Indian Journal of Clinical and Experimental Ophthalmology 2024;10(4):688–693

Content available at: https://www.ipinnovative.com/open-access-journals

Indian Journal of Clinical and Experimental Ophthalmology

Journal homepage: www.ijceo.org

Original Research Article

Evaluation of ultrasound B-scan in a tertiary eye care centre in Central India

Teena Agarwal[1], **Mahesh Agrawal**[2]*

[1]*School of Excellence For Eye MGM Medical College, Indore, Madhya Pradesh, India*
[2]*Dept. of Cataract & Refractive Surgery, Shree Ganesh Netralaya, Indore, Madhya Pradesh, India*

ARTICLE INFO

Article history:
Received 27-03-2024
Accepted 27-05-2024
Available online 30-12-2024

Keywords:
B- scan
Vitreous haemorrhage
Nucleus drop
IOL drop
Intraocular foreign body
Endophthalmitis
Drusen

ABSTRACT

Aims & Objective: To evaluate the B-scan findings in tertiary eye care Retina Clinic in relevance to clinical management and to find out the visual potential in anterior segment pathology.
Materials and Methods: We are tertiary eye care centre in Central India and do get referral from other centres as well as in house referral to Retina OPD. In present retrospective study, we evaluated 192 eyes of 181 patients, above 16yrs of age. All the B-scan were done by Quantel ABSOLU 15 MHz probe in supine position.
Results: A total of 192 patients were evaluated by B-scan. We have divided total 192 eyes in two groups 1 & 2, Cataract & Non-cataract groups respectively, for ease of understanding the indication of B-scan. Among total 192 eyes, 111 eyes (57.81%) were included in Group 1 & rest 81 eyes (42.18%) fall in Group 2. In group 1, the indications for B-scan were Mature Cataract. In group 2, the most common indication was Vitreous haemorrhage- 28Cases (34.56%), followed by post-surgical trauma- 17cases (20.98%), Corneal Opacity- 13 cases (16.04%), & Inflammatory- 10cases (12.34%). The remaining 13 cases (4 cases of Asteroid hyalosis, 3 cases of Disc coloboma, and 2 cases each of Optic Nerve Head Drusen, Microphthalmos & Intraocular foreign body) were grouped as miscellaneous -16.04%.
Conclusion: B-scan is an important non-invasive and economical tool for posterior segment evaluation. We also noted very important observation that among 13 Corneal Opacity patients, 9 patients were having attached retina with normal sonic appearance of posterior segment which signifies the visual potential in these cases which are often overlooked.

1. Introduction

The diagnostics in Ophthalmology has advanced many folds, still USG B-scan is an old and irreplaceable tool because of its non-invasive, non-ionizing, non-radioactivity nature. The first USG B-scan was done by Baum & Greenwood in 1958, thereafter it has evolved many folds over time in compactness and resolution of images.

2. Materials and Methods

We are tertiary eye care centre in Central India and do get referral from other centres as well as in house referral to Retina OPD. In present retrospective study, we evaluated 192 eyes of 181 patients, above 16yrs of age. All the B-scan were done by Quantel ABSOLU 15 MHz probe in supine position after putting water soluble medium over the closed lid. Images were recorded in database and evaluated later on. The cases included in our study were either referred to VR clinic for posterior segment evaluation or they came to VR Clinic directly (taking treatment elsewhere) for further management

* *Corresponding author*.
E-mail address: g_teena@hotmail.com (M. Agrawal).

https://doi.org/10.18231/j.ijceo.2024.121

3. Results

A total of 192 patients were evaluated by B-scan. We have divided total 192 eyes in two groups 1 & 2, cataract & non-cataract groups respectively, for ease of understanding the indication of B-scan. Among total 192 eyes, 111 eyes (57.81%) were included in Group 1 & rest 81 eyes (42.18%) fall in Group 2. In group 1, we found almost equal sex distribution (51 Male & 49 Female) while there was male predominance (56 Male vs 25 Female out of total 81) noted in non-cataract group. We had 11 female patients with bilateral mature cataract whom we included in Group 1.

