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Original Research Article

# Posterior Segment Evaluation in Ocular Trauma: A Comparative Study of Patients with and without Ocular Media Opacity

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**Abstract**

**Introduction:** Ocular trauma is a significant cause of visual morbidity worldwide. When media opacities like corneal edema, hyphema, or cataract preclude a clear view of the posterior segment, B-scan ultrasonography becomes an indispensable diagnostic tool for evaluating vitreo-retinal pathologies. This study aimed to evaluate the role of B-scan ultrasonography in detecting posterior segment lesions in patients with ocular trauma, with or without opaque media, to aid in diagnosis, management, and prognostication.

**Materials and Methods:** A prospective diagnostic study was conducted on 166 traumatized eyes of 150 patients. All patients underwent a detailed ocular examination followed by B-scan ultrasonography using a 12 MHz probe. The findings were systematically recorded and analyzed.

**Results:** The majority of patients were males (80.7%) in the 20-29-year age group (31.3%). Unilateral injury was more common (89.3%), with the right eye being more frequently involved (60.84%). Open globe injuries (65.1%) predominated over closed globe injuries (34.9%). B-scan revealed posterior segment pathologies in 72.29% of eyes. Vitreous hemorrhage was the most common finding (45.18%), followed by retinal detachment (11.44%), choroidal detachment (7.2%), and posterior vitreous detachment (7.22%). Other findings included posteriorly dislocated lens (3%), globe rupture (3.6%), and intraocular foreign body (2.4%).

**Conclusion:** B-scan ultrasonography is a simple, non-invasive, cost-effective, and highly reliable modality for evaluating the posterior segment in ocular trauma. It is crucial for detecting occult injuries, planning surgical intervention, and predicting visual prognosis, especially in the presence of opaque media.

**Keywords:** Ocular Trauma; Posterior Segment Evaluation; Media Opacity; Ultrasound B-scan; Visual Outcomes.



## Introduction

Ophthalmic ultrasound has revolutionized the diagnosis and management of ocular diseases, becoming an indispensable tool in the ophthalmologist's armamentarium. [1,2] Its utility is paramount in scenarios where the view to the posterior segment is obstructed. Ocular trauma, a major cause of preventable monocular blindness globally, often results in media opacities such as hyphema, cataract, or vitreous hemorrhage, rendering direct fundoscopy impossible. [3,4] In such cases, B-scan ultrasonography provides a critical window into the eye, allowing for a dynamic, non-invasive, and detailed assessment of the posterior segment. [5,6,7] The foundation of diagnostic ultrasound lies in the piezoelectric phenomenon, discovered by the Curie brothers in 1880. Its first ophthalmic application was reported by Mundt and Hughes in 1956, and since then, technological advancements have led to the development of high-frequency probes (typically 10-20 MHz) that offer exceptional resolution of ocular structures. B-scan, or Brightness scan, presents a two-dimensional cross-sectional image of the eye, where echoes are displayed as bright dots on a gray scale, with the intensity corresponding to the echo strength. [7,8,9]

This study aims to underscore the diagnostic value of B-scan ultrasonography in identifying and characterizing posterior segment pathologies in patients presenting with ocular trauma, thereby guiding appropriate management and improving visual outcomes.

## Materials and Methods

**Study Design and Population:** A prospective diagnostic study was conducted over two academic years (2013-2015) in the Upgraded Department of

Ophthalmology. The study included 150 patients with a history of ocular trauma, resulting in a total of 166 traumatized eyes.

Patients with polytrauma, those who were critically ill, and those with pre-existing diagnosed posterior segment pathologies were excluded from the study.

**Equipment:** Examinations were performed using a "Desmin Optopol" ultrasound B-scan machine equipped with a high-resolution 12 MHz probe.

**Procedure:** Each patient underwent a comprehensive evaluation:

**History:** Detailed patient particulars and history of the traumatic event were recorded.

**Clinical Examination:** This included assessment of visual acuity, anterior segment examination with a slit lamp, and evaluation of the lids, conjunctiva, and ocular motility.

**B-Scan Ultrasonography:** The examination was primarily performed through closed eyelids using methylcellulose as a coupling agent. Dynamic scanning was performed by asking the patient to move their eyes in different gazes. Standard probe orientations were employed:

- **Transverse Scans:** To assess the lateral extent of pathology.
- **Longitudinal Scans:** To evaluate the radial extent from the posterior pole to the ora serrata.
- **Axial Scans:** To visualize the lens, optic nerve, and macula in a single view. A systematic limbus-to-fornix approach was used to screen the entire globe from the posterior pole to the far periphery.

