

Delayed Development of Maxillary Second Premolar: Case Report and Literature Review

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Delayed tooth development (DTD) is the development progress of a tooth germ that takes place later due to local or general causes. This case report reviews a 16-year-old Asian adolescent whose bilateral upper second premolar germs were at Nolla's 6 stage as shown on a panoramic radiograph. It is unusual that tooth germs of the maxillary second premolar are developed after 11 years of age. To reduce the chance of misdiagnosis, clinicians should consider the possibility of DTD if a tooth germ does not present in radiographs.

Keywords: Delayed tooth development, premolar, children

INTRODUCTION

Delayed tooth development (DTD) is the development progress of a tooth germ that takes place later from local or general causes. Generally, tooth development occurs at particular age. For instance, the hard tissue of maxillary second premolars forms at 2-2.5 year old, and the enamel completed at 6-7 years old; Normally, They will erupt at 10-12 years old.¹ It is rare if the development of a tooth germ is delayed. This case exhibits delayed tooth development (DTD) in a male adolescent whose maxillary second premolars did not exist at the first visit when he was 11 years old, but the tooth germs could be seen on another panoramic radiograph when he was 16 years old. To reduce the chance of misdiagnosis, clinicians should consider the possibility of DTD if a tooth germ does not present in radiographs.

Case report

A Han nationality male, born in Oct 2002, aged 11 years old was referred to the Peking University School and Hospital of Stomatology in November 2013 for a routine examination. The patient had no systemic disease or abnormal medication history. The intraoral examination revealed early permanent dentition with completely erupted lower premolars (34, 35, 44, 45), present and partially erupted upper premolars (14, 24), and clinically absent upper second premolars (15, 25). A panoramic radiograph revealed initial tooth bud formation of the upper right second premolar (25); however, there was no indication of the upper left second premolar (15), and the presence of all third molars was apparent (Figure 1). In July 2018, the patient underwent another panoramic radiograph; the upper left second premolar (Nolla's stage 6) was present, and the upper right second premolar was also at Nolla's stage 6 (Figure 2). The patient's father lost his upper central incisors (11, 21) because of trauma; his upper left first and second molars, upper left second premolar, and lower right second molar (25, 26, 27, 47) were missing because of periodontal disease; and his upper right second premolars were congenitally absent (Figure 3). His mother does not have missing teeth.

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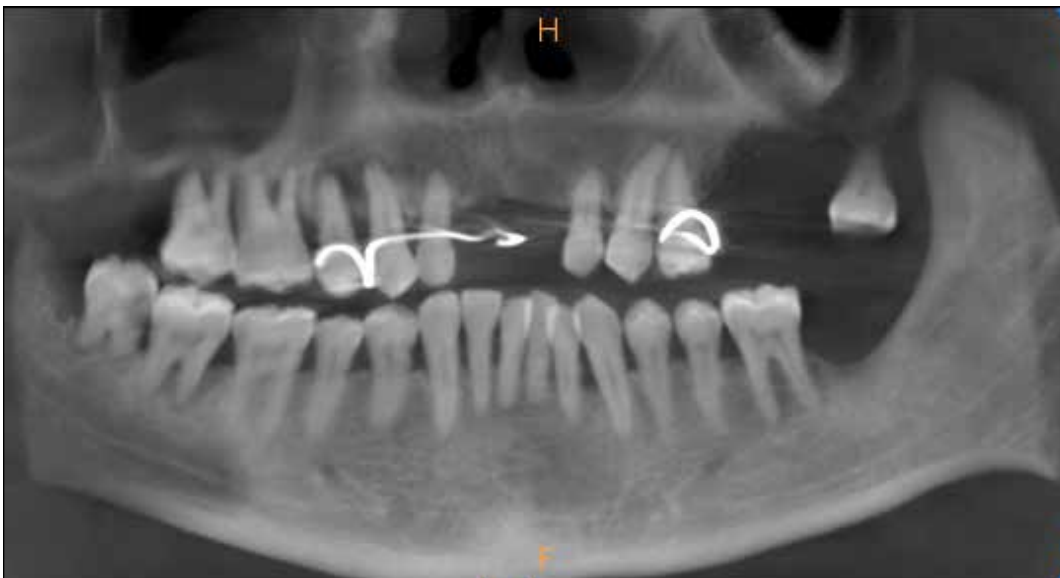
Figure 1. Panoramic radiograph showing missing upper right premolar bud (November 2013)



Figure 2. Panoramic radiograph showing upper second premolars were in Nolla's stage 6 (July 2018)



