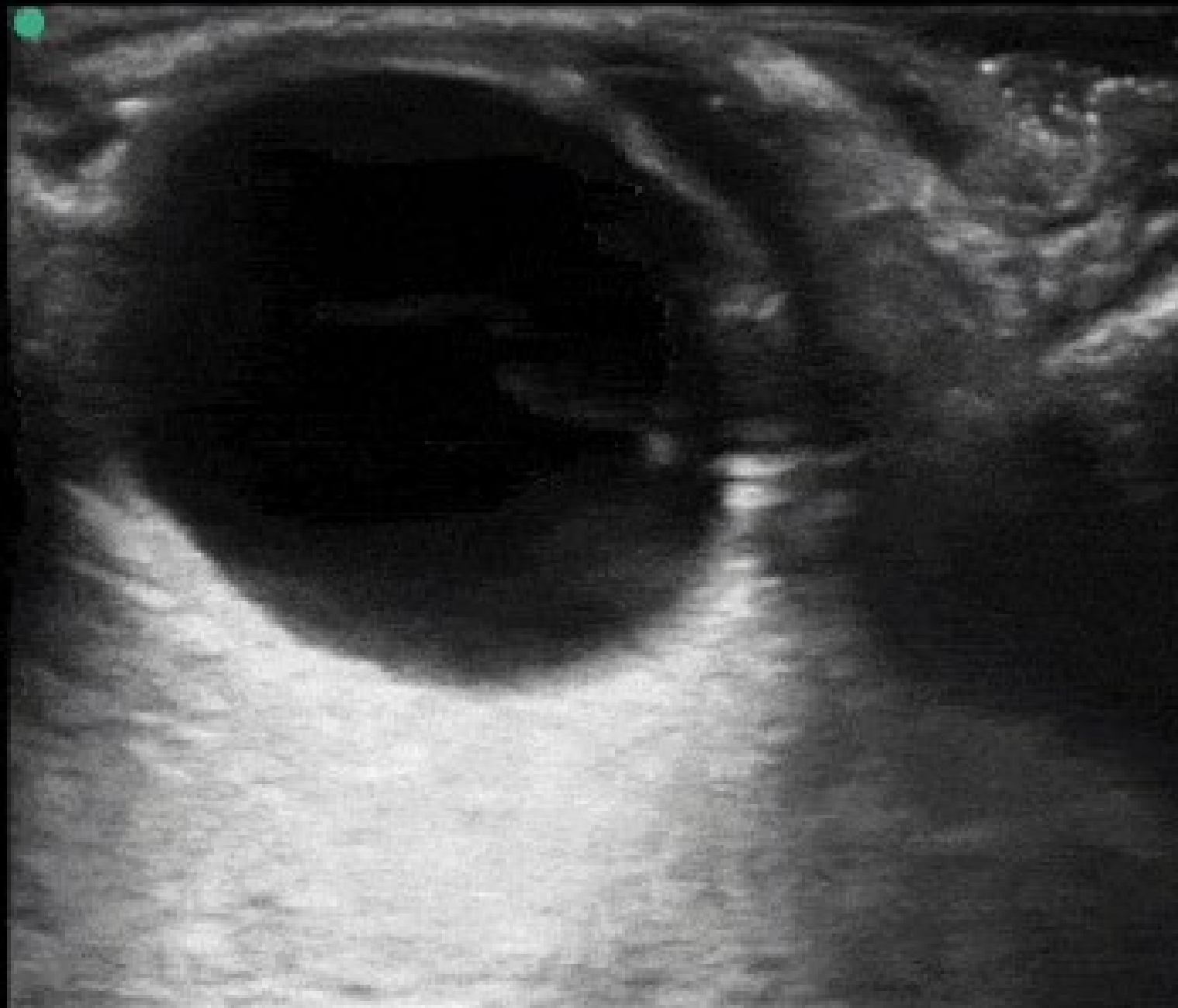
ASC ACCE
12-4
7 Hz
3.5cm

P



D
Res
Gn 100
47
7/3/3



Res
S MB



Nrv
HFL
56%
MI
0.8
TIS
0.1

A 
B 

3.3





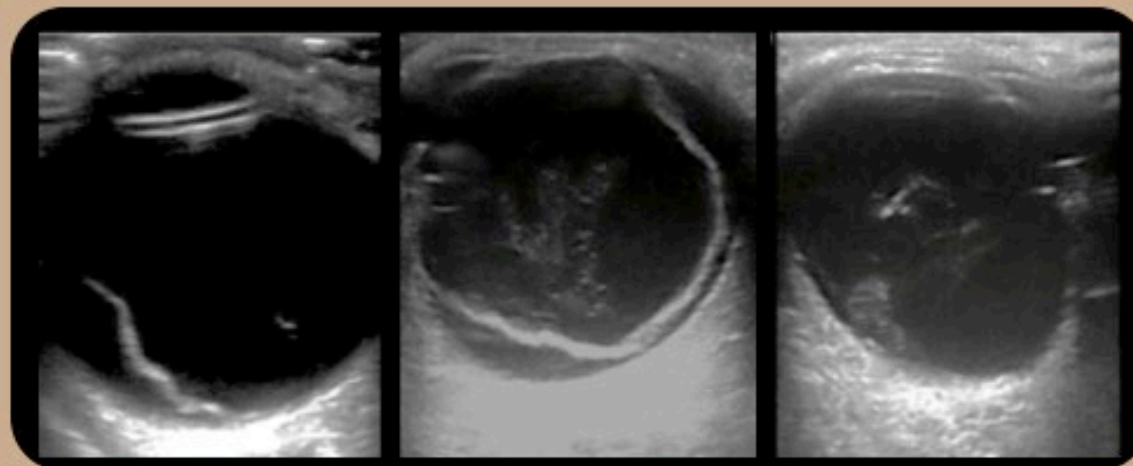








OCULAR: RD + VH + VD



Question:

How accurate is point-of-care ultrasound for diagnosing retinal detachment (RD), vitreous hemorrhage (VH), and vitreous detachment (VD)?

Methods:

Prospective multicenter observational convenience sample of ED patients with symptoms of ocular pathology. POCUS compared to standard of ophthalmologic evaluation.

n = 225

RESULTS

Pathology	Sens	Spec
RD	96.9	88.1
VH	81.9	82.3
VD	42.5	96.0

CASE #2 KEY TAKEAWAYS

Ultrasound for retinal detachment is 98% sensitive and 93% specific so it's worth doing.

Increase the gain to find vitreous hemorrhage/vitreous detachment.



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CASE #2 Q&A

POST YOUR QUESTIONS IN THE CHATBOX



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CASE #3

16 yo female with a baseball to the
R orbit.

