

Orthodontic treatment of an impacted maxillary central incisor with dilacerations

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Impaction with a severely dilacerated root is seldom reported, especially in the maxillary incisor. It is probably because of the high clinical difficulty associated with bringing the dilacerated tooth into proper position, and the high chance of failure due to ankylosis, external root resorption, and root exposure after orthodontic traction. Even the successful cases may need periodontal surgery to improve the unesthetic gingival shape. However, it has previously been reported that an impacted maxillary central incisor was successfully treated by proper crown exposure and orthodontic traction. This article presents a case of an invertedly impacted maxillary right central incisor with a developing dilacerated root, which was aligned into proper position after orthodontic traction composed of two stages of a closed eruption technique. (*Korean J Orthod* 2007;37(2):159-63)

Key words: Impacted maxillary central incisor, Dilacerated tooth, Closed eruption technique

INTRODUCTION

In the early mixed dentition, patients with impacted maxillary central incisors are referred to orthodontists by general practitioners or pediatric dentists because patients and their parents usually want to retain and align the impacted teeth into its proper position, even though its occurrence is not frequent.^{1,2} However, impaction with a severely dilacerated root is seldom reported, especially in the maxillary incisor. It is probably because of the high clinical difficulty in bringing the dilacerated tooth into proper position and the chance of failure due to ankylosis, external root

resorption, and root exposure after orthodontic traction.^{3,4} Even the successful cases may need periodontal surgery to improve the resulting unesthetic gingival shape.⁵ However, it has been reported that impacted maxillary central incisor was successfully treated by proper crown exposure and orthodontic traction.⁶⁻¹⁰

CASE REPORT

An eight year and eight month old Korean boy was brought by his parents to the Division of Orthodontics with the chief complaint of uneruption of the maxillary right central incisor. He was in good health and had no medical history, but had a traumatic injury on the maxillary right deciduous central incisor and overlying upper lip at six years of age. The tooth was extracted due to moderate mobility.

Diagnosis

The patient was in the early mixed dentition

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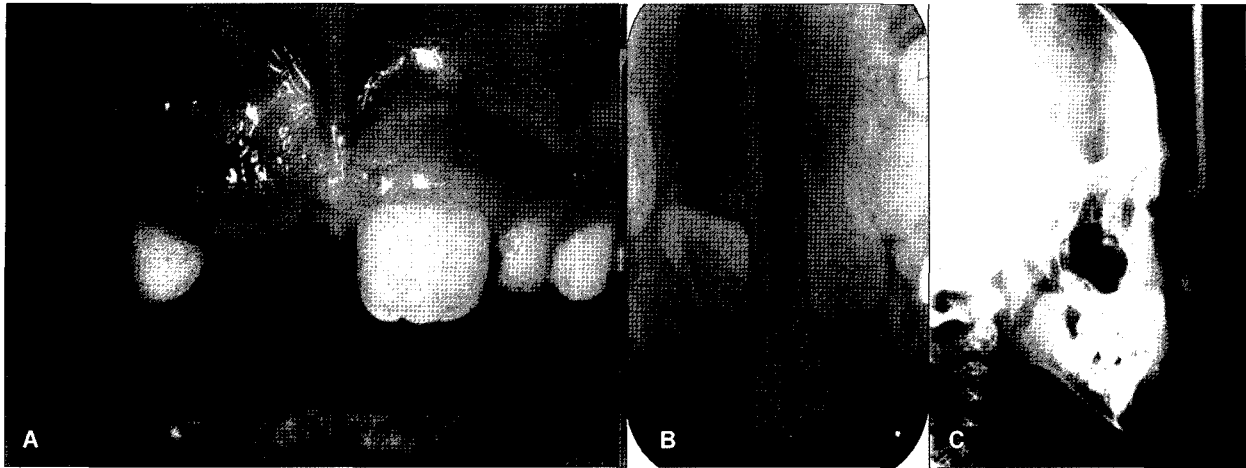


Fig 1. Pretreatment intraoral photograph (A), pretreatment periapical (B) and cephalometric radiograph (C).

