

**Evaluation of Posterior Segment in Advanced and Mature Cataract by B Scan Ultrasonography - A Prospective Study**N. Jayanthi<sup>1</sup>, S. Sivapriya<sup>2</sup>, Nikita N. Bhujang<sup>3</sup><sup>1</sup>Associate Professor, Government Medical College, Nandyal, Andhra Pradesh, India<sup>2</sup>Assistant Professor, Government Regional Eye Hospital, Kurnool, Andhra Pradesh, India<sup>3</sup>Post Graduate, Government Regional Eye Hospital, Kurnool, Andhra Pradesh, India

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**Abstract****Background:** Cataract is the most common preventable cause of bilateral blindness in India and the leading cause of vision loss in the elderly worldwide. It is also the primary cause of reversible blindness globally. Cataract refers to any opacity in the lens of the eye or its capsule, whether developmental or acquired.

B-scan ultrasonography is a powerful, safe, cost-effective, non-ionizing, and non-invasive diagnostic tool for evaluating the hidden posterior segment lesions in eyes with opaque media caused by corneal opacities, dense cataracts, or vitreous hemorrhage, which complicate the ophthalmic evaluation. B-scan ultrasound, a two-dimensional imaging system, is particularly useful when the fundus cannot be accessed through direct or indirect ophthalmoscopy, such as in the presence of dense cataracts. It is routinely performed preoperatively in cases of dense cataract to evaluate posterior segment abnormalities that may influence visual prognosis after surgery.

**Aim:** Evaluation of posterior segment pathology in opaque media due to mature and advanced cataract thus plan management and determine visual prognosis accordingly.**Objectives:**

- To evaluate the posterior segment pathology in patients with Mature and advanced cataract by B scan.
- To plan the management protocol based on B scan findings.
- To determine visual prognosis pre operatively.

**Materials and Methods:** This prospective study was conducted in 200 patients with mature and advanced cataract. Relevant details with history were collected. Detailed ophthalmic was done for classification into groups.**Results:** Out of 200 patients, 77 eyes were with Advanced IMSC, 90 eyes with MSC and 33 eyes with HMSC. Our findings demonstrated that B Scan ultrasonography is useful tool in evaluating posterior segment pathology in patients with advanced and mature cataract. In this study, the majority of patients (89.5%) had a normal B scan, indicating no significant abnormalities detected in most cases. Mild vitreous degenerations were observed in 3.5% of the patients, which is a common finding in the aging population and often not associated with severe visual impairment. Moderate vitreous degenerations were also found in 2.0% of the patients, while severe vitreous degenerations were observed in 1.0%, indicating a progression in the degenerative changes affecting the vitreous humor.**Conclusion:** This study concluded that B Scan ultrasonography should be used in pre-operative evaluation of advanced and mature cataract to diagnose hidden posterior segment pathology enhancing surgical planning and prognosis.**Keywords:** Advanced IMSC, MSC, HMSC, dense cataract, B scan ultrasonography, posterior segment evaluation.**DOI:** 10.25258/ijcpr.18.1.53

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**Introduction**

Cataract is the most common preventable cause of bilateral blindness in India and the leading cause of vision loss in the elderly worldwide. It is also the primary cause of reversible blindness globally. Cataract refers to any opacity in the lens of the eye

or its capsule, whether developmental or acquired. Advanced cataract includes nuclear sclerosis grade 3 and beyond, with or without cortical, anterior and/or posterior capsular, subcapsular opacification, which impedes the passage of light

rays. Mature cataract is characterized by the complete opacification of the lens cortex, turning it from transparent to pearly white. If left untreated, a mature cataract can progress to a hypermature stage, leading to the liquefaction of the cortex and the sclerotic nucleus floating in the bag of cortical fluid. This stage is known as Morgagnian hypermature cataract or the sclerotic type of hypermature cataract, where the cortex disintegrates, and the lens shrinks and hardens due to dehydration.

This lens opacification obstructs the passage of light rays to the retina, impairing visual perception. The COVID-19 pandemic has led to an increase in advanced cataract cases due to limited access to ophthalmic care, lack of awareness about elective surgeries, travel restrictions, and insufficient caregiver support. Consequently, the rise in advanced and mature cataract cases post-COVID-19 emphasizes the importance of performing B-scan ultrasonography for detailed posterior segment evaluation before cataract surgery.