In group 1, the indications for B-scan were mature cataract. In group 2, the most common indication was vitreous haemorrhage- 28 cases (34.56%), followed by post-surgical trauma- 17 cases (20.98%), corneal opacity- 13 cases (16.04%), & inflammatory- 10 cases (12.34%). Apart from these indications, all other cases were included in miscellaneous group (13 cases-16.04%). The cases in miscellaneous group are 4 cases of Asteroid hyalosis, 3 cases of disc coloboma, and 2 cases each of optic nerve head drusen, microphthalmos & intraocular foreign body.

The most important and relevant findings are evidence of Retinal detachment in only 3 out of 111 patients (2.7%) in Group 1 & normal B-scan findings in 9 out of 13 eyes in the subgroup of corneal opacity. These findings suggest the potential of visual recovery commonly neglected in corneal opacity eyes.

4. Discussions

As per the latest report by WHO World report on vision, at least 2.2 billion people around the world have a vision impairment, of whom at least 1 billion have a vision impairment that could have been prevented or yet to be addressed.[1] Further it elaborates 65.2 million cases of Cataract & 4.2 million cases of Corneal blindness falls under 1 billion cases mentioned above in WHO reports.

The assessment of potential vision recovery after eye surgery is again under-evaluated parameters that should be of paramount importance in planning community eye care services to utilize the available resources to its full strength.

In our study, 181 individuals' data were collected and analyzed for demographic evaluation. We found male predominance, 107 Male vs 74 Female (59.11% vs 40.88%), in our study including both groups. Ansari AA et al[2] did cross sectional study on 170 eyes of 136 patients and found 86/136 (63.24%) were males while 50/136 (36.77%) females, similar to our study. Bangal SV et al[3] also found male predominance in their study of 100 cases, 54 male vs 46 female (54% vs 46%). They concluded this preponderance of male population for b-scan could be due to higher incidence of occupational hazard in males. In their study the most common indication for b-scan was decreased vision due to media opacity, 85 cases (85%) while in our case study we divided the study population based on the most common etiolgy of media opacity, i.e. cataract.

In the clinical scenario of media opacities like cataract & corneal opacities, it is imperative to evaluate the vision potential before any surgeries. B-scan has proven track record in predicting the vision outcome or more precisely anatomical integrity of an eye. In our study we found cataract (non-traumatic) as the main indication in 111 cases (57.81%) of B-scan (Chart 1). It is important to note that only 3 out of 111 Cataract cases (2.7%) were found to have sonographically recorded Retinal detachment (Figure 1). Hegde R et al[4] concluded in their study that B-scan has 100% specificity & 100% positive predictive value of "Abnormal Eyes". Their results were comparable to our study as they also found only 2 cases out of 184 eyes (1.08%) of Retinal detachment preoperatively on B-scan, confirmed by fundus examination postoperatively.

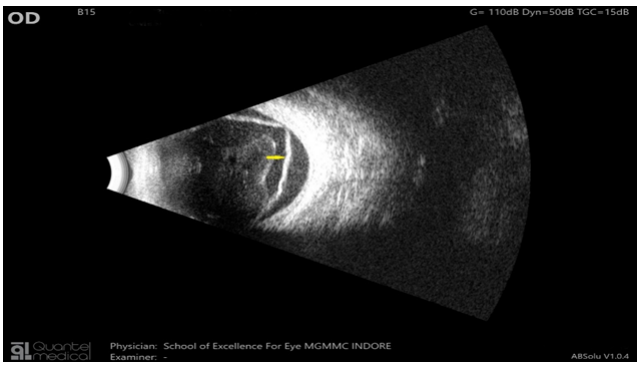

Figure 1: Clinical diagnosis –total cataract. 1. B-scan: Yellow arrow shows high reflective membranous echo attached to disc with minimal after movements suggestive of total retinal detachment

