

Missing Before Eruption: A Case Report of Second Premolars Agenesis in A 12-Year-Old Girl

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Introduction

The human dentition follows a remarkably precise developmental sequence; however, deviations from this pattern are not uncommon. Among these, tooth agenesis represents one of the most prevalent developmental anomalies and continues to challenge clinicians involved in pediatric oral healthcare. Defined as the congenital absence of one or more teeth, agenesis ranges from hypodontia to the complete absence of dentition, with hypodontia being the most frequently encountered form. Premolars, after third molars, are among the teeth most commonly affected, making premolar agenesis a clinically significant finding during the transitional years of dental development.^[1-5]

Premolar agenesis often remains “silent,” escaping clinical detection until the mixed dentition stage, when delayed exfoliation of primary molars or routine radiographic evaluation reveals the absence of permanent successors. This quiet absence can have profound implications, influencing arch integrity, occlusal harmony, alveolar bone development, and future esthetic outcomes. The etiology is complex and multifactorial, with genetic determinants such as mutations in odontogenesis-related genes interacting with environmental influences. While premolar agenesis may be associated with syndromic conditions, the majority of cases present as non-syndromic, isolated findings in otherwise healthy children.^[1,2,6,7]

In the growing child, the diagnosis of premolar agenesis introduces a unique clinical dilemma. The dynamic nature of craniofacial growth, ongoing eruption patterns, and psychosocial considerations demand a cautious and forward-looking approach. Treatment planning extends beyond the immediate replacement of missing teeth and instead focuses on preserving function, guiding growth, and maintaining flexibility for future definitive interventions. Retention of primary molars, when feasible, has emerged as a biologically sound strategy to preserve arch length and alveolar bone, thereby minimizing the need for early invasive procedures.^[8,9]

Early recognition and accurate diagnosis are therefore paramount, allowing clinicians to differentiate true agenesis from delayed dental development and to initiate timely interceptive care. An interdisciplinary, growth-centered approach involving pediatric dentistry and orthodontics is often essential to navigate the long-term implications of this anomaly. This case report presents a non-syndromic premolar agenesis in a 12-year-old girl, illustrating the clinical relevance of early diagnosis and highlighting the importance of conservative, individualized management during the critical years of dental and facial development.^[10,11]

CASE REPORT

Clinical Presentation

A 12-year-old female patient reported to the Department of Pediatric and Preventive Dentistry, Bhabha College of Dental Sciences, Bhabha University, Bhopal for routine dental evaluation. There was no complaint related to missing teeth, pain, or difficulty in mastication. Medical history was non-contributory, and no familial history of dental anomalies was reported. Extraoral examination revealed no facial asymmetry or features suggestive of syndromic involvement.

Intraoral examination revealed a mixed dentition stage with clinically healthy soft tissues. The maxillary and mandibular incisors were fully erupted, and the occlusion appeared stable with acceptable overjet and overbite. Retained primary molars were present bilaterally and exhibited satisfactory crown integrity without mobility.



Figure 1 shows the intraoral frontal view demonstrating stable occlusion and the absence of clinically evident spacing or malalignment.

Intraoral Findings

Occlusal examination of the maxillary and mandibular arches revealed retained primary second molars with intact occlusal morphology. No signs of pathological mobility, extensive caries, or gingival inflammation were observed. The arch form appeared well maintained, suggesting preservation of arch length despite the absence of permanent successors.^[12-14]



Figure 2 illustrates the maxillary occlusal view highlighting the retained primary molars.



Figure 3 depicts the mandibular occlusal view showing intact primary molars and stable arch form.

Radiographic Evaluation

A panoramic radiograph was obtained as part of routine assessment. Radiographic examination revealed the congenital absence of permanent second premolar tooth buds. The remaining permanent dentition demonstrated normal development corresponding to the patient's chronological age. No supernumerary teeth, cystic lesions, or other developmental disturbances were noted.^[10,15]



Figure 4 presents the panoramic radiograph clearly demonstrating bilateral absence of second premolar tooth buds. Intraoral periapical radiographs were taken to further evaluate the retained primary molars. These images revealed normal root morphology with no signs of pathological resorption or periapical pathology, supporting the decision to retain the primary molars during the growth phase.^[13,16]

