

Evaluation of Vitreo-Retinal Pathologies Using B-Scan Ultrasound

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Purpose:: To determine the diagnostic use of B-Scan in the detection of vitreo-retinal pathologies in patients with vitreous opacities.

Material and Methods: The study was conducted in the Department of Ophthalmology, Isra University & Hospital, Hyderabad, Sindh, from Jan 2008 to Dec 2008. In this study evaluation of over a period of 1 year, 73 eyes of 68 patients with vitreous opacities and poor retinal visualization were investigated with B-Scan ultrasound. Patients were selected from the Retina clinic of the Department of Ophthalmology. The B-Scan machine used was US Scan- 3300 (NIDEK).

Results: Out of 73 scans performed, 48 eyes had vitreous hemorrhage, 22 eyes showed inflammation in vitreous and 3 eyes had asteroid hyalosis. Posterior segment pathologies detected in eyes with vitreous hemorrhage were rhegmatogenous retinal detachment, tractional retinal detachment, peripheral retinal tear, posterior vitreous detachment, intra-ocular tumor, intra-ocular foreign body, disciform macular lesion & traumatic scleral rupture. In patients with intra-ocular inflammation, the diagnoses made were endophthalmitis, dropped nucleus and expulsive choroidal hemorrhage.

Conclusion: B-scan ultrasound is very useful diagnostic tool in detection and evaluation of vitreo-retinal pathologies in patients with opacities in the vitreous cavity.

Ultrasound is an acoustic wave that consists of an oscillation of particles within a medium. Ultrasound was first used in ophthalmology in 1956 by American ophthalmologists Mundt and Hughes¹. They used A-scan mode to evaluate an intra-ocular tumor. B-scan was introduced in ophthalmic practice by Baum and Greenwood in 1958². Both A-scan and B-scan techniques are important for the diagnosis of intraocular disease. B (Brightness) mode is useful for a better demonstration of the shape and topographic relationship of lesions in the posterior segment³. B-scan provides cross sectional display of diseased tissues and is valuable in detecting unsuspected posterior segment diseases⁴. The frequency used in the diagnostic ophthalmic ultrasound for posterior segment is 8-10 MHz. Over the last 30 years ultrasonography has greatly advanced and this has enabled us to study posterior segment of the eye in the presence of opaque media⁵.

The purpose of this study is to evaluate the nature of intraocular pathologies detected by ultrasound examination in patients with vitreous opacity.

MATERIAL AND METHODS

Over a period of 1 year (Jan 2008 to Dec 2008), 73 eyes of 68 patients were selected from the Retina clinic of the Department of Ophthalmology at the Isra University Hospital. There was poor visualization of fundus using slit lamp and indirect ophthalmoscope in all the patients due to vitreous opacities. B-scan ultrasound was advised for the evaluation of vitreous opacities and to detect any underlying posterior segment pathology. Patients were explained about the procedure. Topical anaesthetic eye drop was used to achieve ocular surface anesthesia. The B-Scan machine used was US Scan- 3300 (NIDEK). Hydroxypropyl methyl cellulose was used as the coupling material

Patient was seated in comfortable reclining chair; position of chair and the patient was so adjusted that the examiner could see the eye under evaluation and the monitor at the same time. Systematic ultrasound examination was performed. Basic screening was performed initially at high gain (i.e. 80 dB) setting followed by examination under lower sensitivity. Kinetic echography was done by keeping the probe still and asking the patient to move the eyes in different gazes to determine the after movements of membranous structures. Any solid lesion detected was evaluated topographically. Quantitative echography was performed to determine the internal reflectivity of a solid lesion. The clinical and ultrasound findings were recorded in proforma.

