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Treatment of Impacted Maxillary Central Incisor with Removable Appliance: A Case Report

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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Case Study

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ABSTRACT

Maxillary central incisors impaction is a challenging problem in orthodontics, which has a major effect on dental and facial esthetics. Scientific literature agree on the importance of early diagnosis and appropriate intervention. This is a case report of a 10 year-old boy who presented with impaction of maxillary central incisor related to previous trauma to primary dentition and apparent space loss. The treatment proposed involved space reopening with removable appliance, a wait-and-watch approach, surgical exposure of impacted tooth followed by orthodontic traction with a removable appliance. This approach showed many advantages over fixed treatment and early exposure in mixed dentition.

Keywords: Impaction; mixed dentition; orthodontics.

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1. INTRODUCTION

Maxillary central incisor impaction is uncommon, with frequency of 0.06 to 0.2% but its management poses a great challenge for orthodontists because it has a major effect on dental and facial esthetics [1-3]. Treatment for cases of maxillary central incisor impaction needs a synchronized, interdisciplinary approach in order to achieve optimal esthetic outcome and function [4,5]. A non-erupted maxillary central incisor easily diagnosed by both parents and patients. As the condition usually causes concern to parents, many patients are referred to an orthodontist by a pediatric dentist or a general practitioner [6,7]. Maxillary central incisors normally erupt between the ages of 8-10 years and delayed eruption has an adverse effect on esthetic, function and speech. Also, it may result in adjacent tooth migration, space loss and midline deviation [6,8]. Primary causes of central incisor impaction have been attributed to two causes; trauma to the primary teeth and mechanical obstruction [8]. Trauma to the primary teeth is a common type of traumatic injury in the maxillofacial region and about one-third of children have had some injury to their primary dentition [3,9]. Primary teeth are in close proximity to the germs of succeeding permanent teeth so any traumatic event has the potential to cause an adverse effect on eruption of the permanent teeth via transmission of force to the germ of a developing tooth [3,8].

Treatment options for impacted central incisors include extraction of the primary tooth, surgical

exposure and orthodontic traction, extraction of impacted incisor and space closure with substitution of a central incisor with a lateral incisor, or extraction of impacted incisor and replacement with removable or fixed prosthesis [6,7,10]. Before surgical exposure, it is wise to open a space to provoke eruption of the incisor, as we know, adjacent teeth often become tilted to fill the space of a non-erupted incisor [6,7]. Spontaneous eruption occurs in 54-78% of patients [11]. Many approaches are suggested for space opening and tooth traction to the arch, but it must be emphasized that these approaches must be in accordance with objectives of the treatment; these include maintaining periodontal health, dental and facial esthetics and avoiding root resorption [12].

2. PRESENTATION OF THE CASE

A 10-year-old boy was referred to the orthodontic department of Shahid Beheshti Dental School with the chief complaint of a non-erupted left front tooth. The patient had a history of trauma to the chin and primary teeth at age 7. A general dentist practitioner had ordered extraction of the upper left primary central incisor after he observed delayed eruption of the permanent tooth when the patient was 8 years old. Clinical examination revealed absence of the left upper central incisor, migration of the adjacent teeth and space loss (Fig. 1). Molars were in end-on relation. Radiographs confirmed impaction of the upper left central incisor with normal orientation (Fig. 1).



Fig. 1. Pretreatment records showing the absence of the maxillary left central incisor. (A) Intraoral right occlusion, (B) frontal occlusion, (C) left occlusion, (D) frontal smile photographs. (E) panoramic radiograph

2.1 Treatment Objectives

1. Space reopening for left maxillary central incisor.
2. A wait-and-watch approach for spontaneous eruption of the impacted tooth.
3. Exposure of the crown and delivering force to the tooth if no movement occurred spontaneously.
4. To obtain as near to normal as possible appearance of the impacted tooth and gingival tissue.

2.2 Treatment Progress

A removable maxillary appliance was fabricated of two Finger springs made from 20 mil stainless

steel wire mesial to right central incisor and left lateral incisor, an Adams clasp on the first molars and a labial bow with a helix at the site of the impacted teeth (Fig. 2).

The finger springs were activated once a month to regain space for incisor eruption.

After five months of treatment, the space was adequate and the appliance was then used as a retainer to maintain space for incisor eruption. Panoramic radiograph was taken 6 months later with no evidence of eruptive movement of incisor (Fig. 3). Surgical exposure with the closed approach was performed and an eyelet button with a gold chain was bonded to tooth at the time of surgery. The chain was passed through the flap to the oral cavity.

