ORIGINAL ARTICLE

Frequency of Posterior Segment Pathologies in Patients with Ocular Trauma Using B-Scan Ultrasonography

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ABSTRACT

Purpose: To determine the frequency of posterior segment pathologies caused by ocular trauma using B scan USG.

Study Design: Descriptive, cross-sectional study.

Place and Duration of Study: Holy family hospital, Rawalpindi, from September 2015 to March 2016.

Methods: One hundred patients of ocular trauma, 12 to 45 years of age were included in the study. Patients who had any posterior segment pathology prior to the ocular trauma were excluded. B scan was performed in all patients. The data was collected and analyzed using SPSS version 17. For all the categorical variables like gender, type and site of ocular injury, the side of eye involved, type of posterior segment pathology as detected on B Scan, frequencies and percentages were calculated. For the continuous variables like age and time since injury, mean and standard deviation were calculated.

Results: Mean age was30.43 ± 9.58 years. Majority of the patients (35.0%) were between 26 to 35 years of age. Out of these 100 patients, 73 were males and 27 were females with male to female ratio of 2.7:1. Vitreous hemorrhage was the most common and ocular pathology (38 patients). Retinal detachment was seen in 21 patients. Intra-ocular foreign bodies were seen in 12 patients.

Conclusion: Vitreous hemorrhage was the most common posterior segment pathology in ocular trauma followed by retinal detachment and intra-ocular foreign bodies.

Key Words: Trauma, B-scan, Vitreous hemorrhage, Retinal detachment.

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INTRODUCTION

Ocular trauma is one of the common reasons of preventable blindness. Among all the patients presenting in ocular emergency, there are 39.7% related with ocular trauma.[1] Half a million people are monocularly blind worldwide after ocular trauma.[2] Much variation is present in the type and complexity of ocular injuries. It is not possible to visualize fundus of patients with opaque ocular media like those resulting from corneal opacity, vitreous hemorrhage, hyphema, lenticular and vitreous opacities.[3] These pathologies are common in cases of ocular trauma. Early detection of these pathologies and appropriate management is the hope for suffering patients. B scan uses high frequency ultrasound waves (10 MHz) and it

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has high resolution making it very important for scanning intraocular structures.[4] B scan is inexpensive, and serial echography allows us to follow the disease progression and regression.[5] Blunt trauma to the eye causes distortion of globe which can result in more severe injuries than detected on slit lamp examination.[6] B-scan ultrasonography is also a useful imaging modality in the management of an open globe injury. It can offer both diagnostic and prognostic information and it is useful for both surgical planning and further medical management.[6]

Although there is abundant literature on the utility of B-Scan in case of cataract and blast injuries but its utility in cases of severe ocular trauma with hazy media has not been adequately investigated. The aim of this study was to perform gentle B scan in post-traumatic eyes with hazy ocular media so that timely diagnosis and appropriate management could be done and also to find out the frequency of posterior segment pathologies related with ocular trauma.

METHODS

This study was conducted in the department of ophthalmology, Holy family hospital, Rawalpindi, from September 2015 to March 2016. We included both OPD and emergency patients. It was a descriptive, cross-sectional study. The sample size was calculated using the reference value of expected proportion of posterior segment pathologies as 14.5%,[3] keeping confidence level at 95% and desired precision as 7%. One hundred patients were recruited using non-probability, consecutive sampling. Patients between 12 to 45 years of age and of either gender, with history of binocular or monocular trauma to the eye which made clinical assessment of posterior segment difficult were included in this study. Patients with any known post segment pathology prior to ocular trauma and patients with history of diabetes and hypertension were excluded from the study.

Before the start of the study, approval was taken from ethical committee of the hospital. Informed consent was taken from the adults and in case of patients younger than 18 years, parents were asked for consent. Background information like history was taken on structured Proforma. Gentle B scan was performed. Eye was anesthetized using local anesthetic. Gel was applied on closed eye. Transverse probe position was used. Each quadrant of the eye was examined using limbus to fornix approach. The 12-O'clock, 3-O'clock, 6-O'clock, and 9-O'clock positions, were examined carefully. The data was entered and analyzed using Statistical package of social sciences software version 17. For all the categorical variables like gender, type and site of ocular injury, the side of eye involved, type of posterior segment pathology as detected on B Scan, frequencies and percentages were calculated. For the continuous variables like age and time since injury, mean and standard deviation were calculated.

Effect modifiers like age, gender, site of injury, side of eye, time since injury were controlled by stratification. Post stratification Chi-Square test was applied. P value < or equal to 0.05 was considered significant.

RESULTS

Age range in this study was from 12 to 45 years with mean age of 30.43 ± 9.58 years. Majority of the patients 35.0% were between 26 to 35 years of age. Out of 100 patients, 73 were males and 27 were females with male to female ratio of 2.7:1. Mean duration of injury was 2.27 ± 1.42 months with majority of patients i.e. 67 were between 0-3 months of duration. Vitreous hemorrhage was the most common pathology seen in 38 patients. Retinal detachment was seen in 21 patients and intra-ocular foreign bodies were seen in 12 patients.

