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ORIGINAL ARTICLE

Clinical features of hypodontia and associated dental anomalies: a retrospective study

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OBJECTIVE: Hypodontia is the most commonly known developmental dental anomaly in man. This paper aims to investigate the characteristics of tooth absence and associated dental anomalies among the patients attending our paediatric dentistry clinic.

SUBJECTS AND METHODS: For this study, 192 patients aged between 1 and 18 years with congenitally missing teeth were selected among the patients who attended the Department of Paediatric Dentistry of Süleyman Demirel University between January 2000 and December 2003. Clinical and radiographic examinations were performed by two dentists in order to detect the missing teeth.

RESULTS: We determined 503 congenitally missing teeth in 192 patients (male = 93, female = 99), excluding third molars. Twelve of these teeth were deciduous and 491 were permanent. A higher incidence of missing teeth was observed in girls than boys, in mandibular arch than maxillary and on the right side than left side. However the differences between arches and sides were not statistically significant in both sexes.

CONCLUSION: The diagnosis of the hypodontia should be performed as early as possible, thus alternative treatment modalities can be planned and performed in a multidisciplinary team approach, in order to establish an aesthetic and functional dentition in the future.

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Keywords: hypodontia; children; incidence

Introduction

Hypodontia, agenesis of one or more teeth, is a common trait in modern populations and it is often encountered by dental practitioners (Jorgenson, 1980). Lack of one or a few permanent teeth without any systemic disorders is the mildest and the most common phenotype. Although tooth agenesis is occasionally caused by environmental factors, in the majority of cases, hypodontia has genetic bases. It is more common among individuals related to hypodontia patients than in general population (Arte, 2001).

Dhanrajani (2002) classified hypodontia according to the severity of the condition. The term 'mild-to-moderate hypodontia' is used to denote agenesis of two to five teeth, while the absence of six or more teeth, excluding the third molars, indicates 'severe hypodontia'. 'Oligodontia' is the absence of multiple teeth, usually associated with systemic disorders.

The occurrence of hypodontia in the permanent dentition is relatively common, showing prevalence of 3.5–6.5% in the majority of the population (Zhu *et al*, 1996; Caldo-Teixeira and Puppin-Rontani, 2003; Stephen and Cengiz, 2003). There is a variation in the literature about different ethnic groups; in African Negroes and Australian aborigines the prevalence is 1%, but can be as high as 30% in Japanese people. Except third molars, the most affected teeth are second premolars and lateral incisors (Nunn *et al*, 2003). In a survey conducted by Muller *et al* (1970), the authors found that girls had a higher incidence of congenitally missing permanent teeth than boys. In the deciduous dentition the hypodontia prevalence is lower, approximately 1%, not considering the gender (Zarrinnia and Bassiouny, 2003).

Patients referred to dental clinics later than the others, may have psychological, aesthetic and functional problems related to hypodontia. For example, missing lateral incisors may cause diastemas in the anterior region. Thus, the concept of early diagnosis of these patients becomes more important.

The aim of this study is to investigate the characteristics of tooth absence and associated dental anomalies among the patients attending to or referred to our paediatric dentistry clinic.

Subjects and methods

For this study, 192 patients aged between 1 and 18 years (mean ± s.d.; 11.6 ± 3) with congenitally missing teeth were selected among the patients who attended the

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Department of Paediatric Dentistry of Süleyman Demirel University due to dental caries and/or dental pain complaints, between January 2000 and December 2003. Clinical and radiographic examinations were performed by two dentists in order to detect the missing teeth. Panoramic radiographs were taken especially of the patients who had wide diastemas and persistent deciduous teeth. Periapical radiographs were also taken where indicated. Patients with cleft lip/palate or any syndrome were recorded as a different group. Patients with doubtful diagnosis, such as having tooth or teeth lost because of trauma or extraction, were excluded from the study.

Missing teeth were evaluated according to their types, localizations in dental arches and the dentitions they belong to. Patients were evaluated according to age, gender and their familial histories about missing teeth. Other teeth present in the oral cavity were examined for the probability of microdontia, taurodontism, pulp stone and late maturation and development.

Taurodontism was registered in maxillary and mandibular first and second molars according to Mena (1971). Peg-shaped lateral incisors were registered when the incisal mesio-distal width of the tooth crown was shorter than cervical (Bäckman and Wahlin, 2001). Retained deciduous primary molars with no permanent successors were examined for the presence of root resorption and infraocclusion. Amount of root resorption was determined in per cent according to Haselden *et al* (2001). Treatment alternatives were grouped because of the severity of hypodontia.

