

1.7 Investigations:

Ophthalmic

1-B scan (Sonography):
Ultrasound through corneal opacity, cataract or vitreous hemorrhage

2- OCT (Tomography):
light through clear media

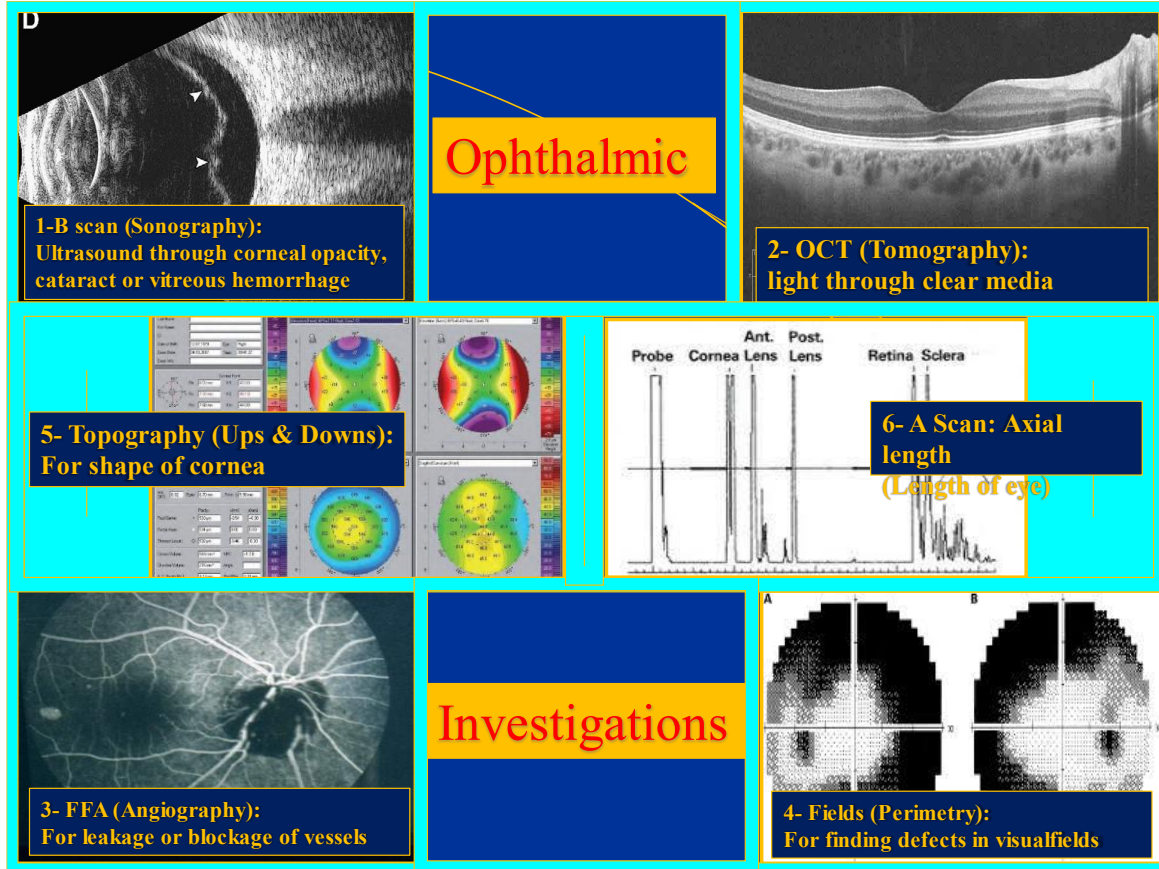
5- Topography (Ups & Downs):
For shape of cornea

6- A Scan: Axial length
(Length of eye)

3- FFA (Angiography):
For leakage or blockage of vessels

4- Fields (Perimetry):
For finding defects in visualfields

Investigations



Prof Mahfooz Hussain
Myeyeademy.com

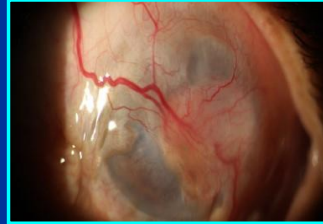
www.youtube.com/@Profdrmahffozhussain7544

1- B Scan

B-Scan: Purpose & indications

Video OSPE 32

- **Source:** Ultrasound waves used
- **Purpose:** To find out status of retina by looking through opaque media like corneal opacity, cataract or vitreous hemorrhage



