

A study of role of B scan ultrasound in posterior segment pathology of eye

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Abstract

Introduction: Ophthalmic ultrasonography has become the most important accurate diagnostic imaging modality for directly evaluating lesions of posterior segment having opaque ocular media. Study was conducted to assess the role of B scan ultrasound in posterior segment pathology of eye. **Material and Method:** This prospective study was conducted in Department of Radiodiagnosis, NSCB Medical College and Hospital, Jabalpur from October 2013 to October 2014. The study included patients referred for high resolution ultrasonography from Department of Ophthalmology. 50 patients were subjected to clinical Ophthalmological examination and B scan USG evaluation. **Results:** The cases were divided according to age ranging from 0-80 years. Maximum no. of patients studied was in 5th decade (22%). Male predominance was seen with sex ratio 3.1:1 (M:F). Loss of vision and redness of eye were the leading symptoms. Maximum no. of ocular abnormalities studied were of Vitreous (40.2%) followed by Retina (25.77%). Also Among vitreous abnormalities, Vitreous hemorrhage was the most common accounting for 56.41% cases followed by vitreous detachment (33.33%), vitreous band was found in 10.25% cases. Retinal detachment was the common retinal abnormality detected (41.5%), while retinoblastoma was seen in 5.66 % cases. Cataract is the most commonly encountered lens abnormality. 81.81% eyes had cataract among total lens abnormalities followed by dislocation of lens (18.18% among lens abnormalities). Choroidal abnormalities include maximum cases of choroidal detachment (80%), while choroidal hemorrhage was seen in 20%. **Conclusion-**From, the present study it was noted that B-scan is very efficient tool in diagnosing various ocular abnormalities. B-scan can categorize the lesions in the posterior chamber well, depending on the echotexture and anatomy. Even the exact location of the lesion can be well made out.

Keywords: B scan USG, Cataract, Retinoblastoma

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Introduction

Eye is affected by spectrum of pathological conditions occurring in all age groups from new born to old age. Many posterior segment lesions occurring in the eye can be evaluated accurately by high resolution sonography since clinical and ophthalmoscopy are less informative [1]. Standardized echography has proved to be highly accurate for the detection and differentiation of intra ocular disorders [2]. Ophthalmic ultrasonography has become the most important accurate diagnostic imaging modality for directly evaluating lesions of posterior segment having opaque ocular media caused by corneal opacities, anterior

chamber opacities, dense cataracts, vitreous hemorrhage, inflammatory opacities which make clinical examination and ophthalmoscopic examination difficult and least informative [3]. B-scan is also indicated in the presence of clear ocular media for evaluation and differentiation of intra ocular tumors, ocular inflammatory diseases such as unexplained retinitis and choroiditis [2]. Diagnostic ophthalmic ultrasonography is the first line of investigation in suspected Vitreo retinal diseases with opaque media. It is possible to identify, evaluate and follow numerous conditions such as retinal tears, vitreous and retinal detachments, vitreous hemorrhage, sub retinal hemorrhage, eccentric disciform lesions. Ultrasonography is the powerful non invasive diagnostic tool for accurate diagnosis, differentiation of

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intra ocular tumors and information regarding the size, location, extension, acoustic characteristics of the tumors which are critical for the management [3]. Ocular trauma is a major cause of vision loss particularly in young populations. In these cases B-scan provides useful information regarding the presence of ocular foreign body of any kind when other radiological investigations (X-Ray) become negative [4]. B-scan gives exact location of foreign body in the eye and also the extent of damage to surrounding tissues such as lens, vitreous, retina and guides in the therapeutic decision related to late effects of ocular trauma [5]. Ocular sonography is painless, non-invasive, safe, rapid, cost-effective, non-ionizing real time diagnostic tool that provides valuable diagnostic information of various ophthalmic disorders not obtainable by any other means [6]. B-scan can be repeatedly performed to assess the various responses to therapy since ocular sonography has no adverse effects and is cost effective [7]. Colour Doppler imaging has role in evaluation of intraocular tumors and also to differentiate vitreous haemorrhage from retinal detachment.

