



ORIGINAL RESEARCH PAPER

Radio-Diagnosis

EVALUATION OF POSTERIOR SEGMENT EYE PATHOLOGIES IN A HAZY ANTERIOR EYE CHAMBER WITH ULTRASONOGRAPHY B SCAN

KEY WORDS: Ultrasound B-scan, posterior segment pathologies, vitreous degeneration, retinal detachment.

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ABSTRACT

Ultrasound B-scan is a crucial diagnostic tool in ophthalmology, particularly valuable when media opacities obstruct direct visualization of the posterior segment of the eye. This study aims to evaluate the frequency and patterns of posterior segment pathologies using B-scan ultrasonography in a sample of 124 individuals (248 eyes). A structured datasheet was used to collect demographic information and clinical findings. Each eye was independently assessed using direct and indirect ophthalmoscopy, and posterior segment abnormalities were recorded using binary coding (1 = present, 0 = absent). The most frequently observed pathology was vitreous degeneration, followed by cataract and vitreous hemorrhage. Posterior vitreous detachment was also relatively common, while serious pathologies such as retinal detachment, staphyloma, and intraocular tumors were rare. Conditions like asteroid hyalosis, choroidal detachment, and endophthalmitis were not observed. The study emphasizes the importance of B-scan ultrasonography as a non-invasive, efficient, and reliable method for evaluating posterior segment conditions, especially when the fundus is not visible through routine methods. The findings underscore the need for early detection and management of degenerative and potentially vision-threatening ocular disorders through routine imaging in clinical practice.

INTRODUCTION

Intraocular diagnosis Ultrasound B-scan Ultrasound B-scan (sometimes known as brightness mode ultrasonography) is a real-time, non-invasive imaging modality routinely used in ocular diagnosis to opacity to evaluate the structure of the eye and orbit where the opacity would otherwise prevent clinical evaluation. This is particularly important in the assessment of posterior disease processes where opacity of the media e.g. dense cataracts, corneal scars or vitreous haemorrhage or hyphema will obscure the fundus view. B-scan ultrasonography has been of great value to the clinician as it has given them anatomical and pathological details of the eye through the generation of two-dimensional cross-sectional images of the eye and subsequently presented a means through which diseases that could not be visible using the standard ophthalmoscopic technique could be detected, diagnosed and subsequently monitored.

The posterior eye has some of the most important components like the vitreous body, retina, choroid and optic nerve head. Retinal pathologies in this area (retinal detachment, vitreous hemorrhage, posterior vitreous detachment, intraocular tumors, staphyloma, choroidal detachment) may have a devastating effect on the vision process and have to be treated immediately. Differentiation and early analysis are significant to facilitate proper management and prognosis especially with respect to these conditions. Ultrasound B-scan is a reliable investigation when assessing such conditions both in emergency conditions or in poorly cooperative patients.

Since it is a cost-effective, simple to operate and diagnostic tool, B-scan ultrasonography has become a standard tool in regular eye practice, mainly in tertiary eye care facilities. This research is dedicated to the usage of ultrasound B-scan assessment of the posterior segment pathologies, which was

aimed to draw the attention to novelty, frequency, patterns, and clinical efficacy of the conditions under consideration. By use of systematic observation and interpretation of the results of the B scans, this study aims to support the role of ultrasonography as a vital complement in assessing the overall condition of the posteriors segments disorders.

Significance OfThe Study

The current study is very relevant to clinical practice because it emphasizes the presence of B-scan ultrasonography to perform an assessment of the posterior segment pathologies in patients with media opacities when the fundus observation cannot be performed directly owing to diseases such as dense cataracts or vitreous hemorrhage. B-scan is a non-invasive, safe, and valid method of diagnosis which helps ophthalmologists to detect and distinguish between many lesions of the posterior segment (vitreous degeneration, retinal detachment, tumor, and staphyloma). The systematical examination of information on both eyes allows taking valuable data on the prevalence and distribution of these conditions that will help to diagnose and provide them with treatment age-appropriate early. It helps to achieve better patient outcomes, particularly in rural or under-equipped areas, where high-level imaging devices are not readily available.

Objectives OfThe Study

- To assess posterior segment pathologies using B-scan ultrasonography.
- To determine the frequency of different posterior segment abnormalities.
- To compare findings between right and left eyes.
- To identify the most common pathologies detected.
- To evaluate the diagnostic role of B-scan when fundus view is obscured.

Research Methodology
 Study Design

It is cross-sectional observational study which seeks to determine prevalence and distribution of different pathologies in the posterior segment pathology patient reporting to an ophthalmology clinic. The right and left eye of each individual was checked along separately to obtain data regarding the eye pathology.

Study Population

These individuals consisted of 124 (248 eyes: 124 right eyes + 124 left eyes).

Inclusion Criteria

- Patients presenting with visual complaints or referred for fundoscopic evaluation.
- Individuals of all ages and genders.

Exclusion Criteria

- Patients with anterior segment-only pathologies.
- Individuals with incomplete ocular examination records.

