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Sonographic Findings in the Posterior Segment of the Eye in Pre-Operative Cataract Patients

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Abstract

Background: Cataract surgery is a common and cost-effective procedure aimed at preventing blindness by removing the lens opacity that obstructs the visualization of the posterior segment of the eye. Visualizing the posterior segment is crucial for predicting visual outcomes after surgery. This study aimed to determine abnormal sonographic findings in the posterior segment of the eye globe among cataract patients and the associated risk factors.

Methods and Results: This retrospective study was conducted at Kafaat Medical Center (Makkah Almokaramah city, Saudi Arabia) from February to May 2025. It included 204 complete patients' records to determine abnormal sonographic findings in the posterior segment of the eye globe among cataract patients and the associated risk factors.

All patients were scanned with a Quante Medical ultrasound (USG) scanner for ophthalmology, Model REF-B1, equipped with a 10 MHz probe. The examination focused on the posterior eye segment.

Among 204 patients with dense cataracts (55.4% men and 44.6% women), 56.9% presented with traumatic cataract (TC), while 43.1% had non-traumatic cataract (n-TC). Most of the patients were over age 60(67.6%). Out of 204 patients, 120(58.8%) had normal findings in the posterior eye segment, 36(17.8%) were found to have posterior vitreous detachment, 30(14.7%) had retinal detachment, and vitreous hemorrhage was found in 8(3.9%) patients. Other findings, which amounted to 10(5%) cases, were asteroid hyalosis, vitritis, and posterior staphyloma. Regarding risk factors, most of the patients who had positive findings in the posterior segments of their eyes were either diabetic or hypertensive. A significant correlation existed between gender and cataract types; 57.5% of male patients were susceptible to TC. The study also highlighted that age groups of 41-60 years and above were more susceptible to posterior vitreous detachment, retinal detachment, and vitritis, while the younger age group (21-40) was susceptible to retinal detachment and posterior staphyloma.

Conclusion: The findings indicate that males are more susceptible to the causes of TC than females of the same age. Detecting disorders like posterior vitreous detachment, retinal detachment, and vitreous hemorrhage preoperatively enhances surgical planning and patient counseling, thereby improving patient satisfaction and visual prognosis. B-scan US can serve as an important diagnostic tool for identifying hidden posterior segment lesions. (**International Journal of Biomedicine. 2025;15(3):540-544.**)

Keywords: cataract • B-mode US • posterior eye segment • sonographic findings

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Abbreviations

TC, traumatic cataract; **n-TC**, non-traumatic cataract.

Introduction

According to the World Health Organization, an estimated 1.3 billion people live with visual impairment. Cataracts are considered the leading cause of blindness worldwide, accounting for approximately 47.8% of blindness globally. In Pakistan, the prevalence is even higher, reaching 51.5% of blindness.[1] Cataract surgery is a common and cost-effective procedure aimed at preventing blindness by removing the lens opacity that obstructs the visualization of the posterior segment of the eye. Visualizing the posterior segment is crucial for predicting visual outcomes after

surgery.[1] Cataract surgery is a cost-effective way to prevent blindness by reducing the opacity in the lens that blocks the view of the posterior part of the eye. Proper visualization is vital for accurately forecasting vision outcomes following cataract surgery.[2] Media opacity can hinder the view of pathology in the posterior region of the fundus. Ultrasonography can detect anomalies in such cases. [3,4]

Traumatic cataract surgery is a potentially difficult technique. When planning surgery, the surgeon may benefit from careful ocular imaging using ophthalmic ultrasound (US), which may provide finer pre-operative data regarding lens support structures.[5] B-scan US provides an accurate image of the intraocular structures and valuable information about the health of the lens, vitreous, retina, choroid, and sclera. Sonographic assessment of the posterior eye globe in patients with opacities is needed to determine the most suitable surgery. In diagnostic ophthalmology, probes with frequencies ranging from 8-10M Hz are routinely utilized for posterior region tests. Advances in ultrasonography have made it easier to analyze the posterior portion of the eye, even with opaque media.[6,7]

Ophthalmic US can be used to evaluate a wide range of diseases, such as suspected intraocular tumors, the location of foreign bodies in the eye, and conditions related to eye injuries.[8] The visual inspection of orbital features is now regarded as a standard procedure. Along with other orbital features, the vitreous body and lens can be visualized particularly well by US. The eye's cystic structure and superficial position allow high-frequency transducers to reveal both normal and abnormal findings of the eye globe.[9] Proliferative diabetic retinopathy is one of the most common causes of vitreous hemorrhage. It appears as gradual changes in the eye's microvasculature. Ophthalmic US provides crucial diagnostic information about ocular illnesses that cannot be obtained through other imaging techniques.[10-12]

Materials and Methods

This retrospective study was conducted at Kafaat Medical Center (Makkah Almokaramah city, Saudi Arabia) from February to May 2025. It included 204 complete patients' records from different nationalities to determine abnormal sonographic findings in the posterior segment of the eye globe among cataract patients and the associated risk factors. Patients with incomplete medical records were excluded from the study.

