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Tooth Agenesis in A Seven Year Old Child at RSGM Soelastri Surakarta Case Report

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ABSTRACT

Agenesis is a dental anomaly that occurs relatively frequently in humans. Agenesis results in the failure of teeth to develop after birth, with tooth development occurring only during childhood. The prevalence of permanent dental agenesis in non-syndromic individuals is higher among Europeans, with 4.6% in males and 5.5% in females, in Australia 5.5% in males and 7.6% in females, and lower among Caucasian Americans, with 3.2% in males and 4.6% in females. A 7-year-old male patient came to RSGM Soelastri with his mother, complaining of small and sharp teeth. In the intraoral examination, abnormalities were found in the deciduous teeth, showing hypodontia where the tooth bud of 42 did not develop. Beside of hypodontia, this case also exhibited a peg shape in tooth 82. The patient's parents should be given communication, information and education regarding the issues that occur. The diagnosis of agenesis requires clinical and supportive examinations. It can be concluded that the main factor causing agenesis and peg shape is genetic.

Keyword: Agenesis; Peg Shape; Deciduous Teeth; Hypodontia; RSGM Soelastri

INTRODUCTION

People of all ages are increasingly concerned with their smile and overall facial appearance, because dental aesthetics strongly influence self-confidence, social interaction, and quality of life. Developmental dental anomalies involving changes in tooth shape, size, position, color, or texture may negatively affect smile harmony and oral function. Among such anomalies, tooth agenesis the congenital absence of one or more teeth is one of the most prevalent developmental dental conditions, with clinical impacts ranging from functional impairment to psychosocial distress due to aesthetic concerns. Tooth agenesis results from disruptions in the multi-staged process of odontogenesis and may be influenced by genetic, epigenetic, and environmental factors (1);(2);(3).

Tooth agenesis encompasses a spectrum of clinical presentations, from mild hypodontia to oligodontia and anodontia. Hypodontia is defined as the congenital absence of fewer than six teeth (excluding third molars), while oligodontia refers to the absence of six or more teeth, and anodontia represents complete absence of both primary and permanent dentitions. Epidemiological studies have demonstrated that hypodontia is the most common form, with prevalence varying by population and ethnicity (4),(5),(6). The most frequently missing teeth are maxillary lateral incisors and premolars, highlighting the importance of early diagnosis and interdisciplinary management

The etiology of tooth agenesis is multifactorial, involving both genetic determinants and environmental influences. Mutations in genes such as MSX1, PAX9, and WNT10A have been strongly associated with non-syndromic tooth agenesis, while environmental factors including prenatal disturbances, trauma, and systemic disease may also contribute (7),(8),(9). Tooth agenesis is often associated with morphological anomalies such as peg-shaped incisors, a form of microdontia characterized by tapered crowns and reduced mesiodistal width, which may complicate esthetic and functional rehabilitation

Management of tooth agenesis and associated anomalies requires a multidisciplinary approach that may involve orthodontic, restorative, prosthodontic, and surgical interventions. Treatment planning should be guided by biological, aesthetic, and functional considerations and individualized according to patient needs and developmental stage.

Despite extensive literature on permanent tooth agenesis, reports focusing on agenesis of deciduous teeth particularly isolated mandibular deciduous incisors remain limited. This case report aims to present the clinical

findings of agenesis of tooth 82 in a pediatric patient treated at RSGM Soelastri, Surakarta, and to discuss its diagnostic and management implications in pediatric dentistry.

Recent advances in dental developmental biology have expanded the understanding of tooth agenesis beyond mere prevalence, emphasizing its biological complexity and clinical heterogeneity. Contemporary studies have demonstrated that tooth agenesis represents a disruption of epithelial–mesenchymal interactions during odontogenesis, resulting in failure of tooth bud initiation or progression (10),(11). These disturbances may occur during both primary and permanent dentition stages, although agenesis of deciduous teeth remains considerably less documented.

Large-scale epidemiological investigations conducted between 2022 and 2025 indicate that tooth agenesis exhibits significant variation across populations, influenced by genetic background and environmental exposure (12),(13). Pediatric-focused studies have highlighted that early identification of missing primary teeth is clinically significant, as it may predict future occlusal discrepancies and permanent tooth absence (14). Notably, mandibular incisor agenesis has been described as one of the rarest patterns, frequently identified incidentally during routine radiographic examinations (15).

