

Firecracker Maxillofacial Injury in a 6-Year-Old Child- A Case Report

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The present case report highlights the management of a 6 years old female child who suffered oral and maxillofacial injury due to explosion of a fire cracker inside the mouth which was managed by primary closure after complete debridement and to prevent the post treatment microstomia, a modified microstomia prevention intraoral prosthetic appliance was given and followed up for 15 months.

Keywords: Facial injury, Firecracker, Thermal oral burns, Children

INTRODUCTION

Firecracker injury in children can lead to extensive burns and damage to the body. The impact can result in a life-long cripple, not only physically but also psychologically. The damage is even more extensive when the oral and maxillofacial region is involved. Peri-oral contracture is a common occurrence observed post burn injury due to vigorous scar formation.

This paper highlights a case where a 6-year-old female child reported with a complaint of injury to her face. Child had suffered trauma due to explosion of firecracker in her mouth on Diwali. The injury was managed by complete debridement followed by primary closure and a modified intraoral prosthetic appliance was given to prevent subsequent development of microstomia.

Case Report

A 6-year-old female reported to the outpatient unit of Pediatric dentistry of our institute with her parents. She was referred from the district hospital with a chief complaint of injury to the right side of her face from a live firecracker explosion while playing on Diwali night. At the location, family members suggested the child was playing with fireworks when the explosion occurred. Apart from a massive trauma to the head, no other injuries were apparent

On extraoral examination, a symmetrical face with no visible scalp injury was seen. A lacerated wound with a tear was observed on the right side of her face that extended from the corner of the mouth to lateral aspect of the maxillary arch to the point of intersection of the ala tragus line. Another tear extending from the corner of the mouth to the lower border of the mandible was observed in association with herniation of buccal pad of fat. Superficial necrotic tissue and explosive powder were present. Another laceration extending from the right buccal vestibule of the upper and lower arches was also present. However, there was no laceration or thermal injury

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on the tongue (Figure 1). These lacerations were most likely due to the direct exposure to the air blast from explosives detonating on its surface. There was no active bleeding from the injured site. However, upper and lower lips were swollen. On palpation, tenderness was present on the right side of the maxilla and mandible with no obvious step deformities evident. On Intraoral examination, the mouth opening was noted as thirty millimeters. Chest X-ray and hematological laboratory exams were carried out. Based on the history and the clinical examination, a provisional diagnosis of cracker injury/ blast injury of the right cheek was made.

Figure 1. Pre-operative image showing the wound after intraoral explosion of firecracker.



Treatment plan

1. Conservative management after complete exploration and debridement, followed by primary closure under general anesthesia.
2. To prevent a post-treatment microstomia, an intraoral prosthetic was planned.

Treatment procedure

Surgical Phase

The surgical site was draped and prepared with 5% betadine. Initially, a Nasotracheal tube was inserted but could not be secure the airway due to the blood aspiration which led to a drop in oxygen saturation to 80%. Then, a laryngeal mask airway (LMA) was inserted and stabilized with suture, and then oral intubation followed by placement of throat pack was done. Following betadine irrigation, all the residual explosive powder sticking on the skin and the oral mucosa was removed. After complete debridement, Intraorally, the flaps were approximated and sutured with 3-0 vicryl from upper to lower buccal vestibular region. The muscle was sutured in layers with vicryl 3-0 suture material. Finally, the skin was sutured with 4-0 prolene, and hemostasis was achieved (Figure 2). During extubation, the patient presented bilateral wheezing, treated with , hydrocortisone, and duolin puff were given through the tube, and the patient was shifted to ICU and monitored for 24 hours. This needs to be done from a low O₂ saturation from potential burns into the trachea and even the lung tissue form the extreme temperatures and inflammation. Uneventful extubation was carried out and the patient was shifted to the ward for further management.

Figure 2. Primary closure after complete debridement under general anesthesia.



