

B-Mode Ocular Ultrasound: The Aba Experience⁶

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Abstract:

Introduction:

B-Mode ocular ultrasound is of great value to the surgeon in pre-operative assessment of posterior structures of the eye in patients with opaque media.

Objectives:

This study reviewed the ocular B- mode findings in patients in Aba. It provides a baseline data for further studies.

Methodology:

One hundred and twenty patients were referred from the Ophthalmology Unit of Abia State University Teaching Hospital and evaluated with B- mode ocular ultrasound at the Radiology department ABSUTH and Todac clinic over a period of 2 years. With patients in a supine position, coupling gel was applied on the closed eyelids and both eyes were evaluated by a Radiologist with high frequency (7.5-12.0 MHz) linear probe on a Sonoscape S-30 ultrasound machine in the longitudinal and transverse planes. Kinetic and Doppler echography were also done.

Results:

Patients between the ages of 6 months and 90 years were evaluated. Fifty-seven patients were males while 63 were females. The most common and the least common sonographic findings were cataract (80.1%) and retinoblastoma (1.67%). Other findings were vitreous degeneration, ectopic lens, retinal detachment, choroidal detachment, posterior vitreous detachment, pan ophthalmitis, phthisis bulbi and optic disc drusen.

Conclusion

B-mode sonography is a veritable tool in eye evaluation. It is safe, non-invasive and accurate way of interrogating the eye. It should be a first line radiological investigation in ocular lesions.

Key Words: B-mode ultrasound, Eye.

I. INTRODUCTION

B- mode sonography of the eye is a non-invasive, inexpensive, real time method of radiological evaluation of the eye. The superficial location of the eye, its cystic structure and the inherent contrast of eye structures make sonographic eye evaluation ideal¹.

Magnetic resonance imaging (MRI) provides high contrast and good image resolution but it is time consuming, expensive, inconvenient and not readily available².

Retinal images from optical methods like optical coherence tomography (OCT) and slit-lamp devices may be obscured by intervening opaque structures like sclera, lens opacities and hemorrhage³.

A lot of work has been done in ultrasound evaluation of the breast, abdomen and pelvis. Though there are studies highlighting the role of ultrasound in the eye evaluation, no documented work has been done in this environment.

There are varied indications for ocular ultrasound scan, this study however evaluated cataract patients prior to surgery, patients with history of ocular trauma that have abnormal pupillary reaction, inaccurate light projection as well as flashes of light. Patients with ocular tumors, poor vision following surgery and vitreous humor lesions were also included in the study.

B-mode ophthalmic evaluation will result in accurate, prompt and better management of patients.

II. OBJECTIVES

1. To review the B-mode ultrasonographic findings in patients referred for eye scan.
2. To provide a baseline data for further studies.

III. METHODOLOGY

It was a prospective study of 120 patients who were referred for ocular sonography for a period of two years: July 2015 – June 2017. Patients were in supine position with eye lids closed. A coupling gel was applied to the eye lids and both eyes were evaluated using a high frequency linear probe mounted on S30 sonoscape ultrasound machine in the longitudinal and axial planes. Kinetic and Doppler echography were also done.

IV. RESULTS

One hundred and twenty patients were reviewed during the period of study (July 2015 to June 2017). Fifty-seven patients were males while 63 were females giving a male: female ratio of 1:1.1. Age range was 6 months to 90 years, with a mean age of 55.34 years.

Of the 240 eyes, 32 eyes were free of pathologies. Some eyes had more than one pathology. The frequency of ocular pathology is shown in table1.

