

CASE REPORT

Natural Tooth as a Functional Space Maintainer

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ABSTRACT

Childhood has been recognized as high-risk period for dental injuries and intrusion is one of the most common types of trauma to primary dentition. These injuries require the dentist to carefully examine not only the damaged tooth but possible sequelae to the permanent tooth germ and the overall health of the child. The present case report describes the treatment of a 3 years old child with completely intruded central incisor which was extracted to prevent damage to permanent tooth germ. A fixed space maintainer was constructed using the extracted tooth to restore the esthetics and function. This appliance is simple and easy to fabricate leading to a successful treatment results for both the child and the parents.

Keywords: Intrusive injuries, Functional space maintainer, Biological restoration.

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INTRODUCTION

Trauma to oral and facial structures is a significant problem that may have serious medical, esthetic and psychologic consequences on both children and their parents.¹ Thirty to forty percent of all children injure at least one of their primary teeth.² In contrast to the hard-tissue injuries that are more commonly seen in permanent dentition, luxation injuries predominate the primary dentition because of larger bone marrow space which results in high elasticity of alveolar bone surrounding the primary teeth. Intrusive luxations constitute 4.4 to 22% of traumatic injuries in primary dentition.³ An intrusive injury occurs when the impact of an axial force displaces the tooth within the socket. Nearly, 69% of intrusive injuries to the primary dentition cause anomalous development of the permanent teeth

due to the close proximity of the developing permanent tooth germ to the primary root apex.⁴ The dentist must take time to carefully examine and analyze not only the damage itself, but also the possibilities of sequelae to the permanent tooth germ and the overall health of the child. In case of a complete intrusion the best treatment option is to extract the tooth, but losing a tooth at such an early stage can be physically and emotionally traumatic for both the parents and the child. Trauma to maxillary incisors has greater impact on psychological and social well being than on functional parameters. Although, premature tooth loss in the anterior region generally does not cause as much concern as premature loss in the posterior region, 'drifting' of the teeth can occur with anterior tooth loss in a very young child. It has also been stated that speech development and the ability to articulate speech sounds are dependent on many related factors among which the presence of maxillary anterior teeth is most important.⁵

Fragments or whole tooth obtained either from the patient or from a tooth bank may be used as a safe and reliable alternative to restore dental anatomy and function with excellent biomechanical properties and esthetics. This procedure of using natural tooth is known as 'biological restoration'. The expression 'biological restoration' was coined by Santos and Bianchi, in 1991.⁶

This case report aims at describing the management of completely intruded primary central incisor with biological tooth replacement as a functional space maintainer.

CASE REPORT

A 3-year-old girl reported to Department of Pedodontics and Preventive Dentistry, Institute of Dental Sciences, Bareilly, with chief complaint of missing front tooth and bleeding from upper and lower lip (Fig. 1). History revealed that the child had a fall and had hit her chin against a stone. The child was administered a tetanus vaccine before reporting to our institution.

All extraoral and intraoral clots and debris were removed prior to examining the oral soft and hard tissue. A thorough extraoral examination was done to ensure that no mandibular or maxillary fractures were present. Extraoral laceration and swelling was present in the upper and lower lips. Both lips were inspected for foreign bodies and tooth fragments. There was no injury to the chin.

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Fig. 1: Preoperative photograph



Fig. 2: Extracted central incisor



Fig. 3: Completely healed extraction site



Fig. 4: Appliance fabricated using natural tooth

Intraorally, the alveolus was palpated to detect any fractures. Each tooth was examined for damage or mobility. The left central incisor was completely intruded in the socket and the incisal edge was visible. The labial mucosa, maxillary frenum, gingival tissues, and tongue were also examined for bruising or lacerations. An intraoral periapical radiograph revealed totally intruded left central incisor (Fig. 2). The intruded tooth was extracted and the socket was irrigated gently using normal saline and compressed. The child was recalled after 5 days for examination (Fig. 3).

The parents were very anxious about the appearance of their daughter and insisted on having a fixed appliance as a teeth replacement. Since, the extracted tooth was totally intact we planned to use patient's own teeth for replacement using an appliance similar to Nance palatal arch space maintainer with acrylic extension (Fig. 4). So, the extracted tooth was thoroughly scaled, polished, and freed of soft tissues and periodontal remnants. After preparation, the extracted tooth was placed in an ultrasonic tank operating at 42 GHz and 100 W output,

at five working cycles in 6% H₂O₂ for 30 minutes. The root portion of the tooth was sectioned and only the coronal part was preserved. The coronal portion of pulp was removed and the cavity was filled using composite restorative material. After completing the procedure the tooth was stored at 4°C in Hank's balanced salt solution (HBSS). Intraoral examination after 5 days revealed a healthy gingival tissue with sound primary teeth and a healing socket which was normal and uneventful. Alginate impression of both the arches was taken and diagnostic casts were made.

