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Radiological Evaluation of Dental Age Assessment Based on the Development of Third Molars in Population of Bosnia and Herzegovina

Radiološko vrjednovanje procjene dentalne dobi bosansko-hercegovačke populacije na osnovi razvoja trećih kutnjaka

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Abstract

Objectives: The development of third molars can be helpful in dental age estimation of adolescents and in early adult period. We tested the repeatability and accuracy of the three dental age radiographic methods (Olze, Demirjian and Solari and Abramovitch) and evaluated which method is more useful. We also aimed at testing to find the correlation of estimated dental and chronological age by these three methods. **Material and methods:** The orthopantomographs (OPGs) of 1007 individuals (8 - 25 years) were divided into two groups (cca 500 OPGs) - one group of OPGs has been presented with all four third molars, while another one was registered with third molar/s hypodontia. And all of OPGs were assessed, to verify the three methods (Olze, Demirjian and Solari and Abramovitch) for age estimation based on third molar development. **Results:** There was a high Spearman's correlation coefficient between stages of development of wisdom tooth and chronological age of subjects by all these three methods. **Conclusion:** We may recommend using third molars for assessing the dental age by Olze, Demirjian and Solari and Abramovitch dental method as well, on Bosnian and Herzegovinian population.

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Key words

Third Molar; Age Determination by Teeth; Adolescents; Bosnia and Herzegovina

Introduction

Dental age estimation is commonly used in pediatric dentistry, orthodontics, pediatric-endocrinology, dental paleopathology and in forensic dentistry (1,2).

Utilizing third molars for age prediction is vitally significant when there is a need to decide the minor or grown-up status of a person when no legitimate archive is accessible just as on account of patient experiencing amnesia and furthermore on examples of legal or anthropological significance (2,3). There are requirements for chronological age estimation related to school attendance, social benefits, employment and marriage as well (4,5) Furthermore, this procedure is sometimes necessary in cases of state administration: adoption, motorcycle driver licence, passport release etc (6).

Moreover, as the consequence of economic globalization and European integration, the number of immigrants

Uvod

Procjena dentalne dobi uobičajena je u pedodonciji, ortodontiji, pedijatriji, endokrinologiji, dentalnoj paleopatologiji i forenzičkoj stomatologiji (1, 2).

Točnost pri utvrđivanju dobi s pomoću trećih kutnjaka (molara) iznimno je važna u slučaju da je potrebno ustanoviti tko je maloljetna ili punoljetna osoba bez valjane dokumentacije, ili ako pacijent pati od amnezije, te pri analiziranju uzoraka u forenzičkim i antropološkim istraživanjima (2, 3). Opisani su i zahtjevi za procjenu kronološke dobi osobe kad je riječ o pohađanju nastave, socijalnoj pomoći, zapošljavanja i braku (4, 5). Taj postupak je katkad potreban tijekom administrativnih procedura poput posvojenja djeteta, dobivanja vozačke dozvole za motocikle, izdavanja putovnice itd. (6).

Uz to, zbog ekonomske globalizacije i europske integracije raste broj imigranata u zemljama s visokim standardom, pa

increases in countries with high living standard, which implies the dental age determination of the incoming population through orthopantomogram analyses (7,8).

There are numerous methods currently employed for dental age estimation. Some of them are based on eruptive developmental phases of third molars as seen on panoramic radiographs (OPGs), while others including various degrees of mineralization of these teeth are also seen on OPGs.

Third molar is a unique tooth due to its variability in form, size, position in dental arch and, also, in its time of forming and the time of eruption as well as in possibility of its agenesis.

Nevertheless, third molars are the only teeth still in development and thus are very important for dental age calculation in the age span of 16-23 years of age (9, 10).

The aim of this study was to determine the accuracy of Olze, Demirjian as well as of Solari and Abramovitch dental methods in the Bosnian and Herzegovinian population using OPGs.

Material and Methods

This study was approved by the Ethics Committee of the School of Dental Medicine in Sarajevo.

The sample of this study consisted of 1007 OPGs of 503 male and 504 female subjects, aged 8 to 25 years, divided into two groups (cca 500 OPGs)- one group of OPGs was presented with all four third molars, while another one was registered with third molar/s hypodontia. Then, both of groups were divided into six groups according to age and sex, with known date of birth. Median age was 20,42 for males and 20,75 years for female subjects (Table 1., 2., 3.).

