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IZVORNI ZNANSTVENI RAD

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Prevalence of Dental Anomalies in Orthodontic Patients

Zastupljenost dentalnih anomalija kod ortodontskih pacijenata

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Abstract

Aim: The aim of this retrospective study was to determine the frequency of hypodontia, hyperdontia, invagination, impaction, dilacerations, peg-shaped lateral incisors, taurodontism and short or blunt and narrow or pipette-shaped roots in Croatian orthodontic patients. **Material and methods:** 506 orthopantomographs and study casts from 12-16 year-old orthodontic patients treated at the Department of Orthodontics, School of Dental Medicine University of Zagreb were analyzed. **Results:** At least one dental anomaly was present in 24.1% of patients, and more than one in 1.2% of them. The frequency was not significantly different between genders. Hypodontia was the most frequent anomaly with the incidence of 7.5 %, followed by teeth impaction with the incidence of 6.3 %. **Conclusion:** The distribution and the prevalence of anomalies were similar to those described in the general Croatian population.

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Introduction

Dental anomalies are abnormalities of teeth structure, form, number, location and size. They can be caused by genetic, systemic, traumatic and local factors (1). They are divided in genetic and acquired. Genetic and environmental factors cause dental anomalies mostly during histodifferentation and morphodifferentiation of teeth (2,3) They occur more frequently in the context of certain syndromes; e.g. their incidence is five times higher in patients with Down's syndrome than in the general population (4). The study of Jukić et al (5) showed that hypodontia is significantly more frequent in children with developmental disturbances than in healthy children. Oral-facial-digital syndrome 1 (OFDS1) is related to hyperdontia, hypodontia and peg-shaped lateral incisors (6,7).

Dental anomalies are most frequently diagnosed by clinical examinations and panoramic radiographs (8). Recently, cone beam computerized tomography (CBCT) has been used more frequently. This technique is, because of its ability to generate three-dimensional representations, more precise, especially in overlapping structures (9). A disadvantage of CBCT is an exposure of the patient to relatively high doses of radiation, even more important because of the fact that children constitute the majority of patients with dental anomalies. Magnetic resonance imaging (MRI) is an alter-

Uvod

Dentalne anomalije su nenormalnosti u strukturi, obliku, broju, položaju i veličini zuba. Uzrokuju ih sistemski, genetski, traumatski i lokalni čimbenici (1). Dijele se na prirođene i stečene. Dentalne anomalije prouzročene su genetskim i okolišnim čimbenicima, posebice tijekom histodiferencijacije i morfodiferencijacije zuba (2, 3). Češće se pojavljuju u određenim sindromima, primjerice, kod pacijenata s Downovim sindromom učestalost je pet puta veća nego u općoj populaciji (4). Jukić i suradnici (5) pokazali su u svojem istraživanju da je hipodoncija znatno češća kod djece s teškoćama u razvoju nego kod one zdrave. S orofaciodigitalnim sindromom 1 (OFDS1) povezani su hiperdoncija, hipodoncija i konični lateralni sjekutići (6, 7).

Dijagnoza dentalnih anomalija najčešće se postavlja kliničkim pregledom i ortopantomogramom (8). Posljednjih godina primjenjuje se cone beam – kompjutorizirana tomografija (CBCT) koja je preciznija zbog mogućnosti stvaranja trodimenzionalnoga prikaza, pogotovo u slučaju preklapajućih struktura (9). Nedostatak CBCT-a je izlaganje pacijenata razmjerno visokim dozama zračenja, što je posebno važno zato što su većina pacijenata djeca s dentalnim anomalijama. Alternativa je magnetska rezonancija (MRI) koja također daje trodimenzionalne prikaze struktura, ali bez upotrebe ionizirajućeg zračenja (10).

native, producing three-dimensional representation of structures, without the use of ionizing radiation (10).

Dental anomalies can lead to abnormal positioning of other teeth in the dental arch. Fixed orthodontic appliances are most frequently used to treat patients with hypodontia (11), because the precise and controlled tooth movements are needed (12) In patients with hyperdontia, especially in *mesiodens* cases, which can be functional as well as esthetical problems (13), extraction therapy followed by fixed orthodontic appliance is often indicated. Therapeutic options for treating dental anomalies include implantoprosthetic replacements (14), dental bridges and orthodontic tractions; in cases in which the anomaly is neither a functional nor an aesthetic problem, treatment is occasionally not needed (11).

Dental anomalies could result in changed length of the maxilla and mandible resulting in occlusal disturbances which complicate and prolong orthodontic therapy (15). The frequency of impaction in patients with orthodontic anomalies Class II division1 as well as short or blunt roots in patients with anomalies Class II division 2 is increased compared to eugnathic patients (16).

Understanding the influence of dentofacial genetics on the diagnosis and planning of orthodontic treatment has become an integral part of modern dental care (17). This study focused on the prevalence of dental anomalies in a sample of orthodontic patients in Croatian population.

Material and methods

This study was performed on a sample of 506 orthopantomographs and study casts of orthodontic patients obtained from the archives of the Department of Orthodontics at School of Dental Medicine University of Zagreb. Inclusion criteria were:

1. No history of permanent teeth extraction before the start of orthodontic treatment
2. No history of endodontic therapy or tooth trauma before the start of orthodontic treatment
3. Orthopantomograms were obtained by standardized method using the same X-ray device (Siemens, Orthopos, average voltage 69 kV, constant current strength of 16 mA/s and time of exposition of 16 s).

