# Ocular Ultrasound

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# Introduction

- Ocular anatomy
- Technique
- Ultrasound evaluation of:
  - Ocular trauma
  - Acute vision loss

# Introduction

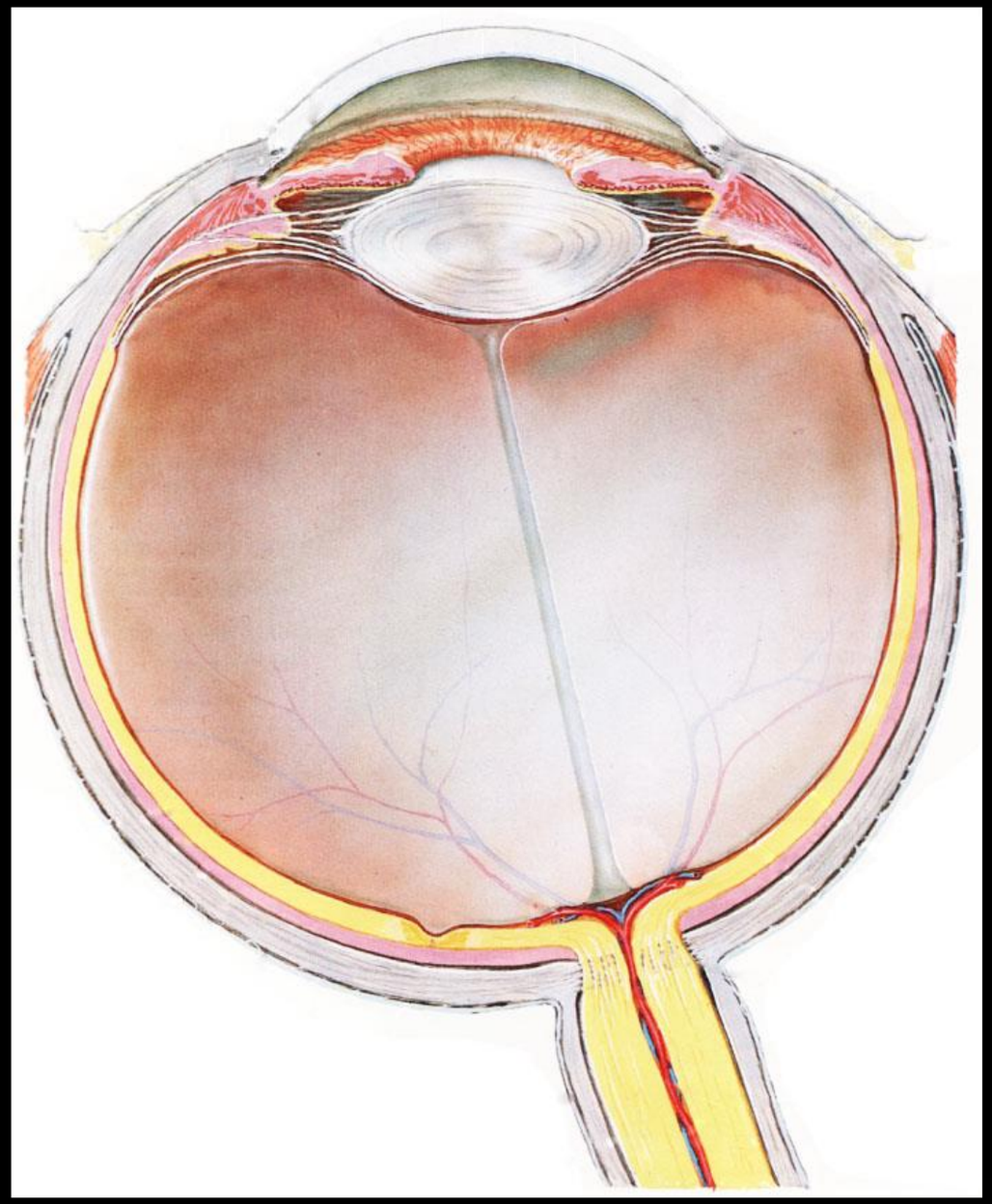
- Eye complaints = 3% of ED visits
- Fundoscopic exam often limited
  - requires pupillary dilation
  - difficult with severe trauma
- The eye is perfect for ultrasound!

# Indications

- Eye trauma
  - retinal detachments, vitreous hemorrhage, retrobulbar hematoma, lens dislocation, globe injuries
- Acute vision change
  - lens dislocation, vitreous hemorrhage, vitreous detachment

Ocular Ultrasound

# Sonographic Anatomy



# Probe Selection

# Scanning Pearls

- Supine position
- May use tegaderm for barrier
- Copious gel if suspicious for globe perforation/rupture
- Stabilize hand

Technique

# Scanning Pearls


Technique

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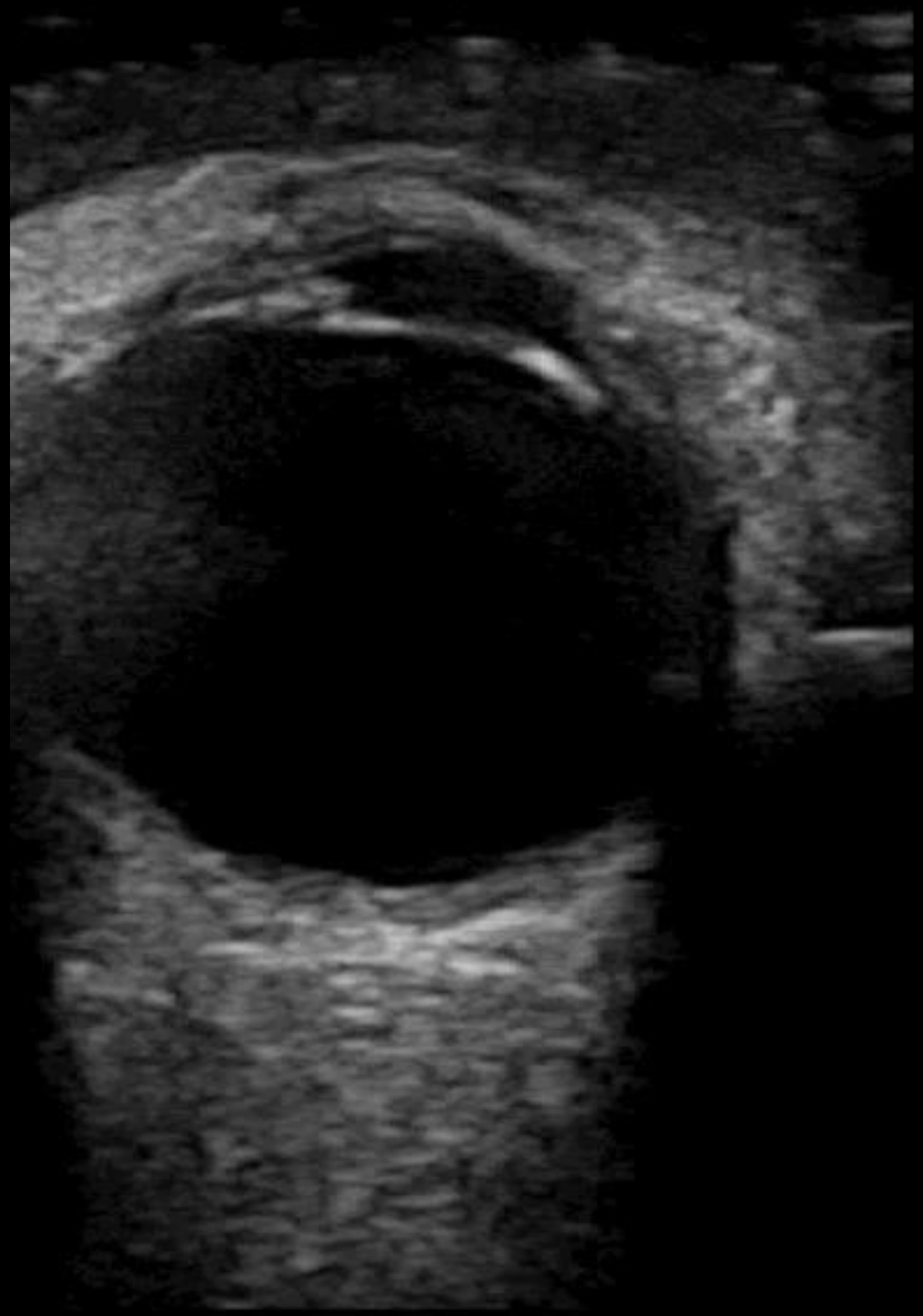
Technique

# Scanning Pearls

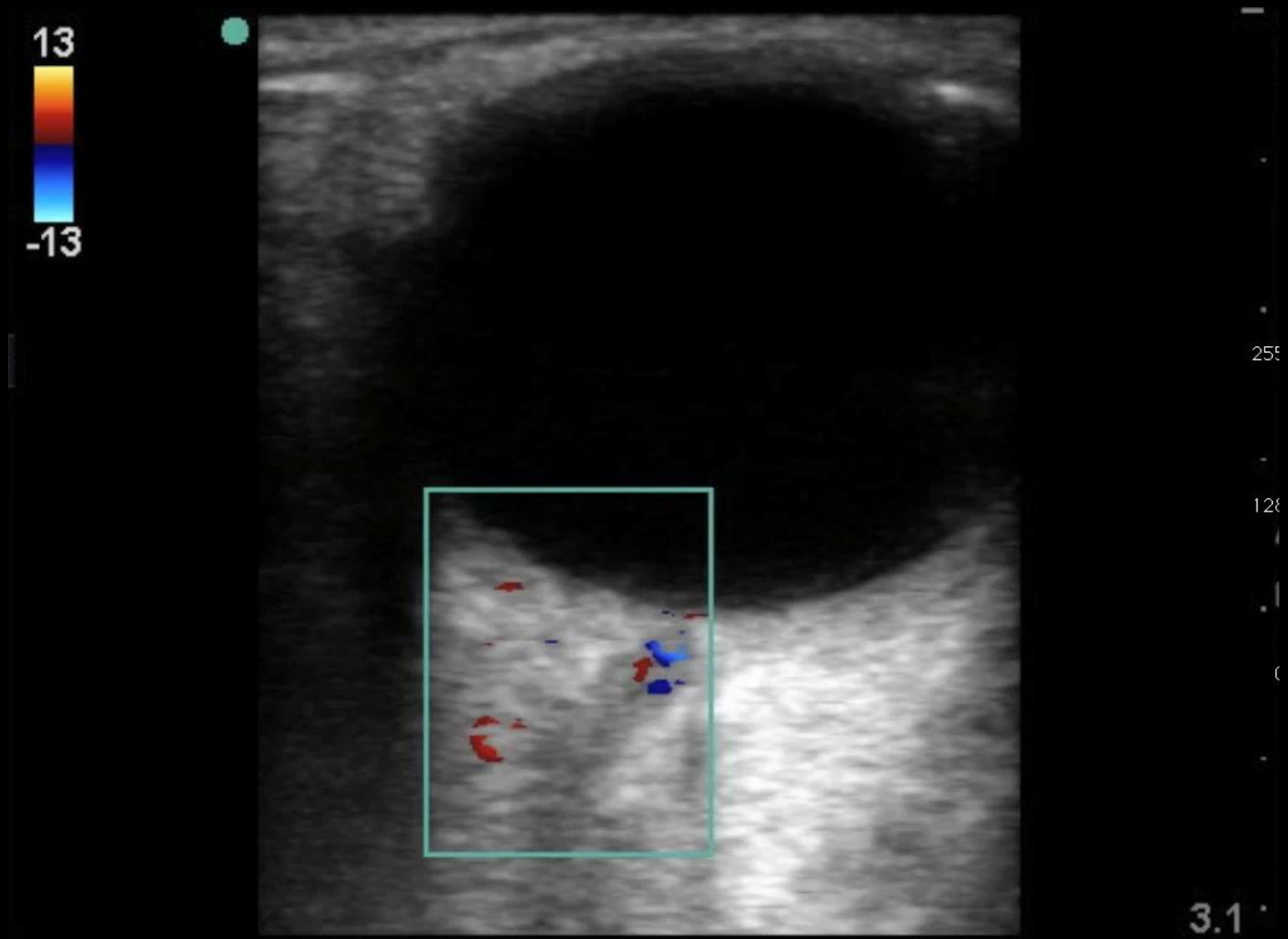
# Kinetic Exam



- examine all quadrants
- improves identification of pathology
- assess extra ocular movements

