

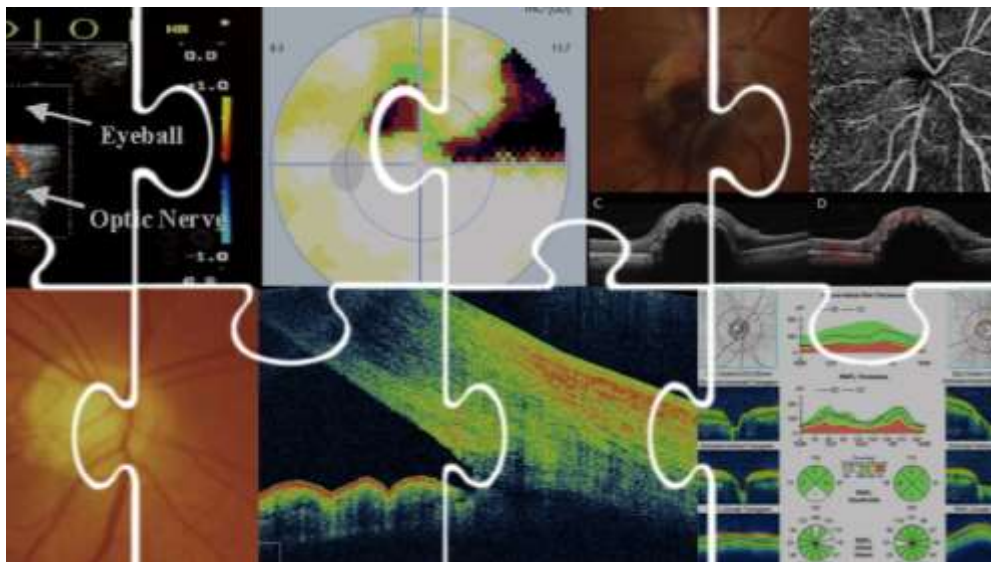


# UBM In Glaucoma

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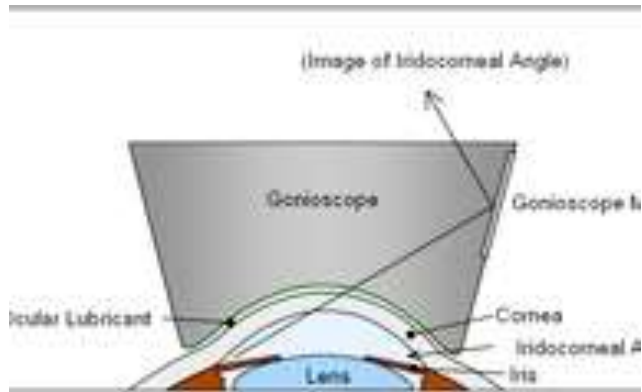
1

Glaucoma is multisectorial disease needs multiple modes of investigations



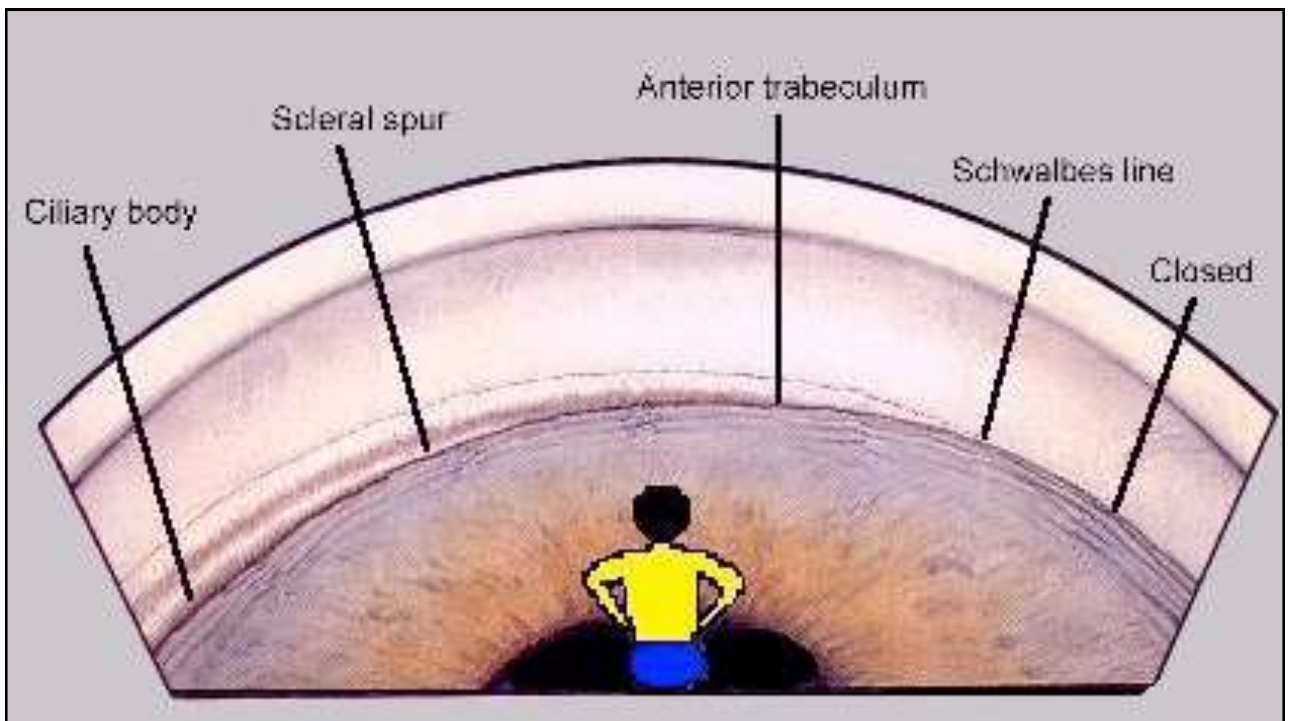
2

# Gonioscopy



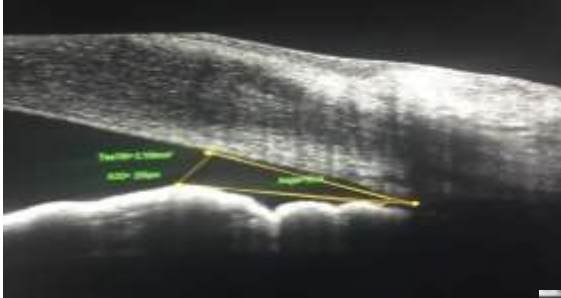
- Gonioscopy was the only mode before recent modalities to examine the angle

3



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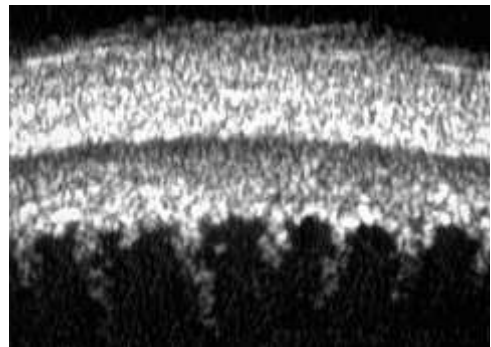
## OCT anterior segment and scheimpflug image of pentacame



5

## UBM (Ultrasound biomicroscopy)

- Looking for the anterior segment anatomy deepely to the cilixry body and ciliary process were the gretest advantage of the UBM



6

## UBM

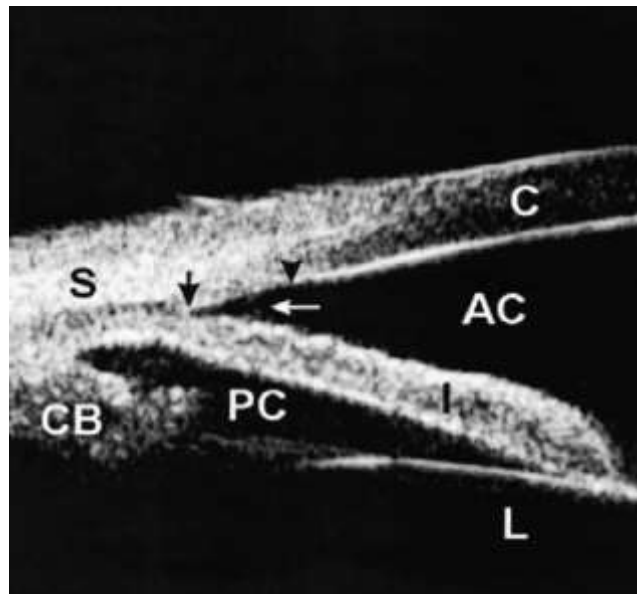
- UBM is a useful non-invasive tool for evaluating the anatomy of the anterior segment, as well as associated pathologies, like angle closure glaucoma, ciliary body cysts, neoplasms, and angle trauma.
- It was first introduced in the early 1990's by Foster and Pavlin to obtain cross-sections of the eye at microscopic resolution

7

## UBM

UBM uses a much higher frequency transducer (35-100 MHz) Compared to regular ultrasound modalities such as A-scan or B scan (10 MHz),).

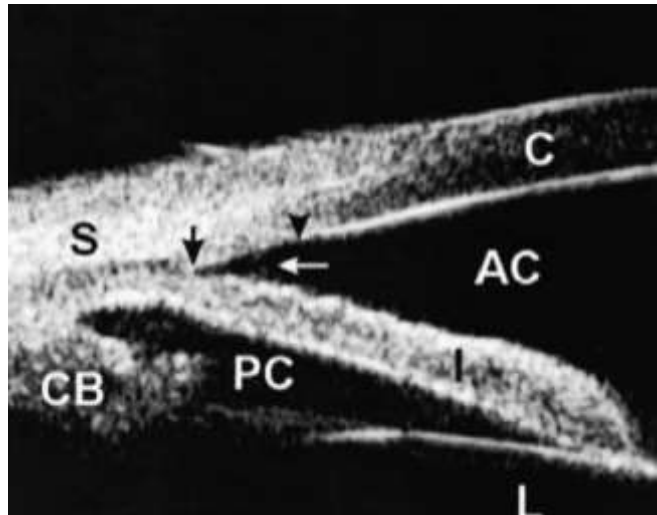
This results in resolutions up to 20um axially and 50um laterally, and depth of tissue penetration is 4-5mm



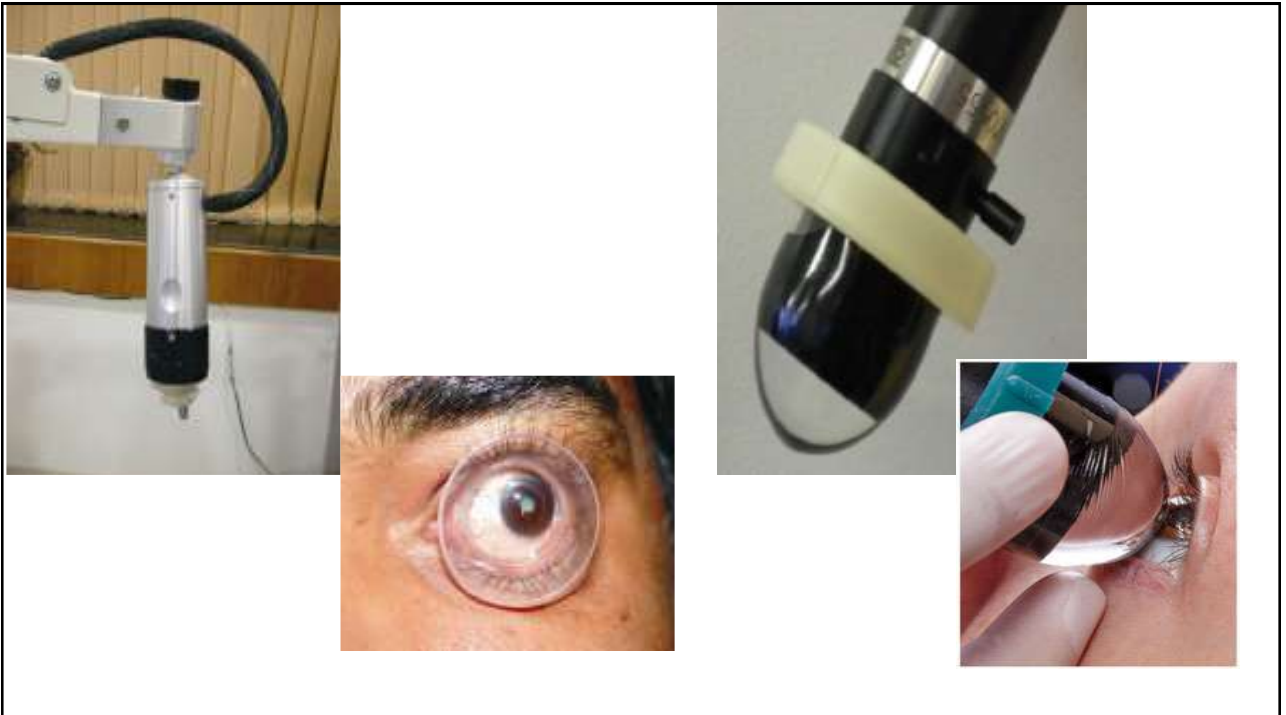
8

## Structures visualized with UBM

Cornea  
 Iris  
 Anterior chamber angle  
 Scleral spur  
 Ciliary body  
 Posterior chamber  
 Anterior chamber  
 Lens  
 Conjunctiva



