



ROLE OF B-SCAN OCULAR ULTRASOUND IN DIAGNOSING POSTERIOR SEGMENT PATHOLOGY IN THE EVENT OF NON-VISUALIZATION OF FUNDUS

Radiodiagnosis

Dr. Satyajeet S. Ghodake*	Assistant Professor, Department of Radiodiagnosis, B.J. Government Medical College Pune, Maharashtra, India.411001*Corresponding Author
Dr. Satish Z. Sorte	Professor and Head, Department of Radiodiagnosis, Indira Gandhi Government Medical College, Nagpur, Maharashtra, India.440018
Dr. Sweta Ojha	Resident, Department of Radiodiagnosis, Indira Gandhi Government Medical College, Nagpur, Maharashtra, India.440018
Dr. Nikhil Bharadwaj	Resident, Department of Radiodiagnosis, Indira Gandhi Government Medical College, Nagpur, Maharashtra, India.440018

ABSTRACT

Aim: To assess the role of B-scan ocular ultrasound in diagnosing posterior segment pathology in the event of non-visualization of fundus.

Methods: A Prospective study including 220 patients from all age groups with suspected posterior segment pathology and non-visualization of fundus. Patients with open wound of eye were excluded.

Results: Majority of the patients were in 51-60 years age group with male predominance.

Most common finding was vitreous degeneration (118 patients) followed by, retinal detachment (39 patients), Posterior vitreous detachment (37 patients), vitreous hemorrhage (20 patients), choroidal detachment and foreign body (7 cases each), posterior staphyloma (3 cases), dislocated lens and phthisis bulbi were seen in (5 cases each), optic drusen and intraocular mass (2 cases each).

Conclusion: Ocular Ultrasound is an easy, non-invasive, non-hazardous, well-tolerated procedure useful in preoperative evaluation of cataract, assessment of localization and characterization of ocular tumors as well as intraocular foreign bodies in ocular trauma.

KEYWORDS

B-scan, Ocular Ultrasound, Vitreous Degeneration, Retinal Detachment, Ocular Trauma

INTRODUCTION

Eye is affected by spectrum of pathological conditions occurring in all age groups from new born to old age. Ultrasound was first used in ophthalmology in 1956 by the American ophthalmologists, Mundt and Hughes^[1]. Over the last 30 years, B (Brightness) scan ultrasonography has greatly advanced and this has enabled us to study posterior segment of the eye in the presence of opaque media such as dense cataract. It not only provides a clue to the diagnosis but also aids in formulating the rationale of treatment. It can be correctly said that "B-scan can see what the ophthalmoscope cannot"^[2].

The present study aimed to evaluate the incidence of various significant posterior segment abnormalities in patients with suspected posterior segment pathology in event of non-visualization of fundus which would allow surgeons to selectively refer cases to higher centres for ocular ultrasonographic evaluation prior to surgery and to provide them proper treatment.

AIMS AND OBJECTIVES

- To assess the role of Ultrasonography in diagnosing posterior segment pathologies of eye.
- Evaluation of intra-ocular posterior segment details obscured by the opacities of cornea, aqueous, papillary spaces, lens or vitreous.
- To study ultrasonographic imaging characteristics of various posterior segment pathologies of eye including intraocular tumor with respect to its location, configuration, extent and relationship to its adjacent structures.
- Evaluation of the ocular trauma with identification, localization and measurement of intraocular foreign bodies.

MATERIALS AND METHODS

All the patients with ocular complaints and suspected posterior segment pathology in the event of non-visualization of fundus referred to our Department of Radiodiagnosis, from Ophthalmology department were included in the study. Instrument used were Phillips HD 11XE and Esaote MyLab Class C USG machines; having a hand held high frequency linear transducers with frequencies ranging from 7.5 to 12MHz. The ultrasonic findings were recorded, evaluated and confirmed by my guide. Study carried out over a period of 23 months from December 2015 to October 2017, excluding the period of data analysis and write-up. The data analysis was done by calculating frequency and percentage of different pathologies and the outcome was computed and compiled using Microsoft word and excel.

