DOI: 10.14260/jemds/2014/3011

ORIGINAL ARTICLE

PELLET GUN FIRE INJURIES IN KASHMIR VALLEY – CAUSE OF OCULAR MORBIDITY

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HOW TO CITE THIS ARTICLE:
Wasim Rashid, Nusrat Shaheen, Imtiyaz A. Lone, Sheikh Sajjad. "Pellet Gun Fire Injuries in Kashmir Valley – Cause of Ocular Morbidity". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 29, July 21; Page: 8051-8058, DOI: 10.14260/jemds/2014/3011

ABSTRACT: OBJECTIVE: To study the type and severity of ocular injuries in gun pellet victims. **METHODOLOGY:** It was a retrospective case series. The study was conducted in the department of Ophthalmology, SKIMC Medical College Bemina Srinagar. The study included gun pellet victims admitted in our department between January 2010 to September 2013. **RESULTS:** Total number of patients were 20 with 19 males and 1 female. Mean age of the subjects was 21.45 years. Ocular injury was unilateral in 17 cases and bilateral in 3 cases. The most common type of injuries encountered were hyphaema in 82.60% of eyes, followed by corneoscleral tear in 78.26% and vitreous hemorrhage in 47.82% of eyes. Out of the 23 eyes, 18 eyes (78.26%) had an open globe injury, while only 3 eyes (13.04%) had closed globe injury at presentation in our hospital. The most commonly performed surgery was corneoscleral repair in 18 eyes. Final corrected visual acuity remained unchanged in 34.78% and improved in 65.22% of eyes. About 47.83% of eyes had final visual acuity < 6/60. **CONCLUSION:** Gun pellet related ocular injuries are becoming increasingly common in Kashmir valley. In severely injured eyes the visual prognosis remained poor despite development of advanced micro-surgical techniques. The best preventive measure for such injuries involve reducing the level of violence in our society.

KEYWORDS: ocular injuries, hyphaema, corneoscleral tear.

INTRODUCTION: Ocular trauma once described as the neglected disorder[1] has recently been highlighted as a major cause of visual morbidity. Worldwide there are approximately 1.6 million people blind from eye injuries, 2.3 million bilaterally visually impaired and 19 million with unilateral visual loss, making ocular trauma the commonest cause of unilateral blindness.[2]

Etiologically ocular injuries can be classified in to domestic, occupational, sports, road traffic accidents, iatrogenic, fights and assaults and war injuries.[3] Almost 100 years ago more than 70% of all serious ocular injuries occurred at workplace.[4] In the 1960s and 1970s road traffic accidents became the most common cause of serious ocular injuries.[5] In the 1980s sports and leisure activities became common cause of severe eye injury.[6,7] The home is now the most common location for eye injuries.[8] However bomb blast and battle field ocular injuries are becoming increasingly common in different parts of the world.[9,10]

Ocular injuries following pellet gun fire has assumed alarming significance in Kashmir valley (India) over the past few years. To curb agitated mobs, the security forces fire pellet gun cartridges, considered to be a non-lethal weapon.

A single pellet gun cartridge upon fire from pellet gun breaks into more than 500 small iron pellets which can penetrate any body tissue including eyes. An eye can thus receive one or multiple pellets and depending upon its velocity and distance can cause both penetrating and non-penetrating injury to the eye.

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The study assumes significance as no such work has been reported in the literature.

MATERIAL AND METHODS: The present retrospective study was conducted in the Department of Ophthalmology, SKIMS Medical College, Bemina Srinagar. The purpose of our study was to evaluate the type and severity of ocular injuries in gun pellet victims. The patient population was defined by reviewing the admission records of the hospital data base. We retrospectively reviewed the clinical files of 20 patients who suffered eye injury from gun pellets. All patients were admitted in the department of Ophthalmology, SKIMS Medical College Bemina Srinagar between January 2010 to September 2013.

The presenting case records, theatre notes and outpatient follow up of each of these patients were obtained and analyzed with regard to age and sex of the patient, circumstances surrounding the injury, presenting ocular signs subsequent management and final visual outcome. There was no subject with a pre-injury history of ipsilateral amblyopia or previous ocular trauma. All patients were victims of gun pellet injuries and all of them belonged to Kashmir valley.

The terms used in the description of ocular injuries conform to the recommendations of Birmingham Eye Trauma Terminology System (BETT) [11] which is an unambiguous, consistent, simple and comprehensive system to describe any type of mechanical globe trauma.

RESULTS: Twenty patients were included in this study. All ocular injuries were due to gun pellet made of iron. Review of the age and sex of these patients demonstrates that typical gun pellet casualties were young males (Fig. 1). The mean age of our study group was 21.45 years. The youngest patient in our study was 14 years old and the eldest patient was 32 years of age, notably 75% of those injured were below the age of 23 years. The 19 males and one female represent a 19:1 male to female ratio.