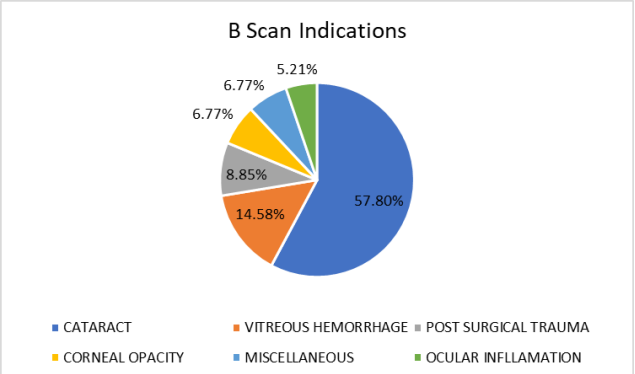

Chart 1: B scan Indications in ocular pathologies

Thatte S et al[5] noted zero case of retinal detachment among 57 cases of non-traumatic cataract, although there were other pathologies like vitreous degeneration, asteroid hyalosis & posterior staphyloma reported. Jacob JM et al[6]

also found B-scan as a good tool to screen patients with media opacity. Although they reported that 102 eyes (20%) B-scan findings were not correlating with clinical findings.

Jitendra Kumar et al[7] also found low incidence of Retinal detachment (RD) in 14 cases out of 180 USG (7.8%) done. Jatin G et al[8] also reported a low incidence of RD, 3 out of 136 non traumatic Cataract eyes (2.2%). Although Sen KK et al[9] found little higher incidence of retinal detachment in 34 out of 164 USG (21.34%) done in media opacities as they have included traumatic cases also. Hassani SN et al[10] also reported higher incidence of RD, 41 out of 295 cases of USG - (13.8%) in non-traumatic cataract cases.

B-scan is indicated in cases where media opacity hampers the direct visualization of retina and optic nerve as well as for disc evaluation in suspicious cases of disc anomalies in clear media. In our study we found Vitreous hemorrhage (VH) as the second most common indications for B-scan (Figure 2) - 28 cases out of 192 (14.58%). Diabetes mellitus was the most common cause of VH - 24 cases (12.5%) followed by blunt trauma - 4 out of 28 cases (14.28%) as per their clinical history. Bandal SV et al[3] included 46 eyes (46%) following ocular trauma in rural Indian population and found traumatic cataract as the most common finding (45 cases) followed by vitreous hemorrhage (14 cases) and dislocated lens (7 cases) respectively. Ansari AA et al[2] studied the 170 eyes of 136 patients and found VH in only 32 eyes (18.18%). Quereshi MA et al[11] reported low incidence of VH, 24 out of 750 cases (3%) in their study. Abdulmannan YAY et al[12] found 7 cases out of 73 traumatic eyes (9.6%) with VH since they studied only traumatic eyes. Dawood et al[13] found Trauma (12 out of 35 cases - 34.28%) as the most common cause of VH followed by Diabetes (9 out of 35 - 25.71%). Rabinowitz et al[14] found that proliferative Diabetic Retinopathy was the most common cause of VH (37 out of 106 eyes – 35%) followed by Trauma (33 out of 106 eyes – 31%).

