Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/mzee0x98

ULTRASONOGRAPHIC FINDINGS IN POSTERIOR SEGMENT OCULAR PATHOLOGIES

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ABSTRACT

Background: Posterior segment ocular pathologies (PSOP) are often challenging to diagnose clinically due to the opaque nature of ocular structures. Ultrasonography (USG) provides a non-invasive, reliable imaging modality for evaluating such conditions. This study aimed to evaluate the role of ocular ultrasonography in diagnosing posterior segment pathologies.

Materials and method: The present study was conducted in the Department of Radiodiagnosis at BVDU, Sangli over 18 months. A total of 58 patients suspected of having posterior segment ocular pathologies were included. Written informed consent was obtained, and the study received ethical approval. Patients were evaluated using a Philips Affinity 50 ultrasonography machine with high-frequency linear transducers (7.5–13 MHz). The ultrasonographic examination was conducted using B-mode, with dynamic imaging and Doppler added as required for further diagnostic evaluation.

Results: Among the 58 patients (38 males, 20 females), the most common clinical features were diminished vision (100%), photopsia (84%), and red hue/cobwebs in vision (22%). Diabetes mellitus (61%) and hypertension (57%) were the most frequent predisposing conditions. The vitreous (54%) and retina (47%) were the most commonly affected sites. The most frequent diagnoses on USG included retinal detachment (33%), vitreous hemorrhage (22%), and cataract with posterior vitreous detachment (14%). The accuracy of ultrasonographic diagnosis compared to operative findings was 100% for all conditions.

Conclusion: Ocular ultrasonography is an effective, non-invasive tool for diagnosing a wide range of posterior segment pathologies. It provides accurate and reliable results, with a high degree of concordance with operative diagnoses.

Keywords: Ultrasonography, Posterior Segment, Retinal Detachment, Posterior Vitreous Detachment

INTRODUCTION

Posterior segment ocular diseases (PSED) primarily affect the retina, choroid, and optic nerve and include conditions such as glaucoma, age-related macular degeneration (AMD), and diabetic

retinopathy (DR). These diseases are major contributors to visual impairment and blindness worldwide. [1]

Globally, at least 2.2 billion people experience vision impairment, with at least 1 billion cases being preventable or yet to be addressed. [2] A study by Vashisht et al. reported that major causes of blindness include posterior segment disorders (5.9%) and glaucoma (5.5%). This highlights the significant burden of posterior segment pathologies in India and the need for effective diagnostic tools. [3]

The slit-lamp examination and fundoscopy remain the primary diagnostic methods for evaluating posterior segment pathologies. However, in cases where media opacities such as dense cataracts, corneal opacities, or vitreous hemorrhage obscure direct visualization, ultrasonography (USG) plays a crucial role in assessment and diagnosis. Ocular B-scan ultrasonography is a non-invasive, real-time imaging technique that provides high-resolution images of the posterior segment, aiding in the detection of retinal detachment, vitreous hemorrhage, choroidal detachment, and intraocular tumors. [4, 5]

Compared to computed tomography (CT) and magnetic resonance imaging (MRI), high-resolution ocular ultrasonography (USG) offers superior imaging of the posterior segment, particularly in the presence of opaque media. [6] It is an essential tool for ophthalmologists and radiologists, providing detailed anatomical and pathological information that facilitates accurate diagnosis and appropriate treatment planning.

In this study, we aim to evaluate the role of ultrasonography in diagnosing posterior segment ocular pathologies, emphasizing its diagnostic accuracy, clinical utility, and impact on patient management.

MATERIALS AND METHODOLOGY

The present study was conducted in the Department of Radiodiagnosis at BVDU Sangli over 18 months. A total of 58 patients with clinical suspicion of posterior segment ocular pathologies were included. Before the initiation of the study, the written informed consent form was obtained from the patients. Approval from the ethical committee was also obtained.

Inclusion Criteria:

Patients who were diagnosed or suspected of posterior segment pathology with opaque or clear media, patients with blunt trauma to the eye, patients presenting with proptosis, and patients suspected or diagnosed with intraocular tumors were included in this study.

