

## **MOUTHGUARD, A PROTECTIVE DEVICE FOR PROCLINED ANTERIORS: A CASE REPORT**

**Abhishek Das, Payel Agarwala, Krittika Samaddar, Shabnam Zahir and Gautam Kumar Kundu**

Dept of Pedodontics & Preventive Dentistry, Guru Nanak Institute of Dental Sciences and Research, Kolkata

### **ARTICLE INFO**

**Article History:**

Received 15<sup>th</sup> July, 2019

Received in revised form 7<sup>th</sup>

August, 2019

Accepted 13<sup>th</sup> September, 2019

Published online 28<sup>th</sup> October, 2019

**Key words:**

Sports dentistry, anterior teeth proclination, apexification, mouthguard.

### **ABSTRACT**

Dental injuries are the most common type of orofacial injury sustained during participation in sports<sup>[1]</sup> specially during mixed dentition period or with proclined upper anteriors. Sports dentistry is one of the most recent and upcoming fields in dentistry which deals with the prevention and management of such injuries. The most significant aspect in this field is prevention utilizing protective devices such as properly-fitting helmets, face masks and/or mouth guards. Anterior teeth proclination is a crucial risk factor for sports-related orofacial injury. Therefore correction of the dental proclination remains an important preventive measure. This case report discusses a case presenting with anterior tooth fracture as a result of sports injury along with anterior dental proclination which was treated with Apexification followed by fabrication of a protective mouthguard as a preventive measure for probable future sports related injuries due to his proclined anteriors.

Copyright©2019 **Abhishek Das et al.** This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

### **INTRODUCTION**

The face is the most vulnerable area of the body and is usually the least protected. Sports-related facial injuries account for 8% of all facial soft tissue injuries. Approximately 11-40% of all sports injuries involve the face. Dental trauma can result in displacement, fracture, or loss of the tooth<sup>[2]</sup>. The consequence of traumatic injuries to teeth includes alteration in physical appearance, speech defects, and emotional impacts, thus affecting the child's quality of life<sup>[3,4]</sup>. Traumatic Dental Injuries (TDI) to primary teeth may eventually create problems to the underlying permanent teeth, such as hypoplasia, discoloration, delay eruption time, and tooth malformation<sup>[5,6]</sup>. Predisposing factors to TDI include physical features such as increased incisal overjet, open bite, protrusion, and lip incompetence<sup>[4]</sup>. So the facial structure including the teeth should give proper protection against TDI.

To avoid TDI the single most important device of oral/facial protective equipment is a properly fitted mouth guard. Mouthguards should be worn when there is a possibility of body-to-body or body-to-equipment contact. They cushion the blows that could cause jaw fractures, dislocations, and trauma to the temporomandibular joint injury to soft tissues and teeth. Mouthguards also aid in reducing the likelihood of concussion by maintaining a separation between the head of the mandibular condyle and the base of the skull.

### **Case report**

A 8-year-old male patient reported to the out-patient department of Gurunanak Institute of Dental sciences and research with a chief complaint of fractured left front tooth which occurred after his fall while playing 20 days back (figure 1).



**Figure 1** preoperative view showing fractured 21

The patient did not give any significant family history or medical history. On extra oral examination, patient was found with a convex profile and incompetent lips and proclined upper anteriors. The patient exhibited Class I molar and Class I canine relation bilaterally, with an overjet of 6 mm and an overbite of 4mm respectively (figure 2&3).



**Figure 2 & 3** intraoral lateral view

Intraoral examination revealed Elli's class III (uncomplicated) fracture in relation to 21. The tooth was asymptomatic without any associated soft or hard tissue injuries to the supporting tissues. Clinical inspection of the tooth showed fractures of the incisal edge and mesial angle, absence of coronal mobility, and

\*Corresponding author: **Abhishek Das**

Dept of Pedodontics & Preventive Dentistry, Guru Nanak Institute of Dental Sciences and Research, Kolkata

negative pulp vitality under cold testing. Radiographic analysis of the root revealed incomplete apex formation (figure 4). The possibility of fracture into the root or luxation injury was rejected, and the diagnosis of pulp necrosis was verified.



