

Prevalence of teeth number anomalies in orthodontic patients

Giedrė Trakinienė, Monika Ryliškytė, Aurelija Kiaušaitė

SUMMARY

Objectives. The purpose of this study was to determine if the prevalence of teeth number anomalies (TNA) is more frequent in orthodontic patients than in common population and what is TNA clinical manifestation.

Material and methods. The records of 824 orthodontic patients (average age 15.22 years) from Orthodontic Clinic of Lithuanian University of Health Sciences were analyzed. The radiographs were analyzed by trained observer who followed a pre-established protocol: general observation of the teeth including third molar, followed by a systematic analysis of the erupted and unerupted teeth number in each quadrant. Descriptive statistics were performed for the study variables. A chi-square test was used to determine the difference in the prevalence of hypodontia between the genders. A value of $P < 0.05$ was considered significant.

Results. The prevalence of hypodontia was 17.11 percent with no statistically significant difference between the genders ($P > 0.05$). More frequently teeth were missing in the lower jaw: in the upper jaw – 10.3%, in the lower – 12.5% without statistically significant difference. Unilateral occurrence of dental agenesis was 1.5 times more common than bilateral occurrence. If more than one tooth was missing, usually other missing tooth was in the same group and in the same jaw. The upper and lower third molars were the most frequently missing teeth, followed by the mandibular second premolar. The prevalence of hyperdontia was 0.85 percent. Mesiodens was the most frequently found supernumerary tooth.

Conclusions. It was found, that 17.96% of orthodontic patients had teeth number anomalies. The upper and lower third molars were the most frequently missing teeth, followed by the mandibular second premolar. Hypodontia occurred more frequently than hyperdontia. Mesiodens was the most frequently found supernumerary tooth. The results confirm that TNA are more often found in orthodontic patients and these patients should be treated with multidisciplinary approach.

Key words: hypodontia, hyperdontia, congenitally missing teeth, third molars.

INTRODUCTION

Understanding of orthodontic patients dento-orofacial genetics and their impact on diagnosis, prevention, and therapy are becoming integral parts of health care. Disturbances during the early tooth

developmental stages may result in congenital absence of one or more teeth. If there is one or more missing tooth in quadrant or a supernumerary one, the need of treatment is very great according to The Index of Orthodontic Treatment Need (IOTN) (1). Patients with tooth number anomalies usually require extensive complex treatment with lifelong maintenance. Recent investigations have diagnosed increasing frequency of agenesis in permanent dentition. This anomaly is increasing over the years in the human dentition (2).

Hypodontia is the congenital absence of one to six teeth (Figures 1, 2). In this study we included third molars. Hypodontia is the most common

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developmental anomaly in man (3). A strong correlation exists between hypodontia in primary and permanent dentitions (4).

Oligodontia refers to the absence of more than six teeth, while in anodontia cases there is complete absence of the teeth. Dental agenesis more frequently affects permanent rather than primary dentition (4-6).

Supernumerary teeth are a developmental anomaly in the dental arches and it may occur in any region (Figure 3). The presence of single supernumerary tooth in permanent dentition is usually seen in the anterior maxilla (4, 7). Supernumerary teeth are named according to the region where they are. Mesiodens is typically located between the two central upper incisors (7).

Hypodontia in combination with hyperdontia (hypohyperdontia) is a condition of mixed numeric variation in the human dentition (8).

Dental anomalies are caused by many reasons. Atavism, dichotomy, hyperactivity of the dental lamina, and the concept of multifactorial inheritance, have been proposed to explain the etiology of this condition, but still etiology is unknown (10). Complex interactions between genetic, epigenetic and environmental factors during the long process of dental development can cause failure of tooth development (4, 9).

Environmental influences such as trauma, infections, radiation, drugs, and hormonal influences have been suggested as possible insults that might have impinged on tooth formation during the embryologic stages of dental development (10). Interplay between genetic and environmental influences during the process of odontogenesis can lead to a range of anomalies of tooth number and size, including hypodontia, supernumerary teeth, microdontia and megadontia (11).

The important role of genetics has been increasingly recognized in recent years with respect to the understanding of dental anomalies, such as tooth agenesis. Identification of genetic mutations in families with tooth agenesis or other dental anomalies will enable preclinical diagnosis and permit improved orthodontic treatment (5). In addition, the different polymorphisms might be a cause of differences in the prevalence of dental agenesis among racial populations (5, 12). Mostly oligodontia is related with syndromic patients, for example, ectodermal dysplasia.