Exclusion Criteria:

Patients who had active painful ocular surface infection with extrusion of intraocular contents, or patients who recently underwent surgery were excluded from the study.

Methodology:

All the patients were subjected to ocular ultrasonography using a Philips Affinity 50 ultrasonography machine. The ocular ultrasound was performed on patients in a supine position, through the closed eyelid with high-frequency linear transducers having a frequency of 7.5-13.0 MHz after the application of adequate coupling gel.

The examination was performed first in B-mode, and the focus, gain, and settings were adjusted during the examination. The focus was adjusted to the depth of the segment to be examined. Greatly reducing the gain showed the walls of the globe and optic nerve sheath perfectly. Increasing the gain enabled the contents of the vitreous body to be studied.

Finally, adding color and pulsed Doppler may be useful in some conditions. Low-flow settings and a small gate were chosen for Doppler. The dynamic exam may be recorded, depending on the equipment, with a series of images or with video sequences.

RESULTS

This study included a total **of** 58 patients, comprising 38 males and 20 females**,** all with a clinical suspicion of posterior segment ocular pathologies**.**

Table 1: Clinical Features

Clinical Features	Number of patients	Percentage of cases (%)
Diminished vision	58	100
Photopsia	48	84
Red hue/ cobwebs in vision	13	22
Ocular pain	6	11
Eye discharge	4	8

The table 1 presents the clinical features observed in 58 patients. Diminished vision was present in all cases (100%), making it the most common symptom. Photopsia (84%) was also highly prevalent, often indicating retinal involvement. Red hue or cobweb-like floaters (22%) suggest possible vitreous hemorrhage or debris in the vitreous humor. Ocular pain (11%) was noted in a small proportion of patients, potentially linked to inflammation or increased intraocular pressure. Eye discharge (8%) was the least common symptom, possibly indicating an infectious or inflammatory process. These findings highlight the importance of assessing retinal and vitreous conditions in patients presenting with such symptoms.

Table 2: Previous Medical or Surgical History

Predisposing condition	Number of patients	Percentage of cases(%)
Diabetes mellitus	35	61
Hypertension	33	57
Both DM and HTN	23	40
Preexisting myopia	30	52
Previous cataract surgery	13	22
Ocular trauma	2	4

The table 2 outlines the predisposing conditions observed in 58 patients. Diabetes mellitus (61%) was the most common risk factor, likely due to its association with retinal complications such as diabetic retinopathy. Hypertension (57%) was also prevalent, as it can contribute to vascular changes affecting the retina. Both diabetes and hypertension (40%) were present in a significant subset, increasing the risk of retinal vascular disorders. Preexisting myopia (52%) was another major risk factor, possibly due to its association with retinal thinning and detachment. Previous cataract surgery (22%) may have contributed to vitreoretinal complications, while ocular trauma (4%) was the least common, indicating a minor role in this cohort.

Table 3- Site of posterior segment pathology-

Site involved	Number of patients	Percentage of Cases (%)
Retina	27	47
Vitreous	31	54
Choroid	3	5
Optic nerve/ papilla	2	3

The table 3 presents the site of involvement in 58 patients. The vitreous (54%) was the most frequently affected site, likely due to conditions such as vitreous hemorrhage or posterior vitreous detachment. The retina (47%) was also commonly involved, suggesting retinal pathologies like diabetic or hypertensive retinopathy, retinal detachment, or vascular occlusions. The choroid (5%) was affected in a small number of cases, potentially due to choroidal neovascularization or inflammation. The optic nerve/papilla (3%) was the least affected site, possibly indicating optic neuropathy or papilledema.

