

CASE REPORT

Orthodontic Traction of an Impacted Maxillary Central Incisor

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Labial impaction occurs in 1%-2% of orthodontic patients,¹ with the maxillary canine impacted most frequently.² Although impaction of maxillary incisors is seen less often, the incisors are more significant in the early mixed dentition, in terms of both esthetics and occlusion.³

The ability to accurately predict tooth eruption in a developing dentition is critical in determining whether the orthodontist should intervene in cases with impacted incisors, and with what method of treatment. The usual procedure (after surgical exposure of the crown) is ortho-

odontic traction, but ankylosis or external root resorption can prevent this approach from working. Even a successful case may end up with an abnormal root formation or an unesthetic gingival margin.

The purpose of this article is to illustrate the importance of proper timing and technique in the management of a horizontally impacted maxillary incisor.

Diagnosis and Treatment Planning

The patient was an 8-year-old female in the mixed dentition

whose chief complaint was an unerupted maxillary right central incisor (Fig. 1). She had a Class I molar relationship, an overbite and overjet of +1mm each, and a 2mm shift to the right of the maxillary midline. The incisal edge of the maxillary right central incisor was palpable under the alveolar mucosa. The arch-length discrepancy in the maxillary arch was -2mm, as calculated from Moyers's prediction tables.⁴ Hellman's dental developmental stage was IIIB (shedding of deciduous canines and molars and eruption of their successors).⁵

Radiographic analysis re-



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vealed a horizontally impacted maxillary right central incisor. The root of the permanent left central incisor was more than two-thirds developed and had an open apex.

From several treatment alternatives, the patient and her

parents selected the plan calling for traction on the impacted central incisor. The treatment objectives were to:

1. Redistribute the space in the maxillary anterior region.
2. Surgically expose the impacted maxillary right central incisor

and guide it into position.