The etiology of supernumerary teeth is still unknown and there are some theories: this problem seems to be caused by genetic or environmental factors (7). In many cases, supernumerary teeth,



Fig. 1. Congenitally missing maxillary lateral incisors



Fig. 2. Hypodontia of mandibular second premolars



Fig. 3. Mesiodens

such as mesiodens, have recurrence within the same family (4, 7). Multiple supernumeraries are found in less than 1 percent of patients. It is part of a pathological syndrome disease in most cases. Supernumerary teeth are found relatively often in cleft lip and palate, dysostosis cleidocranialis or Gardner syndrome .

Some tooth types are more frequently congenitally missing than others. Studies have reported that the prevalence of congenital absence of permanent teeth varies from 3% to 11% among European and Asian populations (13). The prevalence of teeth number anomalies is different between studies. The prevalence of hypodontia was higher in Europe (males 4.6%; females 6.3%) and Australia (males



Fig. 4. Congenitally missing maxillary lateral incisors



Fig. 5. Congenitally missing maxillary left second premolar



Fig. 6. Supernumerary tooth in premaxilla – mesiodens

5.5%; females 7.6%) than in North American Caucasians (males 3.2%; females 4.6%). These differences could be related to sample selection, but it is also possible that different populations vary due to genetic variability and/or different exposure to environmental factors (14). After the third molars, the second premolars have the highest incidence (5%) of congenital absence (Figures 4, 5).

Oligodontia is therefore a relatively rare condition, probably affecting about 0.1-0.2% of the population (15).

Most supernumerary teeth are in the premaxillary region. Mesiodens is the most frequent supernumerary tooth, which is usually small and conical, between 2 maxillary incisors (Figure 6). This is

generally followed by maxillary lateral incisor, maxillary fourth molar, and mandibular third premolar supernumeraries. Maxillary premolar and mandibular fourth molar are the least common ones (7). Supernumerary teeth may appear in both dentitions, but they are usually seen in the permanent dentition. Supernumerary premolars constitute approximately 10% of the total supernumerary cases, and almost 75% of those are in the mandible (16).

The purpose of this study was to find out if the prevalence of teeth number anomalies is more frequent in Lithuanian orthodontic patients than in common population and what is TNA clinical manifestation: its occurrence in relation to gender, location and pattern of distribution in the maxillary and mandibular arches, right and left sides.

MATERIALS AND METHODS

824 records of orthodontic patients before orthodontic treatment between 10 and 39 years of age (average age 15.22 ± 4.82 years) from Orthodontic Clinic of Lithuanian University of Health Sciences Kaunas Clinics over a period of 3 years (2007-2010) were analyzed. Orthopantomograms (OPTG), study models, and an-

amnestic data were examined for evidence of teeth number anomalies (TNA). 67.1% were females (553 patients) and 32.9% males (271 patients). Patients who had syndromes, teeth extractions, trauma and fractures were excluded. OPTG of each patient were analyzed by trained observer who followed a pre-established protocol: general observation of the teeth, followed by a systematic analysis of the erupted and unerupted teeth number in each quadrant including third molar. The radiographs were evaluated twice by the same observer with 2 week interval. There were no statistical differences between findings in OPTG found by the same observer in different time intervals. The descriptive statistics were performed for the study variables. A chi-square test was used to determine the difference in the prevalence of

hypodontia between genders. A value of $P < 0.05$ was considered significant.

RESULTS

The total percentage of TNA was 17.96%. The prevalence of hypodontia was 17.11% and hyperdontia was 0.85%.

Hypodontia was more frequently found in females (12.26% females and 4.85% males) but the difference wasn't statistically significant (Figure 7). More frequently teeth were missing in the lower jaw (in the upper jaw – 10.3%, in the lower – 12.5%) without statistically significant difference (Figure 8). Hypodontia in the upper jaw on the right side (9.0%) was more common than on the left side (6.4%; $p = 0.048$). Hypodontia in the lower jaw was almost the same in both sides (right – 9.3% and left – 9.0%). Half of the patients with hypodontia had only 1 missing tooth, others had 2 or more missing teeth (Figure 9). Unilateral occurrence of dental agenesis was 1.5 times more common than bilateral occurrence. If more than one tooth was missing, usually other missing tooth was in the same group and in the same jaw. The upper and lower third molars were the most frequently missing teeth, followed by the mandibular second premolar (Figure 10, 11).

The prevalence of hyperdontia was 0.85 percent (0.73 percent males and 0.12 percent females), but the difference was not statistically significant, according to small number of cases. Mesiodens was the most frequently found supernumerary tooth (0.73 percent).