Data Collection Tools And Procedure

A case records datasheet was used to properly capture information about a patient including their demographic and clinic information. The demographic factors consisted of the name of the patient, his age, and gender (when available). Clinical information contained information on in-depth results of ocular examinations that were carried out separately on the right and left eye of study subjects. The individual pathologies of the posterior segment recorded were; vitreous hemorrhage, posterior vitreous detachment, vitreous degeneration, asteroid hyalosis, vitritis, vitreous hemorrhage with retinal detachment, retinal detachment, choroidal detachment, endophthalmitis, staphyloma, dislocated posterior chamber intraocular lenses (PCIOLs), intraocular tumors, cataract, and normal fundus findings. The number of each pathology was recorded in a binary coding format where 1 represented the presence and 0 represented the absence of given condition. Direct and indirect ophthalmoscopy were used to perform the ocular examination in order to get an adequate examination of the posterior segment tissue.

Data Analysis

The use of descriptive statistical analysis was undertaken to explore the distributions among the pathology of each posterior segment. The results were well compiled and further analyzed independently on the right and the left eye so as to offer a clear picture of the distribution and occurrence of ocular disorders. Each pathology was determined to have frequencies and respective percentages to measure how they have been impacted in the study population. Microsoft Excel was used in data entry, tabulation as well as output of summary statistics. Moreover, a qualitative comparison of the data obtained in the right and in the left eye and in particular the qualitative determinants of the presence of a certain symmetry or laterality in the occurrence of the posterior segment pathologies were made.

Ethical Consideration

- Patient confidentiality was maintained by anonymizing names and identification numbers.
- Ethical clearance was obtained from the Institutional Review Board (IRB).
- Informed consent was taken from all participants (or guardians in the case of minors).

RESULTS

Table 1: Frequency Distribution Of Posterior Segment Pathologies

Posterior Segment Pathology	Right Eye (n = 124)	Left Eye (n = 124)
Vitreous Hemorrhage	7	8

Posterior Vitreous Detachment	10	4
Vitreous Degeneration	11	15
Asteroid Hyalosis	0	0
Vitritis	0	0
Vitreous Hemorrhage with Retinal Detachment	0	0
Retinal Detachment	1	1
Choroidal Detachment	0	0
Endophthalmitis	0	0
Staphyloma	2	1
Dislocated PCIOs in Vitreous	0	0
Intraocular Tumors	1	0
Cataract	8	10
Normal Findings	6	6

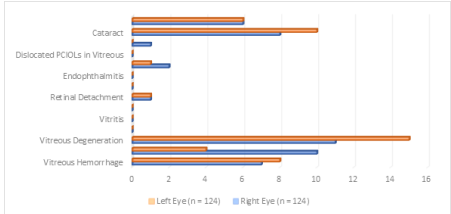


Figure 1: Frequency Distribution of Posterior Segment Pathologies

The frequency distribution of posterior segment pathologies among 124 right and 124 left eyes reveals that vitreous degeneration is the most commonly observed condition, with 11 cases in the right eye and 15 in the left. Posterior vitreous detachment follows, more prevalent in the right eye (10 cases) compared to the left (4 cases). Vitreous hemorrhage is also noted, slightly more in the left eye (8 cases) than the right (7 cases). Cataract, although primarily an anterior segment pathology, is recorded in the posterior segment context for 8 right and 10 left eyes, possibly due to its impact on posterior segment evaluation. Staphyloma and intraocular tumors are rare, with only a few instances (staphyloma: 2 right, 1 left; tumor: 1 right, 0 left). Notably, no cases of asteroid hyalosis, vitritis, vitreous hemorrhage with retinal detachment, choroidal detachment, dislocated PCIOs, or endophthalmitis were observed. Retinal detachment was seen in only one eye on each side. Interestingly, 6 eyes on each side exhibited no abnormal findings.

Table 2: Total Number Of Eyes Affected Per Pathology

Posterior Segment Pathology	Total Eyes Affected (Right + Left)
Vitreous Hemorrhage	15
Posterior Vitreous Detachment	14
Vitreous Degeneration	26
Asteroid Hyalosis	0
Vitritis	0
Vitreous Hemorrhage with Retinal Detachment	0
Retinal Detachment	2
Choroidal Detachment	0
Endophthalmitis	0
Staphyloma	3
Dislocated PCIOs in Vitreous	0
Intraocular Tumors	1
Cataract	18
Normal Findings	12

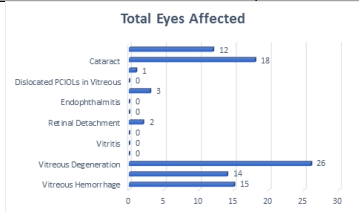


Figure 2: Total Number of Eyes Affected

The data shows that vitreous degeneration is the most common posterior segment pathology, affecting 26 eyes, followed by cataract (18 eyes) and vitreous hemorrhage (15 eyes). Less frequent findings include posterior vitreous detachment (14 eyes) and staphyloma (3 eyes), while several conditions like asteroid hyalosis, vitritis, and endophthalmitis were not observed. Only 2 cases of retinal detachment and 1 intraocular tumor were reported, indicating a low prevalence of severe pathologies. Normal findings were seen in 12 eyes.