INCLUSION CRITERIA

- B-scan was done of all patients of all ages referred to Radiodiagnosis department from Ophthalmology department with diagnosed or suspected posterior segment abnormalities with non-visualization of fundus due to any pathology.

EXCLUSION CRITERIA

- Patients with open wound of eye.
- Patients with visible fundus on direct / indirect ophthalmoscope
- Patient not willing for the study.

RESULTS

Out of 220 patients 137 (62.27 %) were males and 83 (37.72 %) were females. In almost all age groups number of male patients was more than female patients. Mean age for males was (47.7±16.4) years. Mean age for females was (53.02±16.6) years. (TABLE 1)

TABLE 1: Age-sex Distribution

Age (In Years) Group	Males	Females	Total
0 – 10	4	1	05
11 – 20	5	4	09
21 – 30	13	3	16
31 – 40	20	9	29
41 – 50	26	13	39
51 – 60	40	27	67
61 – 70	23	15	38
71 – 80	6	11	17
TOTAL	137 (62.27%)	83 (37.72%)	220 (100%)

Right eye was involved in 112 (50.91%) patients, left eye was involved in 88 (40.00%) patients and both eyes were involved in 20 (9.09%) patients.

The most common clinical complaint of the patients in the ophthalmology OPD was diminution of vision which was seen in 206 patients (93.63%) out of total 220 cases. Normal vision in 6 cases (2.73%) and blindness is seen in 7 cases (3.18%). One case (0.45%) was of two month age so diminution of vision was not applicable to this case.

In all out of 220 patients only 58 patients (26.36%) had watering. Most of the cases i.e. 162 (73.64%) does not complained of watering from

eyes. 31 cases(14.09%) complained of pain in the eye. 188 cases (85.45%) were not complaining of pain in the eyes. One case (0.45%) was of two month age so pain in the eye was not applicable to this case. Out of 220 patients 162 patients (73.64%) were having opacification of lens thus making ophthalmoscopic examination of fundus difficult

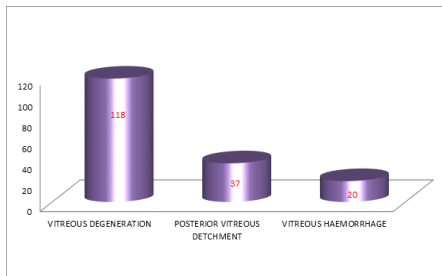
The most common finding was vitreous degeneration which was found in 118 patients (53.64%) followed by, retinal detachment in 39 patients(17.73%), Posterior vitreous detachment was found in 37 patients (16.82%) vitreous haemorrhage in 20 patients (9.09%), choroidal detachment and foreign body in 7 cases (3.18%)each ,posterior staphyloma in 3 cases (1.36%), dislocated lens and phthisis bulbi were seen in 5 cases (2.27%)each, optic drusen and intraocular mass were seen in 2 cases (0.91%) each.(TABLE 2)

TABLE 2: Incidence Of Various Posterior Segment Abnormalities Detected On B Scan Ultrasonography

Abnormal findings	No of patients (n =220)	Percentage
Vitreous degeneration	118	53.64%
Posterior Vitreous detachment	37	16.82%
Vitreous haemorrhage	20	9.09%
Retinal detachment	39	17.73%
Choroidal detachment	7	3.18%
Posterior staphyloma	3	1.36%
Phthisis bulbi	5	2.27%
Optic drusen	2	0.91%
Foreign body in eye	7	3.18%
Intraocular mass	2	0.91%
Dislocated lens	5	2.27%

CHART 1 shows the number of cases along with percentage of the vitreous pathologies. 118 cases (53.63%) were having vitreous degeneration. Posterior vitreous detachment was seen in 37 cases (16.81%) followed by vitreous haemorrhage in 20 (9.09%) cases respectively.