Recent molecular studies have reinforced the polygenic nature of non-syndromic tooth agenesis. High-throughput sequencing analyses have identified pathogenic variants in EDA, LRP6, DVL2, and BMP4, in addition to the well-established WNT signaling pathway genes (16), (17). Functional studies suggest that these genetic alterations impair signaling cascades critical for dental lamina formation and tooth morphogenesis (18). Importantly, genotype–phenotype correlations indicate that specific gene variants may influence the severity and distribution pattern of missing teeth (19).

Emerging evidence underscores that agenesis in the primary dentition is not merely a transient anomaly but may reflect broader developmental disturbances. Longitudinal cohort studies have demonstrated strong associations between missing deciduous teeth and delayed eruption, microdontia, and altered arch development (20),(21). These findings highlight the necessity for careful growth monitoring and early interceptive planning in pediatric patients.

Advancements in diagnostic imaging have improved early detection of tooth agenesis. Recent comparative studies have shown that digital panoramic radiography combined with cone-beam computed tomography enhances diagnostic accuracy, particularly in differentiating agenesis from delayed mineralization in young children (22),(23). Early radiographic confirmation allows clinicians to implement preventive and space management strategies at an optimal developmental stage.

Current literature emphasizes that management of tooth agenesis in children should be individualized and developmentally appropriate. Systematic reviews published after 2022 advocate for conservative, growth-adapted approaches in the mixed dentition period, prioritizing functional stability and psychosocial well-being (24). Interdisciplinary protocols integrating pediatric dentistry, orthodontics, and restorative dentistry have been shown to improve long-term outcomes and patient satisfaction (25),(26).

Beyond functional implications, recent pediatric studies have highlighted the psychosocial burden associated with visible dental anomalies. Children with anterior tooth agenesis have been reported to experience reduced oral health-related quality of life, particularly in social and emotional domains (27). Early counseling and aesthetic planning are therefore recommended as integral components of comprehensive care (28).

Despite growing epidemiological and genetic evidence, rare presentations such as isolated agenesis of mandibular deciduous incisors remain insufficiently represented in the literature. Contemporary methodological analyses emphasize the continued relevance of well-documented case reports in elucidating uncommon developmental patterns and refining clinical decision-making (28).

METHOD

This study employed a descriptive observational research design in the form of a case report. The research design was selected to provide a comprehensive clinical description of a rare dental anomaly observed in a pediatric patient, focusing on diagnostic findings and clinical decision-making rather than hypothesis testing Case reports are an established descriptive observational format for documenting rare or novel clinical findings, facilitating detailed diagnostic description and clinical decision-making while serving as a basis for hypothesis generation rather than formal hypothesis testing (29). Reporting standards and quality appraisal tools (for example Murad tool and CARE checklist) exist to ensure methodological transparency and reproducibility of single-patient reports (30).

The population consisted of pediatric patients attending RSGM Soelastri, Surakarta, and the sample comprised a single seven-year-old male patient selected purposively because he fulfilled predefined inclusion criteria for a rare developmental anomaly. Purposive selection of information-rich cases is an accepted approach in pediatric clinical research when the objective is a detailed descriptive account of a rare presentation rather than hypothesis testing. Case reports are an established descriptive format for documenting rare clinical findings and

should comply with reporting standards and methodological appraisal tools to ensure transparency and reproducibility (31).

Data collection comprised a comprehensive medical and dental anamnesis, extraoral and intraoral clinical examination, percussion and palpation testing, pulp vitality assessment, and panoramic radiographic evaluation. Pulp vitality and sensibility tests have been shown to vary in diagnostic accuracy and therefore should be interpreted in combination with clinical history and radiographic findings (32). Optical pulp scanning and pulse oximetry represent modern adjuncts to conventional sensibility tests and have demonstrated promising diagnostic performance in clinical studies. Panoramic radiography is commonly employed to detect the presence or absence of permanent tooth buds in pediatric populations and is widely used in epidemiological studies of agenesis. Rigorous adherence to case-reporting guidelines ensures that all clinical and diagnostic data are documented for reproducibility and clinical decision-making (33).

Data processing involved organizing collected clinical and radiographic information into a structured descriptive format, and analysis was conducted qualitatively by interpreting clinical observations and radiographic findings to establish diagnosis and management. Presentation followed recognized reporting standards, with narrative description supported by clinical photographs and radiographs to improve transparency and reproducibility (34), (35).

RESULTS

A seven-year-old male patient presented to RSGM Soelastri, Surakarta, accompanied by his mother, with a chief complaint of a small and sharp tooth in the lower anterior region. The patient had never sought treatment for this condition previously because it was not associated with pain. The patient had no history of systemic disease and no known allergies to medications, food, or environmental factors. He had previously visited a dentist for dental restorative treatment. Both parents were reported to be medically healthy and had no history of systemic disease or allergies. Family history revealed that the patient's mother experienced a similar dental condition, characterized by the absence of a lower left tooth and a morphological anomaly of the third molar, as demonstrated by panoramic radiographic examination. This finding suggested a possible genetic contribution to the dental anomaly observed in the patient.

