



ORIGINAL RESEARCH PAPER

Radiology

ROLE OF ULTRASONOGRAPHY IN EVALUATION OF ORBITAL LESIONS

KEY WORDS: B-scan; ocular pathologies; retinal detachment, Orbital masses,

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ABSTRACT B-scan ultrasonography (USG) is an easily available, simple, noninvasive tool for diagnosing lesions of the orbit. Common orbital conditions such as cataract, vitreous degeneration, retinal detachment, ocular trauma, choroidal melanoma, and retinoblastoma etc. can be accurately evaluated with this modality. B-scan USG is cost-effective, which is an important consideration in the developing country like India. In addition, it is noninvasive and the results are reproducible. The purpose of this study is to show how sonography can reveal pathology of the eye and to highlight its usefulness as a simple and cost-effective tool in investigating eye symptoms.

Introduction

The orbit and the visual system forms the most important sense organ in humans. A wide variety of lesions may be encountered in the orbit, diagnosis of which poses challenge to the neuroradiologists and ophthalmologists. The advent of ultrasonography in medical imaging has revolutionised imaging of orbit. Its lack of radiation, widespread availability, ability to characterize lesions has made it the initial imaging modality of choice for orbital lesions. Also the eyeball's fluid content and its superficial position make it ideal for examination with ultrasonography (USG).

Ultrasonography of the eye is a useful tool in diagnosing conditions of the ocular globe, especially when combined with ophthalmoscopy. Pathologic conditions of the ocular globe include several usual and unusual entities, most of which may be properly identified at US. For instance, the ocular globe may have an abnormal size or unusual morphologic characteristics. Lesions of the anterior chamber (eg, hyphema), lens (eg, cataract, luxation), and iris or ciliary bodies (eg, cysts) are usually seen at ophthalmoscopy but may also be depicted at US. Vitreous pathologic conditions may demonstrate echoes caused by various entities such as degeneration, asteroid hyalosis, hemorrhage, and infection, and lines are indicative of different types of detachment, including retinal, choroidal, and hyaloid detachment and retinoschisis. Posterior wall masses are usually tumors (eg, melanoma, metastasis, nevus, and hemangioma) but may also result from subretinal hemorrhage or granulomas (from tuberculosis or histoplasmosis). Calcifications may be caused by drusen or be nonspecific. Foreign bodies may also be seen. So USG can be used to facilitate clinical management in patients with orbital lesions by depicting certain lesions that do not require treatment and suggesting specific surgical approaches for others. The purpose of our study was to evaluate role of USG in assessment and characterization of orbital lesions.

Material and Methods

This prospective study was done in the Department of Radiodiagnosis of M.G.M. Medical College, Indore, Madhya Pradesh from December 2015 to May 2016. A total of 150 patients referred to our department with strong clinical suspicion of orbital lesions were evaluated on ultrasound. The final study group comprised of 141 patients as some patients were excluded from

the study because they lost follow up.

The ultrasonography were performed using a standard USG machine (Philips HD7 XE and SEIMENS ACCUSON) equipped with a 7–13 MHz real time high-frequency probe with the contact method. The probe was placed over the closed eyelid after application of coupling gel.

Technique-With the patient in the supine position, the eye is examined through the closed eyelid with high-frequency linear transducers (7–13.0MHz). Gel was abundantly applied to the closed eyelid to allow better contact. The examination was performed first in B-mode, and the focus, gain, and settings were adjusted during the examination. Greatly reducing the gain showed the walls of the globe and optic nerve sheath perfectly. Increasing the gain enabled the contents of the vitreous body to be studied. Finally, adding colour and pulsed Doppler was useful in some conditions. Low-flow settings and a small gate were chosen for Doppler. The dynamic exam was recorded, with a series of images or with video sequences.

Results-

In our study most common age group of the patients was 16-30 year (39 %). Majority of patients were males (60%) with male to female ratio of 3:2. The most common presenting complaint was diminution of vision followed by trauma. Most common benign mass lesion was optic nerve glioma followed by cavernous hemangioma. Most common inflammatory lesion was endophthamitis followed by pseudotumor and thyroid orbitopathy. Most common malignant mass lesion was retinoblastoma. Most common lesion in other category was vitreous haemorrhage followed by retinal detachment. The distinction between intraocular & extraocular pathologies was made in 100% of cases. 69 % of referrals for USG were with opaque media, whilst 31 % had clear media in which USG was used as a complimentary diagnostic modality

TABLE- 1

Type of orbital lesion	Position	USG	Follow up
Inflammatory lesions	Intraocular	14	12
	Extraocular	8	7
Benign Mass lesions	Intraocular	0	0
	Extraocular	3	3

Malignant Mass lesions	Intraocular	4	5
	Extraocular	3	4
Others		109	110
Total		141	141

Discussion-

In our study most common intraocular pathology was vitreous haemorrhage (27%) followed by retinal detachment. Retinal detachment (RD) showed an incidence of 21% (26 out of 141 examined) due to traumatic and non-traumatic causes in the present study. Retinal detachment appeared as "V" shaped echogenic membrane attached posteriorly at optic disc and anteriorly at ora serrata which doesn't showed after movement on dynamic scan.

