



جامعة المستقبل
كلية التقنيات الصحية والطبية
قسم تقنيات البصريات



Fourth Stage 2024-2025

X-ray and Ultrasound of The Eye

Lecture Title
B-scan ultrasonography

Lecture Number: 9

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B-Scan Ultrasonography

- B-scan (Brightness scan): A two-dimensional cross-sectional image of the eye and orbit.
- Use to visualize posterior segment when the view is obstructed (e.g., due to dense cataracts, vitreous hemorrhage, or corneal opacities).
- Use to diagnose retinal detachments, vitreous hemorrhages, intraocular foreign bodies, and tumors.



Principles of B-Scan

- High-frequency sound waves emitted in a fan-shaped beam.
- Echoes reflected from internal structures are used to construct a grayscale image.
- Brightness of the image corresponds to the intensity of the echo.

Techniques

- **Transverse and Longitudinal Scans:**
 - ✓ Probe placed on the closed eyelid.
 - ✓ Orientation adjusted to visualize specific areas of interest.

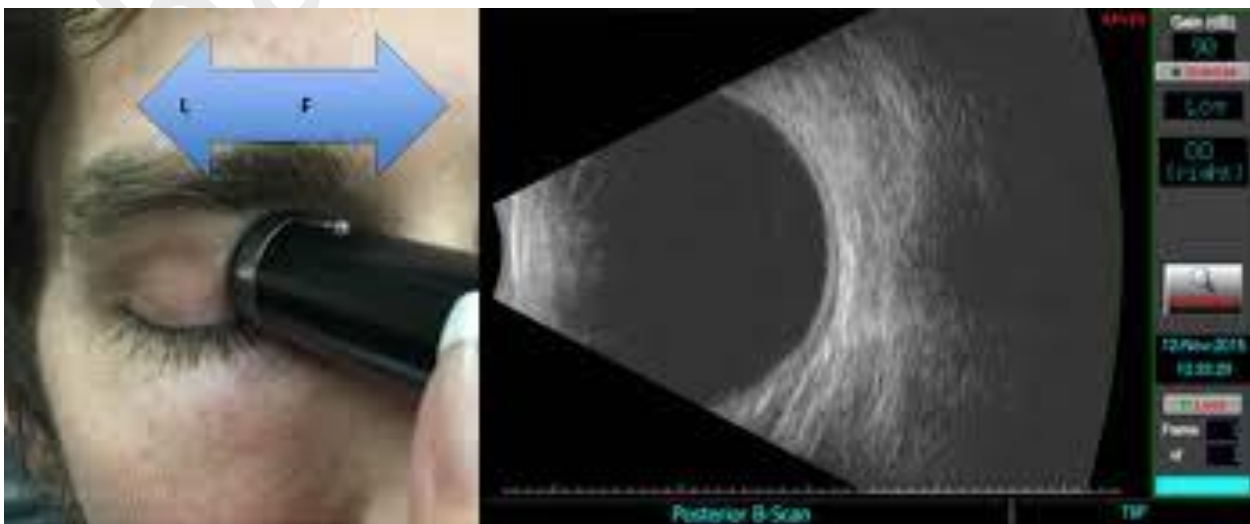
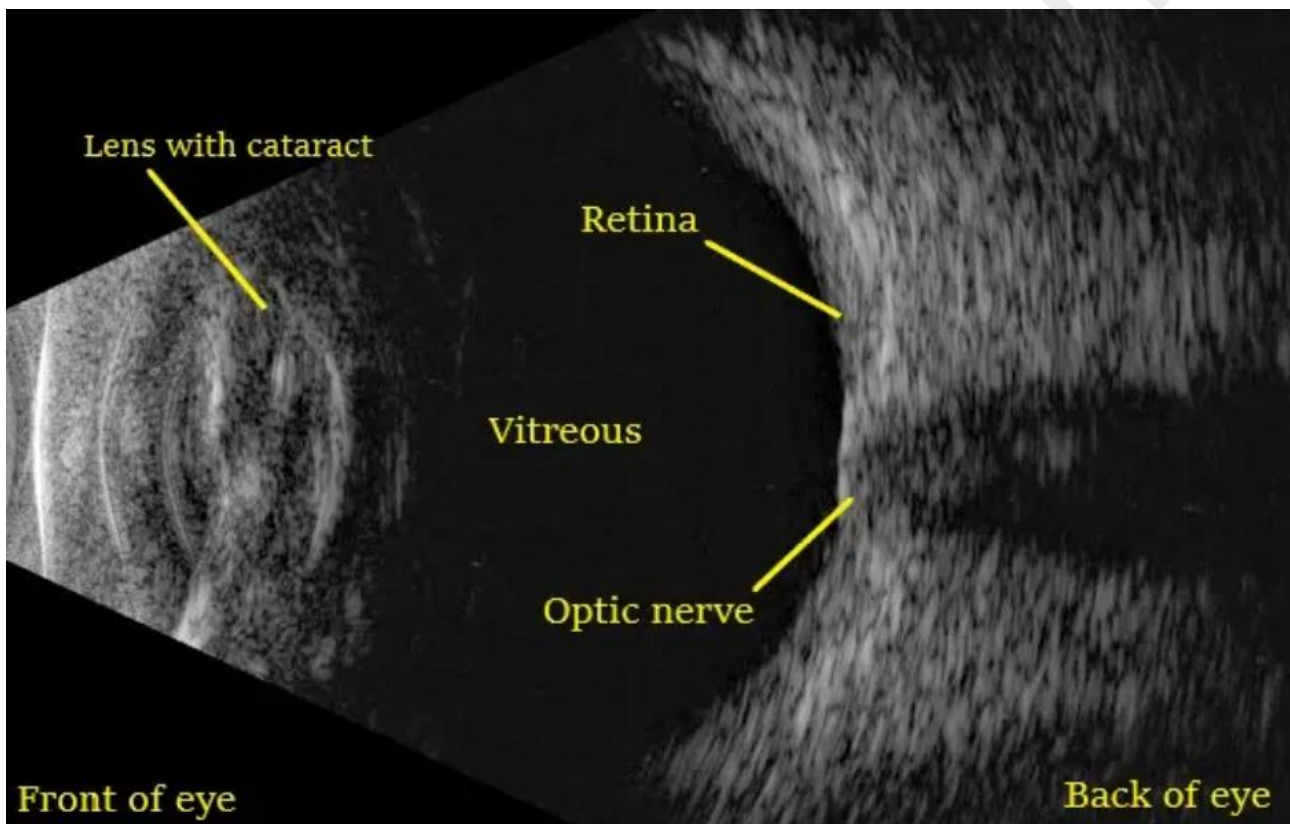
- **Dynamic Scanning:**

