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# Management of a 10-year-old boy's maxillofacial injury caused by an exploding fire cracker: A rare case report

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## ABSTRACT

Fire injuries may be dangerous and lead to severe injuries with long-term defects. If such an injury encompasses the maxillofacial region, it can lead to severe incapacitation. Early and essential treatment of such injury is important to limit the degree of damage. A 10-year-old boy suffered maxillofacial injury due to the explosion of firecracker while playing with it without any adult's supervision. The patient had three shrapnel lodged in his soft tissues due to the explosion of a firecracker. The projectiles were removed under local anesthesia, and the entry wound and the projectile pathway were debrided and sutured. The healing of the wounds was uneventful. The patient had no further concerns on the follow up visit. Use of firecrackers by children should be strictly under the supervision of an adult. Although banning the use of it would be more prudent. Furthermore, other, safer celebration means should be encouraged instead of fireworks.

**Keywords:** Trauma, Maxillofacial injury, Firecracker, Projectile

## 1. INTRODUCTION

Firecracker injury in children can lead to extensive burn and damage to the body. The impact can result in a debilitated state for life. Enormous damage can occur when the oral, and maxillofacial region is involved. Vital structures like eyes, nose, ears, and oral cavity present in close vicinity, the extent of damage cannot be overemphasized. The use of firecrackers, although a traditional part of the celebration has over; the year, led to many injuries and deaths. There have been incidents every year of users being blinded, losing body parts, or suffering other injuries, especially during festivities that customarily involve firecrackers such as Diwali. One of the most common types of injuries seen in the emergency department related to fireworks are burns. Fireworks produce high temperatures and can cause severe burns if they come into direct contact with the skin (Sethy et al., 2020).

These burns can vary in severity, from minor first-degree burns to more severe second or third-degree burns that may require extensive medical treatment. In addition to burns, fireworks can also cause injuries such as eye

trauma. The eyes are particularly vulnerable to damage from flying debris or sparks produced by fireworks. Eyes injuries can range from corneal abrasions and foreign body injuries to more severe conditions like retinal damage or even permanent vision loss (Sethy et al., 2020). According to Sethy et al., (2020), to prevent firework injuries, it is essential to prioritize safety measures. The annual incidence of firecracker related injuries in India is 7 in every 100,000 population. This paper highlights a case where a 10-year-old boy reported with a complaint of injury to his face. Child had suffered trauma due to explosion of firecracker on lower jaw.

## 2. CASE REPORT

A 10-year-old male patient came to our hospital with complaint of trauma to his face. Patient was conscious and well oriented to time, place and person. He gave history of playing with firecrackers without any adult supervision. He had placed the firecracker into a hollow rubber tire tube which had air valves. These valves got projected towards his face when the cracker exploded inside the tube leading the shrapnel to enter his tissues in relation to mandible, at two distinct sites. Immediately following trauma, he was taken to a local hospital and was managed conservatively; along with that basic radiographs were taken. Later he was referred to our maxillofacial Surgery unit.

On examination, approximately 1 to 1.5 cm lacerated wound was present below right corner of mouth, another one of similar size near left corner of mouth; one more over the left upper eyelid region. The first two lacerations depicted suspected entry wound. On palpation, firm, smooth, round lump could be noted near right para symphysis region and left body region with slight edema. Intraoral no laceration was seen. No disturbances to occlusion were noted. The child had no other systemic injuries.

## 3. IMAGING FINDINGS

PA mandible and lateral cephalic view, taken at primary center depicted two radio-opaque foreign bodies in the right mandibular para symphysis and the left mandibular body region. A 3D CT scan of face revealed, two radiopaque foreign bodies lodged in soft tissue drape near right mandibular para symphysis region and left mandibular body region. The maxillofacial bones were intact (Figure 1).

**Treatment**

The child was operated under local anesthesia. All the residual explosive powder sticking on the skin was cleared using 0.9% Normal Saline followed by spirit. Betadine painting and draping was done. On right side submandibular incision was given. On blunt dissection one shrapnel was exposed and removed (Figure 2). Entry wound debridement was carried on same side. Curettage was done for entire travel pathway of projectile from entry wound to incision site. Lastly, double-layer suture was given. Similar incisions and dissection were repeated on the left side. Two shrapnel were removed (Figure 3), again curettage was done for entire travel pathway of projectile from entry wound to incision site and subcuticular suture was taken. Both entry wounds were sutured after refreshing the margins. Patient was kept on antibiotics and postoperative healing after a week was satisfactory with no complications.