The child was recalled after 1 week and maxillary second molars were banded. After the bands were seated completely an alginate impression was made and poured into a dental cast. An appliance similar to Nance palatal arch space maintainer using a 1 mm orthodontic stainless steel wire was fabricated and soldered to the bilateral orthodontic bands. An acrylic button was made using self-cure acrylic material on the cast with a labial extension to which child's natural tooth was attached. The appliance was finished and polished (Fig. 4).



Fig. 5: Appliance cemented in the child

The appliance was cemented in the child's mouth with glass ionomer cement (Fig. 5). Both the child and the parents were pleased with the natural look of the child. The parents were instructed to maintain the child's oral hygiene and to monitor the child's brushing which was recommended twice daily. Thorough mouthrinse after every meal to prevent any food lodgment was advised. Patient was periodically recalled to make the necessary adjustments in the appliance.

DISCUSSION

Intrusion and avulsion are the most severe injuries that affect the developing tooth germ in children 0 to 3 years of age which corresponds to the time of calcification of enamel matrix in the incisal and middle thirds of the permanent central incisor. Dental trauma often occurs in this population because young children tend to be unstable on their feet as they first start to walk, which results in accidents and damaged teeth. The traumatic displacement of primary teeth may affect the development of permanent tooth germs by altering the secretory phase of ameloblasts, resulting in a defect known as circular enamel hypoplasia. The risk of developmental disturbances in a permanent tooth following intrusive injury of its primary predecessor stems from the close relationship between the apex of the primary tooth and the developing permanent successor.

Primary tooth intrusion may result in a variety of pathologic alterations to permanent teeth, including hypoplasia, crown dilaceration, root angulation or dilaceration, partial or complete arrest of root formation, sequestration of the permanent tooth germ, and disturbances in eruption. Of these, hypoplasia (including enamel discoloration and/or enamel defects) is the most common sequelae. Many factors influence the sequelae of intrusion injuries, such as age, direction and severity

of intrusion and type of treatment. Several reports have shown that the younger the child at the time of the intrusion injury, the more severe the induced sequelae to the successor tooth. The main objectives of diagnosis and treatment of traumatic injuries affecting primary dentition are pain management and prevention of possible damage to the developing permanent tooth germ. In most cases, treatment of complicated injuries in primary dentition has been limited to extraction of the affected tooth.¹ In the present case, the left central incisor was completely intruded; therefore, there was an increased chance of injury to the permanent tooth so an extraction was performed.

The loss of a tooth at a very early age can be physically and emotionally traumatic, as the resulting empty site is functionally damaged.⁴ Loss of anterior tooth in a growing child can lead to psychological problems as he/she comes in contact with outside world. Extraction of teeth at a very early age could lead to mesial drifting of adjacent incisors in the space available. Also, of the six components necessary for the development of normal speech (respiration, phonation, resonance, articulation, neurologic integration and audition), articulation is the component most affected by the presence, or absence of maxillary anterior teeth. The anterior teeth appear to be particularly important for the correct production of the (S) and (Z) sounds since their correct production necessitates forcing the air stream through an opening in the oral cavity which has to be small enough to produce friction noises.⁵ So, replacement of the extracted anterior teeth in a very young child is very important.

The treatment options in these cases are removable functional space maintainers or semi-fixed functional space maintainers. Choosing a treatment depends on factors associated with each case regarding the child age, oral hygiene, child cooperation as well as parents' desire of having fixed or removable replacement.⁴ In the present case, the parents insisted on a semi-fixed mode of treatment as the child was very young and would not cooperate for removal functional space maintainer so a fixed functional space maintainer was planned. Esthetics was also a major concern in this case as the tooth loss was in the anterior region so we planned to use the patient's own extracted teeth which was totally intact as biological restoration.

CONCLUSION

The fixed appliance presented in this case report using patient's natural tooth could be considered as an excellent rehabilitation option. The natural tooth provides favorable and long-lasting esthetics as tooth's original anatomic form; color and surface texture are maintained

thereby instilling a positive psychological response as child feels that he/she got back their own lost tooth. It will also restore masticatory function, speech development and prevents the establishment of malocclusion due to drifting of adjacent teeth. The appliance is simple and easy to fabricate.

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