Severe Root Resorption Associated With Ectopically Erupting Teeth: A Case Report

Hatsue Kakuta, DDS, PhD *Shinya Sone, DDS, PhD*
Hiroki Matsumoto, DDS *Mitsuro Tanaka, DDS, PhD*

ABSTRACT

A 12-year-old Japanese boy had ectopic eruption of the permanent maxillary canines and permanent mandibular second molars accompanied by root resorption of the adjacent permanent teeth. The permanent maxillary lateral incisors were extracted, and fenestration traction treatment was performed for the ectopically erupting canines. They were moved to the occlusal position orthodontically using a lingual arch appliance and sectional arch wire. The mandibular second molars were moved distally with an appliance designed to minimize the load on the teeth. The treatment is discussed with consideration of the diagnosis and appliances.

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KEYWORDS: TOOTH ERUPTION, ECTOPIC, ROOT RESORPTION, ORTHODONTIC APPLIANCES

Root resorption in permanent teeth is thought to result from mechanical factors, such as the force pressure of orthodontic appliances, dental trauma, and pressure from an impacted tooth, cyst, or tumor, inflammation, such as chronic apical periodontitis, and poor regeneration of the periodontium in replanted or transplanted teeth.[1] The root resorption of a permanent or primary tooth by an ectopically erupting tooth is sometimes observed in children.[2] Much remains unknown concerning the cause of ectopic eruption and the subsequent resorption of the tooth. While the root of a primary tooth is resorbed physiologically by the eruption of the following permanent tooth, the root resorption of a permanent tooth is rarely observed. Most reports concerning root resorption of permanent teeth are related to impacted maxillary canines, while root resorption caused by second molars is rare. It is rare for the roots of several permanent teeth, including the first molars, to be resorbed bilaterally in a patient. We experienced a case of root resorption of the maxillary central and lateral incisors and the mandibular first molars caused by the ectopic eruption of the maxillary canines and mandibular second molars, respectively.

The purpose of this paper was to report the clinical findings and discuss the treatment strategy in a 12 years-old patient.

CASE REPORT

A 12-year-old Japanese boy was referred by a general dental practitioner to the Pediatric Dental Clinic of Iwate Medical University, Morioka, Japan, due to a slight horizontal mobility and bite pain in his maxillary incisors. As the crown width of the patient's erupted tooth was 1 standard deviation wider than the norm for Japanese boys,[3] the permanent mandibular first premolar had been extracted approximately 20 months earlier by a general practitioner to correct crowding in the premolar area, with no further treatment. Consequently, his molar relationship was Class III bilaterally (Figures 1 and 2). The permanent maxillary canines and permanent mandibular second molars had not yet erupted, and insufficient eruption space existed for the maxillary canines. The permanent maxillary central and lateral incisors had +1 mobility. Radiographs indicated that the roots of the 4 permanent maxillary incisors had been severely resorbed by the ectopically erupting canines (Figure 2). The CT

Drs. Kakuta, Sone, and Matsumoto are assistant professors and Dr. Tanaka is professor, all in the Department of Pediatric Dentistry, Iwate Medical University, Morioka, Japan.
Correspond with Dr. Tanaka at mtanaka@iwate-med.ac.jp

images showed the buccolingual relationship between canines and incisors and the severity of the resorption of the incision (Figure 3). A translucency was observed bilaterally around the canine's crown.

The distal roots of the permanent mandibular left and right first molars also had been markedly resorbed by the ectopically erupting second molars.

Initially, the permanent maxillary left and right lateral incisors were extracted. Fenestration was performed and a hook was bonded to the canine's buccal surface. The canine was first moved distally using a lingual arch appliance to seperate the canine's crown from the central incisor's root and change the path of movement towards the occlusal direction using a sectional labial arch appliance (Figure 4). No bracket was attached to the central incisor to avoid an orthodontic force that might induce further root resorption. This procedure was performed bilaterally.

