Delayed formation of a lower second premolar

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Delayed odontogenesis of a lower second premolar is presented in a case treated without extraction and focuses on the 7-year follow-up of the delayed tooth bud. The follow-up was initiated when the crown formation was diagnosed and was finished when the tooth erupted completely into the orthodontically provided space, which enabled the orthodontic leveling and alignment of the delayed premolar. The long follow-up indicates that delayed tooth buds may develop completely and normally.
J Clin Pediatr Dent 28(4): 299-302, 2004

INTRODUCTION AND LITERATURE REVIEW

The occlusal developmental stage known as mixed dentition occurs on an average from six to twelve years of age. Within this period, twenty-eight teeth emerge and form the permanent dentition. However, permanent teeth may undergo different types of eruptive disturbance, which may impair emergence into the oral cavity. Besides altered odontogenesis, delayed tooth eruption may also have extrinsic local etiology, such as mechanical barriers (supernumerary teeth, odontogenic tumors, cysts and neoplasms), crowding and deviation in the eruptive pathway. In addition, less common local causes related to the odontogenic process may also play an important role in the eruption delay, such as tooth agenesis, ankylosis and the isolated delayed formation when compared to the overall development of the dentition.

The current article focuses on the delayed odontogenic development of a lower right second premolar. The delayed emergence into the oral cavity results from not only altered odontogenesis, but also from a rather slow eruption rate. In a previous report, an eruptive disturbance due to a delay in the formation of an upper left second premolar was also followed up for a long time.[1] In that article, long-term periapical radiographs showed the slow, but continuous development of an upper left second premolar during eight years. At the end of the active eruptive stage, just after spontaneously reaching the occlusal plane, the tooth was orthodontically moved while the apex was still under formation. The aforementioned article differs from other studies because of the long follow-up of the developmentally delayed premolar.

Odontogenic delay of premolars and, specifically, second premolars is not uncommon.[2] Such a problem can also be associated with other anomalies.[3] Studies have reported both unilateral[4-9] and bilateral[6] delays in the initial evidence of calcification of lower second premolars. Delayed odontogenesis of second premolars has also been reported to occur concurrently in both upper and lower arches.[1,5,10-12] Delayed development and eruption of the permanent first molar, mainly in the upper arch, has also been reported. However, determining whether the first molar is either delayed or missing and replaced by a premature eruption of the second molar consists of a diagnostic challenge. This has been referred to as the '9 year-old molar'.[13]

Few studies have reported on the etiology of delayed odontogenesis, but without describing the mechanisms involved in the delay of tooth buds. The delay in the eruption of the first and/or second molars has been associated with odontogenic tumors in about 55% of the cases as well as with developmental anomalies present in the pericoronary tissue of certain teeth during eruption, mainly the lower molars.[14] Lately, those lesions have been defined as "pericoronary hamartomes of odontogenic origin", which can also be found in teeth other than the molars.[15] Anyway, such an etiology was described for teeth with eruptive delay, but not necessarily for teeth with a generalized delay in the odontogenic process.

At the end of the primary dentition phase, around 5-6 years of age, twenty-eight permanent tooth buds in