TABLE 1: FREQUENCIES OF OCULAR PATHOLOGIES

PATHOLOGY	FREQUENCY (no of patients n=120)	FREQUENCY (no of eyes scanned n=240)
Cataract	96 (80%); 41(BIL) 55(UNIL)	137(57.1%)
Vitreous degeneration	68(56%);41(BIL) 17(UNIL)	99(41.3%)
Choroidal detachment	14(11.7%)	14(5.8%)
Retinal detachment	12(10%)	12(5%)
Optic nerve drusen	12(10%)	24(10%)
Posterior vitreous detachment	8(6.7%)	8(3.3%)
Ectopic lens	6(5%)	6(2.5%)
Phthisis bulbi	3(2.5%)	3(1.1%)
Retinoblastoma	2(1.7%)	2(0.8%)
Panophthalmitis	1(0.8%)	1(0.4%)
Optic disc Coloboma	1(0.8%)	1(0.4%)

V. DISCUSSION

Ultrasound is an important tool in eye imaging. It is an adjuvant to clinical examination and ophthalmoscopy in evaluation of particularly the posterior segment of the eye ball.

The females that were evaluated in this study were slightly more than the males (M: F ratio of 1:1.1). The slight female preponderance may be due to the fact that females are more health conscious are usually the care givers to patients and thus closer to health facilities.

Cataract is opacification or thickening of the lens within the globe and it is a leading cause of blindness worldwide^{4,5}.On

ultrasound scan it is seen as increased lens wall thickness and or echogenicity (Fig 1).In our study, cataract was the commonest finding (80%). This is not surprising considering the fact that it is a common pathology especially in the elderly. This is similar to studies done by Marco Mendes et al in which 84% of subjects studied had cataract⁶.



Figure 1: Mature cataract of the right eye.

In vitreous degeneration (fig 2), freely mobile cholesterol crystals appear as punctate or membranous echogenicities in the vitreous body⁷. Usually they are asymptomatic but may present as floaters⁸. Fifty seven percent of patients evaluated had vitreous degeneration this is similar to 77.5% of patients with vitreous lesions as reported by Mendes et al⁶.Vitreous degeneration was bilateral in 60% and unilateral in 40% of patients evaluated respectively. Unilateral cases of vitreous degeneration occurred on the right as frequent as on the left eye. In this study, vitreous degeneration was noted to be common in cataractous eyes.

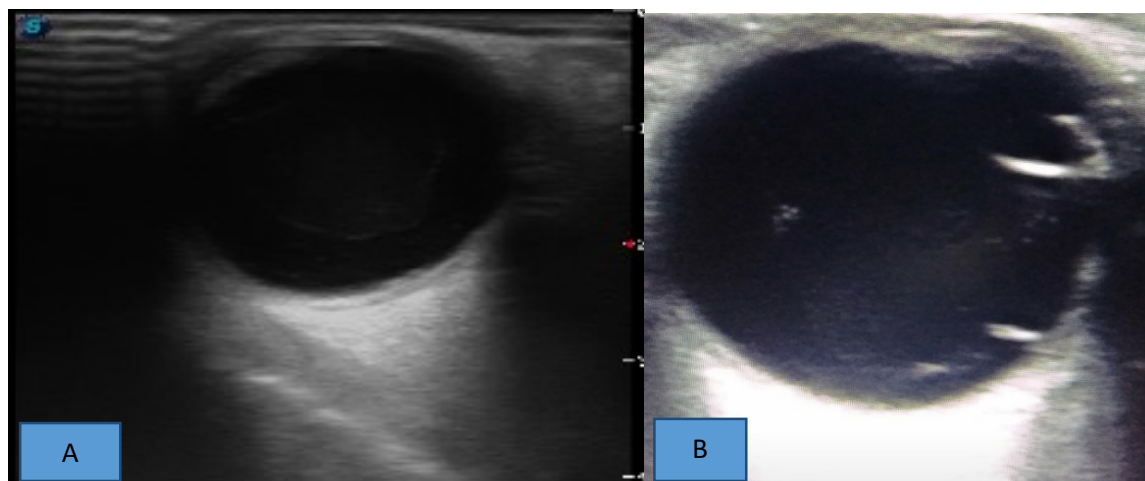


Figure 2: Membranous (A) and punctate (B) echogenicities in the vitreous humor due to vitreous degeneration.