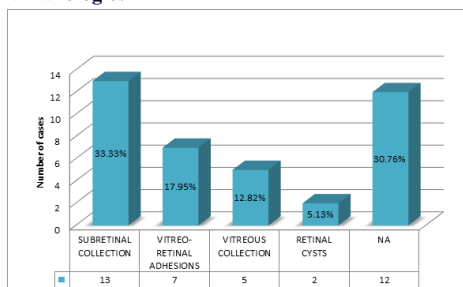
CHART 1: Vitreous Pathologies



In all total 118 cases showed Vitreous degeneration. Vitreous degeneration was seen most commonly in the age group of 51-60 years with 48 patients (40.68%). In 61-70 and 41-50 years age group showed 26 (22.03%) and 22 (18.64%) cases respectively.

CHART 2 shows that out of 39 cases of retinal detachment, sub retinal collection was seen in 13 cases (33.33%). 7 cases (17.95%) of retinal detachment were associated with vitreo-retinal adhesions. 5 cases (12.82%) were associated with vitreous collection followed by retinal cysts with 2 (5.13%)cases. 12 cases (30.76%) showed only retinal detachment and no other associations.

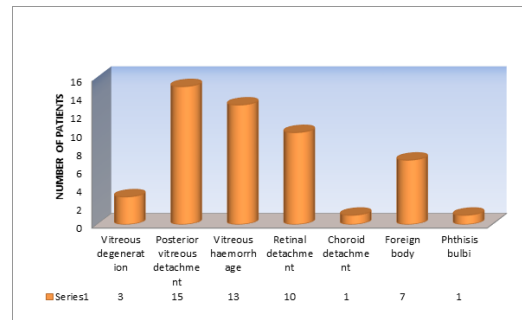
CHART 2: Retinal Detachment With Associated Posterior Segment Pathologies



Out 220 patients total 7 patients were having choroid detachment , maximum 3 (42.86%) among them were on both sides of globe, 2 (28.57%) were on temporal side of globe, one (14.28%) on nasal side and remaining one (14.28%) was kissing type of choroid detachment.

In all 47 patients out of 220 were complaining of ocular trauma. Chart 3 describes about the posterior segment pathologies in the ocular traumatic patients. 3 cases (6.38%) showed vitreous degeneration, posterior vitreous detachment and vitreous haemorrhage in 15 (31.91%) and 13 (27.66%) cases respectively. Retinal detachment was seen in 10 cases (21.28%) and intraocular foreign bodies were seen in seven (14.89%) cases. There was only one case (2.13%) of Phthisis bulbi and choroid detachment each in the ocular trauma patients

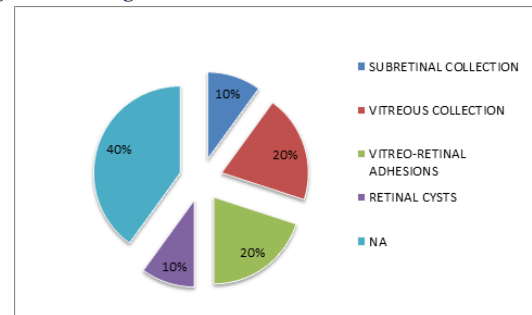
CHART 3 : Posterior Segment Pathologies Found In The Ocular Trauma Patients



As shown in CHART 4 of the all 47 cases of ocular trauma, 10 cases (21.27%) showed retinal detachment. Out of 10cases of retinal detachment in trauma patients, vitreous collection and vitreo-retinal adhesions were seen in 2 cases (20%) each, subretinal collection and retinal cysts were seen in one case (10%)each, remaining 4 cases (40%) were not having any other associated pathology.