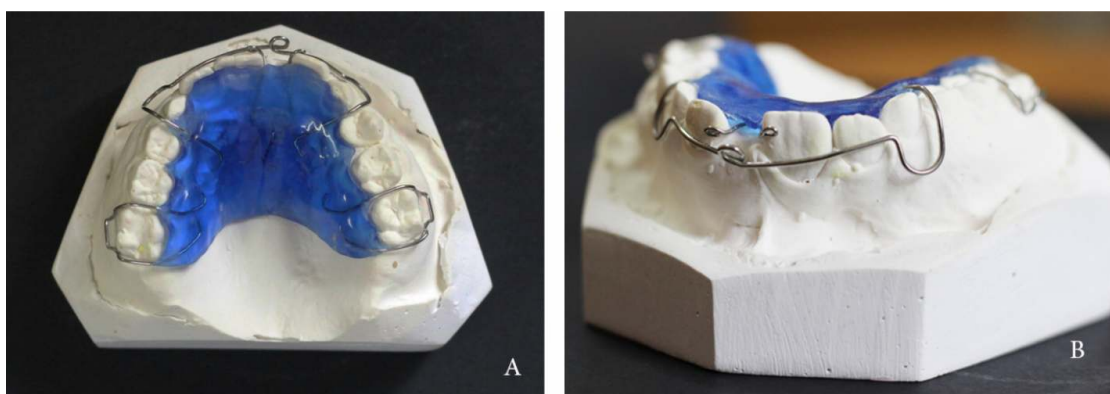


Fig. 2. Removable appliance fabricated for the patient. Finger springs were used for space opening. (A) Occlusal view, (B) Buccal view

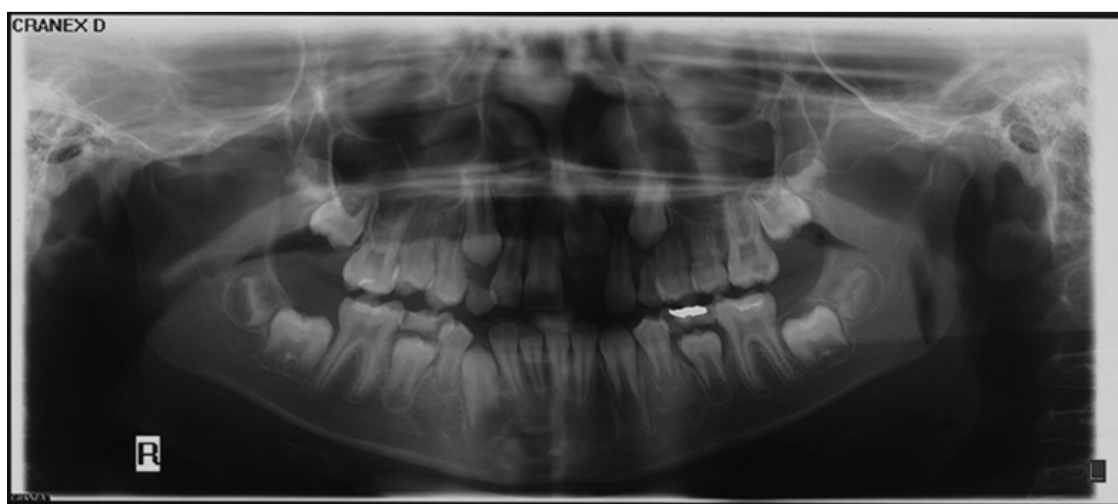


Fig. 3. Panoramic view 6 months after space opening with no evidence of incisor eruptive movement

The chain was attached to the helix of the appliance by means of an elastic thread. The patient was visited weekly to re-activate the elastic thread. After 6 weeks, the patient was referred to a periodontist for surgical exposure of the tooth. Apically positioned flap technique was performed due to lack of keratinized gingiva at the site of the impacted tooth, and a lingual button was bonded to the labial surface of the tooth. The patient was instructed to place a 1/8 inch medium force latex elastic from the button to the helix of the appliance. He was asked to wear it 24 hours a day, except for meal and brushing time (Fig. 4).

After 3 months the incisor had erupted to a good level, so that, the traction was discontinued and the patient used the appliance as a retainer. The patient was then followed -up periodically for eruption of remaining permanent teeth until fixed orthodontic treatment initiation to finalize leveling and alignment (Fig. 5).

3. DISCUSSION

Although impaction of maxillary central incisors occurs less frequently than maxillary canine, such cases cause concern for parents in the early mixed dentition because of esthetic issues and psychological sequel [13].

Treatment options for incisor impaction include extraction, observation and surgical exposure [4]. Many articles have described different approaches for this situation. However, the most conservative method should be chosen, which in this case include space opening to stimulate

spontaneous eruption [4,13]. Spontaneous eruption has been reported in many cases after space creation. If spontaneous eruption does not occur, surgical exposure and orthodontic traction of impacted teeth is the proper choice.