(Hellman's dental developmental stage III A) with a flush terminal plane molar relationship and a normal overbite and overjet. The eruptive pattern was symmetric, except for the maxillary central incisors. The maxillary left central incisor occluded with the mandibular incisors. However, the maxillary right central incisor was not erupted, and a bony bulge was palpated on the right side of the labial frenum, whereas a depression was found on the left side (Fig 1, A). The arch length discrepancy calculated from Moyer's prediction tables (75%) was zero mm in both arches. Drifting of the left central incisor into the unoccupied space was not found and the midline of the maxilla and mandible was coincided with the facial midline.

Several radiographs including periapical and occlusal films, panoramic view, lateral cephalogram and skull P-A demonstrated that the maxillary right central incisor was invertedly impacted with the labial surface of the crown toward the palatal aspect of the alveolus and the lingual surface of the crown toward the labial aspect of the alveolus and was developing with dilacerations (Fig 1, B). The angle between the root and the crown of the right central incisor was approximately 90°. It was positioned between the developing roots of the adjacent teeth. The tip of the crown was close to the developing root apex of the adjacent teeth and the CEJ was close to that of the adjacent teeth. In periapical radiographs, a radiolucent halo, which is a

typical sign of dilacerated teeth, was apparent at the CEJ area of the impacted incisor.

This patient was diagnosed as "skeletal and dental Class I malocclusion characterized by an invertedly impacted maxillary right central incisor with developing dilacerated root."

Treatment Objectives

The objectives of treatment were as follows. (1) To establish an acceptable occlusion and function; (2) To enhance the periodontal health and esthetics of the impacted tooth; (3) To maintain the viability of the impacted tooth.

Treatment Progress

The patient was referred to an oral surgeon for exposure of the impacted incisor. Because the tooth was invertedly impacted with the labial surface of the crown toward the palatal aspect of the alveolus, a two stage surgical exposure of the crown was recommended.

The first stage was to expose the lingual surface of the crown. The overlying mucoperiosteum of the lingual surface of the impacted incisor was elevated to a minimum extent to bond a small button. Special care was given not to traumatize the bone, mucoperiosteum, and gingival tissue around the impacted tooth. The

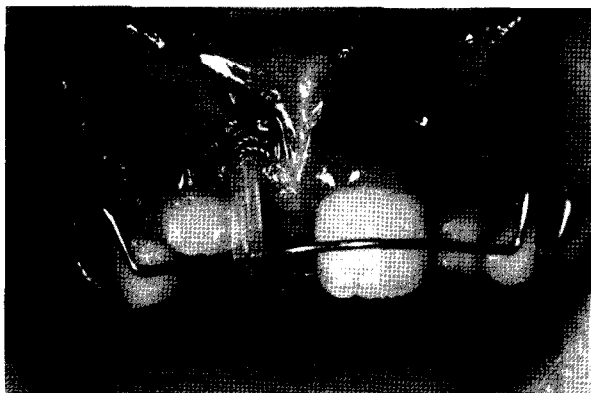


Fig 2. Orthodontic traction using Hawley appliance after surgical crown exposure.

alveolar bone layer and follicle of the labial surface of the impacted incisor were kept intact. A lingual button with a 0.010-inch ligature wire was bonded to the lingual surface of the impacted incisor during surgical exposure. The flap was closed leaving a tied ligature wire with a hook end protruding through the mucosa. Orthodontic traction was started two weeks after surgery. A Hawley-type appliance, with palatal hook placed around the mid-alveolar portion of the maxillary right central incisor, was designed. A light force of approximately 2 ounces (60 grams) was applied by elastics (3.5 Oz. 1/4') between the palatal hook of the Hawley appliance and the ligature wire tied to the button of the impacted tooth (Fig 2). Elastics were changed every two weeks to sustain about 2 ounces (60 grams) of force. As the impacted tooth moved downward, the size of the elastics was changed to maintain the effective force.

As the impacted tooth was palpated clinically, the second stage of the surgical crown exposure was performed. The position of the button was changed from the lingual to the labial surface of the crown. The same procedure of elastic traction was continued. The impacted incisor started erupting around the alveolar crest in a manner resembling normal eruption. Once it was fully erupted, the labial button was removed and 0.018 x 0.025 slot straight wire appliances were placed on the maxillary permanent incisors and the maxillary primary second molars. The initial leveling was

performed with 0.016 NiTi wire, followed by 0.016 x 0.022 NiTi wire. The final alignment was completed with 0.017 x 0.025 beta Ti wire (TMA, Ormco, Glendora, CA) and an ideal overbite and overjet was established. The periapical radiographs during orthodontic traction are shown in Fig 3.