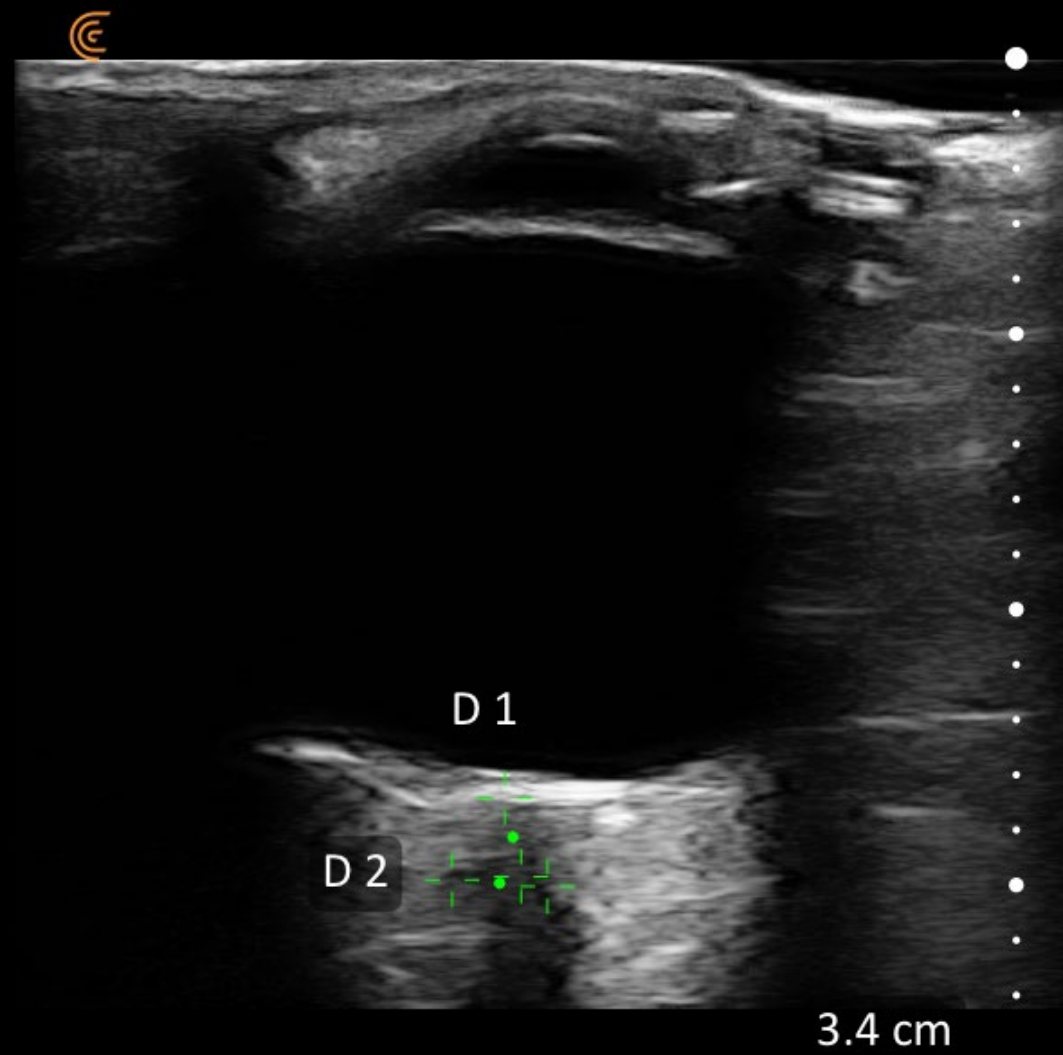


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