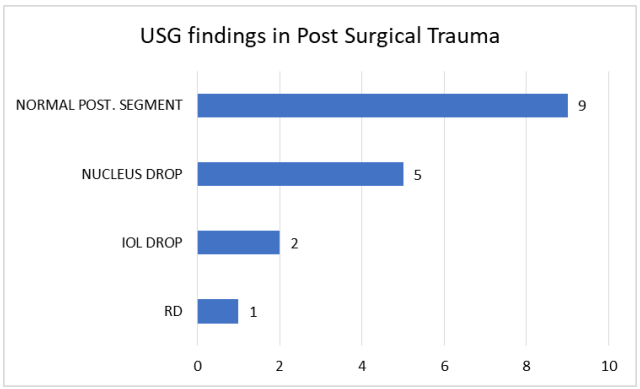

Chart 2: USG findings in post surgical trauma

The third most common indication in our study was the post-surgical trauma (17 cases out of 192 cases - 8.85%) due to complicated cataract surgery (Chart 2), referred to VR clinic by in-house as well as periphery hospitals. 5 cases (2.6%) showed dropped nucleus on b-scan, followed by 2 cases (1.04%) of IOL drop (Figure 3). 1 case (0.52%) was noted as temporal RD on b-scan due to needle perforation marked by vitreous incarceration in ocular coats. The remaining 9 cases (4.68%), referred for posterior segment evaluation following cataract surgery induced corneal edema and low early postoperative vision, reported with normal b-scan findings. Ansari AA et al[2] also reported 8/170 eyes (4.70%) with dislocated lens and 6/170 cases (3.52%) of dislocated posterior chamber intraocular lens (PCIOL) in their study. Abdullah Rizwan et al[15] reported dropped nucleus in 3 out of 22 cases (13.5%) of b-scan findings in intraocular inflammations category. Netam SBS et al[16] studied total 145 cases, divided into various subgroups, and found 2 cases (1.37%) of displaced IOL on b-scan study in non-tumor non trauma group in Radiology department. They also noted 3 cases (2.06%) of posteriorly dislocated lens on b-scan. It is important to note the characteristic distinguishing feature between dropped nucleus and displaced IOL is presence of globular hyperechoic entity without reverberations in posterior vitreous cavity in dropped nucleus while displaced IOL shows well defined, non-globular hyperechoic mass with marked reverberations.

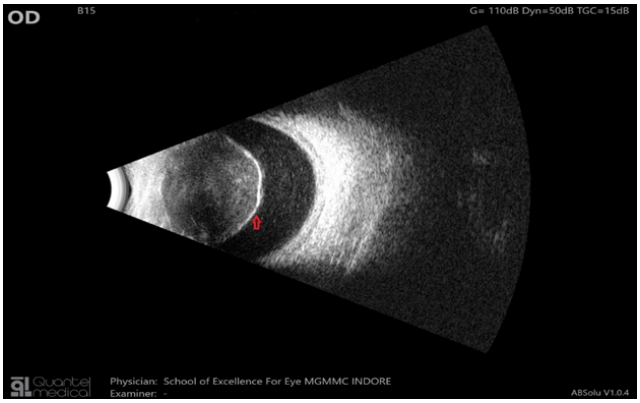

Figure 2: Clinical diagnosis – Vitreous hemorrhage. B scan: Mild to moderate reflective dot vitreous echoes. Red Arrow - Moderate reflective membranous echo, not attached to disc with good after movements, suggestive of Total posterior vitreous detachment (PVD). Retina well attached

There were not much studies found on B-scan findings in corneal opacity (CO) patients specifically (Chart 3). Ansari AA et al[2] found 15/170 cases (8.82%) of corneal opacity in their study. We noted normal b-scan findings in 9 of 13 eyes (69.2%) with CO, 2 cases showed closed funnel RD with decreased axial length, one case showed hypotonus globe with serous choroidal detachment (Figure 4), one case showed decreased axial length with ocular coats calcification.

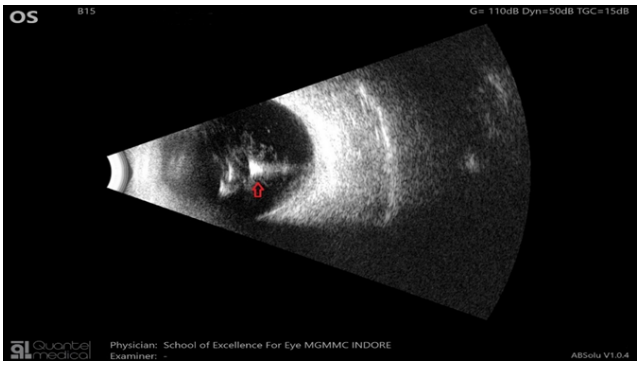

Figure 3: Clinical diagnosis- Displaced (Dropped) IOL following complicated cataract surgery. B scan: Red arrow shows high reflective linear echo with reverberation echoes in mid vitreous cavity suggestive of displaced IOL

