

Glaucoma

Section 1

Ali Moradi MSc,

Glaucoma

- Angle Closure Glaucoma
 - Pupillary Block
 - Plateau Iris
 - Malignant Glaucoma
- Open Angle Glaucoma
 - Pigment Dispersion Syndrome
- Assessing Efficacy of Therapy
 - Laser Peripheral Iridotomy
 - Surgical Iridectomy
 - Post-Glaucoma Surgery
 - Glaucoma Implants (Tubes, Tube Shunts, Valves)
- Secondary Glaucoma
- Congenital Glaucoma

Angle Closure Glaucoma

- In angle closure glaucoma, forces are generated to cause angle closure in four anatomic sites:
- The iris (pupillary block)
- The ciliary body (plateau iris)
- The lens (phacomorphic glaucoma)
- and behind the iris by a combination of various forces (Malignant Glaucoma)

UBM provides valuable information that can help differentiating these affected sites and can greatly assist in choosing the effective line of treatment

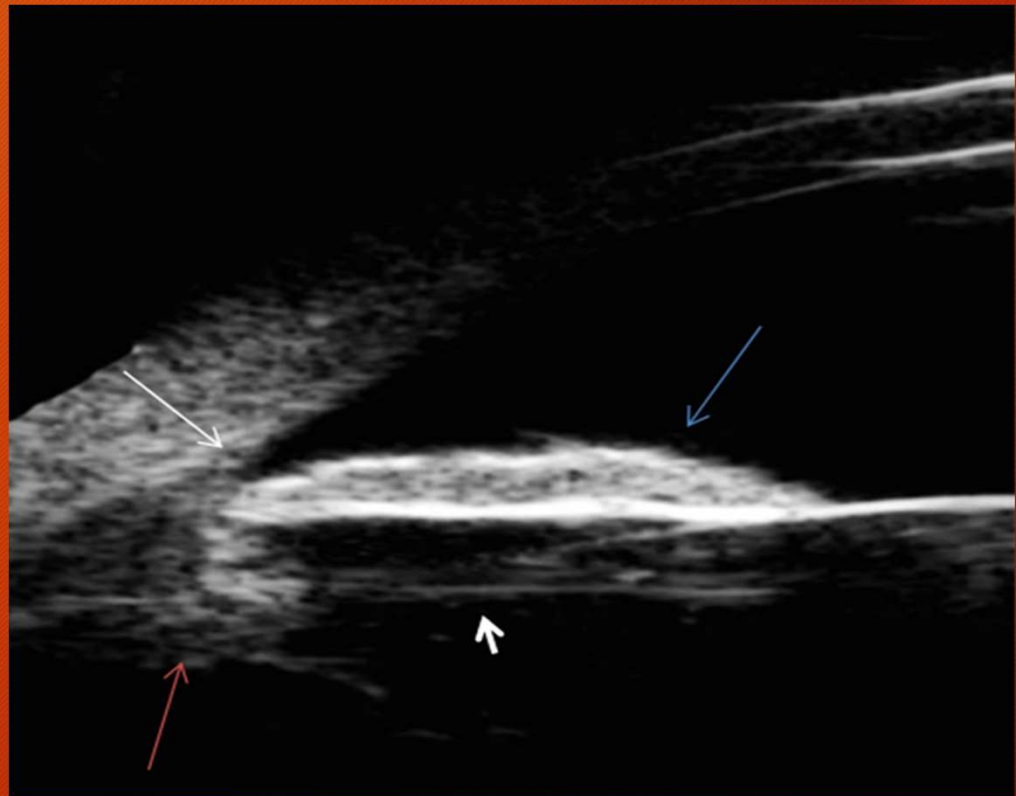
Pupillary Block

- In pupillary block glaucoma, the iris assumes a convex profile (forward bowing of iris) due to the pressure differential between the posterior and anterior chambers
- The anterior convexity of the iris lifts the iris off the lens surface to the point where only the tip of the iris is lying against the lens surface, this amount of lens-iris contact is less than that seen in normal eyes. The iris convexity increases the distance of the iris from the zonule and peripheral lens providing a margin of safety for Yag laser iridotomy.

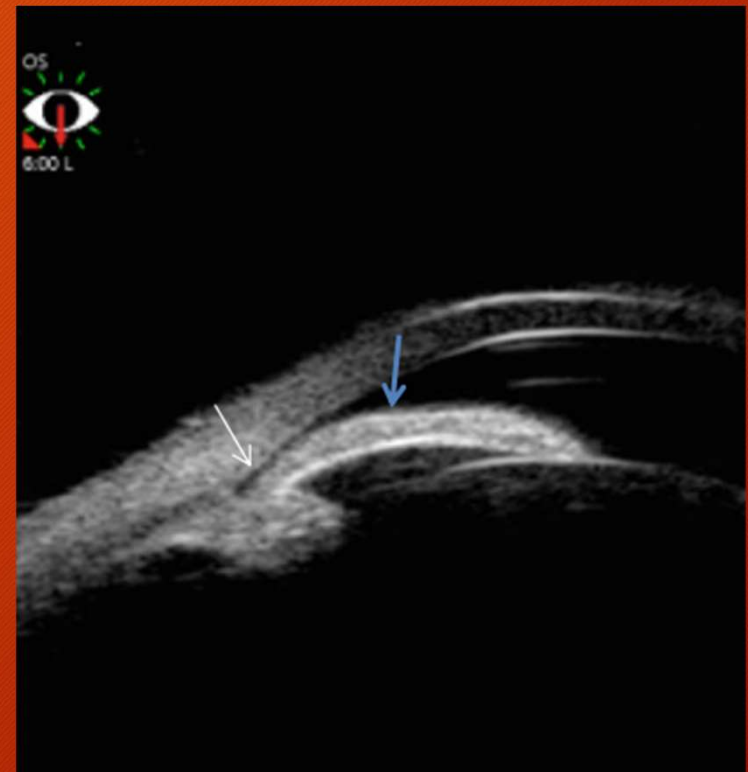
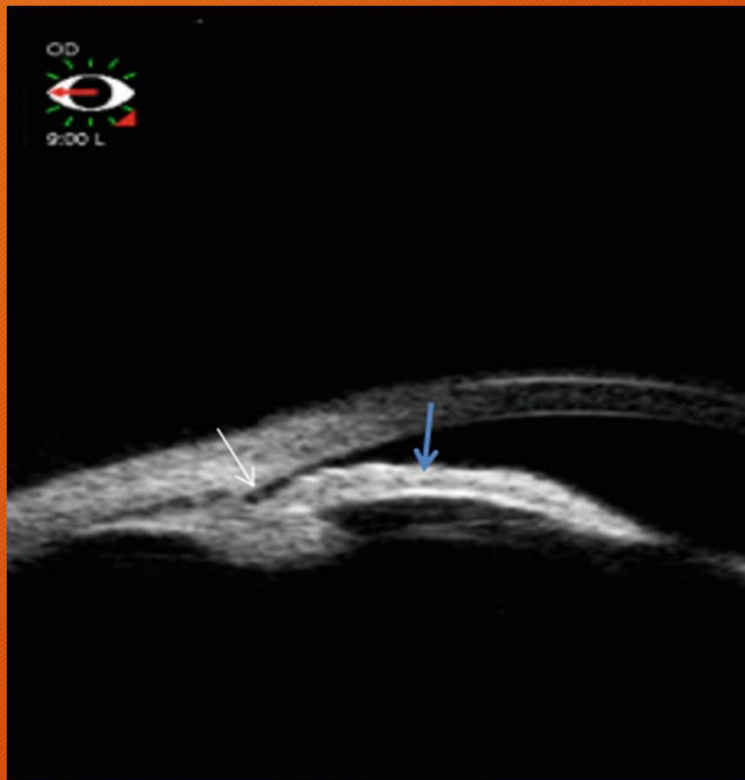
Pupillary Block

UBM image of a normal eye showing the angle.

The iris (blue arrow), scleral spur (white thin arrow), zonules (short white arrow) and ciliary process (red arrow)

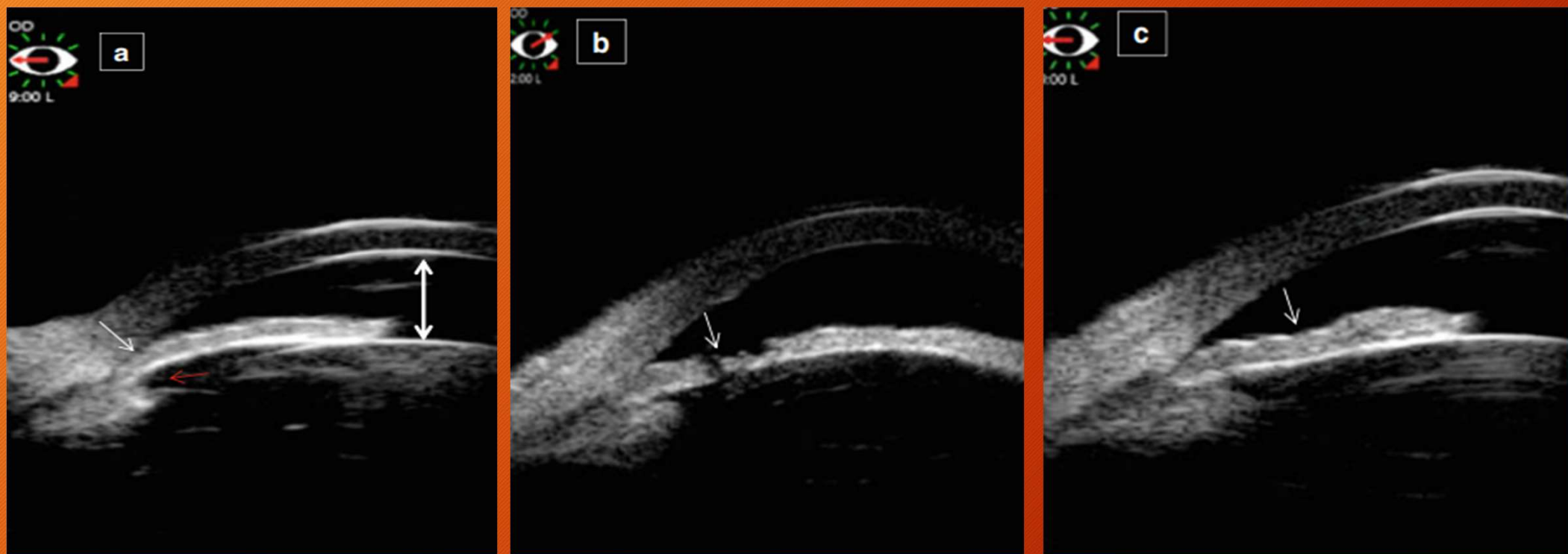


Longitudinal UBM scan of Right and Left eye showing bilateral pupillary block with anterior iris bowing (blue arrows) and slit opening of the angle (white arrows) with more obliterated angle recess in the Left eye