Technique

# Vascular Supply



Technique

# Vascular Supply

# Acute Non-Traumatic Vision Loss

# Differential

- Retinal detachment
- Vitreous hemorrhage
- Central retinal artery/vein occlusion
- Optic Neuritis
- Temporal arteritis
- CVA

# Retinal Detachment

- “Classic” presentation
  - Sudden painless vision loss
  - Photopsias (flashes of light)
  - “Floaters”
  - “Curtain” of vision loss

# Retinal Detachment

- Types of retinal detachment
  - Rhegmatogenous: caused by shrinking vitreous
  - Tractional: Connective tissue creates tractional forces
  - Exudative: Leakage underneath retina

# Retinal Detachment


- highly reflective linear structure
- moves with eye movement
- tethered at ora serrata and optic nerve

Acute Non-Traumatic Vision Loss

# Retinal Detachment

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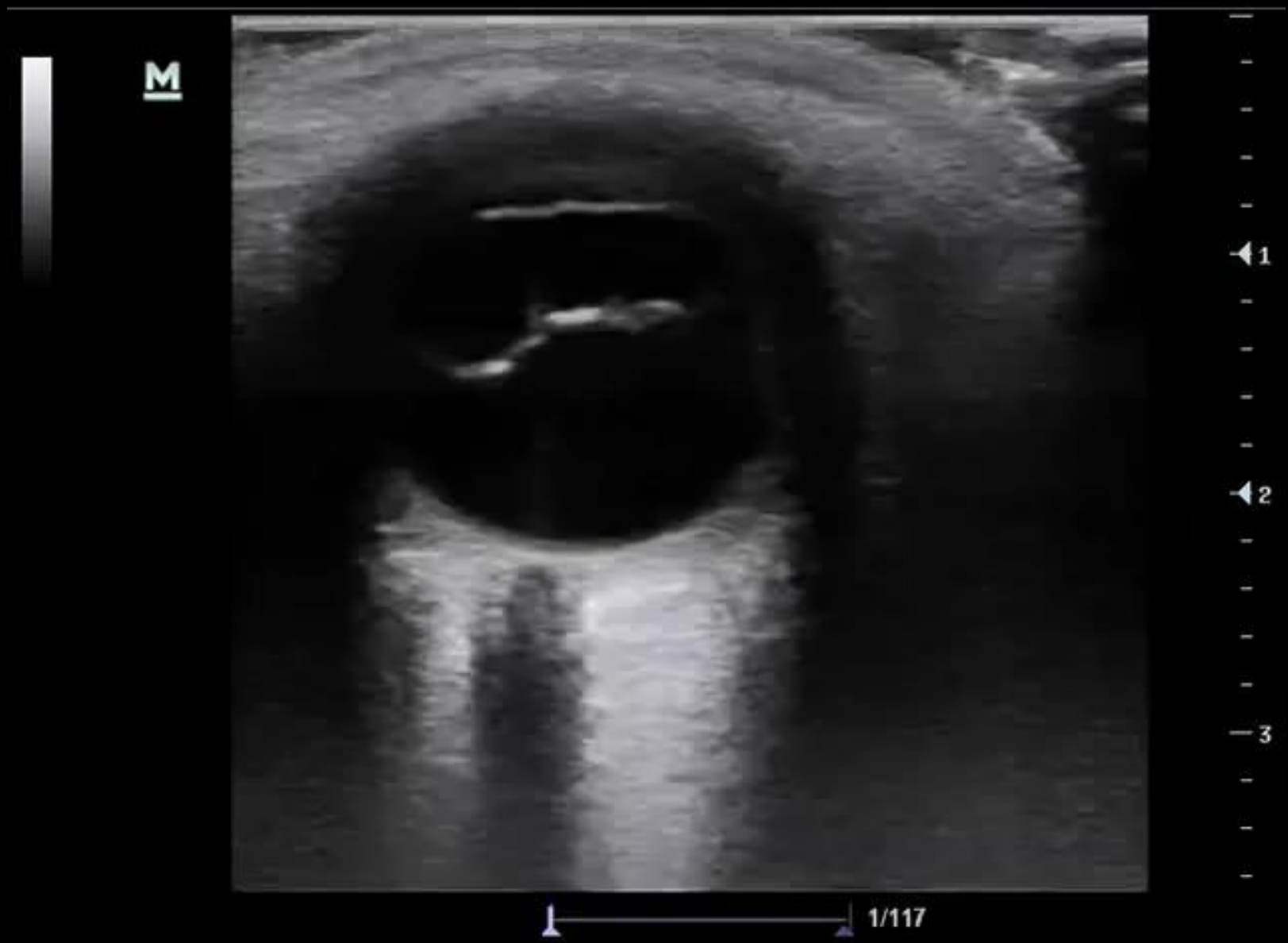
# Retinal Detachment



