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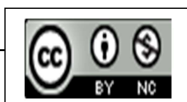
Ophthalmic B-Scan findings in Ocular Trauma patients in Rural Healthcare

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Abstract:

Background: Ocular trauma is a major cause of preventable blindness and monocular visual impairment, with a significant burden in rural population. A comprehensive ocular assessment is crucial for early diagnosis and management. However, when media opacities hinder direct visualization, B-scan ultrasonography becomes a vital diagnostic tool.

Objective: To study the ophthalmic B-scan findings in patients presenting with ocular trauma having opaque ocular media at a rural tertiary care hospital.

Methods: An observational, descriptive cross-sectional study was conducted after the ethical committee approval for 12 months. A total of 40 patients with history of ocular trauma with opaque media were evaluated using ophthalmic B-Scan. Findings were analyzed based on the mode of injury, cause of trauma and diagnosis made using B-Scan.

Results: Most cases were seen in the age group between 16-60 years with 70% occurring in males. Injury with a wooden stick was the most common cause of trauma (55%). Traumatic cataract was the most common finding found in 30% cases. Other ocular findings included vitreous hemorrhage (25%), vitreous degeneration (25%), vitreous detachment (15%), retained foreign body in vitreous (5%), retinal detachment (5%), endophthalmitis (5%) & choroidal detachment (5%).

Conclusion: Ophthalmic B-Scan is a quick, non-invasive, cost effective & easily available investigation, especially valuable in a rural area used to evaluate and determine management for patients with ocular trauma who are at a higher risk of ocular morbidity and vision loss.

Key words: Ocular trauma, B-scan ultrasonography

Introduction

Ocular trauma is the most prevalent ophthalmic emergency worldwide¹, with the World Health Organization (WHO) estimating that approximately 55 million people experience such injuries annually². It remains a leading yet preventable cause of blindness and monocular visual impairment. In India, rural populations are particularly vulnerable to ocular trauma due to occupational hazards, lack of protective eyewear, and limited access to immediate medical care³. The extent of ocular involvement varies depending on the nature and mechanism of the injury, necessitating a prompt and comprehensive evaluation to determine the prognosis. However, in cases where media opacities—such as hyphema, corneal opacity, a cataractous lens, or posterior segment pathology—obstruct visualization of intraocular structures, clinical assessment becomes challenging. In such situations, ultrasound B-scan imaging serves as an invaluable diagnostic tool. This non-invasive and cost-effective modality generates two-dimensional images of the eye⁴, allowing for an accurate assessment of posterior segment pathology even in the presence of opaque media.

Given its simplicity, affordability, and accessibility, ultrasound B-scan is particularly well-suited for use in resource-limited rural settings⁵. Its widespread application in ocular trauma cases can significantly enhance diagnostic accuracy and guide appropriate management, ultimately improving patient outcomes.

Materials and Methods

A retrospective observational study was conducted at a tertiary care rural hospital after obtaining the approval from the Institutional Ethics Committee from January 2024 to December 2024. Written informed consent was obtained from every participant.

The patient's age, sex, detailed history of trauma including nature, mode, site, injury time were noted. A thorough ocular examination was done and the anterior segment was evaluated using a slit lamp. The patient underwent B-scan and the findings were noted in a standard proforma.

Inclusion criteria:

1. All patients presenting with ocular trauma having an opaque ocular media in whom the extent of a posterior segment pathology had to be assessed

Exclusion criteria:

1. Patients unwilling to give written informed consent for the study
2. Patients presenting with active bleeding
3. Patients who have a ruptured globe

Results:

A) Gender and Age wise distribution:

70% of the cases in this study were males, while 30% were females. The maximum prevalence of 25% each was seen in age groups 16 to 30 year olds and more than 61 years of age. The 31 to 45 year olds formed 20%, followed by 15% each from 0 to 10 year olds as well as 46 to 60 year olds.

B) Distribution according to nature of injury

24 (60%) of cases were due to a penetrating injury, while the rest 16 (40%) could be attributed to blunt injury.

C) Distribution according to mode of injury

The highest prevalence of mode of injury of 55% was accidental. This was followed by assault at 20% of cases. Injury while playing and during agricultural activities was 10% of cases each. Road traffic accidents contributed to only 5% of all cases in this study.