3. Expand the maxillary arch to gain additional space for tooth alignment.

Treatment Progress

A lingual arch with two

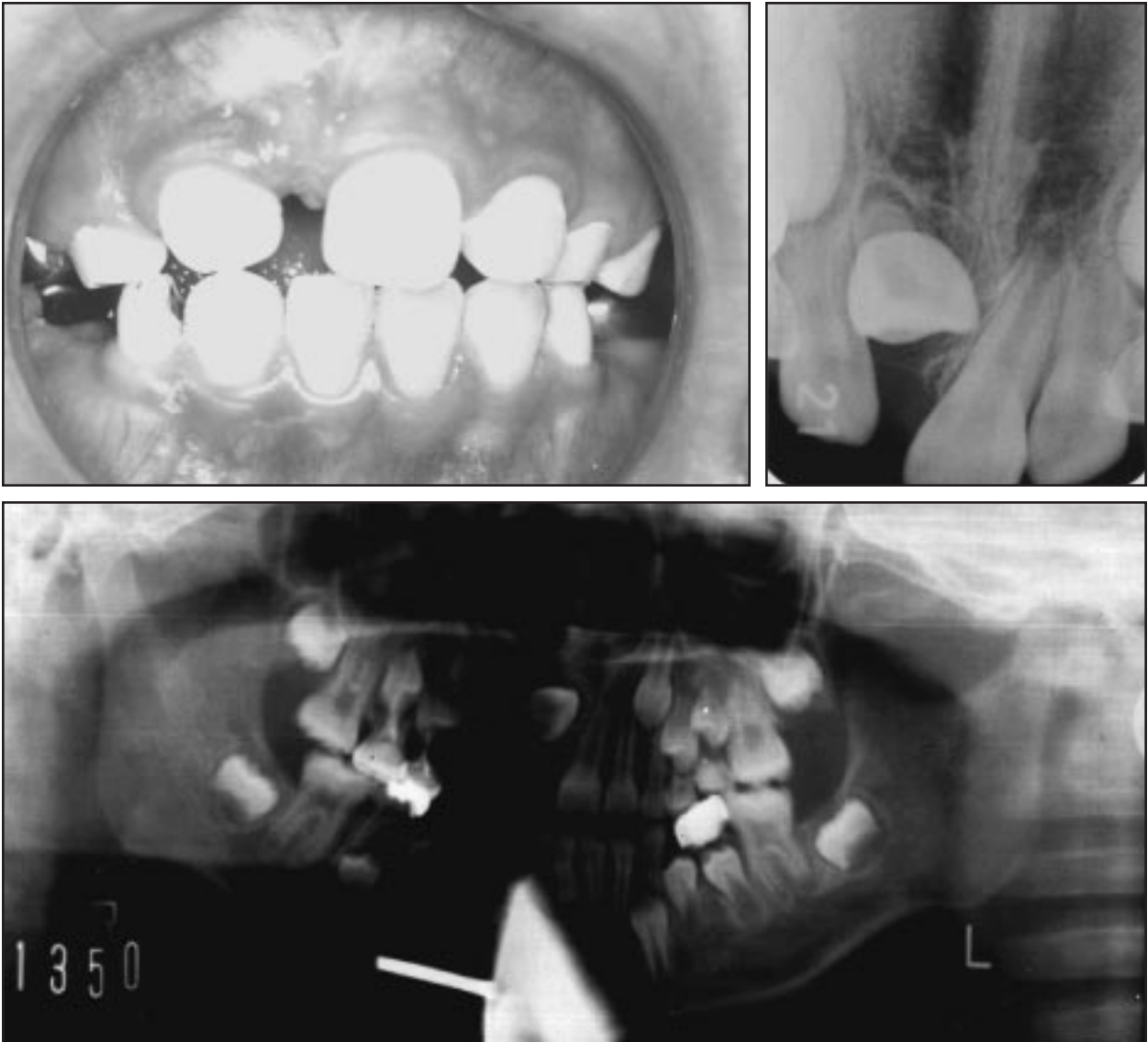


Fig. 1 8-year-old female with unerupted maxillary right central incisor before treatment.

auxiliary springs was placed on the maxillary first molars. By activating the auxiliary springs against the right lateral and left central incisors, space was opened for the impacted incisor.

A week after surgical exposure with an apically positioned flap, a bracket was bonded to the lingual surface of the impacted tooth. An additional auxiliary spring was soldered to the base arch between the original two springs.

The maxillary arch was then expanded with a removable plate. The impacted incisor was properly positioned in four months, using a traction force of 60g or less. Finishing was performed using full fixed appliances, with a total active treatment time of 11 months.

Results

The impacted maxillary right central incisor was brought

into the arch, resulting in a complete anterior dentition (Fig. 2). Overbite and overjet were maintained, and the maxillary midline was corrected. However, the repositioned incisor exhibited gingival recession at its labial margin, resulting in a greater clinical crown height compared to the adjacent central incisor.

The post-treatment periapical radiograph showed a properly positioned maxillary right central incisor with a dilacerated root. The apices of the anterior teeth were closed, indicating completion of root development.

Discussion

According to Nolla's mean stages of tooth development, the maxillary central incisors emerge at age 6 or 7, when root development is two-thirds complete.⁴ If one of these teeth is impacted, it is likely to have a di-

lacerated root, which may become worse with time. Therefore, early treatment of impaction is recommended.

Tooth impaction can result from any number of local causes,³ the most common of which is dental or alveolar trauma.⁶ Although the cause of root dilaceration is not clearly understood, studies have documented several possible causative agents.⁷⁻¹¹ Smith and Winter found that traumatic injury of the deciduous incisors can lead to dilacerations of the permanent successors.¹² Kolokithas and Kawakasis showed that trauma to the deciduous incisor causes a change in the axial inclination of the unerupted tooth.¹¹ While the root develops along its original axis, the crown rotates upward, preventing the incisor from erupting. On the other hand, Stewart, studying 41 cases of dilaceration, found that only nine had a history of trauma and proposed



Fig. 2 After 11 months of treatment.

that root dilaceration was more likely due to ectopic development of the tooth germ.⁷

Lin suggested that the prognosis of an impacted, dilacerated tooth depends on the degree of dilaceration, the position of the tooth, and the amount of root formation.⁸ The best candidate for orthodontic traction would be a tooth with an obtuse angle, lower position, and incomplete root formation. In the case shown here, root formation had advanced due to the patient's delay in presenting for treatment. Our opinion is, therefore, that the dilaceration was caused by the timing of orthodontic traction.

Conclusion

It is important that tooth

development be carefully monitored during the mixed dentition, both clinically and radiographically, so as not to overlook malformed and ectopically erupting teeth. If necessary, appropriate interceptive treatment can be initiated before root formation has proceeded too far.

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