

Ultrasonography (b scan) findings in patients with diminished vision

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Abstract

Introduction

B-scan Ultrasonography (USG) is a simple, noninvasive tool for diagnosing pathologies of the posterior segment of the eyeball. Common conditions such as cataract, vitreous degeneration, posterior vitreous detachment, retinal detachment, ocular trauma, choroidal melanoma, and retinoblastoma can be accurately evaluated with this modality. B-scan USG is cost-effective, which is an important consideration in the rural setting. In addition, it is noninvasive and easily available, and the results are reproducible.

Material and methods

The present study was carried out during the period of December 2021 to March 2022. Most of the patients were from ophthalmology department of BJMC and Sassoon general hospital Pune and few patients were from the other department like medicine. All images presented in this paper were obtained using a standard USG machine (Philips Affinity 30 and Philips affinity 50) equipped with a 7.5–10 MHz Real time high-frequency probe with

the contact method and Tomey B scanner. The probe was placed over the closed eyelid after application of coupling gel. Patients were selected based on having diminished vision and first the clinical diagnosis is made then the radiological diagnosis is made, then these findings are compared with intra operative findings to make a final diagnosis.

Study design

Observational descriptive study

Aims and objectives

To study the role of USG in ocular pathologies

To describe USG findings in various ocular pathologies

Results

In this study the youngest patient was a female of 30 years and oldest patient was a female of 85 years. Maximum number of patients was in the age group of 60-75 years out of these patients. Total of 20 males (44%) and 25 females (56%) were there. Most of the patients that were referred from the eye OPD. They were referred for diminished vision and other complaints with low vision. 42% of them complained gradual painless

diminution of vision. Among these patients most of the patients were presenting with senile cataract (46%).

Few of them had vitreous hemorrhage, POVD, choroid detachment and very few had a combination of few of

the above. Almost 20% were having normal sonographic findings.

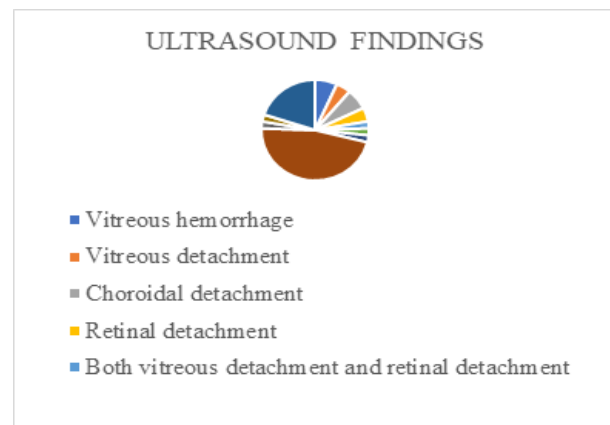
Table 1: Clinical Presentation of Patients.

Clinical Presentation	No of patients	Males	Females
Painless diminution of vision.	32	13	19
Trauma	2	1	1
Painful loss of vision	1	0	1
Pain, watering, swelling, redness of eye	2	2	0
Vision not improving after cataract surgery	3	2	1
Itching and watering	5	1	4
Total	45	20	25

Table 2: Sonographic findings.

USG findings	Males	Females	Total
Vitreous hemorrhage	2	1	3
Vitreous detachment	1	1	2
Choroidal detachment	1	2	3
Retinal detachment	1	1	2
Both vitreous detachment and retinal detachment	0	1	1
Choroidal detachment with vitreous hemorrhage	0	1	1
Foreign body	1	0	1
Cataract	8	13	21
Anterior/posterior synachiae	0	1	1
Endophthalmitis	1	0	1
Normal findings	5	4	9

Graph 1:



Discussion

Cataract

Cataracts are opacification or thickening of lens within the globe, is leading cause of blindness of eye. Ultrasound is done when there is suspicion of posterior globe pathology. The lens will show increased wall thickness and hyper echogenicity within the capsule. Pseudophakia is observed as hyperechoic biconvex structure with small anechoic central area. Reverberation artifacts are seen in vitreous behind it.