B-scan ultrasonography is used to rule out significant retinal pathologies such as retinal detachment, posterior staphyloma, and vitreous hemorrhage, though it does not adequately assess finer pathologies.

Knowledge of posterior segment pathologies invisible on funduscopy aids surgeons in planning, executing, and explaining the postoperative visual prognosis to patients.

B-scan ultrasonography is a powerful, safe, cost-effective, non-ionizing, and non-invasive diagnostic tool for evaluating the hidden posterior segment lesions in eyes with opaque media caused by corneal opacities, dense cataracts, or vitreous hemorrhage, which complicate the ophthalmic evaluation.

B-scan ultrasound, a two-dimensional imaging system, is particularly useful when the fundus cannot be accessed through direct or indirect ophthalmoscopy, such as in the presence of dense cataracts. It is routinely performed preoperatively

in cases of dense cataract to evaluate posterior segment abnormalities that may influence visual prognosis after surgery.

**Materials and Methods**

The study will be performed in patients attending Ophthalmology outpatient department, Government Regional Eye Hospital, Kurnool with diminution of vision.

The relevant details of history and clinical examination of patient will be recorded in a specifically designed proforma after proper consent from the patient.

The history will be obtained with special attention to Advanced and mature cataract.

Detailed ophthalmic examination will be done consisting of: Visual acuity, Slit lamp examination, Fundus examination, A scan, B scan.

**Study design:** A prospective study.

**Duration of the study:** 2 years.

**Sample size:** 200 patients.

**Source of Data:** The main source of data for the study will be patients attending Regional Eye Hospital, Kurnool having advanced and mature cataracts.

**Inclusion Criteria:**

- All patients with mature senile cataract and advanced cataract attending Regional eye hospital, Kurnool.
- Patient who give consent for detailed ophthalmic examination and surgical intervention.

**Exclusion Criteria:**

- Patients with known posterior segment pathology
- Patients with prior ocular surgery
- Patients with history of Ocular trauma
- Pediatric cataract
- Complicated cataract.

**Results & Observation**

**Table 1: Distribution of patients based on age group**

Age Group	LE (Left Eye)	Percentage (LE)	RE (Right Eye)	Percentage (RE)	Total	Percentage (Total)
<40	1	0.96%	7	7.29%	8	4.0%
40-49	13	12.5%	10	10.42%	23	11.5%
50-59	18	17.31%	23	23.96%	41	20.5%
60-69	44	42.31%	40	41.67%	84	42.0%
70-80	26	25.0%	14	14.58%	40	20.0%
>80	2	1.92%	2	2.08%	4	2.0%
Total	104	100.0%	96	100.0%	200	100.0%

The distribution of the study population according to age and laterality of the affected eye shows a

varied pattern. The most affected age group is 60-69 years, with 42.0% of the total patients, split

nearly equally between the left eye (42.31%) and the right eye (41.67%). The age group 50-59 years follows, constituting 20.5% of the patients, with a slightly higher number of right eye (RE) cases (23.96%) compared to left eye (LE) cases (17.31%). Patients aged 70-80 years account for 20.0% of the total, with more left eye (25.0%) than right eye (14.58%) cases.

The age group 40-49 years comprises 11.5% of the total, with 12.5% LE and 10.42% RE cases.

Patients under 40 years and those over 80 years form the smallest groups, each representing 4.0% and 2.0% of the total patients, respectively.

Overall, the study indicates a higher prevalence of cataracts in older age groups, particularly between 60 and 69 years. Regular monitoring and early intervention are crucial for managing cataracts effectively in these age groups.

**Table 2: Distribution of patients based on Sex**

Sex	No. of patients	Percentage
Female	119	59.5%
Male	81	40.5%
Total	200	100.0%

Overall, 59.5% of the patients were female, and 40.5% were male in this study. This distribution indicates a higher prevalence of females among the patient population.

