

Bilateral Asteroid Cornea due to Occupational Firecracker Burst

Rinky Agarwal, Rahul Kumar Bafna, Chetan, Namrata Sharma

Dr. Rajendra Prasad Centre for Ophthalmic Sciences, All India Institute of Medical Sciences, New Delhi, India

Abstract

Firecrackers are largely used by people during festivals for their sound, spark, shine, and explosion while lightening up the celebration mood. Ocular injuries caused by these commodities are usually severe and devastating. Most of these are recreational, occur due to unpredictable explosion and involve individuals actively igniting the crackers or passive bystanders. However, occupational injuries due to these manmade devices has rarely been reported. Presently reported is a case of spontaneous bursting of firecracker, an occupational trauma in a young male, resulting in multiple orange corneal foreign bodies giving the appearance of asteroid cornea.

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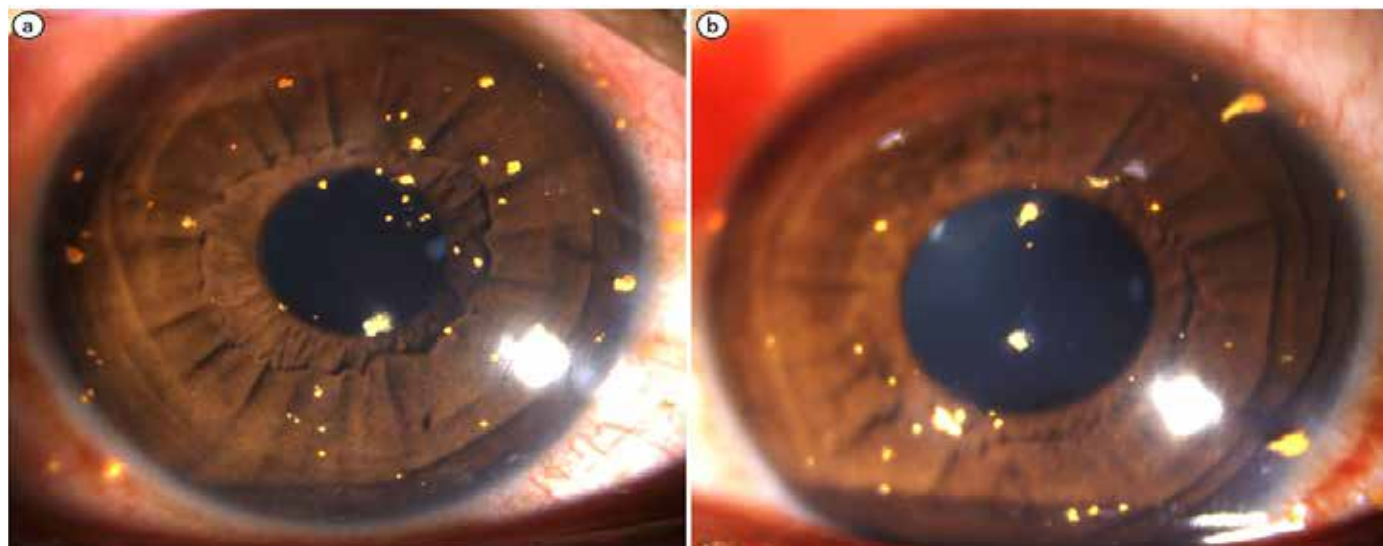
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Introduction

People largely use firecrackers during festivals for their sound, spark, shine and sudden explosion while lighting up the celebration mood. Firecracker-related injuries are a preventable cause of severe ocular damage and blindness globally.^{1,2,3} The type of injury imparted by these commodities is partly determined by the nature of the fireworks involved and partly by the size, shape, velocity and composition of the released fragments.⁴ The sparklers are known to produce only ocular surface burns or abrasions, and rockets, cone fountain bombs, and bombs cause more devastating injuries of the lid, adnexal and anterior and posterior segment. Most of these injuries occur in young males and children and the affected individuals are either actively igniting the crackers or are passive bystanders. Presently reported is a case of spontaneous bursting of firecracker in a young male while working in its factory that resulted in multiple corneal foreign bodies (FBs) giving the appearance of asteroid cornea.