Ocular injuries were unilateral in 17 cases and bilateral in 3 cases. In the 23 eyes of 20 patients whom we studied a wide spectrum of anterior and posterior segment injuries were encountered as shown in table 1.

The most common type of injuries encountered were hyphaema in 82.60% of eyes, followed by corneoscleral tear in 78.26% and vitreous hemorrhage and iridodialysis in 47.82% each.

Out of the 23 eyes, 18 eyes (78.26%) had an open globe injury, while only 3 eyes (13.04%) had closed globe injury at presentation in our hospital. Two eyes had injury to ocular adnexa alone without injuring the eye ball.

Intraocular penetration by gun pellets led to scleral tear in 8 eyes (34.78%), tears involving both sclera and cornea in 5 eyes (21.74%), and corneal tear alone in 5 eyes (21.74%). Vitreous hemorrhage was encountered in 11 eyes (47.83%). Retained IOFB was seen in 6 eyes (26.08%), confirmed on B-Scan USG and one patient developed features of siderosis bulbi due to retained IOFB. Traumatic cataract developed in 7 eyes (30.43%). Retinal detachment in 4 eyes (17.39%) and macular scar in one eye were as other posterior segment injuries encountered in our study.

Five cases had a lid laceration with the pellet traversing the lid to reach the globe or become lodged in the orbit. Out of these five cases, two patients had lower canalicular tear. Moreover only two of these cases had injury to ocular adnexa alone without any injury to the eye ball.

The treatment varied according to the type of injury. 3 cases were managed conservatively with closed globe injury. Rest underwent single/multiple surgical procedures. Corneoscleral repair

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was the most commonly performed surgery. Sclera autografting was done in one patient because of tissue loss. Seven patients needed cataract extraction with intraocular lens implantation. Vitreo-retinal surgery was performed in patients who had non-resolving vitreous hemorrhage, retinal detachment or retained post segment IOFB. Canalicular tear repair with silicon tube implantation was done in two patients (table 2).

The visual acuity on admission and final corrected visual acuity are shown in table 3 and figure 2.

About 52.17% of the eyes had only perception of light (PL +) at the time of presentation in the hospital, reflecting the severe nature of trauma caused by gun pellets. The final corrected visual acuity remained unchanged in 34.78% and improved in 65.22% of cases. About 47.83% of the cases had final corrected visual acuity less than 6/60.

Final corrected visual acuity in open injury group was worse than closed globe injury group. In open globe injuries 61.11% of the eyes had a final corrected visual acuity < 6/60, whereas in closed globe injury group all patients had a final corrected visual acuity of > 6/12.

Factors that were associated with poor prognosis include poor visual acuity at presentation (< 6/60), penetrating injury, delayed presentation in the hospital (more than 10 days), presence of relative afferent papillary defect (RAPD), retinal detachment, retinal IOFB and macular scarring. Factors that were associated with better prognosis were small wound and wound location anterior to the insertion of rectus muscles.

DISCUSSION: Ocular injury is an important and potentially preventable cause of ocular morbidity.[12] Even though the eye comprises only a small part of the surface area of the human body,[8] despite being well protected from all sides except one, it is injured quite frequently.[13]

Over the past few years security forces in Kashmir valley have been using pump action shot gun or pellet gun to disperse violent mobs. Pellet fire arms have been introduced as the latest modality of crowd control considered to be non-lethal weapon.

Review of the age and sex of these patients demonstrates that the 'typical' gun pellet casualties are young males. Out of the 20 patients 19 were males and one was female; notably 75% of those injured were below the age of 23 years. This was due to the fact that these agitated mobs comprised primarily of young males. The only female patient in our study was hit by the pellet while looking out of the window of her house. Both hospital and population based studies indicate a large preponderance of ocular injuries affecting young males[14-17] as was the case in our study.

The spectrum of ocular injury in this series is similar to other studies, but perhaps the most important feature to appreciate is the severity of this type of injury. We noted that hyphaema to be the most common manifestation of gun pellet injuries (82.6%). This is in accordance with the consequences of non-powder fire arm injuries reported previously.[18, 19]

In our study we found that majority of the injuries (78.26%) were open globe penetrating type. This pattern could be explained by the fact that non powder fire arms can generate muzzle velocities of 200 to 900 foot pounds per second[20] whereas ocular penetration can occur at velocities as low as 130 foot pounds per second[21]. Moreover from a single cartridge, more than 500 pellets can be fired, thus accounting for the high incidence of penetrating trauma in our study.

The prognosis for penetrating eye injury is poor; in our study we found that the most important factor predictive of a poor visual outcome is poor visual acuity at presentation (< 6/60).