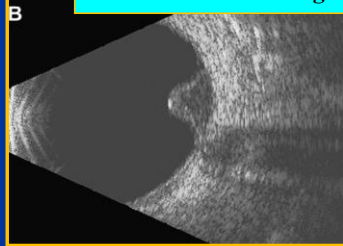
■ Indications/Uses:

- To find out retina is attached or detached
- To find out presence of vitreous hemorrhage or tumor or foreign body

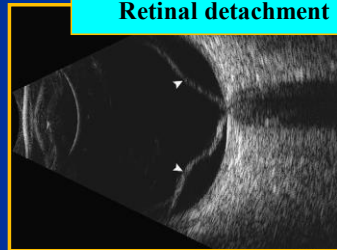
Vv

B-Scan photos

Retinal hemorrhage



Retinal detachment



Vitreous hemorrhage



Foreign body



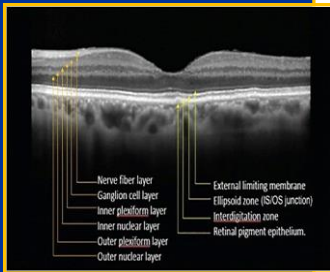
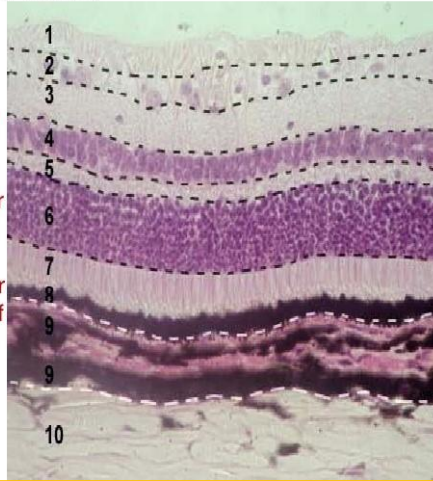
2- OCT (Optical Coherence Tomography)

In OCT we can see layers of retina and choroid

Video OSPE 33

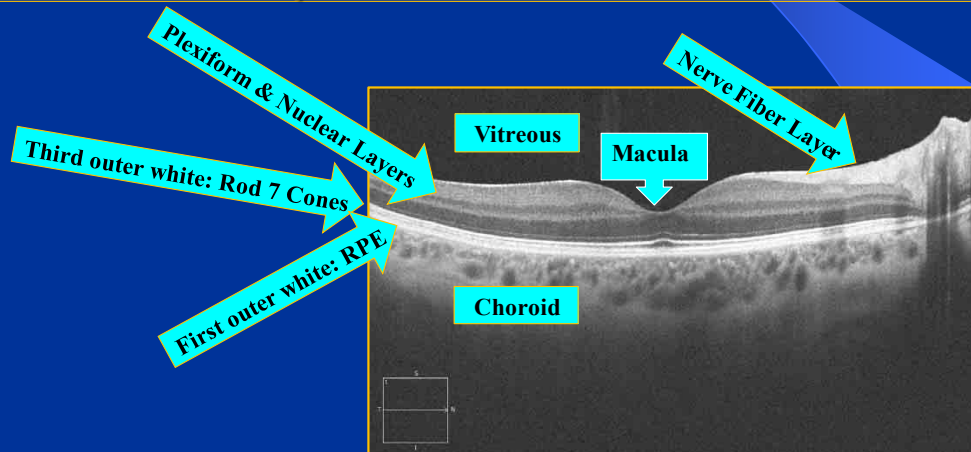
RETINA, CHOROID

- 1 - 8 - retina
- 1 - optic nerve fibers
- 2 - ganglion cell layer
- 3 - inner plexiform layer
- 4 - inner nuclear layer
- 5 - outer plexiform layer
- 6 - outer nuclear layer
- 7 - outer processes of rods and cones
- 8 - pigmented epithelium
- 9 - choroid
- 10 - sclera



Vv

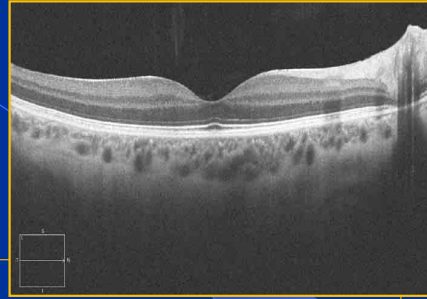
Choroid is outer most
First white outer white layer – RPE (Retinal Pigment Epithelium)
Third from outside – Rods & Cones junction
Plexiform layers are Light white
Nuclear layers are light black
Nerve fiber layer: Dense inner white
Vitreous: Black space