To move the mandibular second molar distally with minimum loading on the first molar, an appliance was prepared (Figure 5). The STLock®(Dentsply-Sankin, Tokyo, Japan) was soldered to a seamless band fitted to the first molar to facilitate removal of the appliance with less pressure on the first molar at the time of orthodontic adjustment. For anchorage, brackets were bonded to the mandibular canine and first and second premolars, and a sectional arch wire (Elgiloy 0.018 light standard wire; Elgiloy Specialty Metals, Elgin, Ill) was applied. The second molar was surgically exposed via a fenestration, and a hook was bonded to the exposed crown surface. After obtaining sufficient upright movement of the second molar using a spring attached to the ST Lock, the appliance was removed and the erupting movement took place observed. This procedure was conducted bilaterally, and the second molars reached to the occlusal plane after 3 months (Figure 6).

DISCUSSION

According to Alqerban et al,[4] the incidence of impacted maxillary canines ranges from 1% to 3%. Chintakanon and Boonpinon[5] reported that the prevalence of ectopic eruption of the permanent first molars was 0.75% among 4232 of 6- to 9-year-old Thai children. Ericson and Kurol[6] surveyed 156 cases of root resorption in the maxillary incisors using computerized tomography (CT) and reported that the frequency of root resorption of the central and lateral incisors caused by an ectopically erupted adjacent canine was 9% and 38%, respectively.

In additional studies, Ericson and Kurol found root resorption of the central incisors caused by ectopically erupted canines in 12% of 125 cases.[7,8] Regarding the cause of root resorption of the adjacent tooth by the ectopic eruption of the maxillary canine, Ericson and Kurol[7] suggested that the following 3 conditions were related to root resorption:

1. The root of the ectopically erupting canine is well developed.

Figure 1. The oral condition at the first visit. No eruption space for the canine existed between the maxillary lateral incisor and first premolar bilaterally. The mandibular left and right first premolars had already been extracted.

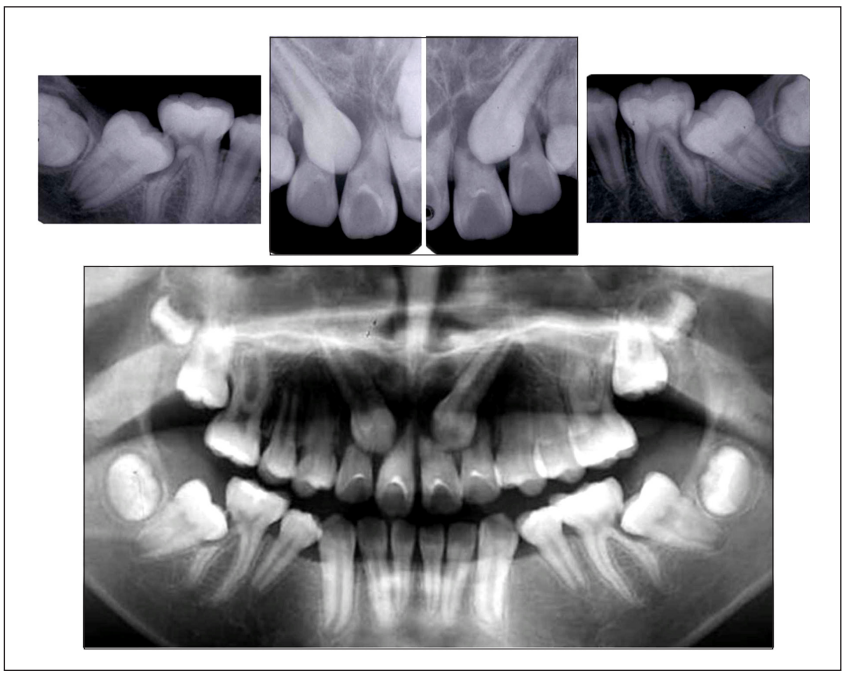


Figure 2. Radiographs at the first examination. The bilateral maxillary canines and mandibular second molars were positioned ectopically under the proximal eeth. Severe root resorption was observed in the maxillary central incisors, lateral incisors, and mandibular first molars bilaterally.