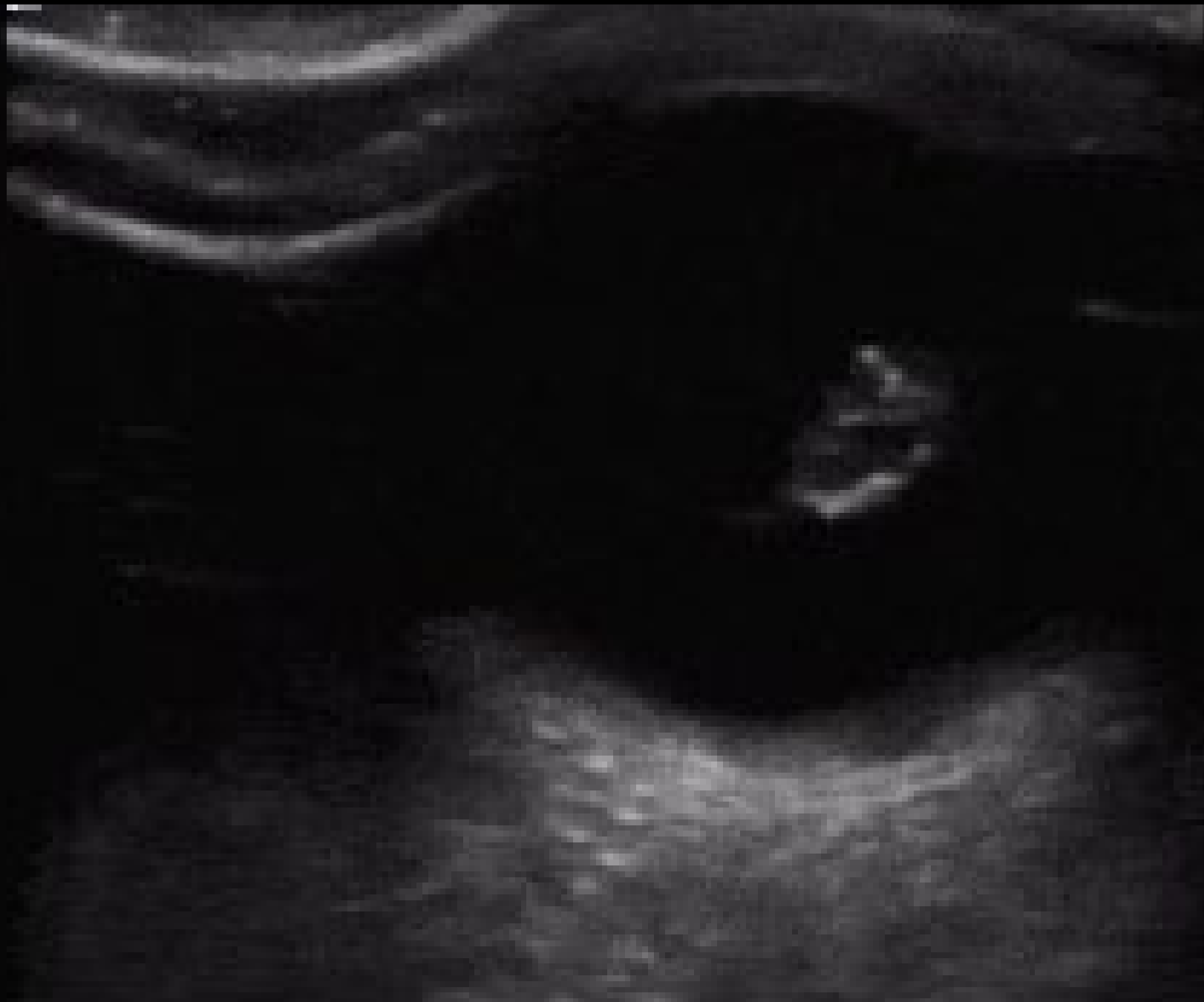
D 1 2.927 mm
D 2 3.47 mm



