



Case Series of Ocular Injury with Firecracker During Diwali in North India

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Abstract

Objectives:- The primary aim of this case series is to evaluate and report the patients presenting at a tertiary care hospital with an ocular injury sustained due to firecrackers during the occasion of the Diwali festival and to report the pattern and severity of firecrackers associated ocular injury and to what extent this affects the visual acuity of these patients.

Methods:- This study is a tertiary care teaching hospital-based prospective study that includes 14 eyes of 12 patients who suffered firecracker-associated ocular injuries. All of them were presented to the hospital's emergency department within one week after the Diwali festival. A detailed history of all the patients was taken and their ocular examination was done. Out of 12 patients, 7 were admitted for further surgical management, and one patient who sustained a superficial facial burn, including periorbital area, without any eye injury was admitted to the department of plastic surgery 4 patients were given conservative treatment. The injuries were classified according to the ocular trauma scoring system (OTSS).

Results:- Out of the 12 patients presented, all were males, all of age group 6 years to 42 years (mean age group 18 years). Eight of them sustained injuries from explosive firecrackers and four sustained injuries from bottle rockets. Six of them were involved in igniting firecrackers, while 5 patients were either bystanders or passersby. Out of 11 patients, the right eye (RE) was involved in 6, the Left eye (LE) was involved in 4 and both eyes (BE) were engaged in 1 patient. Out of 12 eyes, six eyes had open globe perforating injuries involving cornea or cornea and sclera both, two eyes had mild conjunctival congestion and superficial burn over the periorbital region, one eye had conjunctival injury and one eye had a vitreous hemorrhage, one eye had traumatic retinal detachment, one eye had optic nerve avulsion. The maximum number of affected eyes falls under OTSS score II, indicating poor prognosis regarding visual acuity.

Conclusion:- Firecrackers may cause injuries in one or both eyes which may be grievous in nature resulting in an irreversible loss of vision in either or both eyes. Hence, it is a matter of serious concern. Directives should be formulated to register the ocular injury presented to the hospitals. The public should be educated regarding the safe handling of firecrackers. Firecracker manufacturing companies should be instructed to manufacture less explosive and safer firecrackers.

INTRODUCTION

Firecrackers are extensively used in India during various festivals, ceremonies, and social events. They find a special place during Diwali. In India, in cases of

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firecracker-related injury, a spike is noted during Diwali, a week-long festival celebrated between mid-October to mid-November in the Hindu Lunisolar month of "Kartik." The eye is the common site of involvement in firecracker injuries with the incidence ranging from 18 to 45%, which often results in permanent blindness. The nature of injuries varies from mild to grievous injury leading to profound visual loss (PL negative). A significant proportion of these injuries are seen in the pediatric age group. Loss of vision in children is of great concern as apart from the visual disability which will last throughout their life, it also affects their learning capability and lifestyle and causes psychological trauma to the children and their caretakers (Figure 1).

MATERIALS AND METHODS

This tertiary care-based prospective study includes all the patients with firecracker-associated ocular injuries presenting to the hospital's emergency department within 1 week after the Diwali festival. A

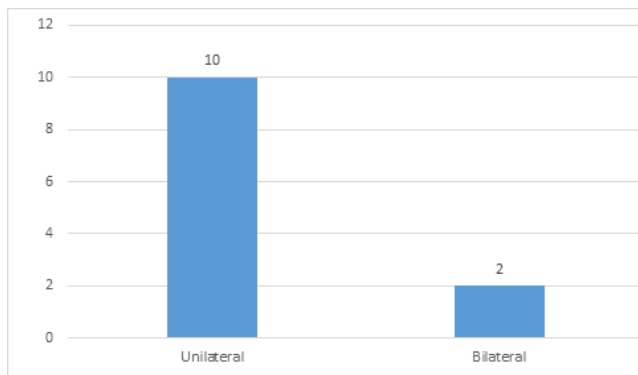


Figure 1: Laterality.