The data were subsequently processed and analysed using the SPSS statistical software package (SPSS for Windows, Version 10.0, SPSS Inc., Chicago, IL, USA). Chi-square test and Pearson Correlation tests were employed to compare qualitative data and determine the statistical significance. The level of statistical significance was set at $P < 0.05$.

Results

In this study, we determined 503 congenitally missing teeth in 192 patients (male = 93, female = 99), excluding third molars. Twelve of these teeth (2.4%) were deciduous and 491 (97.6%) were permanent. The number of missing teeth per child was 2.6 and it was observed that the range varied from 1 to 15 missing teeth.

The range of age of the study population varied from 1 to 18 years with a mean age of 11.6 (± 3). A higher incidence of missing teeth was observed in girls (52%) than boys (48%), in mandibular arch (51%) than maxillary (49%) and on the right side (51%) than left side (49%) (Table 1). However the differences between arches ($x^2 = 2.423$ $P = 0.120$) and sides ($x^2 = 0.270$ $P = 0.603$) were not statistically significant in both sexes.

Dhanrajani's (2002) classification for hypodontia was used in classification of patients with missing teeth. The most frequently observed number of missing teeth was two to five teeth in 107 patients (55.8%) categorized as mild to moderate hypodontia, followed by single tooth absence in 67 patients (35%) and six or more absent teeth in 18 patients (9.2%) categorized as severe hypodontia (Table 2). There was no significant relationship between the severity of hypodontia and gender ($x^2 = 0.492$ $P = 0.782$).

The third molars were the most affected teeth (38.4%). The total number of missing third molars was 321 and 170 (53%) of them were in the maxillary arch and 151 (47%) in the mandibular arch, in patients aged above 9 years. Third molars were followed by the lower second premolars (17.7%), upper lateral incisors (14.7%) and upper second premolars (9.3%).

There were only 12 missing deciduous teeth and it was observed that all of them belonged to male patients. In one patient who had missing deciduous teeth, there were no permanent successors. Missing teeth in relation to gender and affected tooth types are presented in Figure 1.

Most of the teeth were missing bilaterally (73.2%). Thus, 184 tooth pairs (=368) were absent and 135 teeth were absent unilaterally, except third molars (Figure 2).

On clinical and radiographic examinations of the teeth in the oral cavities, 28 patients (14.5%) with microdontia and 21 patients (10.9%) with taurodontic first permanent molar teeth were observed. Thirty-four patients reported that there were individuals who have

Table 1 Frequency of missing teeth in relation to side and arches

	Jaw (%)			*Side (%)*		
	Maxillary	*Mandibular*	*Total (%)*	*Right*	*Left*	*Total (%)*
Permanent teeth	245 (48.70%)	246 (48.90%)	491 (97.61%)	253 (50.29%)	238 (47.31%)	491 (97.61%)
Deciduous teeth	5 (0.99%)	7 (1.39%)	12 (2.38%)	7 (1.39%)	5 (0.99%)	12 (2.38%)

Table 2 Distribution of patients due to severity of hypodontia

	Single tooth absence	*Mild to moderate hypodontia*				*Severe hypodontia*							
Number of missing teeth	1	2	3	4	5	6	7	8	9	11	12	14	15
Number of patients	67	77	10	18	2	2	2	6	1	1	2	2	2
Total	67 (35%)	107 (55.8%)				18 (9.2%)							

