

# CASE REPORT

## Delayed Development of a Maxillary Left Second Premolar

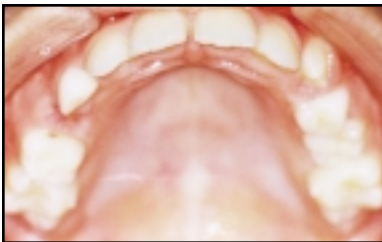
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**T**his report describes a multi-year delay in the development and eruption of an upper

left second premolar in a Class II, division 1 patient treated with headgear and fixed orthodontic appliances in the mixed and permanent dentitions.

mixed dentition when she first presented (Fig. 1). The sequential panoramic radiographs illustrate two unusual and probably independent situations: the distance between the lower second molar buds and the lower first molars, and the delayed development of the upper left second premolar (Fig. 2).

The factor most likely to



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The patient was 9 years old and at the beginning of the second transitional period in the



**Fig. 1** 9-year-old female Class II, division 1 patient at beginning of second transitional period of mixed dentition (May 1992).

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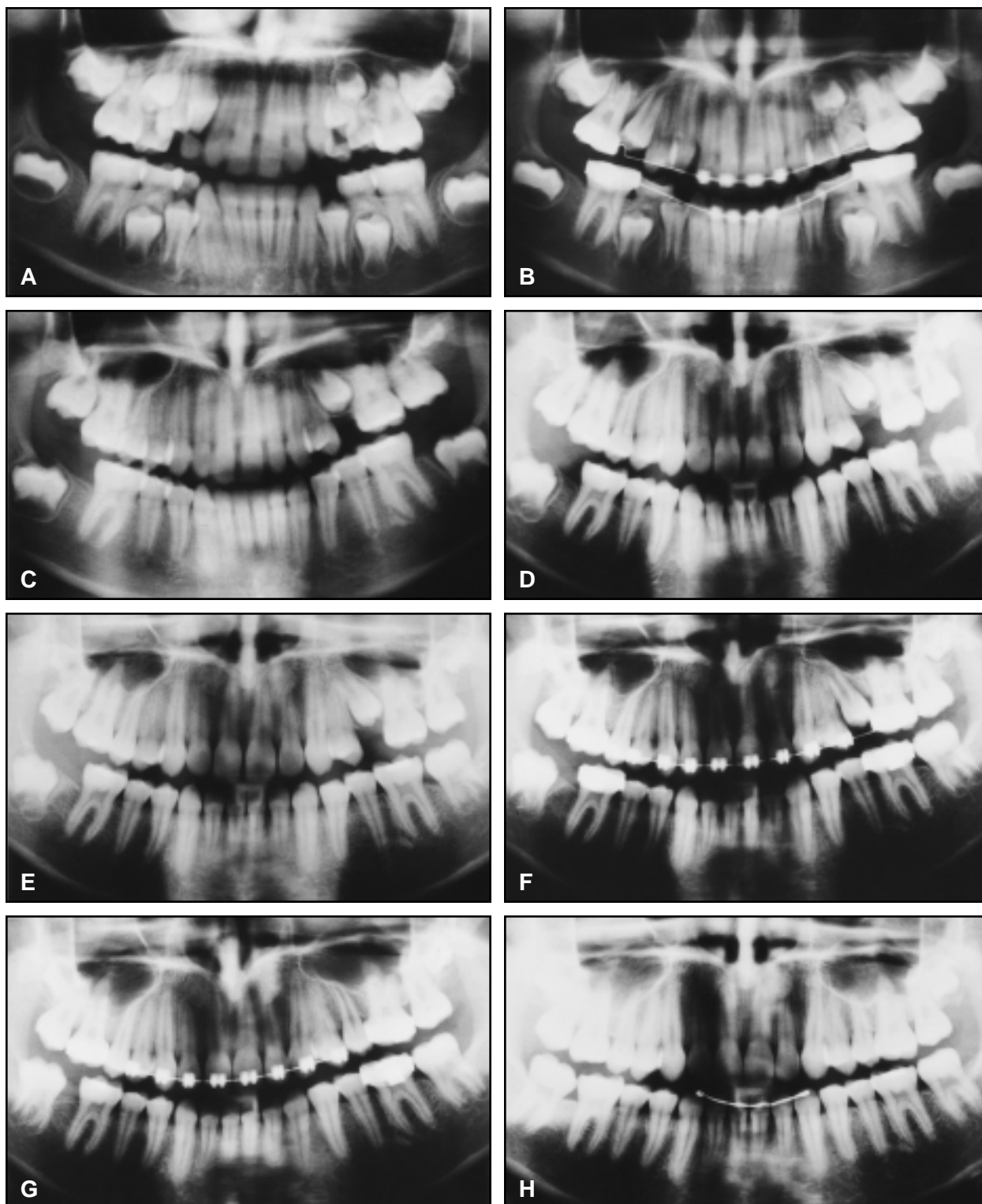