2 cases (0.91%) were having intraocular mass of which one case (0.45%) each of Retinoblastoma and Choroidal melanoma

CHART 4 : Retinal Detachment And Associated Posterior Segment Pathologies In Patients Of Ocular Trauma



DISCUSSION

- In our study majority of the patients were in 51-60 years age group, who accounted for 67 (30.45%) cases. The average age of presentation was 49.7 years.
- Sharma^[3] observed orbital pathologies predominantly in 4th - 5th decade of life with clinical features of diminution of vision followed by trauma. He described presence of abnormal echoes in the vitreous cavity which are seen in vitreous degeneration. Accuracy and specificity of ultrasound to detect ocular pathologies in the vitreous cavity was also explained in his study.
- Aironi and Gandage^[4] described the technique for doing ultrasound of the eye with the help of 7.5-10 MHz real-time high-frequency probe with contact method and explained various ocular pathologies including vitreous degeneration as done in our study.
- Sex distribution showed that in almost all age groups number of male patients (62.27%) were more than female patients. (37.72%)
- The most common finding was vitreous degeneration which was found in 118 patients (53.64%) followed by, retinal detachment in 39 patients (17.73%).
- Retinal detachment appeared as an echogenic, V, T, Y shaped, uniformly reflected membrane extending from the ora serrata to the optic disc. In cases of total retinal detachment, the membrane

was attached to both the ora. This membrane showed moderate after movements in fresh detachments but showed restricted motility in old detachments. Other associated abnormalities with the retinal detachments were also seen like sub-retinal collection, vitreo-retinal adhesions, retinal cysts. Coleman et al^[5], Forrester et al^[6], Innes et al^[7], Nicholas Zakov et al^[8], Fielding et al^[9], Fielding^[10] also described similar findings in cases of retinal detachments.

- In all, 47 patients out of 220 were having history of ocular trauma. 3 cases (6.38%) showed vitreous degeneration, posterior vitreous detachment and vitreous haemorrhage were seen in 15 (31.91%) and 13 (27.66%) cases respectively. Retinal detachment was seen in 10 cases (21.28%) and intraocular foreign bodies were seen in seven (14.89%) cases. There was only one case (2.13%) of Phthisis bulbi and choroid detachment each in the ocular trauma patients
- Mc Nicholas et al^[11] in their series on ocular trauma in 61 eyes, noted that the commonest pathology was vitreous hemorrhage followed by others. They also state that 2mm thin collimated axial CT slices are very accurate in determining the size of metallic IOFB's although was superior in demonstrating the extent of associated intraocular damage. The authors also state early ultrasonographic assessment in eyes with trauma helps recognize early retinal detachments which may improve the visual prognosis.
- We also found same findings as seen by Chugh and Verma^[12] while doing USG of eyes with ocular trauma when corneal edema, secondary cataract, or vitreous hemorrhage or debris were present was helpful as clinical examination is impossible due to opaque ocular media.
- Satisfactory evaluation of intraocular pathologies can also be done by using non-dedicated all-purpose / small parts high frequency transducers, which are widely available in most radiology departments with excellent image quality. Ocular ultrasound is necessary to mention the cost-effectiveness of USG examination in comparison with both CT and MR examinations.
- In preoperative evaluation of cataract, ultrasound screening can detect posterior segment abnormalities, which are very helpful in deciding the future management and the eventual, postoperative prognosis.
- Ultrasound is very useful for screening all eyes of tumors and suspected tumors. Apart from making the diagnosis, exact extent of the tumor can be accurately mapped, and its characteristics defined.
- Ultrasound is essential to screen all eyes with trauma. In trauma, the posterior segment details are usually obscured and hence evaluation by ultrasound is essential for complete diagnosis and makes a big impact on the plan of management.
- Ocular ultrasound is very accurate in diagnosing exact localization of radio-opaque intraocular foreign bodies, in terms of distance from the limbus and other structures and clock hour position. This is extremely useful to the surgeon for planning the surgery.

CONCLUSION

Ultrasound is an easy, cheap, quick, non-invasive, non-hazardous, well-tolerated, bedside procedure done with no patient preparation and is very essential for screening all eyes with opaque media for posterior segment abnormalities, and high frequency B-scan ultrasound done by a non-dedicated probe is also quite accurate in depicting posterior segment abnormalities and produces images of excellent quality.