Acute Non-Traumatic Vision Loss

# Retinal Detachment

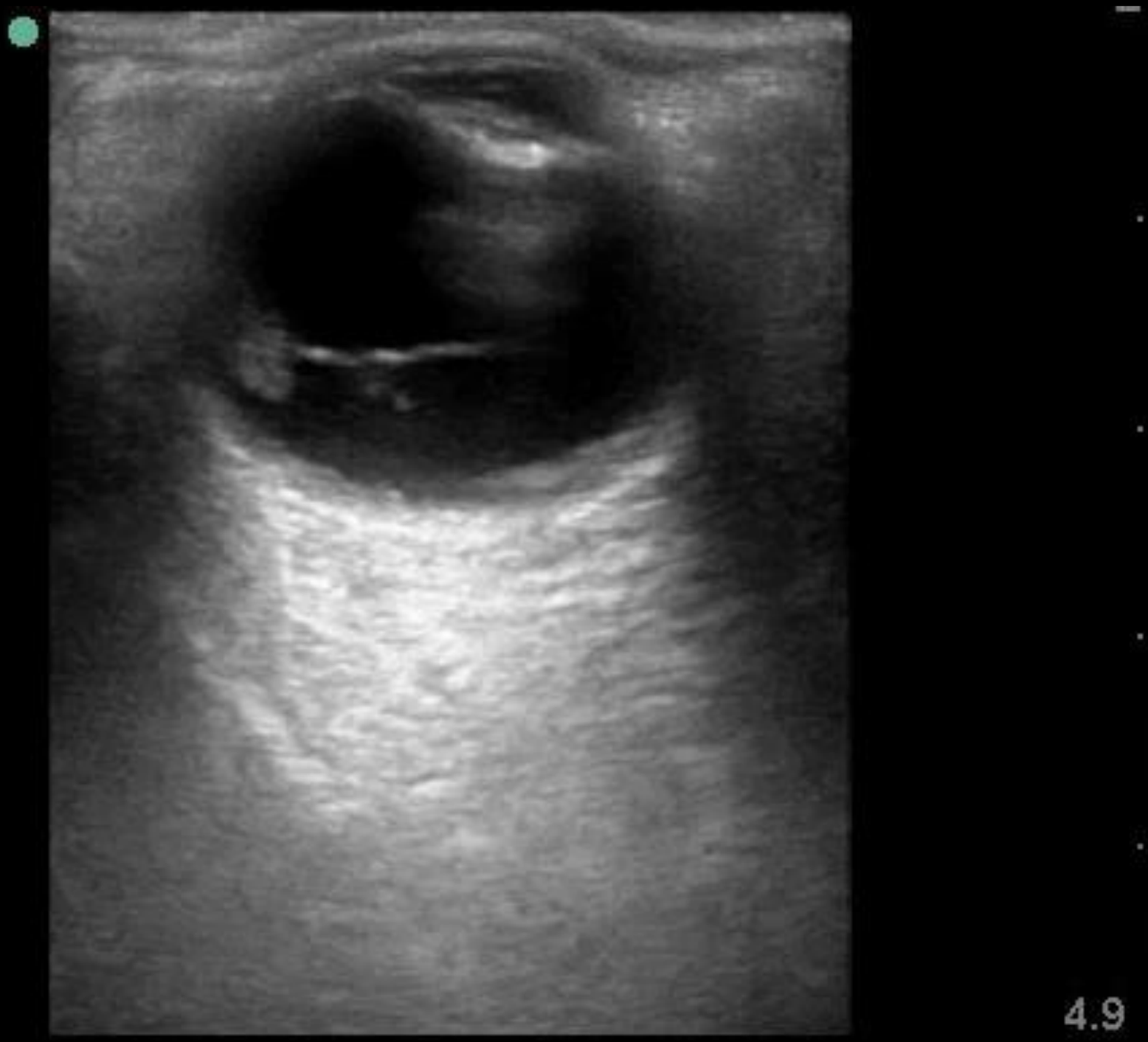
Acute Non-Traumatic Vision Loss

# Retinal Detachment

rhegmatogenous detachment

Acute Non-Traumatic Vision Loss

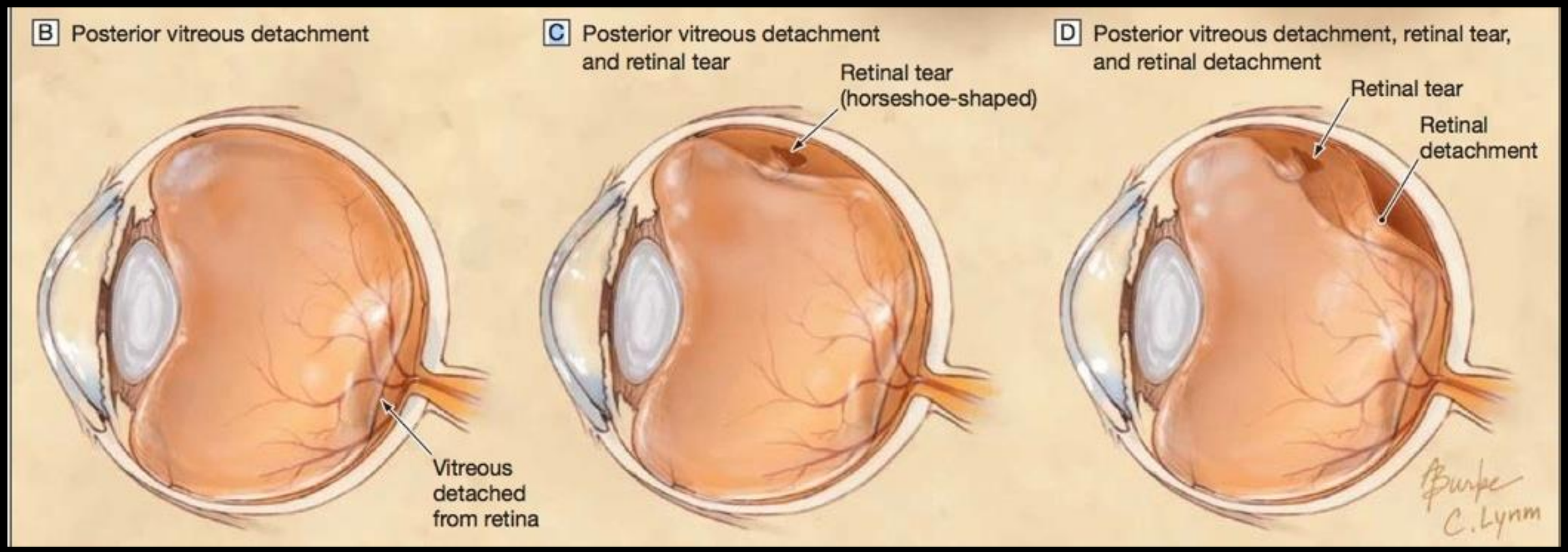
# Retinal Detachment




RD with sub-retinal hemorrhage

Acute Non-Traumatic Vision Loss

# Retinal Detachment



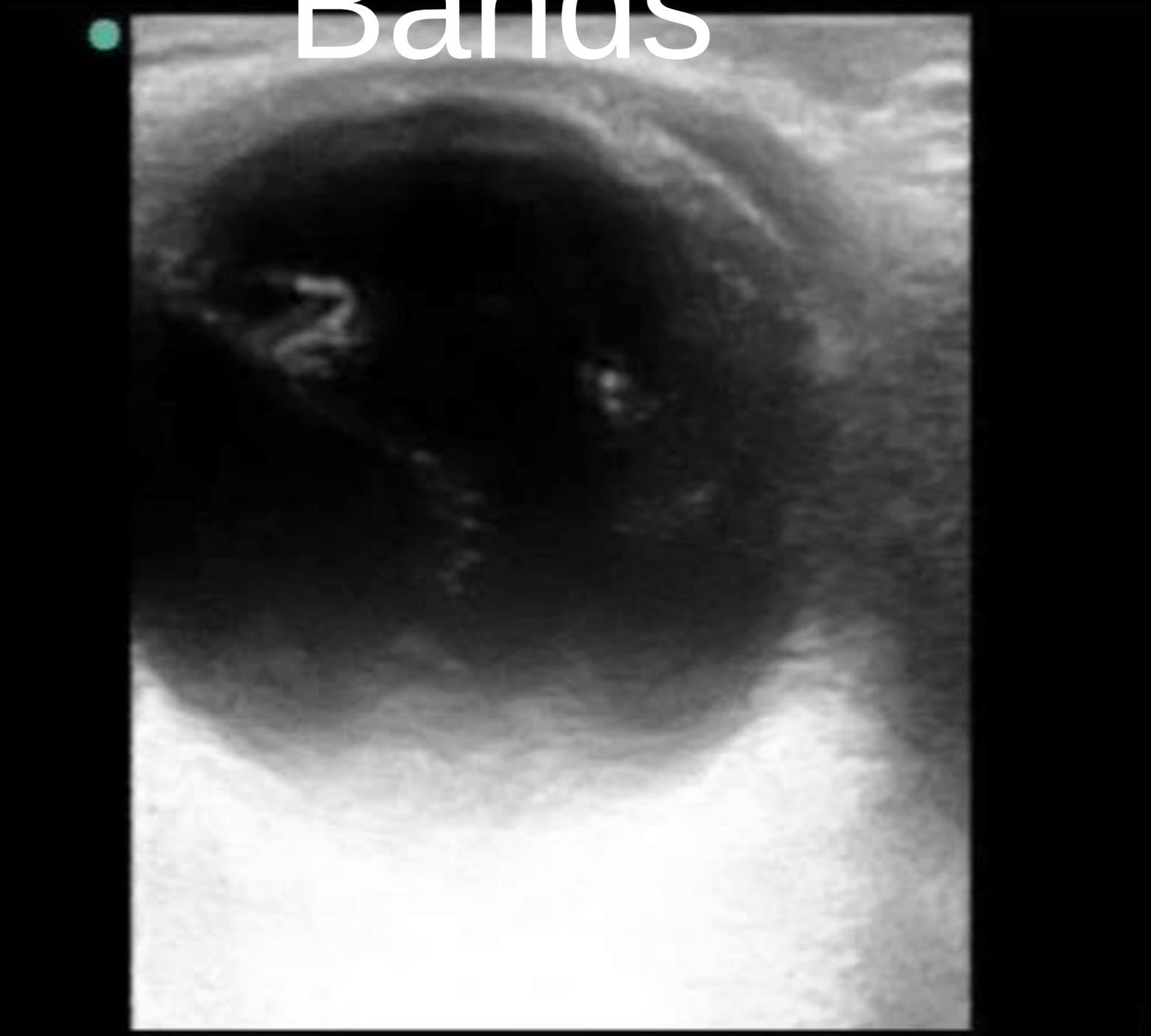

Rhegmatogenous Detachment

# Fibrinous Vitreous Bands

-Usually asymptomatic
-Age related
-Often bilateral
-Also associated with:
  diabetic retinopathy
  prior vitreous hemorrhage
  sickle cell
  prematurity