Panoramic radiographs were collected from the archive of the School of Dental Medicine, University of Sarajevo. We have used OPGs of Bosnian and Herzegovinian patients exclusively, which were made according to the strict specialist instructions. Also, after we had noticed the absence of one, two or three third molars in OPGs of subjects older than 18 years, dental records have been analysed. Subsequently, the subjects have been taken anamnestic data in order to exclude the wisdom tooth extraction.

Eruptive phases of third molars were classified according to 4 stages, from A to D, and analysed by Olze method (2,9). We have also analysed the calcification stages according to the mineralization diagrams proposed by Demirjian et al (11,12). In cases where there was a doubt between the two stages of mineralization, the recommendation had been that the observer determined the least developed stage (12). We have also used method by Solari and Abramovitch in our investigation. It is a modified Demirjians' method with two more stages added, F1 and G1 in order to describe the root developmental stages more precisely. F1 stage describes that root length is at least twice crown length. The roots still have a funnel-shaped ending, while G1 stage implies that root walls are parallel, but apices are not entirely closed. The PDL space at the apical ending is > 1.0 mm (13).

je doseljenicima potrebno odrediti njihovu dentalnu dob očitavanjem s ortopantomograma (7, 8).

Trenutačno se primjenjuju mnogobrojne metode za određivanje dentalne dobi. Neke se temelje na analiziranju eruptivnih razvojnih stadija trećih kutnjaka uočenih na ortopantomogramima, a druge pak na analizi različitih stupnjeva mineralizacije tih zuba, također vidljivih na snimkama OPG-a.

Treći kutnjak jedinstveni je zub zbog varijabilnosti u obliku, veličini, položaju u zubnom luku, zatim u vremenu nastanka i vremenu erupcije, te zbog mogućnosti ageneze.

Unatoč tim činjenicama, treći kutnjaci su jedini zubi koji su još u procesu razvoja i zato su vrlo važni za procjenu dentalne dobi u razdoblju od 16. do 23. godine (9, 10).

Cilj ove studije bio je utvrditi točnost dentalnih metoda prema Olzeu, Demirjiju, i prema Solariju i Abramovitchu na bosansko-hercegovačkoj populaciji s pomoću ortopantomograma.

Materijal i metode

Studiju je odobrilo Etičko povjerenstvo Stomatološkog fakulteta u Sarajevu.

Uzorak za analizu sastojao se od 1007 OPG-ova ispitanika (503 ortopantomograma dječaka i muškaraca i 504 ortopantomograma djevojčica i žena) u dobi od 8 do 25 godina, a bili su podijeljeni u dvije skupine (oko 500 OPG-ova). Jedna skupina sadržavala je OPG snimke sa svim četirima trećim kutnjacima, a u drugoj su bile snimke s hipodoncijom jednog, dvaju ili triju trećih kutnjaka. Obje skupine su zatim podijeljene u šest novih unutar kojih su OPG snimke ispitanika razvrstane prema dobi i spolu, s poznatim datumom rođenja. Srednja dob bila je 20,42 za ispitanike i 20,75 godina za ispitanice (tablice 1., 2., 3.).

Koristile su se OPG snimke iz arhiva Stomatološkog fakulteta Sveučilišta u Sarajevu, isključivo državljana Bosne i Hercegovine, snimljene prema strogim kliničkim indikacijama liječnika specijalista. Uz to, ako je na ortopantomogramskim snimkama ispitanika starijih od 18 godina uočen nedostatak umnjaka, osim analiziranja stomatološke dokumentacije ti su ispitanici bili i anamnestički tretirani kako bi se isključila eventualna ranija ekstrakcija tih zuba.

Eruptivne faze trećih kutnjaka klasificirane su u četiri stadija – od A do D, i analizirane metodom prema Olzeu (2, 9). Analizirane su i faze kalcifikacije umnjaka prema dijagramima mineralizacije koje su predložili Demirjian i suradnici (11, 12). U slučaju dvojbe između dvaju stadija mineralizacije trećeg kutnjaka, preporuka je bila da istraživač utvrdi niži razvojni stadij zuba (12). U našoj studiji koristili smo se i metodom prema Solariju i Abramovitchu. To je prilagođena Demirjiano-va metoda s još dva dodana stadija – F1 i G1, kako bi se preciznije opisali razvojni stadiji korijena umnjaka. Stadij F1 podrazumijeva da dužina korijena iznosi barem dvije dužine krunice zuba. Korijeni još imaju ljevkast položaj završetaka, a G1 stadij podrazumijeva da su korijenski zidovi paralelni, ali njihovi apeksi nisu u cijelosti zatvoreni. Prostor periodontalnog ligamenta u apikalnom dijelu iznosi > 1,0 mm (13).

