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A 4-year Follow-up of a Rare Case with Ectopic Eruption of the Permanent Second Molars Associated with Resorption of the Permanent First Molars

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A 4-YEAR FOLLOW-UP OF A RARE CASE WITH ECTOPIC ERUPTION OF THE PERMANENT SECOND MOLARS ASSOCIATED WITH RESORPTION OF THE PERMANENT FIRST MOLARS

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A rare case—a 11-year-old boy with ectopic eruption of all the permanent second molars associated with resorption of all the permanent first molars was reported. Severe root resorption was found in the mandibular first molars, while moderate root resorption was found in the maxillary first molars. There were several points should be addressed into consideration: (1) young age; (2) the third molars will probably be brought into occlusion in the future; (3) Class III jaw relationship. The orthodontic treatment was approached with two-stage. Stage I treatment was aimed to upright the mandibular second molars after removal of the mandibular first molars. Full mouth comprehensive treatment will be performed in stage II after serial follow-up and reevaluation. Two-stage treatment in such a case will thus reduce the uncertainty of facial growth related malocclusion and unexpected treatment duration. (Taiwanese Journal of Orthodontics. 29(4): 234-243, 2017)

Keywords: ectopic eruption; root resorption; two-stage orthodontic treatment; Class III malocclusion

INTRODUCTION

Ectopic eruption is a common dental developmental disturbance in children.

The causes of ectopic eruption are multifactorial, including genetic components and local factors. Genetic influence plays an important role in this category of tooth eruption disturbances.¹²,³ It should be differentiated from tooth impaction in which the teeth cannot erupt because something impedes it and not because of its ectopic position.⁴,⁵ The most frequently found ectopic teeth are the permanent maxillary first molar and canine, followed by the mandibular canine, mandibular second premolar and the maxillary lateral incisor.⁶,⁷ The prevalence rate of ectopic eruption of the permanent maxillary first molar was reported as 2-6%.⁸,⁹,¹⁰ Ectopic eruption of the permanent first molar is very rare in the mandible,¹¹ the prevalence of ectopic eruption of the second molar was reported as rare as 1.5 %.¹² Mesial eruption of these teeth will result in subsequent reversible or irreversible
impaction of the distal portion in the adjacent teeth. Resorption of those adjacent teeth can also be found whenever reversible or irreversible impaction occur. Malocclusion will probably occur in case of irreversible impaction if there is no early treatment intervention. The case report presented a case of a 11-year-old boy with ectopic eruption of all the permanent second molars associated with resorption of all the permanent first molars. The serial follow-up of 4 years and treatment progress will be presented.

CASE REPORT

A 11-year-old boy was referred to our orthodontic department with a chief complaint of eruption problem in the posterior teeth on the date 2013/06/26. His mother stated that the boy had undergone severe toothache over lower right area several days ago. His general dentist removed the tooth #46 on 2013/06/22 and referred the patient to our clinic for orthodontic examination and consultation (Figure 1).

Figure 1. Initial records of the patient (2013/06/26).
(A) panoramic radiograph taken at the local dental clinics.
(B) panoramic radiograph taken in our clinics.
Extra-oral findings

The extra-oral examination demonstrated that he had a dish-in midface with protruded but competent lips. His face was symmetric in appearance. He had limited upper incisor show and thus no gummy smile. Upper dental midline deviated to his right side by 1 mm relative to his facial midline.

Intra-oral findings

Intraorally, the lower dental midline shifted to his right side by 1 mm as related to his upper dental midline. The overjet was 1.5 mm and the overbite was 0.5 mm. His left side molar relationship was Class I due to missing of the lower right first molar. The bilateral canine relationships could not be distinguished due to partial eruption of upper canines. The upper dental arch had mild malalignment in incisor region with no space deficiency in the arch. The upper right primary second molar was retained. The lower dental arch had 3 mm space excess.

Radiographic findings

The panoramic radiograph showed ectopic eruption of all the second molars and root resorption of the remaining first molars. The radiograph taken at the previous dental clinics indicated that #46 had the most severe root resorption with mesial root involvement followed by #36 with severe distal root resorption. #16 with half of distal root resorption then #26 with the least resorption (Figure 1). The #46 was already removed before coming to our clinic due to severe root resorption and pain. The roots of the lower first molar seemed somewhat abnormal like deciduous molar but with normal crown morphology. All tooth germs of the third molars could be found. The location of tooth #15 was under the tooth #55 and was about to erupt.