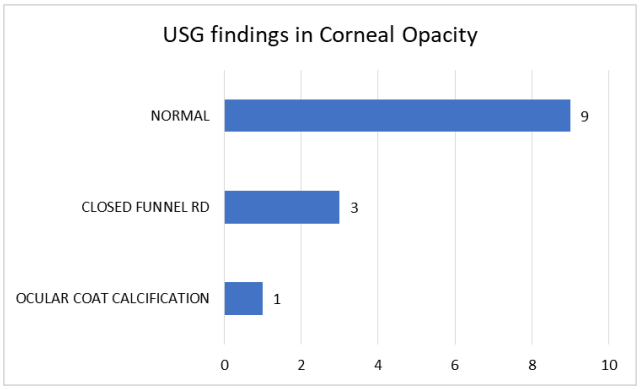

Chart 3: USG findings in corneal opacity

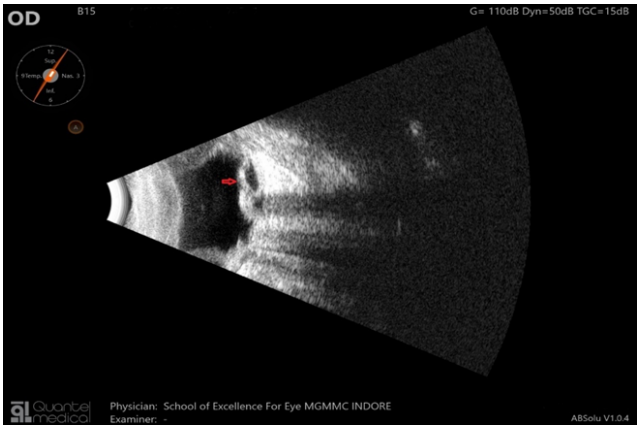

Figure 4: Clinical diagnosis– Corneal opacity with hypotonus globe. B scan: Red arrow showing serous choroidal detachment with hypotonus globe with attached retina

In inflammatory group, the b-scan was done in 6 cases of Endophthalmitis to know the density of exudates in vitreous cavity and retinal and choroidal involvement. We have not found choroidal detachment in any of the cases of endophthalmitis, which is a sign of better visual prognosis. Dacey MP et al[17] also reported CD as the sign of poor visual prognosis in endophthalmitis. B-scan was performed in 4 cases of Uveitis due to hazy vitreous to detect retinal detachment, choroidal thickening and scleritis (T-sign), if any. Netam SBS et al[16] reported total 3 out of 145 cases (2.06%) of endophthalmitis.

In miscellaneous group (Chart 4), we had total 13 cases, 4 Asteroid hyalosis, 3 Disc coloboma – 1 case with RD, 2 cases each of Optic Nerve Head Drusen (Figure 5), Intraocular FB (IOFB) & Microphthalmos. Saxena Navneet[18] found 23 cases out of 200 B-scan (11.5%) with significant posterior segment lesion. He found 5 cases of posterior vitreous detachment (PVD)- 2.5%, 2 cases (1%) of asteroid hyalosis and 1 case (0.5%) of intraocular foreign body. Bandal SV et al[3] found 3 cases of IOFB among 46 traumatic eyes taken for b-scan, among which 2 metallic foreign body was found in vitreous cavity while another one was stone, got impacted on anterior chamber.

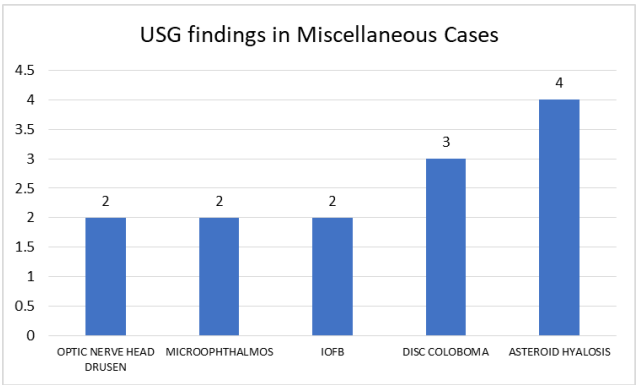

Chart 4: USG findings in miscellaneous cases

We have analyzed frequency of RD in group 1 & group 2 patients together (Chart 5). We found RD in 15 eyes (7.81%) including both group 1&2. The Vitreous hemorrhage was the most common (6 case -3.12%) associated b-scan finding followed by 3 cases (1.56%) each of mature cataract and corneal opacity cases, 1 case (0.52%) each of complicated cataract surgery secondary to needle perforation, disc coloboma (Figure 6) and endophthalmitis. Bandal SV et al[3] also found RD in 31/100 (31%) cases in their study. Maumenee IH et al[19] found RD in 3 out of 82 (3.66%) coloboma eyes studied. Thakker MM et al[20] found RD in 4 cases (7.4%) of endophthalmitis on b-scan.