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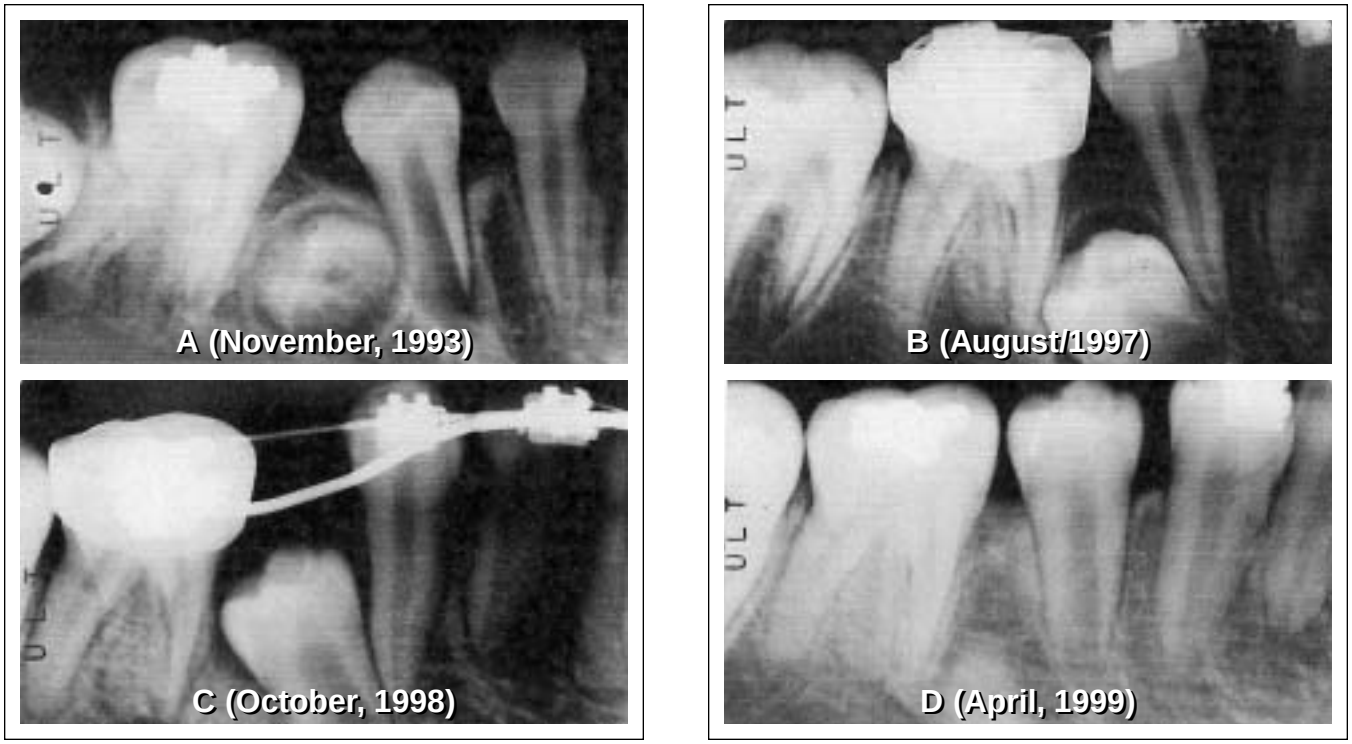

Figure 1. The longitudinal periapical radiographs show the complete development of the lower right second premolar, from tooth bud to full occlusion.

different stages of calcification are normally present within the alveolar bones, except for the third molars whose calcification starts by the age of 9. At this point, panoramic radiographs usually show forty-eight teeth, including twenty erupted primary teeth and twenty-eight permanent tooth buds in different stages of odontogenesis. Studies have recognized that first premolars initiate calcification between 1-1/2 and 2 years of age and second premolars between 2 and 3 years of age.[16] However, it has been said that the odontogenesis of second premolars starts at 3 or 3-1/2 years of age in most cases, with a variability greater than in the rest of the permanent teeth.[17] Due to such odontogenic variability and from a realistic viewpoint, agenesis of lower second premolars should not be diagnosed before 5-6 years of age. This results from the "apparent tooth agenesis"[7,10,11] in which the premolar is found developing, often at a much later stage.

RADIOGRAPHIC FOLLOW-UP OF A LOWER RIGHT SECOND PREMOLAR BUD

A 9-year-old male patient in the second transitional period of the mixed dentition was examined by our team. A Class II malocclusion with early loss of upper and lower primary molars was diagnosed. At the initial radiographic examination, the main problem was the condition of the lower right second premolar bud. Images in the periapical (Figure 1) and panoramic (Figure 2) initial radiographs showed that the calcification of the lower right second premolar bud was initiating, but was significantly delayed in relation to the lower left second premolar. The delayed tooth showed a rudimentary outline, which suggested an arrest in the tooth formation that, in turn, made it difficult to predict its evolution.

Some therapeutic possibilities with good prognosis were suggested to manage the aforementioned situation. The first option was to extract the delayed bud and close the space of the lower right second premolar. The second option was to open the space for an implant or prosthesis or even for the lower right second premolar depending on development. In the present case, the latter treatment plan was chosen and is illustrated by the periapical radiographic follow-up shown in Figure 1, between years 1993 and 1999.