Statistics

Statistical analysis was performed using IBM SPSS program, 22 version.

The Spearman's correlation coefficients were employed to assess accuracy of used methods (Olze, Demirjian and Solari and Abramovitch) in this study, i.e. to find a correlation between estimated dental and real chronological age in Bosnian and Herzegovinian sample.

Results

Intra-observer repeatability of this study was tested by re-examining 10% of OPGs. The Kappa value for all measurements was between 0,884-1.

The age and gender distributions of the individuals in this study were presented in Table 1., 2., 3. The age ranged from 8 to 25 years. For girls, the mean (standard deviation) was 20.75 years (4.84 years), unlike for boys, the mean was slightly lower, 20.42 years (4.90 years).

In our investigation, we have found a high and significant correlation ($p < 0.000$) between estimated age, using developmental phases of third molars by these three methods, and real chronological age in all of four quadrants, on the right and left sides in both jaws, in male and female subjects as well (Table 4., Figure 1.).

Statistika

Statistička analiza obavljena je programom IBM SPSS – verzija 22.

Spearmanovi koeficijenti korelacije izračunati su da bi se procijenila točnost korištenih metoda (Olze, Demirjian te Solari i Abramovitch) u ovoj studiji, tj. radi pronalazjenja povezanosti između procijenjene dentalne i stvarne kronološke dobi na uzorku bosansko-hercegovačke populacije.

Rezultati

Potvrda pouzdanosti ispitivača testirana je ponovnim nasumičnim pregledom 10 % OPG snimki. Kappa vrijednost za sva mjerenja iznosila je između 0,884 i 1.

Dobna i spolna distribucija ispitanika u ovoj studiji prikazana je u tablicama 1., 2. i 3., pri čemu se raspon dobi kretao od 8 do 25 godina. Prosječna dob ispitanica (standardna devijacija) iznosila je 20,75 godina (4,84 godine), za razliku od ispitanika za koje je srednja vrijednost bila nešto niža – 20,42 godine (4,90 godina).

Koristeći se razvojnim stadijima umnjaka s pomoću tih triju metoda i stvarne kronološke dobi u svim četirima promatranim kvadrantima na desnoj i lijevoj strani u objema čeljustima i kod muškaraca i kod žena, u našem smo istraživanju pronašli visoku i značajnu povezanost ($p < 0,000$) između procijenjene dobi (tablica 4., slika 1.).

Table 1 Distribution of respondents with hypodontia of third molars by age and sex
Tablica 1. Raspodjela ispitanika s hipodontijom trećih kutnjaka prema dobi i spolu

Group	Sex of respondents				Total	
	Male		Female		n	%
	n	%	n	%		
8-10 years	42	16.7%	42	16.7%	84	16.7%
11-13 years	41	16.3%	42	16.7%	83	16.5%
14-16 years	42	16.7%	42	16.7%	84	16.7%
17-19 years	42	16.7%	42	16.7%	84	16.7%
20-22 years	42	16.7%	42	16.7%	84	16.7%
23-25 years	42	16.7%	42	16.7%	84	16.7%
Total	251	100.0%	252	100.0%	503	100.0%

Table 2 Distribution of respondents with all four third molars presented by age and sex
Tablica 2. Raspodjela ispitanika sa sva četiri treća kutnjaka prikazana prema dobi i spolu