**Results**

**Demographic and Injury Profile:** The study included 166 eyes from 150 patients. The majority of patients were male (121 patients, 80.7%), and the most commonly affected age group was 20-29 years (47 patients, 31.3%).

Unilateral trauma (134 patients, 89.3%) was far more common than bilateral trauma (16 patients, 10.7%).

The right eye was involved in 101 cases (60.84%), compared to the left eye in 65 cases (39.15%). Open globe injuries (108 eyes, 65.1%) were more frequent than closed globe injuries (58 eyes, 34.9%).

**Table 1: Demographic and Injury Characteristics (n=150 Patients / 166 Eyes)**

| Parameter | Number | Percentage |
|---|---|---|
| **Gender** | | |
| Male | 121 | 80.70% |
| Female | 29 | 19.30% |
| **Age Group** | | |
| <20 years | 23 | 15.30% |
| 20–29 years | 47 | 31.30% |
| 30–39 years | 34 | 22.70% |
| 40–49 years | 26 | 17.30% |
| ≥50 years | 20 | 13.40% |
| **Type of Trauma** | | |
| Unilateral | 134 | 89.30% |
| Bilateral | 16 | 10.70% |
| **Eye Involved** | | |
| Right Eye | 101 | 60.84% |
| Left Eye | 65 | 39.15% |
| **Nature of Injury** | | |
| Open Globe | 108 | 65.10% |
| Closed Globe | 58 | 34.90% |

**B-Scan Findings:** B-scan ultrasonography revealed normal posterior segment anatomy in 46 eyes (27.71%). Pathological findings were detected in the remaining 120 eyes (72.29%). The spectrum of posterior segment lesions identified is summarized in the table below.

**Table 2: Distribution of Posterior Segment Findings and Combined Pathologies**

| Posterior Segment Finding | Number of Eyes (n=166) | Percentage |
|---|---|---|
| Normal B-Scan | 46 | 27.71% |
| Vitreous Hemorrhage (VH) | 63 | 38.00% |
| Retinal Detachment (RD) | 13 | 7.80% |
| Choroidal Detachment (CD) | 8 | 4.80% |
| Posterior Vitreous Detachment (PVD) | 10 | 6.02% |
| Globe Rupture | 6 | 3.60% |

| | | |
|---|---|---|
| Posteriorly Dislocated Lens | 5 | 3.00% |
| Intraocular Foreign Body (IOFB) | 4 | 2.40% |
| **Combined Pathologies** | | |
| VH + RD | 6 | 3.60% |
| VH + CD | 2 | 1.20% |
| VH + PVD | 2 | 1.20% |
| RD + CD | 1 | 0.60% |

Vitreous hemorrhage was the single most common finding, either in isolation or in combination with other pathologies, affecting a total of 75 eyes (45.18%). Retinal detachment was observed in 19 eyes (11.44%) when isolated and combined cases were considered.

**Discussion**

The findings of this study align with the existing literature, confirming the critical role of B-scan ultrasonography in the management of ocular trauma. The demographic profile—predominance of young males—reflects their greater exposure to high-risk occupational and social environments. The higher incidence of unilateral and open globe injuries is also consistent with patterns reported in other studies. [9,10,11]

The key strength of B-scan lies in its ability to visualize the posterior segment through opaque media. In our study, 72.29% of traumatized eyes had detectable posterior segment damage, which would have been missed on clinical examination alone.

This high detection rate underscores the necessity of performing ultrasonography in all cases of significant ocular trauma where the fundus is not clearly visible.

Analysis of Key Pathologies

- **Vitreous Hemorrhage:** As the most frequent finding (45.18%), VH appears on B-scan as mobile, low-to-medium reflective echoes within the vitreous cavity. Its presence warrants careful search for an underlying retinal break or detachment.
- **Retinal Detachment:** RD presents as a thick, highly reflective, immobile membrane that remains attached to the optic disc. The ability to differentiate a rhegmatogenous RD from a tractional or exudative detachment is vital for surgical planning.
- **Choroidal Detachment:** CD is seen as smooth, thick, dome-shaped elevations in the periphery, showing little mobility. Hemorrhagic CD, as often seen in trauma, shows echoes in the suprachoroidal space.
- **Intraocular Foreign Body (IOFB) and Globe Rupture:** B-scan is excellent for detecting radiolucent IOFBs, which appear as bright, high-reflective echoes with acoustic shadowing. While a rupture site may not be directly visible, indirect signs like vitreous incarceration, scleral thickening, and gross distortion of ocular anatomy are highly suggestive.

