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Study Of Ophthalmic B-Scan Ultrasonography

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ABSTRACT

Background: B scan ultrasonography plays an important role in management of patients with ocular trauma for the detection of hidden posterior segment lesions.

Objectives: Present study was carried out to describe the indications for ophthalmic B-scan. And to describe various posterior segment lesions from B-scan.

Materials and methods: A cross-sectional (observational) study conducted among 70 patients. All patients were undergone complete ophthalmic evaluation along with detailed Ocular and medical history followed by examination and measurements as described above. Various measurement was done, including USG B-scan. The B-Scan device used US Scan3300 (NIDEK). The coupling substance used was hydroxypropyl methylcellulose. Comprehensive transverse, longitudinal, oblique, and axial scans were performed on the optic globe. The range of 80 dB to 40 dB was used in the study to discriminate between different tissue densities. Both live and still images were analysed in real-time and later on after they had been frozen. The images of the B-scan were analysed.

Results: The mean age of study participants was 49.29 years. 17.1% of the patients had history of sudden dimness of vision while 15.7% had dimness of vision with pain. History of Penetrating trauma was reported in 11.4% of the patients. Among 7.1% of the patient traumatic cataract was suspected. Provisionally vitreous hemorrhage, microphthalmos, retinoblastoma, total hyphema was diagnosed among 4.3% each of the study participants. 35.7% of the of the study participants had normal posterior segment on B-scan. Out of total 35 patients who were diagnosed as a cataract, through B-scan among 5% were diagnosed additionally with retinal detachment. B-scan confirm clinical diagnosis among 22.9% of the patients who are provisionally diagnosed with other conditions.

Conclusion: B scan ultrasonography may reveal undiscovered posterior segment lesions in trauma patients. B scan helped in accurate diagnosis in patients with opaque media leading to proper treatment. 5.0% of B-scan cataract patients also had retinal detachment, whereas 85.7% had a normal posterior area. Only one-quarter of patients with other preliminary diagnoses had their diagnoses confirmed by b-scan, whereas three-quarters had the same diagnosis on both tests.

Keywords: *B-Scan, Cataract, Posterior Segment, Retinal Detachment*

1. INTRODUCTION

Medical conditions affecting the eyes may strike persons of any age, from infants to the elderly. Since clinical and ophthalmoscopy are less helpful, high-resolution sonography can properly assess many posterior segment lesions in the eye. For the diagnosis and classification of intra ocular diseases, standardized Ultrasound has shown to be very accurate.[1,2] (Sun et al., 2022). Diabetes h The management of diabetes are complete oral, injection controlled diabetes treatment and nearly 70% of patients in Indonesia do not reach the diabetes treatment target (Salwa Kamilia Cahyaning Hidayat, 2022). Diabetes is a complex, incurable, chronic illness that requires strict adherence to medical treatment regimen and the objective of diabetes management is to maximize comfort, diminish symptoms, and prevent complications (Id et al., 2019). To attain these

For evaluating lesions of the posterior segment with opaque ocular media brought on by corneal opacities, anterior chamber opacities, dense cataracts, vitreous hemorrhage, and inflammatory opacities that make clinical examination and ophthalmoscopic examination challenging and least informative, ophthalmic Ultrasonography has emerged as the most significant and accurate diagnostic imaging modality.[3]

When analyzing the posterior portion of the eye in individuals with advanced cataracts, B-scan Ultrasonography is an essential inquiry technique. Many patients in developing nations like India have never been to an ophthalmologist for advice before they show themselves at the hospital to undergo surgery.[4] The use of ocular B-mode Ultrasonography as part of the diagnostic process for ocular disorders is very necessary. Since the 1950s, B-scan has been used in the examination of ocular conditions.[5,6] Lens pathology and diseases of the posterior eye segment are also included in this category of lesions. [7,8] It is helpful for both the planning of surgical procedures and the ongoing medical treatment of the patient since it may yield diagnostic and prognostic information.[9,10]

The ocular B-scan generates a display in which the globe and the orbit are shown in cross-section in two dimensions. It is a non-invasive imaging method that operates in real time and is rapid and has high spatial resolution. It is also possible to conduct at the bedside of the patient. In addition to that, an ocular B-scan may be performed concurrently with eye movement; this kind of investigation is known as a dynamic study.[9,10]

2. MATERIALS AND METHODS

Study setting:

- The study was conducted in the outdoor patient department of Dhiraj hospital, Piparia, Waghodia, Vadodara, Gujarat.