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This is in agreement with other studies.[22-24] Other factors that were associated with a poor visual outcome included delayed presentation in the hospital, presence of RAPD, retinal detachment, retained IOFB and macular scarring. Wound location anterior to the insertion of rectus muscles and small wound were favorable prognostic factors. These findings are in agreement with other studies.[24, 25]

In our study we found that retained IOFB was seen in six eyes (26.08%), out of these six eyes one had IOFB in anterior segment and rest were present in posterior segment. One of the eye developed features of siderosis bulbi in which the IOFB had been missed on presentation in the hospital. Siderous bulbi developed because the gun pellets used were made of iron. Retained gun pellets are best localized by plain x-rays of the orbit, although in selected cases additional information can be obtained from CT scans and B-scans.

The final corrected visual acuity also depended on the type of injury.[26] In patients with closed globe injury (3 eyes) all had a best corrected visual acuity of > 6/12, whereas in those with penetrating eye injury about 61.11% had a final corrected visual acuity of < 6/60. The commonest cause of permanently reduced visual acuity were severe perforation of the globe, retained IOFB and retinal damage.

The final visual acuity is a significant indicator of the extensive, disruptive nature of these ocular injuries, and despite improved micro surgical techniques, in the present study 47.83% of the injured eyes had a final corrected visual acuity of < 6/60. Earlier authors[18, 19, 27] have reported 29-42% of cases in poor acuity category, again reflecting the severe nature of trauma caused by these gun pellets.

CONCLUSION: Our study conclusively proves the severe nature of ocular injuries caused by pellet guns. Their use should not be encouraged and some other non-lethal weapon should be used for controlling agitated mobs. Visual prognosis is often poor, but prompt recognition and treatment should improve outcome. Presence of hyphema, visual acuity worse than 6/60 or an abnormal pupil are particularly important clinical findings suggestive of penetrating eye injury.

The high frequency of penetrating eye injuries among young adults (nearly 75% of the injuries occurred below 23 years of age) underscores the economic and social casts of severe eye trauma. The best preventive measure for such injuries involve reducing the level of violence in our society.

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Figure 1: Bar graph illustrating the age distribution (years) of gun pellet injury to the eye.

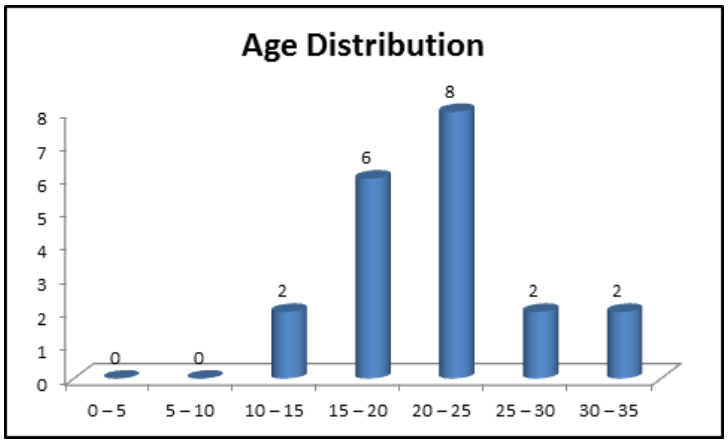

Figure 1

Type of Injury	No. of Eyes	Percentage
Ocular adnexal injury +	5	21.73
Hyphaema	19	82.60
Iridodialysis	11	47.82
Corneal/ sclera tear*	18	78.26
Traumatic cataract	7	30.43
Vitreous hemorrhage	11	47.82
Intraocular foreign body (IOFB)#	6	26.08
Retinal detachment	4	17.39
Macular scar	1	4.34

Table 1: Type and number of eye injuries

\+ out of the five cases two had lower canalicular tear and only in 2 cases ocular edema alone was involved.

* including corneal tear in 5 eyes, sclera tear in 8 eye and corneoscleral tear in 5 eyes.

\# 5 eyes had posterior segment intraocular foreign body (IOFB), and one eye had anterior segment IOFB.

Type of Surgery	No. of Surgeries
Corneal/sclera repair	18
Canalicular tear repair	2
Vitrectomy with IOFB removal	5
Cataract extraction	7
Sclera autograft	1
Removal of F.B. from anterior chamber	1
Retinal detachment surgery	4

Table 2: Type and number of surgeries

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Visual acuity	Initial BCVA		Final BCVA	
	No. of Eyes	%	No. of Eyes	%
PL (-)	1	4.35	1	4.35
PL (+)	11	47.83	5	21.74
HM	3	13.04	1	4.35
CF	4	17.39	4	17.39
6/60 to 6/18	2	8.69	7	30.43
6/12 to 6/6	2	8.69	5	21.74

Table 3: Initial and Final Best Corrected Visual Acuity (BCVA)

Figure 2: Bar graph showing initial and final BCVA.