2. The canine cusp erupts medially to the long axis of the adjacent lateral incisor.
3. The canine's tooth axis inclines more than 25° to the midline when observed in a panoramic radiograph.

They also indicated that the dental follicle of the erupting maxillary canine did not cause root resorption of permanent teeth, while the physical contact with the incisors or the pressure caused by the erupting movement of the maxillary canine might play a major role.[9] The patient was 12 years and 2 months old at his first visit and a translucency was observed radiographically in the crown area of the maxillary canine. The canines and incisors were very close to each other, and these teeth probably made physical contact.

As mentioned in the American Academy of Pediatric Dentistry's guideline on the management of developing dentition and occlusion in pediatric dentistry,[10] the primary canine can be extracted if in close proximity to or overlap of the root of the lateral incisor and the crown of the maxillary canine were observed at an earlier stage. For this purpose, a panoramic radiograph may be needed at the time for the evaluation of the eruption of the lateral incisor.

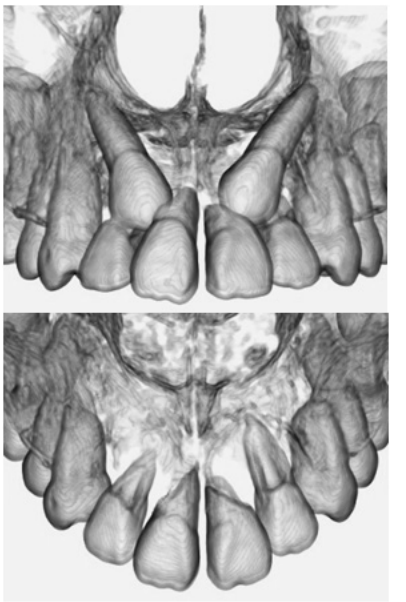


Figure 3. CT images of the maxillary incisor area at the first examination. Canines were removed bilaterally through digital image processing in the lower image.

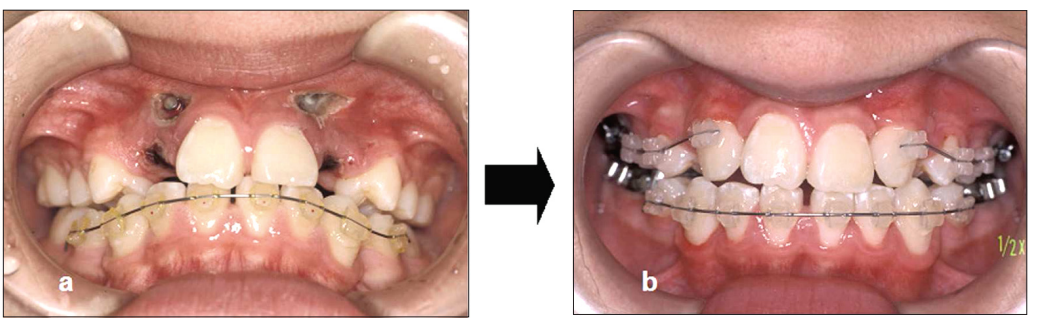
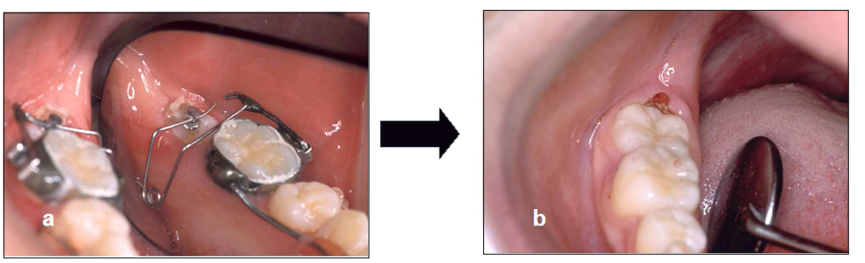


Figure 4. After extracting the lateral incisors, the maxillary canines were surgically exposed via fenestration, and the hook-bonded canines were hauled in the occlusal direction using sectional labial arch appliances.