9



10

## Advantage

- Visualization of structures posterior to the cornea even if opaque
- Posterior to iris pigment epithelium
- Posterior chamber
- lens and lens zonules
- Ciliary body
- Ciliary processes
- Anterior vitreous

## limitation

- **UBM can't visualize structures deeper more that 4 mm from the surface.**
- **UBM may have a narrower field**
- **UBM can't be performed in presence of an open corneal or scleral wound.**

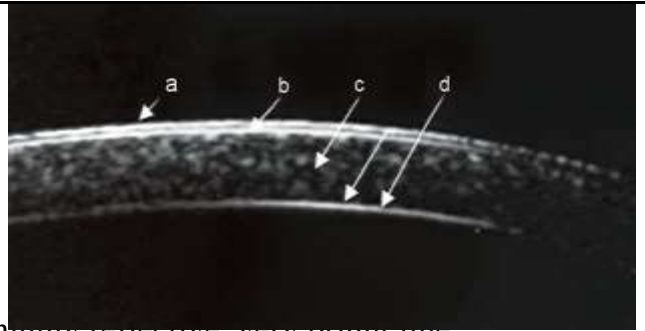
11

UMB	AS-OCT
Image through opaque cornea	Needs clear cornea
Seated upright position or supine positions	Seated upright position
Visualize structures posterior to iris PE	Couldn't visualize structures posterior to iris PE
Requires contact, liquid coupling medium	Non contact
Requires skilled operator	Doesn't need skilled operator
Lower axial resolution	Higher axial resolution
Slower acquisition time	Faster acquisition time
Smaller field of view	Wider field of view

12

- **1-The Cornea (4 layers) :**

- The **epithelium** is a thin, relatively bright (sono-reflective) layer



- The **Bowman's membrane** is seen as a highly reflective, very bright line

- The **stroma** shows homogeneous low-amplitude reflectivity

- The **endothelium** and the **Descemet's membrane** : dense highly reflective line.

13



- **2- The scleral spur:**

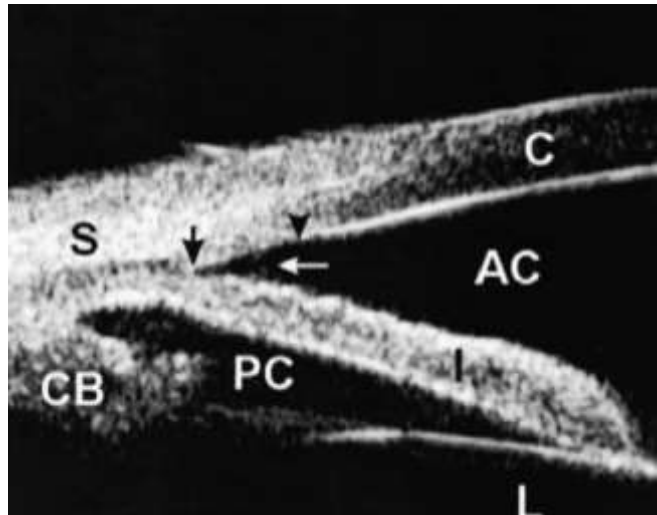
- At the **junction** between the line separating the highly reflective **sclera**, and the lower reflective **ciliary body**, and the end of the **Descemet membrane**

14

### 3-The corneo-scleral junction

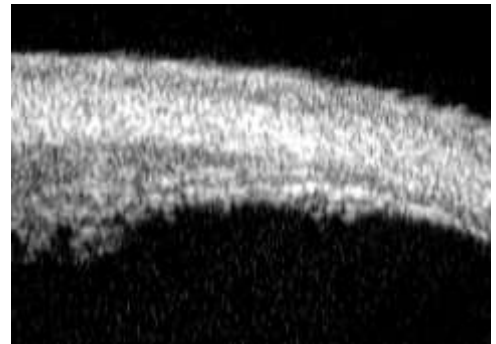
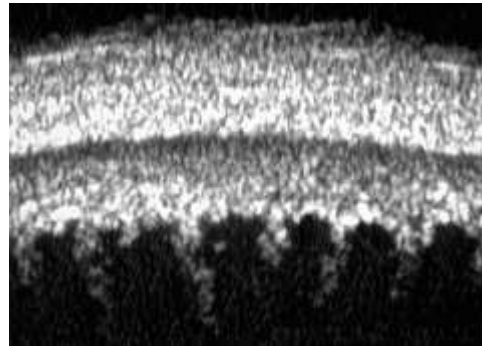
Is differentiated because of the lower internal reflectivity of the cornea compared to the sclera.

**4-The anterior chamber**  
: Low reflective (sonoluscent area), depth measurement



15

- **5-The zonules** : a medium reflective line extending from the ciliary processes to the lens surface.
- **6-The ciliary body** can be clearly defined by UBM from the ciliary processes to the pars plana
- **7-The ciliary processes** : series of fingerlike projections

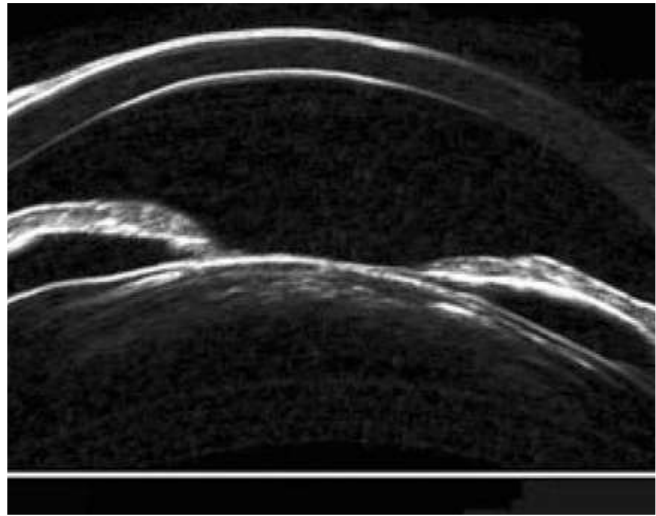


16



**7-The posterior chamber** : space between the anterior vitreous face and the posterior surface of the iris

**8-The peripheral retina and pars plana** : retina is thin and imaged as a single line that cannot be differentiated from the retinal pigment epithelium unless detached.



17

## UBM

### Quantitative studies

- 1) Angle measurements
- 2) Distance

### Qualitative analysis

- 1) Pathophysiology of anterior segment disorders
- 2) Mechanism of appositional angle closure

18

## Qualitative analysis:

- Glaucoma
- Anterior chamber
- Lens
- IOLs
- Tumors
- Cornea
- Sclera
- Ocular adnexa
- Trauma

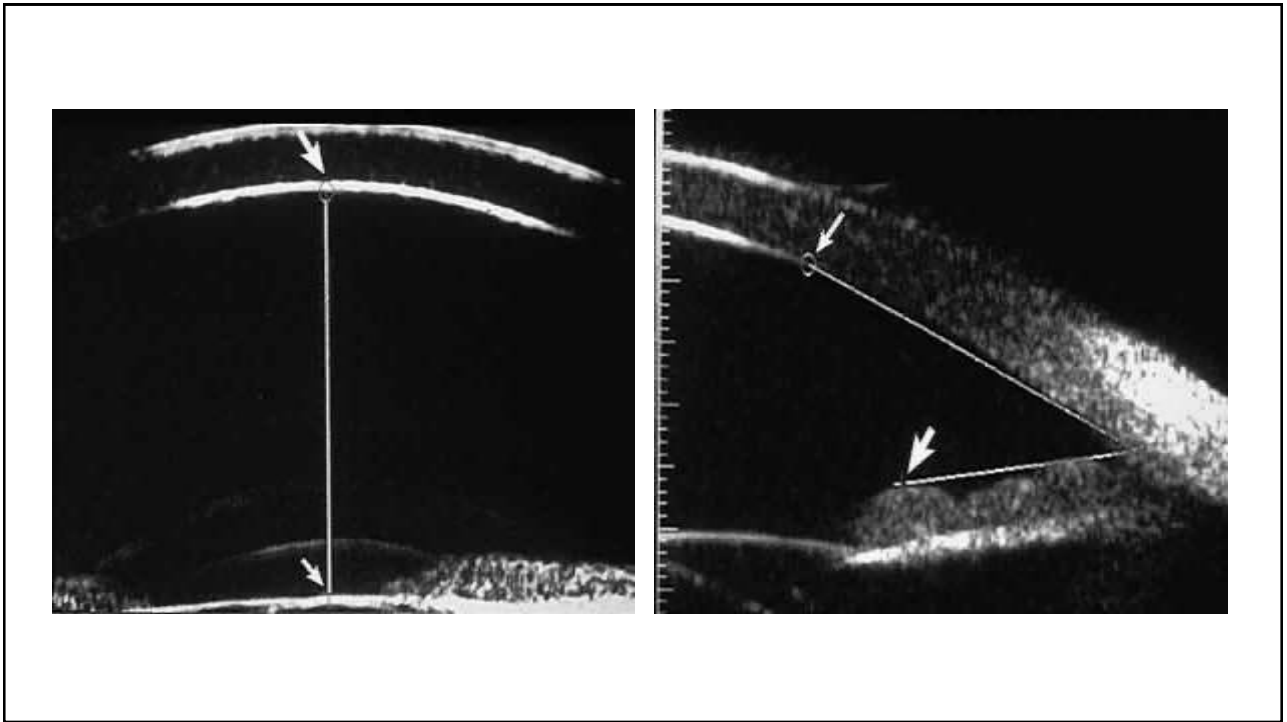
19

## UBM measures several **angle parameters**:

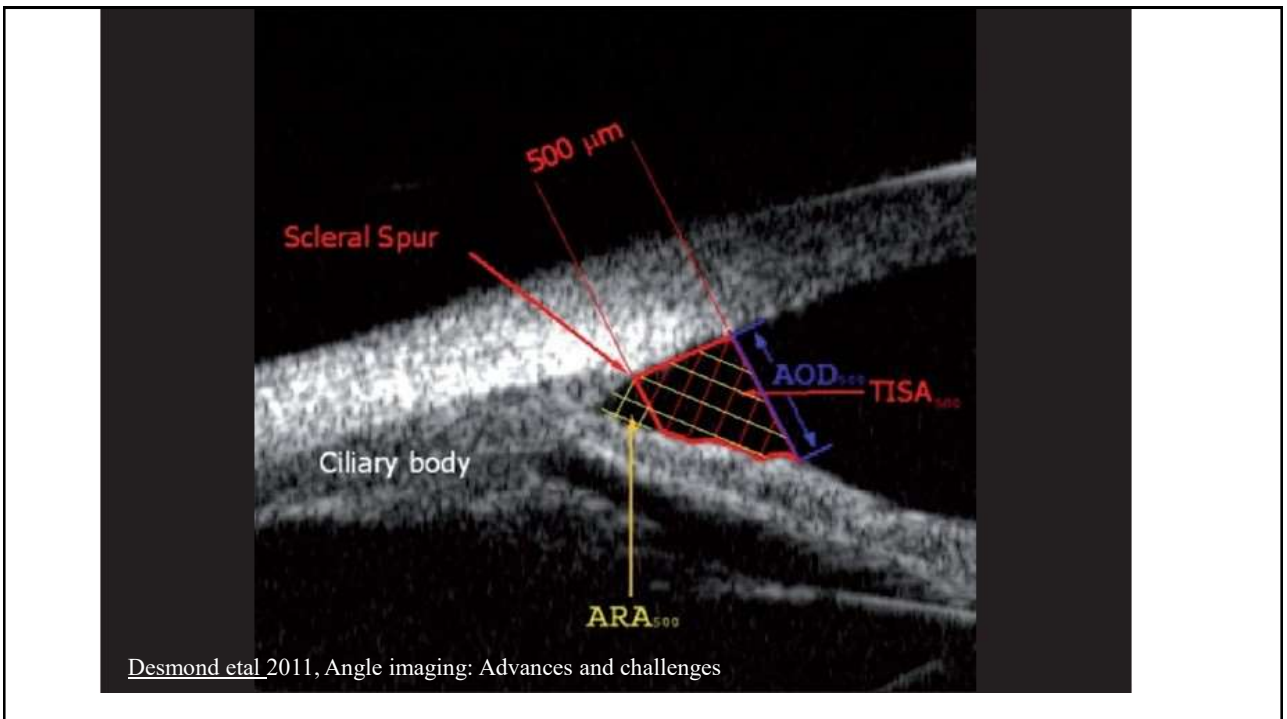
### (Quantitative studies)