Table 3: Most Common Posterior Segment Pathologies (Descending Order)

Rank	Posterior Segment Pathology	Total Eyes Affected
1	Vitreous Degeneration	26
2	Cataract	18
3	Vitreous Hemorrhage	15
4	Posterior Vitreous Detachment	14
5	Staphyloma	3
6	Retinal Detachment	2
7	Intraocular Tumors	1
8	Normal Findings	12

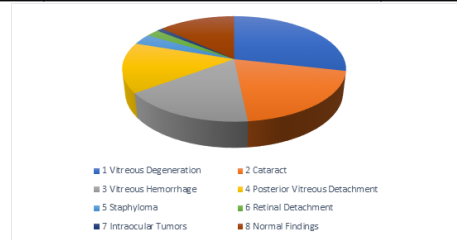


Figure 3: Most Common Posterior Segment Pathologies

This data indicates that vitreous degeneration is the commonest pathology of the posterior segment (26 eyes), cataract (18 eyes), vitreous hemorrhage (15 eyes), and posterior vitreous detachment (14 eyes). Less frequently, there are staphyloma (3), retinal detachment (2) and intraocular tumor (1). The normal results were observed in 12 eyes, and this fact reflects the lack of severe pathologies; although a range of degenerative processes is rather typical.

DISCUSSION

This study was done to determine the prevalence and distribution of the different posterior segment pathologies on a sample comprising of 124 participants, where both the right and left eye of each of the sample individual(s) were assessed (248 eyes). The results present the observations of frequent and infrequent disorders of the posterior segment of the population.

Vitreous degeneration was found to be the commonest pathology accounting to 26 eyes (11 right and 15 left) among the other posterior segment surpluses. Vitreous degeneration, commonly associated with aging and myopia, may be attributed to degenerative changes in the vitreous body leading to syneresis and liquefaction. Its prominence in this dataset suggests that age-related changes and possibly systemic degenerative conditions are relatively common among the studied individuals.

The second most common pathology was cataract, noted in 18 eyes (8 right and 10 left). While cataract is traditionally considered an anterior segment pathology, its documentation here in the context of posterior segment evaluation likely stems from its impact on visualizing the posterior pole during funduscopy. Dense opacities can obscure the examiner's view, thus becoming a relevant variable when analyzing posterior segment health.

Vitreous hemorrhage was observed in 15 eyes (7 right and 8 left), making it the third most frequent finding. This condition may result from multiple causes, including proliferative diabetic retinopathy, trauma, or retinal tears. Although the exact etiology was not captured in this dataset, its occurrence warrants consideration of systemic diseases like diabetes mellitus or retinal vascular disorders as potential contributors.

Posterior vitreous detachment (PVD) was found in 14 eyes, more frequently in the right eye (10) than the left (4). PVD is often age-related and may present with symptoms like floaters or flashes. The higher occurrence in right eyes could be incidental, or may reflect asymmetrical vitreous changes which are not uncommon in clinical settings.^{8*}

Several serious and vision-threatening conditions such as retinal detachment (2 cases), intraocular tumors (1 case), and staphyloma (3 cases) were recorded, though in low frequencies. The limited number of these findings is reassuring in terms of severe posterior segment pathology prevalence in this group. However, their presence underlines the importance of comprehensive posterior segment evaluations, especially in symptomatic individuals or those with known risk factors such as high myopia, trauma, or intraocular surgery.

Interestingly, no cases of asteroid hyalosis, vitritis, vitreous hemorrhage with retinal detachment, choroidal detachment, dislocated posterior chamber intraocular lenses (PCIOLs), or endophthalmitis were found in this population. The absence of these pathologies could be due to either their rarity in the population sampled or possibly under-detection in asymptomatic or early stages.

Lastly, normal posterior segment findings were recorded in 12 eyes (6 in each eye), indicating that only a small portion of the population had no visible abnormalities during ophthalmoscopic examination. This might reflect the demographic composition (older age range in some cases) or the referral nature of the cases, where patients might already have been symptomatic or diagnosed elsewhere.

CONCLUSION

The analysis of posterior segment pathologies among 124 individuals (248 eyes) reveals that degenerative changes of the vitreous, particularly vitreous degeneration and posterior vitreous detachment, are the most frequently encountered conditions. Cataract, while primarily affecting the anterior segment, was also significantly reported due to its impact on posterior segment visualization. Vision-threatening pathologies such as retinal detachment, staphyloma, and intraocular tumors were observed in a small number of cases, highlighting the importance of thorough ocular examination even in asymptomatic individuals. The absence of several severe pathologies like endophthalmitis and dislocated intraocular lenses suggests a relatively low incidence of postoperative or infectious complications in this population. Overall, the findings underscore the necessity for routine posterior segment evaluations, especially in aging individuals, to ensure early detection and management of both common degenerative and rare but serious ocular conditions.

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