Review Article :

ORBITAL ULTRASOUND : COMMON OCULAR DISEASES

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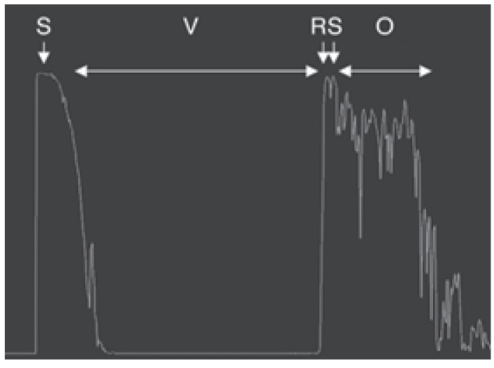
Ophthalmic USG is the main diagnostic imaging modality of the eye.

- safe and noninvasive
- useful in the presence of opaque as well as clear media for evaluation of the iris, lens, ciliary body, and retina
- tumours can be sited , measured and diagnosed

INSTRUMENTATION

- A-scan
- B-scan
- Ultrasound biomicroscopy
- Colour Doppler USG



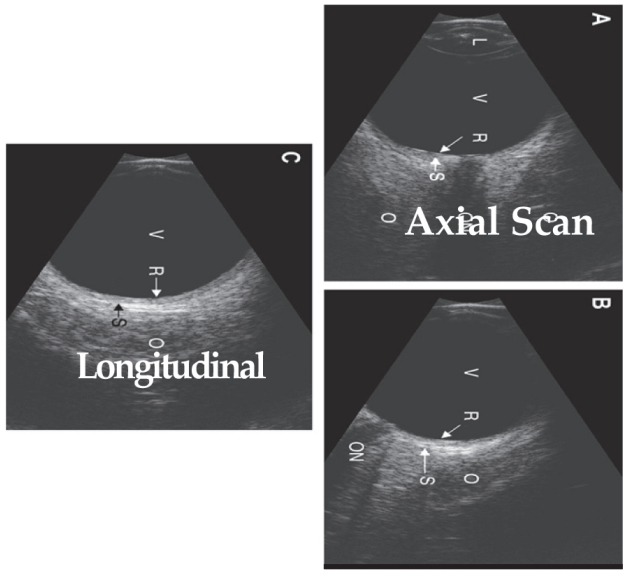
- Three dimensional USG

A-SCAN

- A-scan is a one-dimensional display of echo
- Vertical spikes correspond to echo intensity and are shown on the horizontal axis over time.

1) Biometric A-scan to measure axial length2)standardized A-scan for different ocular diseases

B-SCAN



- Two-dimensional display of echoes using horizontal and vertical orientations to show shape, location, and extension.
- Dots on the screen represent echoes, and the strength of the echo is determined by its brightness.

HOW TO PERFORM

- PATIENT SUPINE OR SITTING
- CONTACT METHOD(probe over sclera/closed eyelids)

TYPES

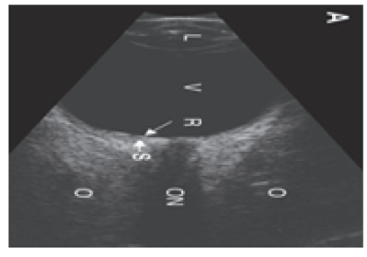
1)STATIC SCAN

2)RAPID EYE MOVEMENT SCAN

Axial Scan

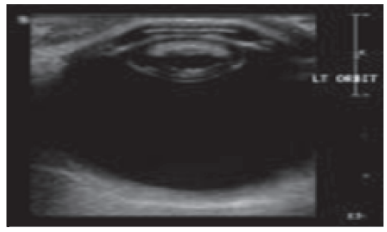
Longitudinal Scan

COMMON OCULAR DISEASES ON B -SCAN



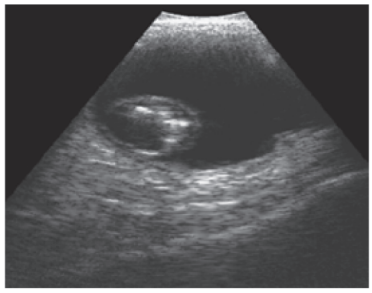
LENS

Degenerative Disease of lens (cataract)



