Original Article

Role Of Ultrasound In Vitreous Hemorrhage - A Prospective Study In A Teaching Hospital

Amtul Mussawar Sami, Khalid Waheed and Muhammad Tayyib

Objective: To detect and assess posterior segment pathology in cases of vitreous hemorrhage by ultrasound examination in patients presenting to ophthalmology department of Services Institute of Medical Sciences, Lahore.

Material & Methods: This study included 179 patients (200 eyes) with vitreous hemorrhage who underwent A and B scan ultrasound by one examiner at Eye unit I in Services Hospital, affiliated to Services Institute of Medical Sciences, Lahore, for the duration of four years from January 2003 to January 2007. 114 were male and 65 were females. All patients had dense vitreous hemorrhage which prevented visualization of the retina. Age range was between 10 to 67 years. Before ultrasound, all the patients were completely examined in OPD including a comprehensive history, record of visual acuity and intraocular pressure. Detailed fundus examination was carried out after dilatation of pupils with mydriacyl (tropicamide) eye drops with 78 D lens and indirect ophthalmoscope.

Results: Unilateral cases were 60 and bilateral cases 70. Proliferative diabetic retinopathy with vitreous hemorrhage was observed in 90 eyes, (tractional retinal detachment was present in 38 eyes, both tent like and table top configuration were observed on B scan while vitreous hemorrhage with proliferative diabetic retinopathy was observed in 52 eyes). Rhegmatogenous retinal detachment was observed in 10 eyes. Vitreous hemorrhage due to penetrating injuries occurred in 55 eyes and out of these 55, metallic intra-ocular foreign body was present in 05 eyes. Eales disease with vitreous hemorrhage was present in 25 eyes. Posterior vitreous detachment was noted in 20 eyes with vitreous haemorrhage.

Conclusion: Vitreo-retinal surgeons consider A-and B-Ultrasound the most important examination tool. It should be typically performed early and frequently after presentation of patient with vitreous hemorrhage.

Keywords: Ultra-sound, Retinal detachment, Vitreous hemorrhage. Posterior vitreous detachment A-scan, B-scan.

Introduction

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 Hughes.[1] They used A scan mode to evaluate an intraocular tumor. B Scan was introduced in ophthalmic practice by Baum and Greenwood in 1958.[2] 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 segment.[3] B scan provides cross sectional display of diseased tissues and is valuable in detecting unsuspected posterior segment diseases.[4] 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 has enabled ophthalmologists to study posterior segment of the eye in the presence of opaque media.[5]

The development of duplex scanners and colored Doppler instruments in the 1980's has facilitated their use in ophthalmology. Sergott, Leib, Williamson, Baxter and Guthoff were responsible for their wider application of Doppler to ophthal-mology.[5-7] Its uses have expended to encompass biometric calculations, tissue characterization, diagnosis of complex vitreo-retinal conditions and differentiation of intraocular masses.[8-11] In the orbit, ultrasound including Doppler is used for the investigation of extraocular muscles diseases[12,13] and retro-bulbar optic nerve diseases,[14-15] vascular anomalies[16] and orbital mass lesions.[17-18]

In 1990, Pavlin and colleagues described the first high frequency ultrasound (50-100MHz) in ophthal-mology.[19] Ultrasound biomicroscopy has allowed us

to investigate subtypes of glaucoma, lesions in the iris, ciliary's body, sclera and pars plana.[20] Previously A-mode (amplitude mode) which used to gauge the depth of any structure was used with liner transducer but now-a-days, it is replaced by B-mode sector scanner using high frequency. This has an advantage of panoramic view of the orbit in addition to anticipated pathology, normal anatomy and co-existing variants. Now ultrasound is considered an essential tool in the investigation and management of many ocular and orbital disorders.[21-22] The evaluation of eyes with opaque ocular media is one of the primary indications for the use of ocular ultra-sonography.[23-24] Therefore preoperative ultra-sonography of the globe has been recommended prior to ocular surgery when the fundus cannot be visualized.[25]

Vitreous hemorrhage is one of the most important causes of sudden loss of vision in an individual.[26] The incidence is approximately seven cases /100,000 of the population. The important causes of vitreous haemorrhage are proliferative diabetic retinopathy, Eales disease, posterior vitreous detachment with or without vitreous hemorrhage and ocular trauma. The relative prevalence of these and other underlying conditions has varied in previous reports.[26]

Despite recent advancements in ophthalmic examination techniques, evaluation of vitreo-retinal diseases with vitreous haemorrhage often presents a diagnostic challenge even when using the standard methods of A-and B- Ultrasound. These techniques are important for the diagnosis of vireo-retinal disorders and before any surgical interventions.

