



HIGH RESOLUTION ULTRASOUND FOR DIAGNOSIS OF OCULAR PATHOLOGIES.

Dr. Amrita Gupta

Resident, Department Of Radiodiagnosis, Sri Aurobindo Medical College And Post Graduate Institute, Indore, M.P, India

Dr. Pramod Sakhi

Professor, Department Of Radiodiagnosis, Sri Aurobindo Medical College And Post Graduate Institute, Indore, M.P, India

Dr. Kumud Julka

Professor, Department Of Radiodiagnosis, Sri Aurobindo Medical College And Post Graduate Institute, Indore, M.P, India

ABSTRACT

The eyeball's fluid content and its superficial position make it ideally suited for examination with USG. When ocular media is opaque it is cumbersome to do ophthalmoscopic examination, ultrasonography provides an accurate, cost efficient and early diagnosis of ocular pathologies in such patients. It provides better information than CT/MRI and dynamic scan can also be done. In this study, 50 patients referred for high resolution ultrasonography were scanned. Post examination follow up for surgery or clinical treatment was taken. It was concluded that two dimensional B-scan ultrasound has high sensitivity and specificity, PPV and NPV and could be used as one of the diagnostic tools for the detection of lesions which can help in planning for operation. Most common pathologies are of vitreous. Vitreous pathologies include posterior vitreous detachment, vitreous hemorrhage commonly. After vitreous, lens is second most commonly affected. Its pathologies include cataract (age related or traumatic), subluxation or dislocation in cases of trauma and changes due to metabolic diseases. Retinal pathologies were detected, it include retinal detachment in diabetics, post traumatic. In children retinoblastoma can be seen. Choroidal hemorrhage, detachments are commonly seen. Other than these pathologies, foreign bodies, endophthalmitis, phthisis bulbi are also commonly encountered specially in postoperative and trauma cases.

KEYWORDS : Ocular pathologies, High resolution USG, posterior segment pathologies, vitreous pathologies.

INTRODUCTION

The eyeball's fluid content and its superficial position make it ideally suited for examination with USG. When ocular media is opaque it is cumbersome to do ophthalmoscopic examination, ultrasonography provides an accurate, cost efficient and early diagnosis of ocular pathologies in such patients.⁽¹⁾ High-resolution Ultrasonography provides important information to the ophthalmologist in a variety of ocular diseases in all age groups^(2, 3). It gives real-time and high-resolution images of the eye and provides better information than CT and MRI for the evaluation of most of the pathologies of the posterior segment of the eye (3). USG of eye could also be done at the patient's bedside; dynamic study is also possible with ultrasound system.⁽⁴⁾

MATERIALS AND METHODS-

A prospective study was conducted in Department of Radiodiagnosis, Sri Aurobindo institute of medical sciences and post graduate institute for duration of 6 months, from 1st July 2022 to 31st December 2022. Study included the patients referred for high resolution ultrasonography from Department of Ophthalmology. Detailed history was collected and 50 patients were subjected to clinical examination and B-mode ultrasonography. Post examination follow up for surgery or clinical treatment was taken. Patients were scanned using high frequency linear transducer.



Inclusion Criteria- All patients referred from Department of Ophthalmology for scanning of ocular pathology either traumatic or non-traumatic, irrespective of age or gender. Patient who are willing to give written consent for the study.

Exclusion Criteria- (1) Patients who had undergone prior surgery with silicone oil instillation (2) suspicious for globe perforation (3) congenital ocular abnormalities (4) patients with extra ocular lesions.

The ocular ultrasound was performed in supine position with closed eyelids. For dynamic examinations of ocular globes, patients were asked to move their eyes from right to left, up and down without opening their eyelids. Color Doppler imaging and Pulse wave Doppler imaging were also done and compared with the central retinal artery and ciliary arterial flow. The USG findings were compared with the ophthalmological examination findings and final diagnosis were made by correlating ocular USG findings with clinical, ophthalmoscopic examination findings, follow-up or cross-sectional imaging findings.

