

Original Article

# Ultrasonography in Detecting the Posterior Segment Pathology in Pre-Operative Cataract Patient

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## ABSTRACT

**Background:** Cataract is the leading cause of blindness globally, accounting for approximately 47.8% of blindness worldwide and 51.5% in Pakistan. The opacity of the lens in cataract patients obstructs the visualization of the posterior segment, making it challenging to predict visual outcomes post-surgery. Ultrasonography, particularly B-scan, plays a crucial role in identifying posterior segment pathologies before cataract surgery, aiding in surgical planning, and improving postoperative visual prognosis.

**Objective:** This study aimed to evaluate the effectiveness of B-scan ultrasonography in detecting posterior segment pathologies in patients with dense cataracts, thus assisting in preoperative planning and predicting visual outcomes.

**Methods:** This descriptive cross-sectional study was conducted at the Outpatient Department of Ophthalmology, Hayatabad Medical Complex, Peshawar, from August 15th, 2019, to February 15th, 2020. A total of 260 eyes from patients with dense cataracts were included. Patients of all age groups and both sexes, including those with traumatic and non-traumatic cataracts, were examined. Exclusion criteria included transmittable ocular surface infections, penetrating ocular trauma, previous glaucoma or vitreoretinal surgery, and siliconized eyes. B-scan ultrasonography was performed using an 8-10 MHz frequency probe. The eye globe was assessed in axial, longitudinal, and transverse positions. Data were recorded and analyzed using SPSS version 25. Ethical approval was obtained from the institutional review board, and the study adhered to the Declaration of Helsinki.

**Results:** Out of 260 eyes examined, 97 (37.3%) were right eyes, 105 (40.4%) were left eyes, and 58 (22.3%) had bilateral involvement. Normal findings were observed in 215 eyes (67.8%), while 32.2% showed posterior segment pathologies. The most common pathology was posterior vitreous detachment (PVD), found in 24 eyes (7.6%). Retinal detachment and vitreous hemorrhage were each observed in 15 eyes (4.7%). Other findings included asteroid hyalosis (18 eyes, 5.7%), vitreous inflammation (11 eyes, 3.5%), intraocular foreign body (3 eyes, 0.9%), persistent hyperplastic primary vitreous (1 eye, 0.3%), and posterior staphyloma (2 eyes, 0.6%).

**Conclusion:** B-scan ultrasonography is an effective tool for detecting posterior segment pathologies in preoperative dense cataract patients, significantly influencing surgical strategies and postoperative visual outcomes. Routine use of ultrasonography in cataract patients can enhance surgical planning and improve patient counseling and prognosis.

**Keywords:** Cataract, Ultrasonography, B-Scan, Posterior Segment Pathology, Preoperative Evaluation.

## INTRODUCTION

Cataract is considered the leading cause of blindness worldwide. According to the World Health Organization (WHO), cataracts are responsible for approximately 47.8% of blindness globally, while in Pakistan, the prevalence is even higher, accounting for 51.5% of blindness (1). Cataract surgery is a common and cost-effective procedure aimed at preventing this blindness by removing the lens opacity that impedes visualization of the posterior segment of the eye. Visualization of the posterior segment is crucial for predicting visual outcomes post-surgery (1-3). Ultrasonography (USG) provides valuable information about posterior segment pathologies prior to cataract surgery.

Ophthalmic ultrasonography comprises two primary types of scans: A-scan and B-scan, both of which are essential for diagnosing posterior segment pathology (4-6). The A-scan is used for biometric calculations and measuring tumor size, whereas the B-scan

quantifies the reflectivity of lesions in the eye and orbit. Different types of probes, operating at various frequencies, are employed in diagnostic ophthalmology, with 8-10 MHz probes being commonly used for posterior segment examinations. Over the past few decades, advances in ultrasonography have significantly enhanced our ability to study the posterior segment of the eye, even in the presence of opaque media (7-9).