Table 4- Ultrasound Diagnosis

Diagnosis	Number of patients	Percentage of cases (%)
Retinal detachment	19	33
Vitreous hemorrhage	13	22
Cataract with PVD	8	14
Dislocated/ subluxated lens	6	10
Retinal detachment with vit. Hemorrhage	4	7
Choroidal detachment	3	5
Retinoschisis	2	3
Old retinal detachment with cyst	1	2
Retinal detachment with subretinal hemorrhage	1	2
Optic nerve glioma	1	2
TOTAL	58	100

The table 4 presents the diagnoses in 58 patients, with retinal detachment (33%) being the most common, followed by vitreous hemorrhage (22%)**.** Cataract with posterior vitreous detachment (14%) (Fig 1) and dislocated/subluxated lens (10%) were also observed. Severe cases included retinal detachment with vitreous hemorrhage (7%)**,** choroidal detachment (5%)**,** and retinoschisis (3%)**.** Rare conditions like old retinal detachment with cyst (2%)**,** retinal detachment with subretinal hemorrhage (2%)**,** and optic nerve glioma (2%) were noted. (Fig 2)

Fig 1: Posterior dislocation of Lens as seen on B scan.

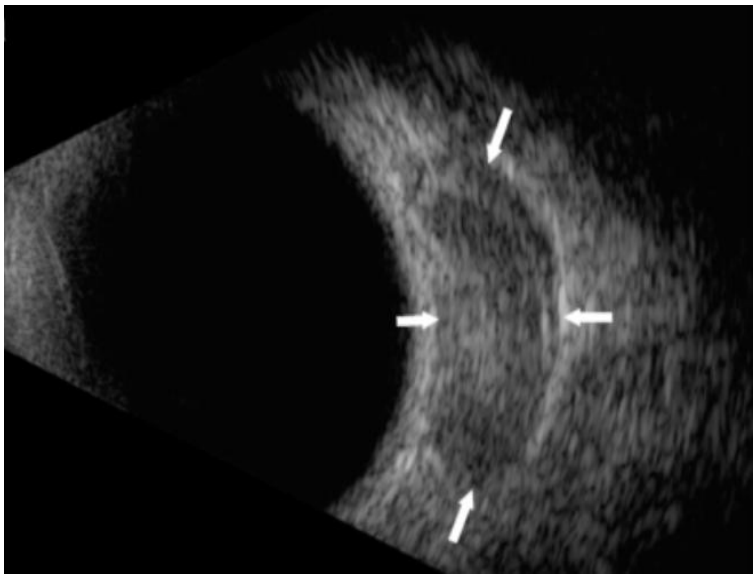

Fig 2: Ocular ultrasound showing an enormous enlargement of the optic nerve (white arrows)

Table 5 – Comparison of Ultrasound and Operative Diagnosis-

	Diagnosis on USG	**Operative diagnosis**	**Accuracy percentage of USG diagnosis**
	Frequency	**Frequency**	
Cataract	33	33	100%
Retinal detachment	19	19	100%
Vitreous hemorrhage	13	13	100%
Cataract with PVD	8	8	100%
Dislocated/ subluxated lens	6	6	100%
Retinal detachment with vit. Hemorrhage	4	4	100%
Choroidal detachment	3	3	100%
Retinoschisis	2	2	100%
Old retinal detachment with cyst	1	1	100%
Retinal detachment with subretinal hemorrhage	1	1	100%

The table 5 compares USG (ultrasonography) diagnosis with operative findings in 58 patients, showing a 100% accuracy rate for all conditions. Cataract (33 cases), retinal detachment (19 cases) (Fig 3), and vitreous hemorrhage (13 cases) were the most frequently diagnosed. Other conditions, including cataract with PVD (8 cases), dislocated/subluxated lens (6 cases), retinal detachment with vitreous hemorrhage (4 cases), and choroidal detachment (3 cases) (Fig 4), were also accurately identified. Less common findings like retinoschisis (2 cases), old retinal detachment with cyst (1 case), and retinal detachment with subretinal hemorrhage (1 case) were precisely diagnosed.

Fig 3: Retinal Flaps (white) as seen in retinal detachment.

