

The clinical analysis of ocular injuries by fire-works during Deepavali festival at tertiary eye care center

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Abstract

Aim: The clinical analysis of ocular injuries by fireworks and assessment of their visual outcome during Diwali festival. **Methods:** It was a prospective study of all patients with ocular injuries by fireworks who was consulted and referred from emergency department of other hospitals to our Tertiary Eye Care Center. Data collection in form of- Age, Sex, Laterality of eye, Type of fireworks, Time of presentation after injury, Location of injuries (home/public places), Active/bystanders, Initial Best Corrected Visual Acuity (BCVA), Type of ocular injuries-classified according to BETTS (Birmingham Eye Trauma Terminology System) and Systemic injuries, Diagnosis, Best Appropriate Management and BCVA minimum at 7th day and maximum at 6th month follow-up documented **Results:** We studied 50 eyes of 38 patients. Injuries were more frequent in male (27, 71%); Children {<15years (23, 60%)} and Closed globe (31, 82%). Anterior segment injuries were as follow- Lid(4,8%); Cornea(23,46%); Conjunctiva(26,52%); Hyphema(9,18%); Iris damage(7,14%); Traumatic cataract(3,6%). Posterior segment injuries were Retinal detachment (6, 12%); Vitreous hemorrhage (4, 8%); Macular edema (6,12%); Choroidal rupture (2,4%). Eyes which require surgical intervention were 19-12 were anterior segments (4 lid tear,1 conjunctival tear, 3 corneal, 2 scleral, 2 corneo-scleral and 6 were Posterior segment and 1 evisceration. Only 5% used protective measures and 15.65% had done firework under observation. **Conclusions:** Fireworks related ocular injuries were most common in male, children and closed globe type. Timely management in form of medical and surgical intervention as and when required gave us very good visual outcome mainly in anterior segment than posterior segment injuries. **Key Word:** Fireworks, Ocular Injuries, Timely Management, BETTS, Visual Outcome

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INTRODUCTION

In India, fun with firecrackers is important part of Deepavali festival. Though a firework is part of happiness, it leads to severe injuries to eye, if proper care

is not taken. These injuries constitute an important cause of preventable blindness in India and if proper precautions are taken, they are totally avoidable. There is still a need to increase awareness among society about firework injuries. We had done a prospective study on firecrackers injuries in eye during Deepavali festival.

AIMS AND OBJECTIVES

- To determine incidence of ocular injuries by fireworks during Diwali festival
- To determine their visual outcome of ocular injuries by fireworks.
- Early diagnosis of injuries and effective surgical or conservative management accordingly
- To assess public awareness about fire-cracker injury in society

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MATERIAL AND METHOD

This was a prospective study carried out during Deepawali festival at Manekland Jagjivan Ujamshi Western Regional Post-Graduate Institute of Ophthalmology, Ahmedabad, Gujarat, India. All patients who had visited or referred were taken in study. On arrival to hospital, the prepared performa was filling up and depending on type and severity of injury-proper medical and/or surgical management was given as and when required. The history regarding the time, date and type of first treatment in form of conservative or surgical management before they reported to us was taken. Detailed ocular examination, i.e. initial best corrected visual acuity, anterior segment examination by slit lamp examination, intraocular pressure (IOP) by Applanation tonometer, gonioscopy by 4-mirror gonio mirror and Fundus by direct and indirect microscopy was performed in all the patients. The Ultrasound (A-B Scan) was carried out in cases of hazy media to rule out retinal detachment, vitreous hemorrhage, to rule out retained IOFB (Intra Ocular Foreign Body). The digital X-Ray was also carried out in cases of IOFB of all patients. The help of CT scan was also taken as and when required. The injury was classified according to **BETTS** classification. The follow-ups of all patients were taken at 1st day, at 1st week, at 1st month, at 3rd month and last follow-up at 6th month. All patients were treated according to standard guidelines.