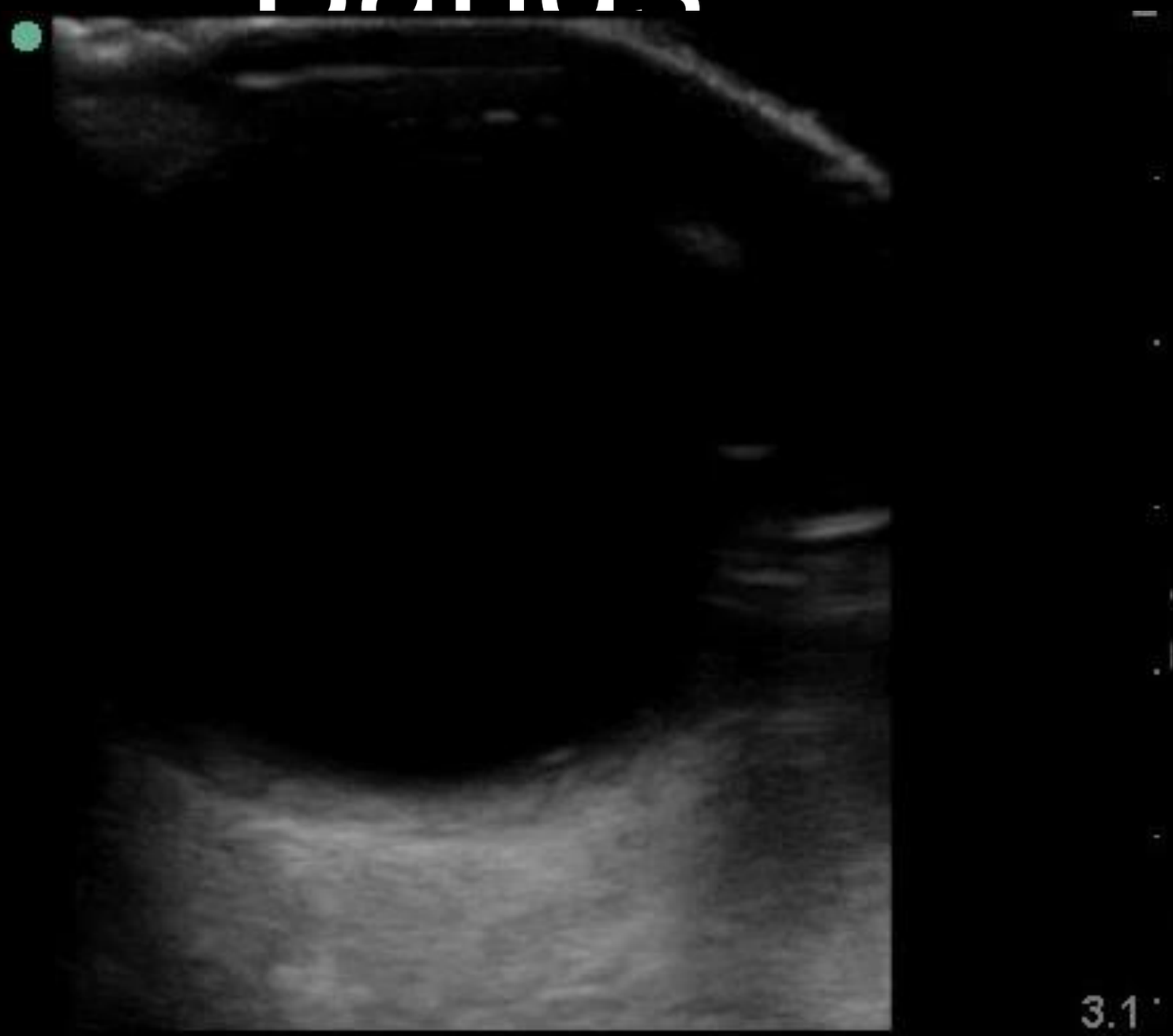
Acute Non-Traumatic Vision Loss

# Fibrinous Vitreous Bands



Acute Non-Traumatic Vision Loss

# Fibrinous Vitreous Bands



# Posterior Vitreous Detachment

-Painless and usually abrupt

-New floaters/photopsia but does not significantly threaten vision

-Usually consequence of aging

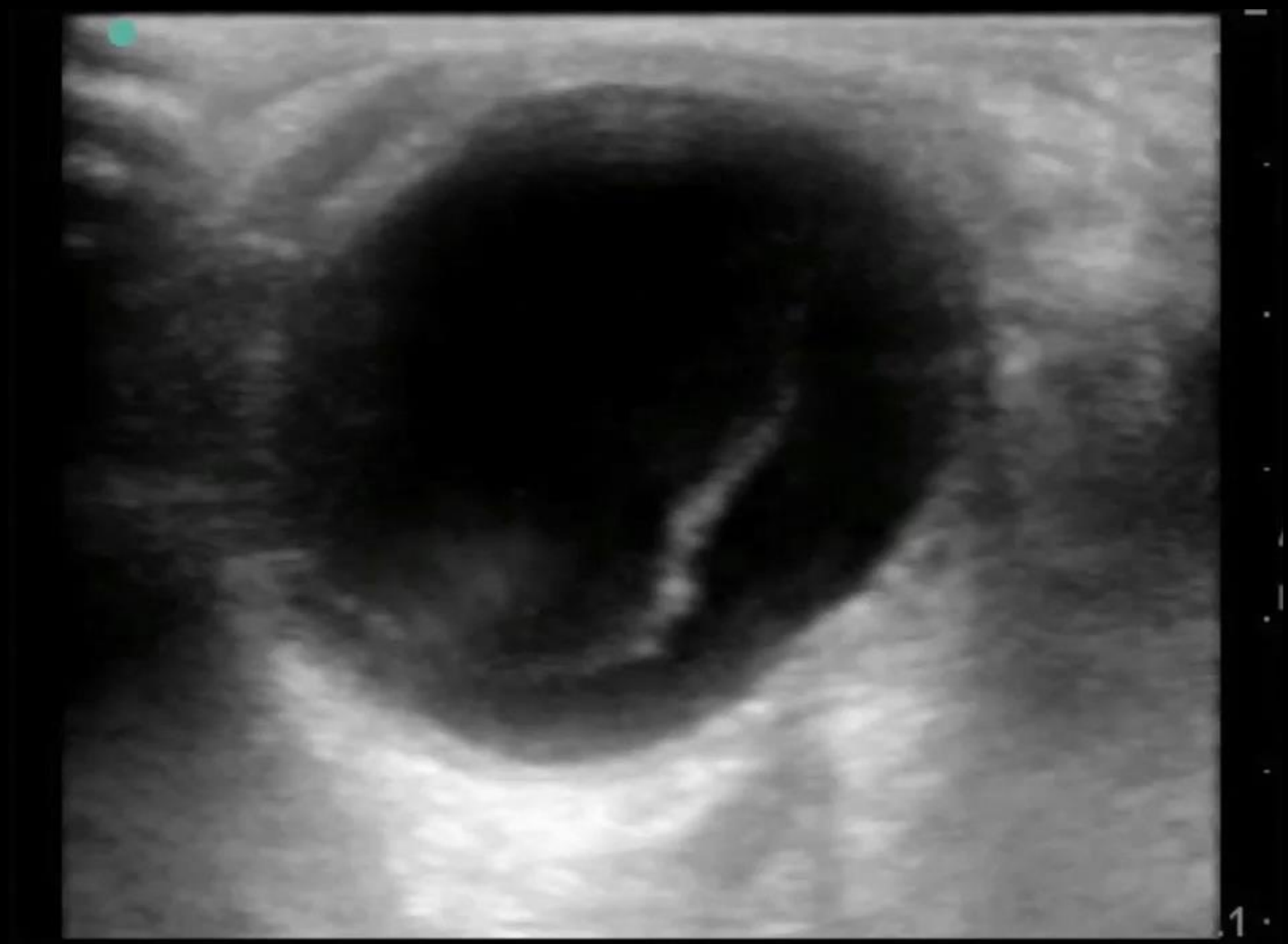
-Often C-shaped

-Thinner more delicate membrane

-Not attached to optic disc

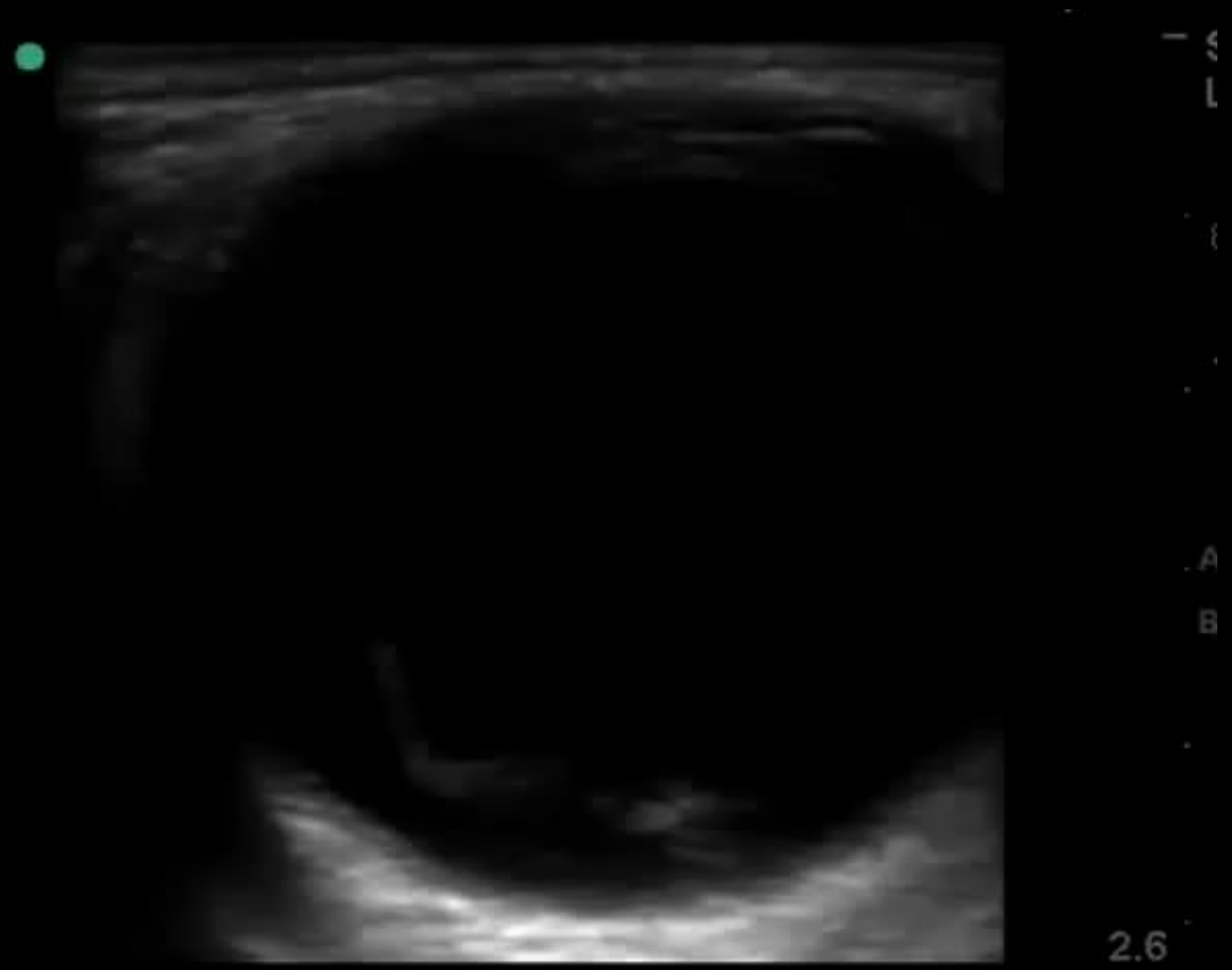
Acute Non-Traumatic Vision Loss

# Posterior Vitreous Detachment



Acute Non-Traumatic Vision Loss

# Vitreous Detachment



Acute Non-Traumatic Vision Loss

# Posterior Vitreous Detachment

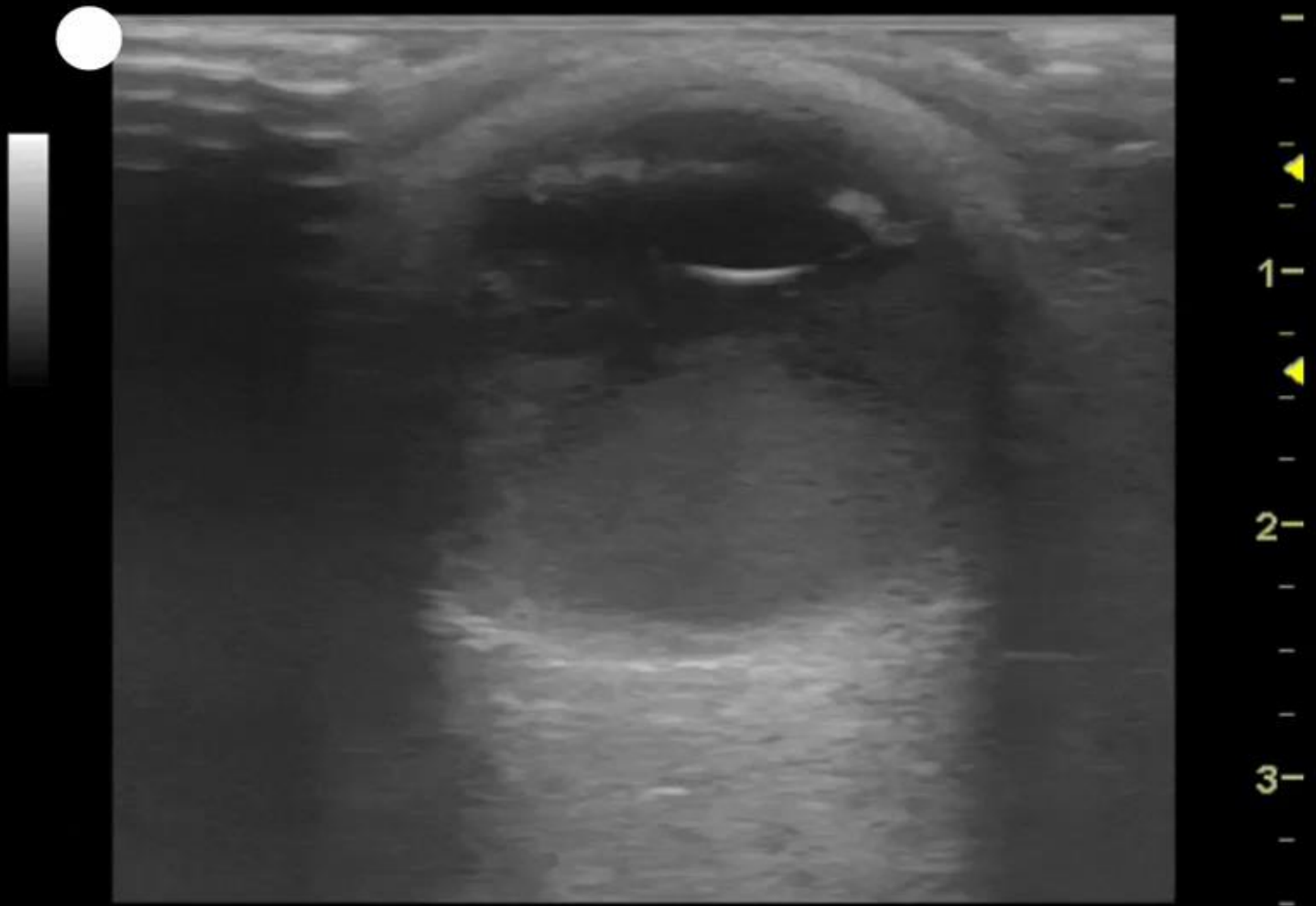

PVD with hemorrhage

# Vitreous Hemorrhage

- Bleeding from fragile vessels in vitreous space
- Risk factors: diabetes, trauma, retinal tears
- Symptoms: floaters, flashes, cloudy vision
- Appearance depends on age and severity of hemorrhage

