

## B-SCAN ULTRASONOGRAPHY BEFORE SURGERY IN EYES WITH ADVANCED CATARACTS: A USEFUL PROGNOSTIC TOOL

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### HOW TO CITE THIS ARTICLE:

Jatin Garg, Eva Tirkey, Shashi Jain, Sujata Lakhtakia, Anamika Tiwari. "B-Scan Ultrasonography before Surgery in Eyes with Advanced Cataracts: A Useful Prognostic Tool". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 37, May 07; Page: 6372-6377, DOI: 10.14260/jemds/2015/926

**ABSTRACT: BACKGROUND:** Ocular ultrasonography is an important tool for evaluating the posterior segment in eyes with opaque media. In cases with dense cataract, where posterior segment evaluation by ophthalmoscopy is not possible, B-scan ultrasonography before surgery can help in surgical planning and guiding the expectations of patients. **PURPOSE:** To determine the relevance and prevalence of posterior segment abnormalities in patients with dense cataracts prior to surgery by ultrasonography. **DESIGN:** Prospective diagnostic study. **METHODS:** Diagnostic B-scan ultrasound was performed on 158 eyes of 132 patients with dense cataract precluding visualization of fundus on ophthalmoscopy from January 2013 to December 2013. Patients were divided in two groups, traumatic (22) and non-traumatic (136). Patients in the age range of 1 to 79 years of both sexes were included. Detailed history and some basic eye examination techniques, like slit lamp and tonometry were done. Patients having already posterior segment lesions and those who had previous history of ocular surgery were excluded from the study. **RESULTS:** 26(16.4%) patients, out of total 158 patients, had posterior segment lesions. Among traumatic group of 22 patients, 15(68.1%) had positive posterior segment lesions, while only 11(8%) patients in the non-traumatic group of 136 patients had positive posterior segment lesions. Out of the 26 positive cases, retinal detachment was found in 8(5%) patients, 7(4.4%) had posterior vitreous detachment, 7(4.4%) had vitreous hemorrhage, 2(1.26%) had retinal detachment with vitreous hemorrhage, 1(0.63%) had asteroid hyalosis, 1(0.63%) had intra-ocular foreign body. **CONCLUSION:** We concluded that B-scan ultrasound has significant importance in the preoperative evaluation of patients with dense cataracts to detect pathologies that may influence the surgical strategy and the postoperative visual prognosis. **KEYWORDS:** Ultrasonic B-Scan, Cataract, Posterior Segment lesion, Trauma.

**INTRODUCTION:** Ultrasound is an oscillating sound pressure wave with a frequency greater than the upper limit of the human hearing range. In 1880, French Scientist Curie brothers described the "Piezoelectric Phenomenon" upon which the current diagnostic ultrasound is based.<sup>[1]</sup> Ultrasound technology, also known as sonar, echography or acoustic imaging, was developed during world war-I as a method of detecting under water objects, including submarines.<sup>[2]</sup> Mundt and Hughes first reported the use of ultrasound in ophthalmic diagnosis in 1956.<sup>[3]</sup> They utilized A-scan mode. Two years later, Baum and Greenwood described B-scan ophthalmic ultrasonography.<sup>[4]</sup> The first commercially available B-scan was developed by Coleman in 1970's. In ophthalmic ultrasonic examination, frequencies used lie mostly in the range from 5 MHz to 20 MHz.<sup>[5]</sup>

B-Scan Ultrasonography is an important tool for evaluating the posterior segment in eyes with opaque media and provides a method of assessing the structural changes in the posterior segment of the eye in such patients.<sup>6</sup> The ability to examine the posterior segment of the eye accurately in patient in dense cataracts, is essential before surgery to aid surgical planning and guide the expectations of patients.

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The purpose of the study was to evaluate the usefulness of diagnostic B-scan ultrasound and to know the prevalence of posterior segment abnormalities, in patients with dense cataracts prior to surgery by ultrasonography.