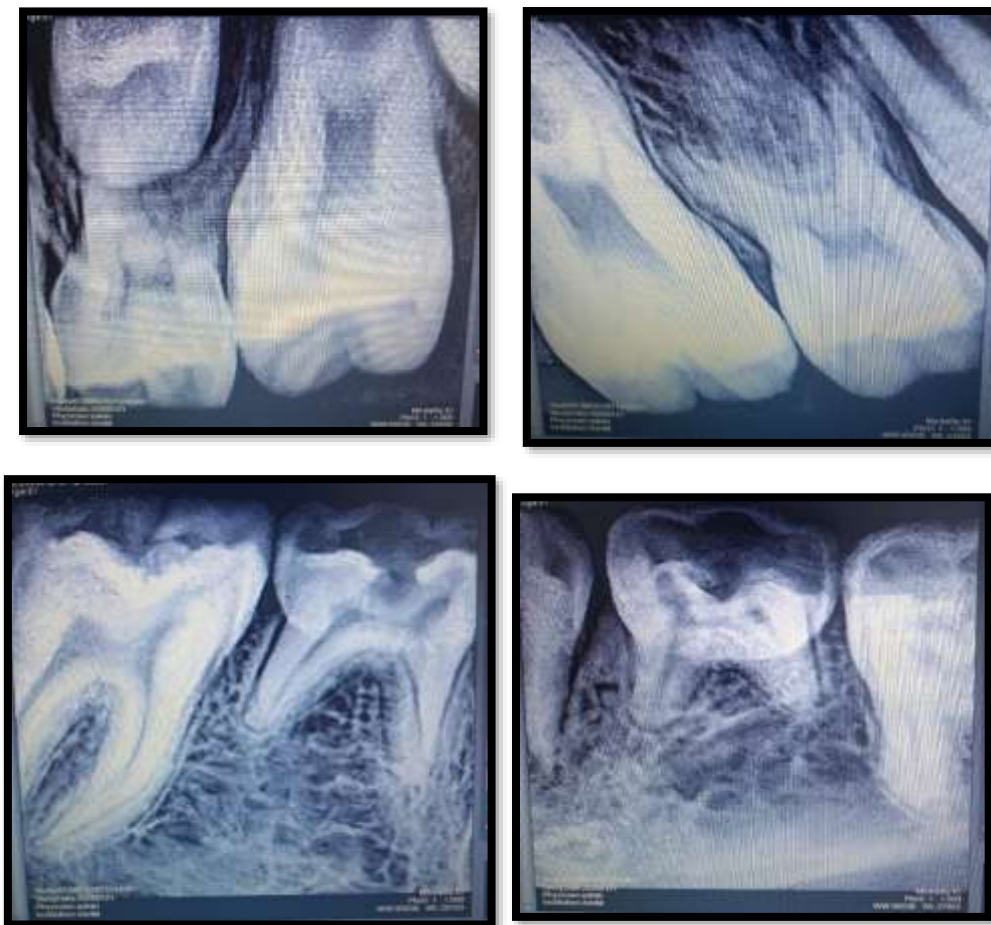


Figure 5 shows the intraoral periapical radiograph of the retained primary molar region confirming the absence of permanent successor tooth buds.

Diagnosis

Based on clinical and radiographic findings, a diagnosis of non-syndromic second premolar agenesis was established. Delayed tooth development was ruled out due to complete absence of tooth germ formation at an age when premolar mineralization is typically evident. ^[1,10]

Management and Follow-Up

Considering the patient's active growth phase, stable occlusion, and healthy retained primary molars, a conservative, growth-oriented management plan was adopted. Emphasis was placed on preservation of the primary molars to maintain arch length and alveolar bone height. Preventive measures, including oral hygiene reinforcement and periodic monitoring, were advised. Orthodontic consultation was planned to reassess space management options after completion of craniofacial growth. ^[8,12-14,17]

Discussion

Tooth agenesis is among the most common developmental anomalies of the permanent dentition, with second premolars being one of the most frequently affected teeth after third molars. The prevalence of premolar agenesis varies widely across populations, underscoring the influence of genetic and environmental factors. In the present case, the absence of permanent second premolar tooth buds was detected during the mixed dentition stage, a period when timely diagnosis plays a critical role in guiding growth-oriented treatment planning. ^[1-3]

The etiology of non-syndromic premolar agenesis is considered multifactorial, involving genetic determinants related to odontogenesis as well as epigenetic influences. Although mutations in genes such as *MSX1* and *PAX9* have been associated with hypodontia, the absence of family history and systemic findings in the present case supports an isolated, non-syndromic presentation. This highlights the importance of comprehensive clinical and radiographic evaluation to exclude syndromic associations and delayed dental development. ^[4-7]

Radiographic examination remains the cornerstone for diagnosing dental agenesis. In the present case, panoramic and intraoral periapical radiographs confirmed complete absence of second premolar tooth germs at an age when mineralization would normally be evident. This allowed reliable differentiation between true agenesis and delayed tooth formation, thereby preventing unnecessary interventions or prolonged diagnostic uncertainty. ^[10,15]

Management of premolar agenesis in growing children presents a unique clinical challenge due to ongoing craniofacial growth and dental maturation. Several treatment options have been proposed in the literature, including early extraction of retained primary molars, orthodontic space closure, or space maintenance for future prosthetic rehabilitation. However, growing evidence supports the preservation of sound primary molars when possible, as this approach helps maintain arch length, occlusal stability, and alveolar bone height. ^[8,9,12,17,18]

In the present case, retained primary molars demonstrated favorable crown integrity and root morphology with no evidence of pathological resorption. Conservative management was therefore considered the most biologically sound approach. This strategy aligns with current pediatric dentistry principles that advocate minimally invasive, growth-centered treatment planning while preserving future therapeutic flexibility. Periodic monitoring is essential, as the longevity of retained primary molars may vary, and treatment needs may evolve with growth completion. ^[12-14,16]

An interdisciplinary approach involving pediatric dentists and orthodontists is fundamental in managing such cases. Long-term follow-up allows timely modification of the treatment plan, whether through orthodontic space closure or prosthetic replacement, depending on occlusal development and patient-specific factors. ^[8,9,17]

Conclusion

Premolar agenesis detected during the mixed dentition stage requires careful diagnosis, long-term vision, and individualized management. This case highlights the importance of early radiographic evaluation in differentiating true agenesis from delayed tooth development and emphasizes the role of conservative treatment strategies during active growth phases. Preservation of healthy primary molars can effectively maintain arch integrity and alveolar bone while deferring definitive treatment until craniofacial growth is complete. A patient-centered, interdisciplinary, and growth-oriented approach remains essential for achieving favorable functional and esthetic outcomes in pediatric patients with dental agenesis. ^[1,8,9]

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Ethical Considerations: Written informed consent was obtained from the parent/guardian of the patient for publication of clinical details and radiographic findings. The study was conducted in accordance with institutional ethical standards.

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