

## Evaluation of the relation between pre-operative b-scan findings and post-operative Fundus findings in patients with opaque media undergoing cataract surgery

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### Abstract

**Objective:** To compare the pre-operative B-scan findings with the post-operative Fundus findings taken as Gold standard in patients with opaque media undergoing cataract surgery.

**Materials and Methods:** This was a longitudinal, cross-sectional study conducted at Department of Ophthalmology, Dr. SMCSI medical college, Karakonam. Pre-operatively Visual acuity, anterior segment examination, intraocular pressure and B scan were done. All patients underwent uneventful Small incision cataract surgery. Post operative Fundus evaluation was performed and compared with the pre operative B scan findings to analyze the sensitivity and specificity of B scan.

**Results:** Pre-operatively, 365 (71.6%) eyes had normal B scan findings. In 283(55.5%) eyes normal B scan findings corresponded with a normal Fundus picture. In 125(24.5%) eyes positive findings on B scan corresponded with positive Fundus findings. Positive retinal pathologies detected were Posterior vitreous detachment, retinal detachment, vitreous hemorrhage, asteroid hyalosis and posterior Staphyloma. In 102 (20%) eyes B scan findings did not correspond to Fundus findings. Sensitivity and specificity were calculated. Specificity was 100% and sensitivity was 55%.

**Conclusion:** B-scan is a valuable prognostic tool for ruling out posterior segment ocular pathology in opaque media but it is not a sensitive test for diagnosis of those pathologies.

**Keywords:** B-scan, Mature cataract, Visual Acuity, Retinal pathology.

### Introduction

Blindness is a cause and also an outcome of poverty.<sup>1,2</sup> One of the most common cause of blindness globally is cataract. It is the leading cause of reversible blindness and visual impairment around the world. Blindness from cataract is common in populations with low socioeconomic status and in developing countries and less commonly in developed countries. World Health Organization (WHO) defined cataract as a visual acuity (VA) of less than 3/60 in the better eye.<sup>3,4</sup> In the year 1990 approximately, 37 million people were found to be blind worldwide, 40% of them mainly due to cataract. Every year, 1-2 million people go blind. Every five seconds, atleast one person round the world goes blind, and a child every minute. It is observed that 90% of blind people live in the economically poor areas in the developing world, and if proper interventions are not carried out, the number of people with blindness will increase by the year 2020.<sup>5</sup> Current statistics show that an estimated 20 million people are blind from this condition. Cataracts cannot be prevented, but currently available treatment like surgery can restore near normal vision in those who have cataract.

Pre-operative work-up of a cataract patient includes meticulous clinical examination, as well as in diagnosis with the help of machines like B scan ultrasound, otherwise called ophthalmic ultrasound. B Scan ultrasonography is one of the most efficient, reliable, Non-invasive and inexpensive diagnostic method for evaluation of ocular pathology. The discovery of modern ultrasound dates back to 1793, when it was observed by Lazzaro Spallanzani (Italy) that bats utilize echoes of their whistles to orient while flying in dark.<sup>6</sup> One of the first clinical uses of time-

amplitude technique (the A-scan) in problems in ocular diagnosis was presented in 1957 by Oksala and Lehtinen.<sup>7</sup> Both A scan and B Scan modes are important for diagnosis of posterior segment pathology. Echography has an equally important role in evaluation of possible Fundus lesions. A-scan (Amplitude) provides unique capacity to characterize the internal structure of intraocular tumors that is highly correlated to the tissue characteristics of the lesion. The quantitative (spike height and regularity) and kinetic (rapid spike movement) criteria provide high specificity and sensitivity in the evaluation of ocular lesions.<sup>8</sup> B (Brightness) mode is useful for better demonstration of shape and topographic relationship of a lesion in the posterior segment. It provides cross sectional display of the diseased tissues and is valuable in detecting unsuspected posterior segment disease. B scan ultrasonography is one of the important techniques for the clinical assessment of various ocular and orbital diseases. With the understanding of the indications for ultrasonography and proper examination technique, a vast amount of information can be gathered, which would not be possible with clinical examination alone.<sup>9</sup> Ocular B-mode ultrasonography (US) is an important tool for clinical assessment of a variety of ocular diseases. When ophthalmoscopy is not possible, mainly due to opacification of the transparent media (e.g., mature cataract or vitreous haemorrhage), ultrasound can guide in diagnosing disease and choosing treatment. Superficial location of the eye, its cystic composition, and the advent of high-frequency ultrasound make sonography ideal for imaging the eye.<sup>10</sup>

**Aim of Study**

To compare the pre-operative B-scan findings with the post-operative Fundus findings taken as Gold standard in patients with opaque media undergoing cataract surgery.