VV

Ocular Coherence Tomography

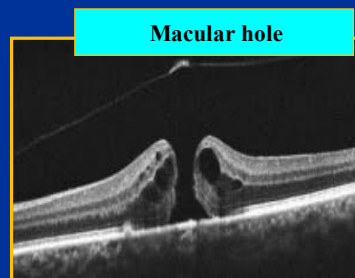
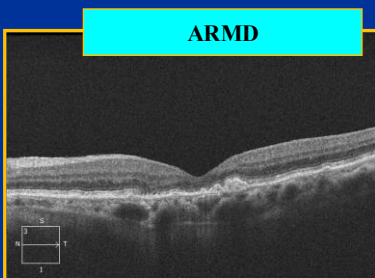
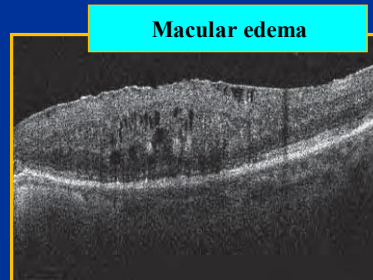
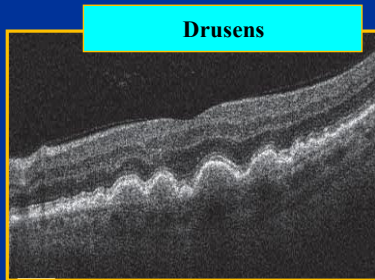
Tomography means cut



- **Source:** Light used
- **Purpose:** For analyzing layers of retina when media is clear
- **Indications/Uses:**
 - Integrity or damage to particular layer
 - Presence of edema, exudates in layers
 - Presence of defects or hole in retina
 - One can see choroid

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OCT photos

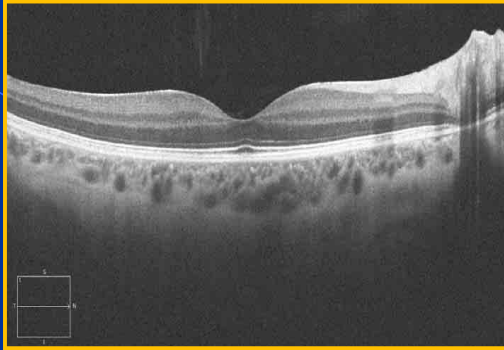
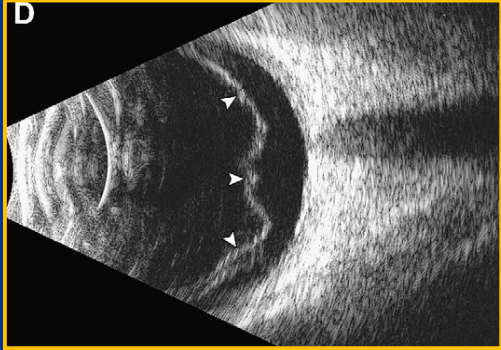


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B Scan vs OCT

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Video OSPE 34



B Scan	OCT
Ultrasound waves	Light 840
Transducer to detect	Spectrometer
2D image	2D (Also 3D, Enface)
Resolution 150 micron	5 micron
Low reproducibility	Reproducible for follow up
Possible with media opacity	Not possible with media opacity

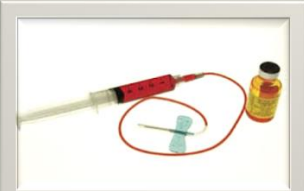
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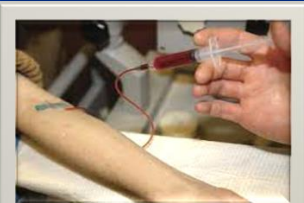
3- FFA (Fundus Fluorescein Angiography)