- The trabecular iris angle
- AC angle
- Iris-lens angle
- The AOD
- The trabecular-ciliary process distance
- Iris thickness
- Iris ciliary process distance
- Iris-lens contact distance
- Iris zonular distance
- AC depth

20



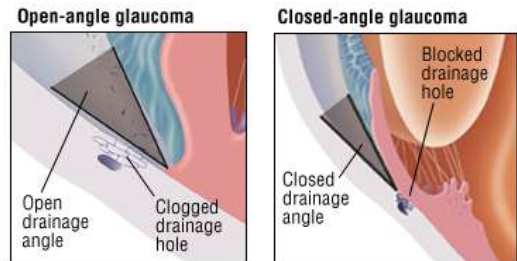
21



22

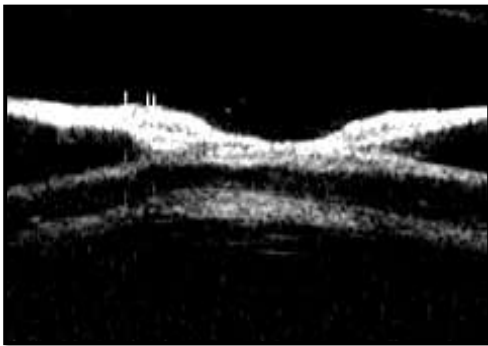
## Glaucoma

- Differentiate open angle from angle closure glaucoma
- Differentiate plateau iris from iris bombe
- Detect causes of 2ry glaucomas
- Postoperative evaluation



