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ORIGINAL ARTICLE

Comparison of the dental anomaly frequency in patients with and without mandibular second premolar agenesis

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Abstract *Background/purpose:* There is remarkably little information in the literature comparing the prevalence of dental anomalies associated with mandibular second premolar (MP2) agenesis with control groups. The aim of the present study was to investigate the frequency of dental anomalies associated with agenesis of the MP2, and to compare the results with control groups.
Materials and methods: A total of 4812 panoramic radiographs (also called orthopantograms, OPGs) and dental casts were used to assess the presence of MP2 agenesis and 245 patients (age range: 11–18 years) with MP2 agenesis were included in the study. OPGs and dental casts were used to assess the presence of the following dental anomalies: (1) tooth agenesis excluding third molars; (2) third molar agenesis; (3) supernumerary teeth; (4) taurodontism of permanent teeth; and (5) microdontia of maxillary lateral incisors.
Results: The prevalence of MP2 agenesis was found to be 5.1% (245/4812) with no statistical sex difference ($P = 0.209$). The prevalence of tooth agenesis excluding the third molars ($P < 0.05$), third molar agenesis ($P < 0.05$), taurodontism ($P < 0.001$), and microdontia of maxillary lateral incisors ($P < 0.05$) were significantly greater in patients with agenesis of MP2.
Conclusion: Tooth agenesis, microdontia of maxillary lateral incisor, and taurodontism are frequently associated with agenesis of MP2 as compared with a well matched control group and different populations.

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Introduction

Hypodontia, which is a common dental anomaly, can causes poor aesthetics, functional problems, and some oral health problems, such as food packing. Genetics play a fundamental role in the etiology of the condition.[1] Several studies have suggested that around half of the relatives of children with hypodontia presented with tooth agenesis and identified a mutation in gene *MSX1* on chromosome 4p in families with agenesis of all second premolars and third molars.[2,3] Several studies have been published of the prevalence of hypodontia in general[4–7] and in pediatric populations in particular.[8–10]

The data for hypodontia, excluding the third molar, in both sexes combined, varies from 0.3% in the Israeli population[11] to 11.3% in the Irish population.[12] This anomaly was found to be more commonly present in orthodontic populations.[13–16] The mandibular second premolar (MP2) is clearly the most frequently absent tooth excluding third molar agenesis,[8–10,17] followed by the maxillary lateral incisor and the maxillary second premolar. The reported prevalence of agenesis of the MP2 ranges from 1.55% to 2.41%.[15,17]

Tooth agenesis is often associated with other dental anomalies, such as taurodontism, microdontia, and delayed dental development.[18–20] These dental anomalies commonly appear together in the same patient; one possible explanation is that a single genetic defect causes a series of different phenotypic expressions. Celikoglu et al[21] found that patients with third molar agenesis had an increased prevalence of agenesis of other permanent teeth, microdontia of the maxillary lateral incisors, and total dental anomalies. Previous studies[22,23] have reported a high degree of association in the occurrence of agenesis of premolars, microdontia of maxillary lateral incisors, and enamel hypoplasia and infraocclusion of deciduous molars, suggesting that these anomalies present a common genetic etiology.

Although recent studies[21,24–26] have reported associations between tooth agenesis and some other dental anomalies, to our knowledge, no study has compared the frequency of dental anomalies between the patients with and without MP2 agenesis. Thus, there is remarkably little information in the literature comparing the prevalence of other dental anomalies associated with MP2 agenesis with the prevalence of those anomalies in general populations and in control groups without MP2 agenesis.

The aim of this study was, therefore, to investigate the frequency of associated dental anomalies such as hypodontia, supernumerary teeth, taurodontism, and microdontia in children with agenesis of the MP2, and to compare the results with the published data in different populations and normal case controls including patients without MP2 agenesis.

Materials and methods

The clinical records [case histories and panoramic radiographs or orthopantograms (OPGs)] of the patients referred to the Departments of Pediatric Dentistry and Orthodontics, Erciyes and Karadeniz Technical Universities were used to determine agenesis of MP2. If an accurate diagnosis of the agenesis could not be made from these records, the patient was excluded from the study (2 patients). All patients in this study were Caucasian and were free from developmental anomalies such as a cleft lip or palate, Down's syndrome, or ectodermic dysplasia. To reduce radiographic misinterpretation, teeth with blurred images (3 images) were not included in the study. Finally, the data of 4812 patients were included in the study.

A total of 245 children and adolescents with agenesis of MP2, between 11 and 18 years of age, were included in the study. For every patient with hypodontia, a case-control individual matching for sex and age to within 0.5 years was randomly selected from the archive of the department (Table 1). OPGs and dental casts were used to assess the presence of the following dental anomalies: (1) tooth agenesis excluding third molars; (2) third molar agenesis; (3) supernumerary teeth; (4) taurodontism of permanent teeth; and (5) microdontia of maxillary lateral incisors.

The critical age of 14 years was considered to be the point of confirmation of the absence of third molars.[27,28] This criterion was used to restrict the sample for evaluation of third molar agenesis to only those with diagnostic records from 14 years of age onwards. A third molar was classified as missing when there was no evidence in the records that it had been extracted and when there was no sign of mineralization of the third molar tooth crown on the OPGs.[21] The maxillary lateral incisor was considered as presenting microdontia when the maximum mesiodistal crown diameter was smaller than the same dimension of the opposing mandibular lateral incisor in the same patient. Permanent mandibular first molars were employed for assessment of taurodontism in this study, because it has been established that these teeth are minimally distorted on the OPGs. To assess taurodontism, the crown body and root lengths of both permanent mandibular first molars in every patient were measured, using the method of Seow and Lai.[29] Supernumerary tooth was defined as the existence of an excessive number of teeth relative to the normal dental formula (32 in the permanent dentition).[30]

All radiographs were reviewed and discussed by the panel in a negatoscope for the presence of MP2 agenesis and associated dental anomalies. The data were analyzed with Pearson Chi-square test and the prevalence of MP2 agenesis in the study sample was compared with control group and published data.[2,20,30–32] The Statistical Package

Table 1 Demographics of children with mandibular second premolar agenesis (MP2) and the control groups.

Individual groups	Sex[a]	*N*	Age (yr)	
			Mean ± SD	Range
Children with agenesis of MP2	Girls	136	13.7 ± 2.66	11.3–17.9
	Boys	109	12.3 ± 1.35	11.0–17.5
Control groups	Girls	136	13.5 ± 2.59	11.1–17.7
	Boys	109	12.5 ± 1.42	11.0–17.6

N = number; SD = standard deviation.
[a] No statistically significant difference in the distribution of MP2 agenesis between sexes.