Figure 3. Cone-beam computed tomography section showing missing teeth in his father (March 2017)



DISCUSSION

This case presents delayed development of bilateral maxillary second premolars in a 16-year-old male. The panoramic radiograph taken when he was 11 years old revealed initial tooth bud formation of the upper left second premolar. Another panoramic radiograph taken five years later presented the delayed development of the bilateral maxillary second premolars. The growth rate was not significantly different from the general interval of approximately 5 years from the onset of hard tissue formation until the crown completes for second bicuspid teeth.^{1,2}

Tooth development involves a complex signaling network between endothelial mesenchymal tissue formed by the neural crest and dentinal epithelium. Delayed tooth development refers to the development of a tooth with Nolla's stage 2 or later than that of the same tooth in the same age group.^{1,3} Park et al,⁴ conducted a survey in 2017 amongst 4611 children aged 6-12.9 years in South Korea, and the prevalence rate of delayed tooth development was 3.4%, of which the second premolar of the upper jaw was the most commonly delayed tooth development, with 1.02%. The proportion of those with delayed development of the second maxillary second molar and second mandibular premolar was 0.88% and 0.74%, respectively.

Causes of this phenomenon may be related to premature birth, malnutrition, hormone secretion disorder and heredity.⁵ Hitherto, more than 200 genes have been identified related to tooth development. Studies have shown that PAX9, MSX1 and WNT10A are associated with both congenital tooth loss and delayed tooth development.^{6,7} Dharmo *et al*,⁸ found a trend of lower stages of tooth development in patients with WNT10A variants. In this case, the presence of bilateral maxillary second premolar loss in the father of the child and delayed tooth development in the child suggested that delayed tooth development may be a genetic developmental abnormality.

In reviewing previous literature, Memmott *et al*,⁹ reported a black female with delayed development of the upper left premolar and congenital loss of the upper right incisor. When she was 17 years and 1 month old, the tooth germ of the upper left premolar with Nolla's stage 6 was found. That is the latest age at which delayed tooth development has been reported. The male in this case is the latest age found in an Asian population. Because the incidence of delayed tooth development is low, compared with other tooth development obstacles, this phenomenon has not received sufficient attention. This case suggests that if tooth germs of maxillary premolars are absent in clinical or imaging examinations, it is necessary to read the film carefully to observe whether there is evidence of the early tooth germ. Treatment plans should be made after a comprehensive analysis. Clinicians should consider the possibility of delayed tooth development so that we can reduce the incidence of misdiagnosis of congenital missing teeth.

CONCLUSION

The presence of delayed tooth development and the wrong diagnosis of congenital tooth loss due to the neglect of this condition will affect the choice of the orthodontic program and the correct time of intervention. To reduce the chance of misdiagnosis, clinicians should consider the possibility of DTD if a tooth germ does not present in radiographs in particular chronological age, and proper radiographs should be periodically examined.

REFERENCES

1. McDonald RE, Avery DR, Dean JA. CHAPTER 9—Eruption of the Teeth: Local, Systemic, and Congenital Factors That Influence the Process. McDonald and Avery Dentistry for the Child and Adolescent .Ed. Ninth, Elsevier;150-176, 2011
2. Ravn JJ, Nielsen HG. A longitudinal radiographic study of the mineralization of 2nd premolars. Scan J Dent Res, 85: 232–236, 1977.
3. Jorgenson RJ. Clinician's View of Hypodontia. J Am Dent Assoc,101: 283-286, 1980
4. Park MK, Shin MK, Kim SO, et al. Prevalence of delayed tooth development and its relation to tooth agenesis in Korean children. Arch Oral Biol,73: 243-247,2017
5. Suri L, Gagari E, Vastardis H. Delayed tooth eruption: pathogenesis, diagnosis, and treatment. A literature review. Am J Orthod Dentofac Orthop, 126: 432-445, 2004.
6. Ye X, Attai AB. Genetic Basis of Non-syndromic and Syndromic Tooth Agenesis. J Pediatr Genet,5:198-208,2016
7. Feng Z, Ouyang S, Lan L, Prosthodontics DO. Research progress on the pathogenesis of non-syndromic tooth agenesis. Int J Stomatol,45(2): 219-223, 2018.
8. Dharmo B, Fennis W, Créton M, et al. The association between WNT10A variants and dental development in patients with isolated oligodontia. Eur J Hum Genet, 25: 59-65, 2016
9. E Memmott J, G Kuster C, E Sullivan R. A very delayed developing premolar: clinical report. Pediatr Dent,7(2):137-139, 1985