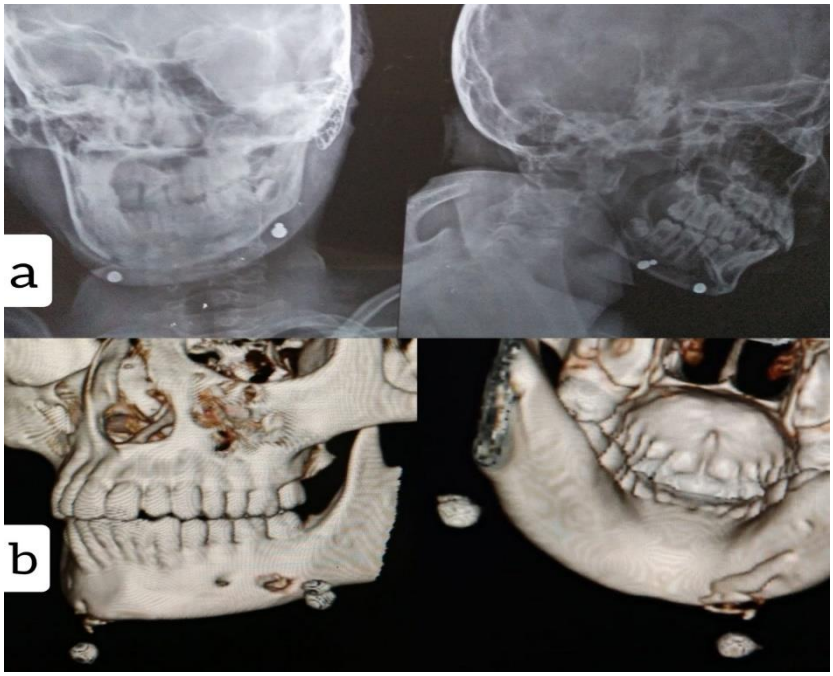


**Figure 1** (a) PA mandible and lateral cephalic view radiographs, (b) 3DCT scan showing radio opaque foreign bodies.

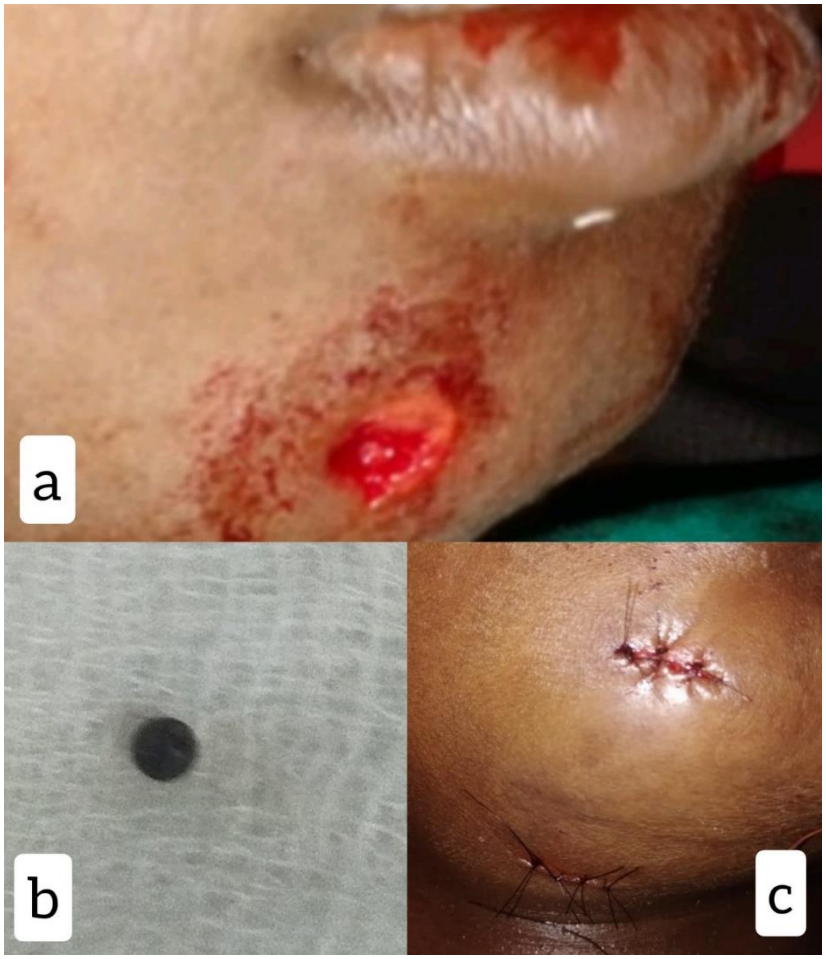


**Figure 2** Right side (a) Entry wound, (b) Foreign body removed, (c) Sutures placed.


**Figure 3** Left side (a) Entry wound, (b) Incision made and foreign body seen after dissection, (c) Foreign bodies removed, (d) Sutures placed.