Dr. Ferrari



Dr. Ozawa

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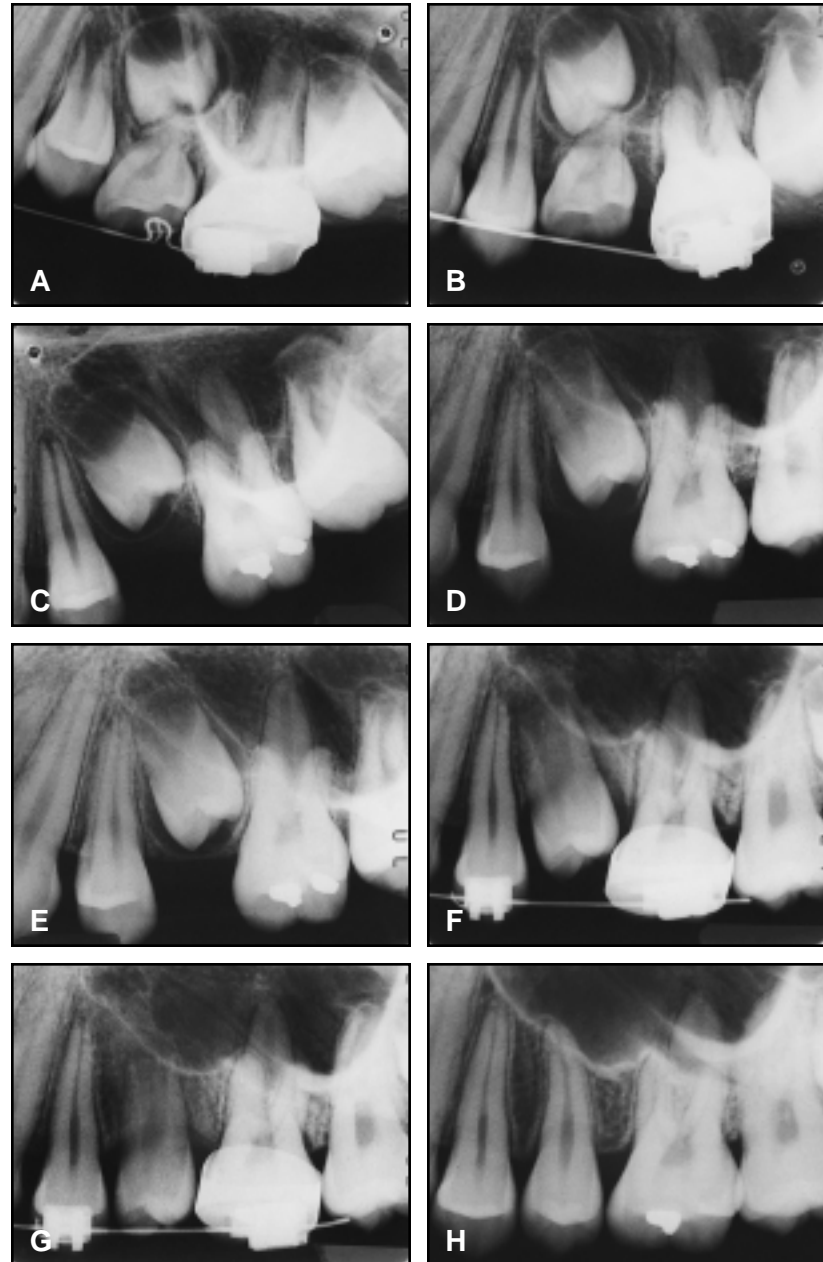
**Fig. 2** Long-term follow-up of panoramic radiographs, showing root formation of upper left second premolar and mesial migration of lower second molars. A. April 1992. B. January 1993. C. April 1995. D. February 1996. E. July 1996. F. March 1997. G. March 1998. H. October 2000.

