SPECTRUM OF COMBAT OCULAR INJURIES IN PAKISTANI TROOPS

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ABSTRACT

Objective: To analyze the demography, characteristics, visual and anatomical outcomes of combat ocular injuries sustained by Pakistani troops.

Study Design: Case series.

Place and Duration of Study: Armed Forces Institute of Ophthalmology (AFIO) Rawalpindi, from January 2010 to June 2014.

Material and Methods: Data of 156 eyes of 120 war wounded patients treated at AFIO from 2010 - 2014 was retrieved and analysed. Record of each patient was evaluated and demographic data, mode and type of injury, initial and final visual acuity (VA), associated globe injuries, concomitant non-ocular injuries, type of surgical procedures and complications were endorsed on a pre-devised proforma. Injuries were classified according to the Birmingham Eye Trauma Terminology (BETT). Statistical analysis of the data was done using SPSS version 13.0.

Results: Mean age of study population was 28.33 ± 7.70 years. Improvised explosive device (IED) blast was the most common mode injury occurring in 51 (42.5%) of casualties. Forty eight (30.76%) eyes sustained closed globe injuries while 108 (69.23%) eyes had open globe injuries. Thirty one (19.87%) eyes were initially managed conservatively, while primary corneo scleral repairs were done in 77 (49.35%) eyes. Overall, final visual outcome was significantly better in closed globe injuries as compared to open globe injuries with 26 (54.16%) eyes with closed globe injury achieving final VA of ≥ 6/12 as compared to 10 (9.25%) eyes with open globe injuries.

Conclusion: Closed globe combat ocular injuries have better visual outcome as compared to open globe injuries.

Keywords: Combat, Eye Injuries, Open globe injuries,Visual outcome.

INTRODUCTION

The malevolence of combat related ocular injuries is a major socio economic and political dilemma as it usually results in loss of career, life style changes and cosmetic disfigurement of young working force of the society. The ocular surface measures only 0.1% of the erect frontal profile of body, but the incidence of combat ocular injuries varies from 0.65%-13%[1,2]. Urbanization and modernization of warfare with development of weapons having higher explosive and fragmentation power has resulted in increased severity and morbidity of warfare ocular injuries over the last few decades. Ocular blast injuries can be primary, secondary, tertiary or quaternary. Secondary blast injuries resulting from the impact of high velocity shrapnel and metallic fragments or from exogenous debris propelled by blast are the commonest ocular injuries sustained during combat environment[1]. In a large study on combat related eye injuries, two major groups of eye injuries were posterior segment injuries (59%) and retained intraocular foreign body (IOFB) (17%)[3]. In another study by Islam[4] major ocular injuries in mine blast victims were open globe injuries (27%) and retained IOFBs (15%), whereas Alam et al[5] in their study on bomb and mine blast victims reported open globe injuries in 62% and IOFB in 20.37% of eyes. Combat ocular injuries are bilateral in 15-25% of cases and preventable/reducible with adequate eye protection[1,2]. Compulsory use of combat eye protection may have helped to reduce the

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proportion of eye injuries to 6% in operation Iraqi freedom and enduring freedom (2001-2005) as compared to an incidence of 13% in operation desert storm (1991) where ocular protection was relatively poor[1]. Very little is known about the pattern and characteristics of combat ocular trauma that is being sustained by our soldiers during ongoing war on terror. The purpose of this study was to analyse the demography, characteristics, visual and anatomical outcome of combat ocular injuries sustained by Pakistani troops.

MATERIAL AND METHODS

A retrospective review was conducted of cases of ocular injuries sustained during ongoing war on terror at the western borders of Pakistan that were admitted to the Armed Forces Institute of Ophthalmology (AFIO) Rawalpindi between January 2010 to June 2014. The study was approved by the institutional ethical committee. All the casualties either reported directly to AFIO or were transferred from peripheral hospital after emergency management were included. In this study definition of combat ocular injury include ocular injury sustained from improvised explosive device (IED) blast, mine blast, bomb blast and gunshot wound. Patients with incomplete hospital record, history of previous ocular surgery, previous chronic ocular disease e.g glaucoma, uveitis, retinopathy, and follow up of less than six months were excluded. Non probability purposive sampling technique was used for inclusion of subjects and calculated sample size was 97 using anticipated population proportion as 0.5, confidence level of 95% and required absolute precision of 0.10.

Record of each patient was evaluated and demographic data, eye involved, mode and type of injury, initial and final visual acuity (VA), associated globe injuries, concomitant non-ocular injuries, type of surgical procedures and complications were endorsed on a pre-devised proforma. Injuries were classified into closed globe and open globe according to the Birmingham Eye Trauma Terminology (BETT)[6]. The initial and final Snellen VA was categorised

Table-1: Demographic and clinical characteristics of the study population.