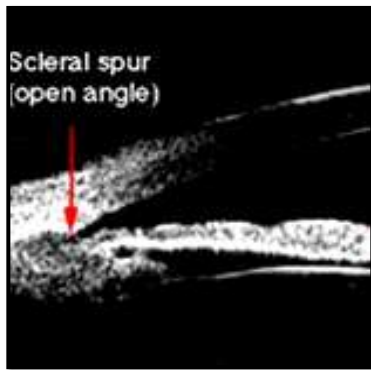
23

### 2ry Angle closure with pupillary block:

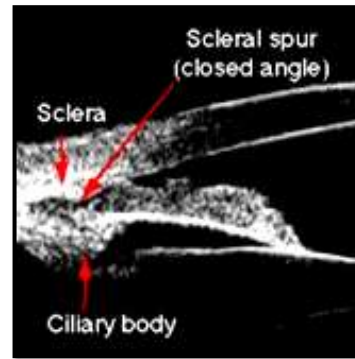


24

## Angle closure with pupillary block:



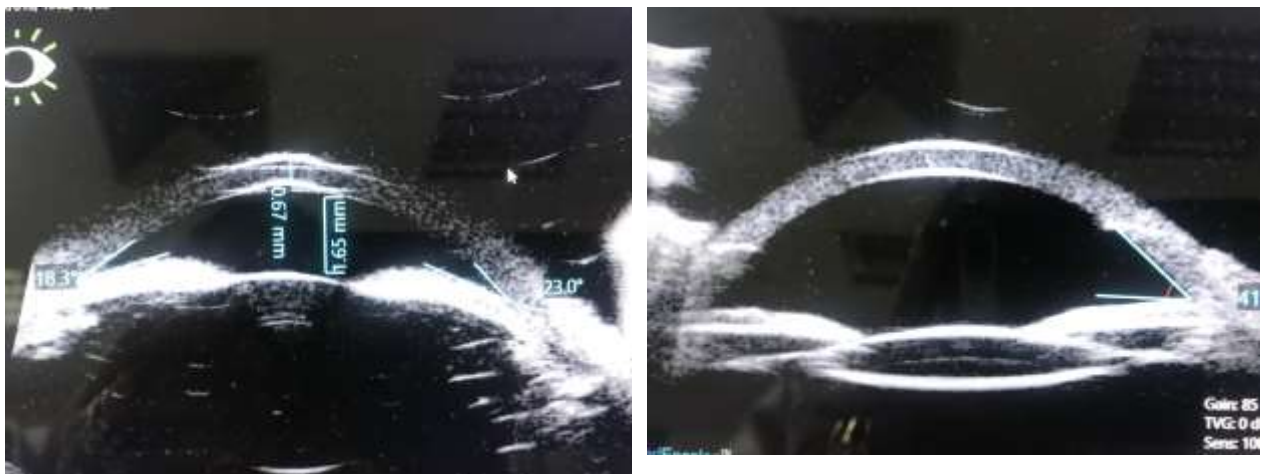
Light room illumination



Dark room illumination

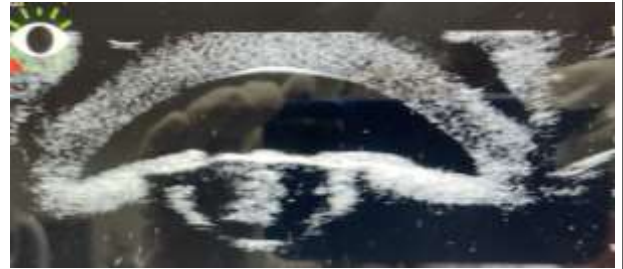
25

## Case of narrow angle glaucoma Pre and Post operative

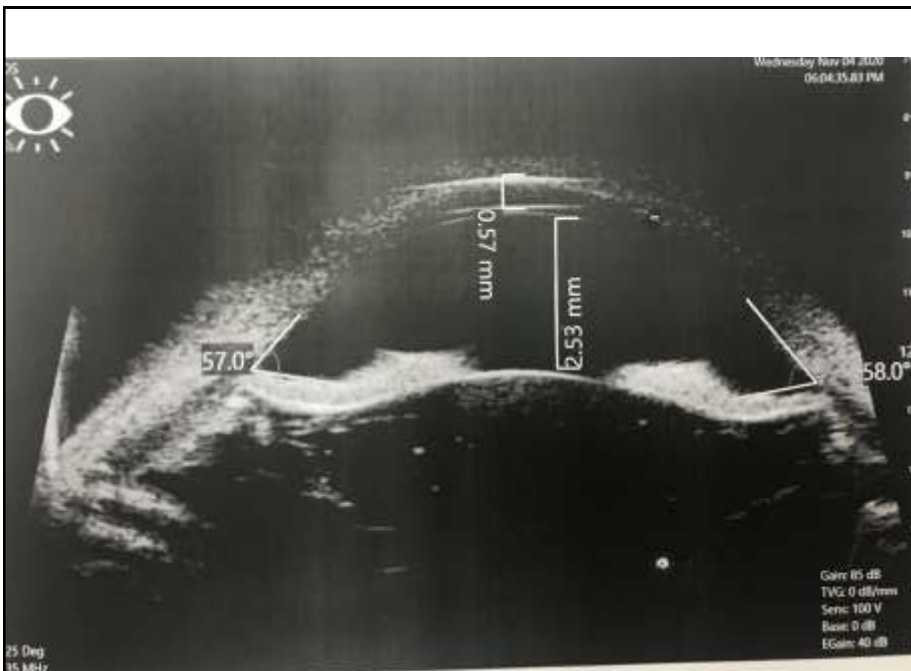


26

## Pupillary block

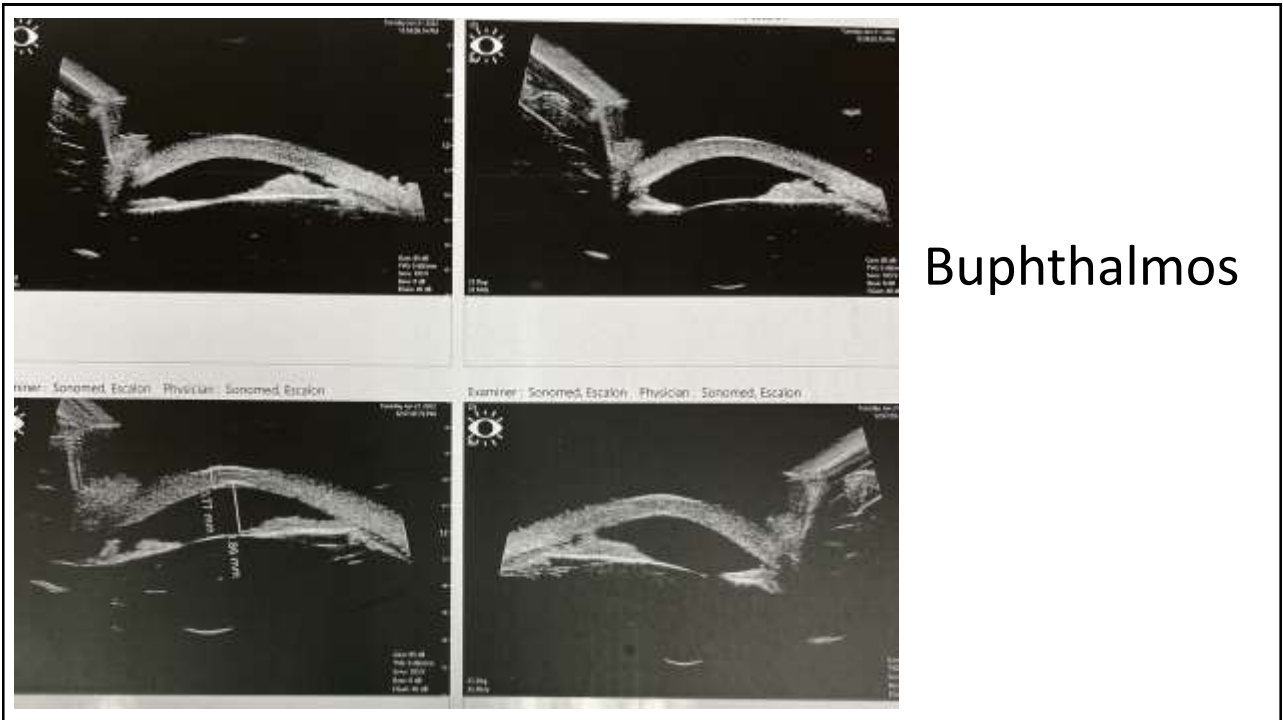


27

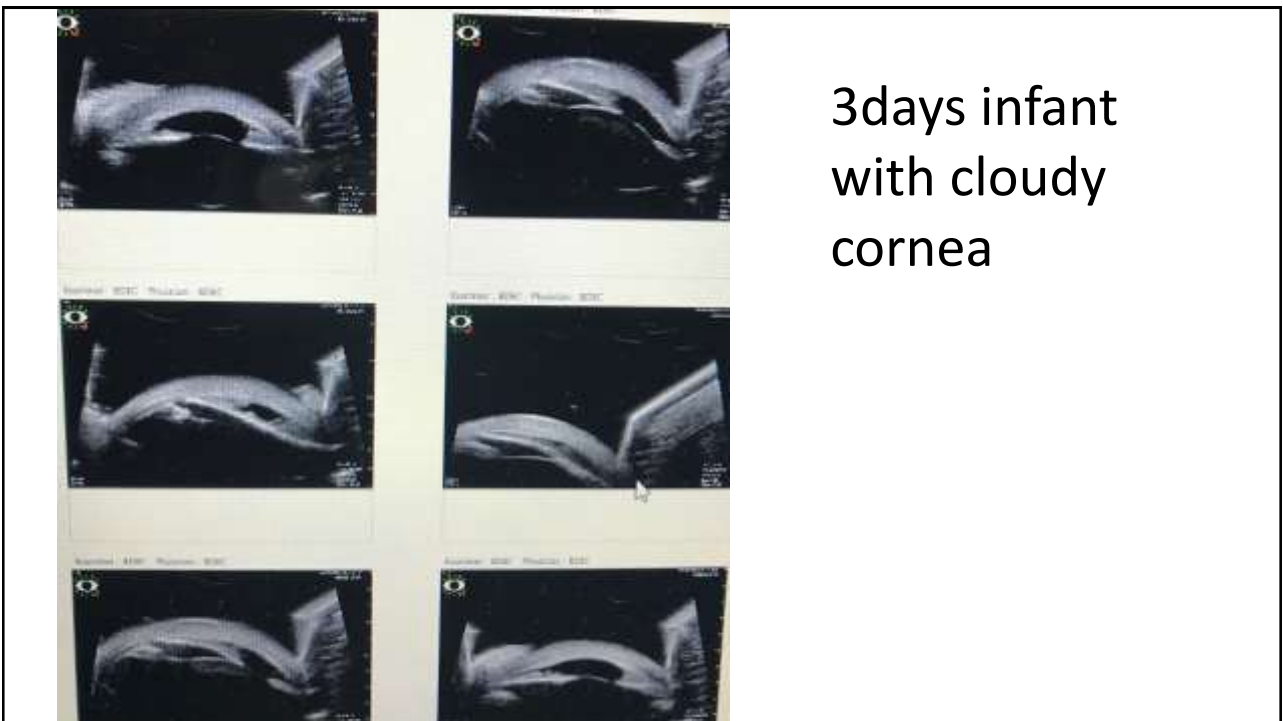


Pigment  
dispersion  
syndrome

28



29

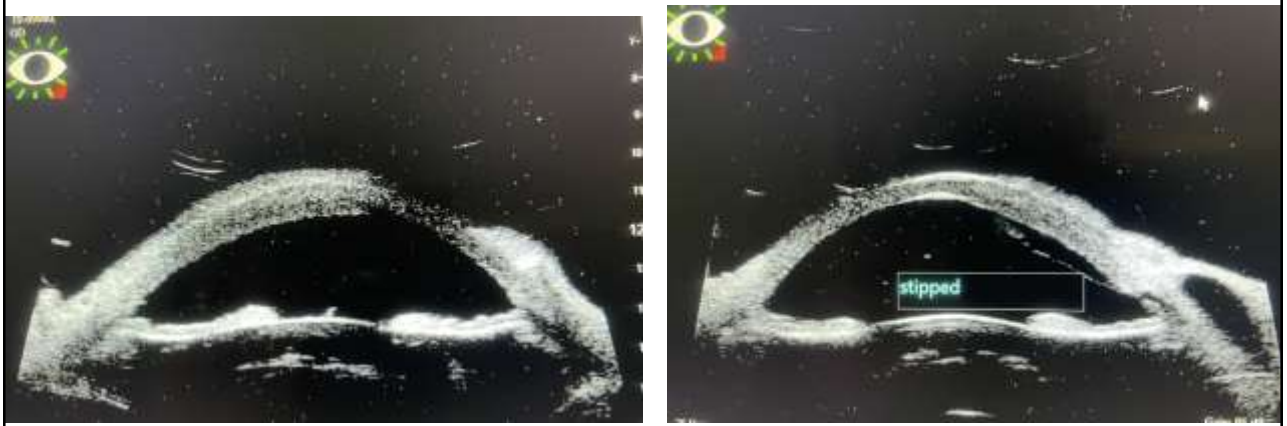


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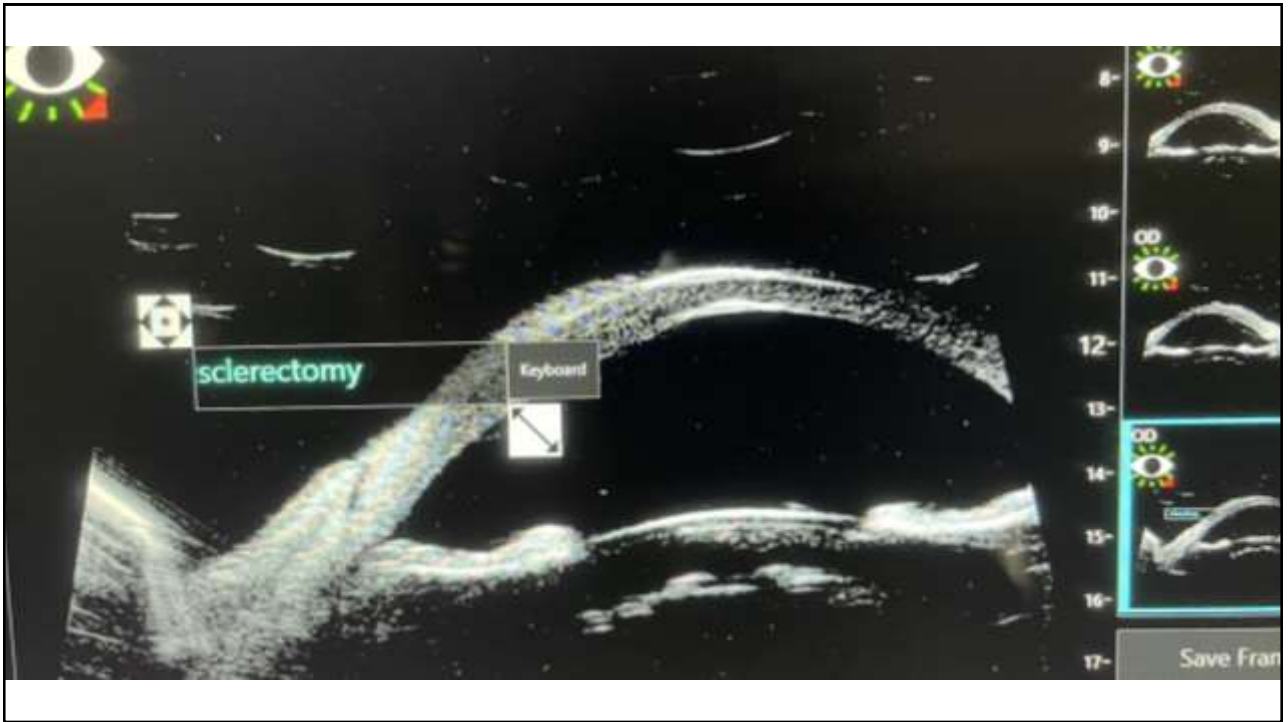
31

Post glaucoma surgery (bleb examination)

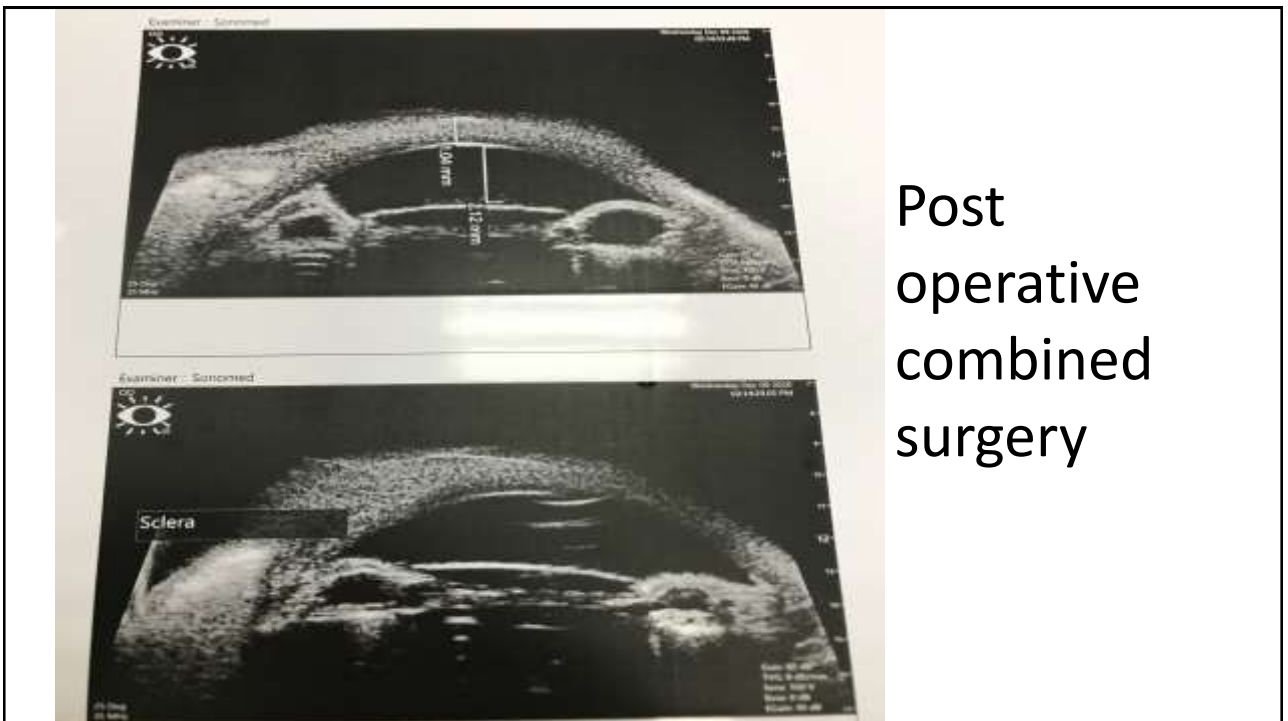


32





33



Post  
operative  
combined  
surgery

34



Supraciliary effusion



35



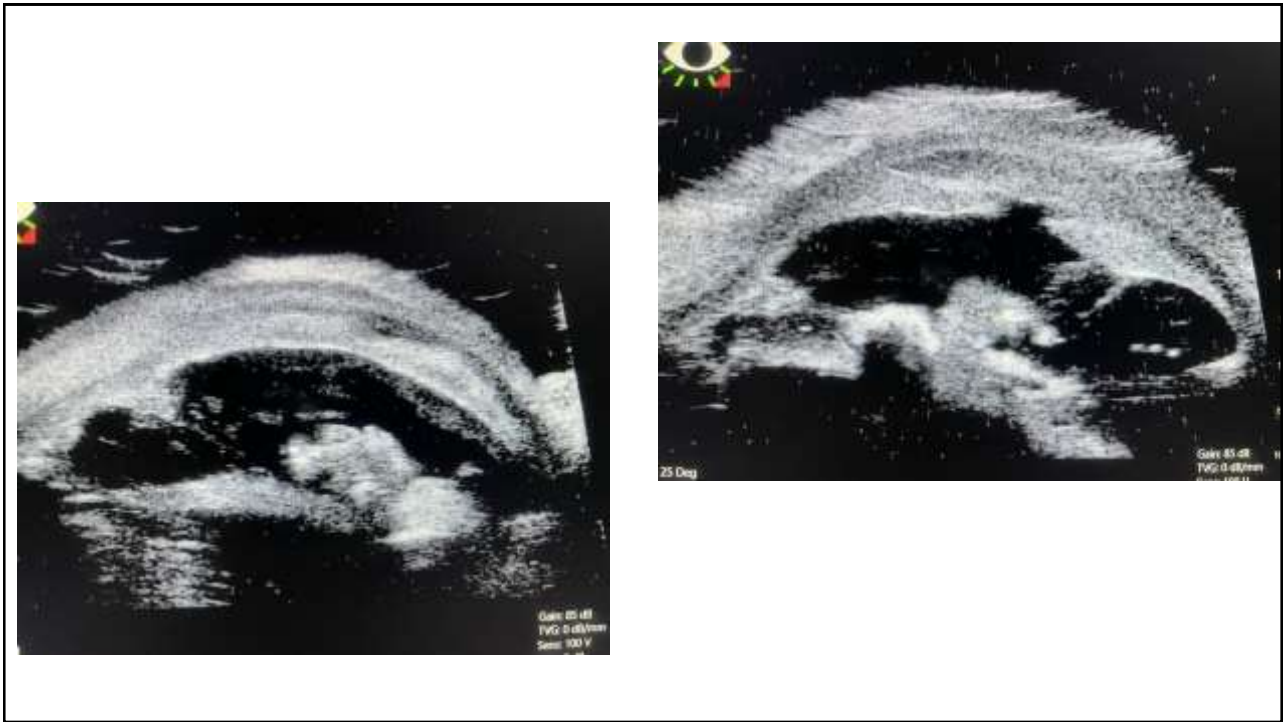
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Malignant  
Glaucoma

