Original Research Article

B scan evaluation of posterior segment in eyes with hazy vitreous

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Abstract

Purpose - To determine the diagnostic utility of ultrasound B-scan in evaluating vitreo retinal pathologies in eyes with hazy vitreous. **Study design** – a cross-sectional observational study. **Methodology**: The present study was conducted in the ophthalmology department, SVRRGGH, Tirupati. During the study period from October 2016 to December 2017, 71 eyes with hazy vitreous and poor retinal visualization were investigated with ultrasound B scan. **Results:** Out of 71 scans performed in 68 patients, 45 eyes had vitreous haemorrhage (VH), 20 eyes showed inflammation in vitreous and 6 eyes had dense degenerative vitreous floaters. Posterior segment pathologies detected in 45 eyes with vitreous haemorrhage(VH) were tractional retinal detachment (TRD), posterior vitreous detachment (PVD), rhegmatogenous retinal detachment (RRD), peripheral retinal tear. In patients with intraocular inflammation, the diagnoses made were endophthalmitis, dropped nucleus and intraocular tumor with choroidal melanoma features and posterior scleritis. In patients with degenerative floaters posterior staphyloma was seen with axial elongation of eye ball. **Conclusion**: B-scan ultrasound is an indispensable diagnostic tool in detection and evaluation of vitreo retinal pathologies in patients with vitreous haze.

Keywords: hazy vitreous, PVD, TRD, ultrasound B scan, VH

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INTRODUCTION

Ultrasound was first used in ophthalmology by the American ophthalmologists, Mundt and Hughes in 1956 [1]. They used A-scan mode to evaluate an intraocular tumour, but B-scan was introduced by Baum and Greenwood in 1958[2]. Both A and B-scan techniques are important for the diagnosis of posterior segment lesion. B -mode is useful for a better demonstration of the shape and topographic relationship of lesions in the posterior segment [3 3]. B-scan provides a cross-sectional display of diseased tissues and is valuable in detecting posterior segment disease [4]. The frequency used in the diagnostic ophthalmic ultrasound B Scan is 8-10 MHz. Ophthalmic ultrasonography has become safe, non-invasive diagnostic imaging modality that provides instant feedback for the evaluation of various ophthalmic disorders. One of the main indications for diagnostic ultrasonography is evaluation of vitreoretinal pathologies in eyes with hazy ocular media. It is most useful in the presence of opaque ocular media caused by corneal opacities, anterior chamber opacities, dense cataracts, dense opacities in vitreous, which make clinical examination and ophthalmoscopic examination difficult and least informative [5]. Opacities in the vitreous can occur from several causes, such as aging, inflammation, infection, and hemorrhage from trauma or systemic disease. The normal, clear vitreous appears black or acoustically empty on B-scan and as a flat baseline on standardized A-scan [6]. The purpose of the present study is to evaluate the posterior segment pathologies by ultrasound B Scan in patients with poor retinal visualization due to hazy vitreous.

MATERIALS AND METHODS

This was a cross-sectional observational study which was confined to the assessment of posterior segment lesion in eyes with vitreous haze by B-scan ultrasound. The study was conducted in the Ophthalmology department, SVRRGGH, Tirupati from Oct 2016 to Dec 2017, after

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getting the approval of the institutional ethical committee (IEC). Written informed consent was taken from all the participants in their language and in the presence of eyewitnesses. Patients presented with defective vision and where complete slit-lamp examination and on Ophthalmoscopic evaluation, visualization of the fundus was poor due to hazy vitreous were included in the study. Patients with open globe injuries and those who are not willing to participate in the study were excluded from the study. In the present study, 71 eyes of 68 patients with hazy vitreous were evaluated. In all the cases, vitreous haze was dense enough to preclude adequate assessment of retina and any underlying pathology. B scan machine, Ophthalmic Ultrasound Scanner Marvel II (Appasamy Associates) with the 10MHz probe was used to evaluate the posterior segment pathology in all the study participants. The ultrasonic probe was placed over the eyeball with a closed eyelid after application of the gel. The basic screening was performed initially at high gain followed by at low gain using the five scan method, including one Axial scan to visualize optic disc and macula of the retina and 4 Transverse scans to see the peripheral retina to ensure evaluation of all segments of the eye. Longitudinal scans were performed to determine topographically identified pathology. Quantitative echography was done to determine the internal reflectivity of a solid lesion. Kinetic echography was done by asking the patient to move the eyes in different gazes to determine the after movements of the membranous structures. The findings were recorded in a standard proforma.