Material and Methods

This prospective study was conducted in Department of Radiodiagnosis, NSCB Medical College and Hospital, Jabalpur from October 2013 to October 2014. The study included patients referred for high resolution ultrasonography from Department of Ophthalmology. 50 patients were subjected to clinical Ophthalmological examination and B scan USG. High resolution USG was done with machine GELogIQ 3 Expert with transducer L-10-5, and colour Doppler was used when required for further evaluation. The probe is placed over the closed eyelid after application of coupling gel.

Examination Technique: B scan probes are thick, with a mark and emit focussed sound beam at a frequency of 10 MHz. Pictures obtained with B scan probe are two dimensional as compared to A scan probe.

The mark on the B scan probe indicates beam orientation so that the area towards which the mark is directed appears at the top of the echogram on display screen. B scanning is done transpalpebrum with slightly increased overall gain.

To obtain high quality B scan pictures one must ensure that:

- Lesions are placed in the center of the scanning beam

- The beam is perpendicular to the interfaces at the area of interest
- The lowest possible decibel gain consistent with the maintenance of adequate intensity should be used to optimize the resolution of images.

B-scan pictures can be obtained by axial, transverse and longitudinal sections.

During the procedure the probe is moved from limbus to fornix in different clock hour meridians and the picture seen is of diagonally opposite meridian.

Three basic probe positions are :

- Transverse
 - Longitudinal
 - Axial
- A) Transverse probe position - most commonly is used.
- The scan is performed with patients gaze directed away from the probe, toward the meridian being examined.
 - This technique demonstrates the lateral extent of the pathology and encompasses approximately 6 clock hours.
 - Because of the area covered, this orientation is used for basic screening examinations when there is no view of the posterior segment.
- B) Longitudinal probe position–
- The longest diameter of the probe is perpendicular to the limbus.
 - The sound beam sweeps along the meridian opposite the probe and thus this method provides radial extent of the lesion.
 - Irrespective of the meridian examined, the probe marker is always directed towards the centre of cornea.
 - Optic disc and posterior fundus is displayed in lower portion of screen, while peripheral globe is displayed superiorly.
- C) Axial probe positioning –
- In axial scan, the patient fixates in primary gaze.
 - The term axial refers to the centering of the posterior lens curve to the left of the echogram and the optic nerve shadow to the right of the echogram rather than the macula.

Results

Table-1: Age / Sex wise distribution in patients with ocular abnormalities

Age in years	Males		Females		Total	
	No. of Cases	%	No. of Cases	%	No. of Cases	%
0-10	4	10.53	4	33.33	8	16
11-20	5	13.15	1	8.33	6	12
21-30	5	13.15	0	0	5	10
31-40	5	13.15	1	8.33	6	12
41-50	8	21.05	3	25.00	11	22
51-60	5	13.15	1	8.33	6	12
61-70	4	10.53	2	16.66	6	12
71-80	2	5.27	0	0	2	4
Total -	38	100	12	100	50	100

Ocular Abnormalities are believed to be more common in males. In present study also male predominance is seen 76% patients were males & 24% were females. The sex ratio was 3.1:1. In present study, Maximum no. of patients in males were in 5th decade (21.05%) & in females were in 1st decade (33.33%) followed by 4th decade.

Table – 2: Sex wise distribution: total no. of normal & abnormal eyes studied

	Males	%	Females	%	Total No of Eyes Studied	%
Normal eyes studied	6	12.76	3	20	9	41.51
Abnormal eyes studied	41	87.23	12	80	53	85.49
Total	47	100	15	100	62	100

In present study in 50 patients total 62 eyes were studied. In which more number of eyes were studied in males (75.8%) than in females (24.19%) Total of 85.48% of eyes were abnormal in the present study & normal study was seen in 14.51% of eyes.

Table -3: Distribution of various ocular abnormalities

Ocular Abnormalities	No. of Abnormalities	%
Lens	22	22.68
Vitreous	39	40.2
Retina	25	25.77
Choroid	5	5.15
Miscellaneous	6	6.18
Total	97	100

In Present Study maximum no. of ocular abnormalities studied were of vitreous followed by Retina.