- ✓ Patient instructed to move the eye to differentiate between fixed and mobile structures.

Image Interpretation

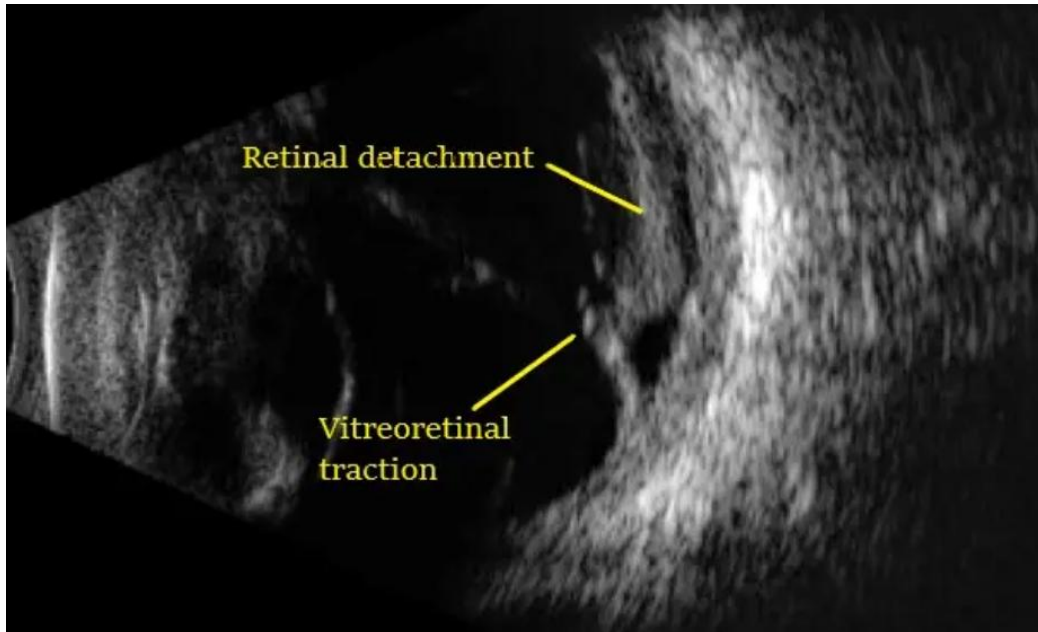
- **Layers of the eye:**

- ✓ Vitreous: Appears as a dark, echo-free zone in normal conditions.
- ✓ Retina: Thin, bright line at the posterior aspect.
- ✓ Choroid and sclera: Bright, distinct echoes.



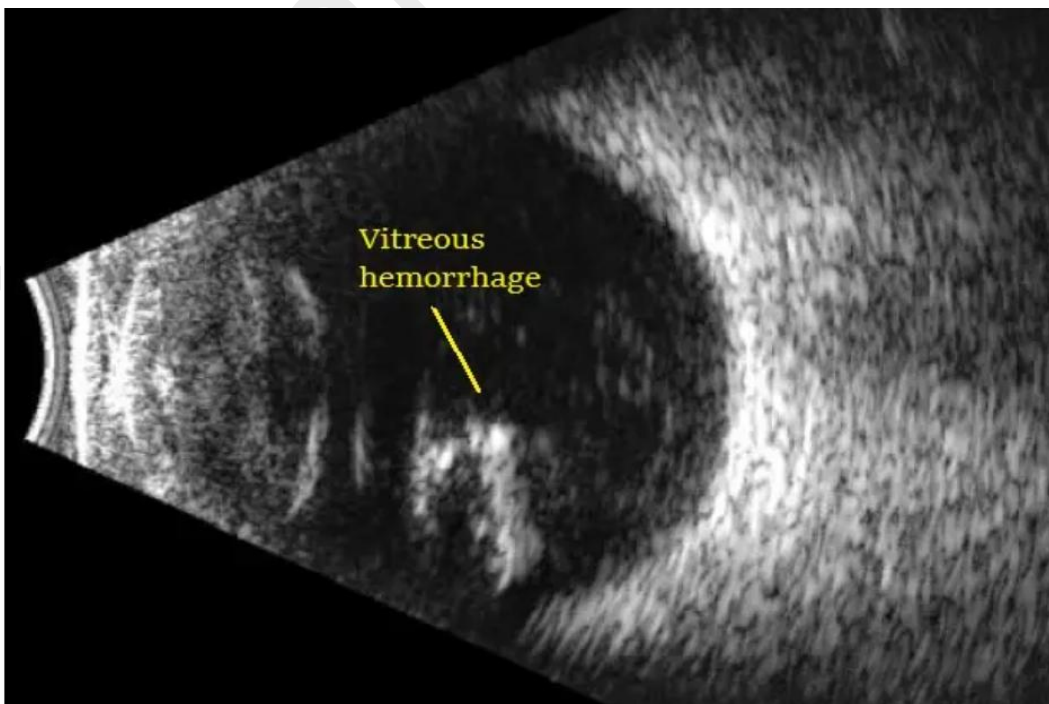
- **Pathological findings:**

- ✓ **Retinal detachment:** Membranous, curved echo separating from the posterior wall.