Acute Non-Traumatic Vision Loss

# Vitreous Hemorrhage



Acute Non-Traumatic Vision Loss

# Vitreous Hemorrhage

Acute Non-Traumatic Vision Loss

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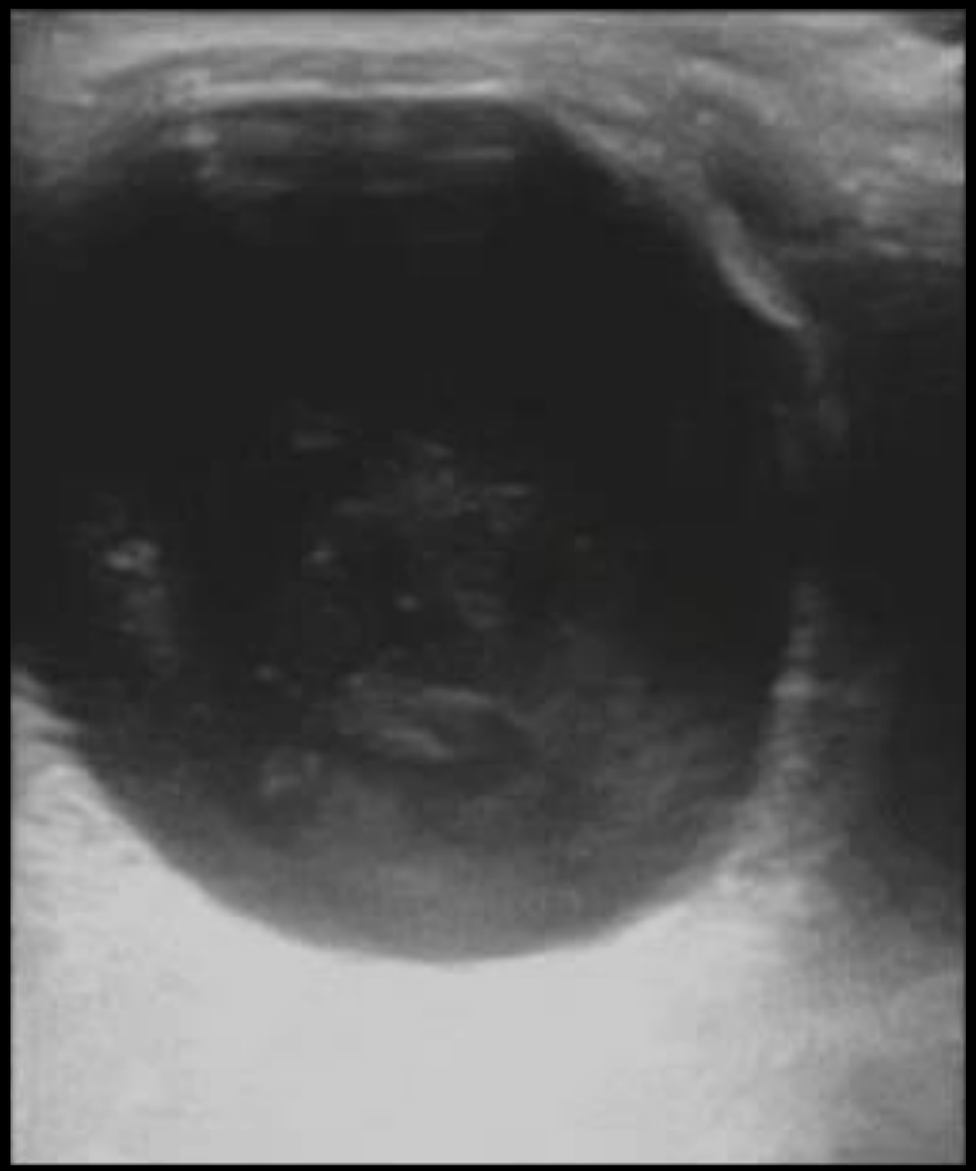
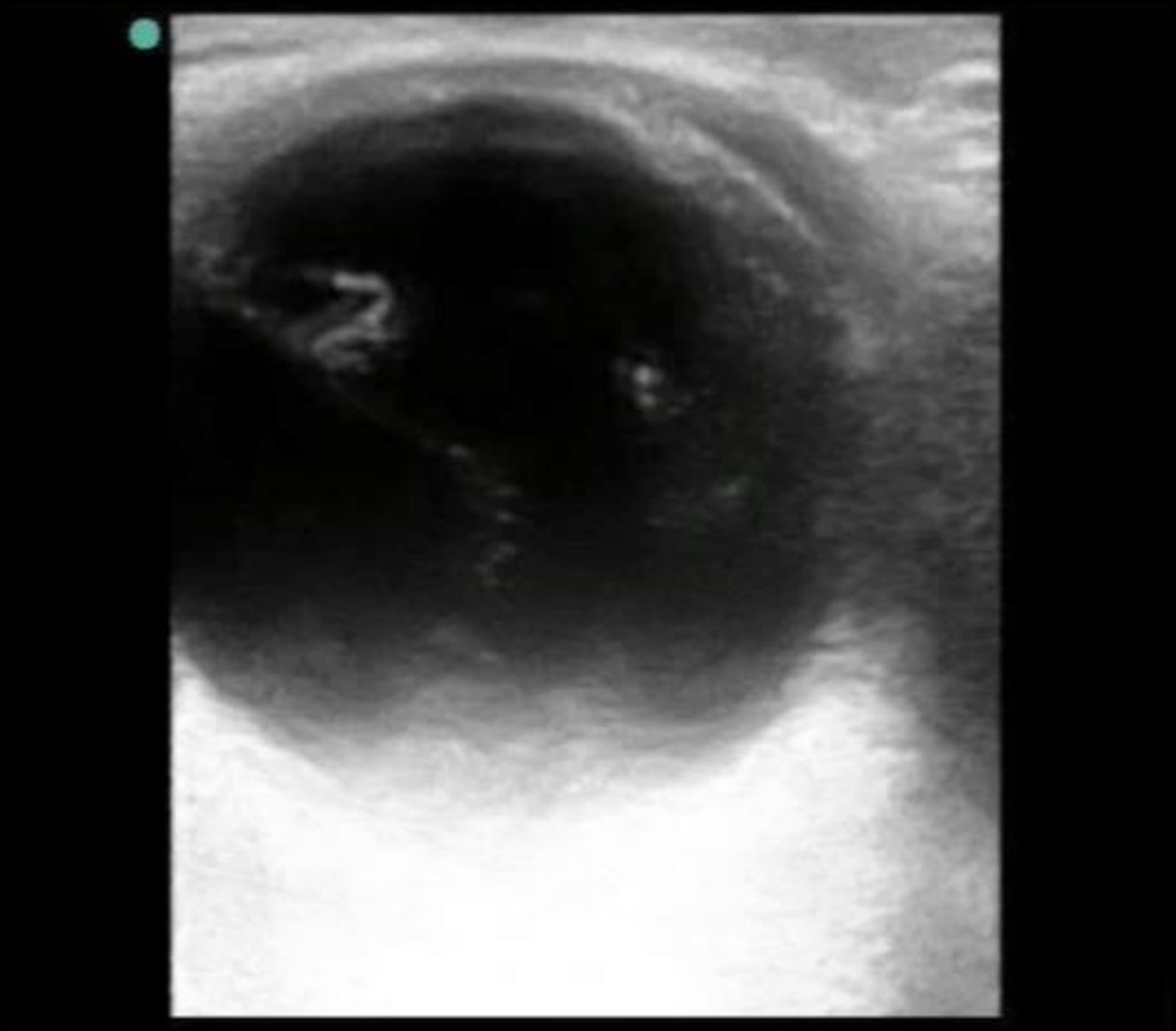


as hemorrhage ages, it organizes in to bands

Acute Non-Traumatic Vision Loss

# Vitreous Detachment



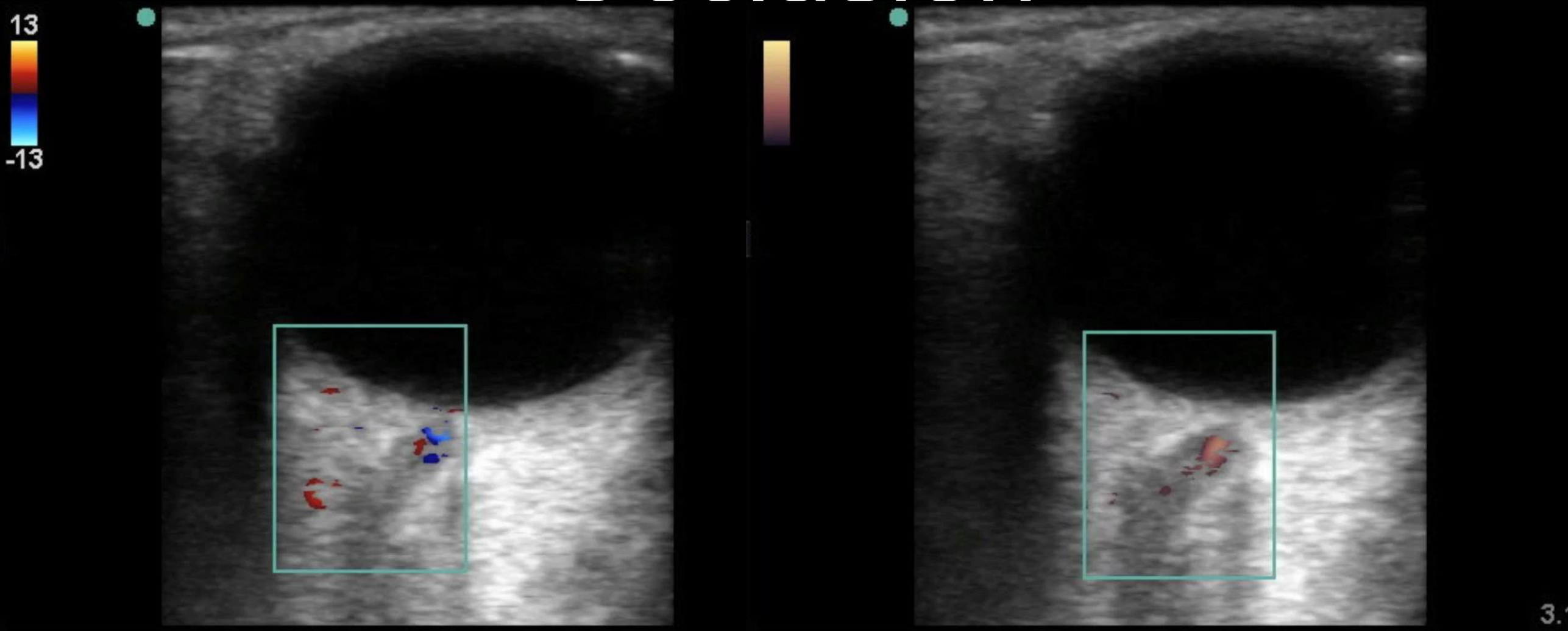
appearance is similar to fibrinous bands

# Central Retinal Artery Occlusion

- Painless vision loss that may or may not be complete
- Arterial AND venous flow should be present
- Color, power, and pulse wave doppler assessment is necessary
- Get an EKG