The cephalometric radiograph showed: ANB: 1.5˚, Mx/Md: 75.6 % indicated a Class III jaw relationship. The dental compensation was significant with proclined upper incisors (U1-SN: 126˚) (Table 1).

Table 1. Cephalometric analysis of the pre-stage I and pre-stage II treatment.

<table>
<thead>
<tr>
<th></th>
<th>Pre-stage I 11y7m</th>
<th>Pre-stage II 15y7m</th>
<th>Norm</th>
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</thead>
<tbody>
<tr>
<td><strong>Skeletal Analysis</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNA˚</td>
<td>86</td>
<td>86</td>
<td>81.5±3.5</td>
</tr>
<tr>
<td>SNB˚</td>
<td>84.5</td>
<td>87.5</td>
<td>77.7±3.2</td>
</tr>
<tr>
<td>ANB˚</td>
<td>1.5</td>
<td>-1.5</td>
<td>4±1.8</td>
</tr>
<tr>
<td>SN-MP˚ (Go-Gn)</td>
<td>29</td>
<td>26</td>
<td>33±1.8</td>
</tr>
<tr>
<td>SN-FH˚</td>
<td>6</td>
<td>6</td>
<td>5.7±3</td>
</tr>
<tr>
<td>Ar-A mm</td>
<td>77.5</td>
<td>81.7</td>
<td>79.4±3.1</td>
</tr>
<tr>
<td>Ar-Gn mm</td>
<td>102.5</td>
<td>113.3</td>
<td>96.5±4.4</td>
</tr>
<tr>
<td>Mx/Mb (percent)</td>
<td>75.6</td>
<td>72.1</td>
<td>82.4±2.4</td>
</tr>
<tr>
<td><strong>Dental Analysis</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>U1-SN˚</td>
<td>126</td>
<td>129</td>
<td>108.2±5.4</td>
</tr>
<tr>
<td>U1-NA mm</td>
<td>9.6</td>
<td>12.9</td>
<td>5.5±1.7</td>
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<tr>
<td>L1-MP˚ (Go-Gn)</td>
<td>102</td>
<td>93</td>
<td>96.8±6.4</td>
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<tr>
<td>L1-NB mm</td>
<td>10</td>
<td>7.5</td>
<td>7.8±1.7</td>
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<td><strong>Facial Analysis</strong></td>
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<td></td>
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<tr>
<td>Upper lip-E line mm</td>
<td>3.5</td>
<td>4</td>
<td>1.9±1.2</td>
</tr>
<tr>
<td>Lower lip-E line mm</td>
<td>7</td>
<td>7</td>
<td>1.8±1.6</td>
</tr>
</tbody>
</table>
Treatment plan

After discussion with his mother, considering all the third molars maybe protracted in the future and his Class III jaw relationship, the treatment approach would be two-stage. Extracting #36 was indicated since the distal root was completely resorbed by ectopic erupting of #37. Stage I was aimed to upright the lower second molars after #36 was removed and the braces could be bonded on #37 and #47. The space of the lower first molars were probably not closed depends on the treatment progress. At the same time, the upper second molars were kept following up for their eruption since the severity of impaction in the first molars were relatively less than the lower second molars. The patient was informed that the upper first molars will be removed in future since root resorption was also noted. Stage II comprehensive treatment will be started after more mesialization or eruption of the third molars and closer to completion of facial growth.

Treatment progress

After #36 was removed on 2013/07/10, stage I treatment was started on 2014/02/19 after 5 months of follow-up. The lower second molars were bonded (Figure 2). Meanwhile, the upper second molars were closely following-up for the progress of eruption. The treatment was started from lower second premolar to second premolar in order to close the anterior spacing and consolidate as anchorage. After that, tubes were bonded on #37 #47 and the uprighting was started with segmented wire. The leveling was initiated with 0.016 NiTi wire, followed by 0.016 x 0.022 TMA wire with tipback bend. The #27 was jumping over and fully erupted (2014/05/07, Figure 3), while #17 was still unerupted (Figure 4). After 1 year of treatment, #37 #47 were uprighted and the space of the first molars was left with about one premolar size. The cessation of the stage I treatment was decided after discussing with parents. The stage II full mouth comprehensive treatment would be reevaluated after growth completion. Extracting #16 was still recommended since resorption of the distal root was severe even though it was symptomless. Protraction of the third molars will be performed in stage II treatment. The fixed appliances were removed on 2015/02/27 (Figure 5). Wraparound retainer was used with premolar acrylic teeth included to keep the uprighting position of #37 #47 by preserving the residual space of #36 #46. Patient was instructed to wear retainer with regular follow-up in every 3 months.