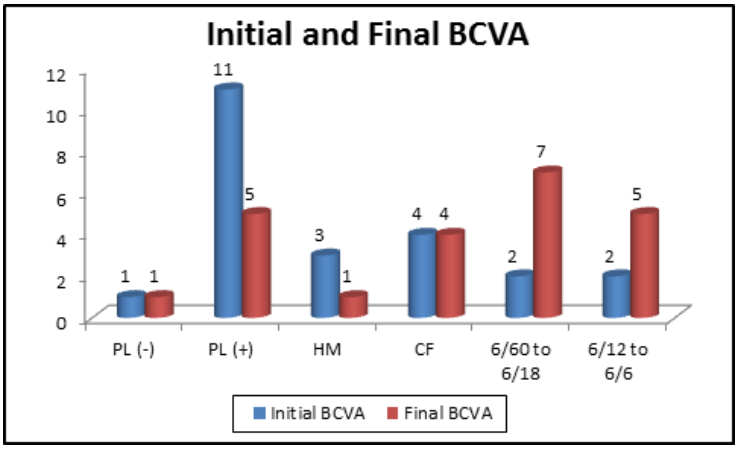
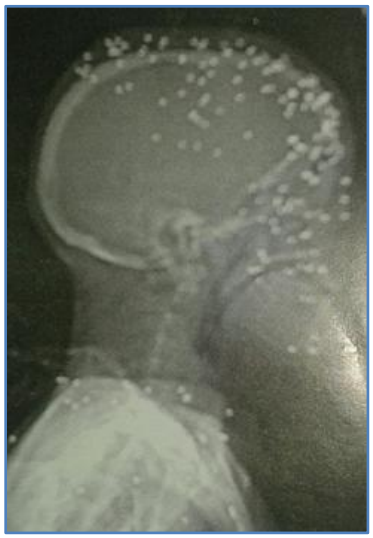
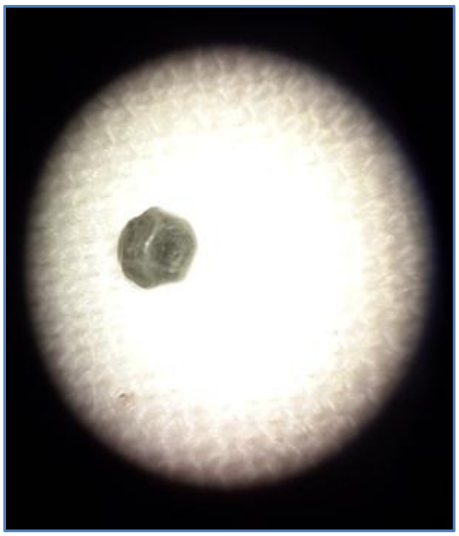


Figure 2



A = CT showing multiple pellets in head and neck region;



B = Iron pellet removed from the patient eye;

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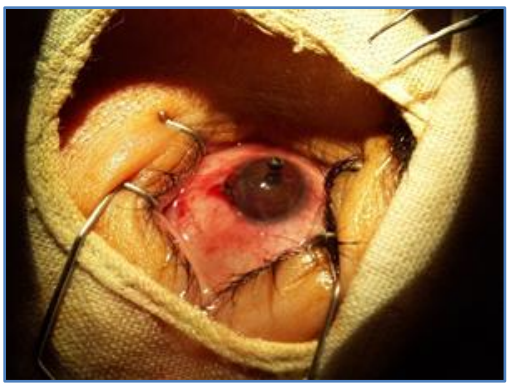
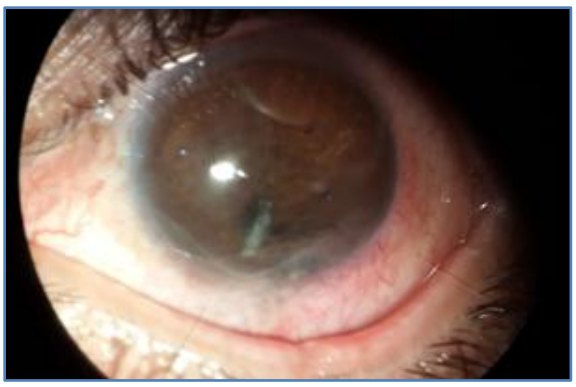


C = Pellet removed from anterior chamber of the eye with limbal tear at 6'O clock;



D = Healed corneoscleral tear;

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Date of Submission: 27/06/2014.
Date of Peer Review: 28/06/2014.
Date of Acceptance: 08/07/2014.
Date of Publishing: 17/07/2014.