The study was performed on a sample of 12-16 year-old children with permanent dentition. Based on orthopantomograms and study casts the following teeth anomalies were studied: hypodontia, hyperdontia, invagination, impaction, dilacerations, the presence of peg-shaped lateral incisors, short or blunt roots, thin or pipette-shaped roots and taurodontism. Data were collected and analyzed regarding the incidence, sex, distribution and type of teeth affected by the anomaly. Statistical analysis was performed using the STATISTICA 9.1 program. The research procedures were carried out following the decision of the Ethics Committee of the School of Dental Medicine University of Zagreb. Participation in the research was voluntary, whereas the participants were guaranteed anonymity and confidentiality.

Dentalne anomalije mogu prouzročiti abnormalnosti u položaju drugih zuba u zubnome luku. Za terapiju pacijenata s hipodoncijom najčešće se koriste fiksne ortodontske naprave (11) jer su potrebni precizni i kontrolirani pomaci zuba (12). Kod pacijenata s hiperdoncijom, pogotovo u slučaju mesiodensa koji može biti i funkcionalni i estetski problem, često su indicirane ekstrakcije te fiksna ortodontska terapija (13). Terapijske opcije za liječenje dentalnih anomalija mogu biti i implantoprotetički radovi (14), mostovi te ortodontsko izvlačenje, a u slučaju da nisu ni funkcijski ni estetski problem, terapija katkad nije potrebna (11).

Anomalije vezane za broj, veličinu, položaj i oblik zuba mogu poremetiti dužinu maksile i mandibule te poremetiti okluziju, što otežava ortodontsku terapiju (15). Uočena je veća učestalost impakcije kod pacijenata s ortodontskim anomalijama klase II/1, a kratkih ili tupih korjenova više je kod pacijenata s anomalijama klase II/2 nego kod eugnatih pacijenata (16).

Razumijevanje utjecaja dentofacijalne genetike na dijagnozu i planiranje ortodontske terapije postaje dio zdravstvene skrbi u svijetu (17). Iako je napisano mnogo studija o dentalnim anomalijama, malo ih se bavilo dentalnim anomalijama ortodontskih pacijenata, posebice u hrvatskoj adolescentskoj populaciji. Cilj ovog rada bio je ustanoviti učestalost različitih dentalnih anomalija u populaciji hrvatskih ortodontskih pacijenata.

Materijali i postupci

Ovo istraživanje provedeno je na uzorku od 506 ortopantomograma i sadrenih modela čeljusti ortodontskih pacijenata preuzetih iz arhiva Zavoda za ortodonciju Stomatološkog fakulteta Sveučilišta u Zagrebu. Kriteriji za odabir bili su:

1. u anamnezi nema podataka o ekstrakciji trajnoga zuba prije početka ortodontskoga tretmana
2. u anamnezi nema podataka o endodontskom tretmanu ili traumi zuba prije početka ortodontskoga tretmana
3. ortopantomogrami su snimljeni standardiziranom metodom na istom rendgenskom uređaju (Siemens, Orthopos – prosječna vrijednost napona 69 Kv uz konstantnu jakost struje od 16 mA/s, vrijeme ekspozicije 16 s).

Istraživanje je provedeno na uzorku djece s trajnom denticijom u dobi od 12 do 16 godina. Na temelju ortopantomograma i studijskih modela ispitivane su sljedeće anomalije trajnih zuba: hipodoncija, hiperdoncija, invaginacija, impakcija, dilaceracija, prisutnost pandžastih i koničnih lateralnih sjekutića kratkih ili tupih, uskih ili gracilnih korjenova, te taurodontizam. Svi prikupljeni podatci analizirani su prema učestalosti, spolu, distribuciji i tipu zuba zahvaćenih anomalijom. Statistička obrada podataka obavljena je u programu STATISTICA 9.1.

Results

Out of a total of the 506 studied orthopantomographs and study casts, 278 (54.9%) of them were female and 228 (45.1%) of male patients. There were no statistically significant differences in the frequency of studied anomalies between sexes (p>0.05), hence further statistical analysis could be performed. The results are presented in Figure 1.

Rezultati

Od pregledanih 506 ortopantomograma i modela čeljusti, 278 (54,9 %) bilo je od pacijentica, a 228 (45,1 %) od pacijenata. Od 506 ispitanika, kod njih 122 (24,1 %) zabilježena je barem jedna anomalija. Između spolova nije bilo statistički značajne razlike u učestalosti ispitivanih anomalija. Rezultati istraživanja prikazani su na slici 1.

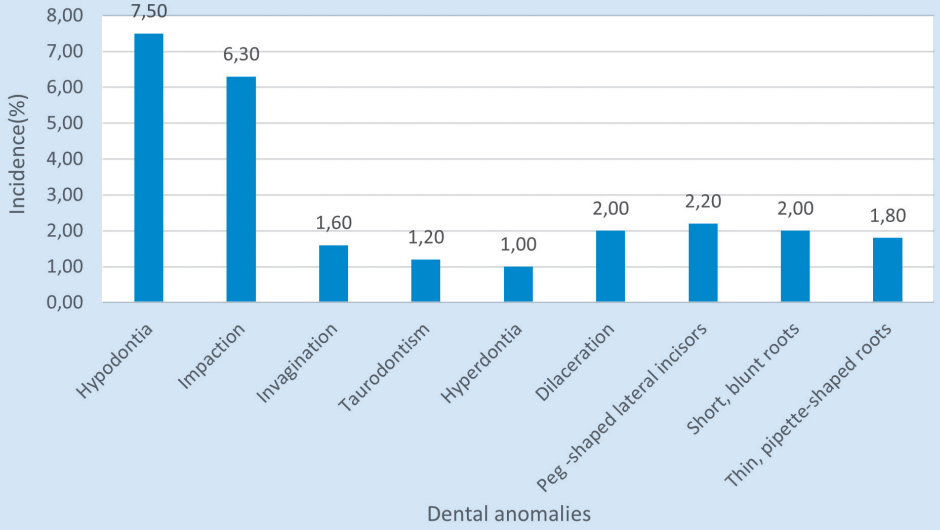

Figure 1 Prevalence of dental anomalies (%)
Slika 1. Prikaz učestalosti dentalnih anomalija u postotcima