Characteristic	No (%)*
Eye Involved (n=120)	
Right	42 (35%)
Left	42 (35%)
Bilateral	36 (30%)
Mode of Injury (n=120)	
IED blast	51 (42.5%)
Bomb Blast	25 (20.8%)
Mine blast	24 (20%)
Gunshot	20 (16.6%)
Closed Globe Injury (n=48)	
Contusion	33 (68.75%)
Corneal Foreign body	19 (39.58%)
Lamellar laceration	3 (6.25%)
Open Globe Injury (n= 108)	
Rupture	-
Penetrating Injury	68 (62.96%)
Perforating Injury	39 (36.11%)
IOFB	26 (24.07%)
Concomitant Injuries (n=43)	
Limbs	25 (58.13%)
Face	25 (58.13%)
Chest	8 (18.60%)
Head	5 (11.62%)
Abdomen	3 (6.97%)

* The occurrence of multiple manifestations simultaneously accounts for the % distribution of > 100%

on the criteria described by the Ocular Trauma Classification Group (OTCG)[7].

Statistical analysis of the data was done using SPSS version 13.0. Descriptive statistics i.e. mean ± standard deviation for quantitative values and frequencies along with percentages for qualitative variables were used to describe the data. Association of initial and final visual outcome with type of injury (closed globe vs open globe) was analysed using Chi square test and a $p < 0.05$ was considered significant.

RESULTS

One fifty six eyes of 120 male casualties fulfilling the inclusion criteria were analysed. Mean age of study population was 28.33 ± 7.70 years (range:20-62 years) with 81 (67.5%) patients in their 3rd decade of life. Single eye was involved in 84 (70%) cases while bilateral involvement occurred in 36 (30%) patients. IED blast was the most common mode of injury responsible for 51 (42.5%) casualties (table-1). Forty three (35.8%) patients sustained concomitant non ocular injuries as well, with face and limbs being the most commonly involved areas (table-1). Forty eight (30.76%) eyes sustained closed globe injuries while 108 (69.23%) eyes had open globe injuries. Ocular contusion was the most frequent closed globe injury occurring in 33 (68.75%) eyes with closed globe trauma while, the most frequent open globe injury was penetrating injury sustained by 68 (62.75%) eyes with open globe injuries (table-1). Most frequent ocular findings in all injured eyes were corneo scleral laceration (49.35%), cataract (34.6%), IOFB (25%), vitreous haemorrhage (29.48%) and retinal detachment (17.94%) (fig-1). Thirty one (19.87%) eyes were initially managed conservatively. A total of 283 ocular surgeries were performed with quite a few eyes requiring multiple surgeries. Primary corneo scleral repair were done in 77 (49.35%) eyes. Other commonly performed surgical procedures included pars plan vitrectomy done in 60 (38.46%) eyes, cataract extraction 60 (38.46%) eyes, and enucleation/evisceration whether primary or secondary in 37 (23.71%) eyes. Corneal opacity 34 (21.79%) and phthisis bulbi 33 (21.15%), cataract 31(19.87%), were the most frequently encountered ocular complications.

Initial VA was no light perception (NLP) in 28 (17.94%), perception of light (PL)+ to 6/300 to in 99 (63.46%), 6/240 to 6/36 in 10 (6.41%),6/30 to 6/15 in 4 (2.56%) and ≥ 6/12 in 15 (9.61%) eyes. Final VA was NLP in 43 (27.56%), PL + to 6/300 in 44 (28.20%), 6/240 to 6/36 in 21 (13.46%), 6/30 to 6/15 in 12 (7.69%) and ≥6/12 in 36 (23.07%) eyes. Overall, final visual outcome was significantly better in closed globe injuries as compared to open globe injuries with 26 (54.16%) eyes with closed globe injury achieving final VA of ≥6/12 as compared to 10 (9.25%) eyes with open globe injuries achieving ≥6/12 [p<0.001] (table-2). Moreover, 3 (6.25%) eyes with closed globe injuries while 40 (37%) eyes with open globe injuries became totally blind (final VA of NLP) p< 0.001.

Table-2: Visual outcome in ocular trauma patients.