**PATIENTS AND METHODS:** Present study was a prospective diagnostic study for assessment of posterior segment lesion at pre-operative stage, carried out in Department of Ophthalmology, S. S. Medical College, Rewa for a period of twelve months from January 2013 to December 2013. Diagnostic B-scan ultrasound was performed on 158 patients with dense cataract, precluding visualization of fundus on ophthalmoscopy. On the basis of previous history of ocular trauma, patients were divided into two groups-traumatic & non-traumatic. Detailed history, slit lamp examination and tonometry were done in both groups of patients. Patients in the age range of 1 to 79 years of both sexes were included and those already having posterior segment lesions and previous history of ocular surgery were excluded from the study. B-scan ultrasonography was done using Sonomed E-Z scan AB 5500 machine. The examination was performed with patient in supine position, using a coupling jelly and the transducer head held over a closed eyelid. Both eyes were scanned serially in transverse and horizontal axial scans. High gain (90-100 dB) and low gain (60 to 70dB) sensitivity were selected during ultrasonography.

**OBSERVATIONS AND RESULTS:** Out of a total of 158 patients, 22(13.93%) patients were of post-traumatic cataract and 136(86.07%) were of non-traumatic cataract. Patients of both sexes in age range 1 to 79 years were included (Table-1).

Age (Years)	Non-Traumatic Group (136 Patients)		Traumatic Group (22 Patients)		Total Patients (158 Patients)
	MALE	FEMALE	MALE	FEMALE	
1-9	3 (2.2%)	4 (2.94%)	1 (4.54%)	1 (4.54%)	9 (5.69%)
10-19	1 (0.73%)	1 (0.73%)	8 (36.36%)	3 (13.63%)	13 (8.22%)
20-29	2 (1.47%)	2 (1.47%)	2 (9.09%)	1 (4.54%)	7 (4.43%)
30-39	1 (0.73%)	2 (1.47%)	2 (9.09%)	1 (4.54%)	6 (3.79%)
40-49	4 (2.94%)	6 (4.41%)	1 (4.54%)	0 (0.0%)	11 (6.96%)
50-59	20 (14.70%)	23 (16.91%)	1 (4.54%)	0 (0.0%)	44 (27.84%)
60-69	21 (15.44%)	27 (19.85%)	0 (0.0%)	1 (4.54%)	49 (31.01%)
70-79	9 (6.61%)	10 (7.35%)	0 (0.0%)	0 (0.0%)	19 (12.02%)
<b>Total</b>	<b>61 (44.85%)</b>	<b>75 (55.15%)</b>	<b>15 (68.18%)</b>	<b>7 (31.82%)</b>	<b>158 (100%)</b>

Table 1: Age and Sex Distribution

In the non-traumatic cataract group of patients, most of the patients (66.91%) were in the range of 50 to 69 years of age as senile cataract is common in this age group. In traumatic cataract group, most of the patients (50%) were in the range of 10 to 19 years, the age group where trauma is more common. Males (68.18%) outnumbered females (31.82%) in traumatic group as males are more involved in outdoor activities and thus more prone to ocular trauma (Table 1).

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Out of a total of 158 eyes, Posterior segment lesions were seen in 26(16.45%) eyes (Table-2). 11(8.08%) cases belonged to the non-traumatic cataract group and 15(68.18%) to traumatic cataract group.

Posterior Segment Lesions	Non-Traumatic Cataract Group (136 Pts)	Traumatic Cataract Group (22 Pts)	Total Patients (158 Pts)
Retinal detachment	3(2.20%)	5(22.72%)	8(5.06%)
Posterior vitreous detachment	4(2.94%)	3(13.63%)	7(4.43%)
Vitreous hemorrhage	2(1.47%)	5(22.72%)	7(4.43%)
Retinal detachment + Vitreous Hemorrhage	1(0.73%)	1(4.54%)	2(1.26%)
Asteroid Hyalosis	1(0.73%)	0(0.0%)	1(0.63%)
Intra-ocular foreign body	0(0.0%)	1(4.54%)	1(0.63%)
<b>Total</b>	<b>11(8.08%)</b>	<b>15(68.18%)</b>	<b>26(16.45%)</b>

**Table 2: Ultrasound B-scan findings**

Out of the 26 positive cases, 8(5.06%) had retinal detachment (Fig. 1), 7(4.43%) had posterior vitreous detachment (Fig. 2), 7(4.43%) had vitreous hemorrhage (Fig. 3), 2(1.26%) were retinal detachment with vitreous haemorrhage (Fig 4) while asteroid hyalosis (Fig. 5) and intra-ocular foreign body (Fig. 6) were found in 1(0.63%) eye each (Table 2).