Ectopic lentis is a malposition or dislocation of the lens of the eye secondary to dysfunction or disruption of zonular fibres. It could be post traumatic, post infective, hereditary or could be seen in syndromic disorders like Ehlers-Danlos and Marfan’s

syndromes. Five percent of our subjects had unilateral ectopia lentis, all were post traumatic in agreement with studies done by polo et al⁹. In this study they were found to be post assault and couching.

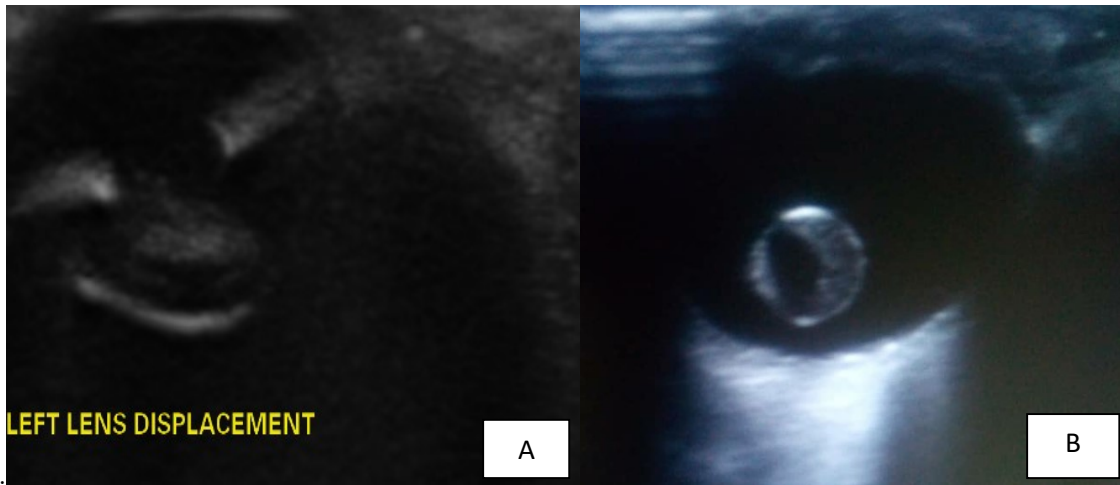


Figure 3: Subluxation (A) and dislocation (B) of the crystalline Lens in to the vitreous bodies respectively.

Choroidal detachment is separation of the choroid from the underlying sclera due to the accumulation of fluid in the suprachoroidal space. This could be due to ocular hypotony, increase in intraocular pressure, post traumatic and with ocular tumours.¹⁰ On B-mode ultrasound, it appears as detachment sparing the optic disc. Fourteen (11.7%) cases of choroidal detachment were identified in this study.

(10%) cases were identified in this study and they were post traumatic or due to high myopia.

Contrary to study done by Polo et al⁹, retinal detachment cases were more than choroidal detachment in this study.