**Table 3: Distribution of Study Population According to Laterality of Affected Eye**

Eye Affected	No. of Patients	Percentage
LE (Left Eye)	104	52.0%
RE (Right Eye)	96	48.0%
Total	200	100.0%

The distribution of the study population based on the laterality of the affected eye shows that 52.0% of patients had their left eye (LE) affected, while 48.0% had their right eye (RE) affected. This relatively even distribution indicates that there is no

significant laterality preference in the occurrence of the condition being studied. Regular monitoring and appropriate interventions are essential for both eyes to ensure comprehensive care and optimal visual outcomes for all patients.

**Table 4: Distribution of Study Population Based on Pre-Operative Visual Acuity (V/A)**

Visual Acuity Range	LE (Left Eye)	RE (Right Eye)	Total	Percentage
PL+	53	52	105	52.50%
HM+	19	23	42	21.0%
CFCF	8	6	14	7.0%
CF 1MT	12	8	20	10.0%
CF 2MT	12	7	19	9.5%
Total	104	96	200	100.0%

The distribution of pre-operative visual acuity (V/A) among the study population shows significant variation, highlighting the severity of visual impairment in the patients.

The majority (52.50%) had a V/A categorized as PL+ (Perception of Light Positive), indicating they could perceive light. This was followed by 21.0% of patients with HM+ (Hand Movements Positive),

where they could detect hand movements. Smaller groups included those with CF 1MT (Counting Fingers at 1 Meter) at 10.0%, CF 2MT (Counting Fingers at 2 Meters) at 9.5% and CFCF (Counting Fingers at Close Range) at 7.0%.

These findings underscore the critical need for surgical intervention to improve vision and quality of life in these patients.

**Table 5: Distribution of Fundus Examination**

Fundus Examination	No. of Patients	Percentage
NO GLOW	129	65%
PERIPHERAL GLOW +	71	36%
Grand Total	200	100%

The distribution of fundus examination findings shows that 65% of the patients had no glow, indicating a dense cataract due to which fundus

findings can't be assessed. Meanwhile, 36% of the patients exhibited peripheral glow, suggesting a central dense cataract with peripheral immature

cataract, allowing some light to pass through and hence fundal glow is seen, but still fine retinal changes can't be assessed. This highlights the need for careful preoperative evaluation with B scan USG in these patients undergoing cataract surgery

as the fundus can't be assessed prior to surgery. The total number of patients evaluated was 200, ensuring a comprehensive overview of the study population.

**Table 6: Distribution of Patients Based on Type of Cataract**

Cataract Type	No. of Patients	Percentage
ADVANCED IMSC	77	39%
MSC	90	45%
HMSC	33	17%
Total	200	100.0%

In this study, the distribution of patients based on the type of cataract was as follows:

ADVANCED IMSC (Immature Senile Cataract): 77 patients, accounting for 39.0% of the cases.

This type of cataract is in an earlier stage where the lens starts becoming cloudy but has not yet reached the hypermature stage.

MSC: 90 patients, making up 45.0% of the total cases. This type of cataract occurs when the lens becomes fully opaque, leading to significant vision impairment.

HMSC: 33 patients, representing 19.0% of the total cases. This type of cataract is characterized by an advanced stage where the lens becomes very hard and opaque.

**Table 7: Distribution of Fundus Examination with type of cataract**

PRE OP FUNDUS	Advanced IMSC	MSC	HMSC	Total	Percentage
No Glow	6	90	33	129	65%
Peripheral Glow	71	0	0	71	36%
Total	77	90	33	200	100%

The distribution of fundus examination findings categorized by the type of cataract and the presence of peripheral glow is presented below. Among patients with Advanced Immature Senile Cataract (IMSC), 6 had no glow, and 71 had peripheral glow, totaling 77 patients, which accounts for 36% of the total. For Mature Senile Cataract (MSC), 90 patients had no glow, and none had peripheral

glow, making up 45% of the total. In the Hypermature Senile Cataract (HMSC) group, 33 patients had no glow, and none had peripheral glow, summing up to 33 patients, or 19% of the total. Overall, out of 200 patients, 129 had no glow, and 71 had peripheral glow, indicating varied severities and stages of cataracts in the study population.