Figure 5 Radiograph after 3 months



Figure 4 Preoperative Radiograph

### Treatment of the fractured tooth

Apexification by MTA and subsequent endodontic treatment were planned and done. The initial formation of the mineralized apical barrier was observed after 3 months (figure5), and the barrier was considered to be completed after 6 months (figure6). But as the patient was involved in sports actively, custom made mouthguard was planned for the patient as personal protective equipment to avoid the consequences of TDI.



Figure 6 Radiograph After 6 months

### Mouthguard fabrication and design

Mouthguard fabrication begins with a good alginate impression and all anatomical structures, especially all teeth in the arch and vestibular regions were covered. Type III dental stone was used for pouring the cast. After the cast had hardened, it was trimmed carefully to include the vestibular borders. For an adequate vacuum, a hole in the centre was made. The cast was rinsed periodically to avoid slurry build-up on the stone. The vestibule was removed to ensure good adaptation and avoid bridging of the material during

formation. A soft, thin polyethyl sheet material was needed, along with a vacuum former. The material was placed in the machine in the sandwich holder. Initially, the heater took about 10 minutes to heat. The material should sag 1 inch, and be smooth and clear. We slowly closed the material to the vacuum deck. The machine was turned on (figure 7).



Figure 7 Vacuum Machine



Figure 8 a&b – Insertion of mouthguard

After about a minute of vacuum suction, the machine was turned off. It had been removed by grasping a corner and peeling the material from the machine. It was cooled under running water to avoid distortion of the cast. When cooled, we inverted the material to remove the cast. We smoothly cut the margins using a sharp scissors with "spring back" features to avoid jagged edges. No further adjustment is generally needed for the tray when trimmed smoothly. Mouthguard was evaluated for rough edges, blanching of tissue on insertion and closure, and frenum. The appliance was delivered to the patient (figure8 a&b). The mouth guard was checked periodically for distortions, tears, or bite-through.

### DISCUSSION

The American Academy of Pediatric Dentistry (AAPD) recognizes the prevalence of sports-related orofacial injuries in the nation's youth and the need for prevention. All sporting activities have an associated risk of orofacial injuries due to falls, collisions, contact with hard surfaces, and contact from sports-related equipment<sup>[7]</sup>. Although some sports-related traumatic injuries are unavoidable, most can be prevented<sup>[8,9,10]</sup>. Helmets, facemasks, and mouthguards have

been shown to reduce both the frequency and severity of dental and orofacial trauma<sup>[8]</sup>. Mouthguards are advisable personal protective equipment for orthodontic patients who engage in contact sports. Personal protective equipment (P.P.E.) is defined as, "Any device or appliance designed to be worn or held by an individual for protection against one or more health and safety hazards" and mouthguards are certainly embraced by this definition<sup>[11]</sup>. All personal protective equipment must satisfy health and safety requirements and must be so designed and manufactured that in the foreseeable conditions of use, for which it is intended, the user can perform the risk-related activity whilst enjoying appropriate protection of the highest possible level. The protective and positive results of wearing a mouthguard have been demonstrated in numerous epidemiological surveys and tests<sup>[12,,13,14,15 16]</sup>. Initially used by professional boxers, the mouthguard has been used as a protective device since the early 1900s<sup>[17,18,19]</sup>. The mouthguard also referred to as a gumshield or mouth protector, is defined as a "resilient device or appliance placed inside the mouth to reduce oral injuries, particularly to teeth and surrounding structures."<sup>[20]</sup> The mouthguard was constructed to "protect the lips and intraoral tissues from bruising and laceration, to protect the teeth from crown fractures, root fractures, luxations, and avulsions, to protect the jaw from fracture and dislocations, and to provide support for edentulous space."<sup>[21]</sup> The mouthguard helps to prevent fractures and dislocations of teeth by providing cushioning from the blow and redistributing shock during forceful impacts and decreases the likelihood of jaw fracture by a similar mechanism and also by stabilizing the mandible. As custom-fabricated mouthguards are designed according to users' dental structures it gives maximum protection and considerable advantages over manufactured mouth protectors. If the guidelines of maximum safety, protection, design, comfort, and advantages are standardized and ruled over by wearers the rate of sports-related dentofacial injuries can be decreased<sup>[22]</sup>. All patients with anterior proclinations who take part in a contact sport should be provided with a mouthguard as personal protective equipment as a protection and to preventive measure thus providing them a good quality of life.