A case of bilateral pupillary block, longitudinal UBM scan of the Right and Left eye showing shallow anterior chamber (double arrow) with anterior iris bowing obliterating the angle (black arrows)





a A case of pupillary block prior to iridotomy showing anterior iris bowing obliterating the angle (white arrow), shallow anterior chamber (double arrow) and opened ciliary sulcus (red arrow)

b showing patent peripheral iridotomy (PI) (arrow)

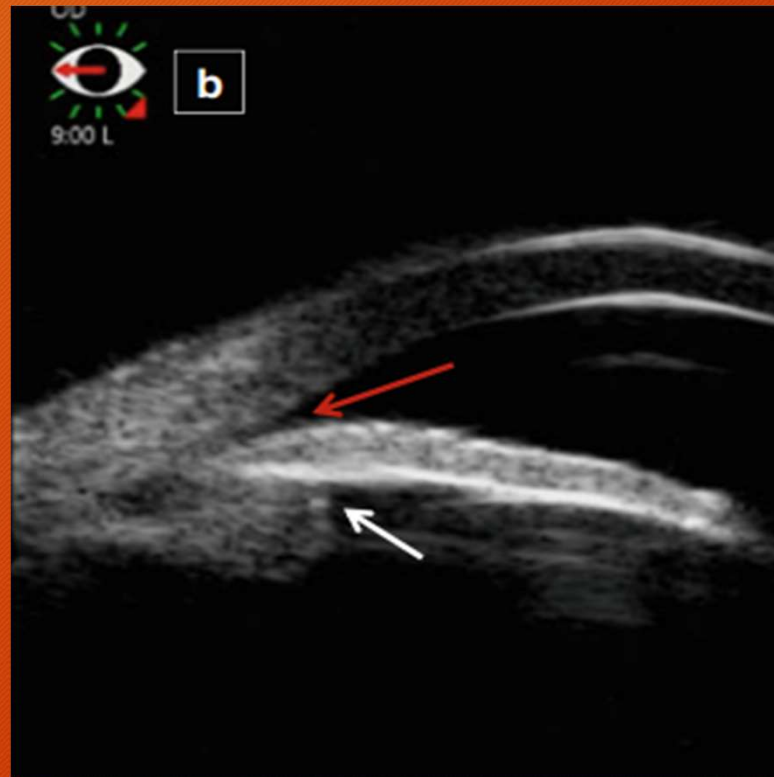
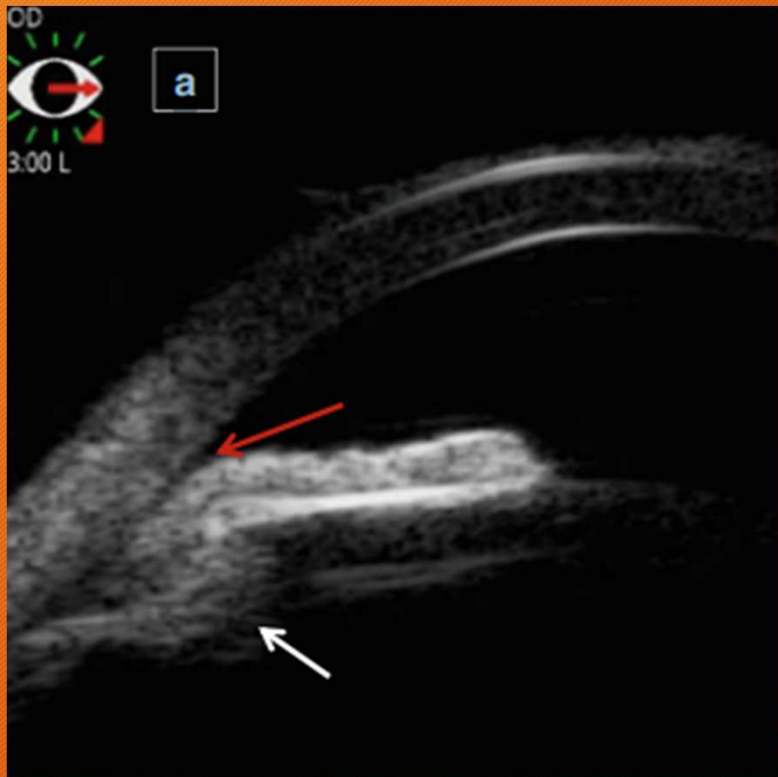
c The iris profile becomes a straight line after the Peripheral iridotomy (arrow)

Plateau Iris

- In plateau iris the ciliary processes are anteriorly located, closing the ciliary sulcus, and providing structural support behind the peripheral iris
- A good way of looking at this phenomenon is that the ciliary processes and the trabecular meshwork form a port through which the iris thickness must pass
- The smaller this port and/or the thicker the iris in this region, the greater the degree of angle closure
- The iris surface looks flat or slightly convex just like in a normal eye
- It can also confirm the “double hump sign” which is normally seen with gonioscopy by the use of an indentation.

Plateau Iris

- UBM special technique that imposes mild pressure on peripheral cornea with the skirt of the eyecup
- UBM can provide other evidence of plateau iris such small anterior chamber depth, absence of trabecular-ciliary process distance, as well as iris-zonule distance that is smaller than normal



Longitudinal UBM scans of temporal and nasal side (at 3 and 9 o'clock), showing a case of Plateau iris. Note the anterior location of the ciliary processes (white arrow in a) closing the ciliary sulcus (white arrow in b), and preventing the peripheral iris from falling away from the trabecular meshwork and narrowing the angle (Red arrows)



Longitudinal UBM scan of Plateau iris showing the double hump sign on indentation

Malignant Glaucoma

UBM findings include shallow or flat anterior chamber, anterior rotation of ciliary processes. Supraciliary effusion may or may not be present. The detection of supraciliary effusion on UBM is of significance as it indicates the need for aggressive medical management rather than immediate surgical intervention

Malignant Glaucoma

Malignant glaucoma is defined as a condition in which shallowing of the anterior chamber with elevated pressure occurs in spite of a patent iridotomy. Also known as aqueous misdirection or ciliary block.

Malignant glaucoma usually occurs after glaucoma surgeries; however, it can also occur after other ocular interventions such as phacoemulsification, laser iridotomy, laser capsulotomy or cyclophotocoagulation

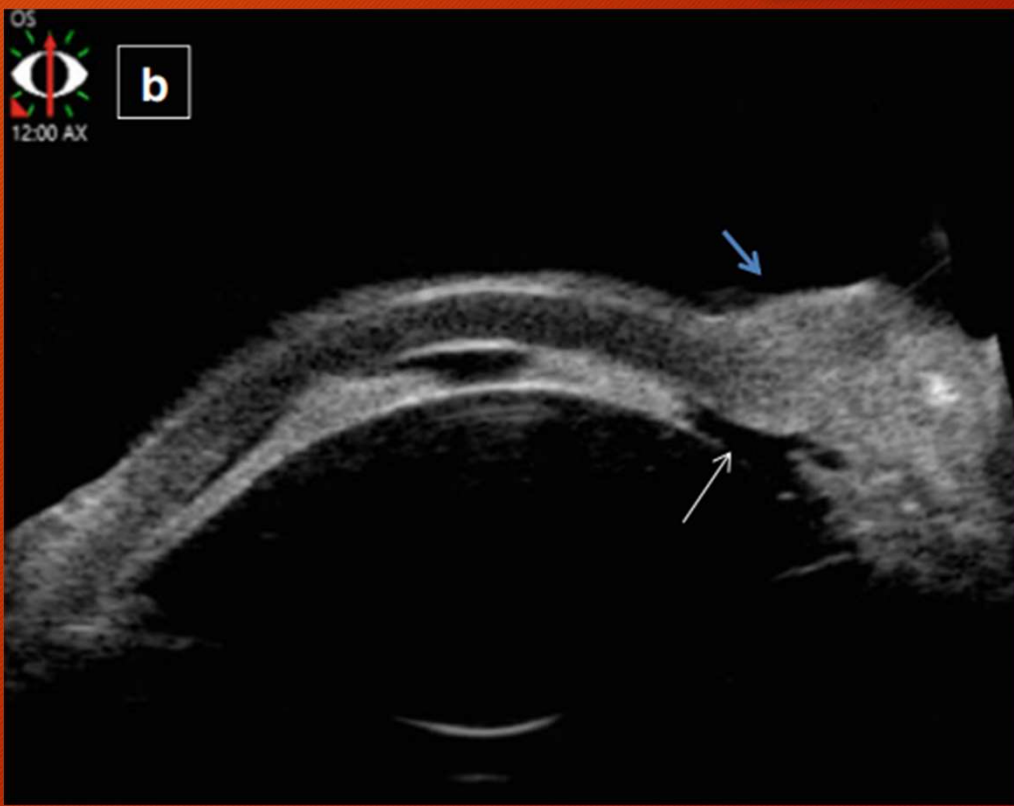
Malignant Glaucoma

Although the exact etiology of this disease is not yet fully understood, it is believed to evolve from posterior misdirection of the aqueous humor into or behind the vitreous.