RESULTS

In this study 68 patients (73 eyes) with vitreous opacities and poor retinal visualization were investigated with B-Scan ultrasound. There were 45 male (66%) and 23 female (34%) patients. Age range was 5-69 (mean = 39) years. Vitreous opacification was due to vitreous hemorrhage in 48 (65%) eyes, intraocular inflammation in 22 (30%) eyes and dense asteroid hyalosis in 3 (5%) eyes (Table I). Among 48 eyes with vitreous hemorrhage (Fig. 1), concomitant posterior segment pathology was detected in 34 (71%) eyes while 14 (29%) eyes did not demonstrate any other pathology on B-scan; there was tractional retinal detachment (TRD) in 12 (25%) eyes (Fig. 2), rhegmatogenous retinal detachment (RRD) in 6 (12.5%) eyes (Fig. 4), posterior vitreous detachment (PVD) in 8 (17%) eyes (Fig. 3), peripheral retinal tear in 2 (4%) eyes, intra ocular tumor in 2 (4%) eyes, intra ocular foreign body in 2 (4%) eyes, disciform macular lesion due to age related macular degeneration (ARMD) in 1 (2%) and traumatic scleral rupture in 1 (2%) eye (Table 2). In patients with intraocular inflammation (Fig. 5), the diagnoses made were endophthalmitis in 11 (50%) eyes, drop nucleus in 3 (32%) eyes and expulsive choroidal hemorrhage in 1 (13.5%) eye and vitritis in 7 (4.5%) eyes (Table 3).

DISCUSSION

Ophthalmic ultrasound has become an indispensable diagnostic tool that has increased our ability to detect and differentiate many ocular and orbital diseases. Echography is indicated whenever opacification of ocular media does not allow the examiner to peep into the posterior segment the latter is kept in the dark

about the possibility of various pathologies. If the surgeon knows about these pathologies preoperatively, he can modify his plan of surgery and can also take measures to combat various predictable complications⁷.

Table 1: Vitreous opacities

Vitreous opacities	No. of eyes n(%)
Vitreous Hemorrhage	48 (65)
Intraocular Inflammation	22 (30)
Asteroid Hyalosis	3 (5)
Total	73

Table 2: Diagnosis in cases with vitreous hemorrhage (n = 48)

Diagnosis	No. of eyes n (%)
Vitreous Hemorrhage Only	14 (29)
Tractional Retinal Detachment	12 (25)
Rhegmatogenous Retinal Detachment	6 (12.5)
Posterior Vitreous Detachment	8 (17)
Peripheral Retinal Tear	2 (4)
Intra Ocular Foreign Body	2 (4)
Intra Ocular Tumor	2 (4)
Disciform Macular Lesion due to ARMD	1 (2)
Traumatic Scleral Rupture	1 (2)
Total	48

Table 3: Diagnosis in cases with intraocular inflammation (n = 22)

Diagnosis	No. of eyes n (%)
Endophthalmitis	11 (50)
Vitritis	07 (32)
Drop Nucleus	03 (13.5)
Expulsive Choroidal Hemorrhage	01 (4.5)
Total	22