## References

1. Scott J, Burke FJ, Watts DC. A review of dental injuries and the use of mouthguards in contact team sports. *Br Dent J* 1994; 176:310-4.
2. R. Lam, "Epidemiology and outcomes of traumatic dental injuries: a review of the literature," *Australian Dental Journal*, vol. 61, no. 1, pp. 4-20, 2016.
3. M. B. Siqueira, M. C. Gomes, A. C. Oliveira, C. C. Martins, A. F. Granville-Garcia, and S. M. Paiva, "Predisposing factors for traumatic dental injury in primary teeth and seeking of post-trauma care," *Brazilian Dental Journal*, vol. 24, no. 6, pp. 647-654, 2013.
4. K. Garg, N. Kalra, R. Tyagi, A. Khatri, and G. Panwar, "An appraisal of the prevalence and attributes of traumatic dental injuries in the permanent anterior teeth among 7-14-year-old schoolchildren of North East Delhi," *Contemporary Clinical Dentistry*, vol. 8, no. 2, pp. 218-224, 2017.
5. M. Ranka, H. Dhaliwal, S. Albadri, and C. Brown, "Trauma to the primary dentition and its sequelae," *Dental Update*, vol. 40, no. 7, pp. 534-543, 2013.
6. M. Fontenele, M. Macedo, P. Reboucas *et al.*, "Sequelae in primary teeth after traumatic injury," *Brazilian Dental Science*, vol. 20, no. 2, pp. 70-75, 2017.
7. "Policy on Prevention of Sports-related OrofacialInjuries". Reference Manual V 40 / No 6 18 / 19
8. Ranalli DN. Sports dentistry in general practice. *Gen Dent* 2000; 48(2):158-64.
9. 1st World Congress of Sports Injury Prevention. Abstracts. *Br J Sports Med* 2005; 39:373-408.
10. S. M. Chadwick & D. T. Millett (1995) Mouthguards and Orthodontic Treatment, *British Journal of Orthodontics*, 22:3, 283-285
11. Mills S. Can we mandate prevention? *J Pediatr Dent Care* 2005;11(2):7-8.
12. Glendor U. Aetiology and risk factors related to traumatic dental injuries: A review of the literature. *Dent Traumatol* 2009;25(1):19-31.
13. American Dental Association Council on Access, Prevention, and Interprofessional Relations and Council on Scientific Affairs. Statement on athletic mouthguards.
14. Ranalli DN. Sports dentistry and dental traumatology. *Dent Traumatol* 2002;18(5):231-6.
15. Ozawa T, Tomotaka T, Ishigami K, *et al.* Shock absorption ability of mouthguard against forceful, traumatic mandibular closure. *Dent Traumatol* 2014; 30(3):204-10.
16. Maeda Y, Kumamoto D, Yagi K, Ikebe K. Effectiveness and fabrication of mouthguards. *Dent Traumatol* 2009; 25(6):556-64. 46.
17. Takeda T, Ishigami K, Mishima O, *et al.* Easy fabrication of a new type of mouthguard incorporating a hard insert and space and offering improved shock absorption ability. *Dent Traumatol* 2011;27(6):489-95.
18. Knapik JJ, Marshall SW, Lee RB, *et al.* Mouthguards in sport activities: History, physical properties, and injury prevention effectiveness. *Sports Med* 2007;37(2):117-4.
19. Kumamoto D, Maeda Y. A literature review of sports relatedorofacial trauma. *Gen Dent* 2004;52(3):270-80.
20. Mayer C. Tooth protectors for boxers. *Oral Hyg* 1930; 20:298-9.
21. Newsome P, Tran D, Cooke M. The role of the mouthguard in the prevention of sports-related dental injuries: A review. *Int J Paediatr Dent* 2001;11(6):396-404.
22. Bhupendra V Zunjarrao., *et al.* "Mouthguard a Preventive Mode in Sports Dentistry. A Review". *Acta Scientific Dental Sciences* 2.12 (2018): 160- 164.

\*\*\*\*\*