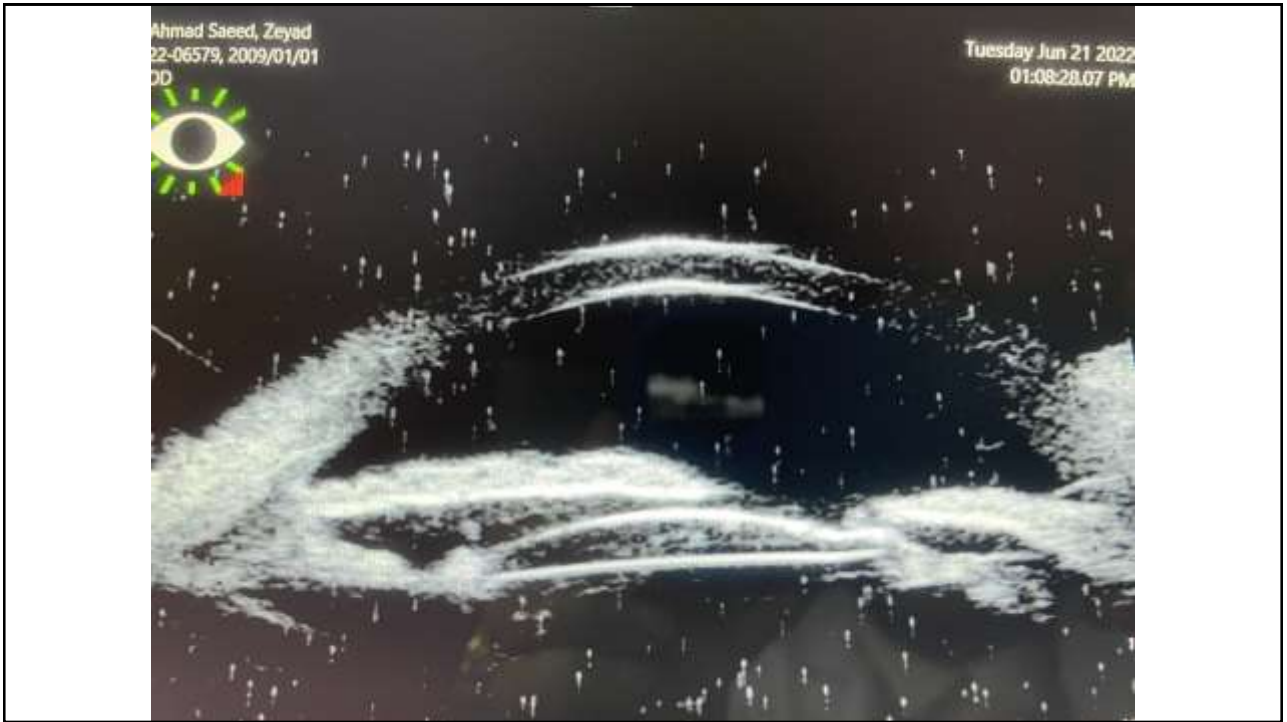
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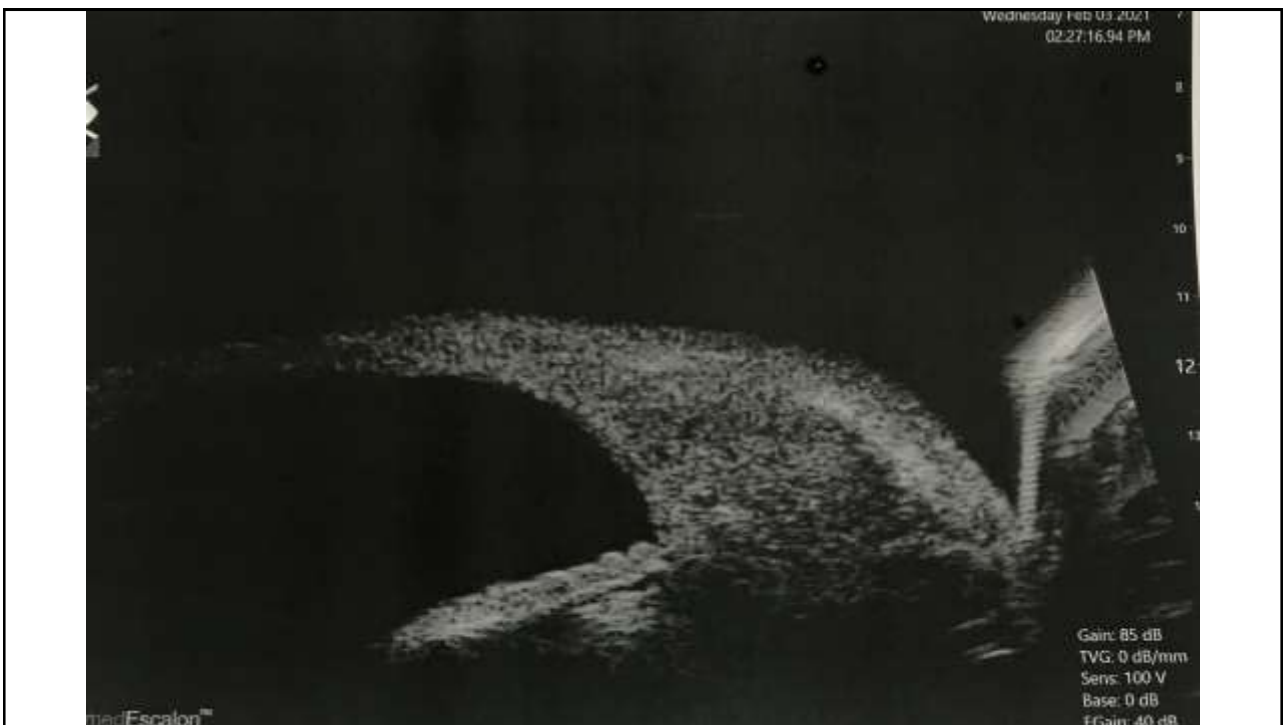
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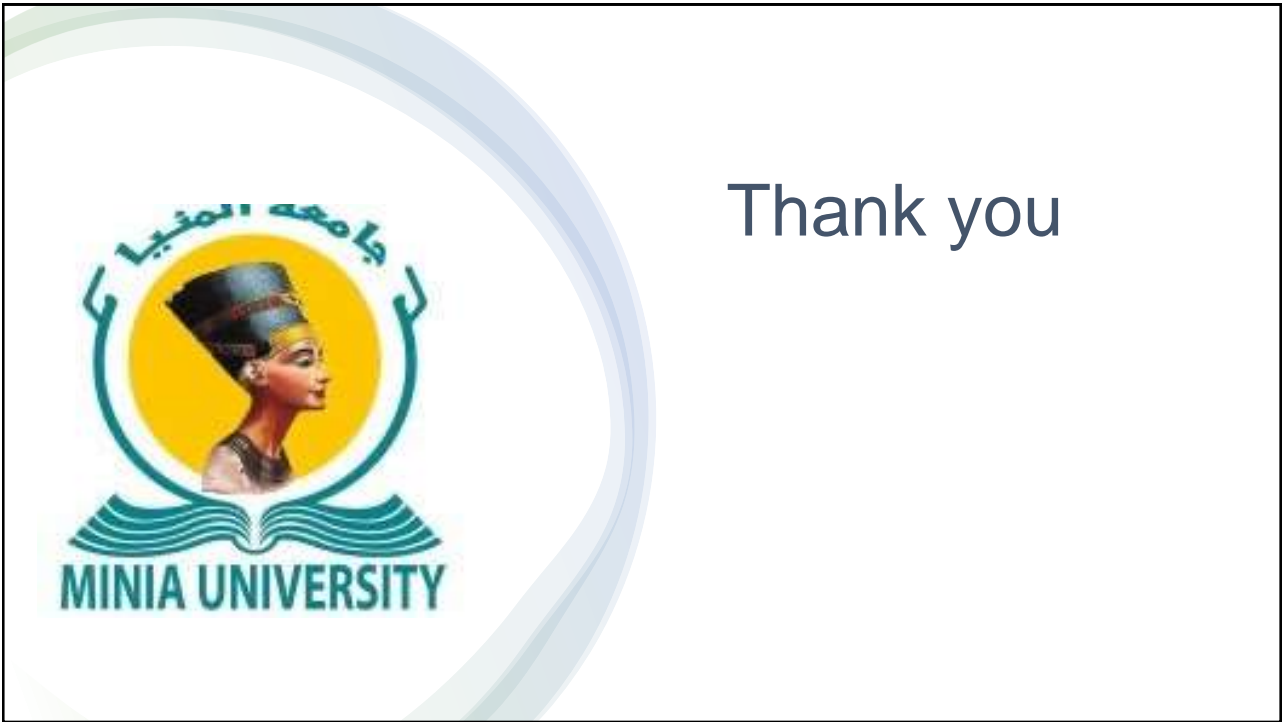
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43



44



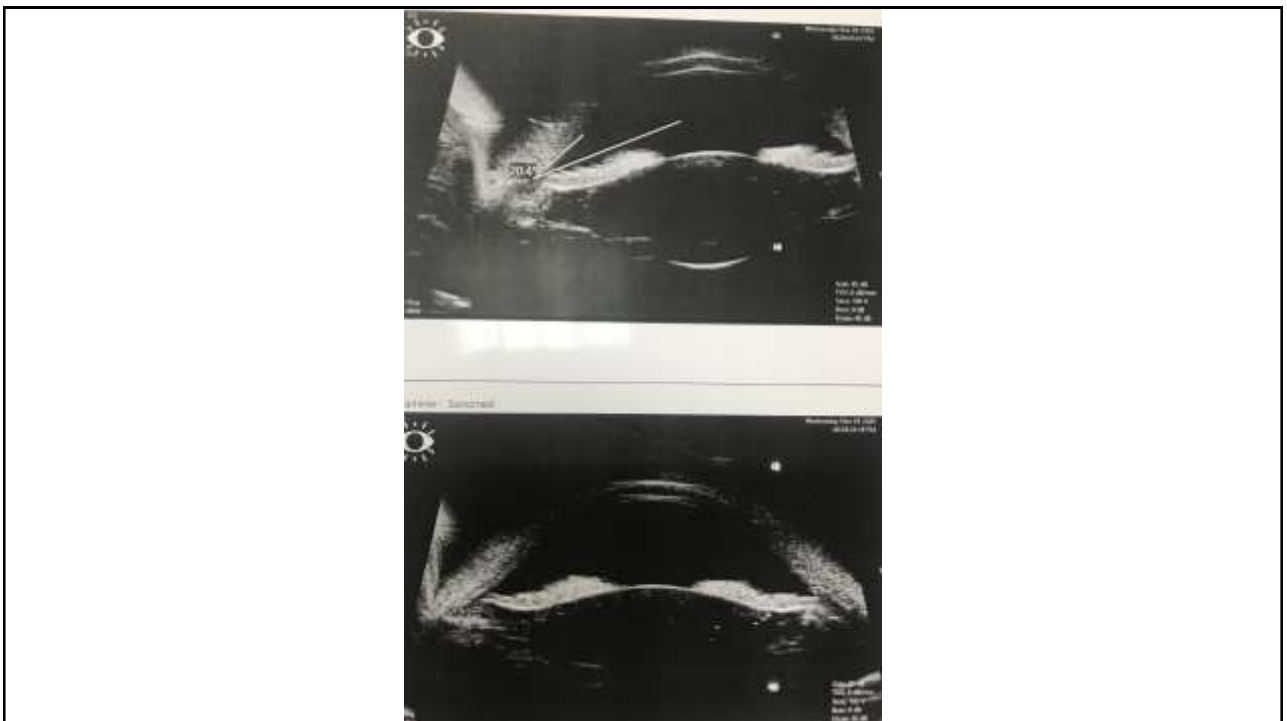
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46