Table – 4: Spectrum of lens abnormalities in total patients

Various Abnormalities	No. of eyes having Lens Abnormalities	Percentage (n=22)	% in total Abnormal Eyes (n=53)
Cataract	18	81.81	33.96
Subluxation/Dislocation	4	18.18	7.54
Other	0	0	0
Total	22	100	-

Cataract is the most commonly encountered lens abnormality. In present study 81.81% eyes had cataract among total lens abnormalities (33.96% among total abnormal eyes) followed by dislocation of lens (18.18% among lens abnormalities).

Table – 5: Spectrum of vitreous abnormalities in total patients

Vitreous Abnormalities	No. of eyes having Vitreous Abnormalities	Percentages (n=39)	% in total Abnormal Eyes (n=53)
Vitreous Detachment	13	33.33	24.52
Vitreous hemorrhage	22	56.41	41.5
Others :			
Vitreous Band	4	10.25	7.54
Total	39	100	-

In present study among Vitreous Abnormalities, most abnormal eyes had Vitreous hemorrhage (56.41%) followed by Vitreous detachment (33.33%).

Table – 6: Spectrum of retinal abnormalities in total patients

Various Abnormalities	No. of eyes having retinal abnormalities	Percentage % (n=25)	% in total Abnormal Eyes (n=53)
Retinal Detachment	22	88	41.5
Retinal hemorrhage	0	0	0
Retinoblastoma	3	12	5.66
Total	25	100	-

In present study 41.5% of total abnormal eyes had retinal detachment, while Retinoblastoma seen in 5.66%.

Table – 7: Spectrum of choroidal abnormalities in total patients

Choroidal Abnormalities	No. of eyes having Choroidal abnormalities (n = 5)	Percentage %	% in total Abnormal Eyes (n=53)
Choroidal Detachment	4	80	7.54
Other lesions :			
Choroidal Hemorrhage	1	20	1.88
Total	5	100	

Choroidal abnormalities include maximum cases of choroidal detachment (80%), choroidal hemorrhage was seen in 20%.

This table shows most of the cases among miscellaneous abnormalities seen were of optic nerve drusen (50%) followed by phthisis bulbi, foreign body in posterior chamber & posterior staphyloma (16.67% each).

Discussion

Various ocular abnormalities commonly seen are related to lens, vitreous, choroid and retina. Clinical diagnosis becomes tough especially when the light conducting media are opaque. B-scan has proved to become an extremely important tool in the diagnosis of various ocular abnormalities with great accuracy. Its non-invasiveness, cost effectiveness and no exposure to ionizing radiation are some of the added advantage. Ocular abnormalities are believed to be more common

in males than in females. In a study done by OP Sharma the sex ratio was 2:1. In present study also male predominance was seen as 76% patients were males & 24% were females. The sex ratio was 3.1:1. In another study by David Mcleod and Marie Restori male predominance was observed [7]. In a study done by OP Sharma ocular abnormalities were observed maximum in 4th to 5th decades. In present study, maximum abnormalities were seen in 5th decade both in males

(20%) and females (40.90%). In present study most common ocular abnormality detected was of vitreous. In present study (41.89%) male and (34.78%) female were found to have vitreous disease. In a study by David Mcleod and Marie Restori 176 eyes were studied and maximum cases were of vitreous abnormalities. In another study by OP Sharma similar results were obtained. In the present study also maximum cases were of vitreous abnormalities (40.2%). In another study by Jasmin Zvornicanin et al, maximum cases were of vitreous abnormalities(25,3%)[8]. In present study among vitreous abnormalities most abnormal eyes had vitreous haemorrhage (56.41%) followed by vitreous detachment (33.33%). Other vitreous lesion noted in abnormal eyes was vitreous band (10.25%). Study by David Mcleod and Marie Restori on 176 cases revealed increased prevalence of vitreous detachment (61%) than vitreous haemorrhage (57%). However study by OP Sharma on 122 cases revealed vitreous haemorrhage as the most common intraocular pathology (41.17%) followed by retinal detachment (26.4%). In another study by Jamil Ahmed and Co, most cases were of Vitreous Hemorrhage (29%) followed by Retinal Detachment (25%)[9]. Cataract is the most commonly encountered lens abnormality In present study also cataract was the most common lens abnormality and 81.81% cases had cataract among total lens abnormalities followed by dislocation of lens which was 18.18%. In present study, retinal detachment was the most common retinal abnormality detected (41.5%), while retinoblastoma seen in 5.66% of abnormal eyes studied. In a study by Lt col KK Sen and colleagues retinal detachment was the most common retinal pathology. In another study by Hassani and Bard retinal detachment was seen in 13.8% of total abnormalities. Whereas in another study Coleman DJ showed 25% incidence of RD and Taneja et showed 7.6% incidence. In another study by Haile M, Mengistu Z the most common abnormality was retinal detachment (39%) followed by vitreous opacities (31%)[10]. In another study by Ejaz Ahmed Javed and colleagues most cases were of retinal detachment (14.7%) followed by vitreous hemorrhage (13%)[11]. In study by Lt col KK Sen and colleagues retinoblastoma accounted for 3% of various ocular abnormalities, while in present study it accounts for 5.66%.[12]. Choroidal abnormalities included maximum cases of choroidal detachment (80%), while rest 20% cases were of choroidal hemorrhage. Among miscellaneous abnormalities maximum cases (50%) were of drusen of optic nerve followed by foreign body in posterior