Table 1 Number of abnormal teeth in the maxillary arch
Tablica 1. Broj maksilarnih zuba s anomalijom

	17	16	15	14	13	12	11	21	22	23	24	25	26	27
Hypodontia • Hipodoncija			5			7			9	1	1	6		
Teeth impaction • Impakcija			1		15			2		11		4		
Invagination • Invaginacija				1		4			4			1		
Taurodontism • Taurodontizam		4											1	
Hyperdontia • Hiperdoncija							3							1
Dilaceration • Dilaceracija			2			3	2	1						
Peg- shaped lateral incisors • Pandžasti konični lateralni sjekutići						6			9					
Short, blunt roots • Kratki ili tupi korijeni			1			3	7	8	3					
Thin, pipette- shaped roots • Uski ili gracilni korijeni							1	1						

Table 2 Number of abnormal teeth in the mandibular arch
Tablica 2. Broj mandibularnih zuba s anomalijom

	47	46	45	44	43	42	41	31	32	33	34	35	36	37
Hypodontia • Hipodoncija			4	1		4			3		1	8		
Teeth impaction • Impakcija			4							1	2	2		
Invagination • Invaginacija														
Taurodontism • Taurodontizam	1												1	
Hyperdontia • Hiperdoncija														1
Dilaceration • Dilaceracija			1											
Peg- shaped lateral incisors • Pandžasti konični lateralni sjekutići														
Short, blunt roots • Kratki ili tupi korijeni														
Thin, pipette- shaped roots • Uski ili gracilni korijeni						3	3	2	2			1		

At least one anomaly was found in 122 (24.1%) patients. In 6 (1.2 %) cases, more than 1 anomaly was noted. Five anomalies were combinations of hypodontia with another anomaly. In two cases, hypodontia coexisted with peg-shaped lateral incisors and taurodontism, and in one it coexisted with short or blunt roots. Impaction coexisted with thin or pipette-shaped roots in one patient. Hypodontia of the left upper lateral incisor was most frequent (24%), followed by the left lower second premolar (21%), right upper lateral incisor (18%) and left and right upper premolar (16% and 13% of cases) (Tables 1 & 2). In 30 patients (79%), hypodontia was present on only one tooth, and in 8 (21%) in more than one teeth. *Mesiodens* was found in three patients (60%) and an additional tooth was found in the molar area in two patients (40%). Invagination occurred most frequently on the upper lateral incisors (4 patients), single, or in combination with other teeth. It occurred on one tooth in six patients (75%), and on more than one in two patients (25%). In all cases, invagination occurred in the upper jaw. Impaction most frequently affected the upper right canine (15 patients), and the upper left canine (11 patients). One tooth was affected in 23 (72%), and more than one in 9 patients (28%). It occurred much more frequently in the upper than lower jaw (23 vs. 8 patients); in one patient (3%), both, the upper and lower jaw, were affected. Dilaceration occurred on the right upper lateral incisor in 3 (30%), and on the right upper central incisor and right upper second premolar in 2 patients (20%) each. In all 10 patients, dilacerations occurred on only one tooth, in 8 patients it occurred in the upper and in 2 patients in the lower jaw. Peg-shaped lateral incisors occurred on one side in 7 (64%), and on both sides in 4 patients (36%); on the left side in 9 patients, and on the right side in 6 patients. Short and blunt roots occurred most frequently on upper median and upper lateral incisors; on one tooth in 2 patients (20%), and on more than one in 8patients (80%). Maxillary teeth were affected in all cases. Thin or pipette-shaped roots were found in 9 patients, most frequently on lower incisors (67%). In 5 patients, they were present on one (56%), and in 4 patients on more than one tooth (44%). They were located in the lower jaw in eight patients (89%), and in the upper jaw in one patient (11%). Taurodontism was noted in six patients. It occurred most frequently on the first upper right molar, in 4patients (67%) on single tooth or in combination with other teeth. Taurodontism was noted on one tooth in 5 patients (83%), and on more than one in one patient (17%). It occurred in the upper jaw in 4 patients (67%), and in the lower in 2 patients (33%).