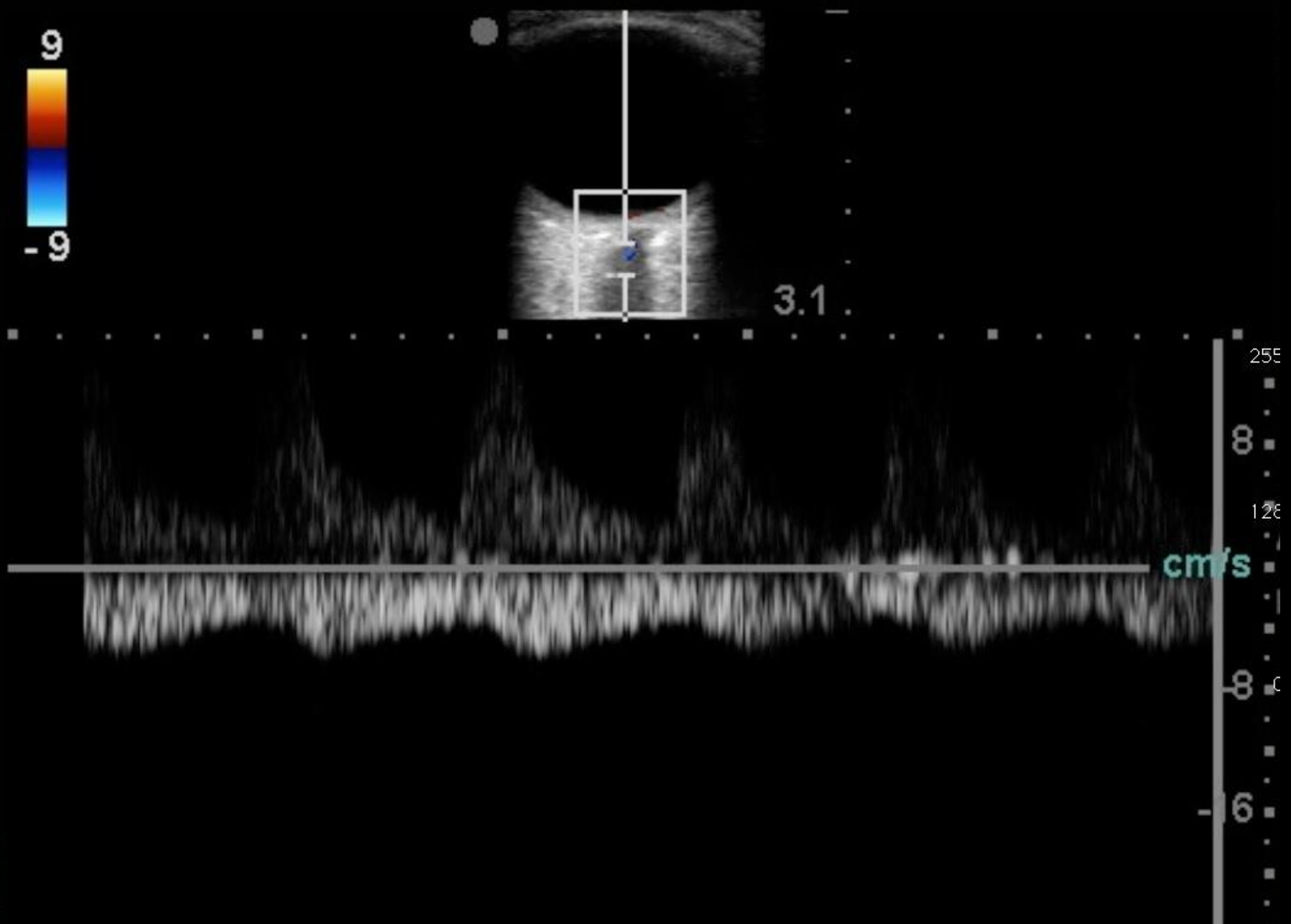
Acute Non-Traumatic Vision Loss.

# Central Retinal Artery Occlusion



Acute Non-Traumatic Vision Loss.

# Central Retinal Artery Occlusion



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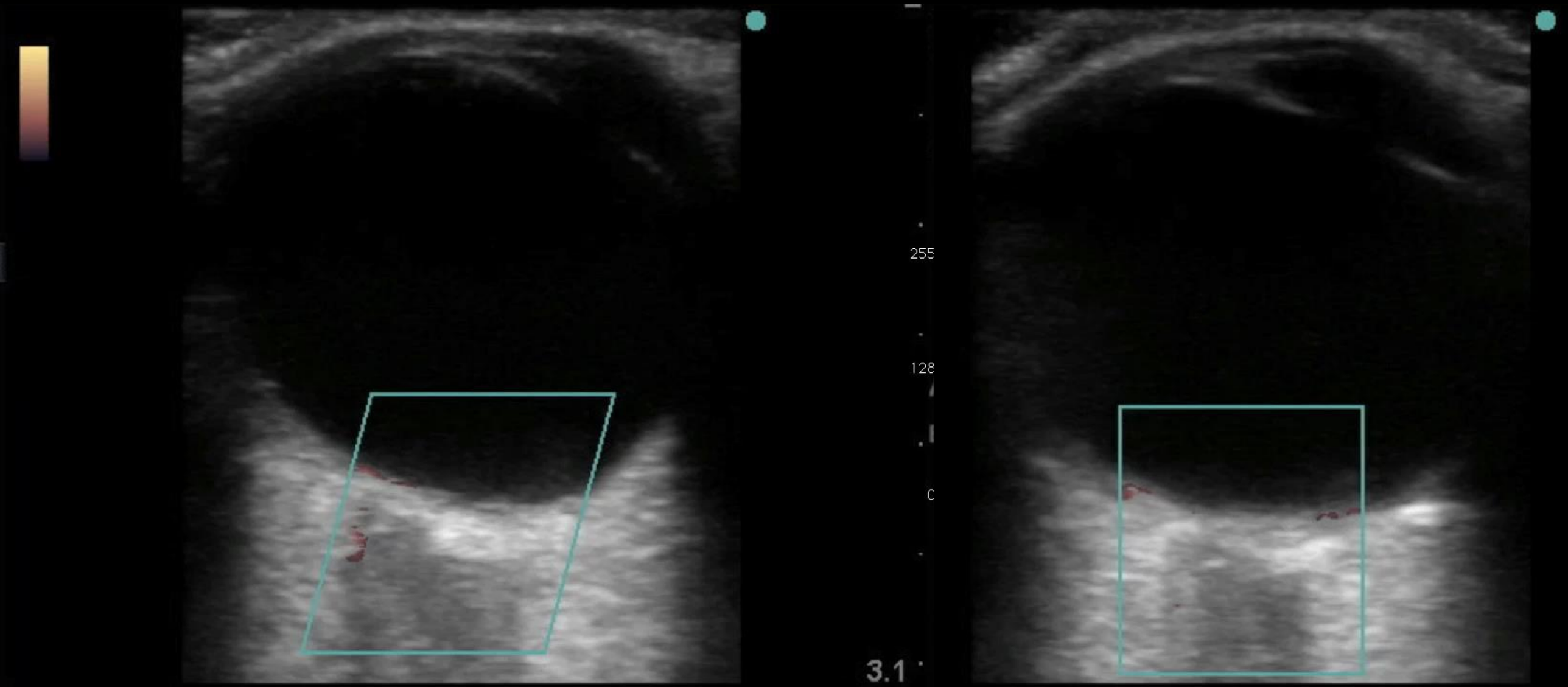
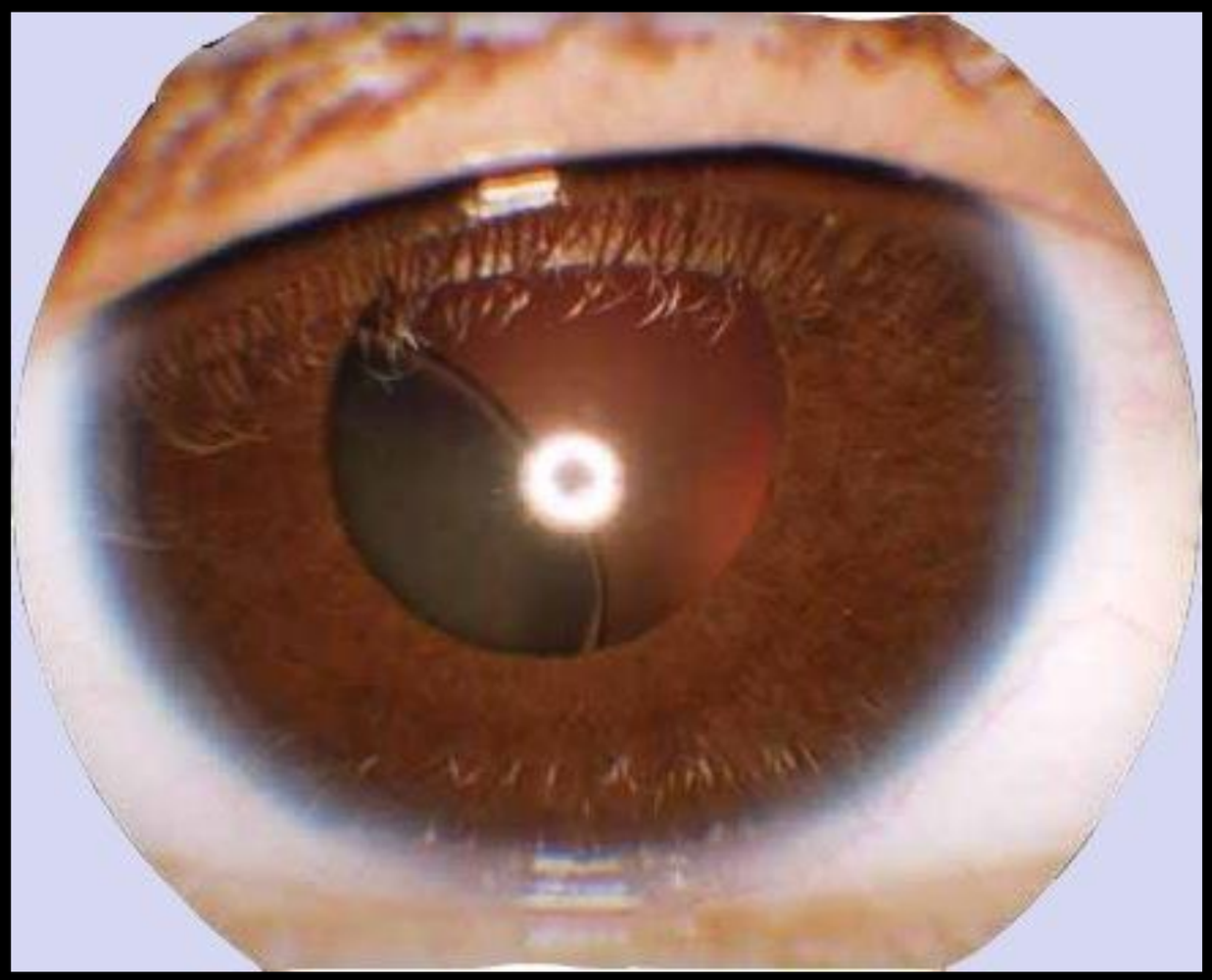