D) Distribution according to cause of trauma

The highest prevalence of cause of trauma of 55% of cases was due to wooden sticks. This was followed by fist fights at 20% of cases. Injury due to metal object and due to cow's horn was 10% of cases each. Cricket ball injury contributed to 5% of all cases in this study.

E) Distribution according to diagnosis established using B-Scan findings

25% of cases showed a normal B-Scan. Rest of the cases can be divided according to the ocular structure affected and diagnosis established using B-Scan.

a) Chorio- retinal:

15% of cases affected the chorio-retina in this study. Of them, 5% of cases were due to choroidal detachment followed by 5% due to retinal detachment and 5% due to posterior staphyloma.

b) Vitreous:

90% of cases involved the vitreous cavity in this study. Of them, 30% had posterior vitreous detachment, followed by 25% of cases each of vitreous hemorrhage and vitreous degeneration. Remaining 5% of cases each were diagnosed with foreign body in vitreous cavity and vitreous exudates suggestive of endophthalmitis.

c) Lens:

40% of cases involved the lens in this study. Traumatic cataract was present in 25% of cases and subluxation of lens in 15% cases.

Discussion:

In our study we found ocular injuries were higher in males 70% compared to females 30%. This was in line with studies done by Wagh V. et al where 88%, Maiya AS. et al where 82% and Shazlee MK et al. where 68% males showed a higher incidence of trauma.^{3,4,6} In our study both more than 61 year old and 16-30 year old groups showed equal incidence of 25% each, accounting for 50% of all cases. Maiya AS. et al found maximum cases in 21-40-year-old group, similar to our study. In the Wagh V. et al study 31-40-year-old group, while in Misra S. et al the 0-10-year-old group was most common.^{3,6,7} This difference of higher incidence in >61 year olds may be as we have included both newly inflicted trauma and past history of trauma cases in our study.

The comparison between our study, Misra S. et al⁷ study and Gupta A. et al⁸ study findings are compared below:

Mode of injury	Our study	Misra S. et al	Gupta A. et al
Accidental	55%	-	16%
Assault	20%	-	26%
Play	10%	36%	-
Agriculture	10%	43%	30%
Road traffic accident	5%	3%	4%
Domestic	-	16%	24%
Total	100%	100%	100%

A) Cause of trauma:

The comparison between our study, Misra S. et al⁷ study and Wagh V. et al³ study findings are compared below:

Cause of trauma	Our study	Misra S. et al	Wagh V. et al
Wooden stick	55%	52%	6.5%
Fist	20%	-	-
Metal objects	10%	16%	6.5%
Cow horn	10%	3%	1.5%
Cricket Ball	5%	-	1.5%
Fall	-	-	67%
Others	-	29%	17%
Total	100%	100%	100%

B) Diagnosis based on B-Scan findings:

The comparison between our study, Gupta A. et al⁸ study, Sujatha G. et al⁹ and Nanda R. et al¹⁰ study findings are compared below

Diagnosis based on B scan findings	Our study	Gupta A. et al	Sujatha G. et al	Nanda R. et al
Traumatic cataract	20%	23%	-	-
Vitreous Hemorrhage	13.4%	23%	26.5%	25.5%
Vitreous degeneration	16.6%	3%	-	
Vitreous detachment	10%	13%	-	
Displaced lens	3.3%	4%	0.5%	-

Retained foreign body in vitreous	3.3%	-	-	-
Vitreous Hemorrhage+ Retinal detachment	3.4%	-	8%	8%
Retinal detachment	-	23%	7%	7%
Choroidal detachment	3.4%	1.5%	1%	-
Posterior staphyloma	3.4%	-	1%	-
Endophthalmitis	3.4%	-	1%	-
Misc	-	9.5%	-	8.5%
Normal	16.6%	-	54.5%	51%
Total	100%	100%	100%	100%

Conclusion:

Ophthalmic B-Scan is a quick, non-invasive, cost effective & easily available investigation invaluable for evaluation of ocular trauma with opaque media. It's therefore of utmost importance to learn how to perform and interpret Ultrasound B-scan in a tertiary center where trauma cases are common especially in a rural setting.

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