**Table 8: Distribution of patients based on B Scan Findings**

B Scan Findings	No. of patients	Percentage
Normal Study	179	89.50%
Mild Vitreous Degenerations	7	3.50%
Moderate Vitreous Degenerations	4	2.00%
Severe Vitreous Degenerations	2	1.00%
Posterior Vitreous Detachment	4	2.00%
Vitreous Hemorrhage With PVD	1	0.50%
Retinal Detachment	2	1.00%
Posterior Staphyloma	1	0.50%
Total	200	100.0%

In this study, the majority of patients (89.5%) had a normal B scan, indicating no significant abnormalities detected in most cases. Mild vitreous degenerations were observed in 3.5% of the patients, which is a common finding in the aging population and often not associated with severe visual impairment. Moderate vitreous degenerations were also found in 2.0% of the patients, while severe vitreous degenerations were

observed in 1.0%, indicating a progression in the degenerative changes affecting the vitreous humor. Posterior vitreous detachment (PVD) was present in 2.0% of the patients, which can sometimes lead to more serious conditions such as retinal tears or detachment if not monitored closely. Retinal detachment was found in 1.0% of the patients, a serious condition that can lead to permanent vision loss if not treated promptly. Vitreous hemorrhage

with PVD was observed in 0.5% of the patients, indicating bleeding into the vitreous body, which can obscure vision significantly. Posterior staphyloma, a condition where an ectasia of the posterior eye wall occurs, was found in 0.5% of the patients. This condition is often associated with

high myopia and can lead to significant visual disturbances. Overall, this distribution highlights the prevalence of various B scan findings within the study population, providing insight into the common and less common ocular conditions observed.

**Table 9: Distribution of patients based on type of surgery**

Type of Surgery	No. of patients	Percentage
Ecce Only Under La	1	0.5%
SICS With PCIOL Under La	196	98.0%
SICS With Iris Claw Under La	2	1.0%
Referred To Vitreo Retina Services	1	0.5%
Total	200	100.0%

In this study, the majority of patients (98.0%) underwent SICS (Small Incision Cataract Surgery) with PCIOL (Posterior Chamber Intraocular Lens) under LA (Local Anesthesia), indicating this was the most common surgical procedure performed.

A small number of patients underwent SICS with IRIS CLAW under LA due to intraoperative complications such as posterior capsular rent, which were managed with iris claw lens implantation, representing 1.0% of the total.

Additionally, one patient (0.5%) who had posterior staphyloma on B scan evaluation underwent ECCE only under LA as a planned management for such cases to attain the best possible visual acuity with minimum subjective correction. Another patient (0.5%) was referred to Vitreo Retina services, highlighting the need for specialized retinal care in certain cases. This distribution underscores the predominance of SICS with PCIOL as the preferred surgical approach for the patient population studied.

**Table 10: Distribution of Patients Based on Immediate Postoperative Visual Acuity (V/A)**

Visual Acuity Range	No. of Patients	Percentage
6/6 to	1	0.50%
6/12 to 6/18	92	46.00%
6/24 to 6/36	98	49.00%
<6/60	9	4.50%
Total	200	100.0%

In this study, the visual acuity of patients immediately post-operation varied across a range of values.

The majority of patients fell within the 6/24 to 6/36 range (49.0%), followed by the 6/12 to 6/18 range

(46.0%). A small number of patients had visual acuity less than 6/60 (4.5%) and only one patient achieved 6/6 to 6/9 (0.5%).

This distribution highlights the varying degrees of visual recovery immediately after surgery.

**Table 11: Distribution of Patients Based on 1st Week Visual Acuity (V/A)**

Visual Acuity Range	No. of Patients	Percentage
6/6 to 6/9	12	6.00%
6/12 to 6/18	141	70.50%
6/24 to 6/36	40	20.00%
<6/60	7	3.50%
Total	200	100.0%

In this study, the distribution of patients' visual acuity (V/A) at the 1st week post-operation 6/6 to 6/9: 12 patients (6.0%) achieved a high level of visual acuity, indicating excellent surgical outcomes. 6/12 to 6/18: The majority of patients, 141 (70.50%), fell within this range, showing a

significant improvement in vision post-surgery. 6/24 to 6/36: 40 patients (20.0%) had moderate visual acuity, suggesting further improvement might be needed. <6/60: 12 patients (6.0%) had poor visual acuity, indicating the need for additional follow-up and care.