47

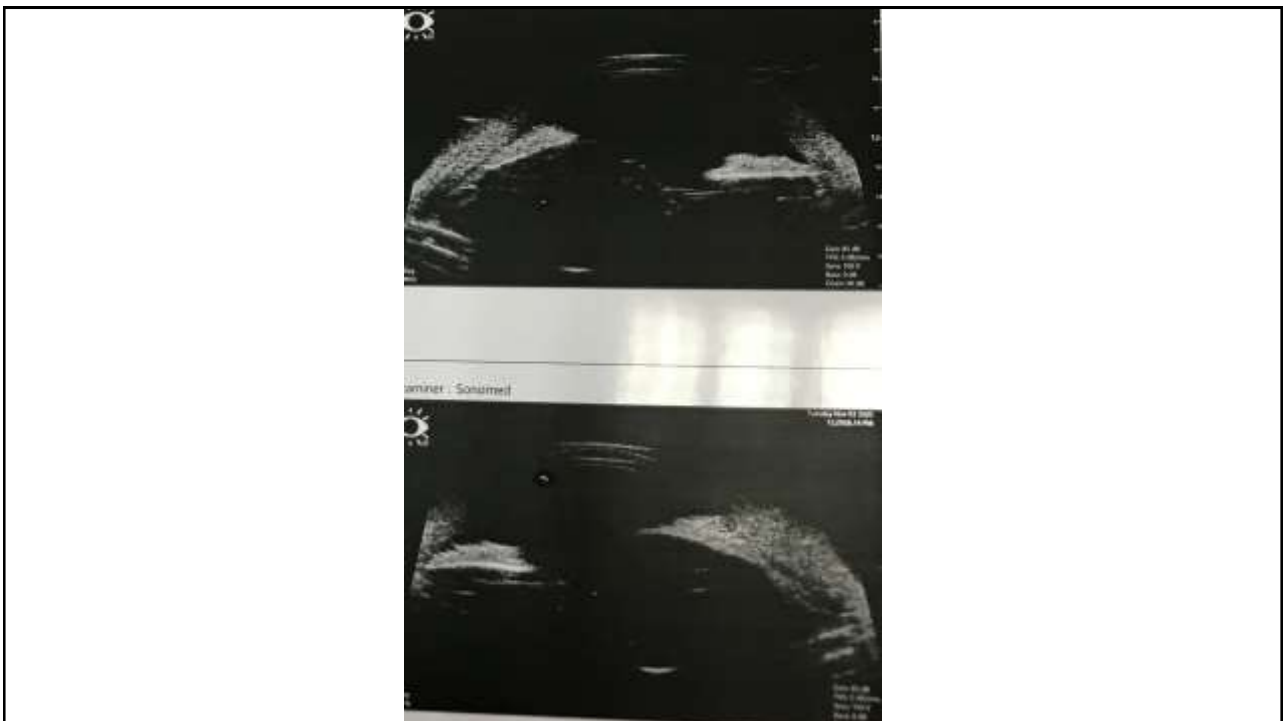


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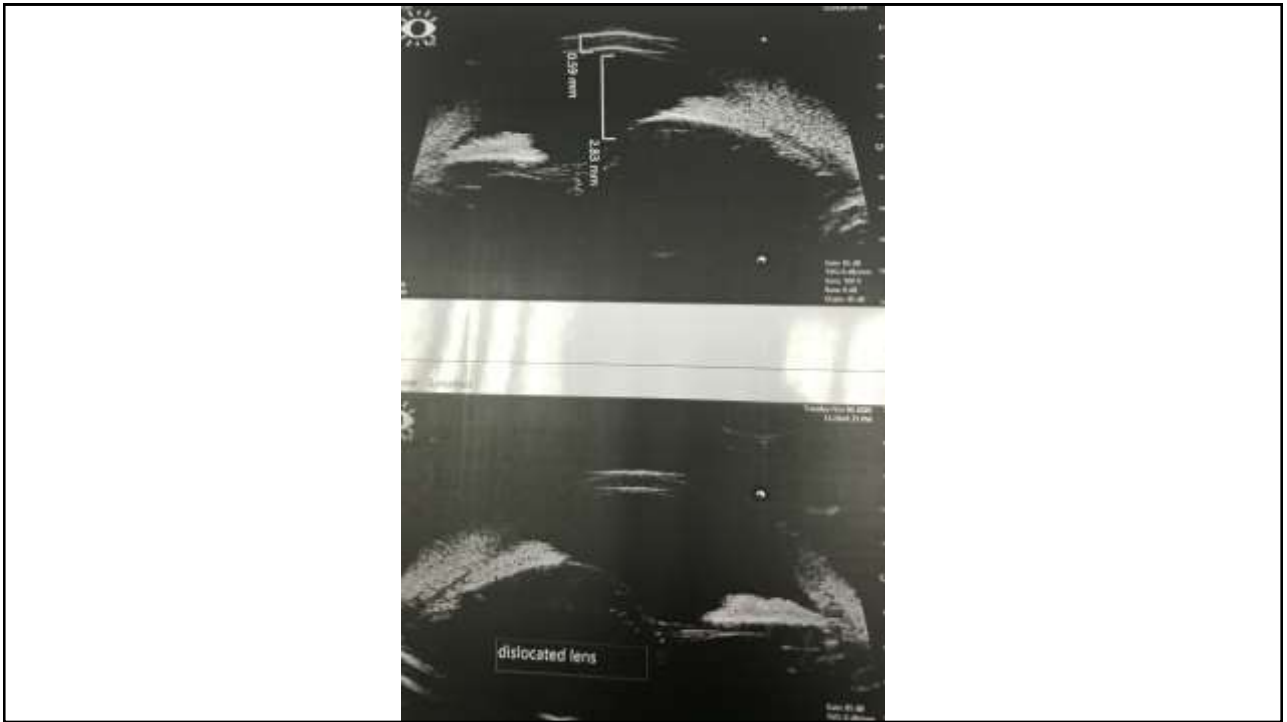