RESULTS

In this study, 71eyes of 68 patients with vitreous haze and poor retinal visualization were investigated with ultrasound B – scan. There were 44 male (65%) and 24 female (35%) patients. Age range was 10- 80yrs. Of the 68 patients, 17 patients had the history of ocular trauma.Causes for the vitreous haze was due to vitreous hemorrhage in 45 (63%) eyes, inflammatory floaters in 20 (28%) eyes and dense degenerative floaters in 6 (9%) eyes. [Table 1]

Table 1: Causes for vitreous haze

Pathology	Eyes (n=71	(%)
vitreous haemorrhage	45	(63%)
inflammatory floaters	20	(28%)
Dense degenerative floaters	6	(9%)
Total No. of eyes with Vit. Haze	71	(100%)

Ultrasonically detectable posterior segment pathologies among the 45 eyes with vitreous haemorrhage include isolated VH without any other pathology in 15 eyes, VH with TRD in 12 eyes, VH with PVD in 10 eyes, VH with RRD in 6 eyes and VH with peripheral retinal tear in 2 eyes.[Table 2]

Table 2: Ultrasonically detectable pathologies among eyes with VH

Ultra sound finding Eyes (n=45)		(%)
Isolated VH	15	(33.30%)
VH with TRD	12	(26.60%)
VH with PVD	10	(22.20%)
VH with RRD	6	(13.30%)
VH with retinal tear	2	(4.44%)
Total No of eyes with VH	45	(100%)

Of 20 eyes with inflammatory vitreous floaters as a cause for vitreous haze, B-scan findings include, endophthalmitis in 4 eyes (20%) with or without TRD and nucleus drop, mild inflammatory vitreous floaters with only thickening of the retino choroidal complex in 7eyes(35%) and along with inflammatory floaters, one of these findings were observed. They were Choroidal detachment in 4 eyes (20%), Posterior scleritis in 4 eyes (20%), choroidal melanoma in 1 eye.[Table 3]

Table 3: Ultrasound diagnosis in eyes with vitreous inflammation

Ultra sound finding Eyes (n=20)		(%)
Endophthalmitis	4	(20.00%)
Inflammatory floaters with RCS complex thickening	7	(35.00%)
nucleus drop and choroidal detachment	4	(20.00%)
choroidal melanoma	1	(5.00%)
Posterior scleritis	4	(20.00%)
Total No.of eyes with inflammatory floaters	20	(100%)

Findings include Asteroid hyalosis in 3 eyes (50%), Posterior staphyloma in 2 eyes(33%) and rhegmatogenous retinal detachment in 1eye (17%), were seen in the eye with dense vitreous floaters.[Table 4]

Table 4: USG B – scan findings in eyes with dense degenerative vitreous floaters

Ultra sound finding Eyes (n=6)		%
Asteroid hyalosis	3	(50.00%)
Posterior staphyloma	2	(33.33%)
Rhegmatogenous RD	1	(16.66%)
Total No. of eyes with dense degenerative floaters	6	(100.00%)

Diabetes predominated the etiology of vitreous hemorrhage in the study followed by trauma. Other diseases, posterior vitreous detachment, retinal vascular disorders were the least cause in the study. Among 68 patients, 17 patients had history of blunt trauma;15 eyes were showing vitreous haemorrhage and 2eyes with intraocular inflammation.33% of eyes with vitreous haemorrhage was due to trauma.[Table - 5]