chamber. Phthisisbulbi and posterior staphyloma noted in (16.67% each) [13].

Conclusion

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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References

1. McNicholas MM, Brophy DP, Power WJ, Griffin JF. Ocular sonography. *AJR Am J Roentgenol* 1994 Oct;163(4):921-26.
2. Byrne SF, Green RL. Physics and instrumentation. In: *Ultrasound of eye and orbit*. 2nd ed. St Louis: Mosby; 2002. pp.1-14.
3. Brandy C. Hayden, Linda Kelly, Arun D. Singh. Ophthalmic ultrasonography: Theoretic and practical considerations. *Ultrasound clinics*. [online] 2008 Apr; 3(2):179-8 Available from: doi:10.1016/j.cult.2008.04.007. [Accessed 19th Oct 2008].
4. Bhatia IM, Panda A, Dayal Y. Role of ultrasonography in ocular trauma. *Indian J Ophthalmol*. 1983 Sep;31(5):495-8.
5. Chugh JP, S, Verma M. Role of ultrasonography in ocular trauma. *Indian J Radiol Imaging* 2001;11(2):75-79.
6. Sharma OP. Orbital sonography with its clinico-surgical correlation. *Indian J Radiol Imaging* 2005;15(4):537-54.
7. McLeod D, Restori M. Ultrasonic examination in severe diabetic eye disease. *Br J Ophthalmol*. 1979 Aug;63(8):533-8.

8. Jasmin Zvornicanin¹, Vahid Jusufovic¹, Emir Cabric², Zlatko Musanovic¹, Edita Zvornicanin³, Allen Popovic-Beganovic¹ ; Significance of Ultrasonography in Evaluation of Vitreo-retinal Pathologies;DOI: 10.5455/medarh.2012.66.318-320 {45} Med Arh. 2012 Oct; 66(5): 318-320
9. Jamil Ahmed, Fahad Feroz Shaikh, Abdullah Rizwan, Mohammad Feroz Memon; Evaluation of Vitreo-Retinal Pathologies Using B-Scan Ultrasound; Pak J Ophthalmol 2009, Vol. 25 No. 4.
10. Haile M, Mengistu Z. B-scan ultrasonography in ophthalmic diseases. East Afr Med J. 1996 Nov;73(11):703-7.
11. Ejaz Ahmed Javed, Aamir Ali Ch., Iftikhar Ahmad, Mehmood Hussain Diagnostic Applications of “B-Scan” Pak J Ophthalmol 2007, Vol. 23 No.2
12. Lt Col KK Sen, Lt Col JKS Parihar, Maj Mandeep Saini SM, Brig Moorthy RS. Conventional B-mode Ultrasonography for Evaluation of Retinal Disorders. Med. J. Armed Forces India. 2003; 59 : 310-312
13. Aironi VD, Chougule SR, Singh J. Choroidal melanoma: A B-scan spectrum. Indian J. Radiol Imaging. 2007; 17: 8–10.

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