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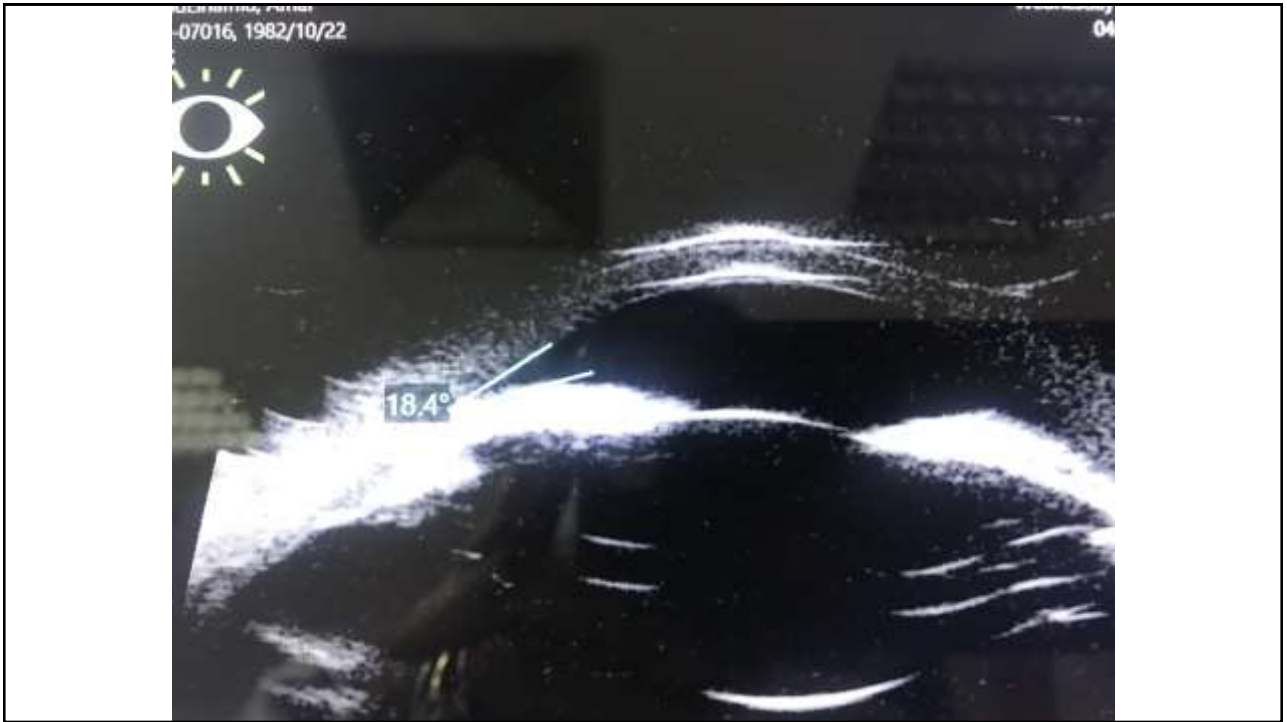
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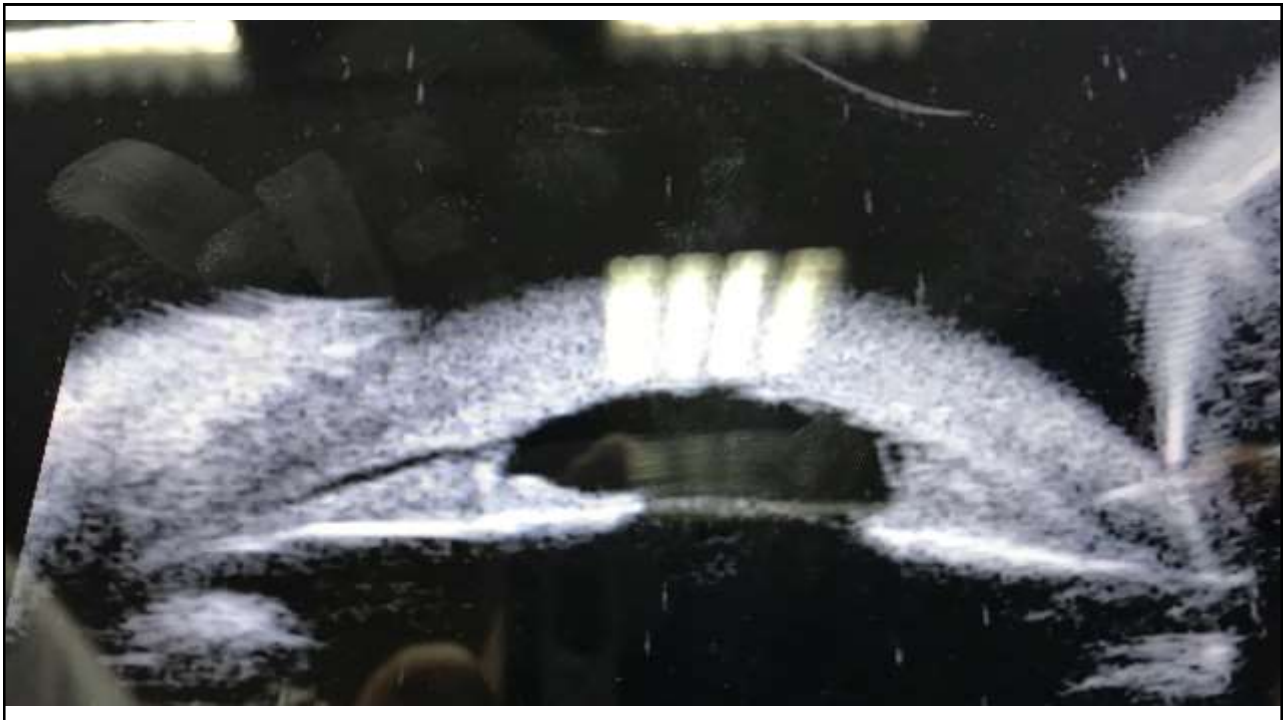
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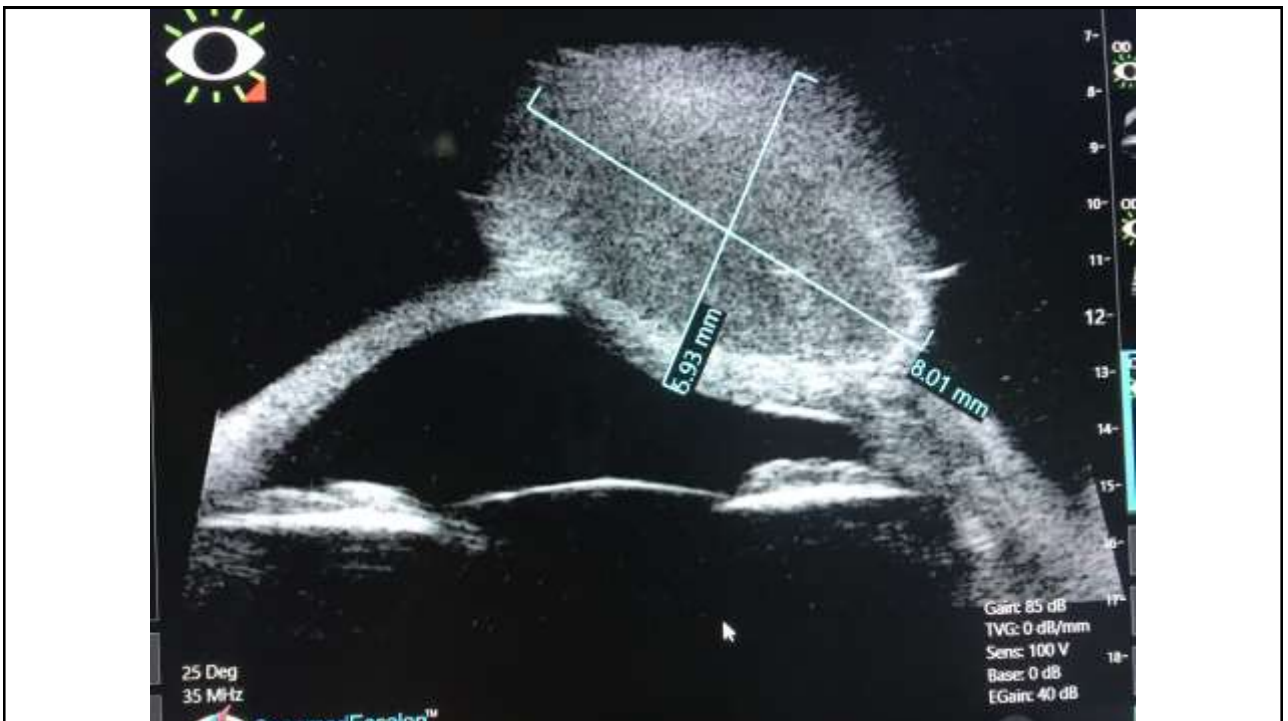
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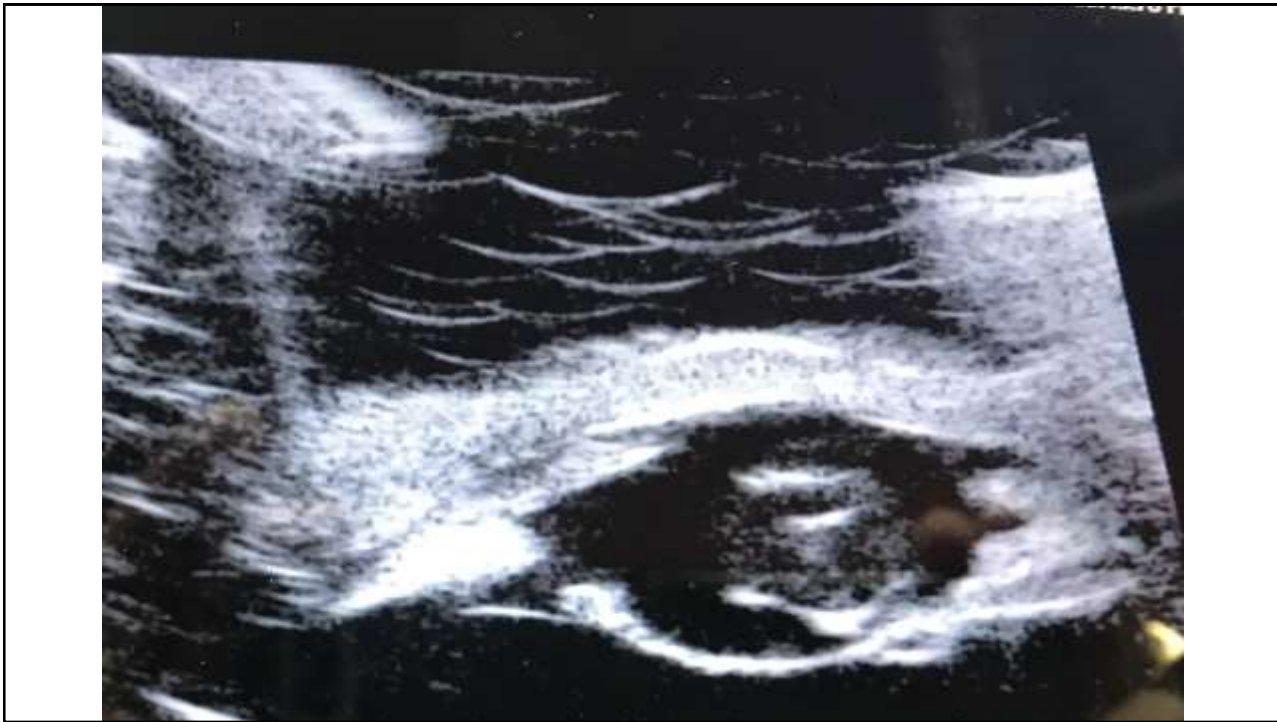
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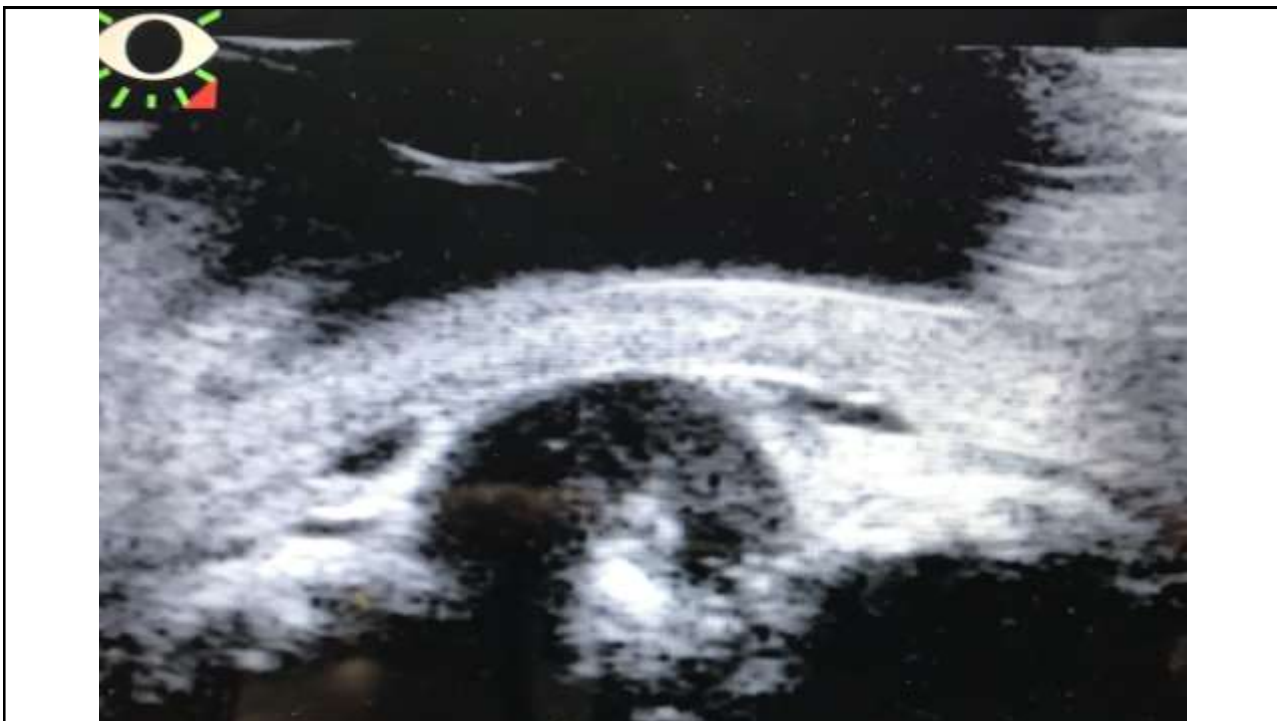
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62



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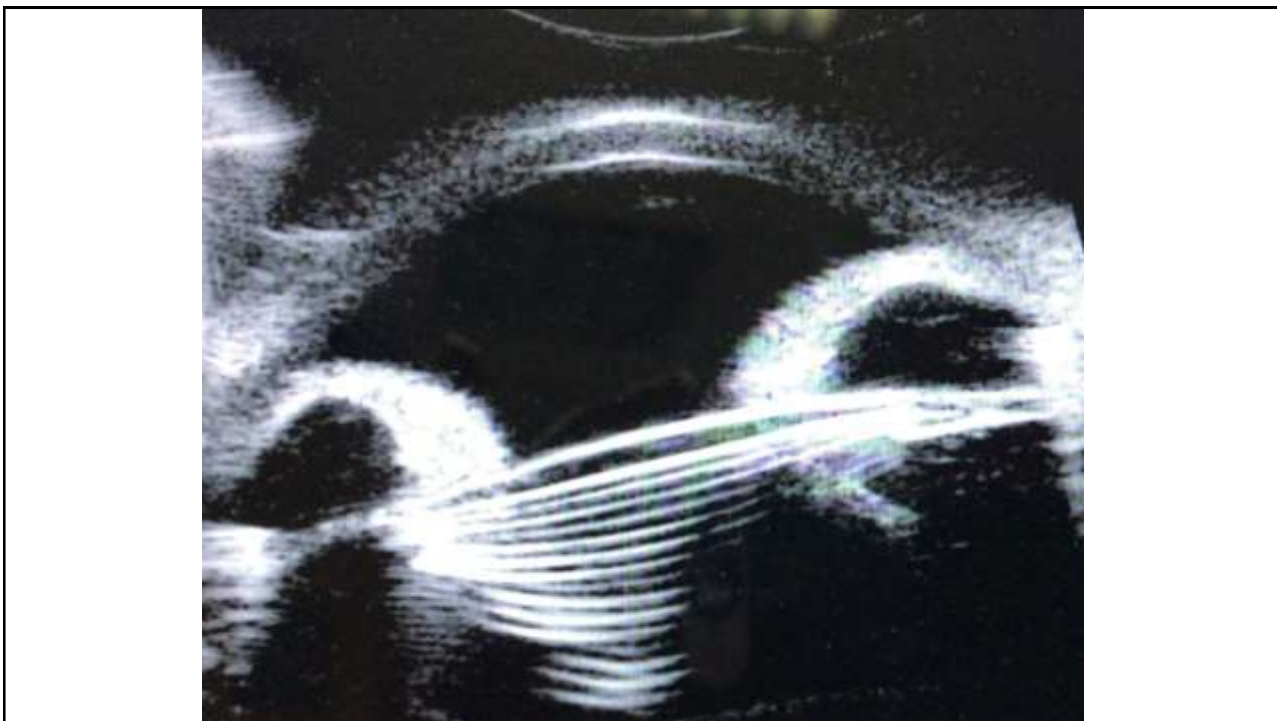