Table 5: Ultrasound findings in eyes with vitreous haze due to blunt trauma

Ultra sound finding	Eyes (n=17	(%)
Isolated VH	9	(52.94%)
VH with RRD	4	(23.50%)
VH with retinal tear	2	(11.76%)
Endophthalmitis with TRD	2	(11.76%)
Total No. of eyes with vitreous haze due to blunt trauma	17	(100.00%)

DISCUSSION

Vitreo retinal pathologies are the most common indication for ultrasonographic imaging of the eye. In situations where there is media opacity obscuring fundus details, echography allows for evaluation of the vitreous, retina, and choroid and it is possible to identify, evaluate various posterior segment conditions such as retinal tears, vitreous and retinal detachments, sub retinal haemorrhage. In the present study, 71 eyes of 68 patients with hazy vitreous were investigated. In all the cases, vitreous haze was dense enough to preclude adequate assessment of retina and any underlying pathology. Vitreous opacification was because of vitreous hemorrhage in 45 eyes, inflammation in 20 eyes and dense degenerative floaters in 6 eyes. The distinction between different opacities was made by clinical as well as echographic. [Table 1] Vitreous hemorrhage is one of the most common differential diagnoses for sudden painless decrease in vision. It is often caused by retinal vascular disorders secondary to common systemic ailments such as diabetes mellitus, systemic hypertension and haematological abnormalities. Sometimes it may be the beginning of a retinal tear and consequent retinal detachment that can be vision threatening if not operated early[7]. Proliferative diabetic retinopathy (32%), retinal tear (30%), proliferative retinopathy after retinal vein occlusion (11%) and posterior vitreous detachment without retinal tear (8%) are the most common causes of spontaneous vitreous haemorrhage [8]. Diabetes predominated the etiology of vitreous hemorrhage in the present study followed by blunt trauma to the eye. Other diseases including PVD, retinal vascular disorders were also listed as causes for VH in the study. The present study was compared and correlated with the study done by Rabinowitz et al [9]. Fresh vitreous hemorrhage appeared as very low reflective dots and short lines on B-scan at high gain settings . [Fig 1]. The more dense the haemorrhage, the more opacities were seen on B-scan. In old vitreous haemorrhage, the dot-like echoes organize to form membranes of varying reflectivity across their extent, most dense inferiorly as a result of gravity [10]. In the study, ultrasonically detectable posterior segment pathologies among the 45 eyes with vitreous hemorrhage include isolated VH in 15 eyes, VH with TRD in 12 eyes, VH with PVD in 10 eyes, VH with RRD in 6 eyes and VH with retinal tear in 2 eyes [Table -2]. It was compared with the study by J .Ahmed et al “Evaluation of Vitreo-Retinal Pathologies Using B-Scan Ultrasound”[11] and study by Abraham MN. “Ultrasonography in eyes with vitreous haemorrhage”.[12]. A highly elevated, totally detached retina appeared as convex bullae extending far into the vitreous from attachment points at the nasal and temporal ora serrata and at the optic nerve. Retinal echoes on A-scan have high amplitude – 100% of the scleral spike. The reflectivity remains equal along the entire extent of the membrane. On kinetic echography restricted after movements were seen in retinal detachment compared to a highly mobile posterior vitreous detachment. Traction was present as tent like with mild elevation of retina, and table top configured shallow or highly elevated detachment or as a complete funnel shaped detachment. Retinal tear was seen at the edge of the detached vitreous as high reflective elevations from the retinal surface with a free edge [10]. In vitreous haemorrhage, the important information which a surgeon seeks in diagnostic echography includes , distribution of haemorrhage, presence, location and consistency of vitreous membranes, presence or absence of posterior vitreous detachment and associated retinal detachment. Of these, presence of retinal detachment is most important, because this profoundly changes the management of the case. It is therefore important to differentiate dense vitreous membranes from retinal detachment. To avoid ultrasonic errors in analysing the vitreous haemorrhage echographically, both A scan and real-time B-scanning should be used complementary to each other and not interpreted independently. Additional findings of optic nerve attachment of the involved structure is looked for in B-scanning [13]. Low reflective vitreous echoes, dot like or cobweb shaped membranes were suggestive of vitreous Inflammation, giving similar ecogenic appearance to fresh vitreous haemorrhage. In more severe cases, thick high reflective membrane like echoes were seen. Even distribution of inflammatory floaters contrasting to inferiorly settled floaters in haemorrhage with established PVD are the differentiating features. Sometimes it needs clinical confirmati[10] Along with Inflammatory echoes ,there were clumps of high reflective echoes in mid vitreous in eyes with severe postoperative inflammation following complicated cataract surgery, suggested the dropped nuclear fragments with severe vitritis .Presence of thicker, cobweb like highly reflective membranes in vitreous with TRD like configuration due to thickened, inflamed posterior hyaloid which is adherent to the retina, suggested endophthalmitis.[Fig 2].