Our results are comparable to those of Mumtaz A. Alam and Ch. Srinivas Murty, who also reported vitreous hemorrhage as the most common lesion and found posterior segment abnormalities in a high percentage of traumatized eyes. [12,13]

The variations in the exact percentages of specific pathologies can be attributed to differences in the study population and the nature of trauma. [14,15]

**Conclusion**

B-scan ultrasonography is an invaluable, non-invasive, and cost-effective diagnostic modality in the evaluation of ocular trauma. Its ability to accurately delineate the structural integrity of the posterior segment through opaque media makes it indispensable for several reasons:

**1. Diagnosis:** It allows for the definitive diagnosis of occult injuries that are not clinically apparent.

**2. Surgical Planning:** It provides essential pre-operative information regarding the extent and nature of vitreo-retinal pathologies, influencing the surgical approach and timing.

**3. Prognostication:** The findings on B-scan help in predicting the potential for visual recovery and counseling patients accordingly.

**4. Monitoring:** It serves as an excellent tool for monitoring the resolution of pathologies like vitreous hemorrhage or the progression of retinal detachment.

Given its simplicity, reliability, and wide availability, B-scan ultrasonography should be considered a routine part of the diagnostic workup for all cases of significant ocular trauma. It bridges the diagnostic gap created by media opacities, ensuring that sight-threatening posterior segment injuries are not overlooked.

**References**

1. Ahmed j, Shaikh FF, Rizwan A, Memon M F: Evaluation of vitreoretinal pathologies using B-Scan ultrasound. Pakistan journal of Ophthalmology 2009;25(4).

2. Whitcomb MB. : How To Diagnose Ocular Abnormalities With Ultrasound. AAEP Proceeding. 2002; 48:272-275.
3. Zafar D, Sajad AM, Qadeer A. Role of B-Scan ultrasonography for posterior segment lesions. Pak J LUMHS. 2008;7:7–12.15
4. Adebayo SB, Onabolu OO, Bodunde TO, Ajibode HA. Nigerian Med Pract. 2007; 52: 82–84.
5. Sripathi Kamath. Ultrasound biomicroscopic evaluation of eyes with blunt ocular injury 2011
6. Kuhn F. Epidemiology of ocular trauma. In: Kuhn F, Morris R, Mester V, Witherspoon D. Ocular Traumatology. Springer- Verlag Berlin Heidelberg. 2005: 47-77
7. Shaikh FU, Narsani AK, Jatoi SM, Shaikh ZA: Preoperative Posterior Segment Evaluation by Ultrasonography in dense cataract. Pakistan Journal of Ophthalmology. 2009;25(3):135-139.
8. Rai P, Shah SI, Cheema AM, Niazi JH, Siddiqui SJ: Usefulness of B-Scan Ultras onography in Ocular Trauma. Pakistan Journal of Ophthalmology. 2007;23(3):136-143.
9. Qureshi M and Laghari K: Role of B-Scan Ultrasonography in preoperative cataract patients. International Journal of Health Sciences. 2010;4(1):34-38.
10. Farvardin M, Mehryar M, Karanjam M, Ashraf H, Mehdizadeh M, Rahimi M, Hosseini H, Siyoofi S, Mosallaei M: The accuracy of Ocular Sonography in Detection and Measurement of Intraocular Foreign Bodies. Iranian Journal of Ophthalmology 2008; 20(4): 20-23.
11. Carrero LJ et al: B-scan ultrasonography to screen for retinal tears in acute symptomatic age-related posterior vitreous detachment. Ophthalmology. 2009;! 16(l):94-99.
12. Yoonessi R, Hussain A, Jang TB: Bedside ocular ultrasound for the detection of retinal detachment in the emergency department. Academic Emergency J Vledicine. 2010; 17(9): 913-917.
13. Alam M, Iqbal M, Khan A, Khan SA: Ocular injuries in blast victims. Journal of Pakistan medical association. 2012;62(2):138-142.
14. Aggarwal P, Garg P, Sidhu HK, Mehta S: Post-traumatic endophthalmitis with retained intraocular foreign body - a case report with review of literature. Nepal Journal of Ophth Palvin almology. 2012;4(7):187-190.
15. Vodapalli H, Murthy SI, Jalali S, Ali MJ, Rani PK. Comparison of immersion ultrasonography, ultrasound biomicroscopy and anterior segment optical coherence tomography in the evaluation of traumatic phacoceles. Indian J Ophthalmol. 2012;60(1): 63-5.