**DISCUSSION:** In developing countries like India, Cataract is an important cause of blindness and due to lack of proper awareness, many patients presents with advanced cataracts that precludes visualization of fundus prior to cataract surgery. Such visualization is considered important to provide accurate prognosis for vision after cataract surgery. Under such circumstances ultrasonographic examination can provide information regarding such abnormalities. Over the last 30 years, ultrasonography has greatly advanced which has enabled us to study posterior segment of the eye even in the presence of opaque media like dense cataract.

Posterior segment of a total of 158 eyes in 1-79 years old patients, divided into two groups, were examined under B-scan ultrasound. Non-traumatic group constitutes majority of the patients (86.07%) and a small number (13.93%) belongs to traumatic cataract group. Similar groups in different age ranges have also been discussed in other studies.<sup>[7-10]</sup> In traumatic cataract group, 50% of the patients were 10-19 years old, correlating with the age range when children are more active and involved in outdoor games and other activities.

Findings of posterior segment lesions (16.4%) in this study were similar to other published studies and very much less than that in the study by Haile and Mengistu who found a 66% incidence of detectable abnormalities.<sup>[8,10,11,12]</sup> However, the latter study included cases with orbital pathology and clear media (10%) and it was not clear whether ultrasonography was being performed routinely on all eyes prior to cataract surgery or only on eyes where intraocular pathology was suspected. In our study 8.08% patients of non-traumatic cataract group and 68.18% patients in traumatic cataract

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group had posterior segment lesions. Qureshi et al,<sup>[10]</sup> reported posterior segment lesions in 8.64 % non-traumatic cataract patients and in 54.93 % patients with traumatic cataract. Ali and Rehman,<sup>[7]</sup> reported posterior segment lesions in 11% non-traumatic cataract patients and in 65.85% patients with traumatic cataract.

Retinal detachment (22.72%) in traumatic cataract patients and (2.2%) in non-traumatic cataract patients was similar to that reported by Qureshi et al,<sup>[10]</sup> who found retinal detachment 21.12% in traumatic cataract and 1.47% in non-traumatic cataract patients; and other study,<sup>[7]</sup> found retinal detachment in 29.26% of traumatic cataract and 3.3% of non-traumatic cataract patients. 13.63% patients in traumatic group and 2.94% patients in non-traumatic group were found to have posterior vitreous detachment (PVD), which is closer to an earlier report,<sup>[10]</sup> of 9.86% in traumatic cataract and 1% in non-traumatic cataract patients. Vitreous hemorrhages were present in 22.72% traumatic cataract patients and 1.47% in non-traumatic cataract patients. Other investigators reported vitreous hemorrhage in traumatic cataract group as 15.49% and 18.3%,<sup>[7,10]</sup> whereas in non-traumatic cases vitreous hemorrhage was present in 1.91% cases.<sup>[10]</sup> Retinal Detachment along with vitreous hemorrhage is found in 4.54% of traumatic cataract and 0.73% of non-traumatic cataract. A lower incidence of asteroid hyalosis (0.73%) was noted in non-traumatic cataract patients as compared to that reported by Qureshi et al,<sup>[10]</sup> (1.77%) and Ali and Rehman,<sup>[7]</sup> (2.93%) in their study but higher incidence was noted as compared to other study,<sup>[9]</sup> (0.4%). Intraocular foreign body was found in 4.54% traumatic cataract patients which is less than earlier reports (8.45%).<sup>[4]</sup>