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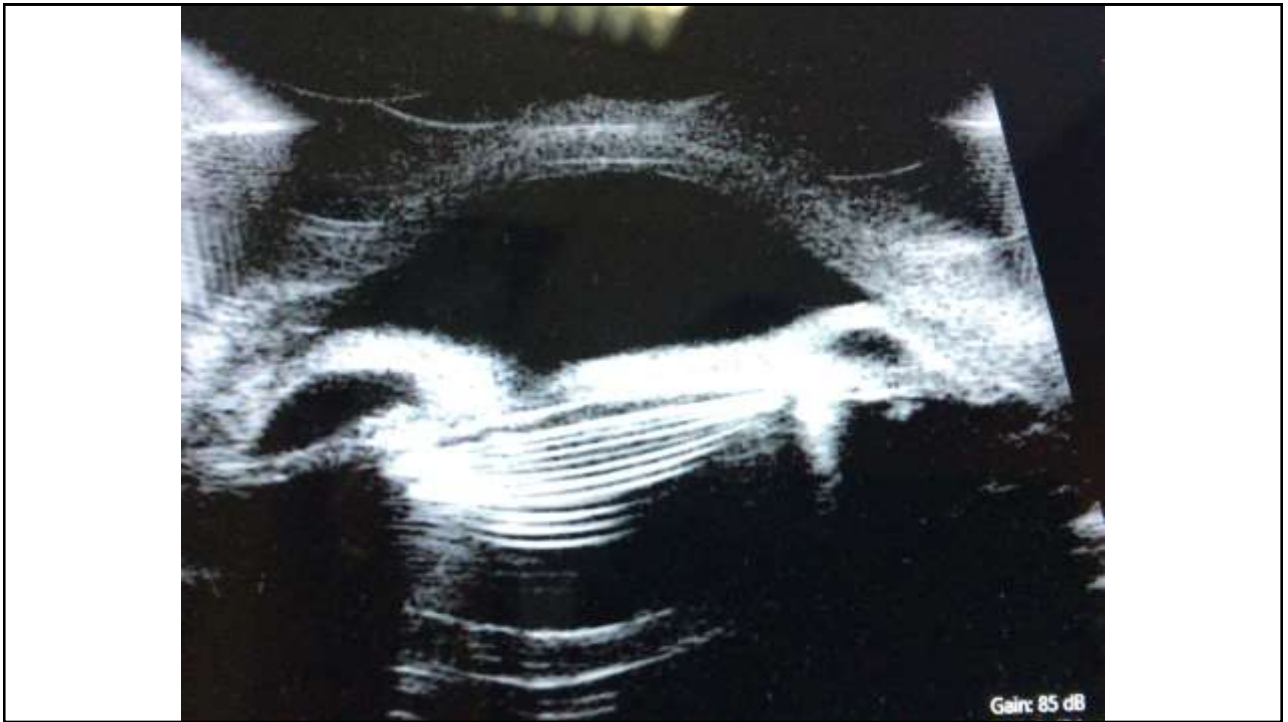




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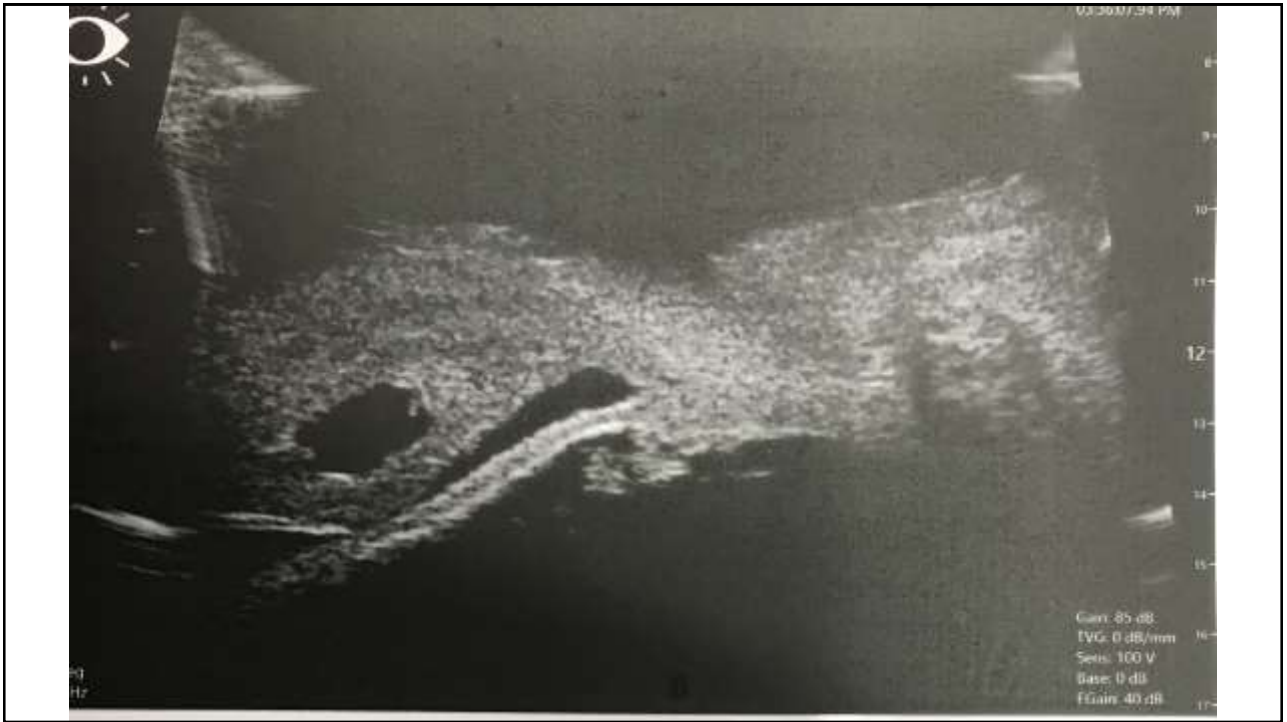
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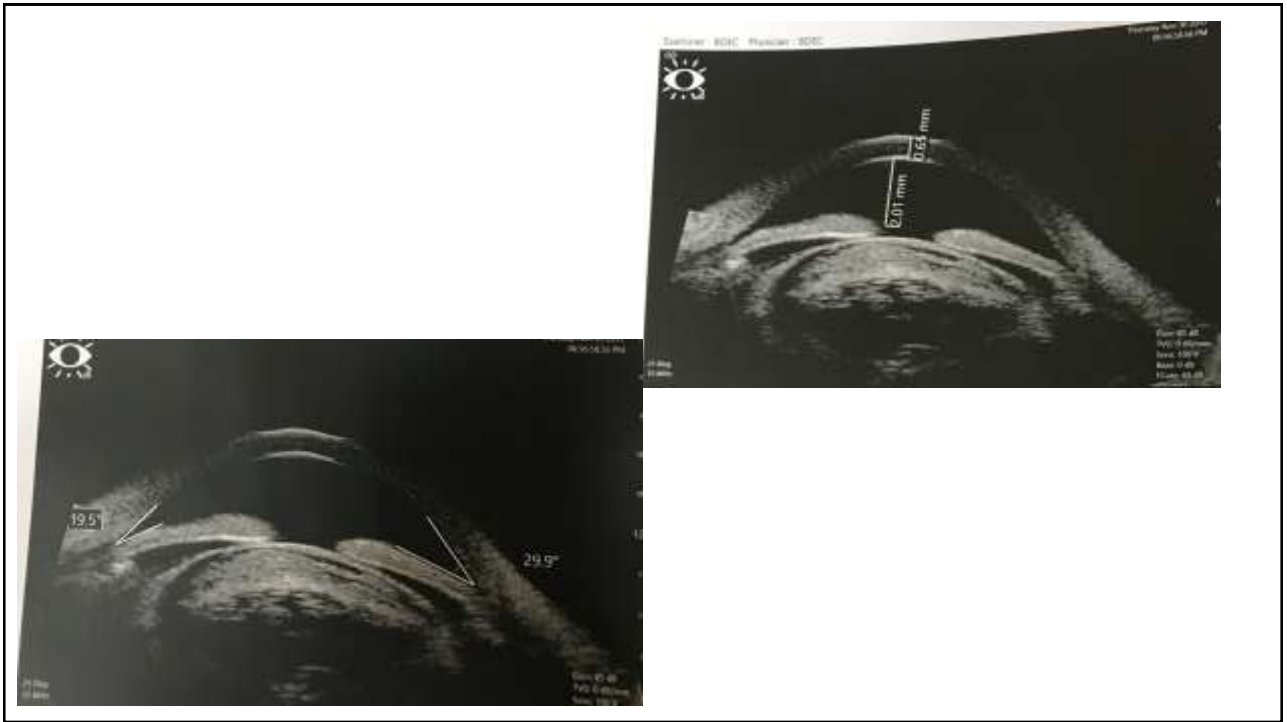
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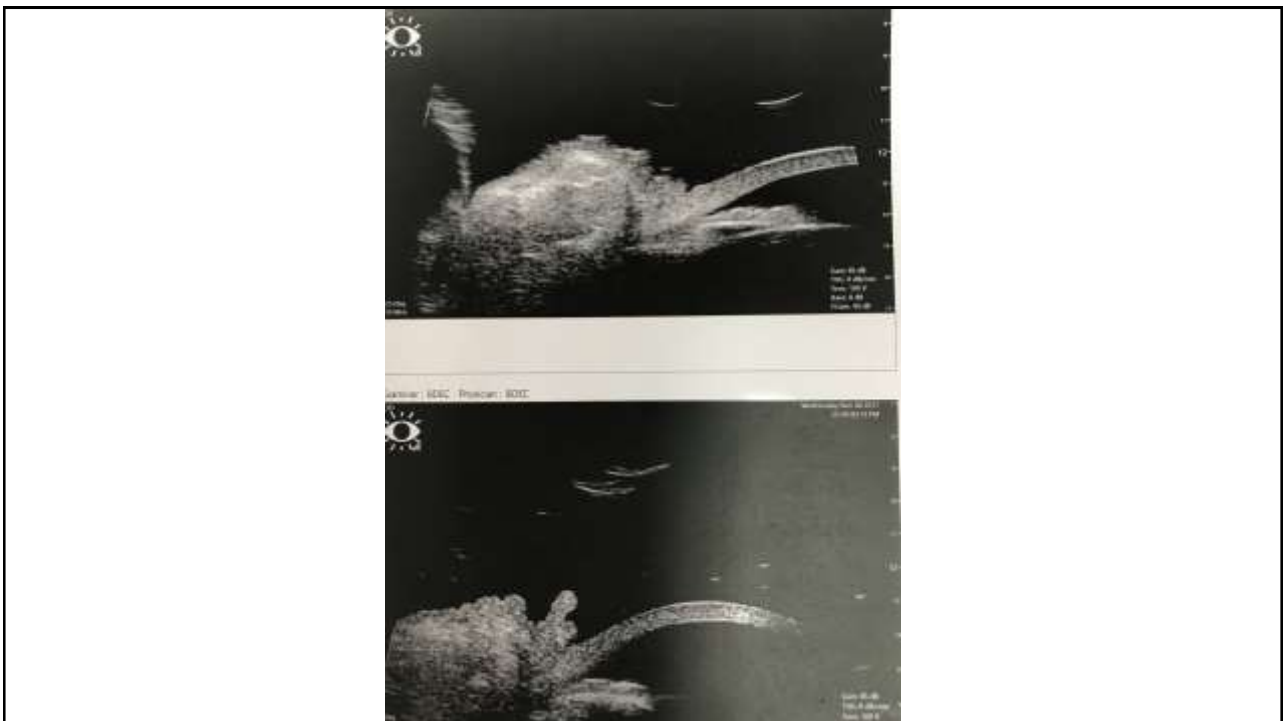
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