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

Agrawal R1, Ahirwal S2

1Dr Rekha Agrawal, Associate Professor, Department of Radiodiagnosis, 2Dr Sushma Ahirwal, Assistant Professor Department of Radiodiagnosis; both are affiliated to NSCB Medical College Jabalpur, MP, India

Address for correspondence: Dr Rekha Agrawal, Associate Professor, Department of Radiodiagnosis, NSCB Medical College Jabalpur, MP, India

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
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.

October, 2015/ Vol 3/Issue 9
ISSN- 2321-127X
Research Article
Available online at: www.ijmrr.in
International Journal of Medical Research and Review
Results

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

| Age in years | Males | %   | Females | %   | Total | %   |
|--------------|------|-----|---------|-----|-------|-----|
| 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 |
| Renita               | 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

| Chroidal Abnormalities       | No. of eyes having Chroidal abnormalities (n = 5) | Percentage % | % in total Abnormal Eyes (n=53) |
|------------------------------|--------------------------------------------------|---------------|---------------------------------|
| Chroidal Detachment          | 4                                                | 80            | 7.54                            |
| Other lesions                |                                                  |               |                                 |
| Chroidal 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
In present study most common ocular abnormality detected was 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%). 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%).

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 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%). In another study by Ejaz Ahmed Javed and colleagues most cases were of retinal detachment (14.7%) followed by vitreous hemorrhage (13%). 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%. 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).

**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.

**Funding:** Nil  
**Conflict of interest:** None.  
**Permission of IRB:** Yes

**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 19 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 Ophthalmol. 1983 Sep;31(5):495-8.

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 FerozMemon; 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., Iftekhar 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 Mandeeq Saini SM, Brig Moorothy 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.

How to cite this article?

Agrawal R, Ahirwal S. A study of role of B scan ultrasound in posterior segment pathology of eye. Int J Med Res Rev 2015;3(9):969-974. doi: 10.17511/ijmrr.2015.i9.180.