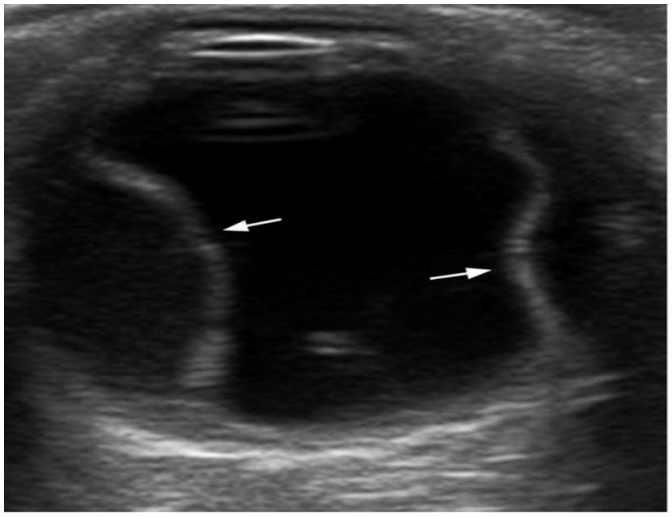

Fig 4: The white arrows pointing the ballooning of white lines into the vitreous characteristic of exudative choroidal detachment.

DISCUSSION

This study included 58 patients, comprising 38 males and 20 females, all with a clinical suspicion of posterior segment ocular pathologies. In a similar study by **Boruah et al., [7]** 81 patients were examined, with 48 males and 33 females, also showing a male preponderance in posterior segment pathologies. Additionally, **Ansari et al., [8]** reported a male predominance, with 86 (63.24%) males and 50 (36.77%) females.

The most common clinical feature in the present study was diminished vision, present in all cases (100%). Photopsia (84%), red hue/cobweb-like vision (22%), ocular pain (11%), and eye discharge (8%) were also reported as other common symptoms in the present study. Similarly, **Boruah et al.**, **[7]** reported that 61 (75.3%) patients presented with decreased vision, emphasizing its significance as a primary symptom of posterior segment pathologies.

Regarding systemic associations, diabetes mellitus (61%) was the most common risk factor in the present study, followed by hypertension (57%). Similarly, **Ansari et al.,** [8] also reported diabetes mellitus (16.18%) and hypertension (8.82 in their study findings.

In the present study, among posterior segment pathologies, retinal detachment (33%) was the most frequently diagnosed condition, followed by vitreous hemorrhage (22%). Similarly, **Adebayo et al.**, **[9]** also reported retinal detachment and vitreous hemorrhage as the most common nontraumatic posterior segment lesions detected on B-mode ultrasonography (USG). Additionally, **Boruah et al.**, **[7]** identified combined ocular pathologies in 18 (22.2%) patients, isolated retinal detachment in 17

(21%) patients, and vitreous detachment with cataracts in 11 (13.6%) patients. However, **Nandy et al., [10]** reported vitreous hemorrhage as the most common pathology, showing variation with the present study findings.

One of the key findings of this study was the 100% accuracy of ultrasound in diagnosing all conditions, as corroborated by operative findings. Cataract (33 cases), retinal detachment (19 cases), and vitreous hemorrhage (13 cases) were accurately diagnosed using USG, as were less common pathologies like retinoschisis (2 cases) and optic nerve glioma (1 case). This finding aligns with **Nandy et al., [10]** who reported a diagnostic accuracy of 99% for retinal detachment using ultrasonography, with a slightly lower specificity (98.6%).

Overall, this study demonstrates the significant role of ultrasonography in diagnosing posterior segment ocular pathologies, with findings showing a high diagnostic accuracy of 100% when compared with operative diagnoses. Despite the promising results, further studies with larger sample sizes are needed to further validate ultrasonography's role and explore its integration with other imaging techniques for enhanced diagnostic accuracy and patient management.

CONCLUSION

This study offers important insights into the clinical presentation, risk factors, and diagnostic accuracy of posterior segment pathologies. Overall, the present study findings highlight the critical role of early diagnosis and intervention, especially in patients with systemic conditions such as diabetes and hypertension that predispose them to these pathologies. Ultrasound proves to be a dependable, non-invasive diagnostic tool for assessing these conditions and guiding surgical decision-making.

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