## 4. DISCUSSION

In discuss on occasions like festivals, social celebrations, weddings and sports events; the firecrackers are an important part of celebrations. During these events or festivals, burn injuries are common. When children suffer from such accidents the challenges regarding treatment increases. The injury can lead to scars and distorted facial appearance hence having impact on child's physical and psychological growth (Singh et al., 2022). Projectile injury due to firecracker in a child, which was equally devastating. Maxillofacial injuries in children always presents a challenge in respect of their management (Yadav et al., 2014). These wounds exhibit, a multi range soft tissue trauma, from burns to foreign bodies, fractures and concomitant trauma. Stepwise management is mandatory in such cases. Thorough debridement to remove all residual explosive powder, foreign body and nonvital tissue is important, followed by immediate reconstructive procedures and adequate management of soft tissue (Yadav et al., 2014).

Male pediatric patients are most likely to suffer firework-related injury by found the highest rates of injuries of male predilection and the age ranging from 10 to 19years (7.28 per 100,000) and 0 to 9 years (5.45 per 100,000), with head and neck trauma (42%) and shoulder and upper extremity trauma (39.1%) comprising the majority of injuries (Mehta et al., 2020). Children aged <5 years were commonly injured by personal failure (delayed withdrawal from ignited firework) and device failure (early or late blast). The age group 5-14 years showed all types of misuse behavior, as well as personal failure (delayed withdrawal). Misuse behavior was rampant in the age group 5-24 years using flare/fountains and crackers particularly string bombs (Puri et al., 2009). Fireworks-related injuries are most common in boys and children more than 10 years of age. Bagri et al., (2013), mentioned the word shrapnel is derived from the name of Major-General Henry Shrapnel, an English artillery officer, who developed a new type of artillery shell.

The term originally referred only to the spherical shot or musket balls dispersed when a shrapnel shell bursts, and this is still the strict technical definition of the term. However, "shrapnel" is now commonly used to describe all types of high-velocity fragments thrown out from an explosion and does not differentiate among the processes that create them (Ebert et al., 2021). When a fragment has low velocity or meets high resistance, it will stop in the body at some point of its trajectory. The projectile had low velocity. This is the possible reason that the shrapnel in our patient did not fracture the bones or exit the soft tissues. Nevertheless, the use of fireworks by children has to be strictly monitored by an adult. The best advice would be not to use fireworks at all but that's not practical as using fireworks to celebrate has become an integral part of our culture (Brook et al., 2011; Ebert et al., 2021).

## 5. CONCLUSION

Firework related injuries are mostly avoidable. Safe handling of fireworks with proper safety measures has to be educated in schools, and children must be prohibited from handling fireworks. Following measures has to be implemented. Fireworks needs to be subjected to a strict standardization, and only standardized fireworks should be marketed. And young adults must be allowed to play with fireworks under adult supervision. Proper safety measures have to be printed onto the packets. Strict enforcement of the existing laws is quite essential. There is no immediate solution to the problem but it can definitely be reduced through proper advertisement and mandatory display of safety precautions.

**Recommendation**

Attend public fireworks displays: Instead of handling fireworks at home, consider attending professional fireworks displays. These displays are managed by experts who follow strict safety protocols, minimizing the risk of accidents.

Follow local laws and regulations: Be aware of the laws and regulations regarding fireworks in your area. Some regions prohibit the use of certain types of fireworks altogether, while others have specific guidelines on when and where they can be used.

Keep a safe distance: If you decide to use fireworks at home, make sure to maintain a safe distance from people, buildings, and flammable materials. Follow the manufacturer's instructions and keep in mind the recommended safety distances for each type of firework.

Adult supervision: Never allow children to handle fireworks. They should always be under the close supervision of responsible adults. Even seemingly harmless fireworks like sparklers can cause serious injuries in young children.

Protective eyewear: Consider wearing protective eyewear when handling fireworks to protect your eyes from potential debris or sparks.

Fire extinguisher and water source: Keep a fire extinguisher or a bucket of water nearby in case of emergencies. This can help prevent small fires from spreading and minimize the risk of injuries.

Alcohol and fireworks don't mix: Avoid alcohol consumption when handling fireworks. Alcohol impairs judgment and coordination, increasing the likelihood of accidents.

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**Author Contributions**

Each author is expected to made substantial contributions to the conception or design of the work; the acquisition, analysis, interpretation of data and the creation of new software used in the work; and substantively revised it.

**Ethical approval**

The study was approved by the Medical Ethics Committee of (Ethical approval code: OMFS/2023/22).

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal identity, but an enmity cannot be guaranteed. Written & Oral informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants from whom identifying information is included in this manuscript.

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**Conflict of interest**

The authors declare that there is no conflict of interests.

**Data and materials availability**

All data sets collected during this study are available upon reasonable request from the corresponding author.

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