Stratification of posterior segment pathologies with respect to age groups, gender, duration of trauma, side involved, type and site of trauma are given in table 1 and 2.

Table 1: *Stratification of Posterior segment pathologies with respect to age groups.*

Posterior Segment Pathologies		12-25 Years (n = 31)	26-35 Years (n = 35)	36-45 Years (n = 34)	P-value
Vitreous Hemorrhage	Yes	11 (35.48%)	14 (40.0%)	13 (38.24%)	0.931
	No	20 (64.52%)	21 (60.0%)	21 (61.76%)	
Retinal Detachment	Yes	08 (25.81%)	06 (17.14%)	07 (20.59%)	0.688
	No	23 (74.19%)	29 (82.86%)	27 (79.41%)	
Intra-ocular Foreign Bodies	Yes	02 (6.45%)	05 (14.29%)	05 (14.71%)	0.519
	No	29 (93.55%)	30 (85.71%)	29 (85.29%)	

Table 2: *Stratification of posterior segment pathologies with respect to gender, duration of trauma, side involved, type and site of trauma are given in table 2.*

Posterior segment pathologies with respect to Gender				
		Male (n = 73)	**Female (n = 27)**	**P-value**
Vitreous Hemorrhage	Yes	27 (36.99%)	11 (40.74%)	0.731
	No	46 (63.01%)	16 (59.26%)	
Retinal Detachment	Yes	11 (15.07%)	10 (37.04%)	0.017
	No	62 (84.93%)	17 (62.96%)	
Intra-ocular Foreign Bodies	Yes	08 (10.96%)	04 (14.81%)	0.598
	No	65 (89.04%)	23 (85.19%)	
Posterior segment pathologies with respect to time since injury.				
		0-3 Months (n = 67)	**4-6 Months (n = 33)**	**P-value**
Vitreous Hemorrhage	Yes	22 (32.84%)	16 (48.48%)	0.130
	No	45 (67.16%)	17 (51.52%)	
Retinal Detachment	Yes	13 (19.40%)	08 (24.24%)	0.576
	No	54 (80.60%)	25 (75.76%)	
Intra-ocular Foreign Bodies	Yes	08 (11.94%)	04 (12.12%)	0.979
	No	59 (88.06%)	29 (87.88%)	
Posterior segment pathologies with respect to side.				
		Right (n = 55)	**Left (n = 45)**	**P-value**
Vitreous Hemorrhage	Yes	21 (38.18%)	17 (37.78%)	0.967
	No	34 (61.82%)	28 (62.22%)	
Retinal Detachment	Yes	11 (20.0%)	10 (22.22%)	0.786
	No	44 (80.0%)	35 (77.78%)	
Intra-ocular Foreign Bodies	Yes	07 (12.73%)	05 (11.11%)	0.805
	No	48 (87.27%)	40 (88.89%)	
Posterior segment pathologies with respect to site of injury.				
		Open Globe (n = 53)	**Closed Globe (n = 47)**	**P-value**
Vitreous Hemorrhage	Yes	23 (43.40%)	15 (31.91%)	0.238
	No	30 (56.60%)	32 (68.09%)	
Retinal Detachment	Yes	14 (26.42%)	07 (14.89%)	0.158
	No	39 (73.58%)	40 (85.11%)	
Intra-ocular Foreign Bodies	Yes	09 (16.98%)	03 (6.38%)	0.104
	No	44 (83.02%)	44 (93.62%)	
Posterior segment pathologies with respect to type of trauma				
		Blunt (n = 61)	**Penetrating (n = 39)**	**P-value**
Vitreous Hemorrhage	Yes	18 (29.51%)	20 (51.28%)	0.029
	No	43 (70.49%)	19 (48.72%)	
Retinal Detachment	Yes	11 (18.03%)	10 (25.64%)	0.362
	No	50 (81.97%)	29 (74.36%)	
Intra-ocular Foreign Bodies	Yes	06 (9.84%)	06 (15.38%)	0.405
	No	55 (90.16%)	33 (84.62%)	

DISCUSSION

Global data suggest that each year more than a million people become blind due to ocular trauma.[7] Early diagnosis and intervention is of utmost importance in preventing blindness in such cases. In developing countries like Pakistan, the burden on healthcare system due to ocular trauma is overwhelming with around 7% admissions in Ophthalmology ward related to ocular trauma.[8] Such injuries can readily be investigated by ultrasound, which is of particular value when the light conducting media are opacified by hemorrhage or other injury.[9,10,11] B-Scan is the most important routine investigation to be done in cases of blunt ocular trauma, especially in the presence of media opacities like Hyphema, Corneal edema, Traumatic cataract which are very common findings after ocular trauma.[12]

One of the most important roles for B-scan ultrasonography remains diagnosis and follow-up of ocular trauma. Ultrasonography can be helpful not only to diagnose intraocular pathology immediately following ocular trauma when no additional imaging is possible but also during follow-up of cases in which view of posterior segment is obscured.[13]