Discussion

Different results about the frequency of dental anomalies were found among studies. In the study of Altug Atac and Erdem (18) on 3043 Turkish orthodontic patients, at least one dental anomaly was found in only 5.46% of patients, while in the study of Thongudomporn et al. (19) on 111 Austra-

U šest slučajeva (1,2 %) bilo je uočeno više od jedne anomalije. Od toga je pet bilo kombinacija hipodoncije s još jednom anomalijom. U dva slučaja zabilježena je kombinacija hipodoncije s pandžastim lateralnim sjekutićem i taurodontizmom, a u jednome hipodoncija s kratkim ili tupim korijenima. Kombinacija impakcije s uskim ili gracilnim korijenom pronađena je kod jednoga pacijenta. Najčešća je bila hipodoncija lijevoga gornjega lateralnoga sjekutića (24 %), zatim lijevoga donjega drugoga pretkutnjaka (21 %), desnoga gornjega lateralnoga sjekutića (18 %) te lijevoga i desnoga gornjega pretkutnjaka (16 % i 13 % slučajeva). Kod 30 ispitanika (79 %) hipodoncija je bila samo na jednome zubu, a na više zuba pronađena je kod njih osam (21 %). Kod jednoga od tih osam pacijenata prisutna je bila hipodoncija svih drugih pretkutnjaka. Meziodens je bio zabilježen kod tri pacijenta (60 %), a u području kutnjaka kod dva (40 %). Invaginacija se najčešće pojavljuje na gornjim lateralnim sjekutićima (4 ispitanika), pojedinačno ili u kombinaciji s drugim zubima. Na jednome zubu pronađena je kod šest ispitanika (75 %), a na više zuba kod dva (25 %). U svim slučajevima invaginacija se pojavila u gornjoj čeljusti. Impakcija je najčešće zahvaćala gornji desni očnjak (15 ispitanika) te gornji lijevi očnjak (11 ispitanika). Jedan zub je zahvaćala kod 23 ispitanika (72 %), a više zuba kod njih 9 (28 %). Mnogo češće nastaje u gornjoj čeljusti negoli u donjoj (23 prema 8 ispitanika). Kod jednoga ispitanika (3 %) nađena je i u gornjoj i u donjoj čeljusti. Dilaceracija je uočena na desnome gornjem lateralnom sjekutiću kod tri ispitanika (30 %), a na gornjemu desnom središnjem sjekutiću i desnome drugom gornjem pretkutnjaku kod dva ispitanika (po 20 %). Kod svih deset ispitanika s dilaceracijom bila je samo na jednom zubu, kod njih osam u gornjoj čeljusti, a dva u donjoj. Pandžasti konični lateralni sjekutići pojavljuju se jednostrano kod sedam ispitanika (64 %), a obostrano kod četiri (36 %). S lijeve strane bili su prisutni kod devet ispitanika, a s desne kod njih šest. Kratki i tupi korijeni najčešći su na gornjim središnjim sjekutićima i gornjim lateralnim sjekutićima. Na jednome zubu zabilježeni su kod dva ispitanika (20 %), a na više zuba kod osam (80 %). U svim slučajevima bila je riječ o zubima maksile. Uski ili gracilni korijeni nađeni su kod devet ispitanika, najčešće na donjim sjekutićima (67 %). Kod njih pet primijećeni su na jednom zubu (56 %), a kod četiri na više zuba (44 %). U donjoj čeljusti zabilježeni su kod osam ispitanika (89 %), a u gornjoj kod jednoga (11 %).Taurodontizam je imalo šest ispitanika. Najčešće je bio na prvome gornjem desnom kutnjaku, kod četiri, odnosno 67 % ispitanika, pojedinačno ili u kombinaciji s drugim zubima. Taurodontizam je uočen na jednome zubu kod pet ispitanika (83 %), a na više zuba kod jednoga (17 %). U gornjoj čeljusti je pronađen kod njih četiri (67 %), a u donjoj kod dva (33 %).

Rasprava

Dosad objavljeni radovi znatno se razlikuju kad je riječ o učestalosti dentalnih anomalija. Tako je u istraživanju Altuga Ataca i Erdema (18), na uzorku od 3043 turska ortodontska pacijenta, kod samo njih 5,46 % nađena barem jedna dentalna anomalija, a u istraživanju Thongudomporna i suradnika

lian patients, in even 74.8% of them. Between these extremes are the results of Shakeel Khan et al. from Pakistan (20) with 16% and Roslan et al. from Turkey (11) with 28.4 %. The latter result is very similar to ours; we found at least one dental anomaly in 24.1% of patients. The reason for such big differences is not completely clear; they might result from real differences in frequency of dental anomalies in different races and populations, but also from differences in indications for orthodontic treatment or diagnostic procedures and criteria for diagnosing dental anomalies. All other studies obtained the results very similar to ours. They failed to find differences in dental anomalies between sexes (21). Only in the study of Thongudomporn et al. were invagination and short or blunt roots somewhat more prevalent in females (19). Hypodontia was the most frequent anomaly in our study, followed by teeth impaction. These two anomalies were also most frequent in all other published studies. Apart from third molars, which were excluded from due to their variability, lateral incisors and second premolars were most frequently missing teeth. This finding is in agreement with Bolk's theory of terminal reduction according to which, in cases of hypodontia of up to 4 teeth, last teeth in a group are most frequently missing: lateral incisors, second premolars and third molars (22). This finding is explained by the fact that embryonal joining of the maxilla with the medial nasal process occurs in the area of maxillary lateral incisors, while mandibular second premolars are located on the genetically unstable area at the end of the dental lamina (23). Hypodontia is usually treated with orthodontic therapy, prosthetic appliance or multidisciplinary – by combining orthodontics and prosthetics (24). Impacted teeth were the second most frequently found anomaly. Likewise, they were most frequent anomaly in studies by Sella Tunis (25), Roslan (11) and Lagan (26). The frequency of patients with impaction in the study of Prskalo et al. (27) – 4.71%, performed on the general Croatian population, was very similar to our results. Peg-shaped lateral incisors are by definition the teeth that have the mesio-distal diameter in the incisal part bigger than that in the cervical part (28). The frequency of this anomaly in our study corresponds to published results in orthodontic patients: 1.9% - 2.7 % (29). It seems that this anomaly is more frequent in patients of Asian ancestry and least frequent in the USA Caucasian population (29). The frequency of dilacerations, defined as deviations of the linear relationship of the crown relative to the root (30), was in our study as expected higher than in the study of Malčić et al. (31) performed on the general Croatian population (1.2%). Dilaceration was most frequent anomaly in the study of Ezoddini et al. on the Iranian population – even 15% (32). Approximation of root length is an indispensable part of prosthetic, orthodontic and periodontal therapy. Root length anomalies are thought to be caused by trauma to the area of affected teeth during their development (33). Root morphology abnormalities increase the probability of its resorption during orthodontic therapy (34). The incidence of short and blunt roots varies from 2.7% in Caucasian (35) even to 10 % in Asian (36). Our results are similar to the results of the studies that obtained 2%. Tooth invagination is an anomaly in which one tooth develops in-