BCVA	Grade	Closed globe (n=48)		Open globe (n=108)	
		Initial	Final	Initial	Final
≥ 20/40 (6/12)	I	13 (27.1%)	26 (54.2%)	2 (1.8%)	10 (9.2%)
20/50 – 20/100 (6/15 – 6/30)	II	4 (8.3%)	5 (10.4%)	-	7 (6.4%)
19/100 – 5/200 (6/36 – 6/240)	III	7 (14.5%)	5 (10.4%)	3 (2.8%)	16 (14.8%)
4/200 – PL + (6/300 – PL +)	IV	24 (50%)	9 (18.7%)	75 (69.4%)	35 (32.4%)
NLP	V	-	3 (6.2%)	28 (25.9%)	40 (37%)

DISCUSSION

The spectrum of combat ocular injuries varies from very mild non-sight threatening to extremely serious with potentially blinding consequences. Combat ocular injuries compared to domestic ones tend to be more severe, usually bilateral, and often accompanied by concurrent systemic injuries and poor visual outcome. Mansour et al reported that ocular

war injuries were significantly more likely to involve males (84.7 vs 75.1%) as compared to domestic ocular injuries, with significantly worse initial and final visual acuities, less visual improvement (28.6% vs. 44.8%), and more intraocular foreign bodies (42.9 vs. 11%)[8]. In our study all the victims were males with mean age of 28.33 ± 7 .70 years. A significant male preponderance of more than 95% with mean ages between 23.43 – 29.5 years were reported in various other studies on combat ocular trauma[4,5,9-14]. In a study by Owens et al[15], IED blasts were responsible for 38% of all combat injuries with significant morbidity that was similar to our findings of 42.5% victims of IED blasts. The wounding pattern in combat environment is more complex than simply an expression of body surface area with involvement of extremities in 54% of casualties, followed by abdomen (11%), face (10%), head (8%), eye (6%) and thorax (6%)[15]. In this study, 43 (35.8%) patients sustained concomitant non ocular injuries with extremities (58%) and face (58%) being the most commonly involved areas.