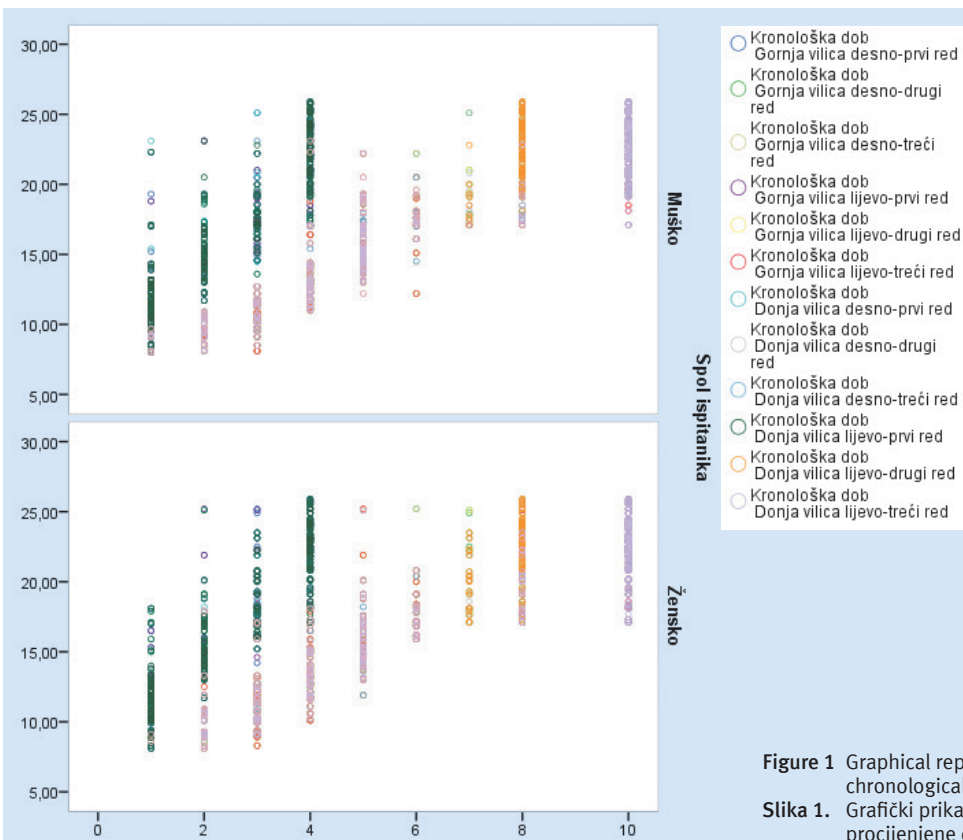
Group	Sex of respondents				Total	
	Male		Female		n	%
	n	%	n	%		
8-10 years	42	16.7%	42	16.7%	84	16.7%
11-13 years	42	16.7%	42	16.7%	84	16.7%
14-16 years	42	16.7%	42	16.7%	84	16.7%
17-19 years	42	16.7%	42	16.7%	84	16.7%
20-22 years	42	16.7%	42	16.7%	84	16.7%
23-25 years	42	16.7%	42	16.7%	84	16.7%
Total	252	100.0%	252	100.0%	504	100.0%

Table 3 Distribution of average age according sex
Tablica 3. Raspodjela prosječne dobi prema spolu

	Sex of respondents					
	Male			Female		
	n	Mean	Std. Deviation	n	Mean	Std. Deviation
Chronological age	503	20.02.20	01.04.90	504	20.75	01.04.84

Table 4 Distribution of correlation between chronological and estimated dental age according to the sex of respondents
Tablica 4. Podjela povezanosti između kronološke i procijenjene dobi zuba prema spolu ispitanika

Stage of third molar development	Sex of respondents					
	Male			Female		
	Chronological age			Chronological age		
	Spearman's rho Correlation	p	n	Spearman's rho Correlation	p	n
Olze – Upper jaw, right side	821	0	392	819	0	381
Demirjian – Upper jaw, right	856	0	392	857	0	380
Solari and Abramovitch – Upper jaw, right	856	0	392	857	0	380
Olze – Upper jaw, left side	827	0	382	797	0	395
Demirjian – Upper jaw, left	864	0	382	841	0	394
Solari and Abramovitch – Upper jaw, left	864	0	382	841	0	394
Olze- Lower jaw, right	858	0	419	845	0	399
Demirjian – Lower jaw, right	884	0	419	875	0	398
Solari and Abramovitch – Lower jaw, right	884	0	419	875	0	398
Olze – Lower jaw, left	848	0	403	847	0	404
Demirjian – Lower jaw, left	881	0	403	872	0	403
Solari and Abramovitch – Lower jaw, left	881	0	403	872	0	403



Discussion

Numerous published studies have showed that the chronological course of wisdom teeth mineralization varies slightly between various population and races. In our investigation, we have found a high and significant correlation between estimated age, using developmental phases of third molars by these three methods, and real chronological age in all of four quadrants, on the right and left sides in both jaws, in male and female subjects. Most authors agree with this statement.

In this study, our sample represents the general population and includes all main ethnic communities in Bosnia and Herzegovina. According to the literature, there are no other published articles about estimating the age on third molars in Bosnian and Herzegovinian population.