B-scan imaging, in particular, provides highly detailed two-dimensional images of the posterior segment in eyes with advanced cataracts. Utilizing ultrasound to detect significant abnormalities before cataract surgery aids in surgical planning and enables surgeons to offer an accurate prognosis to patients. Studies have reported varying incidences of posterior segment pathology in eyes with dense cataracts, ranging from 8.6% to 66% (10-12).

The primary objective of this study was to visualize posterior segment pathologies in patients with dense cataracts using B-scan ultrasonography. This diagnostic tool allows indirect visualization of the fundus before cataract surgery, thereby identifying any posterior segment lesions. This information assists the surgeon in determining the appropriate surgical strategy and predicting postoperative visual outcomes. By providing a comprehensive preoperative assessment, B-scan ultrasonography enhances the overall management and prognosis of cataract patients, ensuring better visual outcomes and improved quality of life for individuals undergoing cataract surgery.

## MATERIAL AND METHODS

This descriptive cross-sectional study was conducted in the Outpatient Department of Ophthalmology at Hayatabad Medical Complex, Peshawar, over a period of six months from August 15th, 2019, to February 15th, 2020. The study aimed to visualize posterior segment pathologies in patients with dense cataracts using B-scan ultrasonography. Patients included in the study were those sent for routine ultrasound examination with dense cataracts, spanning all age groups and both sexes, including both traumatic and non-traumatic cases (14).

Patients with transmittable ocular surface infections such as viral conjunctivitis, penetrating ocular trauma with iris or vitreous prolapse, a history of previous glaucoma or vitreoretinal surgery, and siliconized eyes were excluded from the study. For cooperation, the procedure of the B-scan was thoroughly explained to each patient. They were positioned comfortably on the examination couch, and an 8-10 MHz frequency probe was gently placed on the surface of the closed eyelids after applying gel (15).

The eye globe was then assessed using various probe positions, including axial, longitudinal, and transverse orientations of the B-scan in addition to the A-scan. Ultrasonography was conducted with both high gain (80 to 90 dB) and low gain (60 to 70 dB) sensitivity settings to detect various posterior segment pathologies. Observations were meticulously recorded in a data collection form (16).

Data were analyzed using the Statistical Package for the Social Sciences (SPSS), version 25. The analysis included descriptive statistics to summarize the data and inferential statistics to determine the prevalence of posterior segment pathologies in the study population. Ethical approval for the study was obtained from the institutional review board of Hayatabad Medical Complex, and the study adhered to the principles outlined in the Declaration of Helsinki.

Informed consent was obtained from all participants prior to inclusion in the study. Data confidentiality and patient anonymity were maintained throughout the research process. The findings from this study provide valuable insights into the prevalence and types of posterior segment pathologies in patients with dense cataracts, aiding in preoperative planning and enhancing postoperative visual outcomes (Shah, 2012).

## RESULTS

Table 1: Eye Involvement (N=260)

Eye	Number	Percentage (%)
Right	97	37.3
Left	105	40.4
Both	58	22.3
<b>Total</b>	<b>260</b>	<b>100</b>

**Table 2: Posterior Segment Findings on Ultrasonography (USG)**

USG Findings	Total Number of Eyes	Percentage (%)
Normal	215	67.8
Retinal Detachment	15	4.7
Posterior Vitreous Detachment (PVD)	24	7.6
Vitreous Hemorrhage	15	4.7
Intraocular Foreign Body (IOFB)	3	0.9
Asteroid Hyalosis/Vitreous Opacities	18	5.7
Vitreous Inflammation	11	3.5
Persistent Hyperplastic Primary Vitreous (PHPV)	1	0.3
Posterior Staphyloma	2	0.6
Others	13	4.1
<b>Total</b>	<b>317</b>	<b>100</b>

The study included a total of 260 eyes from patients presenting with dense cataracts, categorized by eye involvement. Of these, 97 eyes (37.3%) were from the right eye, 105 eyes (40.4%) were from the left eye, and 58 eyes (22.3%) exhibited bilateral involvement, indicating a significant distribution across both unilateral and bilateral cases (Table 1).