# Ocular Trauma

# Lens Dislocation

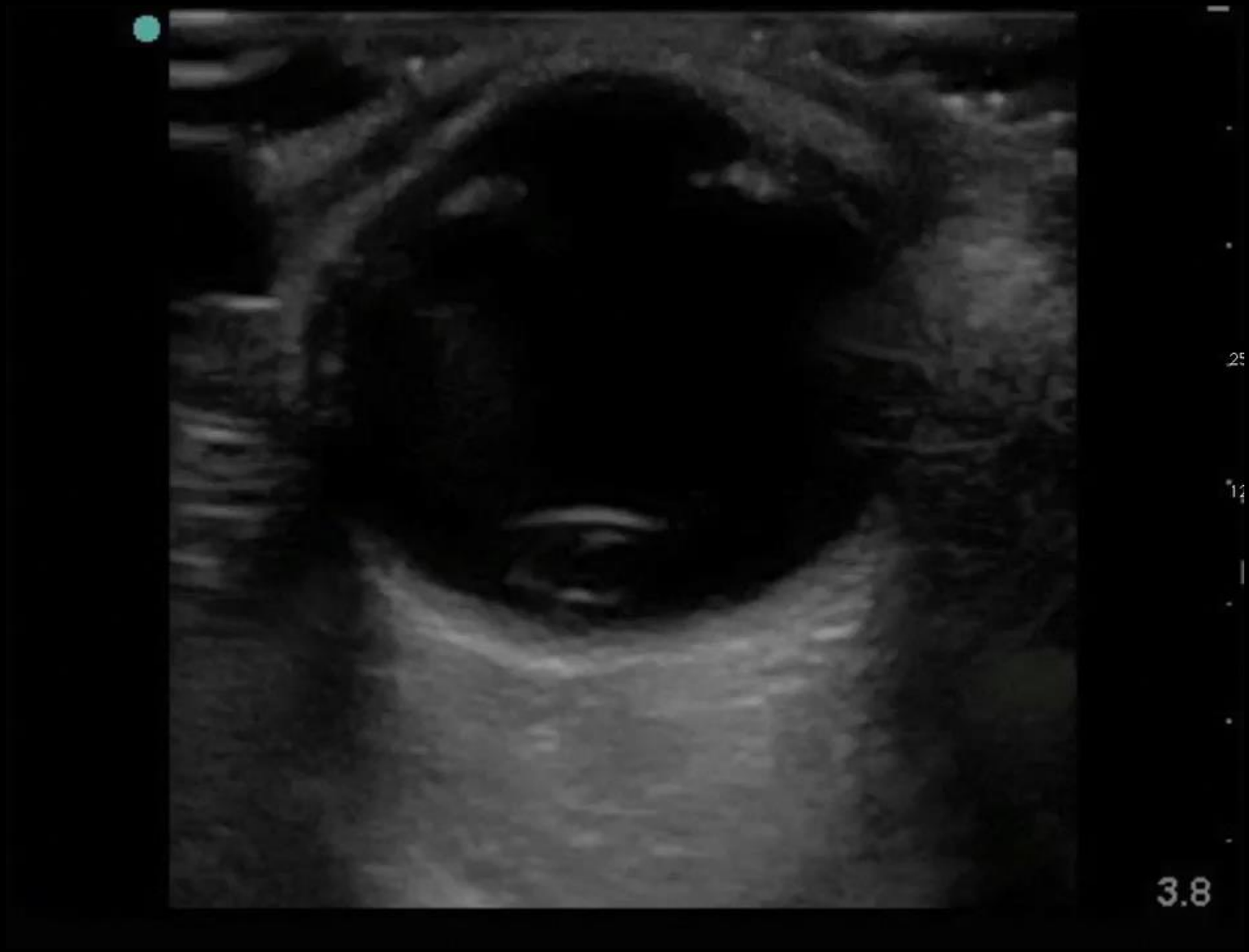
- Risk factors
  - Trauma (most common)
  - Connective tissue diseases
  - Recent cataract surgery
  - Near-sightedness

# Lens Dislocation



- Disruption of zonular fibers
- May be partial or complete

# Lens Dislocation



# Lens Dislocation

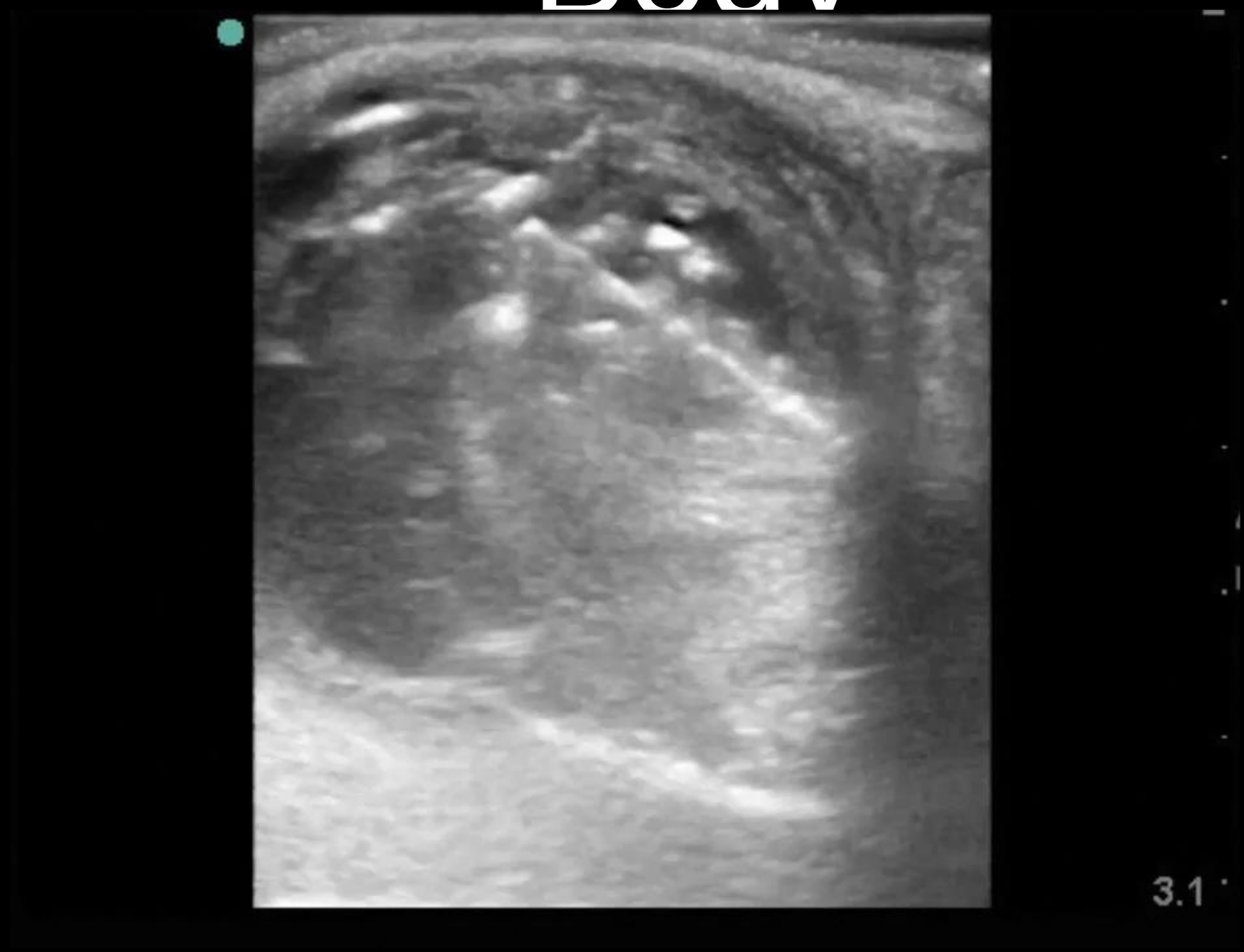
# Lens Dislocation

# Intraocular Foreign Body

- Usually easily seen by ultrasound
- Hyperechoic
- Thin-slice CT slightly more sensitive due to air artifact

Ocular Trauma

# Intraocular Foreign Body



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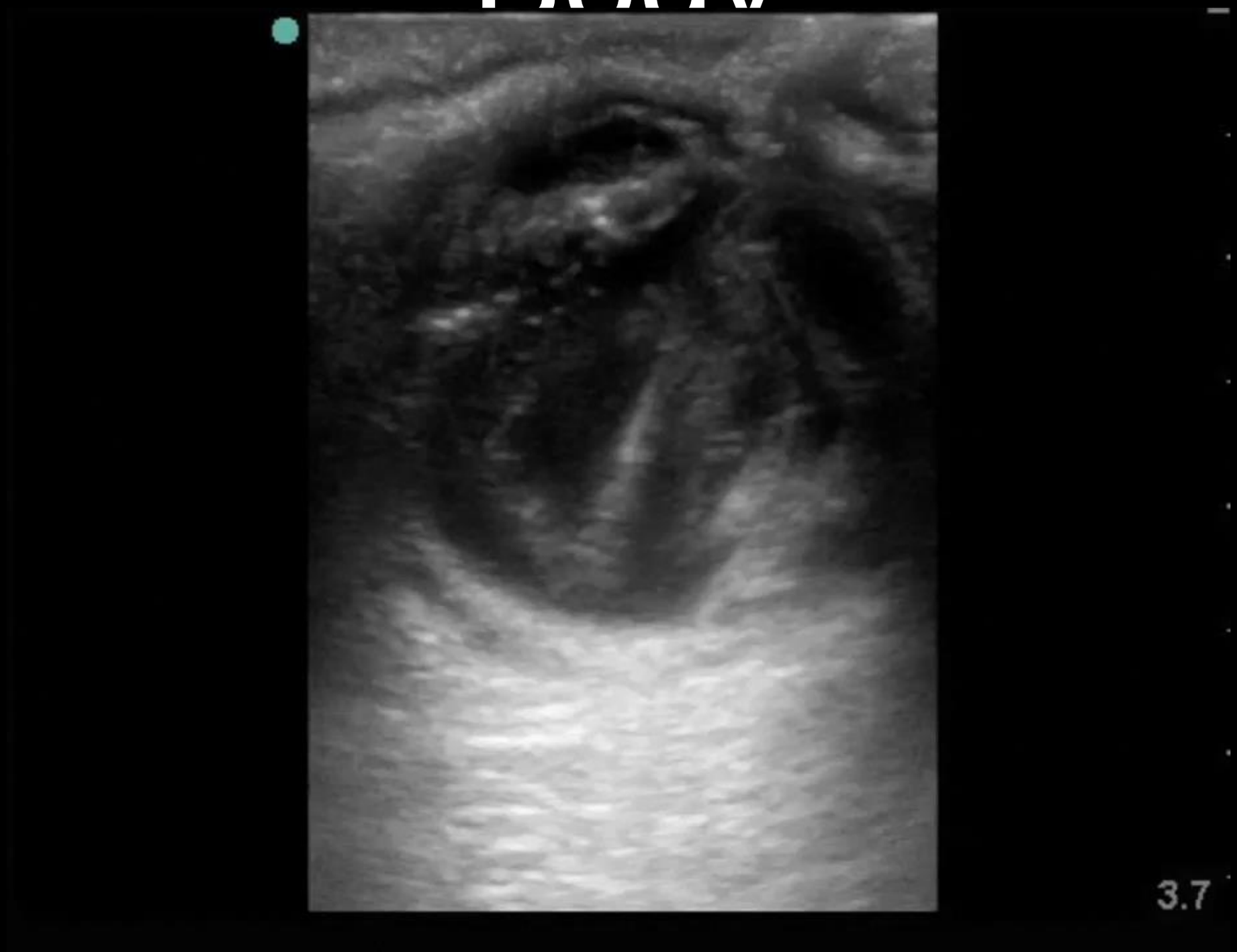