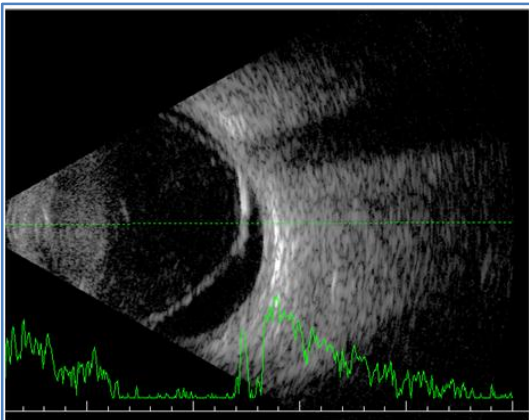
**CONCLUSION:** We concluded that two dimensional B-scan ultrasound is simple, safe, non-invasive, cost-effective, easily available, reproducible and quick investigative technique which proves accurate and beneficial in opaque ocular media to detect posterior segment pathologies. B-Scan ultrasonography should be performed routinely in pre-operative assessment of cataract patients to diagnose pathologies of posterior segment that may influence the surgical strategy and visual prognosis of patients after cataract surgery.

### REFERENCES:

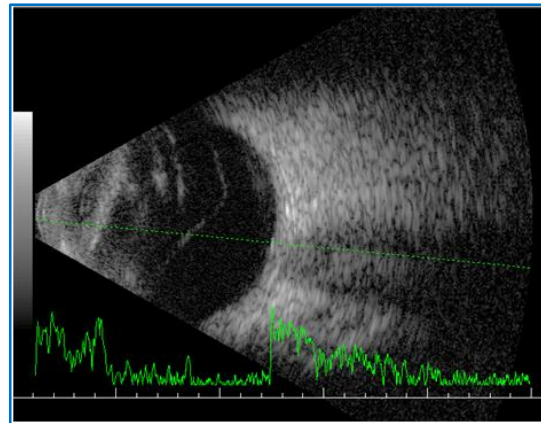
1. Athey PA, McClendon L. Diagnostic Ultrasound for Radiographers. 1st ed. Multimedia Publishing Inc: Denver, 1983.
2. Richard L, Hart LJ. Ultrasound Diagnosis of the eye and orbit; principle and practice of ophthalmology. 1997; 5: 98.
3. Mundt GH Jr, Hughes WF Jr. Ultrasonics in ocular diagnosis. Am J Ophthalmol. 1956; 41: 488-98.
4. Baum G, Greenwood I. The application of ultrasonic locating technique to Ophthalmology. Arch Ophthalmol. 1958; 60: 263-79.
5. Newell FW. Ophthalmology: principles and concept. 7th ed. St Louis: CV Mosby Company. 1992.
6. Bello TO, Adeoti CO. Ultrasonic assessment in pre-operative cataract patients. Niger Postgrad Med J. 2006; 13 (4): 326-8.
7. Ali SI, Rehman H. Role of B-scan in preoperative detection of posterior segment pathologies in cataract patients. Pak J Ophthalmol 1997; 13 (4): 108-112.
8. Anteby II, Blumenthal EZ, Zamir E, Waindim P. The role of preoperative ultrasonography for patients with dense cataract: a retrospective study of 509 cases. Ophthalmic Surg Lasers 1998; 29 (2): 114-8.

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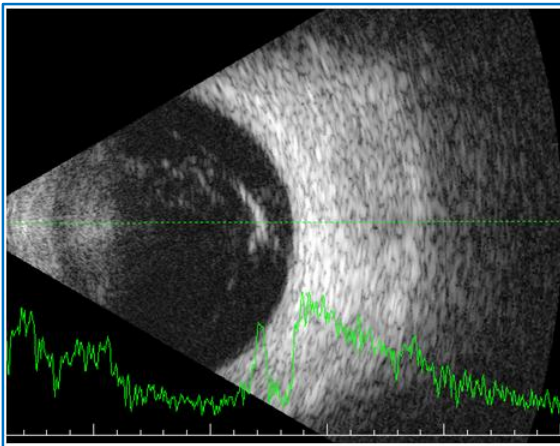
9. Correa. Ultrasound findings in patients with dense cataracts. *Arq Bras Ophthalmol* 2002; 65: 609-13.
10. Qureshi MA, Laghari K. Role of B-Scan Ultrasonography in pre-operative cataract patients. *Int J Health Sci (Qassim)* 2010 January; 4 (1): 31-7.
11. Haile M, Mengistu Z. B-scan ultrasonography in ophthalmic diseases. *East Afr Med J.* 1996; 73 (11): 703-7.
12. Salman A, Parmar P, Vanila CG, Thomas PA, Nelson Jesudasan CA. Is ultrasonography essential before surgery in eyes with advanced cataracts? *J Postgrad Med.* 2006; 52: 19-22.