A number of scientific papers have been published about comparing the accuracy of age estimation of different radiographic methods using third molars (Sisman et al., Orhan et al., Brkić et al., Amanullah et al., Akki et al., Raj et al., Olze et al., Caldas et al., Schmeling et al., Prieto et al., Li et al., Bai et al., Zeng et al., Lee et al., Jung et Cho., Monirafard et al., Johan et al., Selmanagić et al., Attar and AL-Taei, Soares et al., Meinel et al., Ajmal et al., Medeiros de Araujo et al., Rozkovicova et al., Rai et al., Rai et al., De Salvia et al., Branco et al., Suma et al., Sarnat et al., Kohatsu et al., Cordeiro et al., Eto et al.). Furthermore, Mohammed et al. (34) found a significant correlation between dental and chronological age on the sample in South Indian population, with age ranging from 9 to 20 years. Also, the use of specific population standards is recommended in their study.

Then, one year later, Babburi et al. (35) analysed the third molars developmental stages on population from the region Coastal Andhra in India, aged 15 to 22 years and concluded that in the Demirjian's stages D-H, a child is more likely to be 18 years of age. These authors noticed the roots of maxillary third molars were not easily interpreted because the adjacent anatomy structures are present, such as in the studies of Lee et al. (23), Monirafard et al. (25), John et al. (26) and Selmanagić et al. (2). They have also explained that the delayed closure of the apices may be due to poor socioeconomic status in the region.

In our investigation, we found no case with present F1 and G1 level in the root development as proposed to use in the Solari and Abramovitch method, which implies that the observed stages were identical according to the Solari and Abramovitch method as well as according to the Demirjian's method.

Solari and Abramovitch (36) have tested their method on US Hispanic population of children and adolescents, age range 14 to 25 years. The term US Hispanic implies the Mexican-American population, nowadays 60-70 % made up of Mexicans, American Indians and Spanish conquerors. However, there is the great problem of illegal immigration of individuals with false or improper documents in states that share a common border with Mexico, especially in the USA. It is important to confirm the fact that an individual is younger or older than 18 years.

Rasprava

U mnogobrojnim objavljenim studijama istaknuto je da kronološki tijek mineralizacije trećih kutnjaka blago varira između različitih populacija i rasa. U našem istraživanju otkrili smo visoku i značajnu povezanost između procijenjene dobi korištenjem razvojne faze trećih kutnjaka s pomoću tih triju metoda i stvarne kronološke dobi u svim četirima promatranim kvadrantima na desnoj i lijevoj strani u objema čeljustima i kod muškaraca i kod žena. Većina autora slaže se s tom tvrdnjom.

U ovom istraživanju uzorak predstavlja opću populaciju i uključuje sve glavne etničke zajednice u Bosni i Hercegovini. Prema podatcima iz literature nema drugih objavljenih članka o procjeni dobi s pomoću trećih kutnjaka u bosansko-hercegovačkoj populaciji.

Objavljeni su radovi koji kompariraju točnost procijenjene dobi različitim radiografskim metodama koristeći se trećim kutnjacima (Sisman i sur., Orhan i sur., Brkić i sur., Amanullahi sur., Akki i sur., Raj o sur., Olze i sur., Caldas o sur., Schmeling i sur., Prieto i sur., Li i sur., Bai i sur., Zeng i sur., Lee i sur., Jung i Cho., Monirafard i sur., Johan i sur., Selmanagić o sur., Attar i AL-Taei, Soares i sur., Meinel i sur., Ajmal i sur., Medeiros de Araujo i sur., Rozkovicova i sur., Rai i sur., Rai i sur., De Salvia i sur., Branco i sur., Suma i sur., Sarnat i sur., Kohatsu i sur., Cordeiro i sur., Eto i sur.).

Mohammed i suradnici (34) otkrili su značajnu povezanost između dentalne i kronološke dobi na uzorku u populaciji Južne Indije u rasponu od 9 do 20 godina. U svojoj studiji također preporučuju upotrebu specifičnih populacijskih standarda.

Zatim, godinu dana poslije, Babburi i suradnici (35) analizirali su razvojne stadije trećih kutnjaka na populaciji iz indijske pokrajine Coastal Andhra u dobi od 15 do 22 godine i zaključili da metodom prema Demirjjanu, u stadijima od D do H, dijete će najvjerojatnije imati 18 godina. Autori kao što su Lee i suradnici (23), Monirafard i suradnici (25), John i suradnici (26) i Selmanagić i suradnici (2), u svojim studijama uočili da korijeni maksilarnih trećih kutnjaka nisu jednostavni za analizu zbog susjednih anatomskih struktura. Također su objasnili da bi odgođeno zatvaranje apeksa korjenova umnjaka moglo biti posljedica lošeg socijalno-ekonomskog statusa u regiji.

