Post-Surgical Management in an 8-Year-Old Child Sustaining a Firecracker Injury: A Case Report

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Introduction

Firecracker-induced injuries to the face and oral cavity can lead to extensive physical and psychological damage, especially in children [2]. Complications post-surgical and reconstructive treatment may include trismus, microstomia, constriction of circumoral tissues, scars, distorted facial appearances as well negative impacts on a person's quality of life. [2][3]. Additionally, optimal dental care, speech and eating habits can suffer [2].

Etiology and Epidemiology

The majority of fire-cracker induced injuries occur during national or cultural celebrations such as The 4th of July or Diwali, Indian Festival of Light [1][2][3]. Most reports have occurred in young children who were not supervised at the time and were unaware of the potential hazards the explosives contained. The cause of injury is due to the flash powder that explodes as a child is holding, handling, or standing close to the explosive [2][3]. They can also tear soft tissue of the face, herniate the buccal fat pad, and affect teeth. The detonation heat of up to 1000℃ has the potential to tear soft tissue, compromise the vascular supply and render structures non-vital [2]. Primary teeth are more resistant to fragmentation under thermal stress than permanent teeth.

Post-burn scarring can cause perioral contracture, leading to microstomia and complications such as trismus, scars, and distorted facial appearance, which can significantly impact quality of life.

Oral burns can be identified in two groups 1) unilateral or bilateral commissure without involvement of circumoral tissues 2) both commissure and circumoral tissues are involved [2]. Additionally, lacerated wounds can tear along the sides of the face and can extend from the corner of the mouth to lateral aspects of the maxillary arch, intersection of the ala tragus line, lower border of the mandible, and can lead to herniation of the buccal fat pad [2][3].

Treatment Options

A multidisciplinary approach with OMFS and plastic surgeons is used for soft tissue or maxilla/mandible repair. Treatment involves removing powder residue, reconstructive procedures, fracture fixation, buccal fat excision, and soft tissue repair. After surgery, management of trismus, scars, and facial distortion is needed. To restore mouth function when there is limited opening ability, exercises or prosthetic devices like vestibular shields are used to stretch the buccal mucosa, improve blood supply, tonicity, and create new motor function patterns.

Case Report

LAM, an eight-year-old female with a healthy medical history, suffered an unwitnessed blast injury from a firework to her left hand and face on 5/27/2022. She was taken to Highland Hospital where she was intubated for airway protection before being transferred to Children's Hospital Oakland due to massive facial/upper airway trauma, suspected aspiration, and burn injuries.

5/28/2022: Immediate and urgent surgical interventions, included tracheostomy and the initial round of comprehensive facial reconstruction.

5/31/2022: Additional reconstructive surgeries were performed to repair bony injuries and soft tissue injuries.

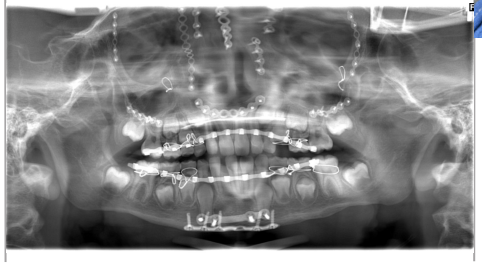
6/21/2022: The initial phase of surgical procedures was completed. It involved closed capsulotomy of TMJs to increase maximal incisal opening ('MIO') from 2 mm to 25mm, and a number of soft tissue reconstruction grafts.

7/8/2022: Discharged from the hospital and followed for outpatient care. The plastic team recommended physical therapy with daily jaw exercises and use of tongue depressors to help with significant trismus.

8/4/2022: MIO was 2-3mm, and she was given an OraStretch device to help increase it.

10/6/2022: The device helped achieve 5 mm MIO, but her opening would collapse overnight due to muscle contraction.

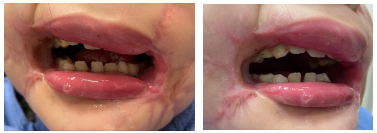
10/20/2022: LAM was referred to our pediatric dentistry department to be evaluated for the fabrication of a nighttime splint to help gain and maintain MIO as well as ensure proper teeth exposure for the next phase of surgical reconstruction after six months of recovery.



Images

First Visit: January 9, 2023

Second Visit: January 18, 2023



Third Visit: February 9, 2023

Fourth Visit: March 15, 2023

Treatment Plan

12/28/2022: LAM presented to our dental clinic for a consultation. Initial MIO was 3 mm. Panoramic radiograph showed loss of mandibular left central incisor and stabilizing wires and screws on the teeth and multiple facial bones and the jaws. Clinically, she presented with bilateral commissure and circumoral tissues scaring, significant reduction of the left vestibule and total elimination of the right vestibule.

1/9/2023: LAM presented with 7.5 mm MIO. An over-the-counter mouth guard in 3mm and 6mm thickness was modified to fit her mouth comfortably by removing extra vestibular flange material. LAM was instructed to begin with the 6mm maxillary guard and then add the 3mm mandibular guard as she felt ready.

1/18/2023: MIO of 9 mm had been achieved and a new 6mm guard was adjusted for her to wear together with the existing 6mm guard.

2/9/2023: MIO increased to 10.5 mm and a new guard was fitted to continue her progress.

3/15/2023: MIO increased to 12 mm. Progress was maintained with the existing guard.

Over the course of 77 days, LAM's MIO capacity increased from 3mm to 12mm. LAM and her parents have been cooperative and positive throughout treatment, contributing greatly to her success. She is now prepared to move on to phase II of her surgical facial and oral reconstruction.

Conclusion

To treat firecracker explosion trauma, prompt and continuous care from a multidisciplinary team is crucial. In this 8-year-old girl's case, using over-the-counter night guards for dental management effectively maintained and improved her intraoral opening, leading to better surgical outcomes and an improved quality of life.

References:

[1] Sardana, D; Goyal, A; Gauba, K. Firecracker explosion in the mouth of a 3-year-old child. Journal of Indian Society of Pedodontics and Preventive Dentistry 30(4):p 337-339, Oct–Dec 2012. | DOI: 10.4103/0970-4388.108935
[2] Singh, Sanjeev Kumar, et al. "Firecracker Maxillofacial Injury in a 6-Year-Old Child- A Case Report." *The Journal of Clinical Pediatric Dentistry*, vol. 46, Mar. 2022, pp. 188–191., https://doi.org/10.17796/1053-4625-46.3.3.
[3] Yadav S, Rai S, Rattan V. Management of Maxillofacial Injury due to Firecracker in a Child. J Postgrad Med Edu Res 2014;48(2):98-99.