The purpose of this study was to detect and assess posterior segment pathology in cases of vitreous hemorrhage by ultrasound examination in patients presenting to ophthalmology department of Services Institute of Medical Sciences, Lahore.

Material And Methods

This study consisted of 179 patients (200 eyes) with vitreous hemorrhage who underwent A and B-scan ultrasound by one examiner at Eye unit I in Services Hospital, affiliated to Services Institute of Medical Sciences, Lahore, over a duration of four years from January, 2003 to January, 2007. All patients had dense vitreous hemorrhage which prevented visualization of the posterior segment. 114 were male and 65 were females. Age range was between 10 years to 67 years.

Before ultrasound all the patients were examined in OPD including a comprehensive history, record of visual acuity and intraocular pressure. Detailed fundus examination was carried out after dilatation of pupils with mydriacyl [tropicamide] eye drops with 78 D Lens and indirect ophthalmoscope.

The A-and B- Ultrasound procedures for evaluating patients with vitreous hemorrhage began with the instillation of topical anesthetic drops into the eye. This was followed by the application of methyl-cellulose to the face of the B-scan probe to facilitate penetration of sound into the eye. Examinations were performed with patients in supine position on the surface of the globe, to maximize sound penetration and to promote adequate patient fixation. The vitreous cavity was evaluated for hemorrhage density, mobility and other pathologies. Vitreo-retinal adhesion and retinal status were noted by careful screening of the globe in all four quadrants. The A-scan was used at the tissue sensitivity gain setting to assess reflectivity of the suspected pathology.

Results

Unilateral cases were 60 and bilateral cases 70. Proliferative diabetic retinopathy with vitreous hemorrhage was observed in 90 eyes, (tractional retinal detachment was present in 38 eyes, both tent like and table top configuration were observed on B scan while vitreous hemorrhage with proliferative diabetic retinopathy was observed in 52 eyes). Rhegmatogenous retinal detachment was observed in 10 eyes. Vitreous hemorrhage due to penetrating injuries occurred in 55 eyes and out of these 55, metallic intra-ocular foreign body was present in 05 eyes. Eales disease with vitreous hemorrhage was observed in 25 eyes. Posterior vitreous detachment was present in 20 eyes with vitreous haemorrhage. Fig I , II and III.

Table-1: Distribution of cases

Patients	Number
Total Numbers of Patients	179
Total Numbers of Eyes	200
Unilateral Cases	60
Bilateral Cases	70

Table-2: Causes of vitreous hemorrhage

Causes	No. of Eyes	Percentage
Proliferative Diabetic Retinopathy	90	50.27%
1. Vitreous Hemorrhage	52	
2.Tractional Retinal Detachment with Vitreous Hemorrhage	38	
Penetrating Injury	50	27.93%
Eales Disease	25	13.96%
Posterior Vitreous Detachment	20	11.17%
Rhegmatogenous Retinal Detachment with Vitreous Hemorrhage	10	5.58%
Penetrating Injury with Metallic intra ocular foreign body	05	2.97%

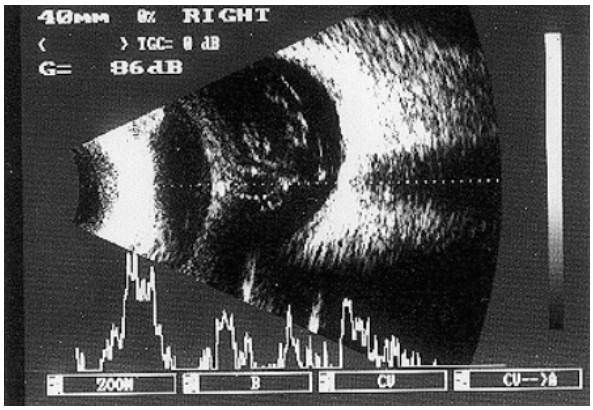

Fig-1: Vitreous Hemorrhage on B-scan

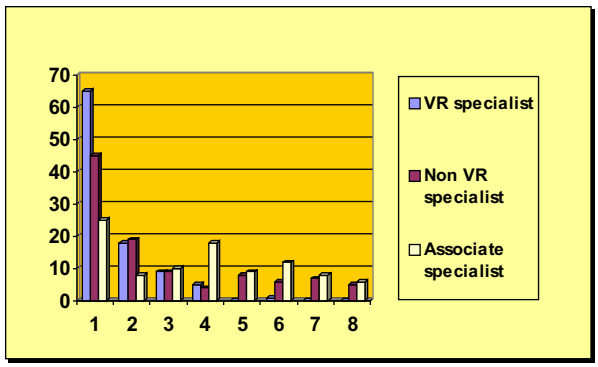

Fig-2: Preference of VR, non VR and associate specialist for B-scan in cases of vitreous hemorrhage