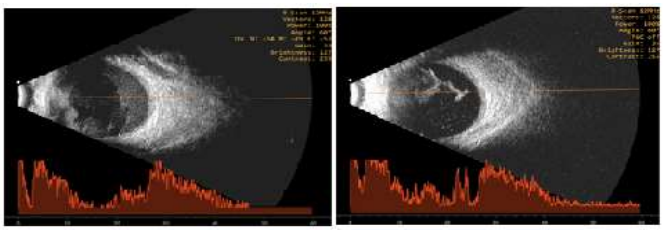

Figure 1: Fresh vitreous haemorrhage; **Figure 2:** Endophthalmitis with TRD

It was diagnosed in 4eyes; 2eyes had history of intraocular surgery, 2 eyes had history of trauma to eye. one old patient with inflammatory floaters in vitreous, on b-scan assessment showed a dome shaped growth with low to medium internal reflectivity and acoustic hollowness suggested choroidal melanoma with masquerade. The Patient lost for follow up. Other features documented in patients with intraocular inflammation were retinochoroidal thickening ; posterior scleral thickening with T- sign, choroidal detachment with Smooth, thick, dome shaped membrane in the periphery with little or no after movement and with typical double peak on A scan; and macular edema in addition to inflammatory floaters. In eyes with degenerative vitreous floaters, bright highly reflecive echoes on B-scan with 100 % reflective spike on A - scan with clear vitreous gel located between opacities and retina suggested asteroid hyalosis. Other features noted were axial elongation with increased axial length and outward bowing of RCS complex, the posterior staphyloma.[Fig 3]. Both were the features in high myopic eyes.

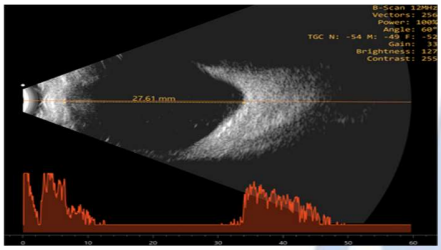

Figure 3: Posterior staphyloma

LIMITATIONS OF THE STUDY

Echographic findings were not confirmed by other modalities of investigations or with clinical findings after the clearance of vitreous haze either by medical or surgical means. Treatment options to individual patients were not studied and were not followed up further.

CONCLUSION

Ultrasound B-scan is a non-invasive, safe and sensitive method for demonstrating the vireo retinal pathologies. B-scan should be combined with A-scan to avoid ultrasonic errors in differentiating various pathologies such as thick posterior vitreous detachments and retinal detachments. B-scan is not safe to use in open globe injuries till the globe wall is reconstructed. With great accuracy in diagnosing and characterizing the abnormalities in eye with opaque media precluding the retinal examination, ultrasonic evaluation not only helps to diagnose the underlying pathology, but also to determine the surgical procedure, timing of surgery and to predict the visual outcome.

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