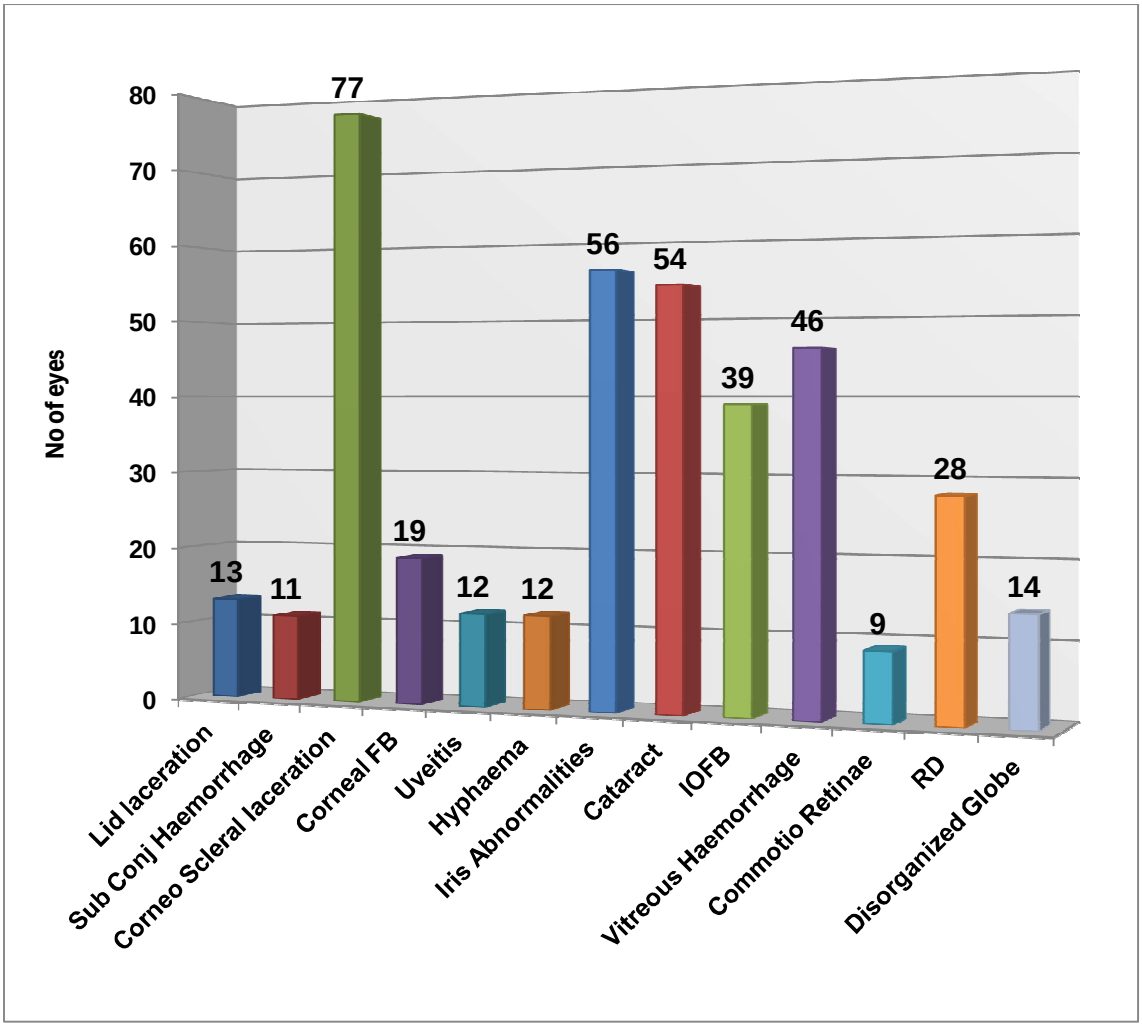

Figure-1:Frequency of ocular manifestations (n=156)*

* The occurrence of multiple manifestations simultaneously accounts for a total count of more than 156.

Weichel et al, in their study reported concomitant non ocular injuries in up to 85% of combat victims with facial and extremities injuries occurring in 58% and 44% of soldiers respectively[10].

Pattern and characteristics of combat ocular injuries are diverse depending upon the mode, mechanism and severity of injury. In our

study, 30.76% of eyes sustained closed globe injuries and 69.23% of eyes had open globe injuries. Incidence of closed globe injuries ranging from 20% to 44.7% and open globe injuries from 37.85% to 80% had been reported in various studies on combat ocular trauma[5,10,12]. Most frequent ocular findings in our our study were corneo-scleral laceration (48.35%), cataract (34.6%), vitreous haemorrhage (29.48%), IOFB (25%) and retinal detachment (17.94%). In local literature, Alam et al[5] and Islam[4] reported frequency of corneo scleral laceration as 48.14% and 19% respectively, while that of cataract was 30.55% and 19%, vitreous haemorrhage was 38.88% and 29% and retinal detachment was 14.81% and 10% respectively. IOFB (mostly metallic) with significant structural damage are much more common in combat ocular injuries as compared to domestic ocular injuries (42.9% vs 11%). Incidence of IOFB from 12.4% to 76% was quoted in literature depending on the combat environment[4,5,11,12,16].

Management and rehabilitation of combat ocular injuries possess a great challenge with victims often requiring multiple specialized vitreo retinal and oculo-plastic procedures and prolonged follow up. In our study, 31(19.87%) eyes were managed conservatively while primary corneo-scleral repair was done in 77 (49.35%) eyes. Alam et al reported conservative management in 37% of ocular injuries in blast victims while corneo-scleral repair was performed in 30.55% of eyes[5]. In the current study, 37 (23.71%) eyes with severe globe damage underwent primary or secondary enucleation/evisceration. Variable frequencies of enucleations/eviscerations from 7.52% to 31% were reported in different studies depending on the mechanism and severity of combat ocular trauma[5,8,11,12,17].

Visual outcome in patients with combat ocular injuries is variable and prognosis depends on the mode, mechanism and type of injuries sustained. Closed globe injuries usually have more favourable visual outcome as compared to open globe injuries. In this study, overall 38 (23.07%) eyes achieved final BCVA ≥ 6/12. A total of 54.16% of eyes with closed globe injuries achieved this VA as compared to only 9.25% of eyes with open globe injuries. Wiechel et al, reported 42% of eyes achieving BCVA of ≥ 6/12 with closed globe injuries accounted for 65% of those cases[10]. In another study, final BCVA of ≥ 6/12 was reported in 58.82% of eyes with closed globe ocular injuries due to bomb and mine blasts[9]. Initial VA of NLP was found in 28 (17.94%) eyes while final VA of NLP was observed in 43 (27.56%) eyes with 3 (6.25%) eyes with close globe injury and 40 (37%) eyes with open globe injuries becoming totally blind (final VA of NLP). Alam et al[5], in their study on blast victims reported initial VA of NLP in 23.14% eyes and final VA of NLP in 25% eyes , whereas, Erdurman et al[12] reported initial VA of NLP in 36% of eyes and final VA of NLP in 43% eyes of IED blast victims . The strength of this paper is the use of the standardized language of eye injury terms (Birmingham Eye Trauma Terminology system, BETT) for classifying injuries and Ocular Trauma Classification Group (OTCG) for VA grading. One of the limitations of the study was retrospective nature with some information often missing from the records, such as pupillary light reaction and size of wounds and associated complications.

CONCLUSION

Menace of combat ocular trauma remains one of the most unmet challenges of ophthalmology. Extent of ocular damage in combat environment depends on the mode, mechanism and severity of injuries with closed globe ocular injuries having better visual outcome as compared to open globe injuries. It is recommended to enforce mandatory use of protective eye gears during combat environment to avoid the legacy of blinded young individuals in our society.

CONFLICT OF INTEREST

The authors of this study reported no conflict of interest.

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