We have enlisted important b-scan findings of few USG diagnosis in Table 1.

Table 1:

USG Diagnosis	USG features
Retinal detachement	Hyper-reflective membranous echo attahed to disc with minimal after movements
Vitreous echoes	Dot like echoes with mild, moderate or hyperreflectvity depends on clinical diagnosis
IOFB	Hyper-reflective echo, persisting on low gain, with shaddowing in case of mettalic foreign body
ONH Drusen	Hyper-reflective globular echo at ONH area persisting on lower gain, usually found bilaterally
Lens Drop	Moderate to high reflective echos seen in vitreous cavity which moves with ocular movements
IOL Drop	Hyper-reflective echo with acoustic reverberations in vitreous cavity

Figure 5: Clinical differential diagnosis – Disc edema/Drusen. B-scan finding - High reflective globular lesion noted at optic disc, at 90db Gain, suggestive of Optic nerve head drusen

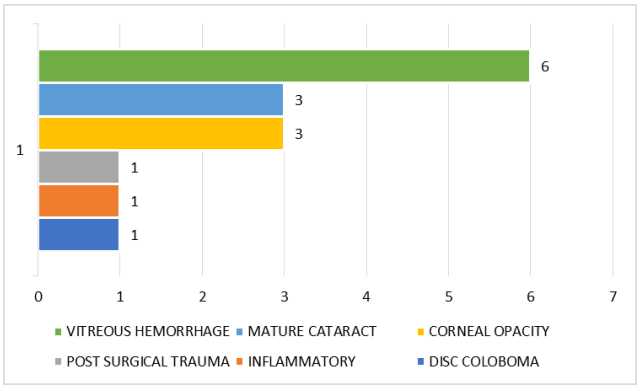

Chart 5: Distribution of retinal detachment in study groups

Figure 6: Clinical diagnosis –Total cataract with Coloboma. B scan: Yellow arrow shows high reflective membranous echo attached to disc with minimal after movements suggestive of posteriorly closed funnel retinal detachment. Red arrow shows excavation of ocular coats at optic nerve head area suggestive of retinochoroidal coloboma involving disc

In our study we have not found any case of false positive findings on b-scan. Although Rabinowitz et al[14] found 37 eyes (35%) diagnosed with RD on b-scan but clinically it was evident only in 30 eyes (28.3%). They noted 7 cases (6.7%) of false positive sonographic RD. Sandinha MT et al[21] studied the accuracy of b-scan diagnosis compared to clinical diagnosis in acute fundus obscuring vitreous hemorrhage. They found complete agreement in 78% cases, partial agreement in 19% cases and agreement was not tested in 3 cases. The reason for 100% complete agreement in our study could be more apt clinical screening before b-scan by the sonographer who is an experienced VR surgeon as well as the dedicated ophthalmic US machine with higher frequency probe.

5. Conclusion

B-scan is an important tool for non-invasive, economical, posterior segment evaluation. We also found very important observation that among 13 corneal opacity patients 9 patients (69.23%) were having attached retina with normal sonic appearance of posterior segment which signifies the visual potential in these cases which are often overlooked.

6. Source of Funding

None.

7. Conflict of Interest

None.