Figure 2. Pre-stage I treatment photographs (2014/02/19).
**Figure 3.** 27 was jumping over the distal root of 26. Left, radiograph on 2013/07/05, right, radiograph on 2014/05/07.

**Figure 4.** Serial periapical films indicated eruption progress of #17.
- Upper row: from left to right 2013/07/05, 2014/05/07, 2015/01/23 (distal cusp tip erupted).
- Middle row: from left to right 2015/12/02, 2016/04/01, 2016/08/19.
- Lower row: 1.5 months after removal of 16, 2016/10/07.

**Figure 5.** Post-stage I treatment 2015/02/27. Panoramic radiograph 2014/11/26.
Ectopic Eruption of Permanent Second Molars

Treatment result

After stage I treatment, #37 #47 were uprighted well. We kept following up of #17 and #27. Distal cusp tip eruption of #17 was found on 2015/1/23 but was still locked in place (Figure 4). The #16 extraction was recommended, patient rejected the suggestion and preferred to continue follow-up since no pain was complained. All the third molars and #17 condition was monitored by regular check with periapical films. The #16 retained till 2016/8/19 for the patient agreed to have extraction (Figure 4). The eruption of #17 #38 and the taurodontism of #37 #47 was noted from the panoramic film taken on 2017/02/28. Orthodontic examination was then arranged (2017/06/21) for reevaluation of stage II treatment (Figure 6). It has been 4 years since first visit (2013/6/22). The cephalometric radiograph showed more pronounced Class III jaw relationship as the ANB angle was from 1.5° to -1.5° with obvious dental compensation (Table 1, Figure 7). His lateral facial profile still presented dished-in midface with protruded lips similar with his first visit.
Intraorally, #38 #48 were found and mesialization of #17 was also noted. Bilateral Class I canine relationship was defined. Although #26 was symptomless with distal root resorption, extraction of #26 with protraction of #27 #28 was planned for the reason of long term prognosis and function. The treatment plan for stage II was to close all the extraction space of the first molars and replace the first molars and second molars with the second molars and third molars. The upper incisors will be retracted by the aid of TADs. The Class I canine and molar relationships will be achieved.

**DISCUSSION**

Ectopic eruption is mostly found in the maxillary permanent first molars. The etiology of ectopic eruption was a local eruption disturbance induced by the genetic factors.\(^1,2,3\) The abnormal mesial erupting path will result in resorption of the distal root of the adjacent primary second molars. The space would be lost and the permanent second premolars would probably be impacted due to lack of space. The unerupted mesial tipping first molars will cause super-eruption of the antagonists and result in malocclusion. Early diagnosis and treatment intervention is important for such uncommon eruption disorder. The treatment included exposure and upright of the ectopic molars by space regaining. Few literatures were mentioned regarding the ectopic eruption of the second molars with the prevalence rate of 1.5%,\(^12\) which is relatively rare as compared to the rate of the maxillary first molars of 2-6%\(^8,9,10\).

The case report presented a rare case with ectopic eruption of all the second molars and root resorption of all the first molars. Severe root resorption was found in the mandibular first molars, while moderate root resorption was found in the maxillary first molars. In the study of Barberia-Leache et al., four grades classification were established according to the severity of the distal root lesion in the primary second molar. To match the classification in the reported case: #46 had the most severe resorption of grade IV (very severe--resorption that affects the mesial root of the primary second molar or the first molar in our case), followed by #36 of grade III (severe--resorption of the distal root leading to pulp exposure), then #17 and #27 of grade II (moderate--resorption of the dentin without pulp exposure). The grade I was defined as mild with limited resorption to cementum or with minimum dentin penetration. Although resorption will be present in grades I and II, spontaneous self-correction can be expected without treatment. However, majority of the cases with grade III or IV would not have the potential for self-correction. The rate of spontaneous self-correction is about 69.4%.\(^10\) In this case, patient underwent pain of #46 caused by severe root resorption. The radiograph indicated poor prognosis of #36 and #46; thus, extraction was decided for a long-term function. For the ectopic eruption of the permanent first molar with resorption of the primary second molar, the space of primary second molar will be preserved for the succeeding second premolars. In this case, upright the ectopically erupted lower second molars was the treatment goal in stage I treatment. The uprighting of second molars could establish the posterior vertical dimension by preventing the bite collapse, super-eruption of the antagonists and tipping of neighboring teeth. Because #16 #26 had relatively less graded root resorption, kept monitoring the eruption of #17 #27 was the strategy. During follow-up, #27 erupted at the age of 12y6m-old, which was 11 months after the first visit. However, #17 didn’t erupt at all. Comparing the outcome of #17 and #27, the impacted area of mesial marginal ridge of the second molar was different; the #17 was impacted in depth of the mesial marginal ridge, while the depth #27 impaction was less than #17. Thus, #27 could slip over and #17 stayed locked in place.