**Table 12: Distribution of Patients Based on 4th Week Visual Acuity (V/A)**

Visual Acuity Range	No. of Patients	Percentage
6/6 to 6/9	61	30.5%
6/12 to 6/18	111	55.5%
6/24 to 6/36	23	11.5%
<6/60	5	2.5%
Total	200	100.0%

In this study, the visual acuity of patients during the 4th week post-operation varied across a range of values. The majority of patients fell within the 6/12 to 6/18 range, with 21.0% having a visual acuity of 6/18 and 14.5% having a visual acuity of 6/12P. Additionally, 26 patients had a visual acuity of 6/12 (13.0%) and 14 patients had a visual acuity of 6/18P (7.0%). Other notable groups included

patients with a visual acuity of 6/9P (21.0%), 6/24 (6.0%), 6/24P (3.0%), 6/36 (1.0%), and 6/36P (1.5%). Less common were those with more severe visual acuity limitations, such as 6/60 (1.0%), CF2MTS (0.5%), HAND MOVEMENTS+ (0.5%), and NIL (0.5%). This distribution highlights the varying degrees of visual recovery and the need for tailored postoperative care and follow-up.

**Table 13: Distribution of patients based on V/A at 6 months**

Visual Acuity Range	No. of Patients	Percentage
6/6 to 6/9	129	64.5%
6/12 to 6/18	63	31.5%
6/24 to 6/36	5	2.50%
<6/60	3	1.50%
Total	200	100.0%

In this study, the visual acuity of patients at 6 months post-operation varied across a range of values. The majority of patients achieved a visual acuity of 6/6 to 6/9 (64.5%), indicating a high level of visual recovery. Additionally, 31.5% of patients had a visual acuity of 6/12 to 6/18. A smaller percentage of patients had a visual acuity of 6/24 to 6/36 (2.50%), and an even smaller group had a visual acuity of less than 6/60 (1.50%). This distribution highlights the effectiveness of the surgical interventions in providing significant visual improvements for the majority of the patient population over a six-month period.

### Discussion

In the current study, 17.0% of patients were diagnosed with HMSC. This finding is comparable to Sharma et al. (2021) who reported 20.0% and Rao et al. (2020) with 17.5%. This consistency highlights the prevalence of advanced cataract stages in similar demographic settings.

The current study found that 39.0% of patients had IMSC, which aligns closely with Sharma et al. (35.0%) and Rao et al. (37.5%). These numbers indicate a significant proportion of patients present with cataracts at an earlier stage that is amenable to surgical intervention.

MSC was the most common type of cataract in the current study, affecting 45.0% of patients. This result is identical to the findings of both Sharma et al. (45.0%) and Rao et al. (45.0%), underscoring the typical progression of cataract severity in the

studied populations. The distribution of cataract types in the current study is consistent with findings from Sharma et al. (2021) and Rao et al. (2020). The majority of patients present with mature senile cataracts, followed by immature and hypermature senile cataracts. Understanding these distributions helps in planning and prioritizing surgical interventions, ensuring optimal outcomes and improving the quality of life for patients.

The pre-operative fundus examination findings in the current study were compared with existing literature to provide context and insight into the prevalence of significant retinal pathologies in cataract patients.

**Current Study:** In our study, 65% of the patients had no glow, indicating dense cataracts where fundus findings couldn't be assessed, while 36% exhibited peripheral glow, suggesting the presence of some retinal changes. Qureshi et al. (2010): This study on non-traumatic cataract patients using B-scan ultrasound found that 93% had no glow, indicating no posterior segment pathology, which is higher than our finding of 65% with no glow. The prevalence of retinal detachment, vitreous hemorrhage, and posterior vitreous detachment was low in their study compared to current study.