The brackets were removed and a maxillary Hawley retainer was delivered. No appliances were used for the mandibular arch. The total length of treatment was seventeen months.

Treatment results

The impacted incisor was successfully aligned into proper position with an acceptable gingival contour (Fig 4). There was no crown opacity found. The clinical crown height was 10.8 mm, which corresponded to the normal figures¹¹ but, was a little longer than the contralateral central incisor by 0.7 mm. The post-treatment radiograph showed that the root of the impacted incisor was dilacerated at the coronal 1/3 of the root and shorter than the contralateral central incisor by 2.5-3.0 mm. However, there was neither apparent root resorption nor periodontal bone loss.

The aligned incisor responded to the Perio-test and percussion tests in a similar degree to the adjacent normal tooth. The width of attached gingiva was abundant and alike with the contralateral central incisor.

The depth of the gingival sulcus was 0.5 to 1.0 mm. Compared to the neighboring teeth, the repositioned tooth presented no significant differences on the EPT.

DISCUSSION

In the present case, the causes of the dilacerated impaction seem to be a combination of the immediate upward displacement of the crown in its dental follicle and the subsequent developmental alteration of the root resulting from traumatic injury.¹²⁻¹⁴

Recently, three-dimensional imaging is gaining wide acceptance in dentistry to localize the impacted teeth. However, since the accuracy of the three dimensional imaging is up to 0.5 mm, it may show only the occlusal classification and gross, but not accurate, differences in



Fig 3. Progressive periapical radiographs during orthodontic traction. 1 week (A), 5 weeks (B), 13 weeks (C), 17 weeks (D) and 17 months (E) after starting traction.



Fig 4. Posttreatment intraoral photograph (A), periapical radiograph (B), cephalometric radiograph (C) and three-dimensional imaging (D) of the dilacerated maxillary right central incisor after treatment using removable appliance and sectional fixed appliance (17 months after starting traction).

alveolar bone height and external apical root resorption. Moreover, it can not discriminate ankylosis because the periodontal ligament space is roughly 0.25 mm.

In most cases, the closed eruption technique is believed to be the best method of uncovering labially impacted teeth, especially when the tooth is located high above the mucogingival junction or deep in the alveolus where an apically positioned flap may be difficult or impossible.^{15,16}

The present case used two stages of the closed eruption technique in order to avoid large bone destruction during the first stage of surgical crown exposure. Therefore, the attached auxiliaries need to be switched from the lingual surface to the labial surface of the impacted tooth in the second stage of surgical crown exposure.

In the present case, a modified Hawley-type appliance, with a palatal hook, placed around the mid-alveolar portion of the maxillary right central incisor, was designed. The downward and palatal directional force was applied by elastics tied on the palatal hook and the ligature wire from the button to make the impacted tooth erupt around the alveolar crest.

SUMMARY AND CONCLUSION

This study reports the treatment outcome of an invertedly impacted incisor with a developing dilacerated root. The result was clinically favorable. However, long-term monitoring of the stability and periodontal health is required after orthodontic traction.

- 국문초록 -

역위 매복된 상악 중절치의 교정적 견인 치험 예

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심한 치근 만곡을 동반한 매복은 흔하지 않으며, 특히 상악 전치의 경우에 그러하다. 이는 외과적 노출과 교정적 견인이 임상적으로 매우 어려우며, 치근유착, 치근의 외출수, 교정적 견인 후 치근 노출 등의 위험이 있을 수 있기 때문이다. 비록 성공적으로 치료된 증례라 하더라도 치은의 심미를 향상시키기 위하여 치주수술이 필요한 경우가 많다. 본 증례보고는 발육중 인 만곡된 치근을 가진 역위 매복된 상악 중절치의 closed eruption technique를 이용한 교정 치험예를 소개하였다.

주요 단어: 매복된 상악 중절치, 만곡, Closed eruption technique

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