One study demonstrated 100% sensitivity and specificity for preoperative ultrasound diagnosis of retinal detachments and intraocular foreign bodies (IOFBs) in 46 patients.[14] In addition, the article revealed retinal detachment, sub-retinal hemorrhage, and hemorrhagic choroidal detachment on imaging to be poor prognostic factors for visual outcome. However, the study population was limited in size and restricted to preoperative use of B-scan ultrasound. It was also seen that ultrasound had comparable results to CT scan in assessing ocular blast injuries in a military setting.[14]

Age range in our study was from 12 to 45 years with mean age of 30.43 ± 9.58 years. In another out of 128 eyes with ocular trauma, 83 eyes (64.84%) had open globe injury and 45 eyes (35.15%) had closed globe injury. B scan was normal in 35.15% eyes, the remaining 64.84% eyes had various posterior segment abnormalities detected on B scan, ranging from vitreous hemorrhage which was present in 42.18% eyes, Retinal Detachment found in 20.09% and Intra Ocular Foreign Body in 14.84% eyes.[3]

In another study, with a sample size of 79, including 78 males (98.73%) and 1 female (1.26%), age ranged from 5 to 60 years with a mean of 23.43 ± 10.67 years. The interval between the time of injury and presentation to ophthalmologist ranged from 1 to 10 days in 44 patients (60 eyes) and was more than 10 days in 35 patients (48 eyes). Ocular injury was

unilateral in 50 (63.29%) patients and bilateral in 29 (36.70%) eyes. Forty one (37.96%) eyes had closed globe injury and 67 (62.03%) had open globe injury. The most common type of injury was corneal/scleral perforation (48.14%) followed by vitreous haemorrhage (38.88%) and traumatic cataract (30.55%).[3]

Bhatia et al reported vitreous membrane in 7 %, Retinal Detachment in 6%, vitreous hemorrhage in 4% and intra ocular foreign body in 4% cases.[15] In another study, ultrasonography revealed Retinal Detachment in 17 (13%), vitreous haemorrhage in 14 (10.7%), macular edema in 14 (10.7%), endophthalmitis in 12 (9.2%), PVD in 7 (5.4%) and panophthalmitis in 1 (0.7%) eye.[16] Djosevska ED, in his study, detected vitreous hemorrhage in 20.9% eyes, Retinal detachment in 4.4%, endophthalmitis in 3.3%, Posterior vitreous detachment in 3.8%, intra ocular foreign body in 6.6% and choroidal detachment in 1.1% eyes on ultrasonography.[17]

Traumatic vitreous hemorrhage is seen after all sorts of traumatic insults (blunt, penetrating, surgical trauma, birth trauma, abusive head trauma, etc.). Despite being uncommon, it accounts for the majority of vitreous hemorrhages in children and adolescents, ranging from 54.3 to 82.5% of all causes of Vitreous Hemorrhage.[18] Incidence of vitreous hemorrhages in neonates is smaller (0.039%).[19] Non-penetrating (blunt) trauma accounts for the majority of traumatic vitreous hemorrhage. It has a predominance of male patients age between 3 to 18 years (mean about 7 to 8 years).[18]

The incidence of the traumatic retinal detachment is about 0.8% according to another study.[20] In the pediatric population, the incidence is even lower, ranging from 2.5 to 2.9 per 100,000 among children aged 10 to 19 years.[20] Traumatic retinal detachment (RD) in children represents 3% to 6% of all causes of retinal detachment.[21] The most common type of retinal detachment after trauma is rhegmatogenous. In this age group, patients usually present with the worst visual acuity and the detachment has a longer evolution with a higher incidence of macular involvement and proliferative vitreoretinopathy (PVR).[20] Retinal dialysis is the most common type of predisposing lesion, responsible for more than half of the traumatic retinal detachment. Retinal tears are the second-most common predisposing lesion, responsible for about 20% of the traumatic retinal detachment.[22]

In a study[23] on 72 traumatic eyes, the major causative agents in penetrating cases were pellet in 11.8%, metallic foreign body and road traffic accident in 9.8%. The major causative agents in blunt trauma was assault by fist/stick in (23.8%).[24]

Limitations of this study was its descriptive cross sectional design. Interventional studies need to be done to see the outcomes of such injuries in different settings.

CONCLUSION

Vitreous hemorrhage was the most common posterior segment pathology in ocular trauma followed by retinal detachment and intra-ocular foreign bodies. B-scan ultrasonography if carefully done, can be a very useful tool for proper evaluation of posterior segment pathologies.

Ethical Approval

The study was approved by the Institutional review board/ Ethical review board. **(R-21/RMC/2015)**

Conflict of Interest

Authors declared no conflict of interest.

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Authors' Designation and Contribution

Fatima Sidra Tanweer; Registrar: *Concepts, Design, Data acquisition, Manuscript review.*

Afia Matloob Rana; Assistant Professor: *Literature search, Data analysis, Statistical analysis, Manuscript review.*

Waseem Akhter; Professor: *Manuscript preparation, Manuscript editing, Manuscript review.*