Medical management:

- Antibiotics/antifungal agents: topical/systemic/intravitreal
- Ant glaucoma drugs
- Cycloplegic
- Anti-inflammatory agents
- Lubricating agents

Surgical management:

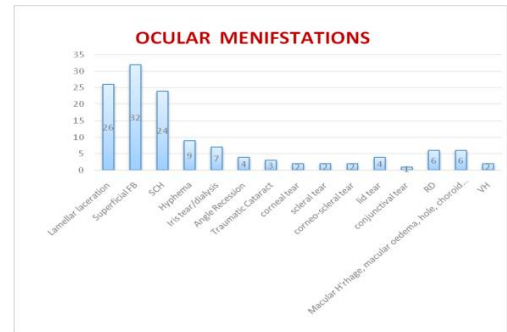
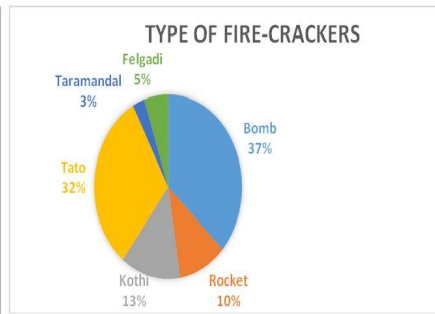
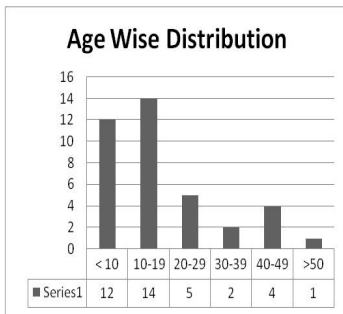
- Repair of lid tear, corneal tear and corneal-scleral tear
- Cataract extraction, dislocated/subluxated lens extraction
- Retinal detachment repair

Follow up: 1st post-operative day, 5th post-operative day, and weekly for 1st month, every 15th day for 3 month and monthly thereafter. The detailed examination, Investigation and intervention done as and when required.

RESULTS

A total 50 eyes of 38 patients were treated in hospital. The injury was more in males (27, 71%) as compare to females (11, 29%), more in children (23, 60%) as compare to adults. In age wise distribution, it shows maximum numbers in 10-19 years were 14(37%) patients,

with the decreasing order <10 years in 12(32%) patients, 20-19 years in 5 (14%) patients, 40-49 years in 4 (10%) patients, 30-39 years in 2 (5%) patients while least in >50 years in 1 (3%) patients (figure-1). In type of firecrackers, most common was bomb in 14(37%) patients, followed by tato in 12 (29%), then Kothi in 5 (14%), Rocket in 4 (11%), Fuljudi in 2 (6%), Taramandal in 1(3%) was found. (figure-2) Out of 38 patients, 22 (58%) were Active-who were lighting fire crackers, while 16 (42%) were bystanders- who were only observing the fireworks. In all injuries, only 5 (13%) patients had used protective measures like ready bucket of water, protective glasses, proper clothes, while 33 (87%) patients had not used. The fireworks under observation of elders/caretakers were done only in 15 (39%) patients, while 23 (61%) were not. The one eye was involved in 26 (68%) patients, while 12 (32%) patients had bilateral involved. On examination, anterior segment injury was more as compare to posterior with varying severity. The closed globe injuries were more common in 31(82%) patients than open globe in 7 (18%) patients. In ocular manifestation, the anterior segments with adnexa include: the lid laceration were in 12 patients; Conjunctival involvements congestion, chemosis, subconjunctival hemorrhage in 24 patients with 1 patient had conjunctival tear; the Corneal abrasion with multiple foreign bodies in 23 patients; Hyphema was in 9 patients; Iris involvement-tear, hole, dialysis in 7 patients; Traumatic cataract developed in 3 patients. (figure-3) In Posterior segment, vitreous hemorrhage was in 2 patients, retinal detachment in 6 patients; macular complication-edema, hole, hemorrhage in 6 patients and choroidal rupture in 2 patients. (figure-4). Open globe injuries, 3 patients had corneal tear; 2 had scleral tear; 2 (%) had corneoscleral tear –one of which required to evisceration. Out of 38 patients, 20 were required hospital admission for management, while rests were managed on OPD (outpatient department) and daily follow-up bases. In visual acuity (VA), 16 (32%) eyes had 6/6-6/12, 24(48%) had 6/12-6/60, 5(10%) had 6/60-1/60, while 5(10%) had <1/60- which was improved after treatment to 44(88%), 1(2%), 1(2%), 4(8%) respectively. (Table-1). On follow-up, USG B-scan shows Retinal Detachment, vitreous hemorrhage, IOFB (intra ocular foreign body) in 6 patients who required surgery include- scleral buckling, vitrectomy, IOFB removal. One badly damaged eye later on underwent evisceration with implant for better cosmetic. On UBM (ultra sound bio microscopy), 4 patient developed angle recession, though IOP was normal in 3 patients.