Case details

A 23-year-old healthy young male presented with a history of mild irritation in right eye after spontaneous bursting of a firecracker, a bomb, 2 days back. The occupational history of the patient suggested that he was working in an industry concerned with production, storage, and transport of firecrackers for two years and that he was actively involved in packaging of firecrackers while suffering from ocular trauma. The patient was well aware of the life and sight-threatening injuries caused by these commodities, had no past history of firecracker injuries in the family or in his colleagues and reported no use of protective eye/ body wear during his entire occupational career. On examination, the patient had few small (<0.5 mm) conjunctival and corneal abrasions with multiple orange coloured intracorneal FBs randomly spread at different levels of the cornea stroma in both eyes giving the appearance of asteroid or starry cornea (Figure 1). The most superficial FBs protruding outside epithelium corroborated with corneal abrasions. However, none of the FBs involved the visual axis and the remainder



Figures 1: Multiple orange coloured corneal foreign bodies seen in right eye (a) and left eye (b)

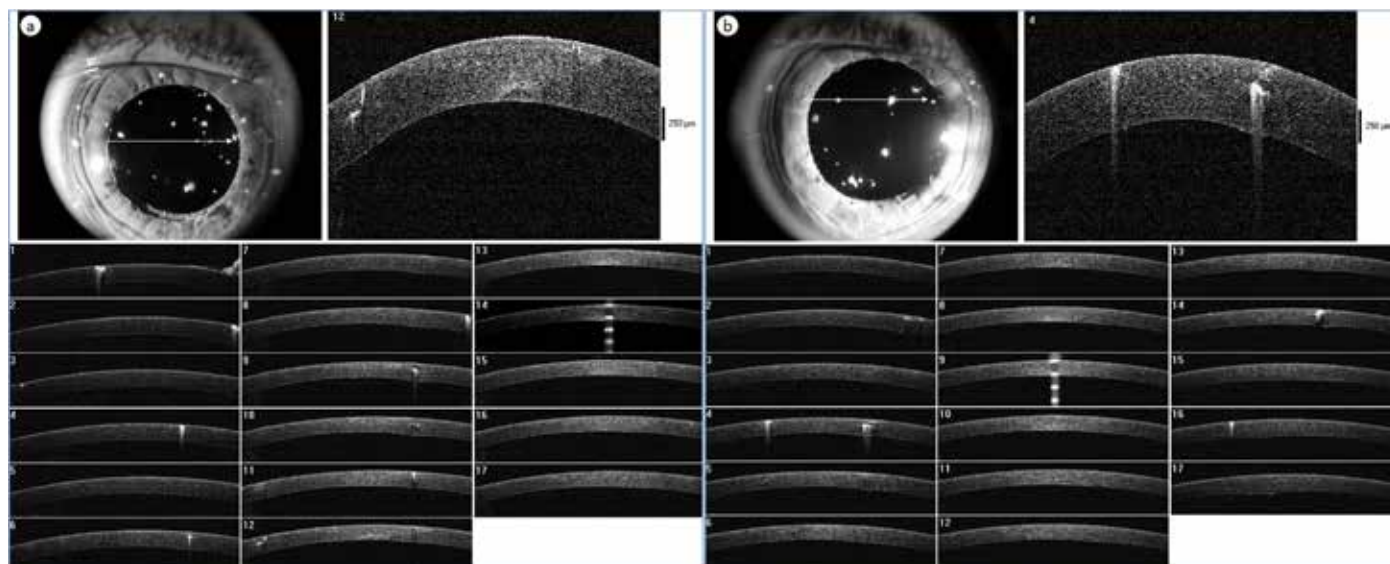


Figure 2: Anterior segment optical coherence tomography showing multiple hyperintense lesions in right eye (a) and left eye (b)

of the anterior and posterior segment examination was uneventful. The visual acuity in both eyes was 6/6 with keratometry, and endothelial count of 44.94D/45.49D @ 12°/102° and 43.77D/44.86D @ 13°/108° and 2800 and 2756 cells/mm² in right and left eye respectively. Anterior segment optical coherence tomography revealed a central corneal thickness of 534 µm in right eye and 540 µm in left eye along with multiple hyperintense lesions at various levels of corneal stroma in both eyes (Figure 2).