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Video OSPE 35

FFA procedure

- 

Injection preparation
- 

Cannula in vein
- 

Inject in vein
- 

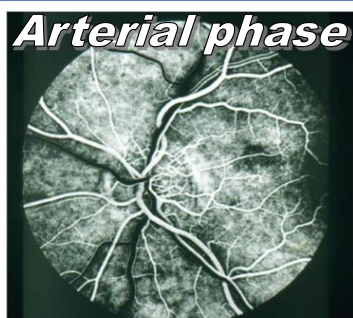
Inject in vein

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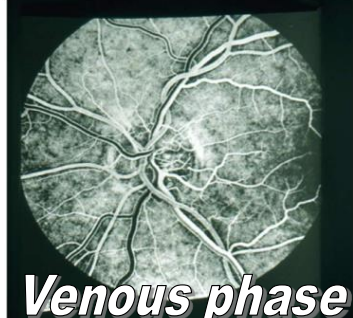
FLUORESCEIN ANGIOGRAPHY

Normal angiogram

- TRANSIENT TIME
- CHOROIDAL PHASE 10 SEC
- ARTERIAL PHASE 12 SEC
- ARTERIO-VENOUS PHASE 15 SEC
- PEAK PHASE 25 SEC
- FADE 30 SEC
- LATE PHASE 10 MIN



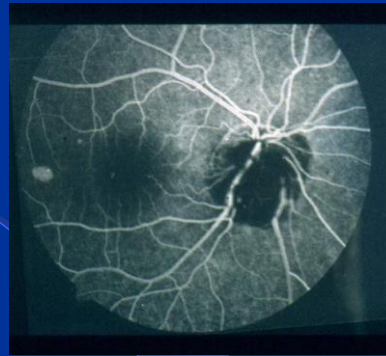
Arterial phase



Venous phase

FFA

Fundus Fluorescein Angiography



- **Source:** Fluorescein dye injected in vein to visualize vessels
- **Purpose:** Visualization of blood vessels
- **Uses:**
 - Leakage of blood vessels
 - Blockage of blood vessels
 - New blood vessels

Vv

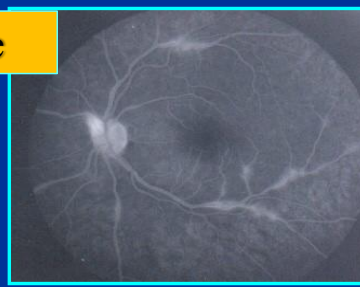
FFA photos



Filling Defect



Leakage

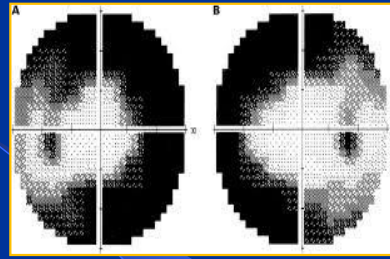


4- Visual fields

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Visual Fields Field of vision (Perimetry)

Video OSPE 36

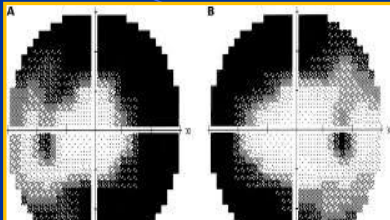


- **Source:** Light
- **Purpose:** To find out extent of visual field
- **Uses:**
 - To detect visual field defects
 - Helps in diagnosis of glaucoma & lesions causing optic nerve, optic chiasma, optic tract and cerebral damage

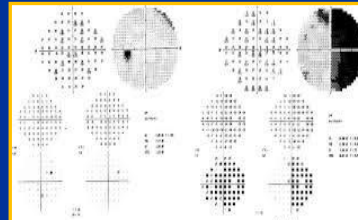
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Visual field photos

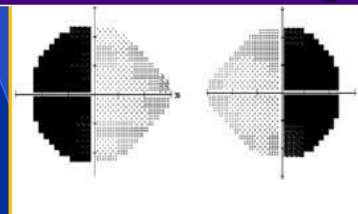
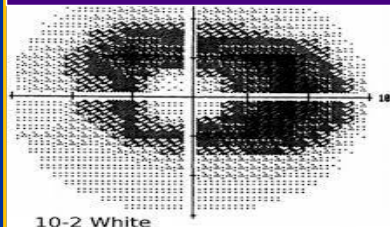
Glaucoma/Retina