A pre-designed, standardized data-collection checklist was employed to extract data from the medical records, and it includes socio-demographic data. Types of cataracts (traumatic cataract [TC] and non-traumatic cataract [n-TC]) and data regarding B-mode US findings (retinal detachment, vitreous hemorrhage, posterior vitreous detachment, asteroid hyalosis, vitreous opacities and exudates, and posterior staphyloma) were analyzed. To ensure data quality and reliability, the researchers verified the accuracy of the extracted data through random checks.

Equipment for the exam included a Quante Medical US scanner for ophthalmology, Model REF-B1, with a 10 MHz probe, USG gel, a transparent plastic film such as Tegaderm, and sterile petroleum jelly.[13,14] Statistical analysis was performed using the statistical software package SPSS version 26.0 (SPSS Inc., Armonk, NY: IBM Corp).

Results

This retrospective study included a total of 204 patients with cataracts (55.4% men and 44.6% women). Most of them were over age 60(67.6%). Among 204 patients, 56.9% presented with TC, while 43.1% had n-TC (Table 1).

Table 1.

Demographic and baseline characteristics of the study participants.

Characteristics	Category	Frequency (n)	Percentage (%)
Age group (years)	< 20	2	1.0
	21-40	26	12.7
	41-60	38	18.6
	> 60	138	67.6
	Total	204	100.0
Gender	Male	113	55.4
	Female	91	44.6
	Total	204	100.0
Cataract types	Traumatic	116	56.9
	Non-traumatic	88	43.1
	Total	204	100.0

Out of 204 patients with dense cataracts, 120(58.8%) had normal findings in the posterior eye segment, 36(17.8%) were found to have posterior vitreous detachment, 30(14.7%) had retinal detachment, vitreous hemorrhage was found in 8(3.9%) patients. Other findings, which amounted to 10(5%) cases, were asteroid hyalosis, vitritis, and posterior staphyloma (Table 2).

Table 2.

US findings on the posterior segment of the eye.

US findings	Frequency (n)	Percentage (%)
Normal findings	120	58.8
Posterior vitreous detachment	36	17.8
Retinal detachment	30	14.7
Vitreous hemorrhage	8	3.9
Asteroid hyalosis	4	2.0
Vitritis	4	2.0
Posterior staphyloma	2	1.0
Total	204	100.0

Regarding risk factors, most of the patients who had positive findings in the posterior segments of their eyes were either diabetic or hypertensive. A significant correlation existed between gender and cataract types; 57.5% of male patients were susceptible to TC (Tables 3 and 4).

Table 3.

Correlations between risk factors and cataract types. (n=204)

Cataract types	Diabetes Mellitus		Total	Hypertension		Total	Exact Sig. (1-sided)
	Yes	No		Yes	No		
Traumatic	50	66	116	44	72	116	.07 .08
Non-traumatic	48	40	88	26	62	88	
Total	98	106	204	70	134	134	

Table 4.

Correlation between gender and cataract types. (n=204)

Gender	Cataract types		Total	Exact Sig (2-sided)
	TC	n-TC		
Male	65	48	113	.01
Female	51	40	91	
Total	116	88	204	

The study also highlighted that age groups of 41-60 years and above were more susceptible to posterior vitreous detachment, retinal detachment, and vitritis, while the younger age group (21-40) was susceptible to retinal detachment and posterior staphyloma (Table 5).

Discussion

Ophthalmic US was crucial for diagnosing various orbital and ocular disorders, especially when opacification of the ocular media hindered visualization of the posterior segment and the identification of related disorders. Patients with severe cataracts often had impaired vision, complicating surgeons' ability to make accurate predictions regarding their visual outcomes. In these cases, US proved helpful in evaluating the visual results. US imaging is essential for giving a precise prognosis after cataract surgery.[15]

In our study, among 204 patients with cataracts, 55.4% were men. In contrast, a previous study by Karim et al.[16] reported equal gender distribution. Mobin et al.[17] reported a higher percentage of males (61.8%) than females (38.2%) with dense cataracts, and 67.6% of people were in the age group 60 and above, followed by 18.6% in the age group 40-60. Age over 40 was the most common demographic risk factor (86.2%). A previous study by Haug et al.[6] revealed "age is the risk factor for retinal detachment following cataract surgery" and reported that younger age is associated with an increased risk of retinal detachment. They also found that a significant correlation exists between the gender of participants and cataract types: 56% of male patients were susceptible to traumatic cataract .