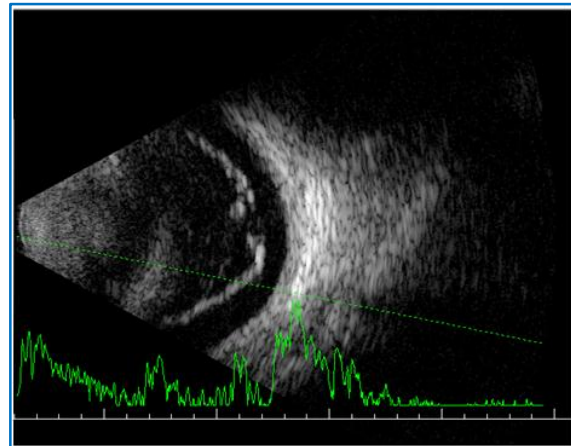
**Fig. 1: B-Scan ultrasonography of the Globe shows a retinal detachment**



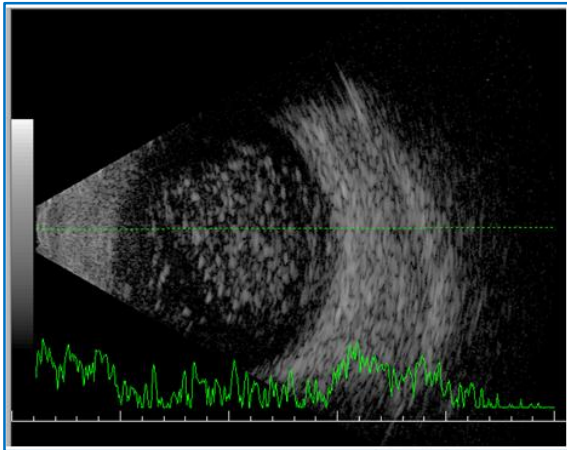
**Fig. 2: B-Scan ultrasonography of the globe shows posterior vitreous detachment**



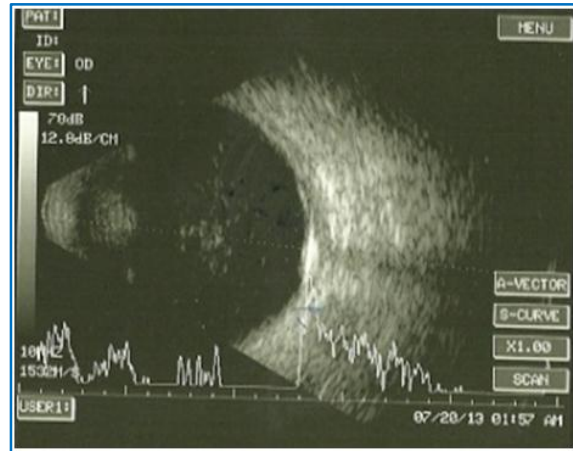
**Fig. 3: B-Scan ultrasonography of the globe shows Vitreous Hemorrhage**



**Fig. 4: B-Scan ultrasonography of the globe shows Retinal Detachment with Vitreous Hemorrhage**



**Fig. 5: B-Scan ultrasonography of the globe shows asteroid hyalosis**



**Fig. 6: B-Scan ultrasonography of the globe shows intra ocular foreign body**

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#### **FINANCIAL OR OTHER**

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Date of Submission: 10/04/2015.  
Date of Peer Review: 11/04/2015.  
Date of Acceptance: 28/04/2015.  
Date of Publishing: 05/05/2015.