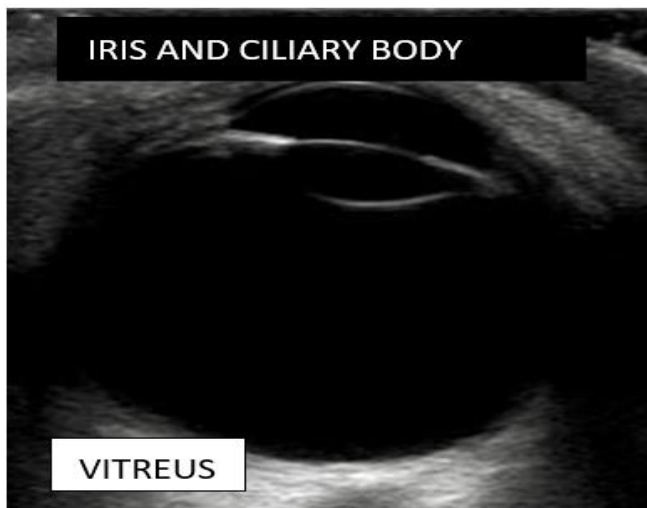


Figure 1: normal structure of eye



Figure 2: cataract

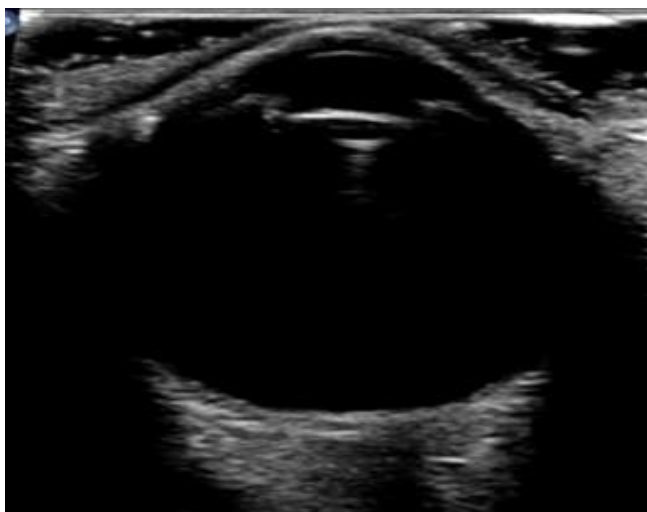


Figure 3: Psuedophakia

Retinal detachment

It is detachment of neurosensory retina from the underlying choroid. Typically appears as a bright, continuous, smooth, and somewhat folded membrane within the vitreous, which is reflective and freely moving on real-time imaging with recruitment of extraocular muscles, the observed independent excursion of this membrane is referred to as an "aftermovement".

Acute retinal detachment is mobile, allowing differentiation from choroidal detachment (which does not demonstrate aftermovements). It is, however, less mobile than a posterior vitreous detachment. Movements become less pronounced in long-standing detachments. When total or extensive, the detached retina has a typical triangular shape with insertion into the optic disc and ora serrata.

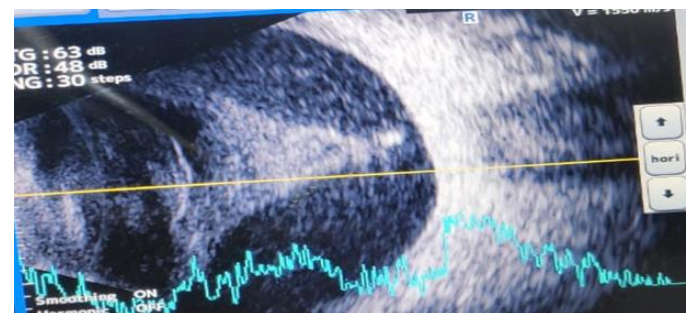


Figure 4: Posterior vitreous detachment.

Posterior vitreous detachment (PVD), also known as hyaloid detachment, occurs when the retinal layer and vitreous body/posterior hyaloid membrane dissociate, with an intervening fluid collection forming in the subhyaloid space. It is thought to be a common consequence of aging, occurring in more than 70% of the population over the age of 60. The sonographic appearance of isolated posterior vitreous detachment are, linear echogenic membrane in the posterior compartment (thickening may be observed in the presence of hemorrhage or inflammation). May demonstrate tethering near the ora Serrata point of attachment referred to as the vitreous base. Freely mobile with

oculokinetic Ultrasonography. Unlike retinal detachment, the membrane will cross the intersection of the optic nerve sheath and posterior wall of the globe. In acute stages, PVD should demonstrate prominent "after movements" that are more prominent than what would be expected from retinal/choroidal detachments. Mobility may be lost over time, making the differentiation from other vitreous pathologies difficult. May be associated with other pathologic findings like, retinal detachment and vitreous hemorrhage.