Posterior segment findings on ultrasonography revealed a predominance of normal findings, with 215 eyes (67.8%) showing no detectable pathology, underscoring the utility of ultrasonography in confirming the absence of posterior segment abnormalities in a majority of cases. Among the pathological findings, posterior vitreous detachment (PVD) was observed in 24 eyes (7.6%), making it the most common abnormality detected. This was followed by retinal detachment and vitreous hemorrhage, each found in 15 eyes (4.7%), highlighting the critical role of ultrasonography in identifying these significant pathologies that can influence surgical outcomes and postoperative visual prognosis.

Other notable findings included asteroid hyalosis or vitreous opacities, present in 18 eyes (5.7%), and vitreous inflammation, identified in 11 eyes (3.5%). These conditions, while less frequent, still represent important considerations for surgical planning and patient counseling. Intraocular foreign bodies (IOFB) were detected in 3 eyes (0.9%), and posterior staphyloma in 2 eyes (0.6%), both of which are rare but clinically significant findings. A single case (0.3%) of persistent hyperplastic primary vitreous (PHPV) was also recorded, illustrating the diversity of posterior segment pathologies that can be encountered (Table 2).

The category labeled as "others" encompassed 13 eyes (4.1%), which included various less common pathologies not specifically categorized but nevertheless relevant for comprehensive preoperative assessment. In total, 317 posterior segment findings were recorded across the 260 eyes examined, highlighting the multifaceted nature of ultrasonography in preoperative cataract evaluation (Table 2). This detailed ultrasonographic assessment provided crucial information for surgical planning and anticipated visual outcomes, affirming its value in the management of patients with dense cataracts.

## DISCUSSION

Ophthalmic ultrasound played a crucial role in diagnosing various ocular and orbital conditions, especially when opacification of the ocular media obstructed visualization of the posterior segment and identification of related pathologies. This lack of visibility was common in patients with dense cataracts, making it challenging for surgeons to predict visual outcomes accurately. B-scan ultrasonography aided in evaluating visual outcomes in such cases (Qureshi et al., 2012; Mobin et al., 2016). In this study, 260 patients with dense cataracts were examined using ultrasonography, with ages ranging from 1 to 65 years. Comparatively, Qureshi noted a broader age range of 1-79 years among patients with dense cataracts where the posterior segment remained invisible. Additionally, Mobin et al. reported an age range of 1-80 years, with 40.2% of cataract patients falling within the 61-70 years age group (16).

The gender distribution in this study was almost equal, with 50.4% male and 49.6% female patients. In contrast, Mobin et al. reported a higher percentage of males (61.8%) with dense cataracts compared to females (38.2%). Similarly, Gareeballah et al. found that females with dense cataracts outnumbered male patients (7). Bilateral dense cataracts were also prevalent, observed in 22.3% of cases in this study, while Salman et al. reported only 24 out of 394 patients with bilateral cataracts. This discrepancy might be due to the higher incidence of cataract-induced blindness in rural areas of Pakistan (18)

Most cataract patients in this study belonged to the non-traumatic group (77.7%), while the traumatic group constituted 22.3%. Jain et al. found similar distributions, with 82% non-traumatic and 18% traumatic cases. However, Qureshi et al. reported 90.53% of

patients in the non-traumatic group and only 9.4% in the traumatic group, suggesting a higher prevalence of trauma in younger patients in our population (20).

The study revealed that 67.8% of patients had normal ultrasound findings, while 32.2% exhibited various posterior segment pathologies. Amjad et al. reported a lower incidence of posterior segment pathology (8.6%), and Qureshi et al. found 12% of patients with ultrasonically detectable lesions. Similarly, Bello et al. and Ngweme et al. observed normal posterior segments in 94.8% and 91.08% of patients, respectively. The higher percentage of posterior segment pathologies in this study could be attributed to the significant proportion of traumatic cataract cases (21).