A B scan cross-sectional image of an eye showing vitreoretinal traction with a retinal detachment.

- ✓ **Vitreous hemorrhage:** Low to medium internal echoes within the vitreous cavity.



A cross-sectional B scan image of an eye showing a vitreous hemorrhage.

- ✓ **Tumors:** Solid masses with varying echogenicity.

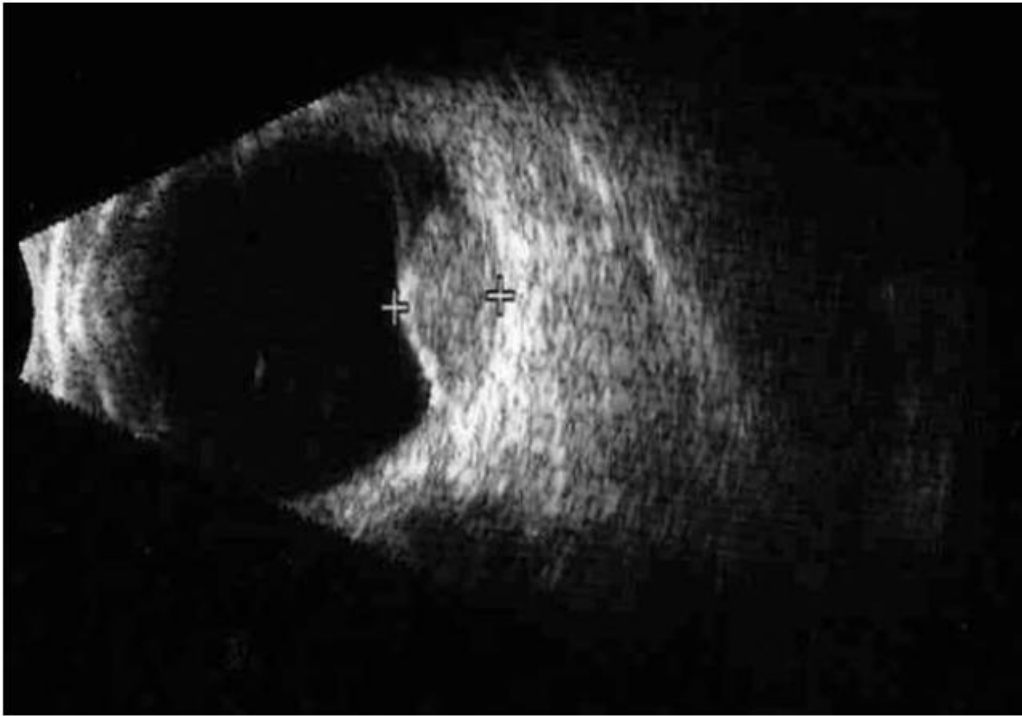


Fig. 2—B-scan ultrasound of the choroidal tumour.

Advantages and Limitations

- Advantages:
 - ✓ Provides cross-sectional imaging of the eye and orbit.
 - ✓ Non-invasive and well-tolerated.
- Limitations:
 - ✓ Requires interpretation by an experienced operator.
 - ✓ Image resolution lower than advanced imaging modalities like OCT.

Clinical Applications of B-Scan

- Evaluation of opaque media conditions (e.g., cataracts, corneal scars).
- Diagnosis of retinal detachment or choroidal detachment.
- Detection of intraocular foreign bodies.
- Assessing optic nerve abnormalities and orbital masses.

Table: Comparative A-Scan and B-Scan

Feature	A-Scan	B-Scan
Purpose	Axial measurements	Cross-sectional imaging
Display	One-dimensional spikes	Two-dimensional image
Main Uses	Biometry, lens thickness	Retinal and orbital imaging
Techniques	Contact/Immersion	Transverse/Longitudinal
Limitations	No structural imaging	Operator-dependent, lower resolution