Agenesis of premolar associated with submerged primary molar and a supernumerary premolar: An unusual case report

NIRMALA S. V. S. G., SANDEEP C., SIVAKUMAR N., BABU M. S., LALITHA V.

Abstract
The combination of submerged primary molar, agenesis of permanent successor with a supernumerary in the same place is very rare. The purpose of this article is to report a case of submerged mandibular left second primary molar with supernumerary tooth in the same region along with agenesis of second premolar in an 11-year-old girl, its possible etiological factors, and a brief discussion on treatment options.

Keywords: Agenesis, Infra occlusion, submerged primary molar, supernumerary premolar

Introduction
Agenesis of permanent teeth is the most common developmental dental anomaly. It is generally determined with autosomal dominant transmission and is associated with several other dental abnormalities.[1,2] The prevalence of agenesis varies from 5% to 10%, excluding third molars and it occurs mostly in second premolars and maxillary lateral incisors.[1,3,4] Researchers have indicated a relationship of 17% between agenesis and infraocclusion of primary molars.[5]

Submergence is a term defining a tooth that remains below the occlusal plane.[6] Dental ankylosis is thought to be a major etiological mechanism of submergence.[6,7] Studies reported the prevalence rates of submerged primary tooth to be from 1.3% to 8.9% of the population with significantly higher incidence between the siblings.[6,8]

Ankylosis is a well-established condition associated with the infraocclusion of primary molars. It involves fusion of cementum to alveolar bone.[9,10] Often at a microscopic level, any obliteration of the periodontal (PDL) ligament may remain undetected in conventional radiographs.[11] The mechanism of initiation of ankylosis is unknown,[12] but it is probably due to developmental disturbances in the periodontium.[10] Furthermore, changes in the distribution of epithelial cell rests of Malassez in the periodontium of anklosed primary molars are etiologically relevant to subsequent root resorption and ankylosis.[13] The combination of the absence of a permanent successor and infraocclusion of primary molars might affect not only alveolar bone growth, which stops in the submerged area, but also occlusal disturbances such as mesial tipping of the permanent first molar.[11,14]

Supernumerary teeth are described as those in excess when compared to the normal dental formula.[15] Their reported prevalence ranges between 0.1% and 3.8% in the permanent dentition, and between 0.3% and 0.8% in the primary dentition. Incidence of supernumerary premolars is reported to be 1 in 10,000 individuals. Several studies have been conducted in order to determine their prevalence. Rubenstein[16] reported 0.64% prevalence of supernumerary premolars. Grahnen and Lindahl[17] reported that mandibular premolar supernumeraries occur in 0.29% of the general population. The etiology of supernumerary teeth is unclear and various factors, namely genetic and environmental, have been suggested.[18] It may result from hyperactivity of the dental lamina, proliferation of dental lamina remnants or cell rests, or division of tooth germs.[19]

The following report describes the management of a patient with agenesis, infraocclusion, and supernumerary premolar.

Case Report
An 11-year-old South Indian girl came to the Department of Pediatric Dentistry, with chief complaint of extra tooth in the mandibular left posterior region since six months. Physical examination revealed no abnormalities and there was no relevant medical history. Clinical examination revealed a symmetric face, normal development of dentition except the mandibular left second primary molar. The teeth present were

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She had an Angle class I molar relationship. Lower left primary second molar was submerged and supernumerary tooth was present adjacent to it on the lingual side, which was showing grade III mobility [Figure 1] and was of supplemental type. The submerged tooth was tilted buccally due to the eruption of supernumerary tooth. The panoramic radiograph was taken to determine the presence and position of left mandibular second premolar and revealed that the mandibular primary left second molar was submerged in alveolar bone with root resorption and also congenitally missing second premolar [Figure 2], but mandibular right premolar and maxillary right and left premolars were present. The root of the supernumerary tooth was not completely formed.

Dental casts were made and analyzed. In view of the degree of root resorption of the retained primary teeth and severity of the infraocclusion, the patient was informed about the condition and treatment options were discussed. Oral prophylaxis was performed, the carious teeth were restored, and it was decided to extract the lower left primary second molar along with the supernumerary tooth. But, as the parent was not willing for the extraction of the submerged tooth, we could extract only the supernumerary tooth under topical anesthesia. The occlusion of the patient after extraction of the supernumerary tooth is presented in Figure 3.

Discussion

The prevalence of infraocclusion in the mandible is considerably higher than in the maxilla, which is in accordance with other reports. Several investigators have reported a higher prevalence for the primary second molar compared to the primary first molar. The following factors have been suggested for ankylosis: disturbance in the interaction between normal resorption and hard tissue repair which takes place in primary molars during eruption of successor teeth, deficient eruptive force and infection, or a deficient vertical alveolar bone growth.