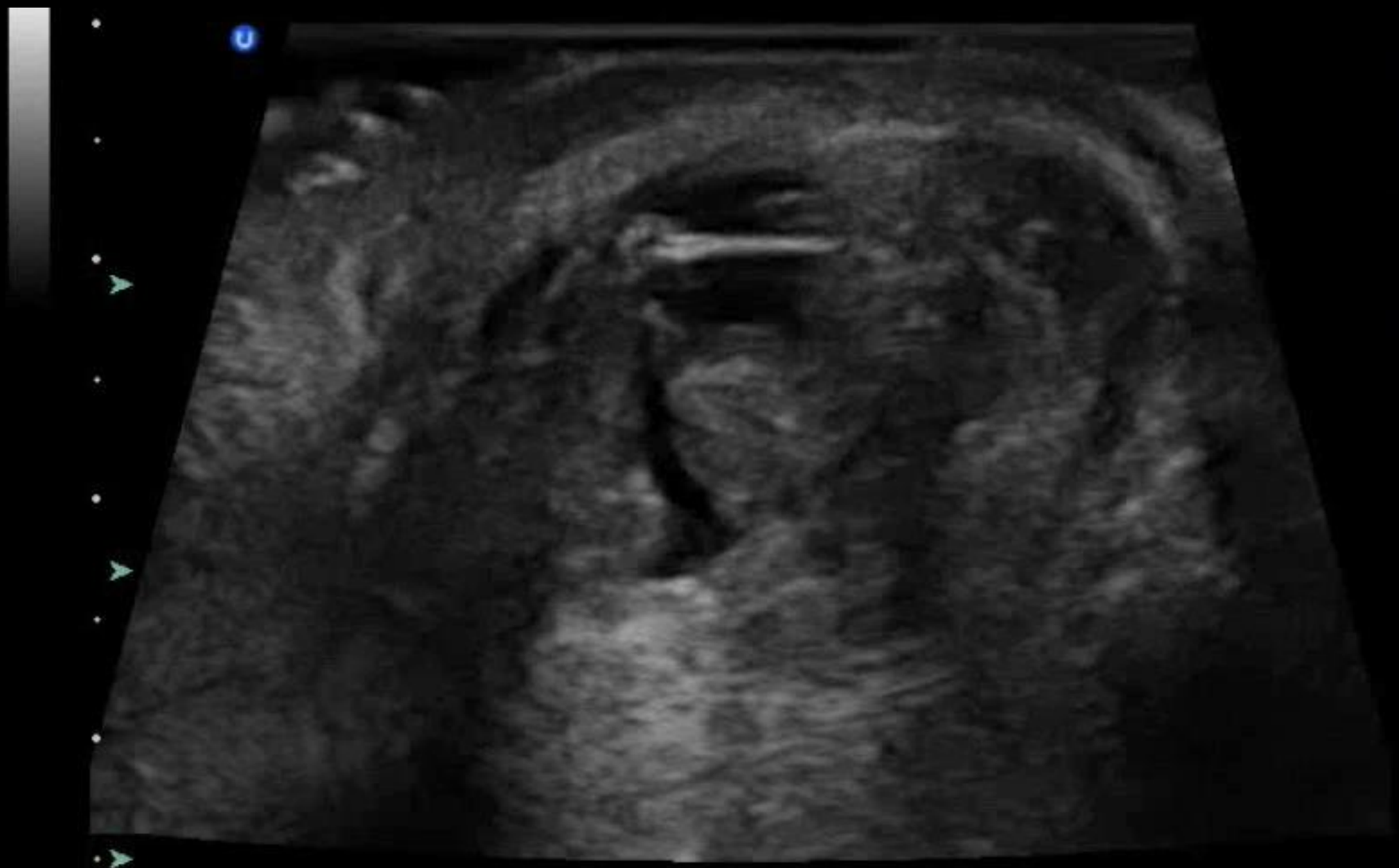
# Globe Rupture

- Loss of intraocular volume and height
- “Flat tire” sign
- Intraocular echogenic material or air

# Globe Rupture

- “Gold standard” is orbit CT
  - CT sensitivity for clinically occult rupture is low (~60%)
- Rupture most likely at insertion of extra ocular muscles
- Ultrasound is *relatively* contraindicatd in known or highly suspected globe rupture

# Globe Rupture



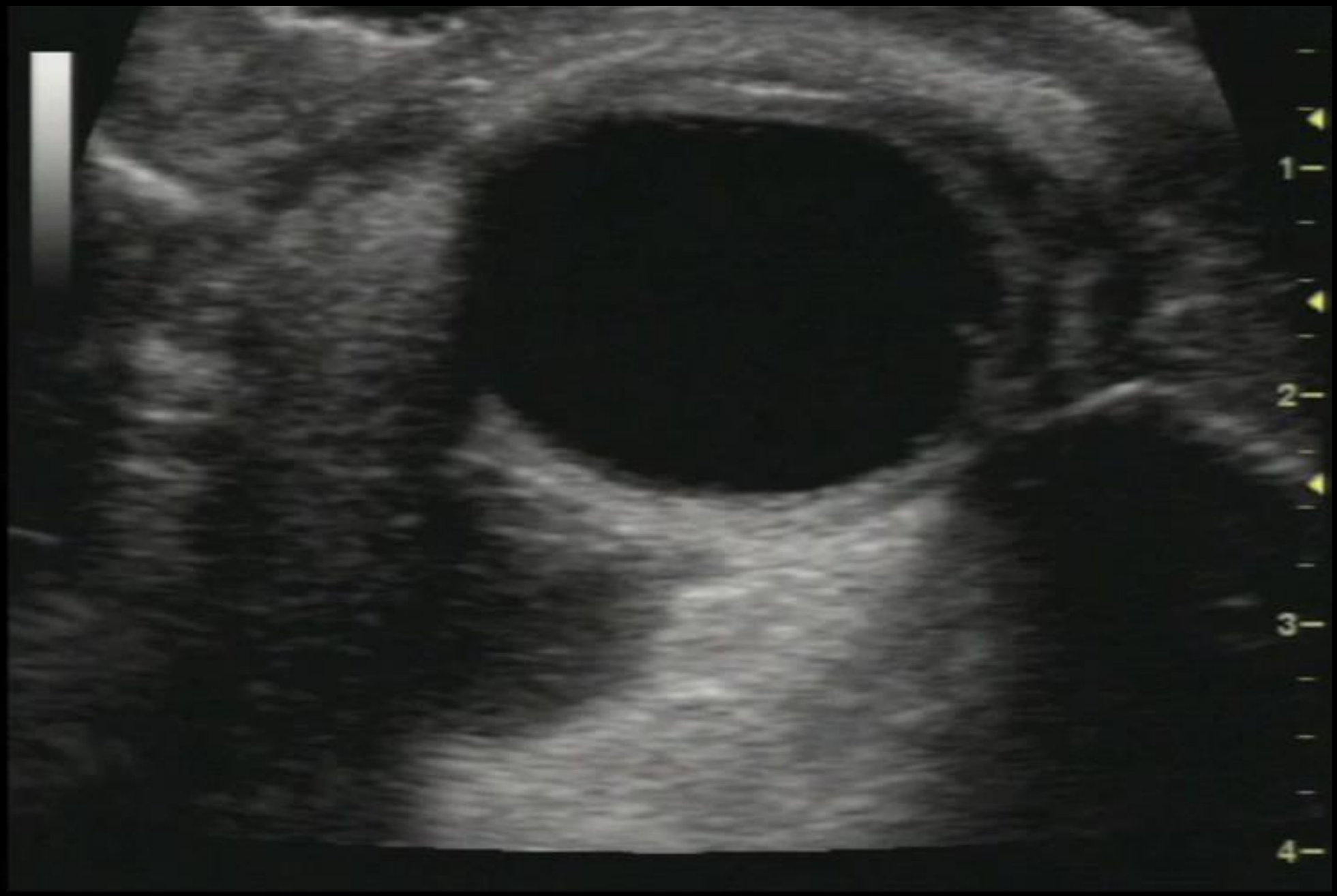
# Retrobulbar Hemorrhage

- Tearing of retrobulbar blood vessels
- Increased orbital volume and pressure
- Develops into compartment syndrome
- Surgical treatment required

# Retrobulbar Hemorrhage

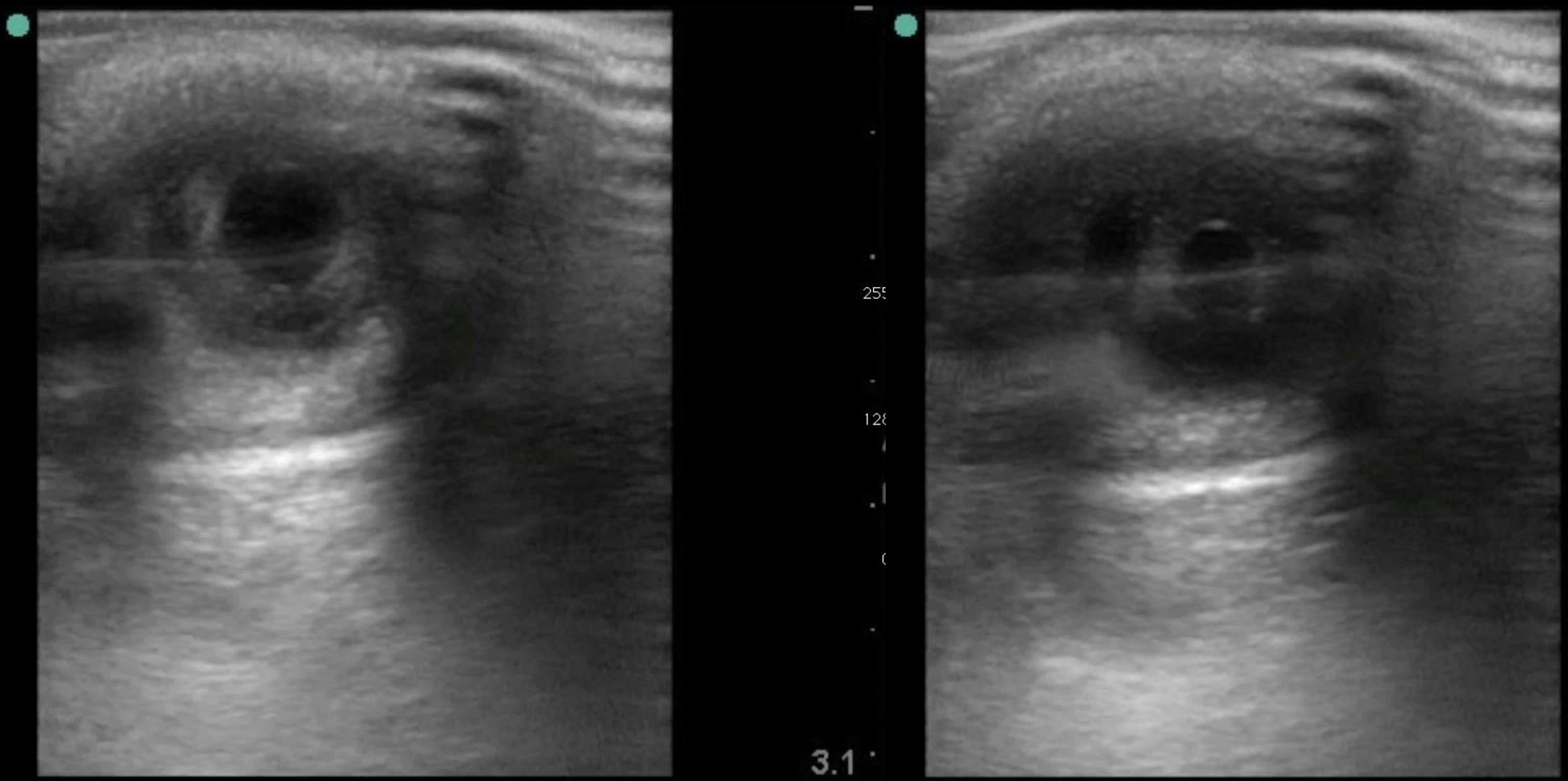
- Proptosis
- Acute vision loss
- Afferent pupillary defect
- Increased IOP

# Retrobulbar Hemorrhage



Ocular Ultrasound

# Light Reflex



# Final Thoughts

- Ocular ultrasound is a relatively easy skill to develop
- Dramatically improve your diagnostic accuracy with eye-related complaints
- Facilitate ophthalmology consultations for time sensitive emergencies