Conventional B-mode Ultrasonography for Evaluation of Retinal Disorders

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Abstract

Sonographic study of 164 patients (328 eyes) in the present series highlights the advantages of ocular ultra sonography (B-mode) in the evaluation of retinal disorders especially in patients with opaque ocular media. B-mode sonography of the eye is a rapid, cheap, safe and reliable investigation for the eye. The sensitivity and specificity of this modality in detecting ocular pathologies has been recorded as extremely high and is of great value to the eye surgeon for a preoperative assessment of the posterior segment when funduscopy is not possible due to opaque ocular media from various causes.

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Key Words : Retina; Sonology

Introduction

Ultrasonic imaging of ocular structures has unique acoustical advantages of the cyst like globe and the dimensions of the important ocular tissues. Routine ocular scanning is performed with B-scan using 7.5 MHz-10 MHz transducers and examinations can be performed at frequencies of up to 100 MHz, permitting the visualization of structures of the anterior segment in near microscopic detail [1,2]. This modality is of great value to the eye surgeon for a preoperative assessment of the posterior segment when funduscopy is not possible due to opaque ocular media from various causes. It is at times impossible to differentiate a retinal detachment (RD) from a posterior vitreous detachment (PVD), which is adherent at optic disc on B-mode sonography as both reflect sound in an identical way. These indeterminate scans require A-mode scan for studying the amplitude reflectivity of such questionable membranes before arriving at a diagnosis [3]. In sagittal section, a total detachment looks like an isosceles triangle [4], which is open towards the anterior segment. In RD, the vitreous gel undergoes shrinkage causing new acoustic interfaces, thus increasing the echogenicity of the vitreous [5]. The sub retinal fluid in long standing retinal detachment shows increase in protein content, which may precipitate, producing multiple free-floating opacities in sub retinal space. However, sub retinal echoes which remain in one location have to be regarded as malignant tumour until proven otherwise [6,7]. Retinoblastoma is seen as an irregular mass with a broad base in the posterior segment of the eye. Calcification is seen only in 50% of patients and when seen it is diagnostic of retinoblastoma. There may be an

associated retinal detachment in 5% of patients [3]. Tumour extension into the optic nerve is associated with 65% mortality, but if nerve is not involved the mortality rate is only 8% [8]. Extension into optic nerve or retro-orbital space is better appreciated on CT scan and MRI rather than on ultra sonography. Coat's disease can be differentiated from retinoblastoma by evaluating the sub retinal space [7,9,10]. The exudative detached retina often gives strong echoes in the sub retinal space due to cholesterol deposits.

Material and Methods

164 patients (328 eyes) of different age groups in both sexes with a clinical suspicion of intraocular and orbital pathology were taken up for sonographic study with a 7.5 MHz transducer sector probe coupled to a conventional ultra sonography equipment., L&T Medical Sigma IAC. Patients in whom funduscopy could not be carried out due to opaque ocular media, patients with blunt trauma to eye, and patients presenting with proptosis formed the main selection group for ultra sonographic scan at our center. The examination was performed with patient in supine position, using a coupling jelly and the transducer head held over a closed eyelid. The cornea was not anaesthetized. Few children had to be sedated prior to the procedure. Both eyes were scanned serially in transverse and sagittal planes. The patient was instructed to move the eye ball upwards, downwards, nasal side and temporal side for delineating better anatomy of the eye ball and mobility of intra-ocular lesions.

Results

Out of the 164 patients examined, 39 retinal disorders were diagnosed on B mode ultrasonography as shown in Table 1 (23.78%). Conventional B mode ultrasonography alone showed a sensitivity of 100% and a specificity of 98.7% in

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Fig. 1 : Total retinal detachment posteriorly at the optic nerve head and anteriorly at ora serata. Vitreous collapse (arrow) is also seen

detecting the ocular pathologies. Each evaluation included thorough clinical examination and analysis of the final outcome and comparison of results with superior imaging modalities like MRI and CT scan.

Table 1

Diagnosis of retinal disorders on B mode ultrasound scanning

Retinal detachment	23
RD + VH	11
Retinoblastoma	5
Total	39

Discussion

With clear ocular media, diagnosis of RD is made at fundoscopy. However, in cases of opaque ocular media as in this series, we could demonstrate morphologic characteristics of RD with anchoring of detached leaflets at optic disc and ora serrata [5,6]. Both rhegmatogenous and non-rhegmatogenous types (exudative and tractional) were noticed. Extentwise focal, partial, complete RD was demonstrable. Morphologically the classical V shape, Y shape with preretinal vitreous proliferation were also noticed. In the current series, 3 patients presented with bilateral RD. The morphology of various types of RD in our study was consistent with the study and observation of RD made by Chakravarti et al 1990 [11].

In this study, RD showed an incidence of 21.34% (34 out of 164 cases examined) due to traumatic and non-traumatic causes while studies of Taneja et al showed 7.6% and Coleman DJ showed 25%. Hassani and Bard in their select group study of cataract patients found 41 cases of RD among 295 patients screened for posterior segment abnormality accounting for 13.8% of all abnormalities. Their low percentage was due to non-inclusion of trauma cases [8]. Comparatively, in our study

Fig. 2 : Bullous retinal detachment (arrow)

RD due to non-traumatic causes accounted for 14% and these were observed in cataract cases that were screened for evaluation of posterior segment pre-operatively. In our study, 11 patients had both RD and vitreous haemorrhage.

All the 5 patients studied in this series for evaluation of leukokoria were correctly diagnosed as retinoblastoma. On B mode, an irregular echogenic mass with a broad base in the posterior segment with foci of calcification was demonstrated. We could not demonstrate any RD associated with the tumour due to the size of the mass. About 5% of retinoblastomas show RD and 50% calcification within [3,12]. We found in our series, 2 patients with retinoblastoma presenting as pthitic eyes, one was bilateral and another presented with proptosis.

Ultrasonography also has the added advantage over fundoscopy in depicting the internal characteristics of a suspected tumour such as calcific foci in retinoblastoma [13]. The ability of ultrasonography to show the outline of the mass as dome shape, regular surface or pedunculated mass, besides also demonstrating a coexisting RD has made it the most reliable non-invasive investigation available to us today. Though A scan further confirms the presence of an intra-ocular mass by reflectivity pattern, it is only an adjunct to the B mode in evaluating intra-ocular mass [4]. In our study, retinoblastoma formed 3% of the various ocular abnormalities noticed. The specificity was also 100% as few foci of calcification were echographically demonstrable which is virtually diagnostic of retinoblastoma. We encountered bilateral involvement in one case. Coleman in his review of 100 cases also showed 100% specificity and sensitivity of B mode ultrasonography in detecting and characterising intra-ocular lesions. In his review of 18 cases, 17 cases were

immediately diagnosed, and one suspected case was diagnosed after a long term surveillance which proved it to be an intra-ocular tumour true to the suspicion made with B mode ultrasonography [13].

The results of the current study by B-mode ultrasonography strongly indicate that it should be the first screening modality in evaluation of retro bulbar lesions before resorting to more costlier imaging modalities like CT & MRI. Furthermore, with easy availability of the B-mode ultrasonography machine and a high frequency transducer, in almost all the Military Hospitals of the Indian Armed Forces this modality can be of optimal use in peripheral centers.

To conclude, a 7.5 MHz 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 of retinal disorders, in patients with opaque ocular media, where a preoperative fundoscopic evaluation is virtually impossible, for assessment of the posterior segment.

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