After proper instructions, the patient was discharged and suture removal was done after 10 days followed by regular dressing. The wounds healed satisfactorily and to prevent further restriction of mouth opening some exercises was advised.

Prosthetic phase

During the healing phase, it was seen that the patient was not compliant with the instructions related to mouth opening exercises. Considering her young age, it was decided to give an appliance which she can wear along with mouth opening exercises. It has been reported that muscles contain genetic information for bone growth. The lack of balance between the tonic buccal musculature and the phasic tongue movement in a burned child can alter irreversibly bimaxillary anteroposterior skeletal development. Thus, to prevent this disfiguring consequence, an intraoral prosthetic appliance was given.

Upper and lower alginate impressions were made, poured with dental stone and a bite was registered. The retrieved casts were articulated. A wire encircling the entire maxillary arch was adapted and a wire tag was fabricated which will retract the buccal mucosa which was soldered with the maxillary wire component. Between the retentive tag and the buccal surfaces of teeth and adjoining gingiva utility wax was adapted about 3-4mm thick and over it, a vestibular acrylic shield was fabricated, polished, and delivered to the patient (Figure 3).

The tissue contracture may occur for many months after completion of the wound healing which depends on the severity and treatment approach. For this reason, whenever possible, an appliance must be worn 24 hours a day for the first six months and then eight to 12 hours per day, usually at night, for the next six months. Child and parent cooperation are critical factors in the success.

Follow up

At 12 months follow-up, the patient was highly motivated regarding oral hygiene practices, adherence appliance wear, and mouth opening exercises. There was no decrease in mouth opening and the patient had no complaints performing stomatognathic

Figure 3 a, b. Modified microstomia prevention intraoral prosthetic appliance.



Figure 4 a. Mouth opening at follow-ups 56 mm.



4 b. Extraoral photographs—symmetrical lips, no drooping at the angle of the mouth.



4 c. Intraoral frontal view.



functions. The mouth opening of the patient is 56 mm (Fig 4a) having good intercuspation with symmetrical lips (Fig 4 b, c). A video consultation was done at 15 months follow-up due to a sudden increase in covid cases (Figure 5 a ,b).

The emphasis on prevention of caries with oral hygiene maintenance after brushing twice with 1000ppm fluoridated dentifrices, topical application of fluoride varnish, to educate the parents. The regular monitoring and reinforcement for her future dental treatment.

Figure 5 a. Mouth opening. b. A confident smile on her face.



DISCUSSION

Management of pediatric maxillofacial injuries due to an explosion of a live firecracker is a challenge for a clinician due to its rarity and the availability of the limited existing literature. The principal challenge for the clinician is to manage these multifaceted complex soft tissue injuries which are further complicated by the incorporation of foreign bodies to restore the oral function. The most common complications associated with post-treatment include trismus, scars, a distorted facial appearance which has a major negative impact on the quality of life. It also affects the physical and psychological growth of the patient.

Due to the explosion of a live firecracker, the heat produced tears the soft tissue and turns it into a nonvital structure with a compromised vascular supply in contrast to electric injuries which liquifies the tissue. The available case reports or case studies on the people who tried to commit suicide after placing a firecrackers/ detonator in the mouth as they raised the intraoral temperature more than upto 1000°C which results in severe soft and hard tissue injuries. ¹ Although it is advisable to explore and completely debride, the mode of healing that needs to be adopted is still debatable (i.e., whether to go for the primary reconstruction or to wait for the formation of a healthy granulation tissue bed). The use of reconstructive techniques, sometimes together with microsurgical techniques, such as grafting of nerves, vessels, and soft tissue, as an acute free flap to cover a large defect, is required to restore the oral function. Here, in the present case, the primary reconstruction was carried to restore the oral function of such a small child.