Hirani et al. (2022): In this study, 31.67% of patients had no glow, and 68.33% exhibited peripheral glow, indicating a higher detection rate of significant pathologies compared to our study. Salman et al. (2021): This study reported that 91.25% of eyes with dense cataracts had no glow,

similar to the findings of Qureshi et al., but higher than present study findings.

In the current study, the B-scan ultrasonography findings among patients with advanced and mature cataracts revealed that the majority of patients (89.5%) had a normal study. This high percentage is comparable to the findings by Qureshi et al. (2010), where 93% of patients had normal B-scan findings. Similarly, Hirani et al. (2022) reported that 31.67% of their patients had normal findings, though this percentage is lower than in the current study.

The detection of mild vitreous degenerations in 3.5% of patients aligns with findings from Qureshi et al. (4.00%) and Hirani et al. (1.67%). Moderate vitreous degenerations were observed in 2.0% of patients in the current study, comparable to 3.33% reported by Hirani et al. The incidence of posterior vitreous detachment was similar across studies, with the current study and Hirani et al. reporting 2.0% and 1.67%, respectively.

Other notable findings include retinal detachment in 1.0% of patients and vitreous hemorrhage with PVD in 0.5% of patients. These findings are consistent with Qureshi et al. and Hirani et al., highlighting the reliability and consistency of B-scan ultrasonography in detecting these conditions.

In the current study, 6.0% of patients achieved a VA of 6/6 to 6/9. This finding is comparable to Khanna et al. (7.0%) and Rao et al. (7.5%). These results indicate a moderate success rate in achieving high visual acuity shortly after surgery.

The majority of patients in the current study (70.50%) had a VA within the range of 6/12 to 6/18. This result aligns closely with Khanna et al. (69.0%) and Rao et al. (72.5%), suggesting a high rate of satisfactory visual recovery among patients.

A significant proportion of patients (20.0%) had a VA in the range of 6/24 to 6/36 in the current study. This percentage is higher than Khanna et al. (20.0%) and Rao et al. (15.0%). This discrepancy suggests that a notable subset of patients may require additional postoperative care to achieve better visual outcomes.

In the current study, the visual acuity of patients at six months post-cataract surgery was meticulously documented. The results show that a significant majority (64.5%) of patients achieved a visual acuity (VA) in the range of 6/6 to 6/9, indicating excellent surgical outcomes.

This finding is consistent with the results reported by Hirani et al. (2022) and Carr and Gangwani (2020), who found 60.0% and 62.5% of their patients, respectively, in this top VA category. These similarities highlight the effectiveness and reliability of modern cataract surgery techniques.

A substantial proportion of patients (31.5%) in the current study achieved a VA in the range of 6/12 to 6/18, which is slightly lower than the optimal range but still represents a significant improvement in visual function. This result closely aligns with the findings of Hirani et al. (35.0%) and Carr and Gangwani (32.5%), further validating the outcomes of this study.

A smaller group of patients (2.5%) had a VA in the range of 6/24 to 6/36. This percentage is comparable to the 4.0% reported by both Hirani et al. and Carr and Gangwani, suggesting that a small but consistent subset of patients may require additional postoperative care to achieve optimal visual outcomes.

## Conclusion

### Study Overview:

- The study evaluated 200 patients with advanced and mature cataracts using B-scan ultrasonography.
- The primary aim was to identify posterior segment pathologies that are not visible through standard ophthalmic examination due to lens opacity.

### Key Results:

- Out of 200 patients, 179 (89.5%) had a normal study, while the remaining 21 (10.5%) showed various abnormalities, including vitreous degenerations, retinal detachment and posterior staphyloma.
- Visual acuity improved significantly postoperatively, with the majority of patients achieving satisfactory vision by six months.

### Importance of B-Scan:

- B-scan ultrasonography proved to be a safe, non-invasive, and cost-effective diagnostic tool.
- It facilitated the detection of significant pathologies that could influence the surgical approach and post-operative visual outcome in patient.

### Recommendations:

- The study suggests B Scan USG should be an integral part of pre-operative work up of patient with dense cataract undergoing surgery to avoid unexpected intraoperative surprises.
- Implementing routine B-scan evaluations for all patients with dense cataracts can enhance preoperative planning and postoperative results.

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