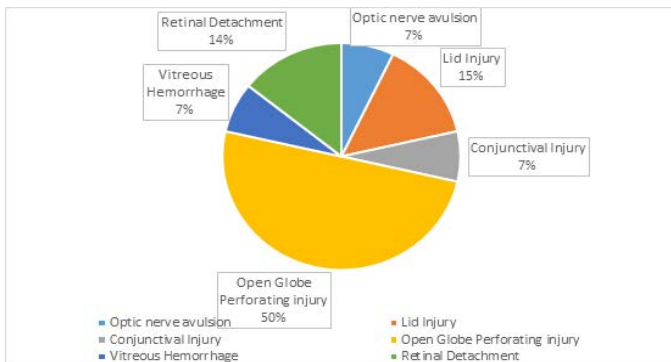


Figure 2: Different case of Ocular Injuries

Table 1: Grouping of affected eyes (Total of 12 eyes) based on visual acuity at presentation

Visual acuity at presentation	No. of eyes
6/6-6/18	4
3/60	1
1/60	2
HMCF- PL negative	7

HMCF - Hand Movement close to face, PL- Perception of light

detailed history of the event and ocular examination of the patients was made. The wounds of all the patients were thoroughly washed with normal saline and the superficial foreign bodies, if present, were removed under topical anesthesia. All the patients underwent slit lamp examination and fundus examination with an indirect ophthalmoscope if feasible. X-ray orbit was advised as a screening tool to rule out the intraocular foreign body as and when needed. Patients have also been advised to get a B-scan or CT scan done depending on the need. Certain routine blood investigation was advised for the patients who needed surgical management. The injuries were classified according to the ocular trauma scoring system (OTSS) (Table 2).

RESULTS

Out of the total 11 patients seen, all were males, all of age group 6 years to 42 years (mean age group 18 years). Nine of them sustained injuries from explosive firecrackers and 3 sustained injuries from bottle rockets. 7 among them were themselves involved in igniting firecrackers, while 5 patients were either bystanders or passersby.

Out of 12 patients, the right eye (RE) was involved in 6, the Left eye (LE) was involved in 4 and both eyes (BE) were involved in 2 patients (Table 1).

Out of 12 cases, seven eyes had open globe perforating injuries involving cornea only or cornea and sclera both, and two eyes had mild conjunctival congestion and superficial burn over the periorbital region, one eye had conjunctival injury one eye had a vitreous hemorrhage, two eyes had traumatic retinal detachment, one eye had optic nerve avulsion.

Out of 12 patients, 9 patients were less than 18 years of age. It shows that most of the firecracker injury victims were young children. Only 3 patients

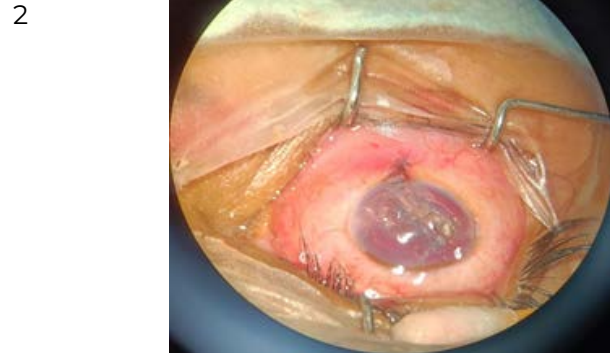
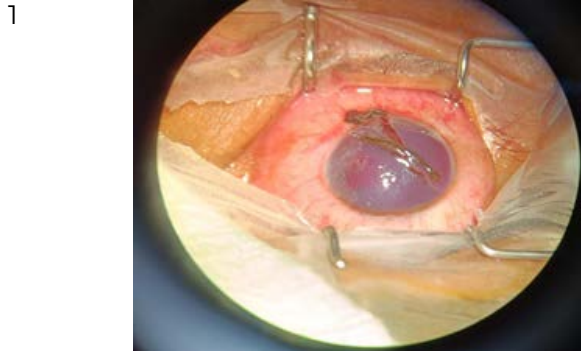


Figure 3 and 4: Case 1. Corneo scleral laceration due to firecracker injury with OTSS Grade II . Pre-operative and immediate post-operative photos.