Discussion

The role of ultrasound in the detection of retinal pathology in eye with opaque media has been established clearly in the past. At present, there is no other method to reliably ascertain the anatomic position of the retina where direct examination is impossible. The demonstration of retinal detachment profoundly changed the management of the cases, thus distinguishing dense vitreous membranes from retinal detachment. Proliferative diabetic retinopathy with vitreous hemorrhage was observed in majority of cases in our study. This is in agreement with the report of Rabinowitz et al[26] and Jameel et al;[27] another national study of Faheem et al[26] shows proliferative diabetic retinopathy as the second common cause of vitreous hemorrhage. Our findings contrast with those of Leangren et al and Lean and Gregor,[26-27] who reported that vitreous detachment and traction of a retinal vessel was the commonest cause of hemorrhage. In our study these causes accounted for only 11.17% of the cases. In diabetic vitreous hemorrhage, single or multiple focal adhesions are frequently seen between incompletely posterior vitreous face and fibrovascular complexes which originate from the optic disc and major retinal vessels.

Hemorrhage into the vitreous tends to form clots. These appear as highly reflective, coalescent echoes, which are usually denser inferiorly. Bleeding associated with posterior vitreous detachment may be confined to the gel or sub-hyaloid space alone or may be mixed. Sub-hyaloid hemorrhage associated with posterior vitreous detachment should raise the suspicion of a retinal tear, especially in an otherwise healthy eye or in high myopes. Sub-hyaloid hemorrhage does not clot, and therefore appears as dispersed mobile small echoes requiring a high gain setting to be demonstrated. Chronic sub-hyaloid hemorrhage may gravitate inferiorly, forming an interface between a thick, highly reflective layer of blood and less dense floating blood cells.

Vitreous hemorrhage due to Eales disease was noted in 13.96% of cases.

Our findings also match with Jack et al, Jalkh et al Kumar and Rab et al[26] who found that preoperative

of the retinas of 84%-89% of the eyes with vitreous hemorrhage.

It was noted in present study that ocular trauma is the second most common cause of vitreous hemorrhage. Total 55 eyes had vitreous hemorrhage and out of these, 05 eyes had metallic intra-ocular foreign body, which is consistent with Rabinowitz et al.[26] Diagnostic techniques such as computed tomography (CT) and plain-film radiography are standard methods for identifying intra-ocular foreign bodies. In the present study, diagnostic ultrasound correctly identified the presence of foreign bodies. Typical metallic foreign body 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 it. The use of ultrasound as an adjunct to the standard imaging techniques (CT scan) when an intra ocular foreign body is suspected in post- traumatic eyes is highly recommended.

Posterior vitreous detachment with vitreous hemorrhage was observed in 11.17% of cases. Posterior vitreous detachment is more extensive in vitreous hemorrhage; inflammatory cells are evenly distributed while vitreous hemorrhage settles inferiorly due to gravity. Posterior vitreous detachment produces smooth membranes that shows low reflectivity as compared to retinal detachment.

Our study also correlates with VJ Vote et al[28] who recommends A-scan and B-scan ultrasound as an important tool for vitreo-retinal specialists and non vitreo-retinal specialists **(Fig -IV)**

Conclusion

A and B-scan ultrasound is a mandatory technique for the assessment and surgical management of patients with vitreous hemorrhage particularly in vitreo - retinal pathologies. It is also useful for monitoring progression of retinal disease.