Study type:

- It was a cross-sectional (observational) study.

Study duration:

- The study was conducted for one and a half years.

Study participants:

Inclusion criteria:

⇒ Patients clinically presenting with opaque light conducting ocular media.

⇒ Patients with clear media with clinical suspicion of having posterior segment disorders.

⇒ Patients with unexplained visual loss.

⇒ Patients with orbital disorders.

⇒ In cases of trauma

Exclusion criteria:

⇒ Patient with active ocular surface infection.

⇒ Patient with a high risk of/with extrusion of intraocular contents in open globe injuries.

⇒ Patient with poor cooperation.

⇒ Patients who were not willing to investigation

Study Population:

- Total 70 eligible patients who visited the Ophthalmology Department, Dhiraj Hospital were acquired purposively in the present study. The patients were enrolled in this cross-sectional study after informed consent was signed by

the participants and after receiving the approval by the Institutional Ethics Committee (IEC).

Data collection procedure:

- After getting permission from the Institutional Ethics Committee (IEC), the data collection procedure was started. Patients coming to the Out Patient Department (OPD) were undergone complete ophthalmic evaluation along with detailed Ocular and medical history followed by examination and measurements. Various measurement was done, including USG B-scan. The images of the B-scan were analyzed.
- Data were collected with the help of a pre-formed case record form which includes

Socio-demographic characteristics, History of the study participants**,** autorefractometer refractive readings, Measurement of Visual acuity, Measurement of Intraocular pressure, Slit lamp biomicroscopy, fundus examination and USG B-Scan.

USG B-Scan:

⇒ According to the operational criteria, B-scan Ultrasonography was done to evaluate vitreous opacities and underlying posterior segment diseases. A topical anaesthetic eye drop was administered to anaesthetize the ocular surface. The B-Scan device used US Scan3300 (NIDEK). The coupling substance used was hydroxypropyl methylcellulose. The patient was sat in a reclined chair. An expert ophthalmologist conducted B-scan.

⇒ The clinical and Ultrasound results will be documented using a standard form. Comprehensive transverse, longitudinal, oblique, and axial scans were performed on the optic globe. The range of 80 dB to 40 dB was used in the study to discriminate between different tissue densities. Both live and still images were analyzed in real-time and later on after they had been frozen.

3. RESULTS

Table 1: Age distribution of study participants (n=70)

	Mean	**SD**
Age (in years)	49.29	23.45

As seen in Table 1, The mean age of study participants was 49.29 years (SD 23.45 years)

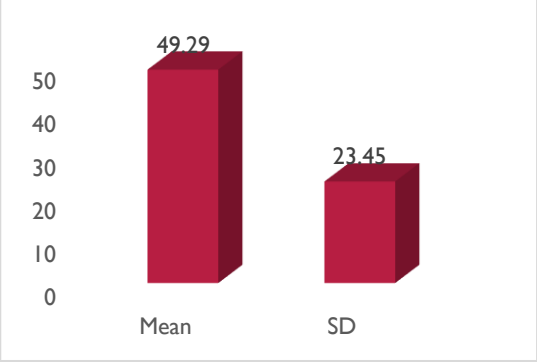

Figure 1: Age distribution of study participants

Table 2: Gender distribution of study participants (n=70)

Gender	**Number**	**Percentages**
Male	48	68.6
Female	22	31.4
Total	**70**	**100**

In present study, 68.6% of the participants were males and 31.4% were females.

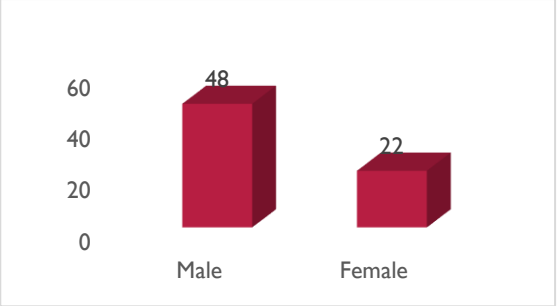

Figure 2: Gender distribution of study participants

Table 3: Side of eye under examination (n=70)

Side of the eye	Number	Percentages
Right eye	40	57.1
Left eye	30	42.9
Total	**70**	**100**

As shown in Table 3, 57.1% study participants had affected right eye while 42.9% ah d affected left eye.