The dentoskeletal features in individuals with ectopic eruption was also studied in literatures. Mucedero et al. found the ectopic eruption of the permanent maxillary first molar was significantly associated with increased
dimensions of the deciduous maxillary second molars and the permanent maxillary first molars, maxillary hypoplasia and dental crowding.\textsuperscript{13} Bjerklin et al. suggested that there is a tendency for a shorter arch length as a predisposing factor but not was significant.\textsuperscript{2} No significant association was found among the occurrence of molar eruption disturbances, aplasia of premolars and small-sized laterals in study of Baccetti et al.\textsuperscript{3}

Bondemark and Tsiopa suggested that the patients with eruption disturbance of second molars showed significantly delayed eruption of their other second molars as compared to the individuals without any eruption disturbances.\textsuperscript{12} Beside the eruption disturbances in the same teeth, Bjerklin et al. also suggested that ectopic eruption of the permanent canines is associated with the ectopic eruption of the permanent first molars.\textsuperscript{2} That means if a patient has one molar with eruption problem, we should check if other molars or the whole dentition have the similar problems. In this reported case, there were 4 second molars with different severity of impaction but no ectopic eruption of other teeth at all. Only mild crowding in upper incisor region was noted.

The morphological tooth anomalies such as root deflections, dens invaginations and taurodontism occur more frequently in these patients. In the reported case, the second molars especially the mandibular two had taurodontism.\textsuperscript{14} Since the space of the first molars will be closed in stage II treatment, whether the taurodontism will influence the tooth movement is worth to monitor.

The facial type associated with the ectopic teeth were mentioned in literatures but no consensus in conclusion. In the study of Salbach et al., they suggested that an eruption disorder in the first permanent molar area is an early indication of faulty development in dentition which eventually leads to inadequate sagittal and transvers dimensions as well as development of Class III malocclusion.\textsuperscript{15} However, in study of Vedtofte et al., an increase in Class II sagittal jaw relationship was found in patients with arrested eruption of the second molars.\textsuperscript{14} In this case, the boy had eruption problems of all the second molars and Class III jaw relationship. In our another extreme case example with an ectopic erupting canine and severe resorption of both lateral and central incisors, also had Class III jaw relationship (Figure 8). More
studies or case evidence must be provided to conclude the correlation between the facial type and eruption disorder of molars or other teeth.

In stage I treatment, #16 extraction was indicated for the eruption of #17. But patient didn’t want to remove it till 3 years after the first visit. Maybe we could only remove the distal interference of #16 for allowing the eruption of #17 in the follow-up period. In stage II treatment, although #27 erupted, considering the protruded anterior teeth and the long-term stability, the treatment plan decided to remove the last first molar #26 due to distal root resorption. All the spaces of the first molars will be closed and the third molars will be protracted mesially. The TADs will be used for retracting the anterior teeth. As mentioned earlier, the mandibular second molars which had taurodontism will be closely monitored during orthodontic movement.

CONCLUSION

The prevalence of ectopic eruption of multiple second molars in the same patient is rare. The case report presented a case with ectopic eruption of all the permanent second molars associated with different grades of root resorption of all the permanent first molars. The etiology of ectopic eruption was a local eruption disturbance involved by the genetic factors. The facial type associated with the ectopic teeth were also reviewed. Two-stage treatment may be necessary in such young adolescent patients if the third molars will be brought into occlusion eventually. It is important to diagnose the problem as early as possible in order to initiate the treatment at the optimal time.

REFERENCES