The resultant pressure differential between the posterior and anterior chambers causes an anterior displacement of the lens-iris diaphragm, anterior chamber shallowing or flattening, and secondary angle closure glaucoma



a Axial UBM scan of flat anterior chamber with forward movement of the iris-lens diaphragm causing iridocorneal touch (blue arrow), and ciliary body rotation (white arrow), **b** showing thickened conjunctival bleb (blue arrow), with patent Peripheral iridectomy (white arrow)



Malignant Glaucoma

Longitudinal UBM scan showing the anteriorly rotated ciliary body (thick arrow) with no evidence of ciliochoroidal detachment (thin arrow)



Open Angle Glaucoma

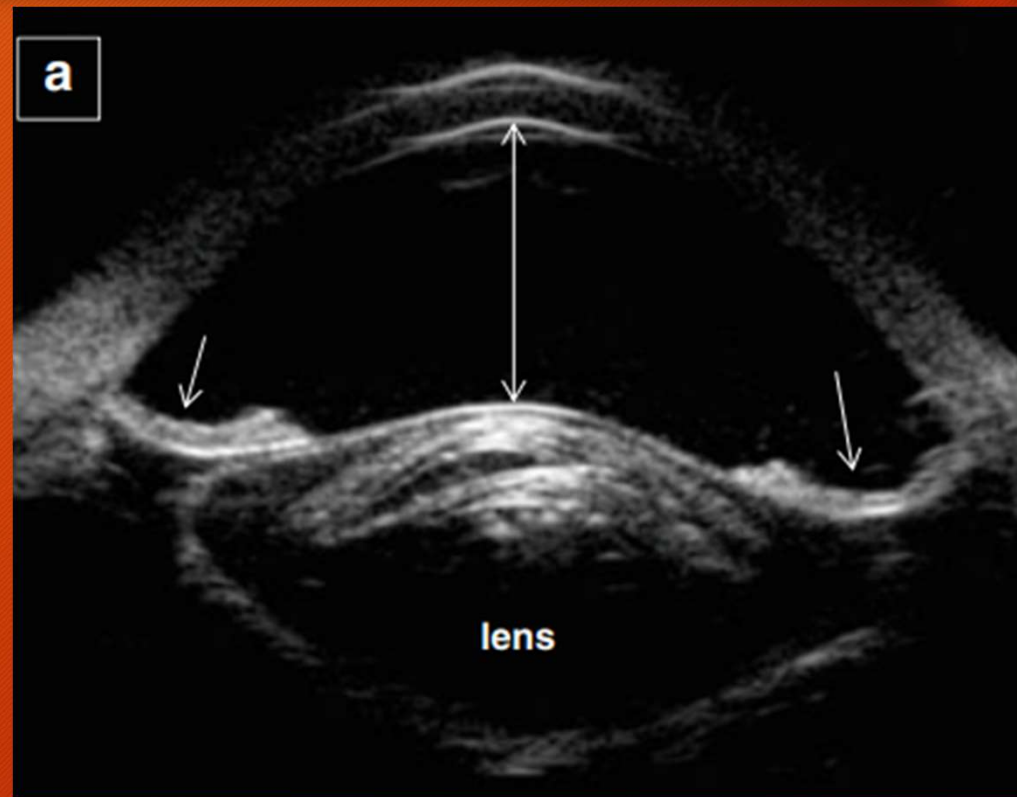
Although UBM can provide a clear, objective view of the anterior segment, its utility is limited in open angle glaucoma because changes taking place in open angle glaucoma occur at a level beyond the current resolution of ultrasound biomicroscopy.

Pigment Dispersion Syndrome

In pigment dispersion syndrome, friction between the posterior iris surface and the anterior zonular bundles causes the disintegration of iris pigment epithelial cells and the release of pigment granules, which are then dispersed by aqueous currents. The liberated pigment is deposited throughout the anterior segment. The classic diagnostic triad consists of a Krukenberg spindle, slitlike radial midperipheral iris transillumination defects, and increased pigmentation of the trabecular meshwork. In UBM the angles are widely open. The iris is with slight concavity (bowing posteriorly), as is true in pupillary block, there is a relative pressure gradient between the anterior and posterior chamber; however, because the anterior chamber is the one that holds higher pressure, this condition is called “reverse pupillary block”

Pigment Dispersion Syndrome

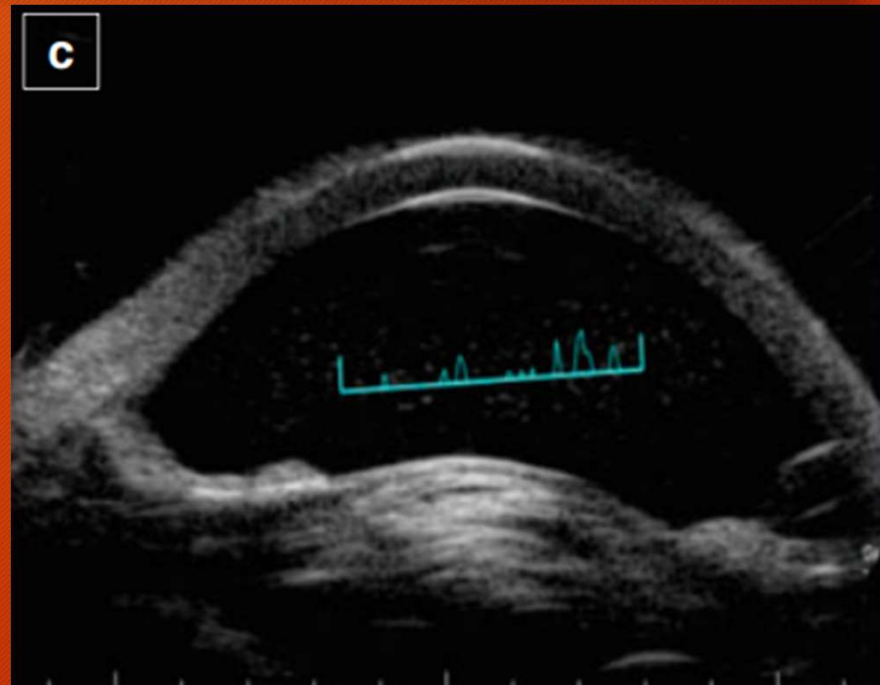
Pigmentary glaucoma;
UBM of an eye with
pigment dispersion
syndrome. Note the deep
anterior chamber(double
head arrow), concave iris
(white arrows)



Pigment Dispersion Syndrome



a Note the deep anterior chamber(double head arrow), concave iris (white arrows),



b IridoZonular touch (blue arrow), **c** multiple echoes in the anterior chamber of low amplitude on A-scan