RESULT: In our study following, observations were noted.

Table 1: Out of total 50 patients, 66% were males and 34% were females. Male: female ratio of 1.89:1 was noted.

Gender	No. of patients	Percentage
Male	33	66%
Female	17	34%

Table 2: In our study 4 patients were of 0-18 years age group, 15 (19-45 years), 23 (45-60 years), rest 8 of > 60 years.

Age group (in years)	No of patients	Percentage (%)
0-18	4	8
19-45	15	30
45-60	23	46
>60	8	16

Table 3: In our study, out of 47 detected pathologies, vitreous anomalies were most prevalent (18, 36%). It included vitreous detachment (12, 66%) and vitreous haemorrhage (6, 44%).

Ocular pathology	No. of patients	Percentage %
------------------	-----------------	--------------

Lens	10	20
Vitreous	18	36
Retina	13	26
Choroid	2	4
Miscellaneous	4	2
No pathology detected	3	6
total	50	100

Second most common pathology detected was of retina (13, 26%). Retinal detachment was detected in 10 (76.9%) cases. Retinoblastoma was seen in 3 (24%) cases.

Lens abnormality was detected in 20 % patients, among lens anomalies, cataract was detected in 8 cases (80%) and 2 (20%) were lens dislocation. Choroidal anomalies (4% of total) included 50% choroidal detachment, 50% choroidal haemorrhage. No findings were detected in 6% of patients.

Miscellaneous cases included PPPV, foreign bodies, endophthalmitis and phthisis bulbi.

Table 4: The findings on USG as compared to post treatment / Operative findings. Out of 50 patients, 45 patients were diagnosed with pathology which correlated with post treatment/ operative findings. 3 patients were not diagnosed on any tests. 2 patients had findings on follow up not detected on USG. Sensitivity was reported as 95.7%, specificity 100%, PPV 100% and NPV of 60 %.

	Post treatment /op findings (+)	Post treatment /op findings (-)	
Findings on USG (+)	45	0	45
Findings on USG (-)	2	3	5
	47	3	50
Sensitivity	Specificity	PPV	NPV
95.7%	100%	100%	60%

DISCUSSION:

Out of total 50 patients, 66% were males and 34% were females with Male: female ratio of 1.89:1. This is more as compared to study conducted by Boruah DK, Vishwakarma D, Gogoi P, Lal NR, Deuri et al.^[5]

In our study 4 patients were of 0-18 years age group, 15 (19-45 years), 23 (45-60 years) and rest 8 of > 60 years. This could be due to the fact that the ocular involvement / complications of chronic diseases like hypertension and diabetes mellitus develops over the time. However, traumatic eye can present at any age.

Table 3: In our study, out of 47 detected pathologies, Vitreous pathology: Vitreous anomalies were most prevalent (18, 36%). It included vitreous detachment (12, 66% and vitreous haemorrhage 6, 44%). Incidence of non-traumatic vitreous hemorrhage was found by Haile M et al.^[6] in 2.5% of patients and by Qureshi MA et al.^[7] in 3% of patients. Qureshi MA et al.^[6] found an incidence of PVD in 2% of patients. Vitreous hemorrhage is one of the most common pathologies of posterior segment ocular lesion, which may occur due to vasoproliferative disease (diabetic retinopathy), posterior vitreous detachment, age-related macular degeneration and trauma. (5)

Second most common pathology detected was of retina (13, 26%). Retinal detachment was detected in 10 (76.9%) cases. Retinoblastoma was seen in 3 (24%) cases. Previous studies showed an incidence of retinal detachment (RD) in 3% of patients by Qureshi MA et al.^[7], 1.5% by Haile M et al.^[6] and 0.94% by Chanchlani M et al.^[8]. Pathologies like retinal detachment and haemorrhages are more common in adult age group due to effects of chronic illness like diabetes and hypertension. Retinoblastoma was found mostly in paediatric age group.