Graph 1: age wise distribution of patients; Graph 2: type of fire crackers causing ocular injury

Graph 3



Figure 1:

Table-1: Visual acuity

Visual Acuity	At Presentation	On last fup
6/6-6/12	16\50	44/50
6/12-6/60	24\50	1/50
5/60-1/60	5\50	1/50
<1/60	5\50	4/50

DISCUSSION

This study was a hospital-based, single-center, prospective case series of firecracker injuries. Cracker related body injuries in general and ocular injuries, in particular, are common during festivals and national celebrations like Deepavali in India, the spring festival in China, Independence Day in the United States and the Chaharshanbe Soori in Iran. This injury and cost to the society are quite substantial considering the disproportionately higher involvement of younger individuals, as can be seen in the present study.⁸ The injury was more in males (27, 71%) and more in child (23, 60%) as compare to adults with maximum numbers (no.) in 10-19 years were 14(37%) patients^{2,3}. Out of all agents, the bomb was most common in 14(37%) same as others studies^{1,8,9}. The most common firecracker causing injury in our study were bombs followed by sparklers and homemade devices. Even though sparklers were reported to cause minimal injuries in one of the studies, were not found to be innocent in our study.¹¹ The bottle rocket injuries also were of a serious nature. In all injuries, only 5 (13%) patients were used protective measures, rest all

not used anything, with only in 15 (39%) patients done fireworks under observation of elders/caretakers. Many of the injuries were caused as a result of negligence of those igniting the firecrackers. The other major cause of injury is the common practice of igniting firecrackers in the streets thus exposing passers by to injury. Out of 38 patients, 22 (58%) were Active-who were lighting fire crackers, while 16 (42%) were bystanders- who were only observing the fireworks, which correlating the finding of the other studies.^{4,7} The injuries reported ranged from lid and Lacrimal apparatus, conjunctival or corneal burns to globe rupture with interventions ranging from ocular wash to repair of globe perforation including evisceration. The visual equity was improved in 44 eyes while 6 eyes had not improved. It was much better in anterior segment injuries and superficial burn, while very worst in posterior segment injuries, globe perforation, and deep burns cases^{1, 3, 4}.Regulating the quality of firecrackers and promoting safe use via schools and media will also have a positive impact, along with tight legislation. Like UK fireworks Act 2003: it is offense to possess fireworks in public places, and setting off fire work during night

(between 11 pm and 7 am) is a punishable offense. The fireworks Act in Canada prohibits selling and setting off fireworks in the country, except between October 24 and November 1 in any year. It also specifies that fireworks may not be sold to a minor without the written permission of the parent or guardian of the minor. In India, we are still waiting for such kind of rules. Countries using restrictive firework legislation have a lower incidence of firework related ocular injuries.¹²The authorities should not allow the use of firecrackers at public places, thoroughfares, communities, settlements, and rooftops. Public fireworks can be arranged in open places during festival times. There should be a recommendation for safety and preventive measures like maintaining a safe distance and use of protective eyewear on warning labels for fireworks.⁸

CONCLUSION

Firework related ocular injuries were most common in male, children and close globe type. Timely management along with active surgical intervention when required gives very good visual outcome mainly in anterior segment than posterior segment injuries. However, Public awareness, Health education, Use of protective measures, lighting fireworks under observation with tighter legislation can reduce further severe ocular morbidity.

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