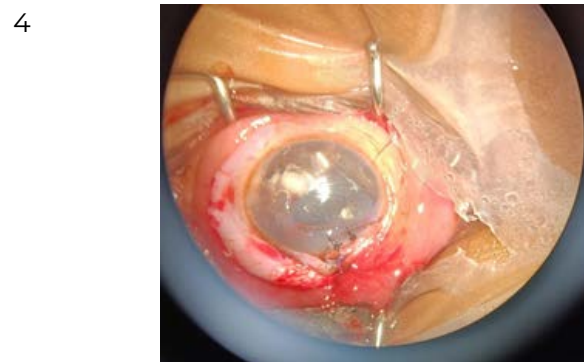
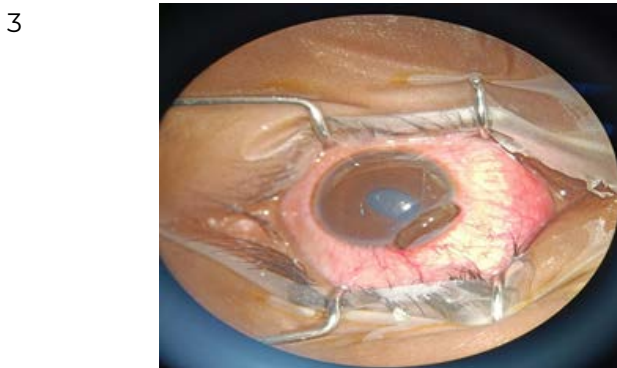


Figure 5 and 6: Case 2. Corneo limbal laceration due to firecracker injury with OTSS Grade II . Pre-operative and immediate post-operative photos.

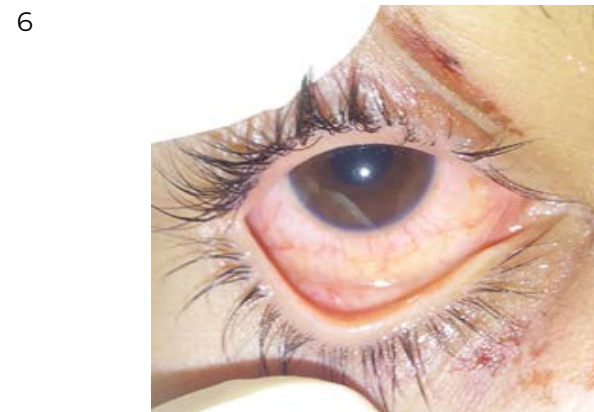
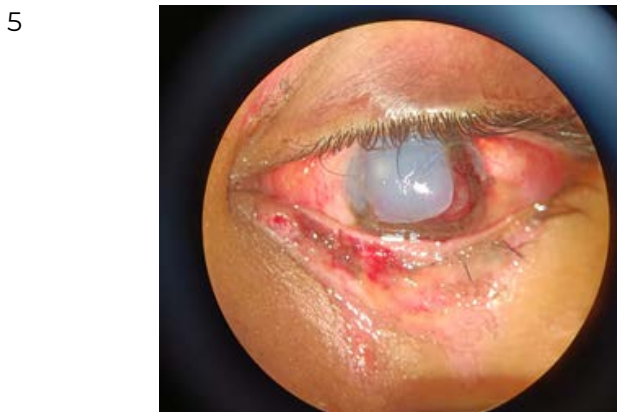


Figure 7: Case 3. Corneo limbal laceration with lower lid injury due to firecracker with OTSS Grade II

Figure 8: Case 4. Firecracker associated injury causing conjunctival congestion. On indirect ophthalmoscopy, vitreous hemorrhage was found. OTSS Grade III

were of age group more than 18 years.

Most of the ocular injuries occurred from explosive firecrackers. Following are the photographs of the affected eye of the patients before and after the surgical intervention was made.

Few more photographs showing ocular injury at the time patient's presentation

Out of 12 cases, 4 cases were managed conservatively. They were prescribed topical antibiotics with steroids, anti-inflammatories, cycloplegics, and lubricating eye drops.

7 of them needed surgical intervention, 6 underwent corneoscleral repair, and 1 underwent corneo-limbal repair (Figure 2).



Figure 9: Case 5. Corneo scleral laceration due to firecracker injury with OTSS Grade II.



Figure 10: Case 6. Corneo limbal tear due to firecracker injury with OTSS Grade II.