Lens abnormality was detected in 20 % patients, among lens anomalies, cataract was detected in 8 cases (80%) and 2 (20%) were lens dislocation. Cataract changes occur commonly in the older age group due to degenerative changes. Cataract in young patients occurs due to congenital cataracts, secondary to trauma or infection.

Choroidal anomalies (4% of total) included 50% choroidal detachment, 50% choroidal haemorrhage. No findings were detected in 6% of patients.

Miscellaneous cases included PPPV, foreign bodies, endophthalmitis and phthisis bulbi.

Table 4: The findings on USG as compared to post treatment/ op findings, Sensitivity was reported as 95.7%, specificity 100%, PPV 100% and NPV of 60 %. The parameters are higher as compared to study by Boruah DK, Vishwakarma D, Gogoi P, Lal NR, Deuri et al.^[5]

Images:



Fig 1. Phthisis Bulbi. A 52 year old male with previous history of trauma to eye with vision loss. On USG, small shrunken orbit was noted with, distortion of globe contour and few foci of calcium deposition suggesting phthisis bulbi.

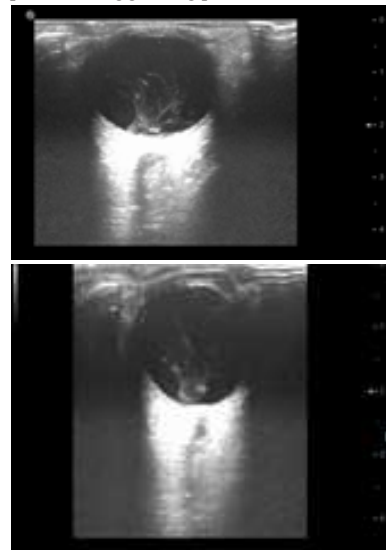


Fig 2. Posterior vitreal detachment. 55 yr old male having sudden onset of floaters in eye and photopsia. On scan thin irregular, undulating membranes attached to optic disc were seen with after movements on dynamic scan. Features consistent with posterior vitreal detachment.

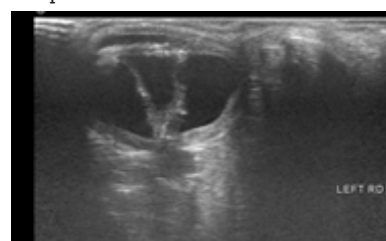


Fig 3 Retinal detachment. 47 yr old, diabetic female having

sudden loss of vision in left eye, usg showed funnel/V shape appearance of retina due to firm attachment at the ora serrata anteriorly and the optic nerve head posteriorly suggesting retinal detachment.

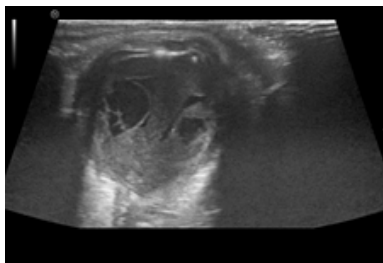


Fig 4 Endophthalmitis. 34 yr male presented with painful red eye, blurred vision, on course of antibiotics for opposite eye infection. On scan there were Endophthalmitis/vitritis with internal echos.

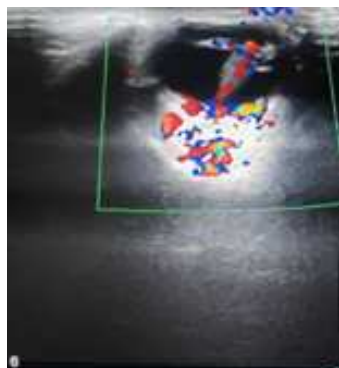


Fig 5. Persistent hyperplastic primary vitreous. One month baby presented with right white eye. On scan a thick echogenic band was noted in posterior segment of orbit extending from posterior surface of lens to optic nerve head with internal vascularity. Features suggested of persistent hyperplastic primary vitreous.