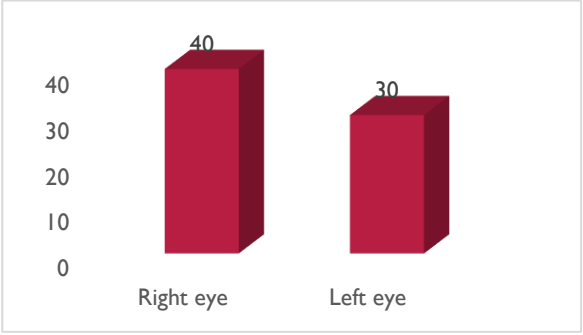

Figure 3: Side of eye under examination

35.7% of the study participants had only perception of light after best correction of visual acuity. Hand movement was appreciated by 24.3% of the patients. Finger counting at one meter, 2 meter, 3meter and 5 meter was observed among 20%, 12.9%, 4.3% and 2.9% of the study participants. Respectively.

Dimunition of vision was seen among 42.9% of the study participants, 17.1% of the patients had history of sudden dimness of vision while 15.7% had dimness of vision with pain. History of Penetrating trauma was reported in 11.4% of the patients. Empty socket, post viral keratitis and white reflex was seen among 4.3% each of the study participants.

Table 4: B-scan findings among study participants (n=70)

B-scan findings	Number	Percentages
Normal posterior segment	35	50.0
Hyperechoic shadow in mid vitreous with organized dot like echoes	11	15.7
Highly reflective undulating membrane attach with posterior pole	08	11.4
Hyperechoic mass with intralesional calcification occupying posterior vitreous cavity	03	4.3
Large posterior capsule rupture with low reflective shadows	03	4.3
Multiple hyperechoic coalesced opacities occupying vitreous cavity	03	4.3

Small globular partially formed eyeball like structure	01	1.4
Highly reflective dome shaped membrane	02	2.9
2-3 hyperechoic clusters seen along posterior capsule with one hyperechoic spot-on inf retina	02	2.9
Multiple discrete point like echoes with posterior vitreous detachment (PVD)	02	2.9

As per Table 4, 50% of the of the study participants had normal posterior segment on B-scan. Hyperechoic shadow in mid vitreous with organized dot like echoes was seen among 15.7% of the study participants on B-scan. Highly reflective undulating membrane attach with posterior pole was seen among 11.4% of the patients. Hyperechoic mass with intralesional calcification occupying posterior vitreous cavity, Large posterior capsule rupture with low reflective shadows, Multiple hyperechoic coalesced opacities occupying vitreous cavity and Small globular partially formed eyeball like structure were seen among 4.3% each of the study participants. Highly reflective dome shaped membrane, Multiple discrete point like echoes with posterior vitreous detachment (PVD) was seen among 2.9% each of the study participants.

Table Error! No text of specified style in document.**: Final diagnosis among study participants (n=70)**

Final diagnosis	**Number**	**Percentages**
Cataract with normal posterior segment	30	42.9
Cataract with retinal detachment	5	7.1
Traumatic cataract with RD	3	4.3
Vitreous hemorrhage due to PDR	9	12.9
Vitritis under investigation	2	2.9
Endophthalmitis	1	1.4
Funnel retinal detachment	1	1.4
Retinal detachment	3	4.3
Microphthalmos	1	1.4
Retinoblastoma	3	4.3
Total corneal opacity with normal posterior segment	3	4.3
Zonular rupture with lens dislocation	2	2.9
Traumatic cataract with choroidal detachment	2	2.9
Dense asteroid with PVD	2	2.9
Lenticular rupture with IOFB	2	2.9
Total	**70**	**100**

As per Table 5, out of 30 cases of provisionally diagnosed cataract, 5 cases were further diagnosed as cataract with retinal detachment with B-scan. Traumatic cataract with RD was diagnosed among 4.3% of the study participants. Vitreous hemorrhage due to PDR was diagnosed among 12.9% through B-scan. Proportion of microphthalmos and retinoblastoma was 1.4% and 4.3, respectively. Total corneal opacity, lens dislocation was observed among 4.3% each of the patients. Lenticular rupture was further evaluated as intraocular foreign body was seen through-scan.