D 1
D 2

3.4 cm

ME



HFL



63%

MW

0.8

TIS

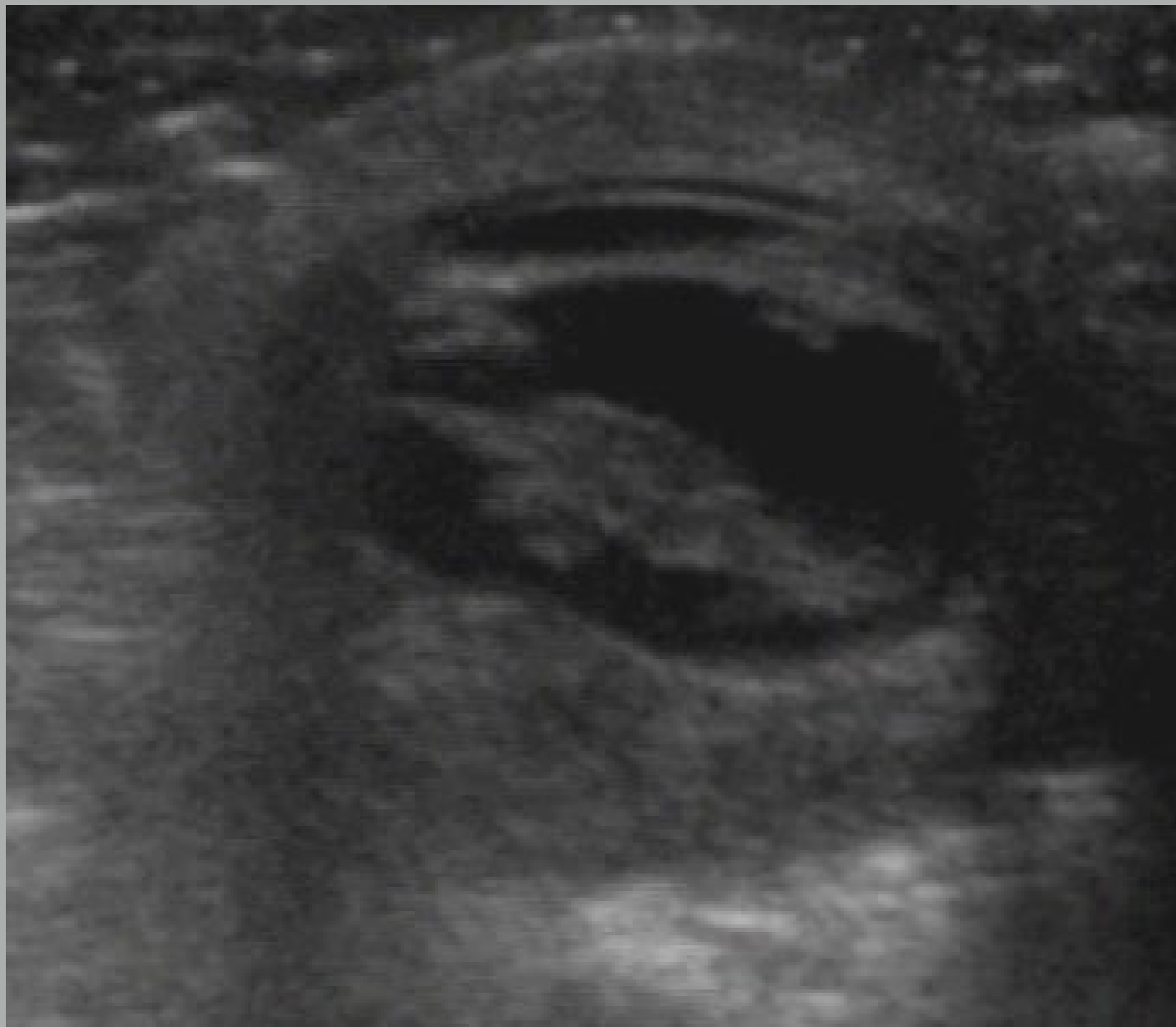
0.1

A 0.0

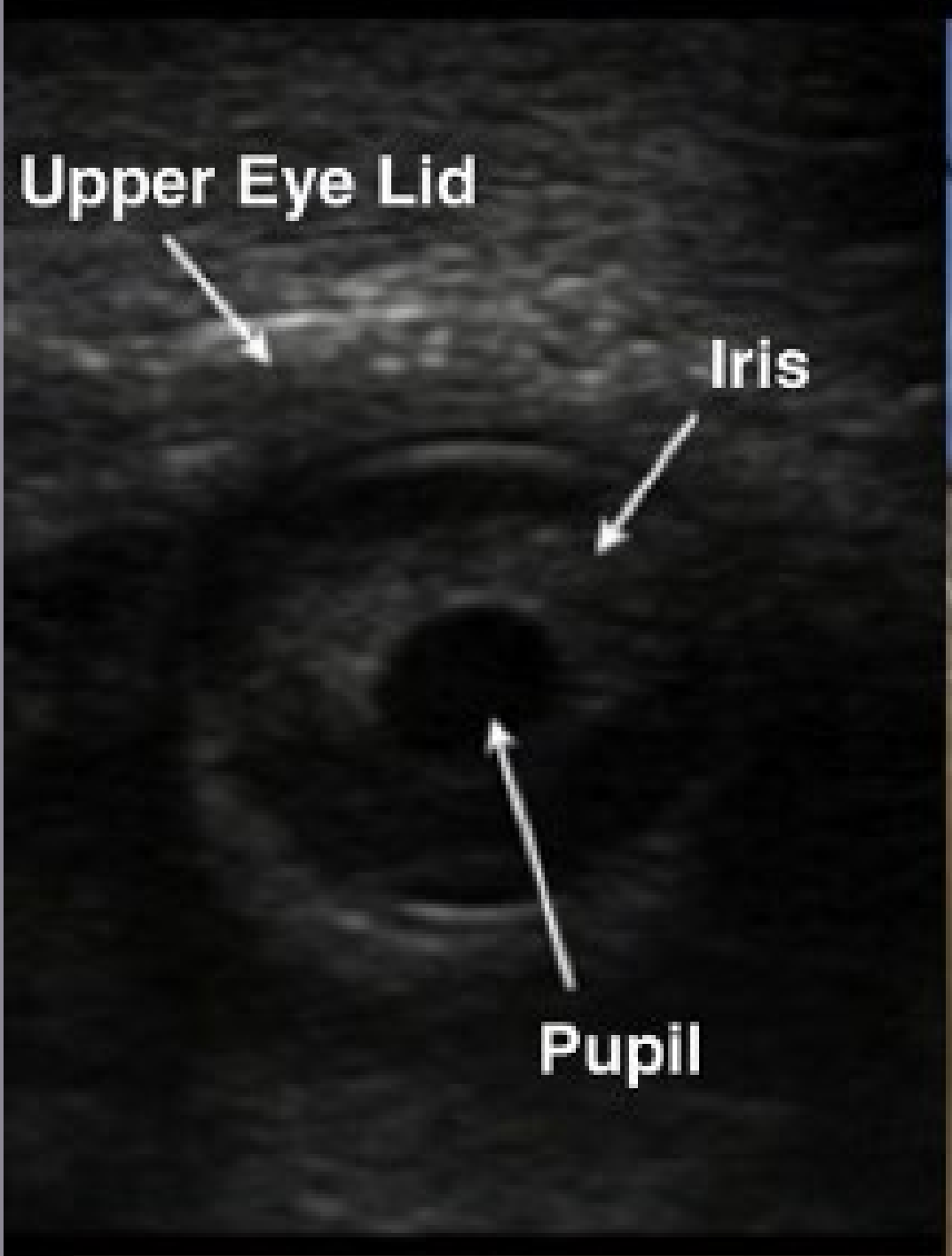
B 0.0

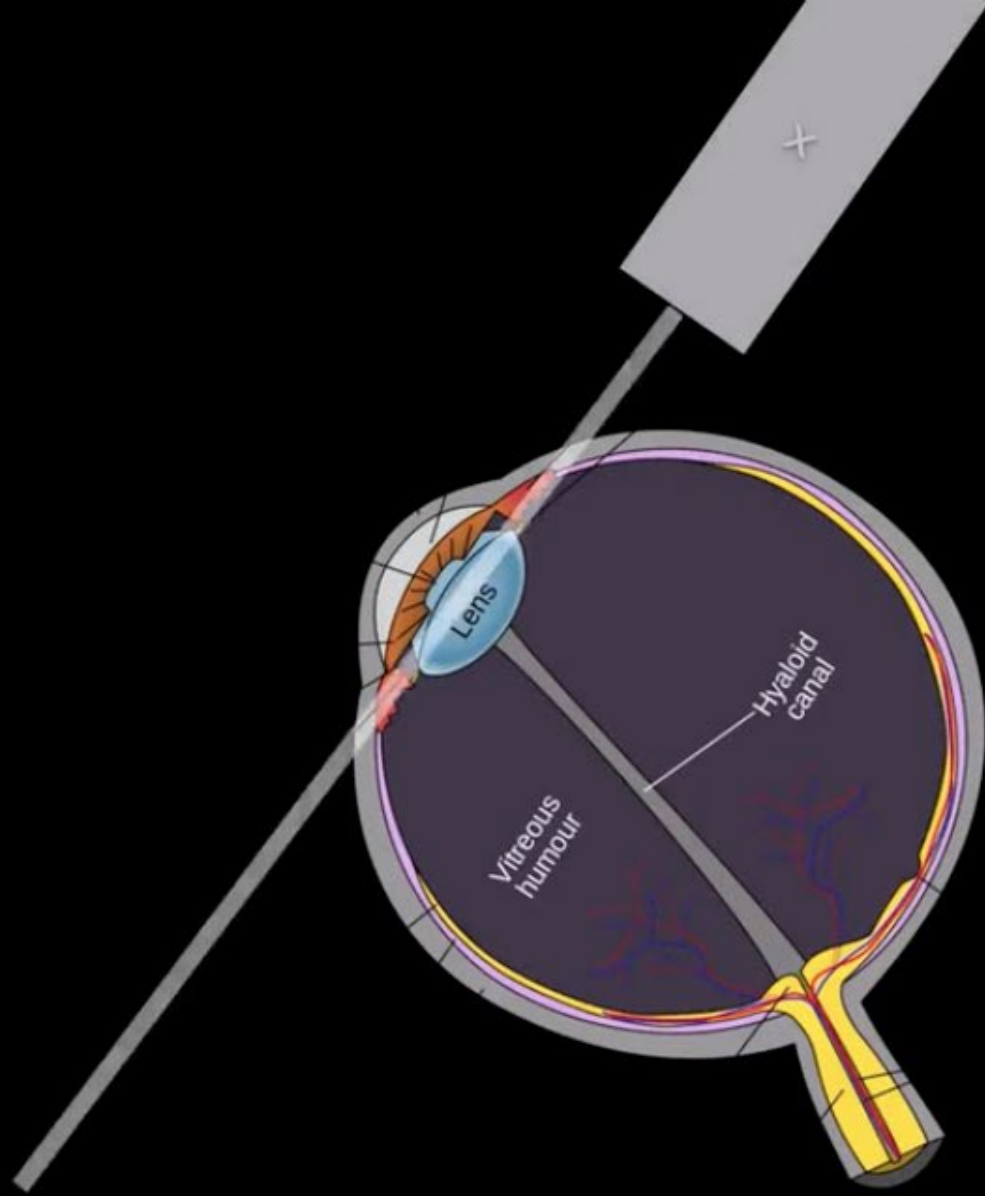
3.3

GLOBE RUPTURE



LIGHT REFLEX







C ACCE

-4

Hz

cm

s

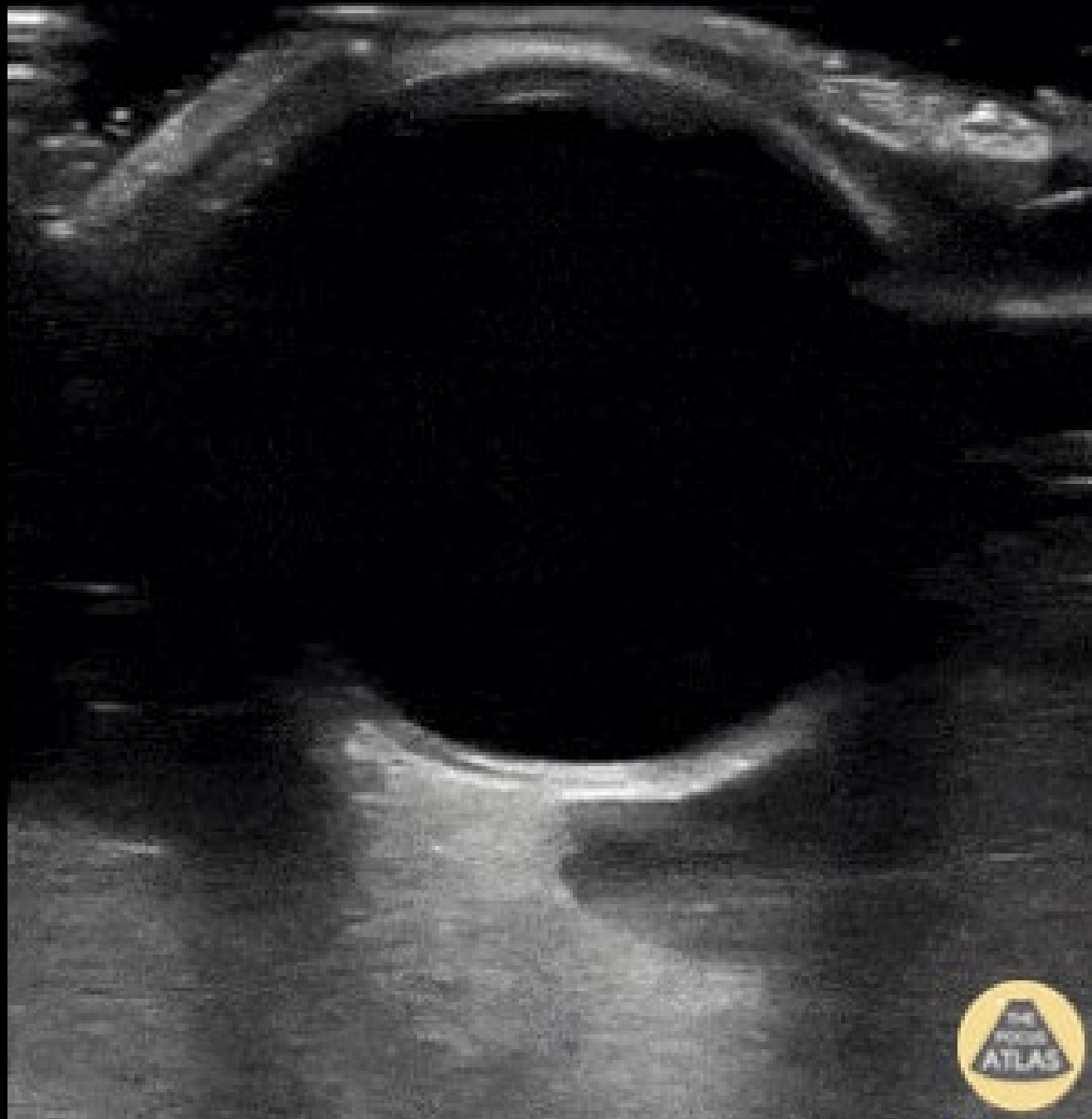
90

3/3



3.0cm







CASE #3 KEY TAKEAWAYS



Ultrasound can be helpful in traumatic injury to assess:

1. Extra-ocular movements
2. Consensual Light Reflex
3. Globe rupture
4. Increased intracranial pressure
5. Retrobulbar hematoma
6. Lens Dislocation

RESOURCES MENTIONED

- Jacobsen, B et al. **Retrospective review of ocular point-of-care ultrasound for detection of retinal detachment.** West J Emerg Med. 2016 Mar;17(2) [PMID: 26973752](#)
- Wilson CL et al. **Novice emergency physician ultrasonography of optic nerve sheath diameter compared to ophthalmologist fundoscopic evaluation for papilledema.** J Am Coll Emerg Physicians Open 2021; 2(1)
- Tessaro et al. **Pediatric point-of-care ultrasound of optic disc elevation for increased intracranial pressure: A pilot study.** Am J Emerg Med 2021:4918-23
- Latham S et al. **Point-of-Care Ultrasonography in the Diagnosis of Retinal Detachment, Vitreous Hemorrhage, and Vitreous Detachment in the Emergency Department.** JAMA network open. 2019;2(4):e192162
- Woo MY et al. **Test characteristics of point-of-care ultrasonography for the diagnosis of acute posterior ocular pathology.** Canadian Journal of Ophthalmology. 2016;51(5):336-341



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