Extraoral examination revealed no abnormalities. Intraoral examination showed a reduced tooth size and sharp, tapered morphology involving tooth 82. Clinical photographs were obtained from occlusal, lingual, and labial views. Objective examination showed negative responses to percussion and palpation tests, while vitality testing yielded a positive response. Based on these findings, a provisional diagnosis of peg-shaped tooth 82 was established. A panoramic radiographic examination was recommended to assess the presence of permanent tooth germs and identify any additional dental anomalies. After receiving a complete explanation of the procedure, informed consent was obtained from the patient's mother. Panoramic radiographic evaluation revealed the absence of the permanent successor of tooth 82, confirming the diagnosis of tooth agenesis associated with peg-shaped morphology.

Two treatment options were discussed. The first option involved future orthodontic treatment if tooth 82 were to exfoliate, aiming to prevent space formation between teeth 41 and 43 once the permanent dentition had fully erupted. The second option involved esthetic restorative treatment, such as veneer placement or direct restoration, to improve the morphology of tooth 82 if the tooth remained present. At the time of consultation, the patient's mother did not express concern regarding the condition; therefore, a conservative approach involving periodic observation was selected.

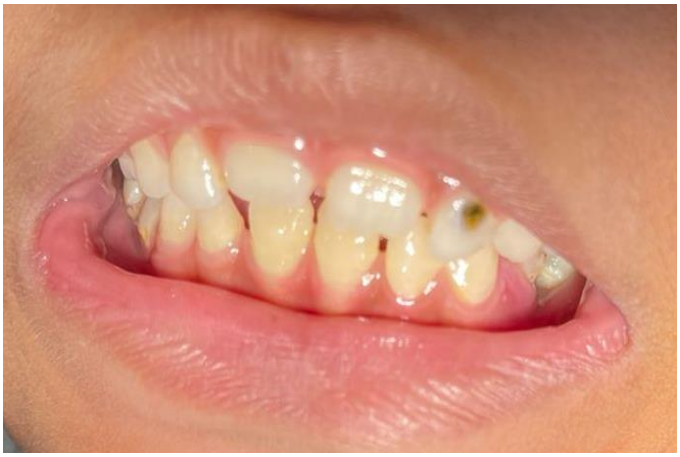

Figure 1. Intraoral photograph of tooth 82 in occlusion

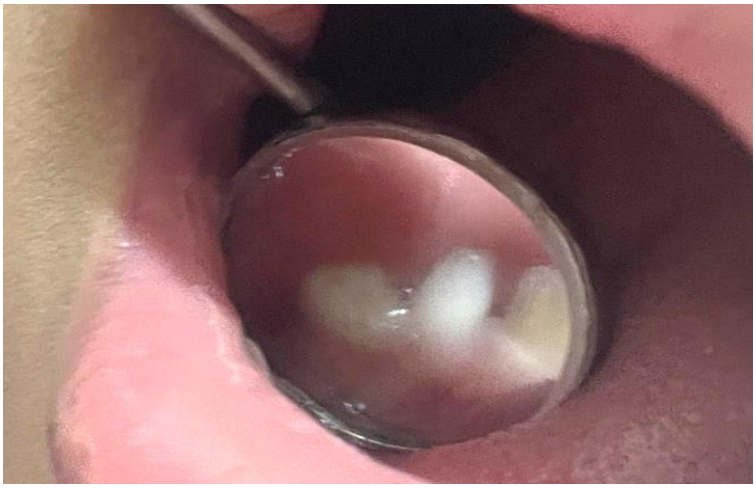

Figure 2. Intraoral photograph of tooth 82 from the lingual view

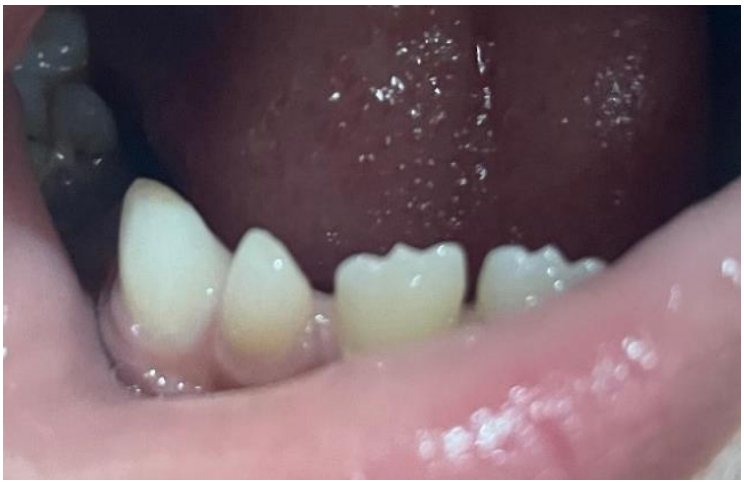

Figure 3. Intraoral photograph of tooth 82 from the labial view

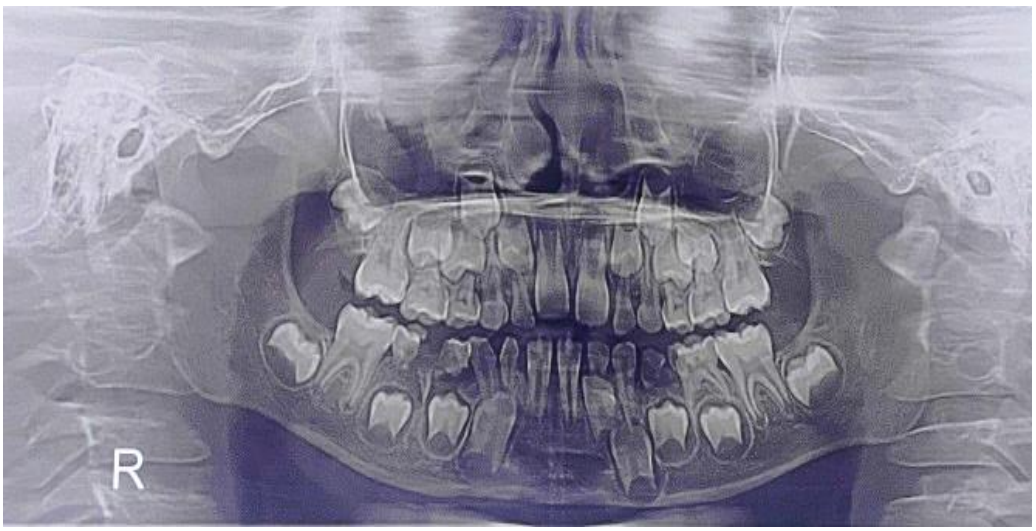

Figure 4. Panoramic radiographic image of the patient

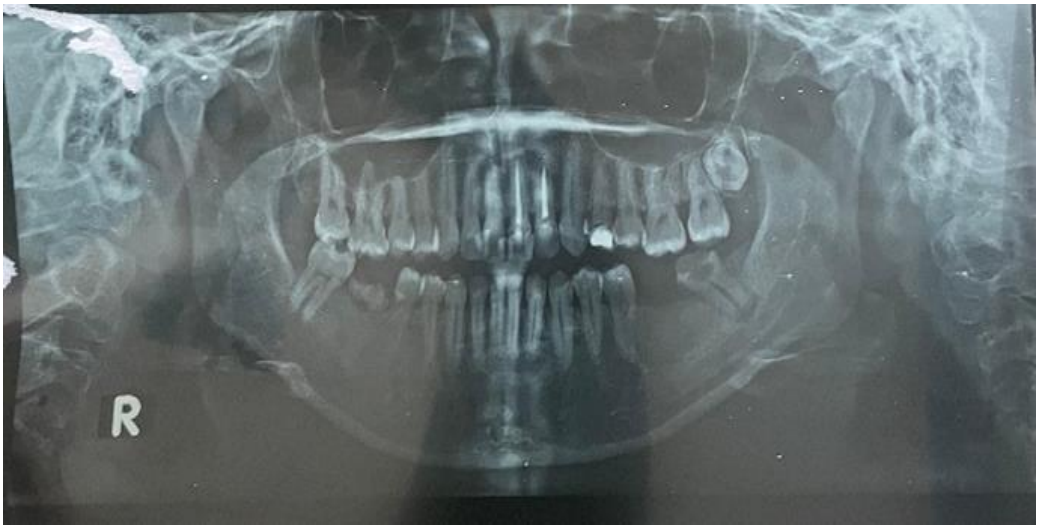

Figure 5. Panoramic radiograph of the patient's mother's dentition

DISCUSSION

Intraoral examination in this case revealed that tooth 82 exhibited a reduced crown size and a sharp, tapered morphology compared to adjacent teeth. These findings are consistent with the clinical characteristics of peg-shaped teeth, which are commonly associated with developmental dental anomalies such as hypodontia. Epidemiological studies have reported that hypodontia represents the most common form of dental anomaly and is frequently accompanied by variations in tooth size and morphology (1),(2). Both environmental and genetic factors have been identified as major etiological contributors to hypodontia. This condition may occur as a non-syndromic anomaly or as part of syndromic conditions involving ectodermal tissues, such as ectodermal dysplasia. Non-syndromic hypodontia has been associated with autosomal dominant, autosomal recessive, or sex-linked inheritance patterns, with considerable variability in phenotypic expression among affected individuals (3).

