

FREQUENCIES OF VARIOUS OCULAR PATHOLOGIES DETECTED ON B-SCAN ULTRASONOGRAPHY IN PATIENTS OF OCULAR TRAUMA

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ABSTRACT

Objective: To determine the frequencies of various ocular pathologies detected on Ultrasound B-scan in patients of ocular trauma.

Study Design: Descriptive cross sectional study.

Place and Duration of Study: Armed Forces Institute of Ophthalmology Rawalpindi and Combined Military Hospital Quetta, from Apr 2014 to Aug 2014.

Material and Methods: One Hundred twenty six eyes of 126 patients between 1 to 60 years of age were studied having history of acute (less than 2 weeks) or subacute (2-4 weeks) ocular trauma, and further placed into three age groups (1-20 years, 21-40 years and 51-60 years). Followed by Ultrasound B-scan using moderate frequency of 10 MHz and the gain was increased when required.

Results: About 85.2% of the patients were males while females were 14.8%, 54% of the patients were from the age group 21-40 year. Open globe injuries were 58.7% and blunt trauma cases were 41.3%. Vitreous haemorrhage occurred in 33.3% followed by Intra ocular foreign body in 24.6%. Pellets/splinters were the causative agents in 28.6% followed by sharp objects 18.3%.

Conclusions: Males are 4 times more frequently exposed to ocular trauma and the age group of 21-40 year is most commonly affected. Open globe was the leading pattern of ocular injury while pellets/splinters were the commonest source of trauma. Vitreous haemorrhage was the most common posterior segment traumatic finding on Ultrasound B-scan. Prophylactic polycarbonate goggles can reduce the risk of trauma.

Keywords: Endophthalmitis, Ocular trauma, Retinal detachment, Ultrasound B-scan, Vitreous haemorrhage.

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INTRODUCTION

Worldwide, ocular trauma is an important cause of eye morbidity and leading cause of monocular blindness. In addition to visual impairment, ocular trauma causes significant morbidity, in terms of pain, psychosocial stress and economic burden¹. The early assessment of ocular trauma is the hallmark in its management plan, predicting the final visual outcome and the need for rehabilitation services in patients with severely injured eyes.

Ultrasound (USG) B-Scan is a readily available, rapid, non-invasive and safe imaging modality to evaluate the clinical findings of traumatic eye². Ultrasound B Scan is based on 'Piezoelectric' phenomenon by using frequencies

that lie in the range from 5MHz to 20MHz. Ultrasound B Scan has ability to detect, outline and characterize the nature of soft tissue of eyeball and orbit, regardless the degree of ocular media transparency³. Frequently findings of posterior segment lesions with and without trauma are recorded on USG B-scan ultrasound like retinal detachment, vitreous haemorrhage, intraocular foreign body, neoplasia and posterior vitreous detachment⁴. The definition of ocular structure is better understood with USG B-Scan than with magnetic resonance imaging (MRI) or computed tomography (CT scan)⁵. Zvornicanin *et al*⁶ showed that B-scan ultrasound is very useful diagnostic tool in detection and evaluation of vitreo-retinal pathologies in patients with opacities in the ocular media.

Epidemiological and clinical findings of ocular trauma have been described in the developed countries with pathologies like retinal

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detachment (27%), vitreous haemorrhage (25%), traumatic cataract (19.4%), ruptured globe (8.96%)⁷, but the burden and pattern of injuries in developing countries are poorly known and not well studied. The spectrum of ocular trauma (industrial and motor vehicle) in Pakistan is not different from many other developing countries but use of Improvised Explosive Devices (IED) in "war against terrorism" has revolutionized the already existing management plans and treatment modalities for ocular and ocular adnexal injuries⁸.

Armed Forces Institute of ophthalmology is a tertiary care hospital receiving patients of ocular trauma from various military operations all over the country as well as the local civilian population. The rationale of conducting this study is to establish a local database with different patterns of ocular trauma on USG B-Scan to recognize and prevent common ocular injuries through a suggestion of broad use of protective glasses.