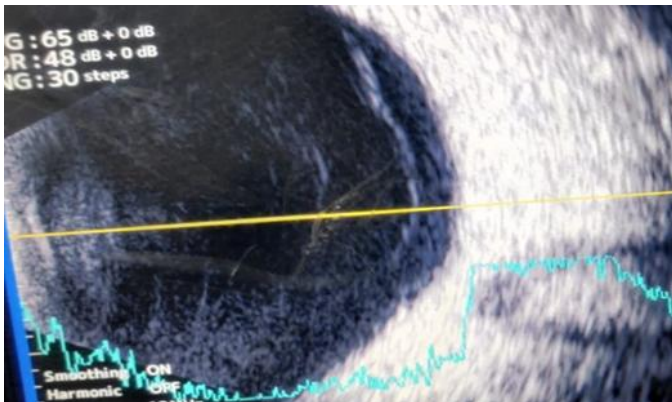


Figure 5: Vitreous detachment showing fluid collection and internal echoes in subhyaloid space

Choroidal Detachment

Choroidal detachment is a detachment of the choroid from the underlying sclera due to the accumulation of fluid in the suprachoroidal space generally due to increased intraocular pressure (IOP), exudative choroidal effusion or transudative choroidal effusion. Choroidal hemorrhage as a result of trauma and surgery can also cause vitreal hemorrhage. It is one of the leading causes of blindness after cataract surgery.

Ultrasonographic findings are paired, convex echogenic bands extending posteriorly from the ciliary bodies. The posterior points of attachment are distal to the optic disc, corresponding to the insertion of the vortex veins, to which the sclera and choroid are tightly adherent remain fixed in position during eye movements, allowing

differentiation from retinal and posterior vitreous detachments.

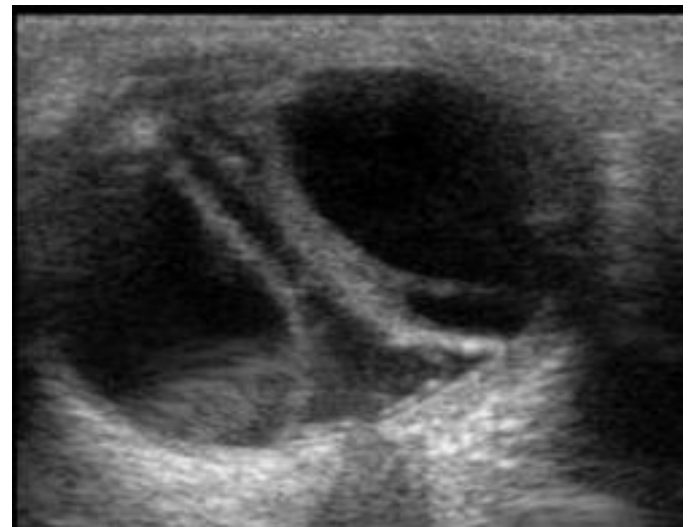


Figure 6: vitreous hemorrhage

Vitreous hemorrhage can result from tearing due to vitreoretinal traction, diabetic retinopathy, vasculitis, subarachnoid hemorrhage, and blunt trauma to the eye. The presence of blood cells in the vitreous gives rise to low intensity echoes.

Later, the hemorrhage may organize and develop fibrinous membranes.

Findings with B-mode ultrasonography depend on both the severity of the hemorrhage and the time elapsed since the hemorrhage occurred.

Scattered, ill-defined collections of slightly echogenic opacities often require considerable increase in gain to visualize/demonstrate. Subacute to chronic vitreous hemorrhage organize to form more echogenic membranous structures. When severe, may obliterate vitreous body as a confluent, echogenic hematoma retains mobility with eyemovements. Mobility declines with age of hemorrhage.

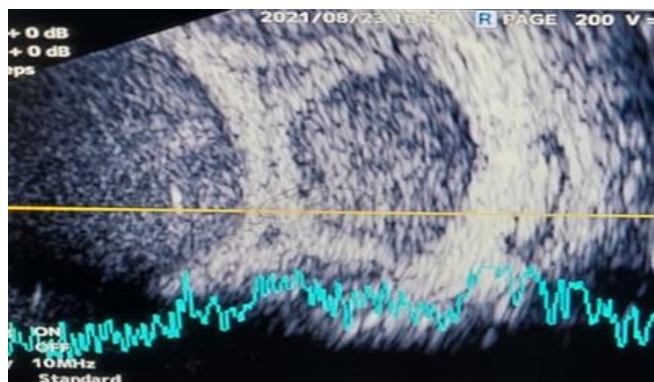
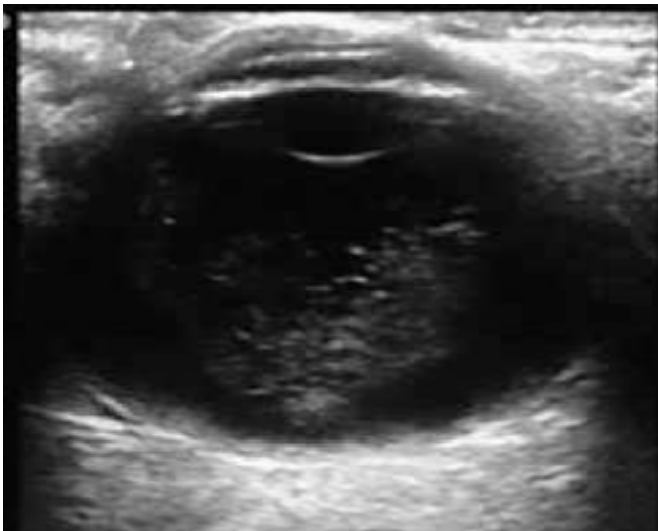