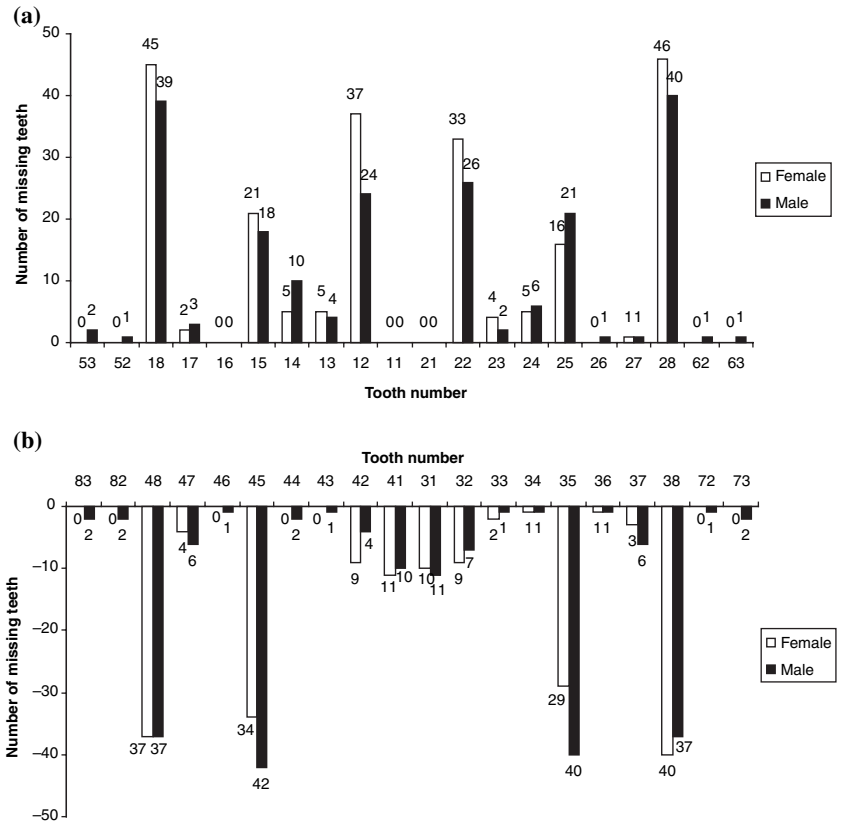

Figure 1 (**a**) Distribution of maxillary missing teeth in relation to gender and affected tooth types. (**b**) Distribution of mandibular missing teeth in relation to gender and affected tooth types

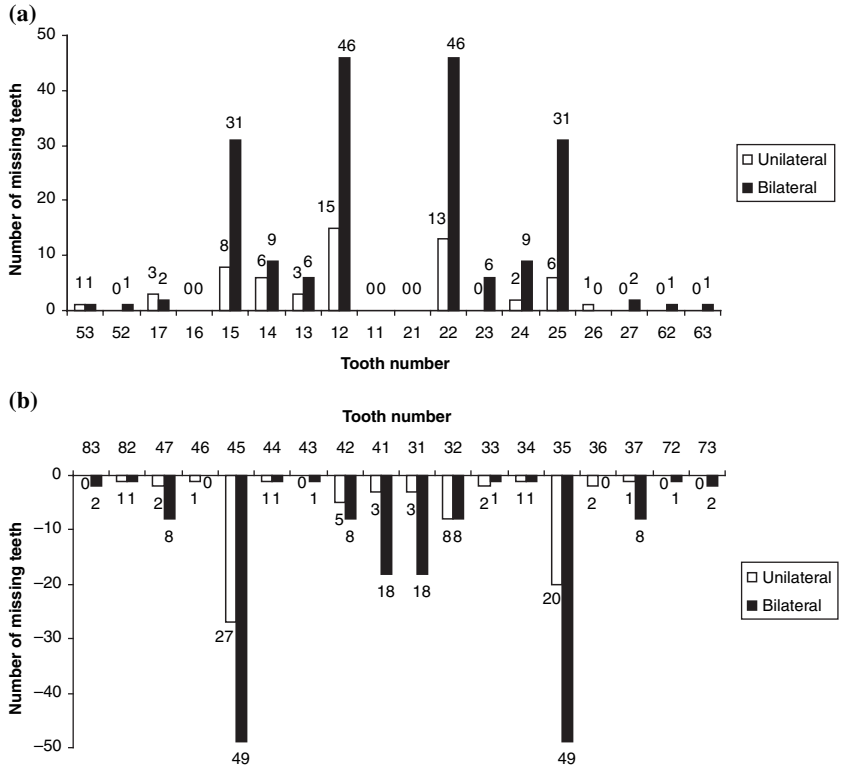

Figure 2 (**a**) Distribution of maxillary missing teeth in relation to their symmetrical situations in dental arches. (**b**) Distribution of mandibular missing teeth in relation to their symmetrical situations in dental arches

congenitally missing teeth in their family. We determined 26 peg-shaped lateral incisors in 20 patients with hypodontia, and the majority of those peg-shaped lateral incisors (17, 85%) were observed in female patients. These and other findings about microdontia, taurodontism, pulp stone, late maturation and

Table 3 Dental findings of the other teeth present in the oral cavity of hypodontic patients and distribution according to gender