interfere with orthodontic treatment is undoubtedly the delayed premolar eruption, because of the location of the tooth in the middle of the dental arch and the difficulty of accurately predicting its development. Lower second molars tend to migrate spontaneously in a mesial direction, which is what occurred in this case, albeit slowly—especially on the right side—probably due to the absence of the lower third molars.

Because the upper left second premolar bud was well positioned in the alveolar bone, the decision was made to wait for its development. Sequential periapical radiographs show the slow but continuous complete development of the upper left second premolar, from the development of the crown until full apical closure (Fig. 3).

Although the upper left second deciduous molar developed a progressive infra-occlusion, it probably did not cause the delay in the premolar eruption. Deciduous teeth in infra-occlusion are relatively common, have a favorable prognosis, and do not seem to influence the root formation of their successors.<sup>1</sup> In this case, the upper left second deciduous molar was ankylosed and extracted before the root of the upper left second premolar began to form (Fig. 3C).

During this period, the patient was treated only with head-gear (Fig. 4). Finally, about five years after the initial records were taken, the second premolar erupted normally. By the time its



**Fig. 3** Long-term follow-up of periapical radiographs, showing root formation and spontaneous movement of upper left second premolar. A. August 1992. B. October 1993. C. June 1994. D. August 1995. E. July 1996. F. March 1997. G. June 1997. H. November 2000.

crown development was completed at age 16, the upper right second premolar had reached the occlusal plane and was orthodontically corrected while its apex closed.

Fixed appliance treatment in both arches was completed at age 17, and the patient received upper and lower Hawley-type retainers (Fig. 5).

## Discussion

Development of the tooth buds can be diagnosed radiographically throughout their formation.<sup>2-8</sup> Calcification of the first premolars begins between 1½ and 2 years of age, and that of the second premolars between 2 and 3.<sup>9</sup> Formation of most of the second premolars does not begin until age 3 or 3½, however, with more variability than the other permanent teeth.<sup>10-14</sup> Because of this, aplasia of the sec-



**Fig. 4** After headgear treatment and extraction of upper second deciduous molar (December 1994).

ond premolars should never be diagnosed before 5 years of age.

Hotz and Kimmel used the term “late bud” to describe a permanent tooth that does not follow a biologically established sequence and whose development is delayed by at least two to three years.<sup>15</sup> Such delayed formation of single teeth is found in 5-9% of patients,<sup>15</sup> with equal frequency for both sexes and a greater incidence in the maxillary arch than in the mandibular arch.<sup>13</sup> Overall, 6.6% of second

premolars and 7.1% of first premolars show delayed mineralization.<sup>15</sup>

Treatment planning of cases with delayed premolars can be confusing, especially when both the orthodontist and the patient prefer to avoid extractions. Clinical evidence suggests that root formation is responsible for pushing a developing tooth toward the occlusal plane, although no study has proven a cause-effect relationship.<sup>16</sup> Authors agree, however,



**Fig. 5** Complete permanent dentition after two years of fixed appliance treatment (May 2000).

that unerupted teeth with closed apices can move only with orthodontic traction.

In the case presented here, the delayed development of the premolar was the only factor indicating extraction. The upper left second premolar was well positioned in the alveolar bone, with its occlusal aspect facing the occlusal plane and a favorable eruption pathway. Therefore, it erupted spontaneously and eventually reached the occlusal plane.

Even when the tooth is well positioned, the possibility of an interruption in tooth formation cannot be excluded. Such a situation requires long-term radiographic follow-up, because as shown in other published cases, a premolar can appear many years after its expected development.<sup>17-22</sup> Unlike the delayed premolars in the other published cases, the one shown here was followed until its complete spontaneous eruption.

Clearly, waiting for unpredictable root formation in cases of delayed single dental buds leads to longer treatment time. In many cases, however, the complete occlusion that is eventually achieved justifies the wait.

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