Thank You For Your Attention

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Basir Clinic



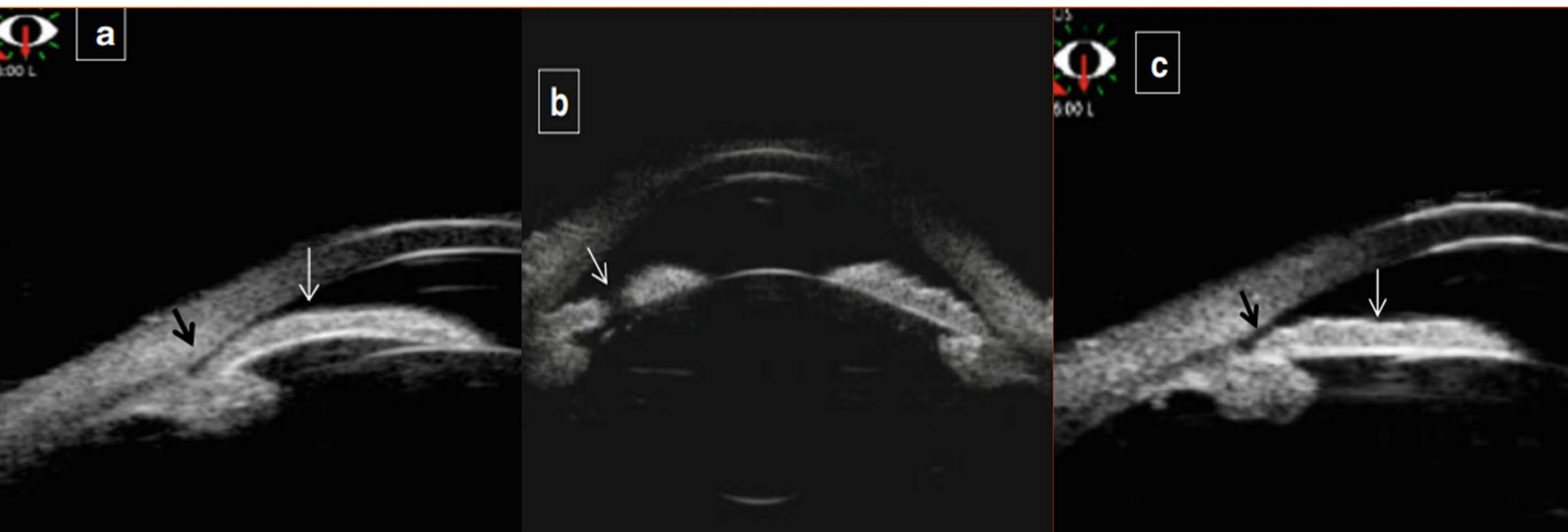
Glaucoma

Section 2

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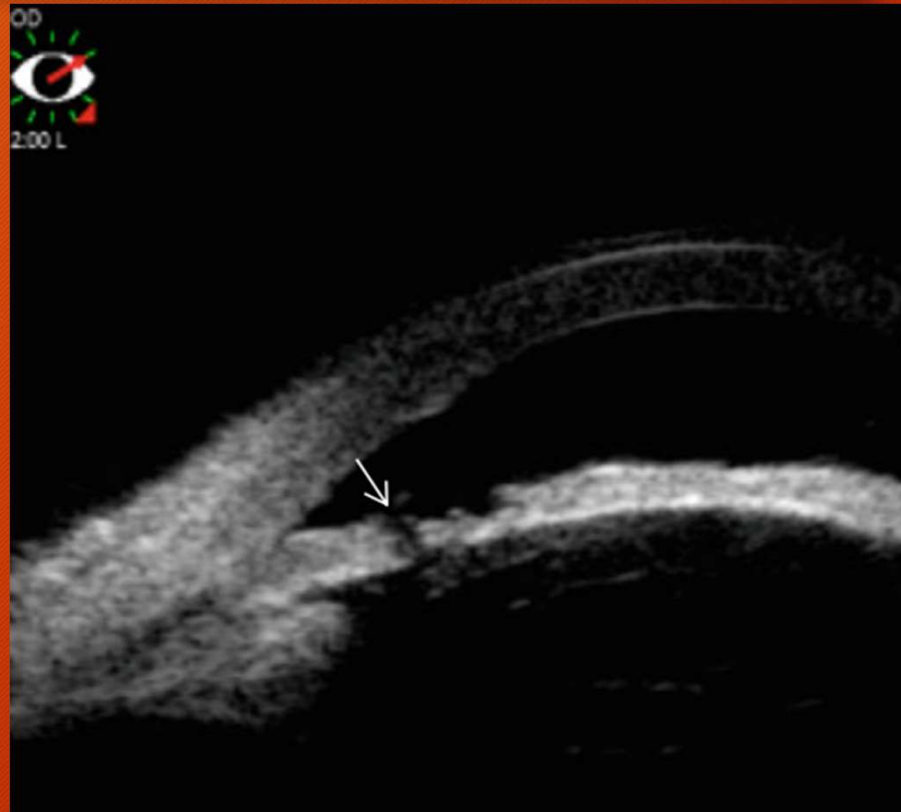
UBM in Assessing Efficacy of Therapy Laser Peripheral Iridotomy

laser peripheral iridotomy, (PI) imaged as a much more irregular opening, with stromal disruption compared to surgical iridectomy. The most important use of UBM post PI is the identification of anterior rotation of ciliary processes and absence of ciliary sulcus to identify plateau iris. The presence of cysts of the ciliary processes may be seen



A case of pupil block glaucoma **a** longitudinal scan of the inferior quadrant showing convex iris bowing (white arrow), slit-like opening of the angle (black arrow) and opened ciliary sulcus, **b** axial scan showing patent peripheral iridotomy (white arrow) at 12 o'clock, **c** The iris profile becomes a straight line at the inferior quadrant (white arrow) with change in the angle opening distance (black arrow)

A longitudinal UBM scan of Patent Peripheral iridotomy shows irregular iris stromal disruption (white arrow)



Surgical Iridectomy

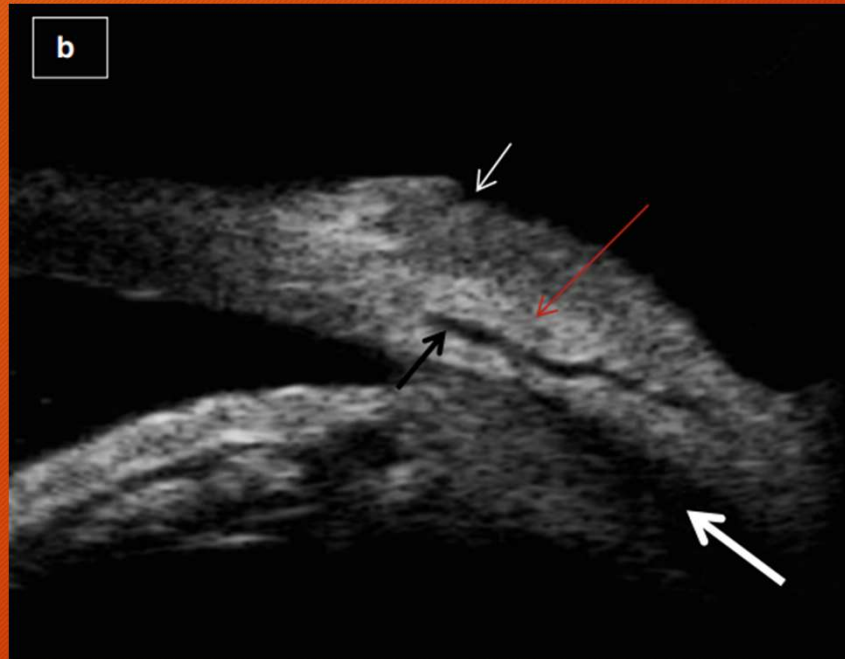
*Surgical iridectomy sites generally show a smooth edged gap in the iris on ultrasound biomicroscopy

Post-Glaucoma Surgery

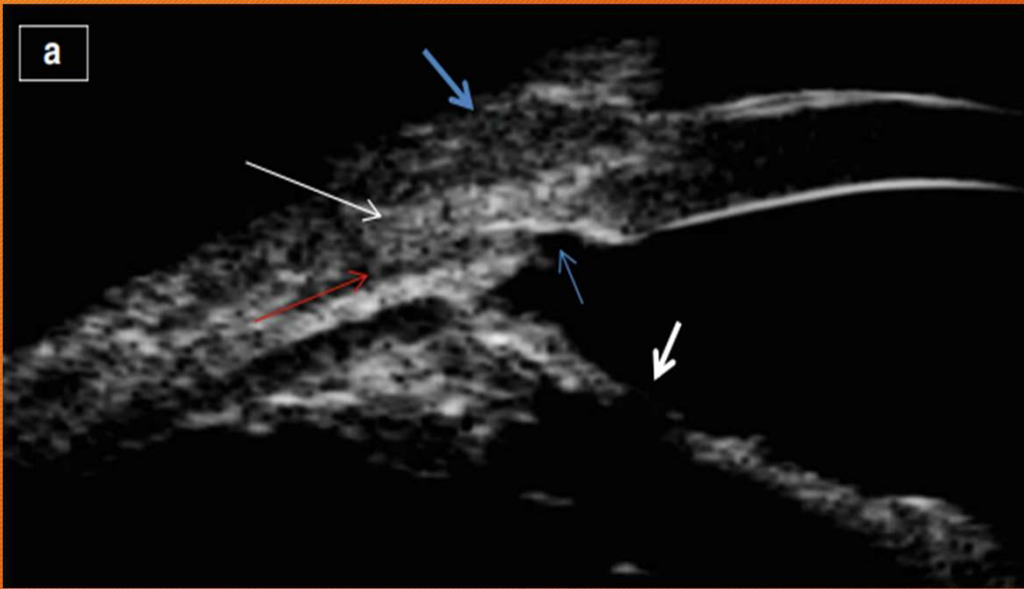
- The basic mechanism of trabeculectomy is to create a fistula at the limbus allowing aqueous humor to drain from the anterior chamber to the episcleral and subconjunctival spaces, thereby reducing the intraocular pressure (IOP)
- UBM identifies the status of a filtering bleb; the height, internal reflectivity within the bleb, cysts inside the bleb and patency of the stoma and its connection to the bleb
- The UBM images of eyes with good IOP control are characterized by better visibility of the route under the scleral flap and a low reflectivity inside the bleb

Post-Glaucoma Surgery

- The most popular non penetrating filtering procedures involve removal of a deep scleral flap, the external wall of Schlemm's canal and corneal stroma behind the anterior trabeculum and Descemet's membrane, thus creating an intrascleral space. The aqueous humor leaves the anterior chamber through the intact trabeculo-Descemet's membrane into the scleral space



Post trabeculectomy showing **a** A Patent ostium (short white arrow) and peripheral iridectomy (thin white arrow) with patent intrascleral pathway (black arrow in a and b), **b** Elevated bleb with low echogenicity (thin white arrow) above the patent intrascleral pathway (black arrow), with evidence of intrableb microcysts. Note the supraciliary effusion (thick white arrow), scleral flap (red arrow)

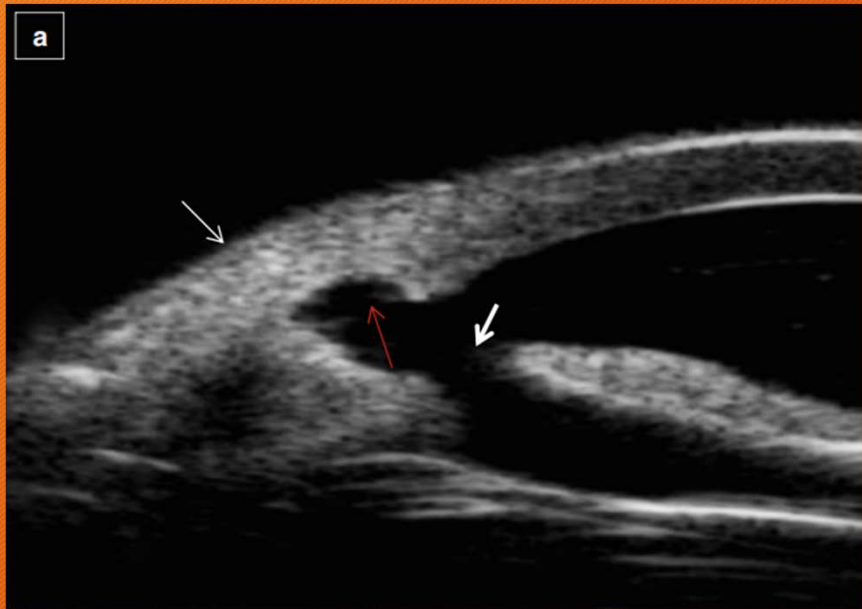


Post trabeculectomy **a** A patent ostium (thin blue arrow) with intrascleral tract (red arrow), peripheral iridectomy (short white arrow) and evident scleral flap (long white arrow), with formed low echogenic bleb (thick blue arrow), **b** showing patent intrascleral tract (white Arrow)





a Magnified longitudinal UBM scan of a diffuse filtering bleb; the bleb showing opened fluid space (white arrow), **b** showing the ostium with peripheral iridectomy.
c Axial UBM scan of the same patient showing the peripheral iridectomy (white arrow), and the ostium (black arrow)



