- Basic aspect
- Probe orientation
- Clinical application
Ultrasound

- High frequency sound wave above the human audible range (20000 cycle / second).

- Audible (human): 20Hz-20000Hz
Instrumentation

- Pulsed-echo system
  - Transducer
  - Amplifier
  - Display monitor
The basis of the echo system is piezoelectric element which is a quartz or ceramic crystal located near the face of the probe.
Terminology

- **Reflectivity** sound which emitted by the probe get reflected back at the interface between two media

- Aqueous, Lens, Vitreous, Retina.....echo

The greater the difference in the density bet. The structure, the greater will be its echo
Angle of incidence
- **Angle of incidence**
  Probe placed perpendicular

- **Frequency**
  8 – 12 MHz

  Shallow structures in small kids
Frequency & its relation

With penetration: how much deep
With resolution: image quality
Medical Ultrasound frequencies

- Abdominal US
  - 1-5 MHz
- Ophthalmic US (B-scan)
  - 8-10 MHz
- Ultrasound Biomicroscopy (UBM)
  - 20-50 MHz
If high frequencies provide the best axial resolution . . .

. . . why not use the highest frequency for all imaging?

THE ANSWER

Higher frequencies have shorter wavelengths . . .

. . . therefore they don’t travel as far into the body.
**Gain**

It does not alter frequency or the velocity of sound, but change the display pattern on the screen.

**Low gain:** Only the structure with higher reflectivity get display

**Increase in gain** is associated with increase in tissue penetration and sensitivity but decrease in resolution.

**Display Modes:**

- A SCAN
- B SCAN
- BOTH
A SCAN

- Fixed transducer
- Measure distance
- Represent tissue reflectivity
- Tissue Criteria

B-scan

- Brightness mode scan
- Examine opposite meridian
- Moving transducer
- Identify morphology
- Represent acoustic density (gray scale)
Examination technique

- Contact

- Emmeression
Probe positioning

- Trans-ocular approach
  - Transverse
  - Longitudinal
  - Axial

Transverse position

Axial  Transverse  Longitudinal
**Longitudinal positions**

- Detects axial (A-P) extent of pathology
- Useful for retinal tears detection
- Shows only 1 clock hour scan

- Probe mark is perpendicular to limbus
- Pt looks towards the area of interest
- Optic nerve shadow is always at bottom of scan
- Limbus-to-fornix approach can be used

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**Positions of axial scan**

- **Horizontal**
  - Marker always nasal
- **Vertical**
  - Marker always superior
Indications

When to do US ??

- To examine intraocular structures with no direct visualization of posterior segment
  - Or
- To confirm or differentiate between pathologies in clear media .....DD
- Trauma

Trauma

Emergency

3 % of eye disease visit
- Dislocated lens
- Retinal detachment
- Vitreous hemorrhage
- Foreign body
Most of the ocular lesion represent in vitreous cavity ??
PEARLS & PITFALLS

- Compare affected to unaffected one
- Have patient move eye in all direction
- scan
Take home message

*Eyes do not see what mind does not know*
thank you