Five cases of intraocular foreign body associated with vitreous haemorrhage were found in our study, all of which presented with history of ocular trauma.

In patients presenting with a history of ocular trauma, vitreous haemorrhage (45%) was the most common finding followed by retinal detachment (25%).

Twenty five patients presented with clinical diagnosis of diabetic retinopathy. Most of them complained of gradual diminution of vision. Of these, 59 % presented with bilateral diabetic retinopathy and 41 % had unilateral involvement. Vitreous haemorrhage (40 %) was the most common radiological finding in cases of proliferative diabetic retinopathy (PDR), followed by vitreous detachment and retinal detachment.

One case of orbital cysticercosis was found. The patient was a diagnosed case of intra- vitreal cysticercosis who came for follow up USG. This lesions showed regression after drug therapy.

Three cases of Retinoblastoma were seen in our study, one of them was found with bilateral involvement. All of them were paediatric age group patients. It appeared as intraocular, solid soft tissue mass of mixed echogenicity, all of them showed internal calcification, one of them demonstrated endophytic growth pattern while other two showed diffuse growth pattern. In one of them there was involvement of optic nerve was seen. On colour Doppler significant vascularity was demonstrated in all of the cases.

Two cases of choroidal melanoma were detected, one of them appeared as hypoechoic lobular intraocular mass showing intense vascularity on colour Doppler. Other one appeared as echogenic mass with cystic spaces in retrolental region near ciliary body with multiple low level echoes and echogenic membrane seen in vitreous cavity and size of globe was reduced. It was misdiagnosed as endophthalmitis.

One case of vitreous haemorrhage was misdiagnosed as endophthalmitis in patient presented with eye discharge, because it appeared as thick echogenic content within the vitreous cavity.

Vitreous detachment appeared as anechoic space in vitreous cavity posterior to detached echogenic vitreous.

Choroidal detachment appeared as thick echogenic kissing membrane in posterior segment of eye not attached at optic disc.

Vitreous membrane were seen as thin echaogenic membrane in posterior sehment of eye showing after movement on dynamic scan.

In our study, Orbital pseudo tumor & Grave's ophthalmopathy were the main extraocular pathologies. 12.29% patients presented with proptosis due to Grave's disease or orbital pseudo tumor. Retro-orbital tumors were the next common cause.

Two cases of inflammatory lacrimal gland lesion were seen in our study, on follow up one of them turned out to be malignant.

We found three benign extraocular orbital mass lesions, out of which two were optic nerve glioma and one was cavernous haemangioma.

Optic nerve glioma appeared as retrobulbar (extraocular intraconal) well defined, hypoechoic, fusiform soft tissue mass encasing the optic nerve, without evidence of calcification with in it, characteristically defining the optic nerve tumor, more likely optic nerve glioma.

Cavernous haemangioma appeared as extraocular intraconal, retrobulbar, well defined, hypoechoic to hyperechoic, predominantly solid with few cystic areas with in it, minimal flow of venous spectral pattern was demonstrated on Doppler scanning.

Three cases of malignant extaocular lesions were seen in our study. Subtyping on the basis of USG appearance was not possible. On follow up, they turned out to be rhabdomyosarcoma, lid carcinoma and metastasis. One case of rhabdomyosarcoma was detected, it mainly appeared as an ill-defined, heterogenous, irregular mass with low to medium echogenicity and a variable intratumoral vascular flow pattern on Doppler examination. It demonstrated intratumoral necrosis and haemorrhage and was seen to extend extraorbital to region reaching up to the infra-temporal fossa.

One case of Lid carcinoma was seen, the pattern of appearance of which is hypoechoic extarocular mass, lobular in shape, and on colour Doppler vascularity is seen.

One case of orbital metastasis was diagnosed in a known case of breast carcinoma which on sonography showed solid appearing hypoechoic mass with ill-defined margins in superolateral part of orbit. Colour Doppler demonstrated internal vascularity with in the mass lesion.

Other miscellaneous conditions diagnosed on USG in the present study was findings of cataract, dislocation of lens.

Overall sensitivity, specificity, Positive predictive value, Negative predictive value of orbital USG in diagnosing benign lesion was 100% each, for inflammatory lesion was 100%,97.5%,86.3%, 100% and for malignant lesion was 77%, 100%, 100%, 98.5%.

CONCLUSION.

The result of the current study by B-mode ultrasonography strongly indicates that it should be the first screening modality in evaluation of orbital lesions before resorting to more costlier modalities like Computerised Tomography and Magnetic Resonance Imaging. High frequency transducer coupled to a routine conventional ultrasonography provides excellent quality real time imaging of various ocular pathologies. It can be extensively used in evaluation and diagnosis of various ocular disorders, especially in patients with opaque ocular media, where a fundoscopic evaluation is impossible to assess the posterior segment. It is also useful in monitoring progression of diseases. B-mode real time ultrasonography with high frequency probes is preferred modality because it provides cost-effective, non-radiation, non-invasive technique which can be performed in outdoor patient without any use of anesthetics or sedative therapy.

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