Figure 11: Case 7. Fire cracker associated injury causing conjunctival congestion with suspected optic nerve avulsion. OTSS Grade II

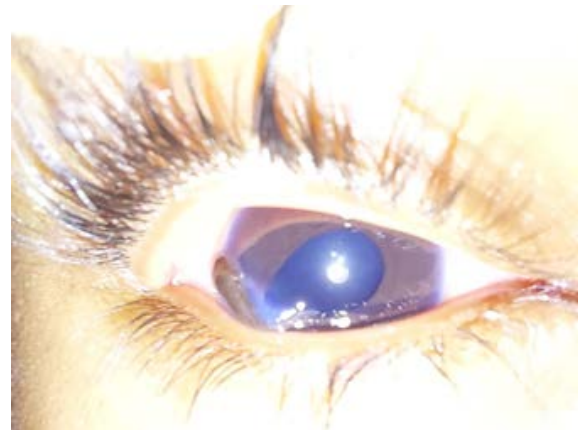


Figure 12: Case 8. Corneo scleral laceration due to firecracker injury with OTS score II.

Table 2: Ocular Trauma Scoring System (OTSS)

Case	Age/Sex	Raw Score	OTSS
Case 1	16Y/M	56	II
Case 2	9Y/M	56	II
Case 3	22Y/M	46	II
Case 4	15Y/M	56	II
Case 5	10Y/M	49	II
Case 6	17Y/M	RE- 47, LE-59	II (BE)
Case 7	16Y/M	66	III
Case 8	17Y/M	80	III
Case 9	6Y/M	76	III
Case 10	30YM	69	III
Case 11	12Y/M	100 (BE)	V (BE)
Case 12	42Y/M	100	V

RE- Right eye, LE- Left eye, BE-Both eye

Table 3: Maximum number of affected eyes falls under OTSS score II, indicating poor prognosis regarding visual acuity

OTSS	No. Of eyes
GRADE II	7
GRADE III	4
GRADE V	3

One patient having superficial burn injury over the face and periorbital region (both sides) with conjunctival congestion (both eyes) with no visual complaints was transferred to the department of plastic surgery.

Grading of injury to the eye was done according to OTSS Table 2.

Maximum number of affected eyes falls under OTSS score II, indicating poor prognosis regarding visual acuity.

DISCUSSION

We could not find a similar report in the existing literature regarding firecracker injuries in northern India. Fireworks are a class of explosive pyrotechnic devices invented by the Chinese in the seventh century. China is still the world's largest manufacturer and exporter of fireworks, with India being the second largest producer. In our study, all the victims were male and 75% of the victims were less than 18 years of age, which is similar to the existing reports. Firecrackers are an integral part of Diwali celebrations. Hence firecracker-related ocular injuries show a higher incidence during this festival. Most of the injuries are usually caused by the negligence of those igniting the firecrackers; however others were unalert bystanders who were not engaged in igniting firecrackers. About 50% of the eyes had suffered an open globe perforating injury. 17% of the total eyes have a high possibility of landing up with phthisis and associated blindness and disfigurement of the face at an early age. As per OTSS, 11 eyes from a total of 14 injured eyes have a poor final visual outcome (Table 3).

Looking at these injured eyes and the predicted outcomes, we can learn that the injuries caused by firecrackers cause significant morbidity; hence, public education should be emphasized to reduce their incidence. Fireworks-related injuries can result in significant ocular morbidity and permanent blindness in all age groups, but children are especially vulnerable to these kinds of injuries. Hence children should always be supervised by the elder group while igniting firecrackers.

CONCLUSION

Firecrackers may cause injuries in one or both eyes, which may be grievous, resulting in irreversible loss of vision in either or both eyes. These injuries are seen exclusively in males and majorly, children and young adults are affected. Thus, this preventable severe irreversible visual compromise has a significant socioeconomic burden on society. As seen in our study, sparklers or green firecrackers were not involved in causing injury to any of the victims in the study; hence their use should be promoted to replace the use of explosive firecrackers. Because this is a single hospital-based case series, thus this

is just the tip of the iceberg. So, it may be desirable to have a national registry to get an estimate of the problem for further action. The public should be educated regarding the safe handling of firecrackers. Firecracker manufacturing companies should be instructed to manufacture less explosive and safer firecrackers.

The limitations of this study are that the sample size is small, the study is based on the patient data at a single center, so the actual spectrum of the ocular injury and its social impact could not be evaluated at the state level, and there is small follow up period so the long-term outcome of the injury could not be evaluated.

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