The initial radiographs showed that not only the eruption, but the entire odontogenic process of the premolar was delayed. However, the serial periapical (Figure 1) and panoramic (Figures 2 to 5) radiographs demonstrated that the bud had good chances to remain in the dental arch. Therefore, the orthodontic mechanics was initiated with the aim to gain space for the right lower second premolar. By the time the tooth development confirmed its likelihood to erupt, the mechanical approach to increase the lower arch length had reached its goal (Figure 5). In summary, the malocclusion was treated with an extraoral headgear in the upper arch, without extractions; additionally, a lip bumper and a NiTi coil-spring between the lower first molar and first premolar were utilized to regain space for the lower second premolar. After full eruption, the lower right

Figure 2. Panoramic radiograph. The significant delay of the lower right second premolar bud in relation to its counterpart makes it difficult to predict its likelihood to erupt.

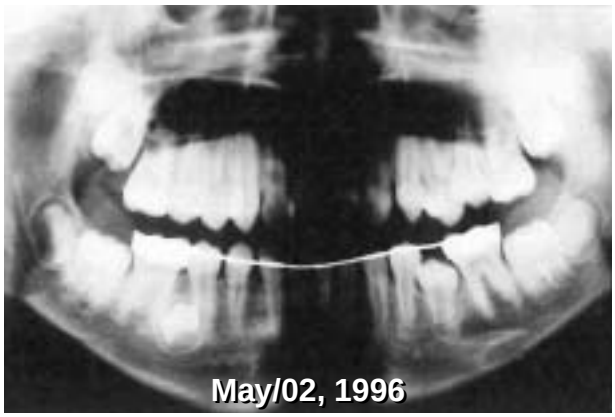

Figure 3. A progressive calcification shapes the crown contour of the lower right second premolar bud.

Figure 4. As root formation started, chances were that the lower right second premolar bud would reach the occlusal plane. The orthodontic mechanics progressed toward this objective.

Figure 5. After eruption, the lower right second premolar was finally bonded, levelled and aligned.

second premolar was bonded and the orthodontic treatment was properly finished (Figure 5).

REFERENCES

1. Silva Filho OG, Lauris RCMC, Ferrari Júnior FM, Ozawa TO. Atraso no desenvolvimento do segundo pré-molar superior: condição rara que exige ponderação. Ortodontia 35: 112-19, 2002.
2. Fass EM. Aberrant second premolars. J Dent Child 37: 494-98, 1970.
3. Symons AL, Taverne AA. A family case report: disturbances in tooth form and eruption of the second premolar. Aust Orthod J 14: 168-71, 1996.
4. Arruda CC, Paiva JB, Rino Neto J, Abrão J. Desequilíbrio na rizogênese de pré-molares. Rev Assoc Paul Cirurg Dent 54: 55-61, 2000.
5. Coote JD. The association between congenitally absent teeth and delayed development. Dent Pract Dent Rec 19: 415-16, 1969.
6. Cunat, JJ, Collord J. Late-developing premolars: report of two cases. J Am Dent Assoc 87: 183-85, 1973.
7. Coupland MA. Apparent hypodontia. Br Dent J 152: 388, 1982.
8. Douglas P, Sloan P, Gillbe GV. A developing complex odontome associated with delayed premolar formation. Br J Oral Maxillofac Surg 29: 61-3, 1991.
9. Torres JS. Late development of second premolar. Oral Surg 34: 350, 1972.
10. Alexander-Abt J. Apparent hypodontia: a case of misdiagnosis. Am J Orthod Dentofacial Orthop 116: 321-23, 1999.
11. Memmott JE, Kuster CG, Sullivan RE. A very delayed developing premolar: clinical report. Pediatr Dent 7: 137-39, 1985.
12. Üner O, Yücel-Eroglu E, Karaca I. Delayed calcification and congenitally missing teeth. Case report. Aust Dent J 39: 168-71, 1994.
13. Rasmussen P. "9-year-molars" aberrantly developing and erupting: report of cases. J Clin Pediatr Dent 22: 151-53, 1998.
14. Philipsen HP, Thosaporn W, Reichart PA, Grundt G. Odontogenic lesions in opercula of permanent molars delayed in eruption. J Oral Pathol Med 21: 38-41, 1992.
15. Yonemochi H, Noda T, Saku T. Pericoronal hamartomatous lesions in the opercula of teeth delayed in eruption: an immunohistochemical study of the extracellular matrix. J Oral Pathol Med 27: 441-52, 1998.
16. Massler M, Schour I, Poncher HG. Developmental pattern of the child as reflected in calcification pattern of teeth. Am J Dis Child 62: 33-67, 1941.
17. Ravin JJ, Nielsen HG. A longitudinal radiographic study of the mineralization of second premolars. Scand J Dent Res 85: 232-36, 1977.