(19) na 111 australskih pacijenata čak 74,8 %. Između tih ekstrema su rezultati Shakeela Khana i suradnika iz Pakistana (20) sa 16 % i Roslana i suradnika iz Turske (11) s 28,4 %. Ovaj posljednji rezultat vrlo je sličan našemu – mi smo našli barem jednu dentalnu anomaliju kod 122 od 506 ispitanika (24,1 %). Razlozi za tako velike razlike nisu posve jasni, možda su posljedica stvarne razlike u učestalosti dentalnih anomalija kod pripadnika različitih rasa ili populacija, ali i razlika u indikacijama za upućivanje na ortodontsko liječenje ili u dijagnostičkim postupcima i kriterijima za dijagnozu dentalnih anomalija. Kao ni u našoj, tako ni u jednoj drugoj studiji nije zabilježena razliku u sveukupnoj učestalosti dentalnih anomalija između spolova (21). Jedino je u studiji Thongudomporna i suradnika istaknuto da su invaginacija i kratki i tupi korijeni nešto češći kod žena Na ispitivanom uzorku najčešća je anomalija bila hipodoncija, a slijedi impakcija. Te dvije anomalije bile su najčešće i u svim ostalim istraživanjima. Osim trećih molara, koje smo zbog varijabilnosti pojave izostavili iz istraživanja, najčešće su nedostajali lateralni sjekutići i drugi pretkutnjaci. Taj se nalaz uklapa u Bolkovu teoriju terminalne redukcije u kojoj su, u slučaju hipodoncije četiri ili manje zuba, zubi koji nedostaju uglavnom oni zadnji u skupini: lateralni sjekutići, drugi premolari i treći kutnjaci (22). To se objašnjava činjenicom da se u području maksilarnih lateralnih sjekutića događa embrionalno spajanje maksile s medijalnim nosnim nastavkom, a mandibularni drugi molari nalaze se na genetski nestabilnom području kraja dentalne lamine (23). Hipodoncija se obično liječi ortodontskom terapijom, protetičkim nadomjestkom ili multidisciplinarno – kombinacijom ortodoncije i protetike (24). Impaktirani zubi kod nas su bili druga najčešća anomalija, a u istraživanjima Sella Tunisa (25), Roslana (11) te Lagana (26) najučestalija. U istraživanju Prskalo i suradnika (27) u hrvatskoj općoj populaciji nađen je vrlo sličan udio pacijenata s impakcijom kao i u ovom istraživanju – 4,1 %. Pandžasti konični lateralni sjekutić onaj je kod kojega je meziodistalni promjer u incizalnom dijelu veći nego u cervikalnome (28). Rezultati našeg istraživanja o udjelu pacijenata s tom anomalijom uklapaju se u raspon rezultata dosadašnjih studija na ortodontskim pacijentima koji iznosi između 1,9 % i 2,7 % (29). Uočeno je da se ta anomalija češće pojavljuje kod pacijenata žute rase, a najrjeđa je kod bijelaca u SAD-u (29). Učestalost dilaceracije, definirane kao odstupanje linearnoga odnosa krune prema korijenu (30), u našem je istraživanju očekivano nešto veća nego u istraživanju Malčić i suradnika (31) provedenom na hrvatskoj općoj populaciji u kojoj iznosi 1,2 %. Najveća učestalost pacijenata s dilaceracijom zabilježena je među iranskom populacijom u istraživanju Ezoddinia i suradnika (32) – čak 15 %. Procjena dužine korijena neizostavan je dio protetičke, ortodontske i parodontološke terapije. Pretpostavlja se da je uzrok anomalijama u dužini korijena trauma u području zuba tijekom njegova razvoja (33). Abnormalnosti morfologije korijena povećavaju vjerojatnost njegove resorpcije tijekom ortodontske terapije (34). Učestalost kratkih i tupih korijena varira od 2,7 % kod bijelaca (35) do čak 10 % kod pripadnika žute rase (36). U skladu s tim su i naši rezultati (2 %). Invaginacija zuba anomalija je u kojoj se jedan zub razvija u drugome. Smatra se da nastaje zbog prodiranja