	Female (%)	*Male (%)*	*Total (%)*
No. of patients with microdontia	18 (9.3%)	10 (5.2%)	28 (14.5%)
No. of patients with taurodontic molars	5 (2.6%)	16 (8.3%)	21 (10.9%)
No. of patients that have pulp stone in permanent molars	9 (4.6%)	4 (2.0%)	13 (6.6%)
No. of patients that have late maturated or developed permanent teeth	14 (7.3%)	21 (10.9%)	35 (18.2%)
No. of patients that have infraoccluded deciduous molars	6 (3.1%)	10 (5.2%)	16 (8.3%)
No. of patients that have peg-shaped lateral incisors	17 (8.9%)	3 (1.5%)	20 (10.4%)

development, infraocclusion and peg-shaped lateral incisor and their distributions according to gender are given in Table 3.

There were 249 persistent deciduous teeth in 119 patients with hypodontia and a statistically significant positive correlation was found between number of missing teeth and number of persistent deciduous teeth ($r = 0.792$ $P = 0.0001$).

The difference between the amount of root resorption of the persistent deciduous teeth and presence or absence of their permanent successors were also statistically significant ($x^2 = 47.837$ $P = 0.0001$) (Figure 3).

Infraocclusion was observed in 32 of 249 deciduous teeth with no permanent successors.

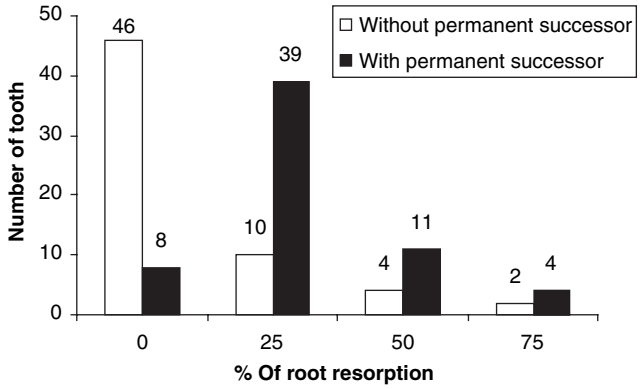

Figure 3 Root resorption ratios of persistent deciduous teeth and their contralateral teeth and distribution according to they have a permanent successor or not

Table 4 The number of missing teeth of patients with systemic disorders or syndromes

	Systemic disorder or syndrome	*Number of missing teeth*
Patient no. 1	Epilepsy, infantile spasm	8
Patient no. 2	Mental retardation	4
Patient no. 3	Trisomy 14	2
Patient no. 4	Spina bifida	2
Patient no. 5	Atrial septal defect	1
Patient no. 6	Epilepsy, diabetes mellitus, hyperthyroidism	2
Patient no. 7	Erythroblastosis fetalis, cleft lip/palate	2
Patient no. 8	Cleft lip/palate	8
Patient no. 9	Cleft lip/palate	4
Patient no. 10	Cleft lip/palate	2
Patient no. 11	Cleft lip/palate	1

There were 86 taurodontic molar teeth (male = 66 female = 20) in 21 patients with hypodontia and the difference between gender and the number of taurodontic molars was statistically significant ($x^2 = 8.480$ $P = 0.037$).

We determined 36 missing teeth in 11 patients who had cleft lip/palate or any syndrome and 15 of those missing teeth were observed in cleft lip/palate cases (Table 4).

Discussion

Hypodontia is an anomaly that may result in dental malpositioning, periodontal damage, lack of development of maxillary and mandibular bone height and has significant psychological, aesthetic and functional consequences. Knowledge of the condition may contribute to the development of more effective therapy (Silva Meza, 2003).

In the present study, bilateral hypodontia (73.2%) was more common than unilateral hypodontia and this was in agreement with the findings of Silva Meza (2003) and Rasmussen (1999) who have reported that 75% of 385 missing teeth and 87.9% of 332 missing teeth respectively, were bilateral. Moreover, in this study we found that there were more missing teeth in mandibular arch (50.3%) than maxillary arch (49.7%) while Silva Meza and Rasmusen reported maxillary arch predominance as 55.2 and 52.1%, respectively. Salama and Abdel-Megid (1994) also reported that maxillary missing teeth (52%) were more common than mandibular teeth (48%).

Female:male ratio of the patients studied was 10:9, while in their study with 249 patients and 356 orthopantomographs, Haselden *et al* (2001) have reported this ratio as 3.4:2.