**Materials and Methods**

1. Study design: Longitudinal study
2. Study setting: Department of Ophthalmology, Dr. SMCSI Medical College, Karakonam
3. Study period: March 2017 to June 2018
4. Study population: All patients visiting Ophthalmology out-patient department
5. Inclusion criteria: All patients undergoing cataract surgery whose Fundus evaluation is not possible pre-operatively due to opaque media
6. Exclusion criteria: Patients who undergo surgery related complications
7. Data collection:

**Tools and technique**

Patients underwent a comprehensive eye examination preoperatively and one week post operatively.

This comprised visual acuity assessment, both uncorrected (UCVA) and best corrected (BCVA) using Snellen’s Chart for distant vision, B scan ultrasound pre-operatively and Fundus finding post-operatively, recorded using +90D lens and slit-lamp biomicroscopy.

**Sample size calculation:** Sample size was 510 eyes

The formula used was:  $n = 4 * P * Q / d^2$

**Data analysis:** Data was collected and entered using Microsoft Excel software. Sensitivity and specificity were calculated.

**Results**

**Demographic Profile**

**Gender:** Out of 510 eyes included in this study, 192(37.6%) were male, 318(62.4%) female

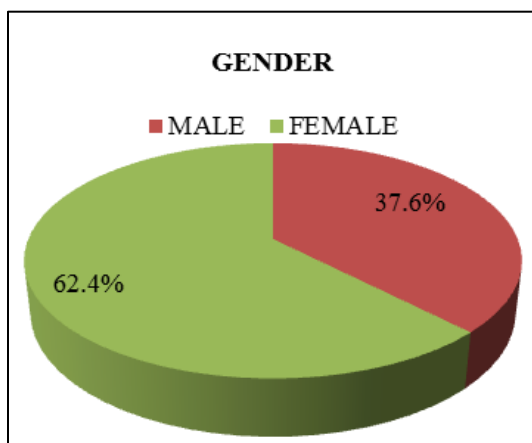


Fig. 1: Male to female ratio

**Age**

Patients enrolled for the study ranged in age from 37 to 89 years. They were categorized into four groups.

**Table 1:** Age distribution of study participants (N=510)

Age	Frequency (N= 510)	Percentage
<50	26	5.1%
50-60	122	23.9%
60-70	236	46.3%
>70	126	24.7%

**Pre-operative Visual acuity**

Distribution of study participants based on their pre-operative visual acuity which was assessed using Snellens chart and converted to Logmar.

**Table 2:** Pre-Operative visual acuity

Pre-operative va	Frequency (n=510)	Percentage
<1.7	48	9.4%
1.7	112	22.0%
>1.7	35	68.6%

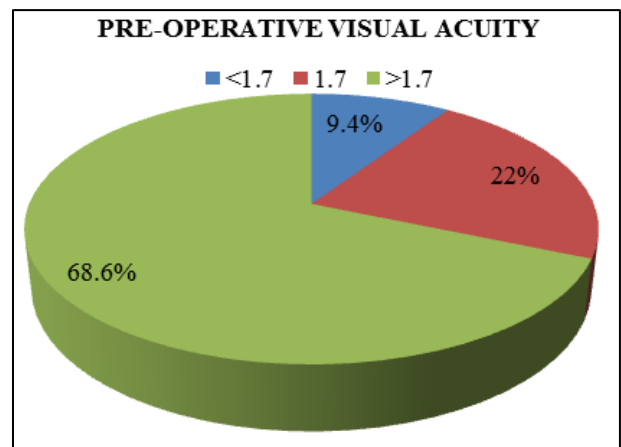


Fig. 2: Pre-Operative visual acuity

Here visual acuity has been categorized into three. Visual acuity less < 1.7 as 0, 1.7 as 1 and >1.7 as 2(according to log mar where 1.7 corresponds to 1/60 on a Snellen’s chart, > than 1.7 denotes VA corresponding to hand movements and counting fingers).

**B scan Ultrasound**

Pre-operatively 365 (71.6%) eyes had normal B scan findings. In 283 (55.5%) eyes normal B scan findings corresponded with a normal Fundus picture. In 125 (24.5%) eyes positive findings on B scan corresponded with positive Fundus findings.

**Table 3:** B Scan Findings

B scan findings	Frequency (n=510)	Percentage
Normal	365	71.6%
Pvd	130	25.5%
Retinal detachment	7	1.4
Vitreous hemorrhage	6	1.2
Asteroid hyalosis	1	0.2
Posterior staphyloma	1	0.2

**Post-operative Fundus findings**

Among the 510 eyes of the study participants, normal Fundus picture was seen in 283 (55.5%) eyes which corresponded with the pre-operative b scan findings. In 125 (24.5%) eyes positive findings on B scan corresponded with positive Fundus findings. In 102 (20%) eyes B scan findings did not correspond to Fundus findings.