side another. It is thought to result from penetration of one enamel organ of one tooth into the area of dental pulp of another (37). Teeth affected by this anomaly have a higher risk of developing caries and dental pulp diseases, and their endodontic treatment is difficult because of atypical morphology of their root channels (38). The prevalence of permanent teeth affected by this anomaly is between 0.3% and 10%; our findings are consistent with such results. Taurodontism is a morphologic anomaly of teeth characterized by apicoocclusal prolongation of the tooth crown and pulp chamber with shortened roots. It is most frequently an incidental finding discovered during X-ray evaluation, because teeth appear to be the same as normal (39). The prevalence of this anomaly is highest in Inuits, persons with Down's syndrome and the Central European population (40, 41). The larger pulp chamber increases the risk of pulp exposure during therapeutic procedures, thus making planning of orthodontic and prosthetic therapies difficult (42). The prevalence of taurodontism was 1.2% in our patients, similar to findings of the study by Brkić et al. (43) on the general Croatian population (2.65%) and Blumberg et al (44) and Witkop et al (45) on American Caucasians (2.5 and 2.6%). Hyperdontia is defined as an increase in the number of teeth in dental arches. Most frequently, the additional tooth is located between maxillary incisors and called *mesiodens* (46). If the additional tooth is next to premolars, it is called a parapremolar, and if it is located distally from the third molar, a distomolar (47). If the additional tooth resembles morphologically its normal counterparts, it is called a supplementary tooth, and if it does not, it is called an atypical or accessory tooth (48). *Mesiodens* is not always clinically visible. It can be impacted and cause diastema between incisors, thus making orthodontic therapy more complicated (49). Similar to our results, some previously published studies reported the prevalence of hyperdontia between 0.2% and 3% (50).

Conclusion

The results of our study on dental anomalies in Croatian orthodontic patients suggest: 24.1% of patients had at least one examined anomaly; Hypodontia was the most frequent anomaly, followed by teeth impaction. The prevalence of investigated dental anomalies was not significantly different between males and females; 1.2% of patients had more than one anomaly. The prevalence of most frequent dental anomalies in orthodontic patients is similar to that in the general population.

Conflict of interest

The authors report no conflict of interest.

Author's contribution: **N. D. B.** - designed and wrote the study; **B. A.** - literature search and data interpretation; **S. M.** - concept and design of the study; **M. L. V.** - designed and wrote the study.

caklinskoga organa u područje zubne papile (37). Na zubima zahvaćenima tom anomalijom vjerojatnije će se pojaviti karijes i pulpne bolesti, a i njihovo je endodontsko liječenje teže zbog netipične morfologije korijenskih kanala (38). Prevalencija trajnih zuba zahvaćenih tom anomalijom iznosi između 0,3 % i 10 %, a u skladu s tim su i rezultati u ovom istraživanju. Taurodontizam je morfološka anomalija zuba koju karakterizira izdužena zubna kruna i pulpna komorica u apikookluzalnom smjeru sa skraćenim korijenima. Najčešće se dijagnosticira slučajno tijekom pregleda rendgenske snimke, jer u ustima izgleda jednako kao zdrav zub (39). Najčešće se pojavljuje kod Inuita, osoba s Downovim sindromom i u srednjoeuropskoj populaciji (40, 41). Zbog povećane pulpne komore veća je mogućnost da će se pulpa otvoriti pri zahvatima na tim zubima, što otežava planiranje ortodontske i protetičke terapije (42). Udio ispitanika s taurodontizmom u našem je istraživanju 1,2 %, a to je slično rezultatima istraživanja Brkića i suradnika (43) na općoj hrvatskoj populaciji (2,5 %) i istraživanjima Blumberga i suradnika (44) te Witkopa i suradnika (45) na američkoj bjelačkoj populaciji (2,5 i 2,6 %).Hiperdoncija je anomalija povećanoga broja zuba. Najčešće je dodatni zub smješten između maksilarnih sjekutića i tada se naziva meziodens (46). U slučaju da se dodatni zub nalazi uz pretkutnjake, tada ga nazivamo parapremolarom, uz kutnjake paramolarom, a distalno od trećega kutnjaka – distomolarom (47). Ako je dodatni zub morfološki sličan normalnim zubima, nazivamo ga suplementarnim zubom, a ako je netipične morfologije, netipičnim ili *dentes accessoria* (48). Meziodens nije uvijek klinički vidljiv – može biti impaktiran te uzrokovati dijasteme među sjekutićima i kompliciratи ortodontsko liječenje (49). U dosadašnjim studijama prevalencija hiperdoncije je između 0,2 % i 3 % (50), što je slično rezultatima u ovom istraživanju.

Zaključak

Na temelju istraživanja dentalnih anomalija na populaciji hrvatskih ortodontskih pacijenata možemo zaključiti sljedeće: kod 24,1 % ispitanika zabilježena je barem jedna promatrana anomalija**,** najčešća anomalija je hipodoncija, a slijedi impakcija**,** nije nađena statistički značajna razlika u učestalosti ispitivanih dentalnih anomalija između muškaraca i žena**,** kod 1,2 % ispitanika zabilježeno je više od jedne anomalije**,** učestalost najčešćih dentalnih anomalija slična je u općoj populaciji i u populaciji ortodontskih pacijenata.

Sukob interesa

Autori nisu bili u sukobu interesa.

Doprinos autora: **N. D. B.** – osmislila i napisala studiju; **B. A.** – pretraživanje literature i interpretacija podataka; **S. M.** – koncept i dizajn studije; **M. L. V.** – osmislila i napisala studiju.