Tooth development is a complex biological process that progresses through several sequential stages, including initiation, proliferation, histodifferentiation, and morphodifferentiation. Disturbances at any of these stages may result in anomalies affecting tooth number, size, shape, structure, color, or eruption. The initiation stage occurs during the seventh to ninth weeks of intrauterine life, when ectodermal epithelial thickening forms the dental lamina. Disruptions during this stage may lead to anomalies in tooth number, such as supernumerary teeth or tooth agenesis. During the proliferation stage, which occurs between the ninth and eleventh weeks of intrauterine life, the enamel organ continues to grow and differentiate into cap-shaped structures. Disturbances at this stage may similarly result in numerical anomalies, including hypodontia and agenesis (4).

Histodifferentiation, also known as the bell stage, begins around the fourteenth week of intrauterine life and is characterized by cellular differentiation of ameloblasts and odontoblasts, which are responsible for enamel and dentin formation, respectively. Alterations during this stage may cause structural and morphological defects such as enamel hypoplasia, amelogenesis imperfecta, dentinogenesis imperfecta, or taurodontism. Morfodifferentiation, occurring around the eighteenth week of intrauterine life, determines the final shape and size of the tooth crown. Disruption during this phase may lead to size and shape anomalies, including peg-shaped teeth, without necessarily affecting the structural integrity of enamel and dentin (5).

Radiographic examination in this case using panoramic imaging demonstrated the absence of the permanent successor of tooth 82, confirming the diagnosis of tooth agenesis. Additionally, the deciduous lateral incisor exhibited a long root without signs of physiological resorption, further supporting the diagnosis. Agenesis of permanent teeth most frequently involves the mandibular second premolars, maxillary lateral incisors, and maxillary second premolars. Studies conducted in various populations have consistently reported similar patterns of missing teeth, although differences in prevalence and tooth distribution may occur due to ethnic and genetic variability (6).

The literature has also examined whether congenital tooth absence occurs more frequently in unilateral or bilateral patterns. Some studies report a higher prevalence of unilateral hypodontia, while others indicate a greater frequency of bilateral involvement. These differences are often attributed to racial and genetic variations among populations. Previous reports have demonstrated a strong association between hypodontia and variations in tooth size and shape within affected families. Peg-shaped maxillary lateral incisors are frequently observed in

individuals with familial hypodontia, supporting the hypothesis that agenesis and morphological anomalies share common genetic determinants (8),(9).

In the present case, the presence of a similar dental anomaly in the patient's mother further supports a hereditary component. Familial aggregation of hypodontia and peg-shaped teeth has been widely documented, reinforcing the role of genetic inheritance in the etiology of these conditions. The coexistence of tooth agenesis and peg-shaped morphology highlights the importance of early diagnosis and long-term monitoring, particularly in pediatric patients, to facilitate timely intervention and optimize functional and esthetic outcomes.

CONCLUSION

Tooth agenesis is a developmental dental anomaly that is frequently associated with peg-shaped tooth morphology and may present early in pediatric patients without subjective symptoms. This case highlights that an accurate diagnosis of tooth agenesis accompanied by peg-shaped morphology requires a comprehensive diagnostic approach, including thorough subjective assessment with emphasis on family history, detailed clinical examination, and panoramic radiographic evaluation to confirm the absence of permanent tooth germ and assess related dental structures. The findings of this case emphasize that early and precise diagnosis plays a critical role in determining appropriate treatment planning and long-term management, particularly in preventing future esthetic and functional complications. Parental education is essential to enhance understanding of the etiology, hereditary nature, and potential impact of dental anomalies on the child's oral health and esthetic appearance in adulthood, thereby supporting informed decision-making and adherence to follow-up care. The primary limitation of this case report is its descriptive design involving a single patient, which restricts the generalizability of the findings and precludes broader epidemiological conclusions. Therefore, further studies involving larger sample sizes, genetic evaluation, and long-term follow-up are recommended to better elucidate the inheritance patterns, clinical progression, and optimal management strategies for tooth agenesis and associated morphological anomalies in pediatric dentistry.

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