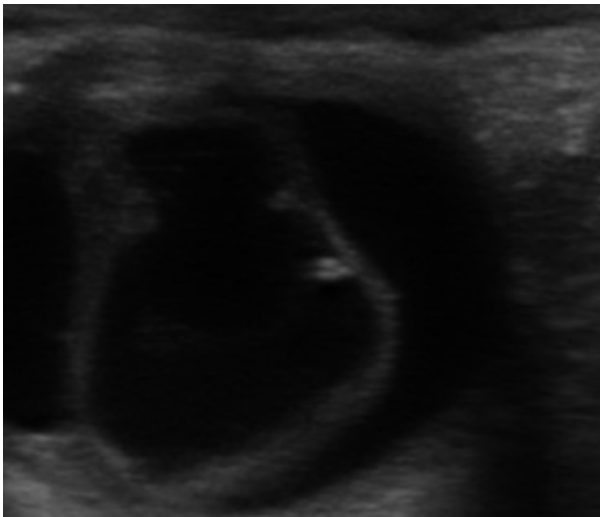


Figure 4: Choroidal detachment

Retinal detachment is the separation of neurosensory retina from the underlying pigment epithelium in association with accumulation of fluid in the potential subretinal space. Predisposing factors to retinal detachment are trauma, high myopia, positive family history and retinal detachment in the other eye¹¹. On ultrasonography retinal detachment is identified as a V-shaped echogenic membrane which is attached to the optic disc and ora serrata (figure 5). Twelve

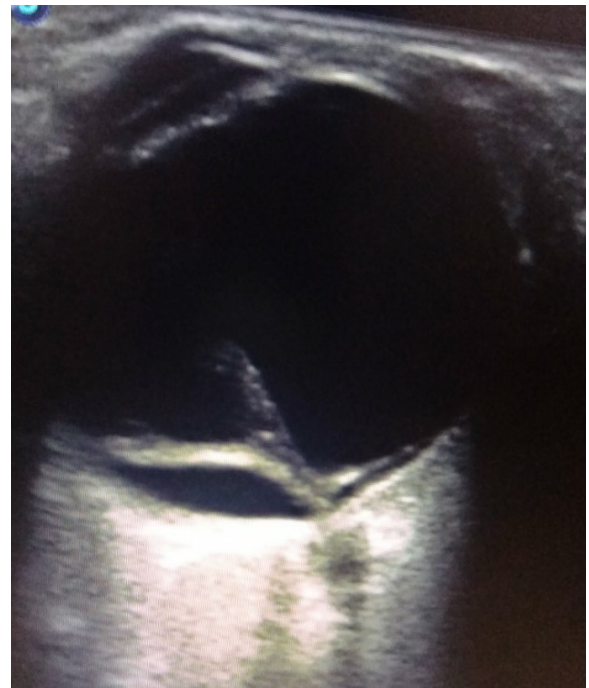


Figure 5: Retinal detachment

Posterior vitreous detachment occurs when the vitreous a jelly-like substance in the posterior segment of the eye liquefies, shrinks and pulls away from the underlying retina. It is usually asymptomatic. The posterior vitreous or hyaloid

detachment appears on ultrasound as a thin membrane paralleling the posterior surface of the globe⁸ (Figure 6). In comparison with retinal detachment, it is thinner, less echogenic, more mobile and not tethered to the optic nerve¹², eight cases (6.7%) were seen in the studied population.

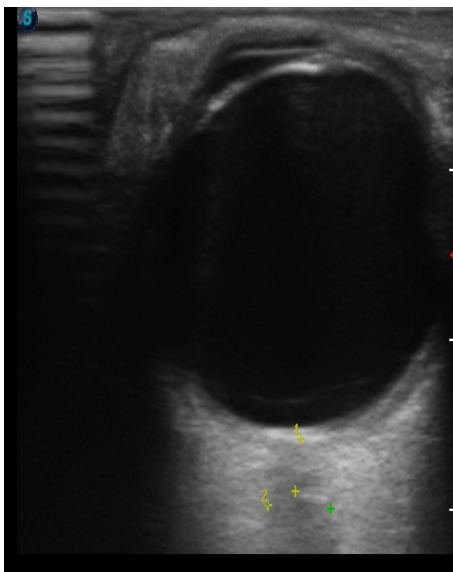


Figure 6: Posterior vitreous detachment.

Optic disc drusen is a benign congenital anomaly of the optic nerve characterized by deposition of calcified hyaline bodies on the optic nerve heads¹³. It occurs in 0.4% to 20% of population and may be bilateral in 67% - 91% of cases⁹. It is identified as echogenic focus on the optic nerve head. Twelve cases (10.0%) were noted in the course of study. This is in keeping with study done by Friedman et al¹⁴. It was bilateral in all cases in keeping with findings of Poloet al⁹ and Tugcu et al¹³.