Fig. 4. Intraoral photographs with the orthodontic traction device

There are two main approaches for surgical exposure of impacted teeth: closed and open approaches. If the tooth is placed at a high level in the alveolar bone then the closed approach is recommended. As Becker has reported, compared with untreated teeth, central incisors exposed by the closed technique showed no significant difference in gingival indices, width of attached gingiva and crown length. The only difference was a small increase in the mean pocket depth compared with untreated teeth. By this method, only about 1/3 of treated teeth showed an abnormal gingival contour [14]. It has been reported that teeth exposed by the

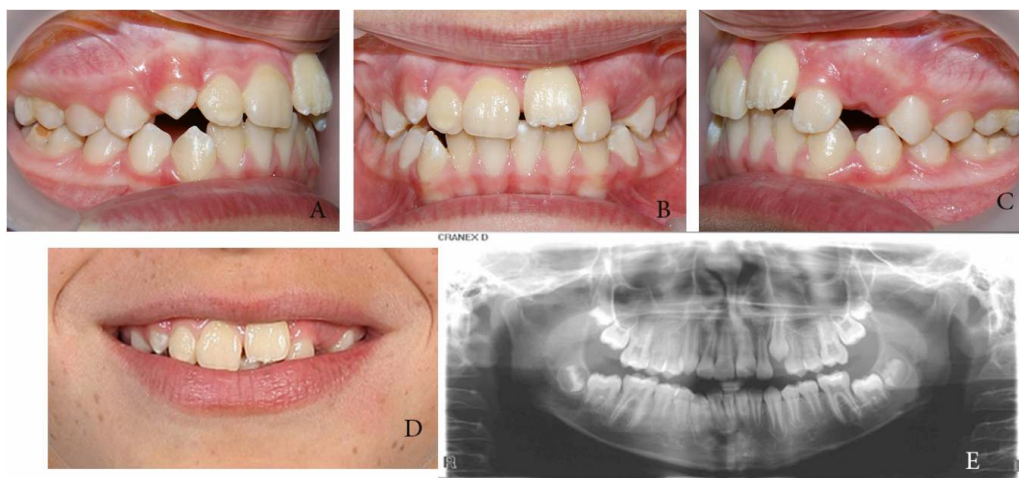


Fig. 5. Phase 1 completion. (A) Intraoral right occlusion, (B) frontal occlusion, (C) left occlusion, (D) frontal smile photographs, (E) Panoramic radiograph

apically positioned flap technique had greater crown height, increased probing depth, gingival scarring and a tendency to vertical relapse but a greater amount of keratinized gingiva [15]. In this patient, the initial selection was the closed approach but after some movement of the tooth and due to lack of keratinized gingiva, the apically positioned flap was treated.

The closed-eruption technique is the recommended treatment of choice when the tooth is impacted in the middle of alveolus or high level near the nasal spine [15]. In the present case, the periodontal status of the exposed incisor after orthodontic treatment revealed an acceptable gingival contour and attached gingiva and no further mucogingival surgery was needed.

In order to apply the orthodontic traction, anchorage must be reinforced with a heavy rectangular arch wire on the fixed orthodontic appliance or a removable appliance. Factors such as dental age, compliance, and oral hygiene may influence selection of treatment [7,15].

Several reports have recently presented success in treating impacted maxillary anterior teeth by proper crown exposure surgery and orthodontic traction, although anchorage preparation with removable appliance is seldom reported. As in many patients with complaints of incisor impaction are usually in mixed dentition with only the first molars and incisors available for bonding so that the force may impact on the anchored teeth and may lead to root resorption in adjacent teeth, as well as, changes in arch form. Application of a removable appliance allows for the reaction force to be anchored by posterior teeth and palatal area, so there is no side effect on the adjacent teeth. Another issue with utilizing fixed appliance is oral hygiene, which is challenging in mixed-dentition patients. Using fixed appliance in these children has greater potential for decalcification and gingival inflammation due to lack of cooperation and poor oral hygiene. Orthodontic traction with removable appliance, shortens the length of further fixed orthodontics which by turn decrease the risk of complications [16].

One of the limitations of removable appliance is that, optimal results can only be achieved if there is excellent cooperation by the patient. In our case, the patient was concerned about the esthetic effect of the impacted tooth and was

motivated to wear the appliance. Furthermore, as the tooth was erupting, motivation increased and he became even more compliant.

Another difficulty with removable appliance is that, precise positioning of the tooth is impossible with it. The erupted tooth is usually rotated or had improper tip or torque. This necessitates second phase of treatment with fixed appliance.

The esthetic result was excellent as no gingival recession was observed, which is common in teeth that were previously impacted. The radiographs showed no sign of root resorption in the impacted tooth or in other teeth. The periodontium was in a healthy condition despite a 12- month treatment time. It is postulated that the removable nature of the appliance help the patient to maintain a good level of oral hygiene.

4. CONCLUSION

The patient with impacted central incisor was successfully treated with a removable appliance which used to re-open space and apply eruptive force. The esthetic and periodontal result was excellent.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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