DISCUSSION

In studies about TNA in orthodontic patients hypodontia and hyperdontia were more frequent than in the common population. The prevalence of hypodontia varied from 6 to 15% and was higher in orthodontic patients in Hungary, Slovenia and Japan (17-19). In all these studies third molars were excluded. In our study prevalence of hypodontia was more often seen, because we included third molars. In Lithuanian orthodontic patients prevalence of hypodontia without wisdom teeth was about 8% and it corresponds with findings in Yildiray Sisman and Gomes R. studies. All authors agree that there is no statistically significant difference of hypodontia between the genders.

The location of missing teeth differs in all studies. Some authors found that hypodontia appears equally in both jaws; others confirm that the number of missing teeth was greater in the mandible than

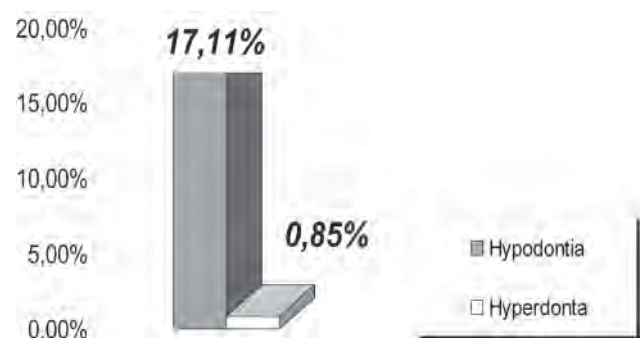


Fig. 7. The prevalence of hypodontia and hyperdontia in orthodontic patients

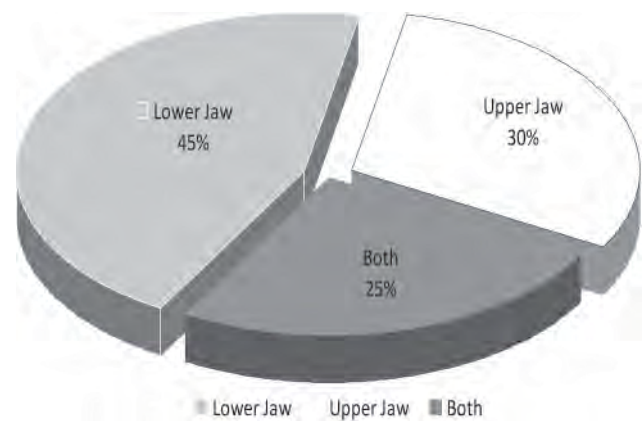


Fig. 8. Prevalence of hypodontia in the jaws

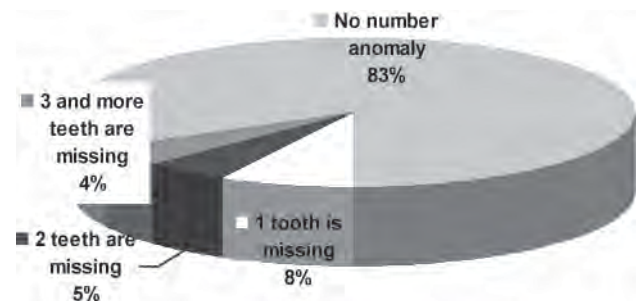


Fig. 9. Prevalence of hypodontia in orthodontic patients

in the maxilla (20). In majority studies the distribution of missing teeth between the right and left sides was the same (21). In our study teeth were missing more often on the right in the upper jaw in contrast to the study of Farhat Amin where hypodontia was most common on the left side (20). Studies didn't agree which tooth was the most often missing. Some studies stated that upper lateral incisors were the most frequently missing teeth (17, 19, 21, 22), others affirm that lower second premolars were missing most often (18, 20). In our study wisdom teeth were missing most frequently, followed by the mandibular second premolar. Authors agree that majority of patients had one or two teeth missing as we found in our study (20, 21).