In some of the previous studies, the most affected teeth were reported as maxillary lateral incisors, followed by mandibular second premolars or maxillary second premolars, excluding third molars (Zhu *et al*, 1996; Silva Meza, 2003). Unlike in this study where mandibular second premolars, followed by maxillary lateral incisors, were the most affected teeth. This may be caused by the fact that second premolars are the latest developing ones in the segment. Absence of maxillary central incisors, maxillary and mandibular first molars and canines seemed to be very rare in our study, confirming the data in the literature (Dhanrajani, 2002; Zarrinnia and Bassiouny, 2003).

Although some studies (Brook, 1984; Mckeown *et al*, 2002), have shown an association between hypodontia

and microdontia, this relationship was not statistically significant in the present study ($P = 0.145$).

Zhu *et al* (1996) reported that 10.8% of the mandibular first molars of the patients with severe hypodontia showed taurodontism. In the present study it was 10.9% for the maxillary and mandibular, first and second molar teeth.

Similarities or differences between our findings and the findings of the previous studies on hypodontia may be partly a result of the methodology applied or because of typical genetic factors in different ethnic groups among the samples studied (Nunn *et al*, 2003).

Primary teeth that have no permanent successors may be ankylosed or infraoccluded. Beside this, root resorption of these teeth will be less than of those with permanent successors (Haselden *et al*, 2001). Before the choice of treatment is made, the practitioner should decide whether to extract present deciduous teeth and maintain to the space until prosthetic rehabilitation, or keep those teeth in the oral cavity until their root resorptions become more severe.

The majority of the hypodontic patients were in mild-to-moderate group. Treatment modalities performed for these patients may be easier than of those with more severe hypodontia. In cases of infraocclusion, these persistent deciduous teeth were restored with an occlusal composite resin onlay. Peg-shaped lateral incisors were restored with composite resin and strip crowns to obtain a much more aesthetic appearance. In severe hypodontia cases, overdenture prostheses were provided to allow the retention of retained primary teeth. Active removable appliances were used for space redistribution of the cases with tipped adjacent teeth. There were 12 patients who could not be treated because of the patients' and parents' lack of interest. In the case of maxillary lateral tooth absence, no treatments were performed (20 of 192 patients) and mesial eruption of the upper canine tooth was allowed by considering the occlusion, age of the patient and the number of the missing teeth. Routine controls of these patients and spontaneous closure of the space were planned. Although dental implants have been reported as established alternatives for replacing missing teeth (Bergendal *et al*, 1991; McMillan *et al*, 1998), there are studies showing disadvantages and complications of implants when placed in a growing child (Oikarinen *et al*, 2003; Op Heij *et al*, 2003). For this reason dental implants were not preferred as a treatment option in this study.

According to some authors (Carter *et al*, 2003) in the case of maxillary lateral incisor absence, the canine tooth will erupt mesially and satisfactory appearance following closure of both upper lateral incisor spaces will be possible. On the contrary, some other authors (Caldo-Teixeira and Puppin-Rontani, 2003) recommend maintaining the space until prosthetic rehabilitation, or opening the space where there is little or no crowding. Treatment of these patients with space closure or space opening depends on several parameters, i.e. growth pattern (vertical, sagittal), crowding or spacing in the dental arch, marginal bone level, midline deviation, asymmetry of the dental arch.

It was disappointing that the majority of the hypodontic patients who attended our clinic were not aware of their missing teeth. Dental caries and/or dental pain were the major causes for seeking dental care. There were only five patients who attended because of aesthetic problems (e.g. diastemas). It has been proven that in the majority of cases hypodontia has a genetic base and this anomaly may arise as a familial condition which may appear in two or three generations (Stimson *et al*, 1997; Kau *et al*, 2003). Dental practitioners should be aware of the importance of detailed medical and dental history for all patients, as congenitally missing teeth are common. Clinical and radiographic examinations of patients with familial history of hypodontia should be done in order to detect missing teeth, especially in early ages. Parents should also be informed that hypodontia is a familial condition and the children of parents who have missing teeth are at risk of hypodontia.

Crucial to a successful outcome for these young patients is good communication both between professionals including paediatric dentists, orthodontists and prosthodontists in an interdisciplinary team, and also with patient/parents/carers.

Conclusion

Early introduction of children to the dentist enables the early detection of missing teeth in addition to other dental problems. The results of this study confirm that by early detection of the problem, alternative treatment modalities can be planned and performed with a multidisciplinary team approach, in order to establish an aesthetic and functional dentition in the future and to minimize the complications of hypodontia.

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