PATIENTS AND METHODS

This descriptive cross sectional study was carried out in Armed Forces Institute of Ophthalmology (AFIO) Rawalpindi and Combined Military Hospital (CMH) Quetta, after approval from hospital ethical committee from April 2014 to August 2014, in which 126 eyes of 126 patients were studied. Sample size was been calculated using WHO Calculator for Correlation, keeping confidence interval 95%, margin of error 5%, absolute precision required 0.05 and anticipated population proportion 0.0896. Patients between 1 to 60 years of age irrespective of gender, with history of acute (less than 2 weeks) or subacute (2-4 weeks) ocular trauma presenting in AFIO outpatient department (OPD), were selected through non-probability consecutive sampling, and further placed into three age groups (1-20 years, 21-40 years and 51-60 years). The cases were informed in detail about the study, including the possible side effects associated with the procedure. Detailed ophthalmic history was taken regarding age,

occupation, cause of trauma, duration of trauma, systemic diseases, use of systemic and topical drugs and history of previous ocular trauma and surgery. After which comprehensive ophthalmic examination was done including vision, refraction, slit lamp examination, measurement of intraocular pressure and dilated fundus examination. Patients with known anterior or posterior segment's ocular pathology, previous history of ocular trauma, or surgery were excluded from the study. This was followed by USG B-scan by an experienced ophthalmologist using Quantel medical A/B-Scan machine. B-scan was done using moderate frequency of 10MHz and the gain was increased when required.

All the data was collected by the trainee

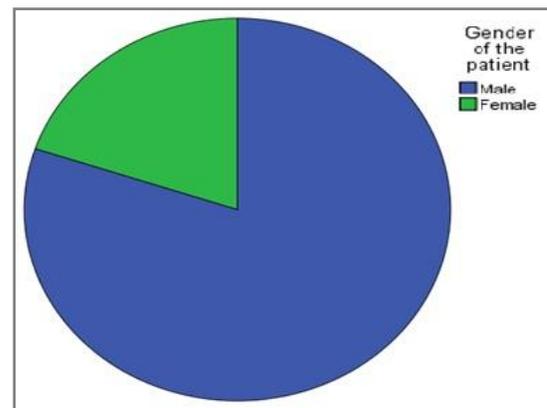


Figure: Gender distribution.

researcher and findings were recorded in a specially prepared proforma, and analyzed in the statistical package for social science (SPSS) version 14.0. Descriptive statistics were calculated for quantitative and qualitative variables. Mean and standard deviation were calculated for quantitative data. Categorical variables were presented by frequency and percentages. Effect modifiers like age and gender were controlled by stratification and post stratification chi square test. Level of significance was taken as $p \leq 0.05$.

RESULTS

This study showed that 85.2% of the patients were males while females were 14.8%. (figure & table-I). 54% of the patients were from the age group 21-40 years (table-II), 27% from

group 01-20 years and 19% from group 41-60 years.

Leading pattern of ocular injury was open globe with 74 patients (58.7%) followed by blunt trauma 52 (41.3%). Among open globe injuries 35 patients (27.8%) were with Intra ocular foreign body (IOFB), penetrating injuries were 26 (20.6%) and perforations were 13 (10.3%) as shown in table-III. The most common posterior segment finding on ultrasound B-scan in ocular trauma patients is vitreous haemorrhage (33.3%) followed by IOFB (24.6%), retinal detachment

DISCUSSION

Ocular trauma is the second leading cause of visual impairment in United States after cataract and approximately 2.5 million eye injuries are reported in the United States annually. Trauma due to blunt objects accounts for the largest percentage followed by sharp objects⁹. Ocular injuries can be classified on etiology into domestic, occupational, sports, road traffic accidents, iatrogenic, fights and assaults and war injuries. Although ocular trauma is an important cause of preventable monocular

Table-I: Gender of the patient.

Gender of the patient	Frequency	Percentage (%)
Male	101	80.2
Female	25	19.8
Total	126	100.0

Table-II: Age of the patients in years.

Age of the patient in years	Frequency	Percentage (%)
1-20	34	27.0
21-40	68	54.0
41-60	24	19.0
Total	126	100.0

Table-III: Type of Injury.

Type of Injury	Frequency	Percentage (%)
Blunt	52	41.3
Open globe injury	Penetrating	26
	Perforating	13
	IOFB	35
Total	126	100.0

(RD) (11.7%), endophthalmitis (7%), globe rupture (7%), traumatic cataract and lens dislocation (4%), traumatic enucleation (0.8%), while choroidal detachments and posterior vitreous detachments were less common findings (table-IV).