4. DISCUSSION

The eye occupies a prominent and noticeable position in our body, providing us with a panoramic view of situations, assisting us in our everyday duties, pleasure activities, and protection against odds and professional responsibilities. If an eye issue happens due to age, sickness, drug addiction, or trauma, all the charms of life are negatively impacted, leading to a decrease

in quality of life. Among these issues, age-related cataract takes a prominent role. As a result, thorough examination and care are required for cataract patients. Ocular trauma is one of the most prevalent preventable causes of blindness, provided cases are treated promptly and appropriately. Ultrasonography, particularly B scan, is a simple, cost-effective, and non-invasive method for visualizing the posterior segment in cloudy & opaque media .[11,12]

The ultrasound (USG) B-Scan is a simple, quick, non-invasive, and safe imaging method for assessing the clinical signs of the traumatic eye. In most instances, ultrasound was chosen as the first imaging modality because it was easily accessible, easy, cost-effective, non-ionizing, non-invasive, and dependable. In a considerable proportion of instances, it establishes the diagnosis quickly. For the diagnosis of ocular diseases, it offers a greater spatial and temporal resolution than both CT and MRI.[13,14] The present study described various posterior segment lesions for properly planning and managing respective conditions.

In the present study, The mean age of study participants was 49.29 years (SD 23.45 years). In the study by **Shrivastava P et al.,[15]** the Mean age was**42.7±20.2 years.** In the study by **Tanweer FS et al.,[16]** the mean age was 30.43 years, which is lesser than **the present study.**

In the present study, 68.6% of study participants were males, while 31.4% were females. In the **Tanweer FS et al.[16] study,73% were males, and 27% were females.** In the study by **Shrivastava P et al.,[15]** 54.8% were females**.**

As shown in Table 3, 57.1% of study participants had affected the right eye, while 42.9% had affected the left eye. In the study by **Ansari AA et al.,[17]** the left eye (39.71%) was slightly more commonly affected than the right eye (35.29%), and in the remaining 25% of patients, both eyes were affected.

As per Table 4, 50% of the of the study participants had normal posterior segment on B-scan. Hyperechoic shadow in mid vitreous with organized dot like echoes was seen among 15.7% of the study participants on B-scan. Highly reflective undulating membrane attach with posterior pole was seen among 11.4% of the patients. Hyperechoic mass with intralesional calcification occupying posterior vitreous cavity, Large posterior capsule rupture with low reflective shadows, Multiple hyperechoic coalesced opacities occupying vitreous cavity and Small globular partially formed eyeball like structure were seen among 4.3% each of the study participants. Highly reflective dome shaped membrane, Multiple discrete point like echoes with posterior vitreous detachment (PVD) was seen among 2.9% each of the study participants.

In the **Ngweme G et al.[18]** study**,** the most common abnormality was posterior vitreous detachment in 15 (3.43%) eyes, followed by retinal detachment in 13 (2.97%) eyes. In the study by **Ansari AA et al.,[17]** the proportion of posterior vitreous detachment was 20%.

B-scan was also beneficial for identifying an intraocular foreign body's size, shape, and composition. In 2.9% of instances in this research, IOFB with lenticular rupture was identified. IOFBs were found in 3.27 percent of patients in the research done by **Sharma et al.[19]** In the investigation conducted by **Bengal CV. et al.[5],** IOFBs were discovered in 3% of cases, two of which were metallic and stuck in the anterior vitreous.

In situations with opaque ocular media when a disease is suspected but not visible on clinical examination, B-scan is especially beneficial for assessing the posterior region. B-scan USG complements and confirms the clinical diagnosis by providing additional information on the lesion's extent, size, and type in the presence of clear ocular media.

5. CONCLUSION

- B scan ultrasonography plays an important role in management of patients with ocular trauma for the detection of hidden posterior segment lesions. B scan must be performed routinely in all the cases of ocular trauma for early diagnosis and appropriate management of each case and to reduce the ocular morbidities. In patients with mature cataract where fundus examination is not possible, B-scan helps to rule out or confirm posterior segment diseases like Retinal Detachment.
- Present study was carried out to describe the indications for ophthalmic B-scan. And to describe various posterior segment lesions from B-scan.

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