References

1. WHO. World report on vision. Geneva: World Health Organization; 2019. Available from: https://www.who.int/docs/default-source/documents/publications/world-vision-report-accessible.pdf.
2. Ansari AA, Atnoor VB, Sayyad S. Clinical study of B-scan USG in posterior segment disorders of the eye. *Indian J Clin Exp Ophthalmol*. 2018;4(1):78–84.
3. Bangal SV, Bhandari AJ, Siddhiqui F. Pattern of ocular pathologies diagnosed with b-scan ultrasonography in a hospital in rural India. *Niger J Ophthalmol*. 2016;24:71–5.
4. Hegde R, Hegde V, Bappal A. Role of B-scan ultrasonography in preoperative evaluation of posterior segment in dense cataract An observational study in a tertiary eye care hospital. *J Clin Ophthalmol Res*. 2022;10(2):67–9.
5. Thatte S, Singh S. B- Scan an Innocent Key to the Dynamic Lock. *J Ophthalmic Stud*. 2018;1(1). doi:10.16966/2639-152X.103.
6. Jacob JM, Thadam JJK, Goudinho S. Evaluation of the relation between pre-operative b-scan findings and post -operative Fundus findings in patients with opaque media undergoing cataract surgery. *Int J Aesthet Health Rejuvenation*. 2019;2(2):30–3.
7. Kumar J, Jaisal PK, Ram A. A Study of Role of B-scan in Evaluating Posterior Segment Pathology of Eye. *IOSR J Dent Med Sci*. 2018;17(10):41–7.
8. Garg J, Tirkey E, Jain S, Lakhtakia S, Tiwari A. B-Scan Ultrasonography before Surgeryin Eyes with Advanced Cataracts: A Useful Prognostic Tool". *J Evol Med Dent*. 2015;4(37):6372–7.
9. Sen KK, Parihar J, Saini M, Moorthy RS. Conventional B-mode Ultrasonography for Evaluation of Retinal Disorders. *Med J Armed Forces India*. 2003;59(4):310–2.
10. Hassani SN, Bard RL. Real time ophthalmic ultrasonography. *Radiology*. 1978;127(1):213–9.
11. Qureshi MA, Laghari K. Role of B-scan ultrasonography in pre-operative cataract patients. *Int J Health Sci (Qassim)*. 2010;4(1):31–7.
12. Yusuf A, Yusuf A, Ahmad M, Alnour H. B-scan Ultrasonography in Ocular Trauma in Al-Obeid, Sudan. *Sudanese J Ophthalmol*. 2017;9(2):55–6.
13. Dawood Z, Mirza SA, Qadeer A. Role of Bscan ultrasonography for posterior segment lesions. *Pak J LUMHS*. 2008;07(1):7–12.
14. Rabinowitz R, Yagev R, Shoham A, Lifshitz T. Comparison between clinical and ultrasound findings in patients with vitreous hemorrhage. *Eye (Lond)*. 2004;18(3):253–6.
15. Ahmed J, Shaikh FF, Rizwan A, Memon MF. Evaluation of Vitreo-Retinal Pathologies Using B-Scan Ultrasound. *Pak J Ophthalmol*. 2009;25(4). doi:10.36351/pjo.v25i4.614.
16. Netam SBS, Jain V, Singh R, Kumar S, Dutt V. Real time B-Scan evaluation of Posterior chamber & extraocular pathologies of Eye & Orbit. *Int J Med Res Rev*. 2015;3(9):925–33.
17. Dacey MP, Valencia M, Lee MB, Dugel PU, Ober RR, Green RL, et al. Echographic findings in infectious endophthalmitis. *Arch Ophthalmol*. 1994;112(10):1325–33.
18. Saxena N. Role of B-Scan ultrasonography in evaluation of pre-operative cataract patients. *J Evol Med Dent Sci*. 2015;25:4331–7.
19. Maumenee IH, Mitchell TN. Colobomatous malformations of the eye. *Trans Am Ophthalmol Soc*. 1990;88:123–32.
20. Thakker MM, D'Amico DJ, Ray SK. Ultrasonographic Characteristics of Eyes with Endophthalmitis. *Invest Ophthalmol Vis Sci*. 2003;44(13):1847.
21. Sandinha MT, Kotagiri AK, Owen RI, Geenen C, Steel DHW. Accuracy of B-scan ultrasonography in acute fundus obscuring vitreous hemorrhage using a standardized scanning protocol and a dedicated ophthalmic ultrasonographer. *Clin Ophthalmol*. 2017;11:1365–70.

Author's biography

Teena Agarwal, Associate Professor https://orcid.org/0000-0002-7189-8124

Mahesh Agrawal, Director & Consultant https://orcid.org/0000-0002-0506-3057

Cite this article: Agarwal T, Agrawal M. Evaluation of ultrasound B-scan in a tertiary eye care centre in Central India. *Indian J Clin Exp Ophthalmol* 2024;10(4):688-693.