Figure 7: Choroidal detachment (kissing sign) with vitreous hemorrhage

Anterior synachiae

The peripheral iris attaches anteriorly in the anterior chamber angle

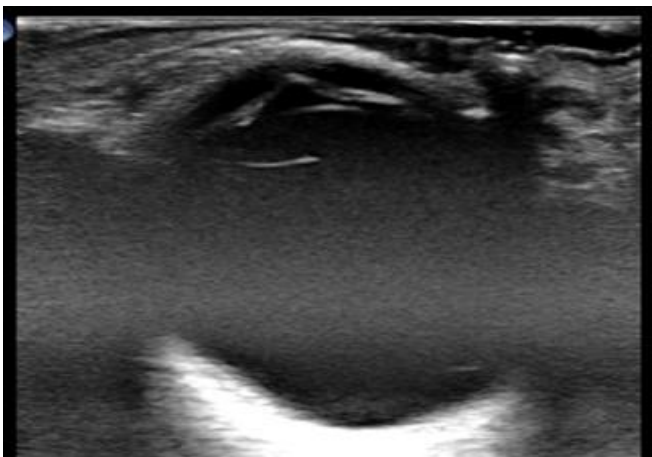


Figure 8: Anterior synechiae in a patient with history of trauma years back

Endophthalmitis

Endophthalmitis is a potentially sight-threatening condition that involves intraocular inflammation of any cause. It is distinguished from pan ophthalmritis in that it does not extend beyond the sclera. It is either infectious or non-infectious in etiology, but in clinical practice, intraocular infections are the commonest cause. The ultrasound examination we may show organization of opacities in the vitreous, membranes formation, the thickening of the choroid, posterior vitreous membrane detachment, detachment of the choroid, the retinal detachment, choroidal abscess or granuloma, the edema of the optic nerve head and thickening of sclera. Not all these ultrasound findings are always present.

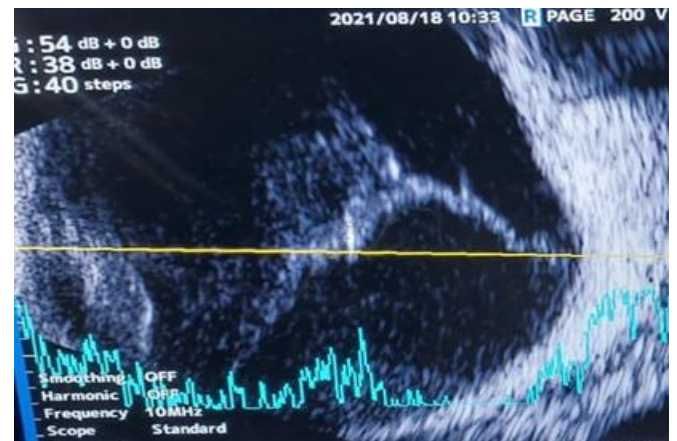


Figure 9: B scan of endophthalmitis showing organized opacities in vitreous with membrane formation.

Conclusion

Ultrasound is a noninvasive, rapid, safe and sensitive method for differentiating orbital pathology.

Differentiation of the orbital pathologies required high frequency and high-resolution ultrasound. It is the only study that allows to study the dynamic assessment thus assessing after movements of retinal and posterior vitreal detachment and floaters. B scan is especially useful for diagnosing cataract, trauma, and foreign bodies. B scan should be combined with A scan and color doppler.

Bscan does play a major role in diagnosis specifically the pathologies of posterior segment of eye. Diagnosing and characterizing the abnormalities with great accuracy by B-scan not only helps in preoperative cases but also changes the management of various other patients. Its non-invasiveness and no exposure to ionizing radiation is an added advantage. However, experience and understanding of the principles are essential for accurate diagnosis.

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