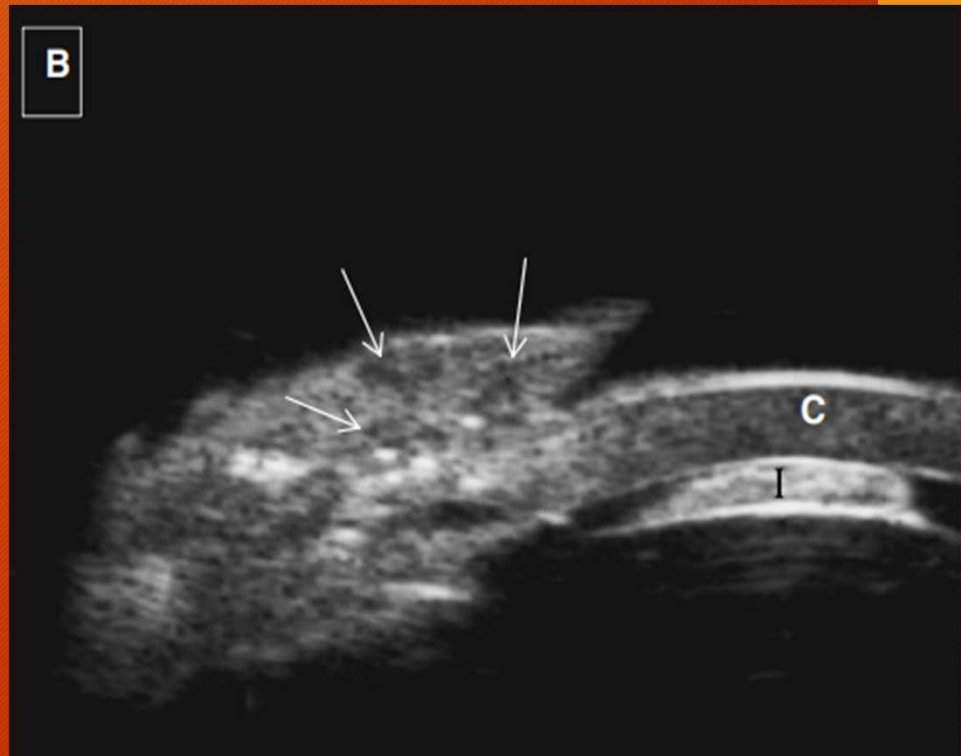
Post trabeculectomy. **a** Longitudinal UBM scan showing the ostium (red arrow) with no evident of scleral tract with flat bleb (white arrow), as well as peripheral iridectomy (short thick arrow), **b** evident of ciliochoroidal detachment (blue arrow)

UBM examination can demonstrate the presence of intrascleral space and the remaining thin **TDM** (trabeculo-descemet's membrane) and a filtering bleb



Non penetrating glaucoma surgery (deep sclerectomy): with adequately formed intrascleral space (red arrow in a and b), and evidence of formed bleb of low echogenicity with evident of fluid space (short white arrow), **b** Apparent scleral flap (white arrow) with visible trabeculo-descemet's membrane (black arrow). Note the iris in contact with the TDM, Moreover, the UBM scan is showing evidence of anterior rotation of the ciliary body (thin white arrow) and shallow anterior chamber (double head arrow)

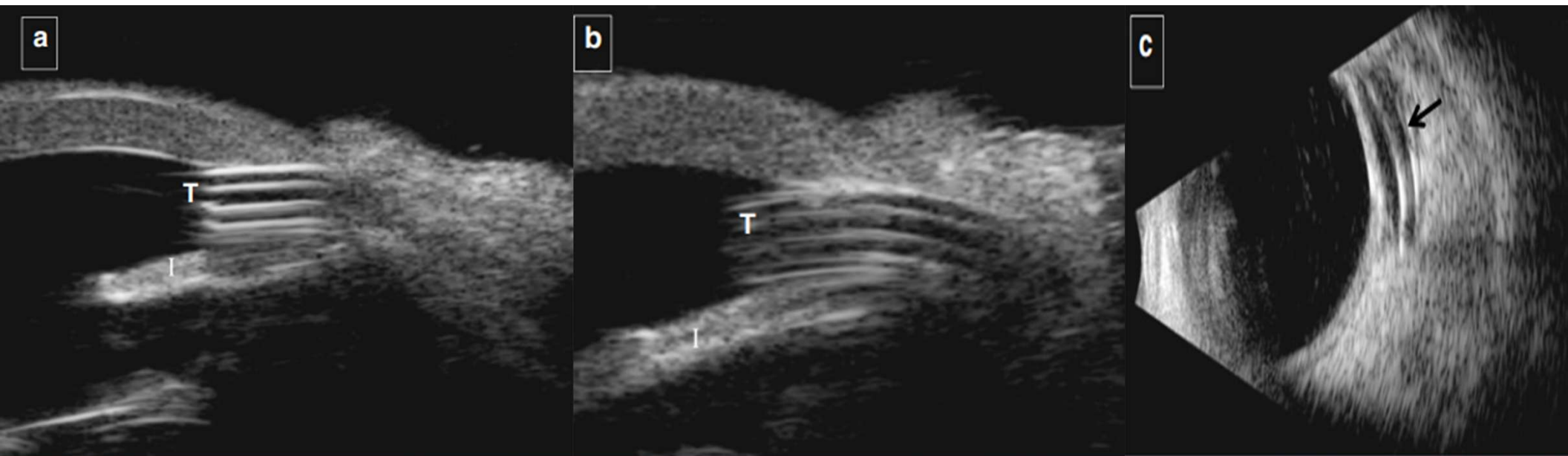
Associated features like suprachoroidal effusion and ciliary process rotation can be detected by UBM



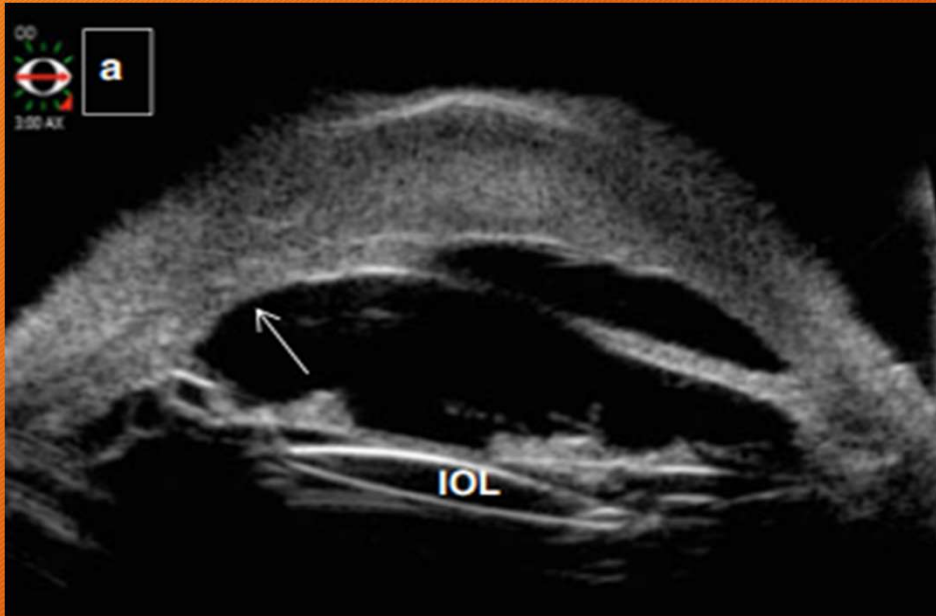
A case of malignant glaucoma **a** showing patent ostium (thick arrows) with peripheral iridectomy (thin arrow), **b** Elevated low to moderate echogenic bleb with microcysts (arrows). Note the flat anterior chamber with forward movement of the iris-lens diaphragm and the iridocorneal touch (double arrow in a), C:cornea, I: iris,

Glaucoma Implants (Tubes, Tube Shunts, Valves)

- The patency of aqueous drainage tubes as well as the location can be determined by UBM .
- Where A&B-scan ultrasonography may be used to identify the presence or absence of a glaucoma filtering bleb over the glaucoma implant plate especially if the plate is sutured into place at or posterior to the ocular equator

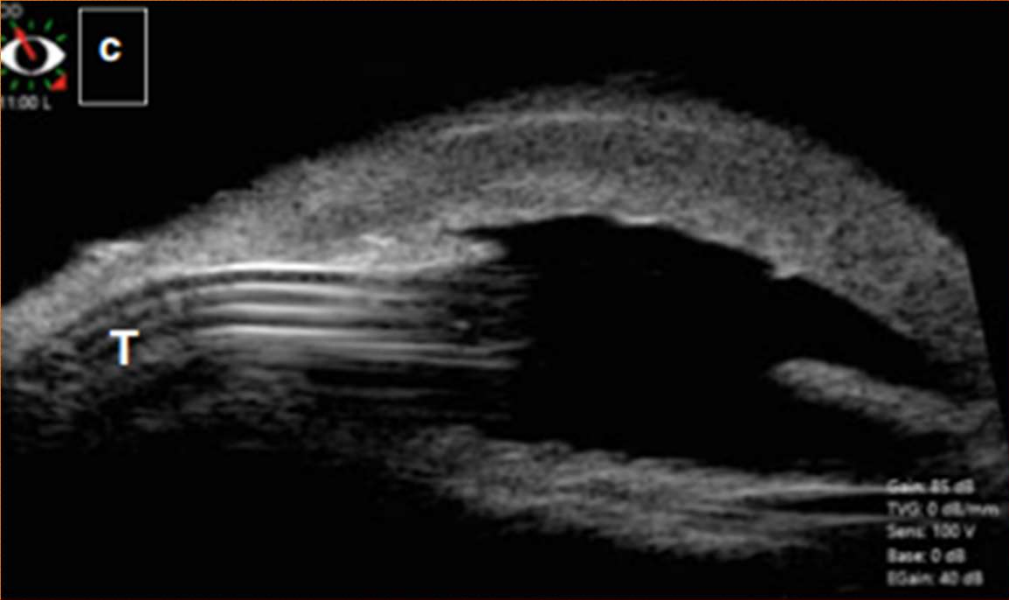


a and b Longitudinal UBM scan showing implanted tube in the anterior chamber, I (iris), T (Tube), c Transverse B-scan showing a patent superior “Ahmed glaucoma drainage device” with large fluid reservoir (black arrow)