The first primary molar showed higher prevalence of infraocclusion in children below 9 years of age, while after this age, the second primary molar predominated. Rygh and Reitan stated that root resorption of infraoccluded tooth occurred regardless of whether the permanent successor was present or not, which is in accordance with our report. This finding also indicates that infraocclusion is governed by intrinsic factors. Regarding the suggested influence of the permanent successor on root resorption, it is worth noting that infraoccluded primary molars with aplasia of the permanent successor also showed root resorption, in contrast to primary molars in normal positions with aplasia of the permanent successor, where a thicker cementum was seen instead of resorption. In children of 9 to 10 years of age, resorption might still start later. However, even the roots of primary teeth that do not have a permanent successor eventually resorb. The mechanism of resorption and variable resorption rates in different cases is largely unknown. Normally, the root is protected from resorption by the presence of a narrow PDL cell layer which is mainly composed of collagen fibers, fibroblasts, and cementoblasts. Degradation of PDL precedes root resorption and specifically removal of the collagen fibers of the PDL is considered a main
step in the initiation of this process. Collagen digestion is mediated by matrix-degrading enzymes such as the matrix metalloproteinases (MMPs) and their extracellular inhibitors, the tissue inhibitors of metalloproteinases (TIMPs). MMPs and TIMPs are produced by osteoblasts. PDL cells as well as by odontoclasts, and osteoclasts seem to play an important role in normal and pathologic bone and connective tissue turn over, as well as in physiologic root resorption process. In addition, it was found from a previous research that no primary molars in infraocclusion with agenesis of the successor exfoliated spontaneously, in contrast to primary molars for which the successor was present. However, our case showed resorption of primary molar. Till date, various causes were reported for submerged teeth. The most frequently stated cause of this phenomenon is ankylosis, i.e., the fusion of teeth with surrounding bone. A genetic input has also been suggested, based on observations in several members of the same family. The dental, medical, and family history of our patient did not contribute to explain the reasons for submergence. It is established in dental literature that the treatment plan of a submerged primary tooth depends on the degree of abnormality, the presence of its successor permanent teeth, and time of onset. The simplest classification of this abnormality can be described as slight, moderate, and severe, seems to be the most useful to the clinician in which “slight” is defined as between occlusal surface and the proximal contact. “Moderate” being within the occlusal, gingival dimensions of the inter-proximal contact points and “severe” being anywhere below the interproximal contact point. The related tooth of our patient remained “slight.” It was a slight submergence case and the treatment was planned based on the findings.

Mandibular premolar supernumeraries have been reported as 6.6%, 9.2%, and 14% of all supernumeraries. The wide variation in percentage reported can be attributed to variations in size of study, age range, racial composition, and methods of detection.

The combination of infraocclusion of primary molars and agenesis of the permanent successors is rare and that with supernumerary premolar is very rare. Delaying extraction increases the risk of additional alveolar bone loss, and one of the consequences of long-standing and untreated infraocclusion of the primary molar is over eruption of the opposing teeth. In this case, parent was not willing for extraction of submerged lower left second primary molar. Based on genetic studies, it is evident that agenesis is a heterogeneous trait and that several mutated genes are responsible for this anomaly. Studies of odontogenesis at the molecular level, mostly with mouse teeth as models, indicate that the development of teeth is under strict genetic control, which determines the position, number, and shape of different teeth. Once agenesis of permanent teeth is detected, it is necessary to confirm the congenital absence of other permanent teeth, but it was not found in this case. Similarly, several theories, including atavism, dichotomy, hyperactivity of dental lamina, and the concept of multifactorial inheritance, have been proposed to explain the etiology of supernumerary teeth.

Several techniques can be used for patients who have no permanent successors, if the submerged tooth has adequate crown exposure, and sufficient root length to be maintained for many years as a functional unit in the dental arch. The submerged tooth can be extracted and orthodontic therapy can be used to create ideal occlusion and arch integrity. In patients whom orthodontic therapy is not indicated or has not been undertaken, other procedures have been commonly used. The submerged tooth can be extracted and removable or fixed space maintainer can be placed to restore proximal and occlusal function until such time as a fixed partial dental prosthesis is indicated. When the submerged tooth has been retained until or near maturity, the anatomic crown form, occlusion, and proximal contacts can be restored with a gold casting stainless steel crown, acrylic resin crown, all ceramic or composite resin crown, or composite resin with amalgam.

According to the literature and based on the morphology of the tooth, this case may be considered as agenesis of premolar associated with submerged primary molar and a supernumerary premolar.

Conclusion

The main purpose of submerged primary molars with successors is to allow the normal eruption of the successor. The first decision is to determine the time of onset. Late-onset cases usually are in a slight infraocclusion; hence, treatment objectives are focused on the exfoliation of the submerged tooth. Early-onset cases are divided into those diagnosed early and those diagnosed late. Late diagnoses of early-onset conditions are likely to present with tipped adjacent teeth, supra-eruption of the antagonist, and therefore indicate orthodontic intervention followed by extraction. Thus, whenever a tooth is congenitally missing, an early diagnosis is vital to provide adequate treatment and to prevent malocclusion, particularly if agenesis occurs in association with another dental defect.

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