Sažetak
Cilj rada: Željela se ustanoviti učestalost hipodoncije, hiperdoncije, invaginacije, impakcije, dilaceracije, pandžastih koničnih lateralnih sjekutića, taurodontizma te kratkih ili tupih i uskih ili gracilnih korjenova kod hrvatskih ortodontskih pacijenata. **Materijali i metode:** Analizirano je 506 ortopantomograma i studijskih modela pacijenata u dobi između 12 i 16 godina liječenih u Zavodu za ortodonciju Stomatološkog fakulteta sveučilišta u Zagrebu. **Rezultati:** Najmanje jedna dentalna anomalija zabilježena je kod 24,1 % pacijenta, a kod 1,2 % više od jedne. Nije uočena razlika u učestalosti među spolovima. Hipodoncija je bila najčešća u 7,5 % slučajeva, a slijedi impakcija u 6,3 %. **Zaključak:** Distribucija i prevalencija dentalnih anomalija kod ortodontskih pacijenata slična je opisanoj u općoj hrvatskoj populaciji.

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References

1. Brook AH, Griffin RC, Townsend G, Levisianos Y, Russell J, Smith RN. Variability and patterning in permanent tooth size of four human ethnic groups. Arch Oral Biol. 2009 Dec;54 Suppl 1:S79-85.
2. Temilola DO, Folayan MO, Fatusi O, Chukwumah NM, Onyejaka N, Oziegbe E, et al. The prevalence, pattern and clinical presentation of developmental dental hard-tissue anomalies in children with primary and mix dentition from Ile-Ife, Nigeria. BMC Oral Health. 2014 Oct 16;14:125.
3 Šutalo J, editor. Patologija i terapija tvrdih zubnih tkiva. Zagreb: Naklada Zadro; 1994.
4. Alpöz AR, Eronat C. Taurodontism in children associated with trisomy 21 syndrome. J Clin Pediatr Dent. 1997 Autumn;22(1):37–9.
5. Jukić J, Škrinjarić I, Glavina D, Ulovec Z. The Prevalence of Oral and Dental Anomalies in Children with Developmental Disturbances. Acta Stomatol Croat. 2002; 36(1): 79-83.
6. King NM, Sanares AME. Oral-facial-digital syndrome, Type I: a case report. J Clin Pediatr Dent. Winter 2002;26(2):211-5.
7. MeSH Browser [database on the Internet].Tuli A, Sachdev V, Singh A, Kumar A. Physical and dental manifestations of oral-facial-digital syndrome type I. J Indian Soc Pedod Prev Dent [Internet]. 2011 [cited 2022 Feb 13];29(6 Suppl 2):S83-6. Available from: https://www.jisppd.com/article.asp?issn=0970-
8. Bilge NH, Yeşiltepe S, Törenek Ağırman K, Çağlayan F, Bilge OM. Investigation of prevalence of dental anomalies by using digital panoramic radiographs. Folia Morphol (Warsz). 2018;77(2):323-328.
9. Liu DG, Zhang WL, Zhang ZY, Wu YT, Ma XC. Three-dimensional evaluations of supernumerary teeth using cone-beam computed tomography for 487 cases. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2007 Mar;103(3):403-11.
10. Tymofiyeva O, Proff PC, Rottner K, Düring M, Jakob PM, Richter E-J. Diagnosis of dental abnormalities in children using 3-dimensional magnetic resonance imaging. J Oral Maxillofac Surg. 2013 Jul;71(7):1159-69.
11. Roslan AA, Rahman NA, Alam MK. Dental anomalies and their treatment modalities/planning in orthodontic patients. J Orthod Sci. 2018 Sep 6;7:16.
12. Mitchell L. Fixed appliances. In: Mitchell L, editor. An introduction to orthodontics. 3rd ed. Oxford: Oxford University Press; 2007. p. 191-2.
13. Russell KA, Folwarczna MA. Mesiodens--diagnosis and management of a common supernumerary tooth. J Can Dent Assoc. 2003 Jun;69(6):362-6.
14. Zivko-Babic J, Jakovac M, Carek A, Lovric Z. Implantoprosthetic therapy of a missing front tooth. Acta Stomatol Croat. 2009;43(3):234-40.
15. Uslu O, Akcam MO, Evirgen S, Cebeci I. Prevalence of dental anomalies in various malocclusions. Am J Orthod Dentofacial Orthop. 2009 Mar;135(3):328-35.
16. Uslu O, Akcam MO, Evirgen S, Cebeci I. Prevalence of dental anomalies in various malocclusions. Am J Orthod Dentofacial Orthop. 2009 Mar;135(3):328-35.
17. Trakinienė G, Ryliškytė M, Kiaušaitė A. Prevalence of teeth number anomalies in orthodontic patients. Stomatologija. 2013;15(2):47-53.
18. Altug-Atac AT, Erdem D. Prevalence and distribution of dental anomalies in orthodontic patients. Am J Orthod Dentofacial Orthop. 2007 Apr;131(4):510-4.
19. Thongudomporn U, Freer TJ. Prevalence of dental anomalies in orthodontic patients. Aust Dent J. 1998 Dec;43(6):395-8.
20. Khan, Shakeel Q. Prevalence of dental anomalies among orthodontic patients. Aust Dent J. 1998 Dec;43(6):395-8.
21. Reshitaj A, Krasniqi D, Reshitaj K, Anic Milosevic S. Hypodontia, Gender-Based Differences and its Correlation with other Dental Clinical Features in Kosovar Adolescents. Acta Stomatol Croat. 2019;53(4):347–53.
22. De Beer G. Sir, Embryos & Ancestors. 3rd ed. Oxford: Clarendon Press; 1958.
23. Vastardis H. The genetics of human tooth agenesis: new discoveries for understanding dental anomalies. Am J Orthod Dentofacial Orthop. 2000 Jun;117(6):650-6.
24. Kositbowornchai S, Keinprasit C, Poomat N. Prevalence and distribution of dental anomalies in pretreatment orthodontic Thai patients. KDJ. 2010;13(2):93-100.
25. Sella Tunis T, Sarne O, Hershkovitz I, Finkelstein T, Pavlidi AM, Shapira Y, et al. Dental anomalies' characteristics. Diagnostics (Basel). 2021;11(7):1161-74.
26. Laganà G, Venza N, Borzabadi-Farahani A, Fabi F, Danesi C, Cozza P. Dental anomalies: prevalence and associations between them in a large sample of non-orthodontic subjects, a cross-sectional study. BMC Oral Health. 2017 Mar 11;17(1):62.
27. Prskalo K, Zjaca K, Skarić-Jurić T, Nikolić I, Anić-Milošević S, Lauc T. The prevalence of lateral incisor hypodontia and canine impaction in Croatian population. Coll Antropol. 2008 Dec;32(4):1105-9.
28. Grahnén H. Hypodontia in the permanent dentition: a clinical and genetical investigation. Odont Rev 1956;7(1):1-100.
29. Hua F, He H, Ngan P, Bouzid W. Prevalence of peg-shaped maxillary permanent lateral incisors: A meta-analysis. Am J Orthod Dentofacial Orthop. 2013 Jul;144(1):97-109.
30. Asokan S , Rayen R , Muthu MS, Sivakumar N. Crown dilaceration of maxillary right permanent incisior- a case report. J Indian Soc Pedod Prev Dent. Oct-Dec 2004;22(4):197-200.
31. Malcić A, Jukić S, Brzović V, Miletić I, Pelivan I, Anić I. Prevalence of root dilaceration in adult dental patients in Croatia. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2006 Jul;102(1):104-9.
32. Ezoddini AF, Sheikhha MF, Ahmadi H. Prevalence of dental developmental anomalies: a radiographic study. Community Dent Health. 2007 Sep;24(3):140-4.
33. McNamara T, Woolfe SN, McNamara CM. Orthodontic management of a dilacerated maxillary central incisor with an unusual sequela. J Clin Orthod. 1998 May;32(5):293-7.
34. Witcher TP, Brand S, Gwilliam JR, McDonald F. Assessment of the anterior maxilla in orthodontic patients using upper anterior occlusal radiographs and dental panoramic tomography: a comparison. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2010 May;109(5):765-74.
35. Apajalahti S, Hölttä P, Turtola L, Pirinen S. Prevalence of short-root anomaly in healthy young adults. Acta Odontol Scand. 2002;60(1):56–9.