◗ lens outline is seen clearly

A posteriorly dislocated crystalline lens appears as an



◗ Oval shaped,

◗ highly reflective mass

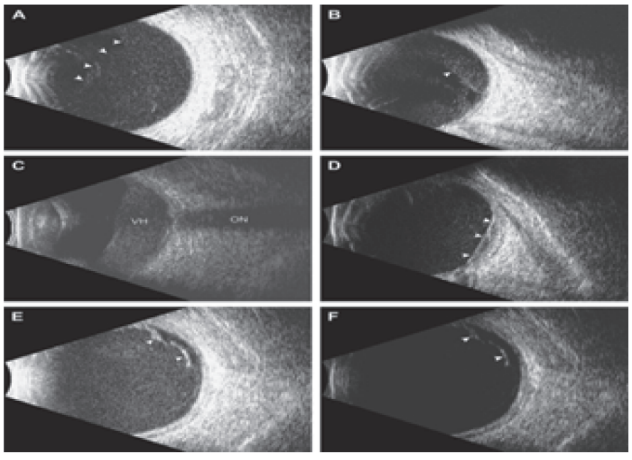
◗ Moving with eye movement

VITREOUS

Vitreous haemorrhage

Extravasation of blood in vitreous chamber

CAUSES



◗ Posterior vitreous detachment

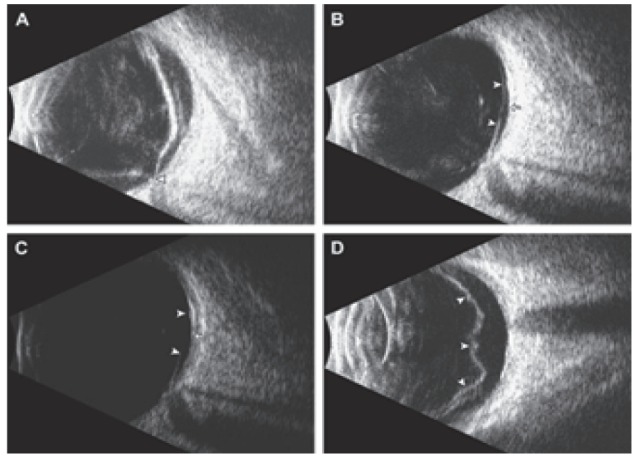
◗ Diabetic retinopathy

◗ Trauma

STAGES of vitreous haemorrhage – b-mode 1. DIFFUSE OPACITIES 2.LAYERING 3.MEMBRANE.

POSTERIOR VITREOS DETACHMENT

Degenerative process in which the vitreous



gel loses its attachment from its base.

Most common cause - age related

Site- - Posterior pole

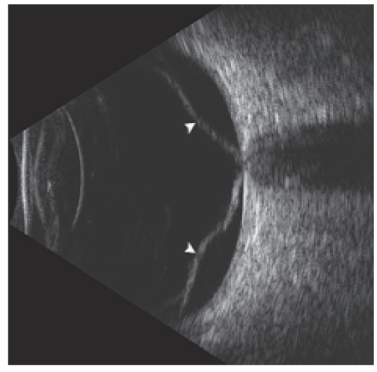
B-**scan** -a) incomplete b)complete

RETINAL DETACHMENT

When neurosensory retina separates from the pigment epithelium.

Types

1)Rhegmatogenous



-presence of a full-thickness retinal tear

PATHOGENESIS

◗ liquefaction of the vitreous gel.

◗ tractional forces to produce a retinal tear.

◗ retinal tear allows fluid from the liquefied vitreous into the subretinal space

Ultrasonographic differentiating features between posterior vitreous detachment and retinal detachment

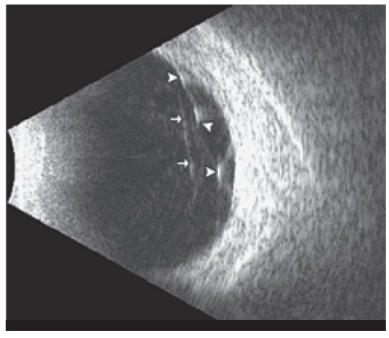
PVD **Retinal** D.

Echogenicity Low Medium / High **Change with gain** Disappears with low Visible with low (DB) gain gain **Mobility** High Low **Optic disc**

Present or absent Always present Attachment

2)Tractional Retinal Detachment

vitreoretinal adhesions that cause mechanical separation of the retina.