Most common source of ocular trauma was blast injuries (shockwave, pellets and splinters) (28.6%), followed by sharp objects (18.3%), road traffic accidents and falls (15.9%), vegetative (11.9%), stone (9.5%), glass, plastic and rubber (5.6%), hand, fist and finger (5.6%) miscellaneous group (sports, assault and etc) accounts (4.8%) as shown in table-V.

blindness worldwide but considered as a neglected issue with relatively little epidemiological information available outside the United States and developed countries¹⁰.

Along with the visual loss, ocular injuries can cause human unhappiness, economic inefficiency and monetary loss. However, not so many studies had been carried out on patterns, findings and outcome of ocular trauma. This study will provide information on magnitude and pattern of ocular injuries in Pakistani population and will serve as the basis for designing and implementing preventive measures by respective authorities.

In this study, most of the patients were males (80.2%) as compared to females (19.8%). Karaman *et al*¹¹ and Rai's *et al*¹² studies supported my finding that mechanical ocular injuries occur more frequently in the males. Jahangir *et al*¹⁰ also showed male to female ratio of 3:1 for ocular injuries in Pakistani population which is in accordance with the result of our study.

The most affected age group in our study was middle age group 21-40 years (54%) followed by age group 1-20 years and 41-60 years

parts of world. Govind *et al*¹⁵ described RTA as the leading cause of ocular injury. Asaminew *et al*¹⁶ showed that the commonest cause of injury was violence, and wood was the commonest agent/ source of trauma.

Arfat *et al*¹⁷ described open globe injury as the leading pattern in the list of ocular emergencies. Owais *et al*¹⁸ proposed that open globe injuries occur more frequently and with more severity in combat related trauma, same was also reported in various war campaigns like

Table-IV: USG B-scan findings.

US B-scan findings	Frequency	Percentage (%)
Vitreous Haemorrhage	42	33.3
Retinal Detachment	14	11.1
IOFB	31	24.6
No abnormality	12	9.5
Enophthalmitis	7	5.6
Globe Rupture	7	5.6
Cataract, subluxated lens	5	4.0
Traumatic enucleation	1	.8
MISC	7	5.6
Total	126	100.0

Table-V: Agent / Source of trauma.

Agent / source of trauma	Frequency	Percentage (%)
Stone	12	9.5
Vegetative/wood (stick)	15	11.9
Blast injury (pellets/splinters)	36	28.6
Plastic, glass, rubber	7	5.6
Hand, fist and finger	7	5.6
Fall, RTA	20	15.9
Misc (sports, assault)	6	4.8
Sharp objects	23	18.3
Total	126	100.0

representing (34%) and (24%) respectively. Both Rao *et al*¹³ and Oum *et al*¹⁴ showed that the most common age group involved in ocular trauma was from 20-40 years age group, which is in consistent with the results of our study. This is most probably due to the nature of their professional work and activities including assault, sports, RTA and active involvement of young soldiers and officers in war against terrorism¹³.

The cause of different ocular injuries is difficult to estimate worldwide because of different scenario of ocular trauma in different

Operation Iraqi Freedom, and mine explosions¹⁹. Our study also showed 58.7% of the ocular injuries were open globe injuries. Rai's *et al*¹³ detected cataract (15.3%) as the most common traumatic intraocular pathology followed by IOFB (13.8%). While our study showed vitreous haemorrhage as the commonest posterior segment traumatic finding on B-scan (33.3%) followed by IOFB (24.6%).

This study provides a local data base which shows the burden of ocular trauma that requires special attention and therefore help

in the planning further line of management and prophylactic measures, such as internationally recommended polycarbonate protective eyewear being highly useful in reducing the likelihood of ocular injuries. Simple safety procedures like wearing seat belts in driving, protective goggles in welding and supervising children while playing, etc. should be advocated using mass media.

CONCLUSION

The impact of ocular trauma is immense, it casts long lasting physical, social and economic implications. USG B-scan is safe, non-invasive imaging technique to detect and differentiate traumatic intra ocular pathologies. Males are 4 times more frequently exposed to ocular trauma compared to female and age group of 21-40 years is most commonly affected. The leading pattern of ocular injury is open globe injury and pellets/splinters were the commonest source of trauma. The most common posterior segment traumatic finding on USG B-scan is vitreous haemorrhage. This study provides a local data base which shows the burden of ocular trauma that requires special attention for planning the further lines of prophylactic measures, such as polycarbonate protective eyewear and wearing seat belts in driving.

Disclosure

This article is a CPSP approved dissertation based original article.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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