Department of Eye
SIMS/Services Hospital, Lahore
theesculapio@hotmail.com

References

1. Mundt GH,Hughes WF. Ultrasonic in ocular diagnosis. Am J Ophthalmol1950;41:488-98.
2. Baum G, Greenwood I. The application of ultrasonic locating technique to ophthalmology. Arch Ophthalmol1958;60:263-79.
3. Till P, Osoining KC. Ten year study on clinical echography in intraocular diseases. Bibl Ophthalmol 1975;83:49-62.
4. Hodes BL. Eye disorders; using ultrasound in ophthalmic diagnosis. Post grad Med 1976; 59:197-203.
5. Zafer D, Sajad AM ,Qader A. Role of B- Scan ultrasonography for posterior segment lesions. JLUMS 2008;07:7-12.
6. Blaivas M, Theodore D, Sierzenski PR. A study of bedside ocular ultrasonography in the emergency department. Acad Emerg Med 2001; 9;791-9.
7. Coleman DJ, Silverman, Rondeau MJ. Correlations of acoustic tissue typing of malignant melanoma and histopathologic features as a predictor of death. Am J Ophthalmol 1990;110:380-8.
8. Green RL, Byrne SF. Diagnostic ophthalmic ultrasound. *In* Retina; vol 1:Rvan SJ ed .Toronto. The CV Mosby Company 1998;1:191-273.
9. Gentile RC, Berninstein DM. High resolution ultrasound biomicroscopy of the pars plana and peripheral retina. Ophthalmol 1998;478-84.
10. Snell RS, Lemp MA. Clinical anatomy of eye. Boston: Black well Scientific publication.1989;1.
11. Grayson M. Diseases of the cornea. St.Louis; Mosby ,1983.
12. Lofstrom JB, Bengtsson MA. Practice of anaesthesia, physiology of nerve conduction and local anaesthesia drugs. 6th edition. London. Wylie and Churchill Davidsons. 1995; 172-88.
13. Hogan M, Alvarado J, Weddell. Histology of human eye. Philadelphia; WB Saunders 1971.
14. Yoneya S, Tso MOM. Angioarchitecture of the human choroid. Arch Ophthalmol 1987; 105:681.
15. Perry HD, Hatfield RV, Tso MOM. Flourescein pattern of the chorio capillaries in the neonatal rhesus monkeys. Am J Ophthalmol 1977;81:197-204.
16. Khalil AK, Kubota T, Tawara A, Inomata H.. Ultrastructural changes on the posterior iris surface. Arch Ophthalmo 1996;114(6):721-5.
17. Davson H. The Bowman lecture, the little brain. Trans Ophthalmol Soc UK 1979;99(1):21-37.
18. Hamilton RC. Techniques of orbital region anaesthesia. Br J Anaesthesia 1995:75:88-93.
19. Eisner G. Biomicroscopy of the peripheral retina. New York: Springer Publicating co. 1973.
20. Apple DJ. Anatomy and histopathology of macular region. Intl Ophthalmol Clin 1981:2(3):1-9.
21. Gissen AJ, Cavino BG, Gregus J. Differential sensitivity of mammalian nerve fibers to local anaesthetic agents. Anaesthiol 1980:467-74.
22. Wise GN .Dollery CT,Hankindl

P. The retinal circulation .New York, Harper and Row Publisher, 1971.
23. Bellhorn RW. Control of blood vessel development. Trans Ophthalmol Soci UK 1980; 100(3):328-31.
24. Rafferty NS .The ocular lens structure ,function and pathology. New York :MARCEL decker:1985;1-60.
25. Kanski JJ. Clinical Ophthalmology: A systemic approach,5 edition. Oxford; Butterworth Heinmann 2003; 143.
26. Rabinowitz R. Comparison between clinical and ultrasound findings in patients with vitreous hemorrhage. Eye 2004;18:253-6.
27. Ahmed J, Sheikh FF, Rizwan A,Memoon MF. Evaluation of vitreo -retinal pathologies using B-scan ultrasound. Pak J Ophthalmol 2009; 207-11.
28. Vote BJ, Membrey WL, Casswel AG. Vitreous haemorrhage without obvious cause: national survey of management practices. Eye 2005;19: 770-77.

CORRIGENDUM

Esculapio
Journal of Services Institute of Medical Sciences, Lahore
Volume 06, Issue 01, April - June, 2010

In Case Reports,
"Concomitant infestation of Meckel's diverticulum and appendix by pinworm (enterobius vermicularis in a 15 year old male "
By Abreen Imran (Assistant Professor of Pathology/Pakistan Postgraduate Medical Institute, Lahore),

And in another case report
Volume 05, Issue 04, April - June, 2010
"Chondroid syringoma of the arm: an unusual localization: a case report and preview of the literature"
1. By Abreen Imran (Assistant Professor of Pathology/Pakistan Postgraduate Medical Institute, Lahore),
2. Muhammad saeed Akhtar Khan (Associate Professor of Pathology/Pakistan Postgraduate Medical Institute, Lahore),

Page No. 34 should be read authors name in both case reports as follows:

Ambreen Anwar Imran and Saeed Akhtar Khan