

# CASE REPORT

## Delayed Eruption of a Maxillary Second Premolar Due to a Late Bud

ROSALIA LEONARDI, DDS, MS  
CLAUDIA LOMBARDO, DDS  
ERSILIA BARBATO, DDS, MS

**D**elayed eruption of permanent teeth has been attributed to local, systemic, and genetic factors,<sup>1-7</sup> but only a few cases of delayed eruption due to late bud development have been reported. Silva Filho and colleagues described delayed development of a maxillary left second premolar that finally erupted when the patient was 14 years old.<sup>8</sup> Taguchi and colleagues reported five cases of delayed eruption of maxillary second premolars associated with late bud development; the premolar eruption occurred between ages 13 years, 3 months, and 14 years, 6 months, in four of these cases, but not until age 17 years, 8 months, in the other.<sup>9</sup>



**Fig. 1** Initial panoramic radiograph of 12½-year-old male patient, showing maxillary second premolars in different stages of development and agenesis of mandibular second premolars.

This article describes extremely delayed development and eruption of a maxillary right second premolar due to a late bud.

### Diagnosis and Treatment Plan

A 12½-year-old male in the

Dr. Leonardi is a Professor and Dr. Lombardo is a doctoral candidate, Catania Dental College, University of Catania, Policlinico, Via S. Sofia 78, 95123 Catania, Italy. Dr. Barbato is a Professor of Orthodontics, University of Rome "La Sapienza". E-mail Dr. Leonardi at rleonardi@unict.it.



**Dr. Leonardi**



**Dr. Lombardo**



**Dr. Barbato**



mixed dentition presented with a Class I skeletal pattern and a mild mandibular asymmetry. He had a Class I molar relationship on the right side and a Class II malocclusion on the left, with a severe maxillary dental midline deviation due to rotation of the lower right central incisor. All four deciduous second premolars were still present.

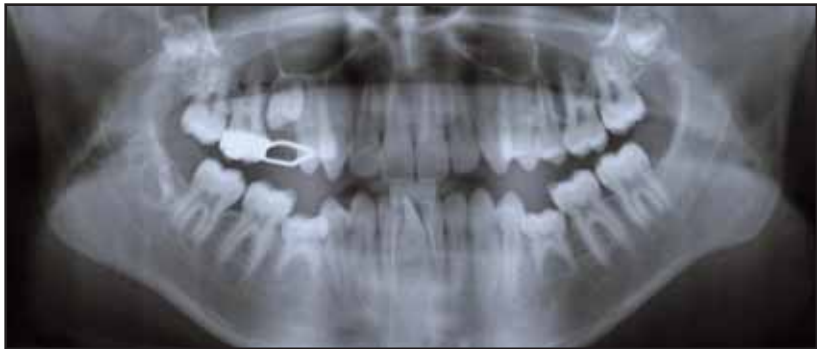
The initial panoramic radiograph revealed delayed development of the maxillary right second

premolar compared with the contralateral tooth, as well as congenital agenesis of both mandibular second premolars and the mandibular left third molar bud (Fig. 1).

Because the maxillary right second premolar bud was well positioned in the alveolar bone, it was decided to wait for its development. Serial panoramic radio-



**Fig. 2** Computed tomographic scans showing underdevelopment of maxillary right second premolar compared with contralateral tooth.



**Fig. 3** Panoramic radiograph taken 18 months after initial records, showing slow development of right premolar root.



**Fig. 4** Panoramic radiograph taken 30 months after initial records, showing continued premolar root formation.



**Fig. 5** Final panoramic radiograph, taken 44 months after initial records, showing premolar eruption before completion of apicogenesis.





Fig. 6 Eruption of second premolar through space maintainer.

graphs showed slow but complete development of the maxillary right second premolar.

### Radiographic Progress

The initial panoramic radiograph taken at age 12½ showed complete formation of the maxillary right second premolar crown at the occlusal surface in the cervical direction (Fig. 1). This corresponds to stage C in the developmental classification of Demirjian and colleagues.<sup>10</sup> On the left side, premolar development was more advanced, with the pulp chamber walls in the form of an isosceles triangle and the root length greater than the crown height (stage F). Computed tomography confirmed the underdevelopment of the maxillary right second premolar compared with the left second premolar (Fig. 2).

At age 14 years, 3 months (18 months later, Fig. 3), development of the maxillary right second premolar crown was complete, and root formation had begun (stage D); the contralateral tooth had a partially open root at the apical end (stage G). The maxillary right deciduous second molar was extracted to enable eruption of the premolar, and a space maintainer was placed.

At age 15 years, 3 months (30 months after initial records, Fig. 4), radiography showed slow development of the maxillary right second premolar, with the pulp chamber walls forming straight lines, although the root length was less than the crown height (stage E). The premolar crown was visible on clinical examination.

At age 16 years, 2 months (44 months after initial records, Fig. 5), root development appeared complete (stage F). The second

premolar had erupted normally, but had not yet reached the occlusal plane. Orthodontic treatment consisted solely of the space maintainer, along with continual clinical monitoring (Fig. 6).