IMAGES

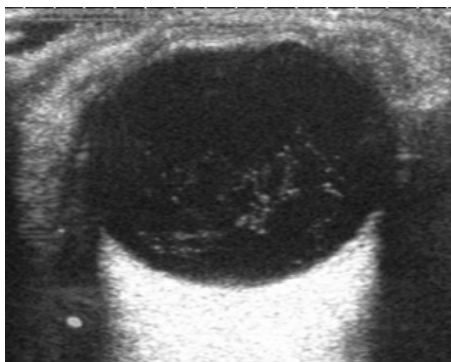


FIGURE 1: Vitreous degeneration

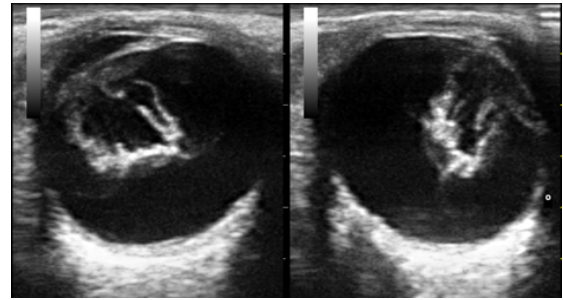


FIGURE 2: Posterior vitreous detachment

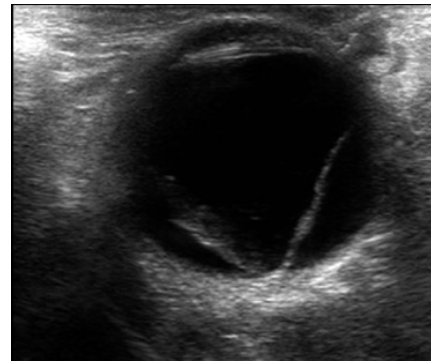


FIGURE 3: Open funnel (V shaped) retinal detachment

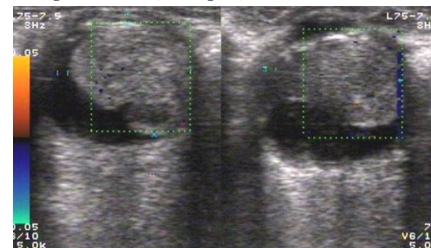


FIGURE 4: Choroid melanoma.

REFERENCES

1. Mundt GH, Hughes WF. Ultrasonics in ocular diagnosis. *Am J Ophthalmol.* 1956;41:488-98.
2. Garg J, Tirkey E, Jain S, Lakhtakia S, Tiwari A. B-scan ultrasonography before surgery in eyes with advanced cataracts: A useful prognostic tool. *Journal of Evolution of Medical and Dental Sciences.* 2015; Vol. 4:6372-77.
3. Sharma OP. Orbital sonography with it's clinico-surgical correlation. *Indian J Radiol Imaging* 2005;15:537-54.
4. Aironi VD, Gandage SG. Pictorial essay: B-scan ultrasonography in ocular abnormalities. *Indian J Radiol Imaging* 2009;19:109-15.
5. Coleman DJ, Jack RL, Franzen LA. Ultrasonography in ocular trauma. *Am J Ophthalmol.* 1973 Feb;75(2):279-88.
6. G.R.Sutherland, J.Y.Forrester, B-scan ultrasonography in ophthalmology. *British journal of radiology* July 1974; 47,383-386.
7. Innes J, McCreath G, Forrester J.V.Ultrasonic patterns in vitreo-retinal disease. *Clinical radiology* 1982; 33,585-591.
8. Zakov Z.N, Berlin L.A, Gutman F.A. Ultrasonographic mapping of vitreoretinal abnormalities. *AJO* 1983,96: 622-631.
9. Fielding JA. Ultrasound imaging of the eye through the closed lid using a non-dedicated scanner. *Clin Radiol* 1987 Mar,38(2):131-5.
10. Fielding JA. Ocular ultrasound. *Clin Radiol* 1996 Aug;51(8):533-44.
11. McNicholas MM, Brophy DP, Power WJ, Griffin JF. Ocular trauma: evaluation with US. *Radiology* 1995 May;195(2):423-7.
12. Chugh JP, Susheel, Verma M. Role of ultrasonography in ocular trauma. *Indian J Radiol Imaging* 2001;11:75-9.