Posterior vitreous detachment (PVD) was the most common pathology detected in this study (7.6%), closely aligning with Mutwaly et al. (6.36%) (11). However, Mobin et al. reported a lower incidence of PVD (2%), while other studies, including Carrero et al., Gareeballah et al., and Correa et al., found higher prevalence rates of 26.1%, 19.6%, and 26.1%, respectively (12). In contrast, Mobin et al. found retinal detachment (4%) to be more common than PVD (2%), differing from the findings of Mendes et al., where vitreous opacities were the most frequent pathology in preoperative cataract patients (12.1%).

In this study, vitreous opacity or asteroid hyalosis was the next most common posterior segment pathology (5.7%). Qureshi et al. reported an incidence of 1.77% in non-traumatic preoperative cataract patients, while Jacob et al. found a much lower incidence (0.2%). The incidence in this study was also lower compared to Mendes et al., who reported vitreous opacities in 12.1% of cataract patients.

Retinal detachment and vitreous hemorrhage were both observed in 4.7% of cases in this study, similar to findings by Mobin et al., Bello et al., and Parrey et al., who reported incidences of 4%, 5.2%, and 6%, respectively (6). However, Qureshi et al. and Ali and Rehman found lower incidences of retinal detachment in non-traumatic cataract patients (1.47% and 3.3%, respectively) and higher rates in traumatic cataract patients (21.12% and 29.26%, respectively) (1, 17). Naik et al. reported 17.1% retinal detachment in traumatic cataract patients. Vitreous hemorrhage was found in 3.4% of patients in Kumar et al. and 3.2% in Qureshi et al. (1).

This study also identified IOFB, PHPV, and posterior staphyloma in 0.9%, 0.6%, and 0.3% of patients, respectively. Similar findings were present in Rafi et al., who reported 2.5% persistent fetal vasculature and 0.5% posterior staphyloma (20). Haile et al. and Chanchlani reported higher percentages of IOFB and posterior staphyloma. The remaining 4.1% of patients had various miscellaneous lesions (21-23).

The ultrasonographic examination in dense cataract patients provided critical information regarding posterior segment pathology, aiding in accurate postoperative prognosis. However, limitations such as the inability to diagnose certain pathologies preoperatively, like diabetic maculopathy, macular hole, and retinal vein occlusions, should be considered. Patients undergoing cataract surgery should be informed of these limitations (Mendes, 2009). In conclusion, two-dimensional ultrasonography was found to be an effective tool in detecting posterior segment pathology in preoperative dense cataract patients. This tool significantly influenced surgical strategies, outcomes, and postoperative visual prognosis (14).

## CONCLUSION

In conclusion, two-dimensional ultrasonography proved to be an effective tool for detecting posterior segment pathologies in preoperative dense cataract patients, significantly influencing surgical strategies and postoperative visual outcomes. The ability to identify conditions such as posterior vitreous detachment, retinal detachment, and vitreous hemorrhage preoperatively enhances surgical planning and patient counseling, ultimately improving visual prognosis and patient satisfaction. The implementation of routine ultrasonographic screening in cataract patients can thus enhance overall healthcare quality, ensuring timely and appropriate interventions that address underlying ocular conditions, thereby reducing the burden of preventable blindness.

## REFERENCES

1. Qureshi MA, Laghari K. Role of B-Scan Ultrasonography in Pre-Operative Cataract Patients. *Int J Health Sci (Qassim Univ)*. 2010;4:31-7.
2. Dineen B, Bourne RRA, Jadoon Z, Shah SP, Khan MA, Foster A, et al. Causes of Blindness and Visual Impairment in Pakistan. The Pakistan National Blindness and Visual Impairment Survey. *Br J Ophthalmol*. 2007;91:1005-10.
3. Madhu C, Roshan C. A Study of Posterior Segment Evaluation by B-Scan in Hyper Mature Cataract. *J Clin Exp Ophthalmol*. 2016;7:1.
4. 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.
5. Awan ZH, Mahar PS, Memon MS. Blindness and Poverty. *Pak J Ophthalmol*. 2011;27:3.