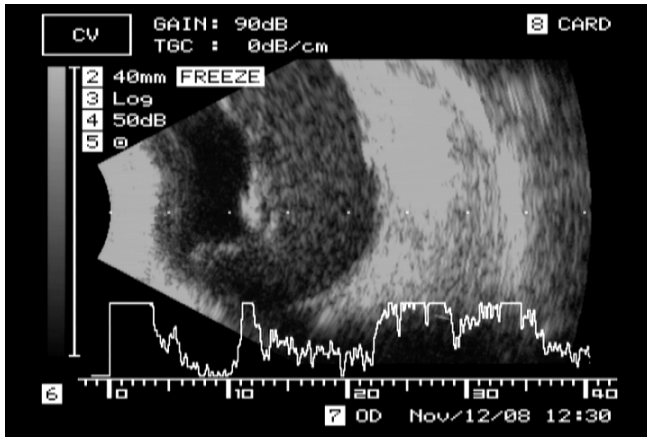


Fig. 1: B-scan showing vitreous hemorrhage

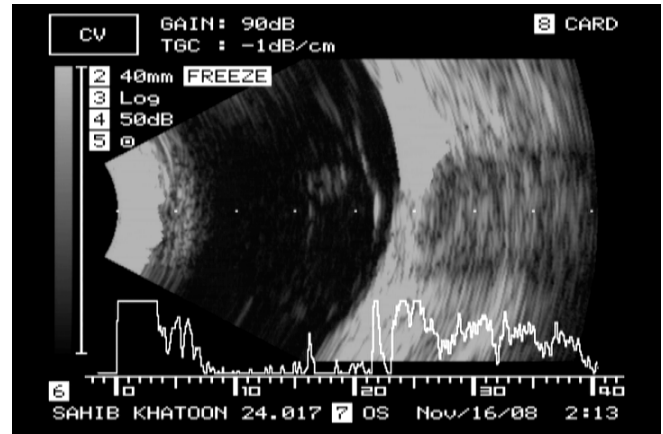


Fig. 4: B-scan showing rhegmatogenous retinal detachment



Fig. 2: B-scan showing tractional retinal detachment



Fig. 5: B-scan showing intraocular inflammation

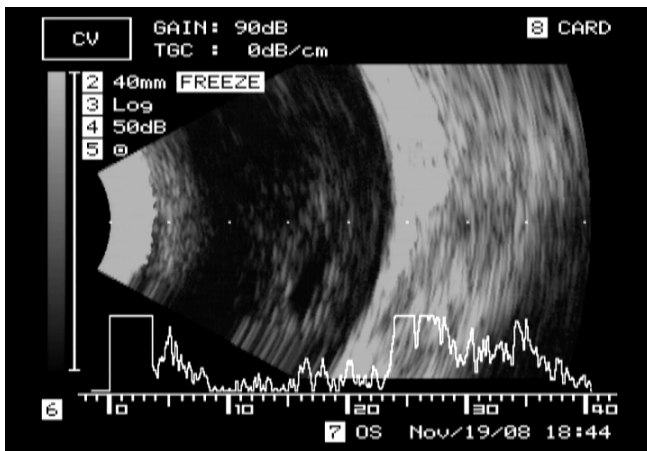


Fig. 3: B-scan showing vitreous hemorrhage with posterior Vitreous detachment

In this study, 73 eyes of 68 patients with vitreous opacities were examined. In all the cases, vitreous opacities were dense enough to preclude adequate assessment of retina and any underlying pathology. Vitreous opacification was because of vitreous hemorrhage in 48 eyes, intraocular inflammation in 22 eyes and asteroid hyalosis in 3 eyes. The distinction between the opacities was clinical as well as echographic.

Fresh vitreous hemorrhage appears as dots & short lines on B-scan. The more dense the hemorrhage, the more opacities are seen on B-scan. Organized blood produces larger membranous surfaces on B-scan. Inflammatory cells in vitreous give similar echogenic appearance as fresh vitreous hemorrhage; however, certain feature on B-scan can help

differentiate posterior vitreous detachment (PVD) is more extensive in vitreous hemorrhage; inflammatory cells are evenly distributed while vitreous hemorrhage settles inferiorly due to gravity⁶. In asteroid hyalosis, calcium soaps produce bright echos on B-scan with clear vitreous gel located between asteroid opacities and retina⁶.

Out of 48 eyes with vitreous hemorrhage, 34 eyes showed associated posterior segment pathologies. Rhegmatogenous RD was detected in 6 eyes; it produces a bright continuous folded membrane that inserts into optic disc and/or ora serrata⁸. In contrast PVD produces a smooth membrane that shows low reflectivity as compared to RD. Kinetic echography is helpful in differentiating these 2 conditions; in PVD there is very fluid undulating after movement on B-scan, whereas RD exhibits a more tethered and restricted after movement. However there are situations in which the acoustic behavior of PVD is similar to RRD and the distinction may be quite challenging. Peripheral retinal tear was detected with B-scan in 2 eyes; this appears on B-scan as a retinal flap; with a PVD or vitreous strand attached to it.

Twelve eyes with Tractional RD and vitreous hemorrhage were examined. The causes of TRD in our patients were advanced diabetic eye disease in 10 eyes and penetrating ocular trauma in 2 eyes. Both tent like and table top configurations were observed on B-scan. Whereas tent like TRD is produced by a point like adherence, the table top detachment is the result of a broader vitreoretinal adherence. A thorough echographic examination is very helpful before vitrectomy in eyes with TRD; it demonstrates the safest region to break the posterior hyaloid, allows the surgeon to anticipate areas of vitreoretinal traction and provide reasonable assessment of expected visual prognosis⁹.

In our study, 2 patients had penetrating ocular trauma with vitreous hemorrhage and retained intraocular foreign body. Standardized echography is invaluable in precise localization of IOFB and to determine the extent of intraocular damage, even when a foreign body (FB) has been previously localized with CT scan. Typical metallic FB produces a very bright signal on B-scan that persists at low sensitivity; also there is marked shadowing of ocular and orbital structures just posterior to it¹⁰. One patient had severe blunt trauma and presented with hemorrhagic chemosis and dense vitreous hemorrhage. B-scan showed RD and features

suggestive of posterior scleral rupture i.e. irregular scleral contour and low reflectivity in the area of rupture along with vitreous incarceration and episcleral hemorrhage⁶.