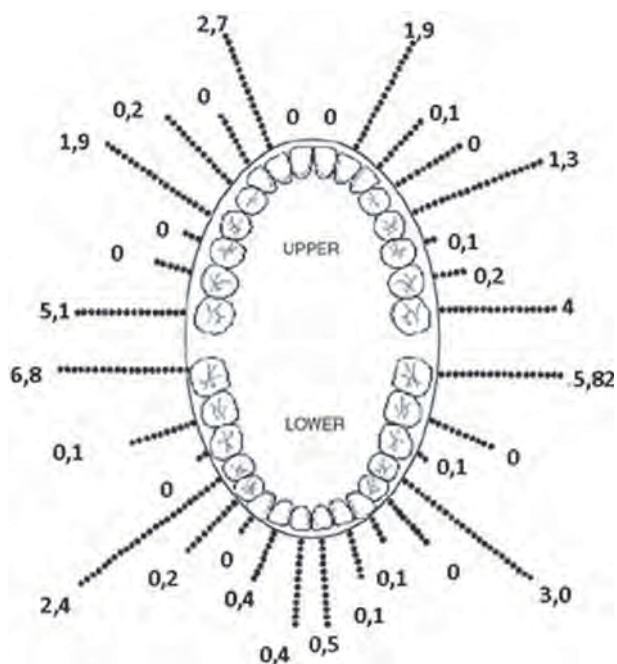


Fig. 10. Percentage of missing teeth

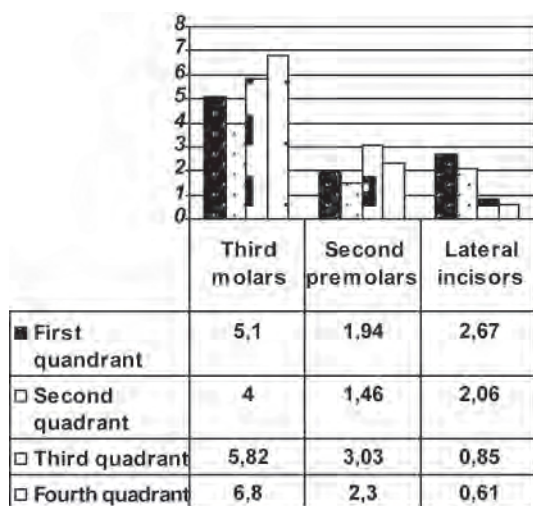


Fig. 11. Frequency of hypodontia in quadrants

In Gábris K. study accessory teeth were found in 1.53%. (17) The prevalence was bigger than in our study and it could be due to different sample size. Authors agree that the most often accessory tooth was mesiodens(17, 23).

In our study we didn't find oligodontia, but in Hungary orthodontic patient's prevalence of oligodontia was 1.04% (17).

As we found there are some differences in the results of analogical studies and they could be related to different sample selection. It is also possible that different populations vary due to genetic variability and different exposure to environmental factors. All authors agree that TNA are often seen in the practice of orthodontist. TNA affects the

esthetics and function of all the dentofacial system and should be treated with a multidisciplinary team approach (19).

Patients with congenitally missing teeth may present undeveloped alveolar bone morphology, making implant reconstruction a challenge (24). Also usually it is asymmetric malocclusion what is essential for success of treating these problems (25).

Several dental anomalies have been reported together with agenesis: delayed formation, ectopic eruption, microdontia and shape anomaly (4). The disturbances in dental development is twice more common in patients with tooth agenesis than in patients without hypodontia (3). Peg-shaped or mesiodistally deficient maxillary lateral incisors demonstrate variation in the expression of the trait. The maxillary canine is second after the wisdom tooth in the hierarchy of impacted teeth (12, 27, 28).

Oligodontia is a disability that affects patient's function and esthetics. These features include straight to concave profile, pointed chin, reduced lower facial height, and altered dental inclinations, reduced width and height of bone, inclination of adjacent teeth, and supra-eruption of antagonist teeth (29).

Supernumerary teeth might resemble normal teeth or be amorphous (7, 30). There is some evidence of a local effect with greater differences in tooth dimension adjacent to the site of the supernumeraries (31). Supernumeraries can be impacted, erupt spontaneously, or exhibit ectopic eruption (7, 32). In some cases they are found to cause a malocclusion, disturbed eruption, loosened teeth or cystic complications (32-37). On the other hand, sometimes supernumeraries are asymptomatic and are detected in radiographic examinations by coincidence (7).

CONCLUSIONS

In this study a sample of orthodontic patients was studied in order to obtain epidemiological and clinical information related to the congenital TNA including third molars. It was found, that about 18% of orthodontic patients had teeth number anomalies. Hypodontia occurred more frequently than hyperdontia. Hypodontia appears equally between the genders in both jaws. Third molars were the most frequently missing teeth, followed by the mandibular second premolars. Mesiodens was the most frequently found supernumerary tooth. Part of the TNA occurred in the anterior part of the dentition which is very prone to the treatment and needs multidisciplinary approach of treatment.

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