36. Ando S, Kiyokawa K, Nakashima T, Shibo K, Sanka Y. Studies on the consecutive surgery of succedaneous and permanent dentition in Japanese children. 4. Behavior of short-rooted teeth in the upper bilateral central incisors. J Nihon Univ Sch Dent. 1967 Jun;9(2):67-82.
37. Rushton MA. A collection of dilated composite odontomas. Br Dent J. 1937;63(1):65-85.
38. Thakur S, Thakur NS, Bramta M, Gupta M. Dens invagination: A review of literature and report of two cases. J Nat Sci Biol Med. 2014 Jan;5(1):218-21.
39. Pillai KG, Scipio JE, Nayar K, Louis N. Prevalence of taurodontism in premolars among patients at a tertiary care institution in Trinidad. West Indian Med J. 2007 Sep;56(4):368-71.
40. Goldstein E , Gottlieb MA. Taurodontism: familial tendencies demonstrated in eleven of fourteen case reports. Oral Surg Oral Med Oral Pathol. 1973 Jul;36(1):131-44.
41. Jaspers MT. Taurodontism in the down syndrome. Oral Surg Oral Med Oral Pathol. 1981;51(6):632–6.
42. Dineshshankar J, Sivakumar M, Balasubramanium AM, Kesavan G, Karthikeyan M, Prasad VS. Taurodontism. J Pharm Bioallied Sci. 2014 Jul;6(Suppl 1):S13-5.
43. Brkić H, Bagić I, Vojvodić D. The Prevalence of Taurodontism in Croatian Population. Acta Stomatol Croat 1992:26(2):79-84.
44. Blumberg JE, Hylander WL, Goepp RA. Taurodontism: a biometric study. Am J Phys Anthropol. 1971 Mar;34(2):243-55.
45. Witkop C J, Keenan K M, Červenka J, Jaspers MT. Taurodontism: An Anomaly of Teeth Reflecting Disruptive Developmental Homeostasis. In: Optiz J M, Gorlin R J - editors. Neural Crest and Craniofacial Disorders, Genetic Aspects. New York: Alan R Liss Inc; 1988. p. 85-95.
46. Hurlen B, Humerfelt D. Characteristics of premaxillary hyperodontia. A radiographic study. Acta Odontol Scand. 1985;43(2):75–81.
47. Gábris K, Tarján I, Fábián G, Kaán M, Szakály T, Orosz M. Frequency of supernumerary teeth and possibilities of treatment. Fogorv Sz. 2001 Apr;94(2):53-7.
48. Waingade M, Gawande P, Aditya A, Medikeri RS. Pindborg tumor arising in association with an impacted supernumerary tooth in the anterior maxilla. J Mich Dent Assoc. 2014 Jun;96(6):26-9.
49. Russell KA, Folwarczna MA. Mesiodens--diagnosis and management of a common supernumerary tooth. J Can Dent Assoc. 2003 Jun;69(6):362-6.
50. Subasioglu A, Savas S, Kucukyilmaz E, Kesim S, Yagci A, Dundar M. Genetic background of supernumerary teeth. Eur J Dent. Jan-Mar 2015;9(1):153-158.