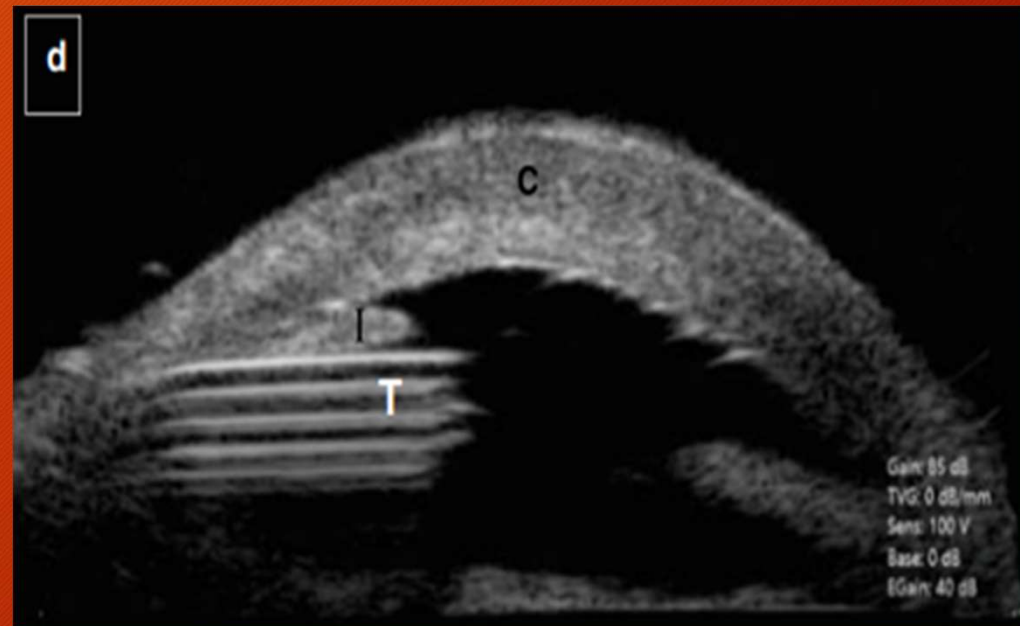


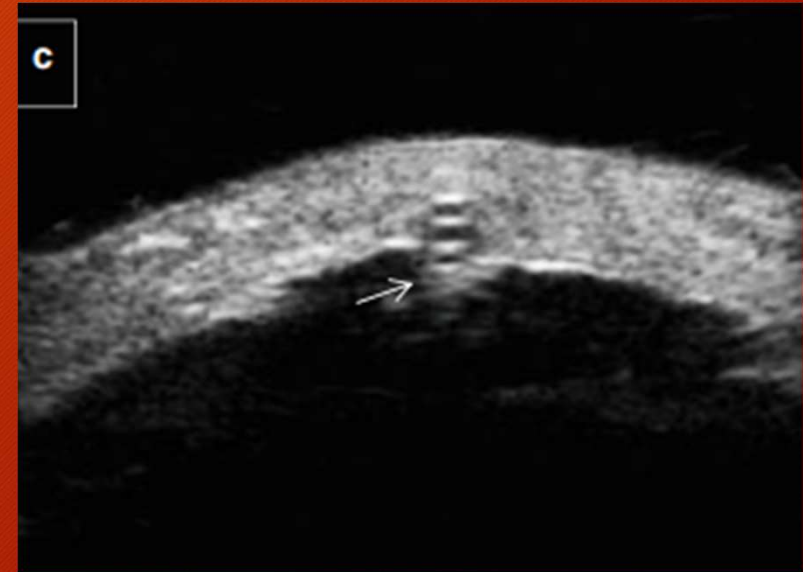
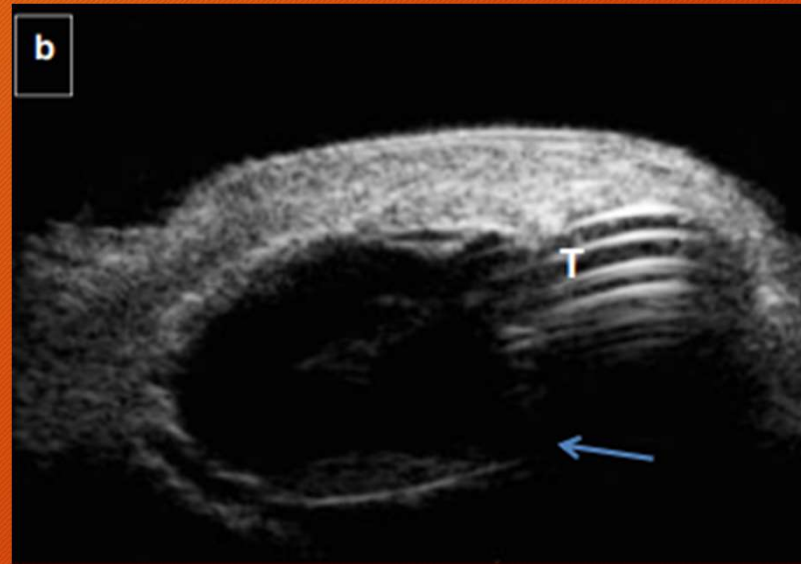
a and b Axial and longitudinal UBM scan of an eye with anterior synechiae (white arrow) at 9 o'clock extending to 12 o'clock. Note the tilted IOL





c and d Implanted tube in the posterior chamber with the iris seen above it (I: iris), (c: cornea), (T: tube)





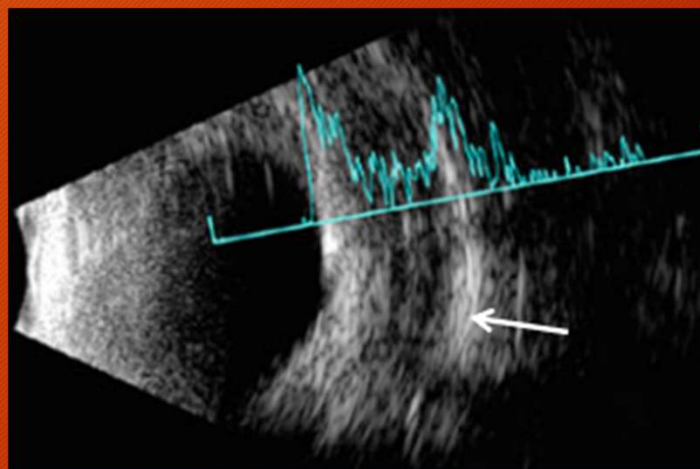
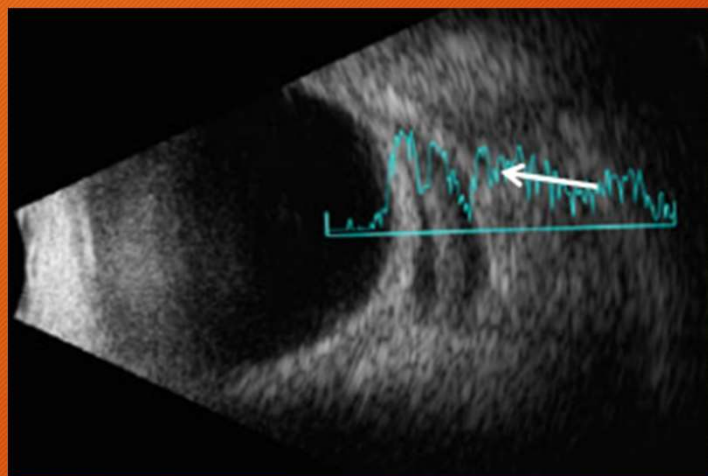
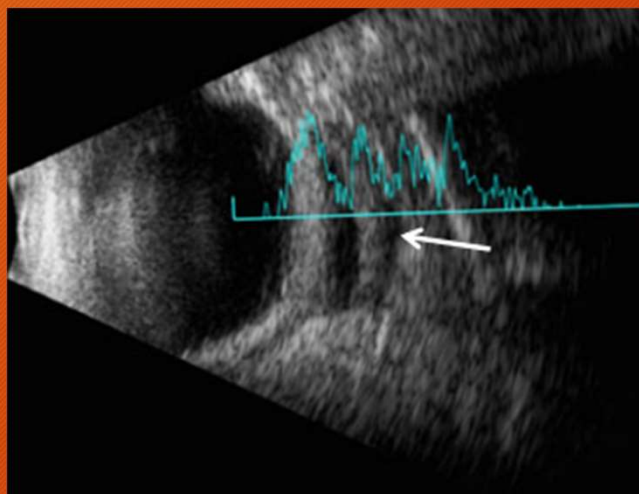
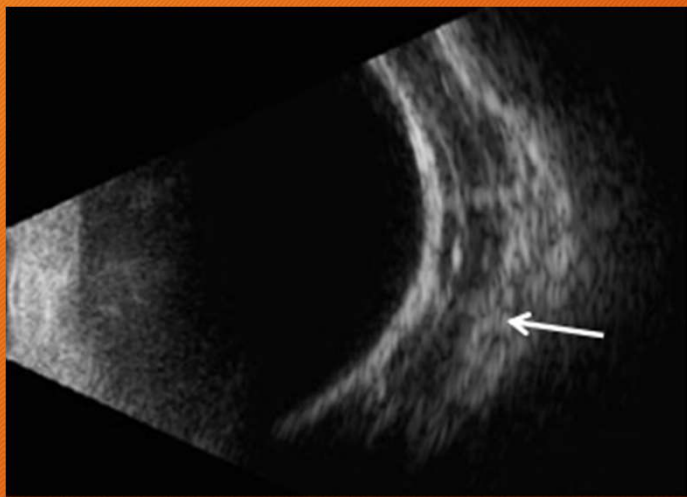
a A case with total anterior synechiae (short arrows) showing the lens (star) pushed anteriorly causing lenticulo-corneal touch (c: cornea), b The implanted tube obliterated by the lens (arrow), c transverse scan exposing the obliterated tube