Normal US was found in 58.8% of patients. In comparison, 41.2% exhibited various posterior segment pathologies, which is consistent with a previous study by Karim et al.,[16] who reported 67.8% of patients had normal US findings and 32.2% showed various posterior segment pathologies. The most common posterior segment pathology detected in a study by Jacob et al.[4] was posterior vitreous detachment in 130(25.5%) eyes.

Our study showed a statistically significant association between sample age groups and sonographic findings of the posterior segments of the eye; the age group of 41-60 years and above were more susceptible to posterior vitreous detachment, retinal detachment, and vitritis, while the younger age group of 21-40 were susceptible to retinal detachment and posterior staphyloma. These results align with a recent study by Karim

Table 5.

Age group US findings crosstab.

Age group (years)	Normal findings	Posterior vitreous detachment	Retinal detachment	Vitreous hemorrhage	Asteroid hyalosis	Vitritis	Posterior Staphyloma	Total	Exact Sig (2-sided)
< 20	0	0	2	0	0	0	0	2	.000 .005
21-40	12	2	6	0	0	0	2	22	
41-60	24	6	6	0	0	2	0	38	
> 60	84	28	16	8	4	2	0	142	
Total	120	36	30	8	4	4	2	204	

et al.,[16] which found that posterior vitreous detachment, retinal detachment, and vitreous hemorrhage were the most common pathologies, while asteroid hyalosis and posterior staphyloma were the least common. In contrast, identifiable posterior segment abnormalities were noted in nearly one-eighth of the patients with ocular injuries examined via US. When combined with vitreous hemorrhage, retinal detachment was the most frequent US result among patients with ocular trauma. The fluid in the vitreous cavity travels through holes or tears in the retina, separating it from the underlying pigmented retinal epithelium, leading to posterior vitreous detachment.[18] This finding was also consistent with a study by Qureshi et al.,[1] which reported that vitreous hemorrhages were present in 15.49% traumatic cataract patients and 1.91% in non-traumatic cataract patients.

Mobin et al.[17] in 2019 studied US results before cataract surgery in eyes with dense cataracts. Of the 625 eyes, 78(12.5%) had one or more positive US findings. The most frequent were posterior vitreous detachment (2%) and retinal detachment (4%), followed by vitreous hemorrhage (0.8%) and posterior staphyloma (1.6%). A previous study reported that vitreous hemorrhage was present in 2.5% of cases, which is higher than our data. This study confirms that US is useful in assessing both ocular traumatic and non-traumatic lesions, providing valuable information through clinical examination. The significance of US in ocular evaluation is demonstrated by its ability to distinguish between eyes with cataracts and eyes with ocular abnormalities other than cataracts as the cause of poor vision.[19]

Our study revealed that abnormal US findings were found more frequently among traumatic cataracts. Regarding risk factors, most of the patients who had positive findings in the posterior segments of their eyes were male and either diabetic or hypertensive. In the study by Kalpana et al.,[20] diabetic retinopathy was the most common finding in patients with cataracts, and post-traumatic retinopathy was more common in men than in women.

Two-dimensional ultrasonography successfully detects posterior segment disease in dense cataract patients before surgery. This instrument impacted surgical techniques and post-operative visual prognosis.

Study Limitations

Regarding study limitations, the study's retrospective nature is associated with potential selection bias, given that the authors relied on existing medical records for data acquisition. This may further limit the accuracy of the data and the study findings. Since the current study was conducted at a single tertiary center in the western region of Saudi Arabia, the study population and findings may not represent the entire Saudi population.

Conclusion

The findings indicate that males are more susceptible to the causes of traumatic cataract than females of the same age. Detecting disorders like posterior vitreous detachment, retinal detachment, and vitreous hemorrhage preoperatively enhances surgical planning and patient counseling, thereby improving patient satisfaction and visual prognosis. B-scan US can serve as an important diagnostic tool for identifying hidden posterior segment lesions.

Ethical Considerations

The study protocol was reviewed and approved by the Kafaat Medical Centre Ethics Committee (5/2025).

Competing Interests

The author declares no competing interests.

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