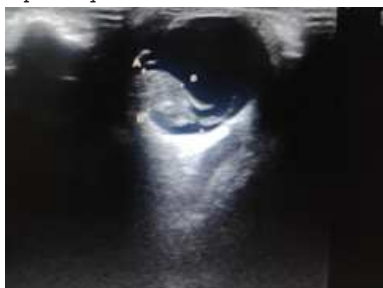


Fig 6. Retinoblastoma. 3 month child having white eyes with loss of red eye reflex. USG revealed soft tissue mass with chunky calcification and vascularity noted in temporal retina. Features suggesting retinoblastoma.

CONCLUSION –

High resolution ultrasonography examination provides useful information regarding the ocular pathology. Ocular USG is investigation of choice for various posterior segment pathologies in patients with dense opaque media. [5] It is cost effective and non-radiation exposure and can also be used for follow up. Various ocular abnormalities seen are related to lens, vitreous, choroid and retina. Ocular abnormalities are believed to be more common in males with sex ratio 1.9:1 and age group 45-60 years, likely due to the fact that the ocular involvement/ complications of chronic diseases like hypertension and diabetes mellitus develops over the time. Most common pathologies are of vitreous. Vitreous pathologies include posterior vitreous detachment, vitreous hemorrhage commonly. Other than these persistent hyperplastic primary vitreous and vitritis are also

encountered. Sometimes, vitreal bands are also seen. After vitreous, lens is second most commonly affected. Its pathologies include cataract (age related or traumatic), subluxation or dislocation in cases of trauma and changes due to metabolic diseases. Retinal pathologies were detected in include retinal detachment in diabetics, post traumatic. In children retinoblastoma can be seen. Choroidal hemorrhage, detachments are commonly seen. Other than these pathologies, foreign bodies, endophthalmitis, phthisis bulbi are also commonly encountered specially in postoperative and trauma cases. We concluded that two dimensional B-scan ultrasound has high sensitivity and specificity, PPV and NPV and could be used as one of the diagnostic tools for the detection of lesions which can help in planning for surgery.

REFERENCES-

- 1) Aironi VD, Gandage SG. Pictorial essay: B-scan ultrasonography in ocular abnormalities. *Indian J Radiol Imaging.* 2009;19(2):109-115. doi: 10.4103/0971-3026.50827.
- 2) Byrne SF, Green RL. Physics and instrumentation. In: Byrne SF, Green RL, editors. *Ultrasound of the eye and orbit.* 2nd ed. Mosby; 2002. pp. 1-14.
- 3) Sharma OP. Orbital sonography with its clinico-surgical correlation. *Indian J Radiol Imaging.* 2005;15(4):537-554. doi: 10.4103/0971-3026.28792.
- 4) Dessi G, Lahuerta EF, Puce FG, Mendoza LHR, et al. Role of B-scan ocular ultrasound as an adjuvant for the clinical assessment of eyeball diseases: A pictorial essay. *J Ultrasound.* 2014;18(3):265-277. doi: 10.1007/s40477-014-0153-y.
- 5) Boruah DK, Vishwakarma D, Gogoi P, Lal NR, Deuri A. Utility of High-Resolution Ultrasonography in the Evaluation of Posterior Segment Ocular Lesions Using Sensitivity and Specificity. *Acta Med Litu.* 2023;30(2):171-180. doi: 10.15388/Amed.2023.30.2.9. Epub 2023 Jul 31. PMID: 38516520; PMCID: PMC10952424.
- 6) Haile M, Mengistu Z. B-Scan ultrasonography in ophthalmic disease. *East Afr Med J.* 1996;73(11):703-707.
- 7) Qureshi MA, Laghari K. Role of B-Scan Ultrasonography in Pre-Operative Cataract Patients. *Int J Health Sci (Qassim)* 2010;4(1):31-37.
- 8) Hanchlani M, Chanchlani R. A Study of Posterior Segment Evaluation by B-Scan in Hyper Mature Cataract. *Clin Exp Ophthalmol.* 2016;7(1):516. doi: 10.4172/2155-9570.1000516.