6. Mobin M, Kanodia P, Malhotra R, Akaram SM, Yadav D. Role of B-Scan Ultrasonography Before Cataract Surgery in Eyes With Dense Cataracts. *JMSCR*. 2019;7:890-4.
7. Gareeballah A, Gameraddin MB, Ali G, Babiker MS, Elzak Maisa. Sonographic Findings in Posterior Segment of the Eye in Sudanese Adult Patients Examined With Cataract. *Sudanese J Ophthalmol*. 2017;9:50-4.
8. Jain A, Gauba N, Kaur I, Singh S, Jaswal H. Role of B-Scan in Cataract Patients. *Indian J Appl Radiol*. 2017;3:110.
9. Bello TO, Adeoti CO. Ultrasonic Assessment in Pre-Operative Cataract Patients. *Niger Postgrad Med J*. 2006;13:326-8.
10. Ngweme G, Bambi N, Lutete LF, Kilangalanga NJ, Hopkins A, Stachs O, et al. Ophthalmic Ultrasonography in Sub-Saharan Africa—A Kinshasa Experience. *Diagnostics*. 2021;11:2009.
11. Mutwaly R, Gammoh Y, Abdu M. Evaluation of Role of Ophthalmic Ultrasonography in Ophthalmic Examination Pre-Cataract Surgery. *SJ Ophthal*. 2020;12:23-6.
12. Carrero JL. Incomplete Posterior Vitreous Detachment: Prevalence and Clinical Relevance. *Am J Ophthalmol*. 2012;153:497-503.
13. Corrêa ZM, Goldhardt R, Marcon AS, Marcon IM. Ultrasound Findings in Patients With Dense Cataracts. *Arq Bras Oftalmol*. 2002;65:609-13.
14. Mendes MH, Betinjane AJ, Cavalcante Ade S, Cheng CT, Kara-José N. Ultrasonographic Findings in Patients Examined in Cataract Detection-and Treatment Campaigns: A Retrospective Study. *Clinics (Sao Paulo)*. 2009;64:637-40.
15. Jacob JM, Thadam JJK, Goudinho S. Evaluation of the Relation Between Pre-Operative B-Scan Findings and Post-Operative Fundus Findings in Patients With Opaque Media Undergoing Cataract Surgery. *IJAHR*. 2019;2:30-3.
16. Parrey MUR, Bhatti MO, Channa S, Alswailmi FK. Posterior Segment Eye Diseases Detected by B-Scan Ultrasonography in Advanced Cataract. *Indo Am J P Sci*. 2019;6:11261-6.
17. Ali SI, Rehman H. Role of B-Scan in Preoperative Detection of Posterior Segment Pathologies in Cataract Patients. *Pak J Ophthalmol*. 1997;13:108-12.
18. Naik A, Prasad S, Magdum R. Role of B-Scan Ultrasonography in Detecting Obscured Ocular Abnormalities in Mature Traumatic Cataract. *IJSR*. 2019;10:127-30.
19. Kumar J, Prasad K, Nath Ram A. Role of B-Scan in Advanced Cataract Patients. *IOSR-JDMS*. 2018;17:29-32.
20. Rafi PMM, Khan MR, Azhar MN. Evaluation of the Frequency of Posterior Segment Pathologies Determined by B-Scan Ultrasonography in Patients With Congenital Cataract. *Pak J Ophthalmol*. 2013;29:210-3.
21. Haile M, Mengistu Z. B-Scan Ultrasonography in Ophthalmic Diseases. *East Afr Med J*. 1996;73:703-7.
22. Chanchlani M. A Study of B-Scan Ultrasonography in Detecting Posterior Segment Pathologies in Senile Mature Cataracts. *Ophthalmology and Allied Sciences*. 2018;4:160-2.
23. Shaikh FU, Narsani AK, Jatoi SM, Shaikh ZA. Preoperative Posterior Segment Evaluation by Ultrasonography in Dense Cataract. *Pak J Ophthalmol*. 2009;25:135-8.