Secondary Glaucoma

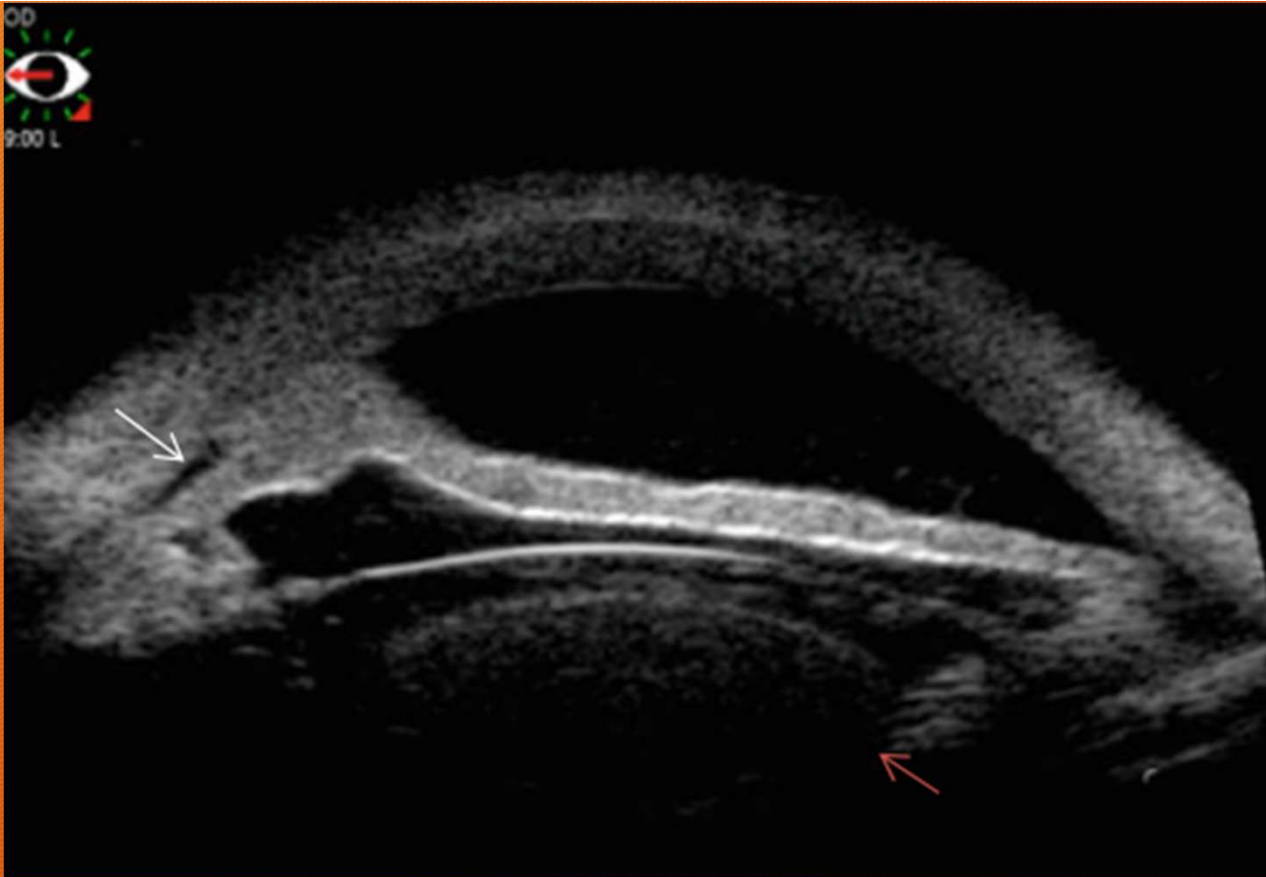
The estimated proportion of glaucoma damage that is clearly secondary to other ocular or systemic disease, or to trauma, may represent as much as 20% of all glaucoma subtypes. Secondary glaucoma is properly considered to represent those eyes in which a second form of ocular pathology has caused IOP above the normal range, leading to optic nerve damage

These processes may include one of the following:

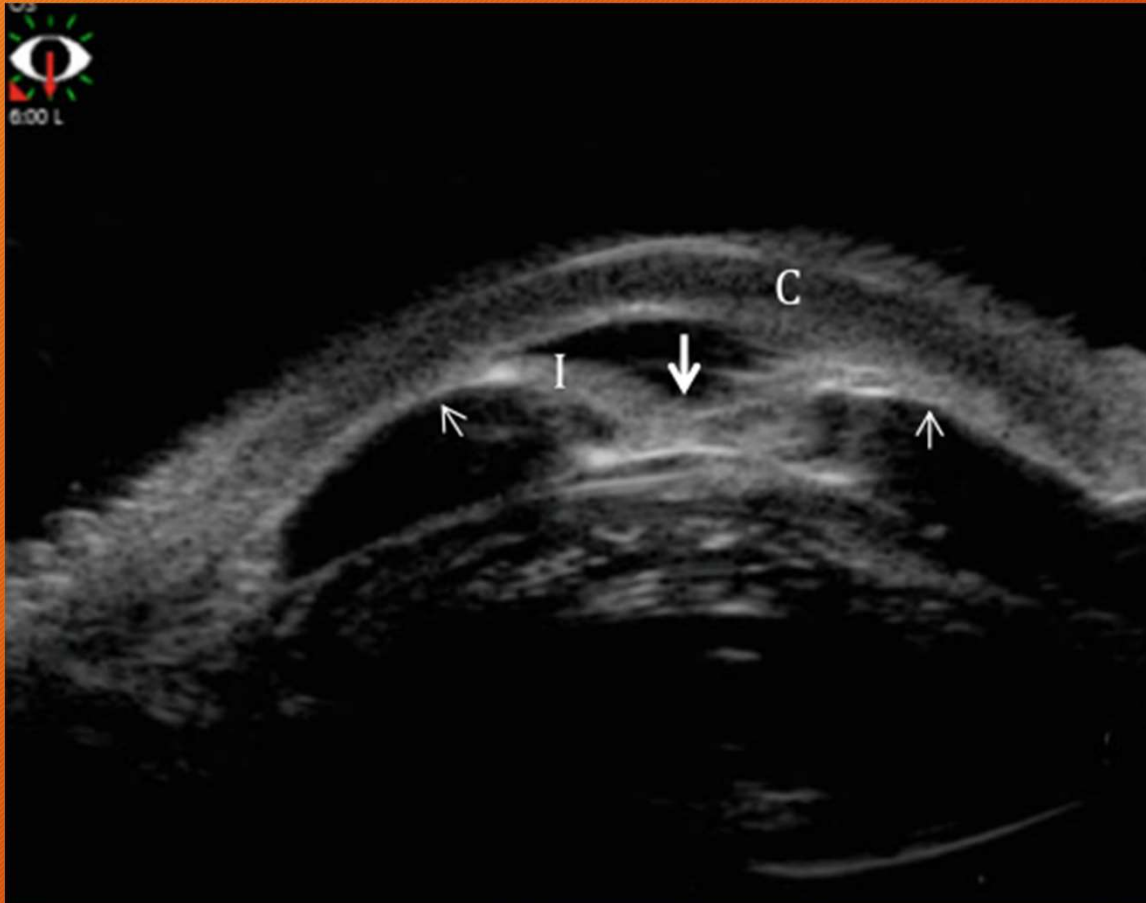
- (1) Neovascularization
- (2) Uveitic
- (3) Trauma
- (4) Lens related



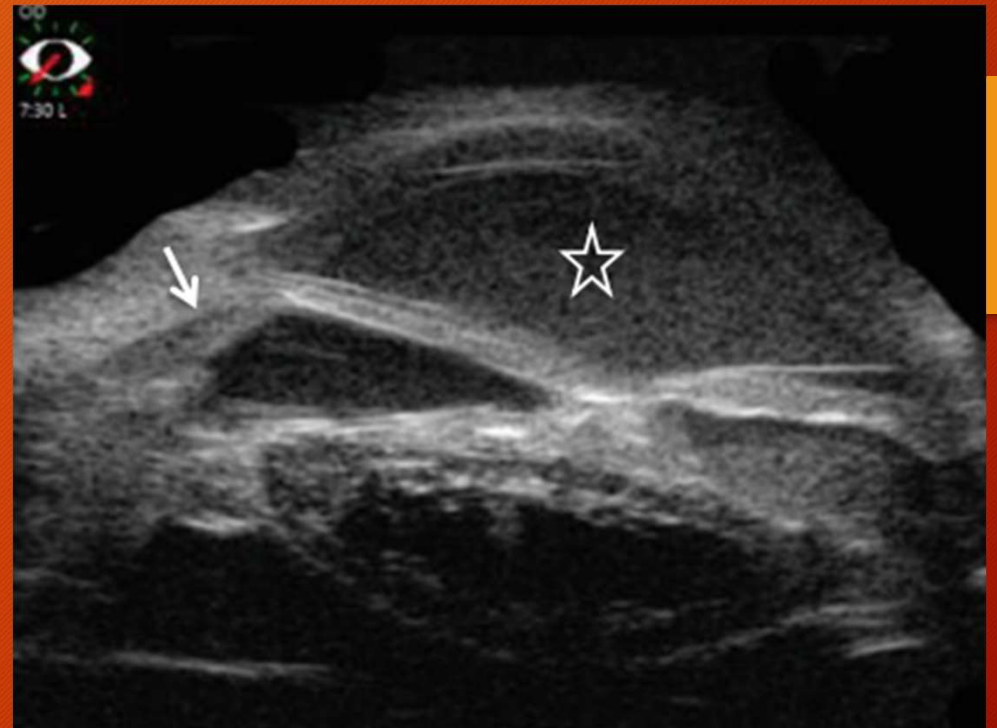
Transverse B-scan
of different patients
showing
patent superior glaucoma
drainage devices with large
fluid reservoir (arrows