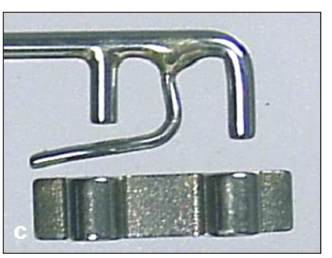


Figure 5. After exposure of the mandibular second molar via fenestration, an appliance using the ST Lock was set on the first molar and the second molar was moved distally.

Figure 6. The final oral condition and radiographs after active treatment.

Few studies have described the root resorption of an adjacent tooth caused by the ectopic eruption of mandibular second molars. Omnell and Sipher[11] and Groper[12] reported that probable causes of root resorption of the first molars were insufficient growth of the mandible and insufficient space for the eruption of the second molar. Another important cause is the pressure applied by the adjacent tooth. In our case, as the second molar's crown was closer to the first molar's root, the pressure of the erupting second molar may have contributed to resorption.

Tronstad13 reported 2 causes of root resorption in a permanent tooth: (1) inflammatory resorption; and (2) replacement resorption. Inflammatory resorption is caused by the pressure from the erupting tooth and orthodontic force, inflammation in the surrounding area. Inflammatory resorption is further divided into transient inflammatory resorption and progressive inflammatory resorption. The former is observed in the root resorption following trauma or exclusive orthodontic pressure. The latter continues progressively because of mechanical irritation, physical pressure, surrounding inflammation. The root resorption in our case appeared to have been caused by continuous pressure, of the ectopic teeth. As root resorption of the permanent tooth does not necessarily occur,[7,8] however, even when an ectopic tooth is positioned near the root of the preceding permanent tooth, the true mechanism is not clear.

According to Becktor et al.,[14] 23% of the patients who had root resorption of the maxillary incisors caused by an ectopically erupted canine experienced root resorption of the primary second molars. Although this was not true in our case, careful observation is required to determine the possibility of root resorption of the maxillary incisors caused by the canine when the root of the primary second molar is resorbed by the ectopically erupted first molar. Becktor et al.[14] also discussed the early pathological resorption of the primary maxillary molar in connection with later incisor root resorption and attributed the cause to poor protection of the tooth root to resorption due to a hereditarily susceptible periodontal ligament. This speculation requires further investigation.

Many studies have discussed the utility of CT in the diagnosis of impacted teeth.[15-18] Although root resorption in the mesial or distal surfaces can be detected using 2-dimensional X-rays. According to Ericson and Kurol,[15] 20% of the crown of an ectopically erupting maxillary canine are located buccaly to the adjacent lateral incisor. Three-dimensional analysis using CT is very effective for determining the precise position of ectopically erupting maxillary canines.[15] The CT image of our patient showed the precise positions of the impacted teeth and showed the degree of root resorption clearly. The use of CT in this case provided valuable information and its use can be justified, despite the inevitable radiation exposure.

To minimize the load on the first molar at the time of seamless band application and detachment, an ST Lock was successfully used as an attachment, enabling the spring portion to be removed without detaching the seamless band from the first molar at the time of adjustment (Figure 5).

The 3 possible treatment options for the ectopic eruption of permanent molars are:

1. separate the contact between the ectopically erupting tooth and the impacted tooth by twisting

the contact point with a brass wire or an elastic ligature[19,20] to change the direction of the erupting molar;
2. cause upright movement of the erupting tooth by orthodontic force using a fixed appliance with a spring wire or elastic ligature[21,22]; and
3. extract the tooth when the root resorption is severe.

In our case, although the resorption was advanced, extraction was not selected because the patient was growing and was too young to have permanent prosthodontic treatment. The viability of the preserved molars with root resorption and also that of the preserved incisors is not predictable presently, and prosthodontic treatments will be required in the event of an unfavorable prognosis. The erupting movement of the third molars is another important factor that will require observation in the future.

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