### Discussion

Hotz and Kimmel defined a “late bud” as a permanent tooth that does not follow a biologically established sequence and whose development is delayed by at least two or three years.<sup>11</sup> The premolars exhibit greater age variability in calcification than any other permanent teeth.<sup>12</sup> Calcification of the second premolar usually begins at 2 to 2½ years of age, and crown formation is generally complete by age 6 or 7.<sup>13</sup> In many cases, however, the mandibular second premolars do not even begin to calcify until age 5.<sup>9,14</sup> Therefore, maxillary second pre-



molar aplasia should never be diagnosed before that age.

The degree of tooth formation on the opposite side of the arch may help predict the approximate age at which the "late" premolar will erupt. A slow, asymmetrical development of the contralateral second premolar should alert the clinician to the possible presence of an unmineralized tooth bud.<sup>13</sup> Alexander-Abt reported that when a third molar or second premolar is absent, agenesis or delayed mineralization of the remaining teeth is more likely.<sup>15</sup> The present case confirms that delayed tooth formation may be a mild expression of developmental hypodontia and is usually associated with other dental anomalies.<sup>16</sup>

Although several treatment options are available in cases of delayed tooth development and eruption, both the orthodontist and the patient often prefer to avoid extractions. In our patient, because the underdeveloped premolar was well positioned in the alveolar bone, it was decided to maintain space for the tooth with an orthodontic appliance and await its eruption while monitoring root growth. Such an approach

has been recommended until at least age 16 or 17.<sup>4,8,17</sup>

In the present case, follow-up began when premolar crown formation was noted and ended when the tooth erupted into the orthodontically maintained space. This article demonstrates the value of a flexible and cautious approach to tooth underdevelopment, especially in the presence of other dental anomalies.

## REFERENCES

1. Brin, I.; Zilberman, Y.; and Azaz, B.: The unerupted maxillary central incisor: Review of its etiology and treatment, *A.S.D.C. J. Dent. Child.* 49: 352-356, 1982.
2. Kobayashi, H.; Taguchi, Y.; and Noda, T.: Eruption disturbances of maxillary permanent central incisors associated with anomalous adjacent permanent lateral incisors, *Int. J. Paediat. Dent.* 9:277-284, 1999.
3. Jacoby, H.: The etiology of maxillary canine impactions, *Am. J. Orthod.* 84:125-132, 1983.
4. Taguchi, Y.; Kobayashi, H.; and Noda, T.: The palatally displaced canine in Japanese children, *Pediat. Dent. J.* 10:155-159, 2000.
5. Bjerklin, K. and Kurol, J.: Prevalence of ectopic eruption of the maxillary first permanent molar, *Swed. Dent. J.* 5:29-34, 1981.
6. Kurol, J. and Bjerklin, K.: Treatment of children with ectopic eruption of the maxillary first permanent molar by cervical traction, *Am. J. Orthod.* 6:483-492, 1984.
7. Suri, L.; Gagari, E.; and Vastardis, H.: Delayed tooth eruption: Pathogenesis, diagnosis, and treatment: A literature review, *Am. J. Orthod.* 126:432-445, 2004.
8. Silva Filho, O.G.; Lauris, R.C.M.C.; Ferrari, F.M. Jr.; and Ozawa, T.O.: Delayed development of a maxillary left second premolar, *J. Clin. Orthod.* 36:291-295, 2002.
9. Taguchi, Y.; Yano, Y.; Kobayashi, H.; and Noda, T.: Retarded eruption of maxillary second premolars associated with late development of the germs, *J. Clin. Pediat. Dent.* 27:321-326, 2003.
10. Demirjian, A.; Goldstein, H.; and Tanner, J.M.: A new system of dental age assessment, *Hum. Biol.* 45:211-227, 1973.
11. Hotz, R. and Kimmel, F.: *Uber Spatanlagen bleibender Zahne, Zahnarztl. Rundsoh.* 63:651-654, 1954.
12. Moorrees, C.F.; Fanning, E.A.; and Hunt, E.E. Jr.: Age variation of formation stages for ten permanent teeth, *J. Dent. Res.* 42:1490-1502, 1963.
13. Massler, M.; Schour, I.; and Poncher, H.G.: Developmental pattern of the child as reflected in the calcification pattern of the teeth, *Am. J. Dis. Child.* 62:33-67, 1941.
14. Nielsen, H.G. and Ravn, J.J.: A radiographic study of mineralization of permanent teeth in a group of children aged 3-7 years, *Scand. J. Dent. Res.* 84:109-118, 1976.
15. Alexander-Abt, J.: Apparent hypodontia: a case of misdiagnosis, *Am. J. Orthod.* 116:321-323, 1999.
16. Ranta, R.: Hypodontia and delayed development of the second premolars in cleft palate children, *Eur. J. Orthod.* 5:145-148, 1983.
17. Cunat, J.J. and Collord, J.: Late-developing premolars: report of two cases, *J. Am. Dent. Assoc.* 87:183-185, 1973.