Two patients with vitreous hemorrhage and intraocular tumor were scanned; the features were consistent with choroidal melanoma in one patient i.e. mushroom shape growth showing acoustic hollowness, choroidal excavation and orbital shadowing¹¹. The other patient was an elderly lady with carcinoma of breast and metastatic spread. Her B-scan showed an irregular lesion with lobulated appearance and high internal reflectivity consistent with metastatic choroidal carcinoma. Disciform macular lesion secondary to exudative ARMD was the cause of vitreous hemorrhage in one patient. The lesion appears as a small dome shaped subretinal elevation in the macular area¹².

Endophthalmitis was diagnosed in 11 patients; 6 of these were postoperative eyes, 3 had traumatic endophthalmitis, while 1 patient had bilateral endogenous endophthalmitis secondary to meningococcal septicemia. Ultrasound is useful to determine the severity and extent of inflammation in clinically suspected cases of endophthalmitis. When the presence of infection is questionable from clinical appearance, B-scan may help to differentiate whether the vitreous opacities are secondary to inflammation or to vitreous hemorrhage, as already discussed⁶.

3 postoperative patients showed vitreous opacities and membranes along with a dropped nucleus that appeared as an oval spherical mass adhered to the retina or floating in the vitreous cavity. One postoperative patient with history of expulsive hemorrhage during surgery large dome shaped membranes, extending from the periphery to the posterior pole along with echogenic shadows of fresh and clotted blood in the supra-choroidal space. Echography is useful in following the course of hemorrhagic choroidal detachment and in determining the appropriate time for drainage⁶.

B-scan ultrasound is very important for demonstrating the nature and extent of abnormalities in eyes with vitreous opacification¹³. It is also useful for monitoring progression of retinal diseases. In eyes with vitreous haze that are being considered for vitrectomy, ultrasonic evaluation helps to diagnose the underlying pathology, to determine the timing of surgery, in optimal placement of vitrectomy instruments and to predict the visual outcome.

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REFERENCE

1. **Mundt GH, Hughes WF.** Ultrasonics in ocular diagnosis. *Am J Ophthalmol.* 1956; 41: 488-98.
2. **Baum G, Greenwood I.** the application of ultrasonic locating technique to ophthalmology. *Arch Ophthalmol.* 1958; 60: 263-79.
3. **Till P, Ossoining KC.** Ten year study on clinical echography in intraocular disease. *Bibl Ophthalmol.* 1975; 83: 49-62.
4. **Hodes BL.** Eye disorders: Using ultrasound in ophthalmic diagnosis. *Post grad Med.* 1976; 59: 197-203.
5. **Zafar D, Sajad AM, Qadeer A.** role of B- Scan ultrasonography for posterior segment lesions. *JLUMHS.* 2008; 07: 7-12.
6. **Freeman HM.** Diagnostic ophthalmic ultrasound. In: Ryan SJ, editor. *Retina.* vol. 3, 3rd ed. St: Louis: Mosby, 1989: 280-306.
7. **Intiaz SA, Rehman HU.** Role of B-Scan in Preoperative Detection of Posterior Segment Pathologies in Cataract Patients. *Pak J Ophthalmol.* 1997; 13: 108-12.
8. **Kerman BM, Coleman DJ:** B- Scan ultrasonography of retinal detachments. *Ann Ophthalmol.* 1978; 10: 903-11.
9. **Bigar F, Bosshard C, Kolti R.** combined A- and B- scan echography: preoperative evaluation of vitrectomy patients. *Mod Probl Ophthalmol.* 1977; 18: 2-11.
10. **Awaschalom L, Meyers SM:** Ultrasonography of vitreal foreign bodies in eyes obtained at autopsy. *Arch Ophthalmol.* 1982; 100: 979-80.
11. **Ossoining KC.** Standardized echography: basic principles, clinical applications and results. *Int Ophthalmol Clin.* 1979; 19: 127-210.
12. **Valencia M, Green RL, Lopez PF.** Echographic findings in hemorrhagic disciform lesions. *Ophthalmology.* 1994; 101: 1379-83.
13. **McLeod D, Restori M.** Ultrasonic examination in severe diabetic eye disease. *Br J Ophthalmol.* 1979; 63: 533-8.