**Table 4:** Post-Operative fundus findings

Post-op fundus findings	Frequency (n=510)	Percentage%
Normal	283	55.5
Pvd	102	20
Retinal detachment	7	1.4
Vitreous hemorrhage	6	1.2
Diabetic retinopathy	51	10
Chorioretinal atrophy	14	2.7
Glaucomatous disc changes	23	4.5
Armd	12	2.3
Rp	1	0.2
Foveal atrophy	2	0.4
Posterior staphyloma	1	0.2
Erm	1	0.2
Optic atrophy	5	1
Cme	1	0.2
Asteroid hyalosis	1	0.2

**Discussion**

Cataracts are an important cause of blindness in countries like India and many of these cases have advanced cataracts that obstruct visualization of Fundus prior to cataract surgery. This visualization is considered important to provide accurate prognosis for vision after cataract surgery. Posterior segment pathology present in the Fundus cannot be visualized due to media opacity. In such circumstances ultrasonographic examination can provide information regarding such abnormalities. Numerous studies were conducted around the world in this regard.

B scan has proven to be one of the most useful device for the accurate evaluation of posterior segment pathologies in all cases with opaque media. It has become the indispensable diagnostic tool that has increased our ability to detect and differentiate many ocular diseases especially in opaque media.

The prime objective of our study was to analyse the posterior segment findings using B scan ultrasonography in patients with mature, dense cataracts prior to undergoing cataract surgery. Way back as early as 1983, ultrasound was used to detect pathologies of posterior segment as is seen in a study done by Das et al.<sup>11</sup> Their diagnosis was found to be accurate in 86% of cases where ultrasound was used. Similar results were seen in other studies done in various

centres across India. In a study by Kumar et al, patients with systemic and ocular risk factors showed high incidence of posterior segment pathology,<sup>12</sup> while in our study association with systemic risk factors were not considered.

Out of the 510 eyes with mature cataracts and hazy media or no view of the posterior segment, 365(71.6%) eyes had normal B scan findings, 283 (55.5%) eyes had normal B scan findings that corresponded with a normal post operative Fundus picture, while 125(24.5%) eyes had positive B scan findings which corresponded with Fundus findings. The most common posterior segment pathology detected in this study was posterior vitreous detachment 130 eyes (25.5%), which differs slightly from other studies done by Mohod et al where retinal detachment was the most common abnormality detected.<sup>13</sup> In another study by Kalpana et al diabetic retinopathy was the most common finding.<sup>14</sup> In their study the occurrence of significant posterior segment abnormalities on ultrasonography in 680 (55%) eyes with cataract which was more than the incidence reported in study of Anteby et al<sup>15</sup> (19.6%) and less than that in the study by Haile and Mengistu, who found 68% incidence of detectable abnormalities.<sup>16</sup> A study by Saxena et al showed that out of 200 patients, positive findings i.e., posterior segment lesions were seen in 23(12%) patients, but

they were categorized into traumatic and non-traumatic group which was not done in this study.<sup>17</sup>

In our study, post-operatively Fundus was evaluated using 90 D lens and slit-lamp biomicroscopy and findings recorded. Other studies also noted that post-operatively, on Fundus examination, posterior segment abnormalities other than the ones detected by B scan were seen. These were diabetic retinopathy changes, glaucomatous changes, age-related macular degeneration, retinitis pigmentosa, optic atrophy, foveal atrophy, and CME and epiretinal membrane. In 102 (20%) eyes B scan findings did not correspond to Fundus findings. Sensitivity and specificity were calculated. Specificity was 100% and sensitivity was 55%.

Detection of posterior segment lesions by B scan in a study by Kumar et al was lower (14%) than our study, while it was 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.

In India, several similar studies were conducted where parameters analyzed differed when in comparison to our study. In a study by Vijaya et al, post-operative visual outcome assessed was not favorable due to surgery-related complications.<sup>18</sup> Nanda et al discussed in their study about vitreous hemorrhage being the most common posterior segment pathology detected on B scan followed by retinal detachment.<sup>19</sup> The increase in vitreous hemorrhage was attributed to trauma as the cause.

## Conclusion

B-scan is a valuable prognostic tool for ruling out posterior segment ocular pathology in opaque media but it is not a sensitive test for diagnosis of those pathologies.

**Conflict of Interest:** None.

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