Phthisis bulbi is an end stage eye. The globe is shrunken, distorted, echogenic with calcific foci. It has variety of causes like severe infection and trauma¹⁵. Three (2.5%) patients were seen and as in work done by Bell et al¹⁶, they were post infective and traumatic.

Retinoblastoma is a small round-cell tumour arising from neuroepithelial cells. It is the most common childhood intraocular malignancy¹⁷, occurring at a median age of 18 to 24 months¹⁷. Retinoblastoma was diagnosed in 2 females aged 17 & 21 months representing 1.7% of cases. They were unilateral in both cases; in keeping with the fact that unilateral retinoblastoma is more common¹⁸. Echogenic soft tissue masses protruding into the vitreous from the retina were seen (figure 7).

Calcific foci and increase blood flow on Doppler interrogation were also noted within the masses in keeping with findings by Katse et al¹⁷.



Figure 7: Retinoblastoma

Panophthalmitis: This is due to acute suppurative infection of the globe, which may occur after trauma and ophthalmological procedures¹⁵. It is the inflammation of all the coats of the eye and its contents. The only case we had in this study was postsurgical.

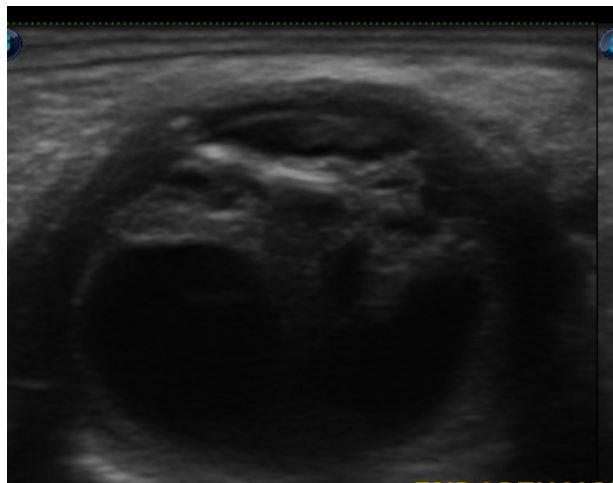


Figure 8: Panophthalmitis

Optic disc Coloboma is a well-defined excavation in the optic nerve head usually located inferiorly with an intact superior neuroretinal rim¹⁹. Ultrasound evaluation reveals a focal posterior defect in the globe with vitreous herniation. In this study, Coloboma was an incidental unilateral finding in a patient evaluated for cataract (0.8%). This is as noted in study by Barkovich AJ²⁰ in which an incidence of 0.5 -7.5 per 10,000 births was recorded.

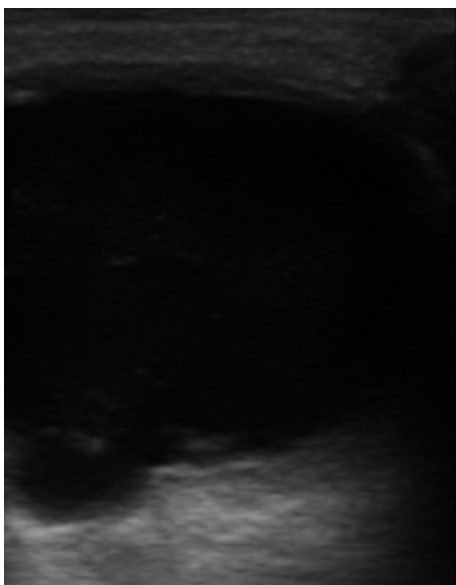


Figure: 9: Coloboma

VI. CONCLUSION

B-mode sonography of the eye is a veritable tool in imaging of the eye.

Ultrasound evaluation is ideal for ocular evaluation. Varied intraorbital and intraocular lesions are readily assessed.

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