Causes

1) PVD

2) trauma

3) Retinopathy of prematurity

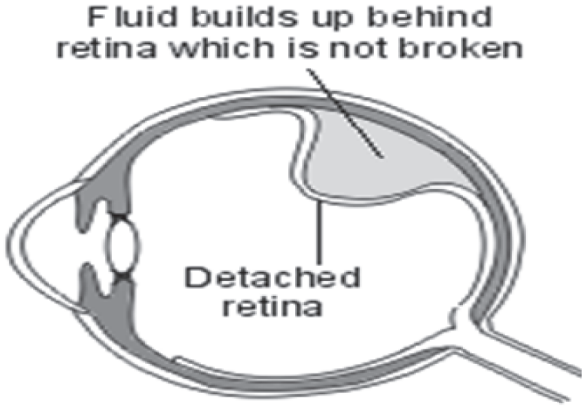
4) diabetic retinopathy

3) Exudative Retinal Detachment

Accumulation of fluid between retina and RPE in the absence of a retinal tear

Causes -

- Hypertension,
- Inflammatory
- Neoplastic
- Iatrogenic



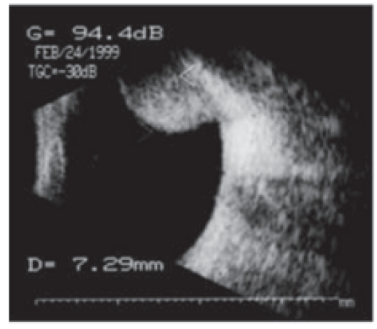
Traction and Exudative RD

BSCAN- smooth surface

- absence of rugae
- absence of a retinal tear
- shifting of subretinal fluid with movement.

4) TOTAL RETINAL DETACHMENT

RDs which is attached only at optic disc at one end and ora serrata on other end



B-SCAN

FUNNEL SHAPED RETINA

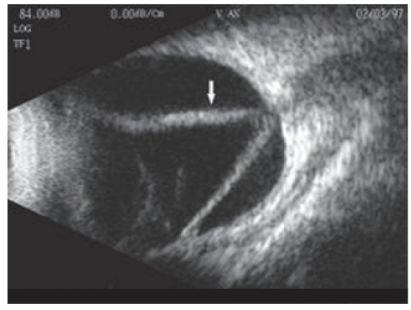
OCULAR TUMOURS

Retinoblastoma

- childhood tumour

Endophytic - Grow from the retina inward towards vitreous

Exophytic - Grow from the retina outward into the subretinal space



B - scan

- mass with calcification
- retinal detechment
- may invade optic nerve or extra-ocular area

LEUCOCORIA

- Retinopathy of prematurity
- Persistent hyperplastic primary vitreous
- Coats' disease
- Toxocariasis
- Medulloepithelioma

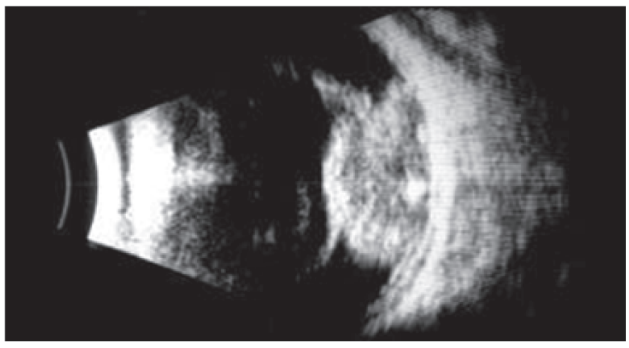
RETINOPATHY OF PREMATURITY

- **H/O prematurity and** oxygen therapy

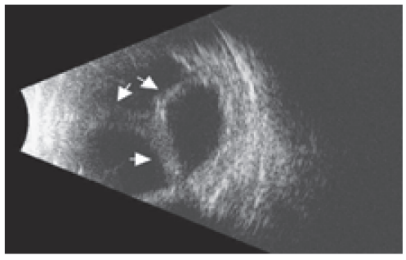
B-scan - detachment Highly reflective, closed funnel shaped retinal

PHPV

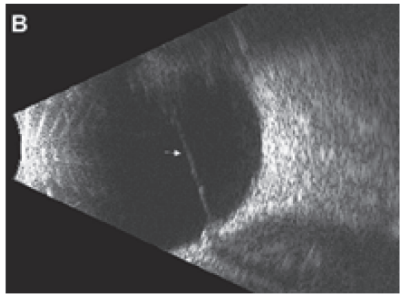
- **Persistence of primary**



- **vitreous in microophthalmic eye**
- **unilateral B-scan -demonstrates thickened vitreous**
- **band adherent to optic disc.**
- **COATS DISEASE**
- **Severe Retinal telangiectasia**
- **B - SCAN**

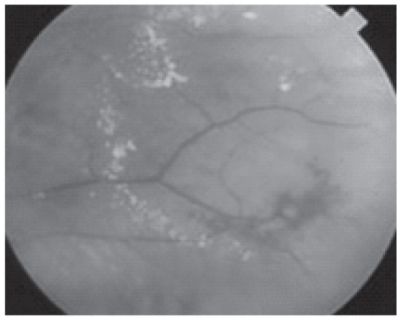


- **intraretinal and subretinal exudates**
- **Retinal detachment**
- **subretinal cholesterol crystals**
- **UVEAL TUMORS**