Chiasma/tract/cortex



What is different in R & L side images

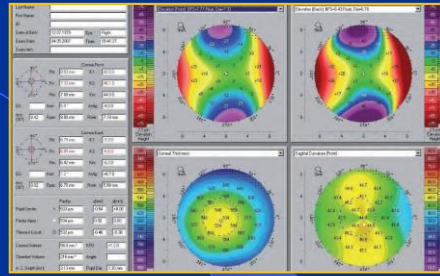


5- Topography

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Corneal Topography Ups & downs of cornea

Video OSPE 37



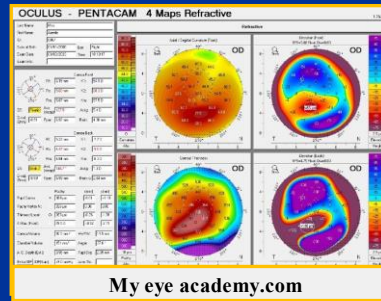
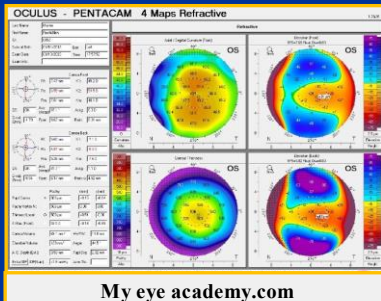
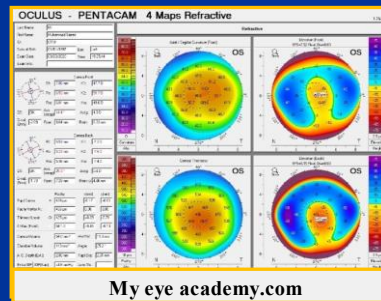
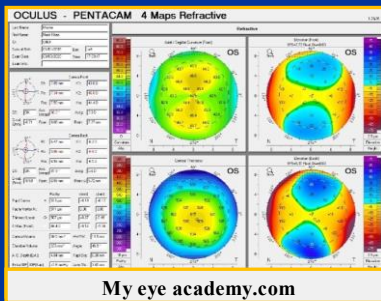
- **Source:** Light
- **Purpose:** For elevations & depressions of cornea
- **Uses:**
 - To find out irregularities in cornea
 - To find out diseases like keratoconus
 - To find out thickness of cornea

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Topography photos

Yellow & Green is normal

Red is abnormal or elevated



6- A Scan

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A-Scan

Video OSPE 38



- **Source:** Sound waves
- **Purpose / use:** To find out axial length of eye
- **Procedure:**
 - Topical anesthesia to cornea
 - Touch cornea with probe off

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A Scan: Procedure

- Topical anesthesia to cornea
- Touch cornea with A -scan probe (Fig 1)
- Take readings (Fig 2)



Figure 1

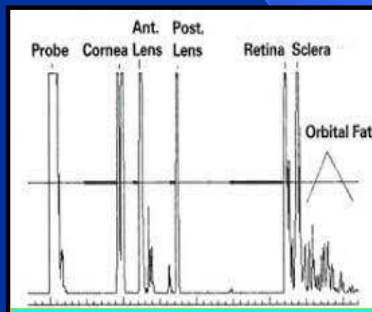


Figure 2

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Video OSPE 39

What is Biometry

- The application of statistical analysis to biological data
- Biometrics are physical (figure prints) characteristics analyzed for identification

In Ophthalmology:

Application of statistical analysis (Axial length & Corneal curvature) to find out biological data (power of lens)

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To find out power of implant/IOL/Intra ocular lens

- 1- Axial length
- 2- Corneal curvature

22 D lens

Same axial length but Different shape of cornea So different lens power

17 D lens

Vv

How Biometry done

- A Scan (Length of eye)
 - Axial length measurement (Fig 1)
 - A scan readings (Fig 2)
- Keratometer- shape of cornea (Fig 3)
 - K readings (Fig 4)
- Formulas to calculate IOL power (Fig 5)

Figure 1

Figure 2

Figure 3

Avg: 43.27/43.77 D	
K1: 43.27 D @ 46°	
K2: 43.77 D @ 136°	
ΔD: +0.50 D @ 136°	
K1: 43.27 D @ 50°	
K2: 43.77 D @ 140°	
ΔD: +0.50 D @ 140°	
K1: 43.27 D @ 50°	
K2: 43.77 D @ 140°	
ΔD: +0.50 D @ 140°	

Figure 4

SRK FORMULA

$$P = A - 0.9K - 2.5L$$

Figure 5