The differential diagnosis of golden colour lesions in the corneal stroma include corneal degenerations such as climactic keratopathy, metal deposits in chalcosis, argyrosis and siderosis and corneal infiltrates due to dematiaceous fungi. However, climactic keratopathy is long-standing and associated with elevated lesions. While chalcosis and siderosis have a characteristic history of trauma with metallic objects, Argyrosis usually occurs in patients with a characteristic occupational history. Clear surrounding stroma and absence of anterior segment inflammation ruled out microbial keratitis in our case.

A diagnosis of fire-cracker burst induced bilateral asteroid cornea was confirmed in our case by its sudden onset of signs and symptoms, a characteristic history of firecracker burst trauma, and uneventful lid, adnexal, and anterior and posterior segment inflammation.

The patient was started on topical antibiotic-steroid-lubricant combination for seven days following which complete healing of epithelial defects, a decrease in ocular irritation and maintained visual acuity were noted. All medications were discontinued after seven days and the patient was advised regular follow up and use of protective eye-wear for further work in the future. The ocular condition remained unchanged till one-year follow-up.

Discussion

Both firecracker-related ocular injuries and corneal FB trauma are encountered in an ophthalmic emergency set-

up.^{5,6,7} Both these injuries are usually unilateral and have significant male preponderance.¹ However, the corneal FB traumas are usually occupational and trivial in nature and the firecracker injuries are recreational and sight-threatening. While the recreational firecracker injuries are commonly ceremonial in occurrence, occupational firecracker injuries can be perennial with an increase in their incidence during festivals owing to increased sale. Nevertheless Both recreational and occupational firecracker injuries are usually accidental and negligence and ignorance of the participant contribute majorly to their occurrence. Besides, both can become unexpectedly fatal by involving surrounding individuals.

While recreational firecrackers injuries have already been reported to deposit multiple FBs in the cornea, an occupational fire-cracker injury presenting as benign bilateral multiple orange-coloured superficial as well as deep corneal FBs is being reported for the first time.¹ The orange colour of FBs in the present case could be attributed to the presence of calcium salts in the fire-cracker.⁸ Though the mechanism for self-ignition of firecracker remains elusive in the present case, it could be attributed to long-term storage induced internal changes in it. The benign nature of otherwise grievous firecracker-related ocular injuries in the present case could be explained due to following reasons. It is possible that the self-ignition of the firecracker produced fewer trajectories, particularly calcium-containing, than their active ignition. Therefore, these remained localized to the superficial ocular coats due to their low velocity and momentum. Also, unlike other calcium products related injury such as lime, where alkaline nature of calcium hydroxide causes intense damage to the eye, inert nature of calcium chloride in the present firework could have resulted in minimal ocular trauma.⁹ Yet, despite their minimal thermochemical injury in the immediate phase and non-reactive nature till one year follow up, serial follow-ups are required to see how these extraneous particles behave in the long-term. In our case,

they did not affect patient's visual acuity or quality and were therefore left untouched.

Due to the serious effects of occupational firecracker injuries on humans as well as environment, it is important to restraint them urgently. While multiple measures have been taken to curb recreational firecracker injuries by putting a legislative ban on their sale, minimal steps have been taken to control occupational firecracker injuries due to their negligible occurrence.² The present case throws light on their occurrence and as more such cases get reported, restrictive legislation on their production, transport and storage can be laid in the future to curb these preventable manmade accidents. Conduction of awareness campaigns, improvement in education facilities and provision of protective body-wear to the workers should also be practiced regularly for maintaining safety of employees in such factories.^{2,10} Besides similar asteroid corneas require a proper documentation as they may be mistaken for additional serious ocular conditions by other ophthalmologists in the future if the affected individual fails to recall their characteristic history in lieu of its benign nature.

To conclude, ocular trauma from fireworks commonly affects young males and often results in serious and vision-threatening yet preventable complications. These are not only serious recreational dangers but also grave occupational hazards and conducting appropriate education campaigns and provision of protective body-wear to factory workers are essential preventive measures for curbing this manmade ocular hazard.

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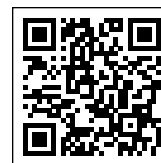
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Address for correspondence

Rinky Agarwal MD, DNB, MNAMS
Dr Rajendra prasad centre
for ophthalmic sciences,
All India Institute of Medical Sciences
New Delhi India
E-mail- rinky.1990@gmail.com



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