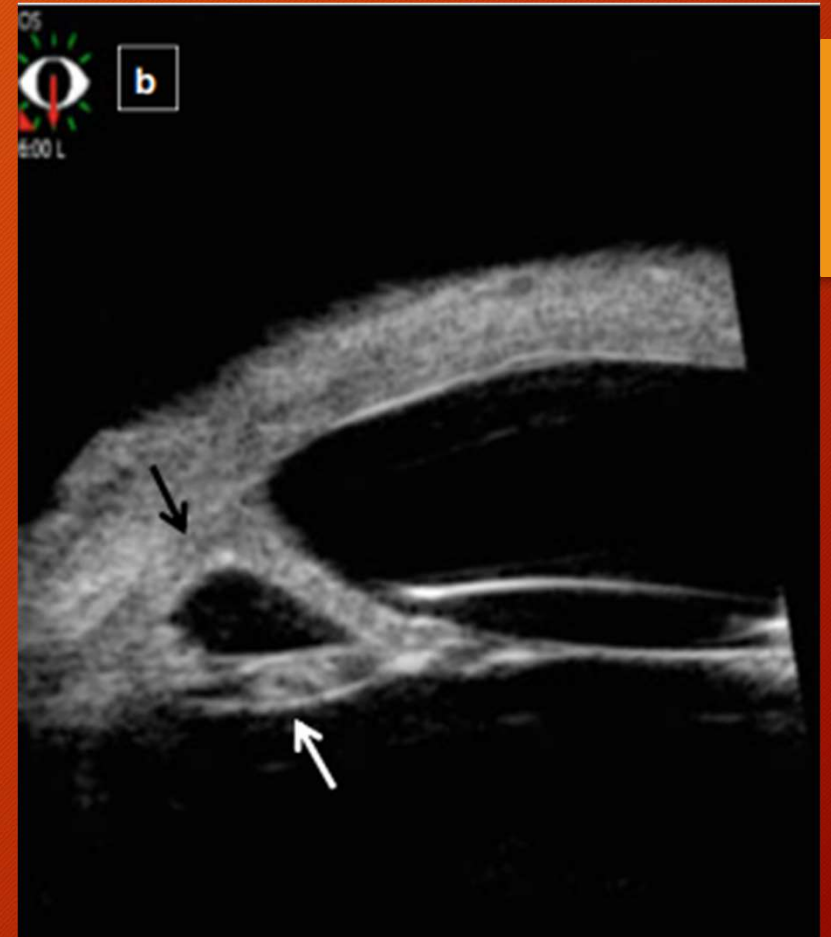
UBM scan of a case of uveitis showing peripheral anterior synechiae with aqueous-filled slit-like opening (white arrow). Note the swollen cataractous lens (red arrow)



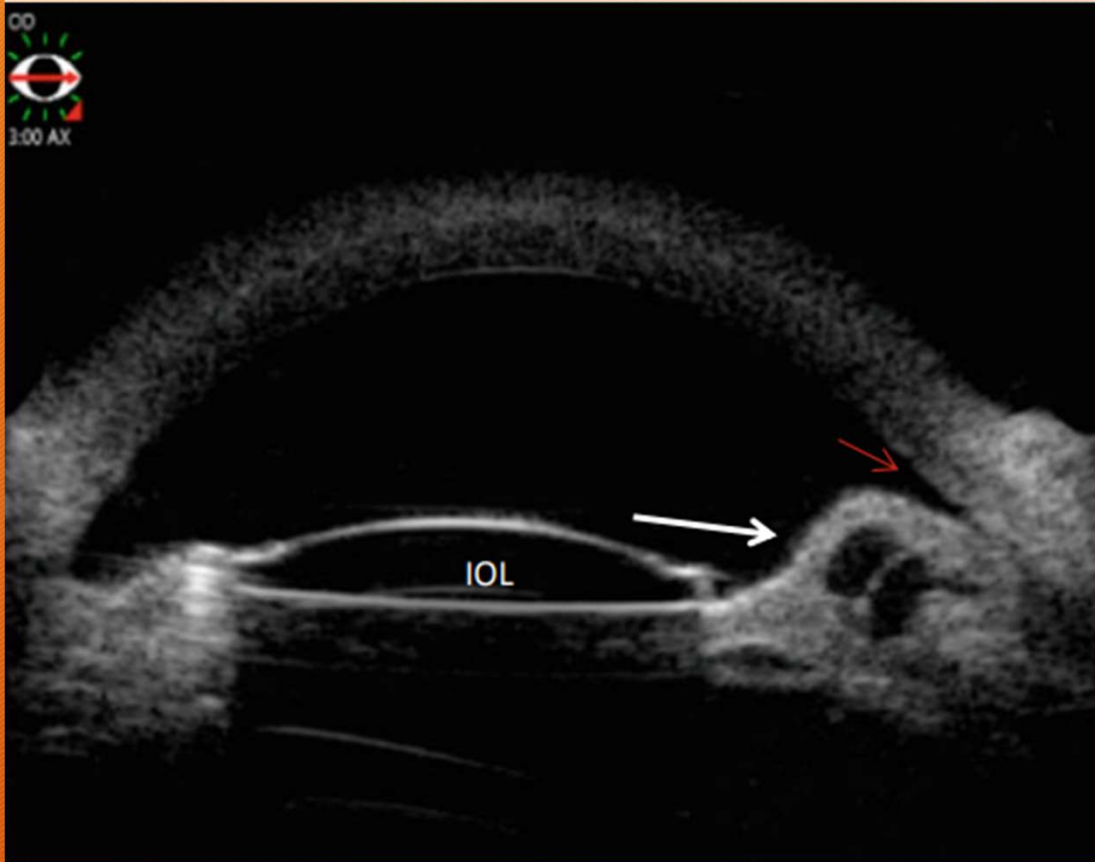
Axial UBM scan of occlusio pupillea (thick arrow) with iris bombe causing iridocorneal adhesion (short arrows) leading to angle obliteration. (C: cornea—I: iris)



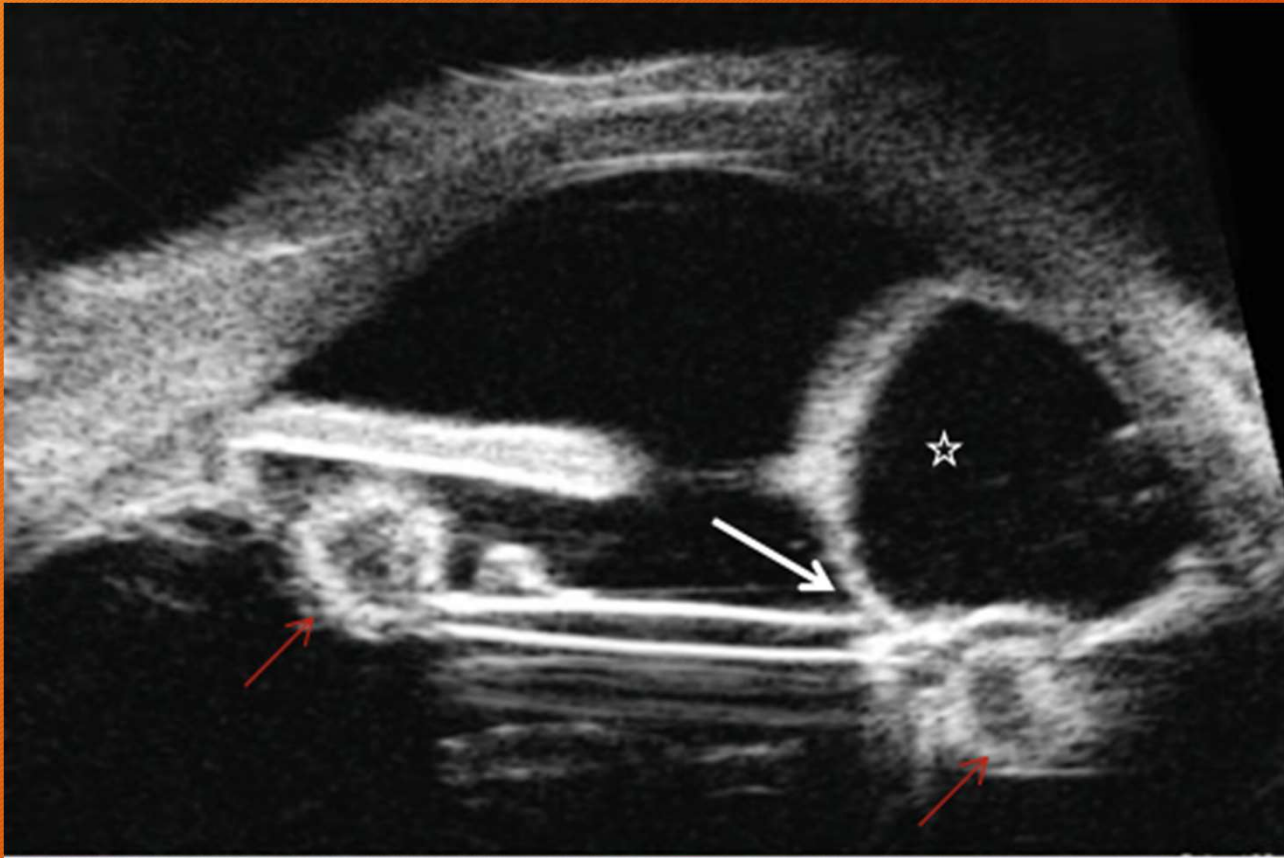
A case of hyphema (star) with anterior synechiae (white arrow) obliterating the angle almost in all quadrants



a and b Axial and Longitudinal UBM scans showing pupillary IOL capture causing anterior synechiae obliterating the angle (black arrows), Note the Soemmering's ring (white arrows)



Axial UBM scan of pupillary IOL capture causing iris cyst formation (white arrow)
almost obliterating the angle (red arrow)



A case of a subluxated IOL with the haptic embedded in the iris (white arrow) causing iris irritation and cyst formation (star) resulting in obliteration of the angle at this site. Note the Soemmering's ring formation at both sides (red arrows)