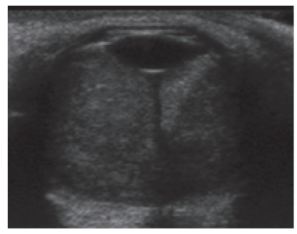
Most common uveal tumor-BENIGN NEVUS

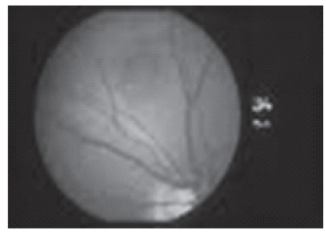
- **ON B SCAN-**
- Flat or dome shaped
- Highly refractile
- No vascularity



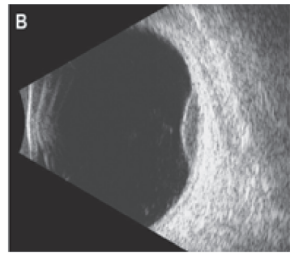
MALIGNANT MELANOMA

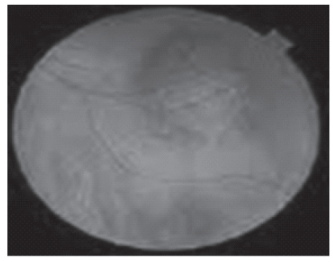
- Collar button/dome shape





- Solid consistency
- Acoustic quiet zone
- Choroidal excavation





- Intrinsic vascular pulsation

CHOROIDAL HAEMANGIOMA

- may be a part of Sturge-Weber syndrome
- dome shaped lesions

B-scan shows

- Hyperechoic
- Regular internal structure
- little internal blood flow.
- Serous retinal detachment at the margins
- Calcification may be present

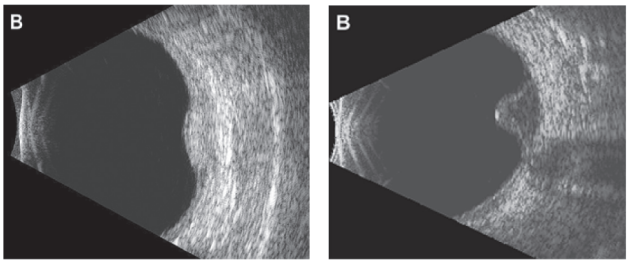
OPTIC NERVES

Optic nerves are symmetric, and measure samthickness in whole length.

Sheath diameter is measured in two locations

- 3 mm posterior to optic nerve head
- close to orbital apex .
- Normal retrobulbar optic nerves -2.2 to 3.3 mm in diameter

A difference of 0.5 mm between eyes - abnormal

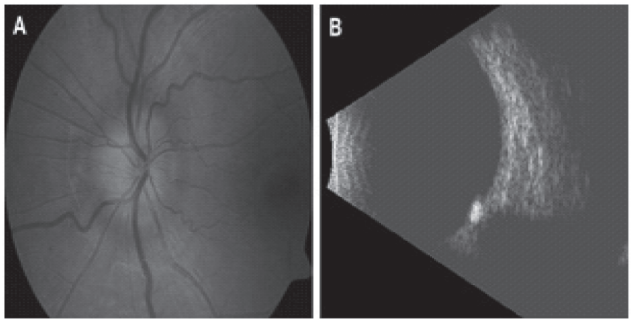


Increased optic nerve thickness -

- increased subarachnoid fluid
- retrobulbar mass
- perineural thickening

Increased subarachnoid fluid can be differentiated from thickening of the parenchyma or perineural sheaths **by 30 Degree Test-**

1) The patient fixates in primary gaze .and optic nerves are measured



2) patient's gaze is directed 30 laterally, and the perineural sheaths are measured again

3) when the eye is fixated laterally, the optic nerve sheaths are stretched and the subarachnoid fluid is spread.

A decrease in sheath diameter of greater than 10% in lateral gaze, is considered positive

OPTIC NERVE DRUSCEN

Congenital optic disc anomaly manifest as calcific deposits within optic nerve head.

- calcified foci in optic nerve head with acoustic shadow

Retrobulbar optic N. leison shows asymmetric optic nerve sheath diameter

- Glioma, meningioma
- circumpapillary choroidal melanoma
- demyelinating optic neuritis
- optic nerve cysticercosis

REFERENCES

1.Atlas of Ophthalmic Ultrasonography and Biometry.H John Shammas.St Louis: CV Mosby Co,1984

2.Ultrasonography of the eye and orbit.Coleman DJ,Lizzi FL,Jack RL(Eds):Philadelphia: Lea and Febiger.

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