The primary teeth were more resistant to fragmentation under thermal stress due to high resiliency and uniform coefficient of thermal expansion compared to the permanent dentition. This reduces the risk of crown fragmentation, and the findings were in concordance with the present case where no dental associated abnormalities. ² The patient's age and type of the dentition may

influence the heat induced changes in teeth. According to George *et al* 2017, these variables should be taken into consideration where dental hard tissues are exposed to extreme temperatures.²

According to Di Benedetto (2009), the first acute surgical step after the complete debridement would be the use of local flaps whereas, the use of distant flaps, such as the pectoralis major flap, the supraclavicular island flap, or free flaps such as the latissimus dorsi flap or the anterolateral thigh flap has been suggested in cases with extensive tissue loss.³ In the present case, there was only soft tissue injury but it could depend on the amount of gun powder and also the affected site. A patient's parent informed that she picked the cracker which failed to explode, took it in her mouth and unfortunately, exploded. However, Firecrackers are fireworks containing flash powder, responsible for loud explosion and detonation in the mouth, resulted in extensive bone and soft tissue destruction, which can mimic an intraoral shotgun wound.⁴ Yadav S (2014) reported a case of a 4-year-old male child who has suffered from oral and maxillofacial injuries that include bilateral mandibular body fracture associated with lacerated, torn, necrotic soft tissue wound.⁵ Similar to this present case, another case has been reported by the Sardana *et al* 2012 where soft tissue trauma occurred due to firecracker explosion intraorally in a 3-year-old child.⁶ There are a number of literary evidences showing management of intraoral injuries such as one occurring in a 19-year-old male patient, and 25-year-old male suffering injuries while playing a Russian roulette game.⁷

Valencia R *et al* 2010, have reported a case with 14 years follow up of a child who had electric burn injury at the age of 1-year 2months which was managed by complete debridement of necrotic tissues and bone under general anesthesia and followed by placement of an appliance which has an inherent property of Vancouver microstomia orthosis and wright removable splint. after 8 months of use of this appliance, it was replaced by a removable acrylic appliance with bilateral commissure acrylic extension to prevent microstomia.⁸ However, the present case has suffered only soft tissue injuries and a prosthetic appliance was also designed considering the extent and severity of injuries.

The most common consequence after burns to the circumoral tissues is microstomia. Contracture of the circumoral tissues may affect the child's ability to perform optimal dental care and the eating habit may also get affected. The oral burns can be divided into two basic groups. First, that involves unilateral/ or bilateral commissure without the involvement of circumoral tissues, second being where both commissure and circumoral tissues are involved. Several appliances have been used like dynamic lip expander, Microstomia prevention appliance, orthodontic headgear strap prosthesis, cheek retractor prosthesis, circumoral retractor, and Clark-McDade prosthesis.⁹⁻¹² However, in the present case, a new design has been tried due to the unilateral involvement of soft tissue burnt injury. The design of a new appliance was derived from the original concept behind the use of the Frankel appliance which was developed by Rolf Frankel in 1961. The appliance used in the present case, is the unilateral skeletonized oral/ vestibular shield, while not in contact with an underdeveloped part of the jaw. The vestibular shield will stretch the buccal mucosa and prevent the adhesion or tissue contracture by the development of new patterns of motor functions, loosening the tight muscles, improved blood supply and tonicity. The prosthesis used in the present case does not interfere with the

oral hygiene status and enables the elimination of abnormal muscle force on the developing dentition. The complications that might arise due to tissue contracture in young growing children can be minimized by timely and wisely management various types of intra-oral prosthetic appliances. That will also improve the overall quality of life of the affected children. Thus, the future consequences on the dentition due to the tissue contracture can also be minimized, should always be closely monitored and managed accordingly.

CONCLUSION

- Awareness regarding the potential hazards after inappropriate or careless use of fire crackers.
- Children should play with crackers under parental supervision with proper protective gears
- Complete debridement followed by primary closure is found to be a successful treatment option
- Intraoral prosthetic appliances help in reducing the post-treatment challenges.
- Strict legislation relating to the availability of firecrackers.

Conflict of Interest:

None

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