U našem istraživanju nismo pronašli ni jedan slučaj sa stadijima F1 i G1 u razvoju korijena, kako je predloženo u metodi Solarija i Abramovitcha, što implicira da su promatrani stadiji umnjaka bili identični u metodi prema Solariju i Abramovitchu te u metodi prema Demirjjanu.

Solari i Abramovitch (36) testirali su svoju metodu na američkoj latinoameričkoj populaciji djece i adolescenata u rasponu od 14 do 25 godina. Termin *Hispanoamerikanci* obuhvaća meksičko-američko stanovništvo koje danas od 60 do 70 % čine Meksikanci, američki Indijanci i potomci španjolskih osvajača. No velik je problem ilegalna imigracija pojedinaca s lažnim ili nevaljanim dokumentima u državama koje imaju zajedničku granicu s Meksikom, posebno u SAD-u. Važno je potvrditi da je osoba mlađa ili starija od 18 godina.

And, the results of this study suggest that third molars in Latinos develop earlier than in a population sample of Canadian Caucasians. Ethnicity is probably the main reason. During the study, the observers noticed some difficulties in evaluating the level of upper third molar's root on OPGs due to the superimposition of adjacent anatomic structures, such as in the studies of Monirafard, Johan, Lee, Selmanagić, Baburi et al.

Selmanagić et al, Sisman et al., Orhan et al., Brkić et al., Amanullah et al., Soares et al., Akki et al., Raj et al., Olze et al., Schmeling et al., Prieto et al., Li et al., Bai et al., Zeng et al., Lee et al., Jung et Cho, Monirafard et al., Johan et al., Attar and AL-Taei, Ajmal et al., Medeiros de Araujo et al., Rozkovicova et al., Rai et al., Mohammed et al., De Salvia et al., Branco et al., Suma et al., Sarnat et al. found similar results to those in our study. (2,4,8,9,11,12,14,15,16,18,19,20,21,22,23,24,25,26,27,29,30,31,32,34,37,38,39,40).

Contrary to the results of the above mentioned studies, Kohatsu et al., Cordeiro et al. and Eto et al. did not verify the correlation between the chronological age and dental development of third molars (41,42,43).

Conclusion

Based on this study, we can recommend wisdom teeth for assessing the dental age by the Olze, Demirjian as well as Solari and Abramovitch method in Bosnian and Herzegovinian population.

In any case, it is very important to keep in mind the fact that the difference between dental and chronological age might be affected by various factors such as precision of method, investigator's skill and experience, size and structure of sample (age, gender, ethnic and national belonging, social status...) as well as taking a statistical approach to the obtained results.

Conflict of interest

None declared

I rezultati ove studije pokazuju da se treći kutnjaci kod latinskoga stanovništva razvijaju ranije negoli u uzorku kanadskih bijelaca, a glavni je razlog vjerojatno etnička pripadnost. Tijekom rada na studiji, promatrači su na ortopantomogramima uočili poteškoće u procjeni razvojnog stadija korijena gornjega trećeg kutnjaka zbog superponiranja susjednih anatomskih struktura, kao što su to već spomenuli u svojim istraživanjima Monirafard, Johan, Lee, Selmanagić, Baburi i ostali.

Selmanagić i sur., Sisman i sur., Orhan i sur., Brkić i sur., Amanullah i sur., Soares i sur., Akki i sur., Raj i sur., Olze i sur., Schmeling i sur., Prieto i sur., Li i sur., Bai i sur., Zeng i sur., Lee i sur., Jung i Cho, Monirafard i sur., Johan i sur., Attar i Al-Taei, Ajmal i sur., Medeiros de Araujo i sur., Rozkovicova i sur., Rai i sur., Mohammed i sur., De Salvia i sur., Branco i sur., Suma i sur., te Sarnat i sur., dobili su slične rezultate kao u našoj studiji. (2, 4, 8, 9, 11, 12, 14, 15, 16, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 32, 34, 37, 38, 39, 40).

Suprotno rezultatima u spomenutim studijama, Kohatsu sa suradnicima, Cordeiro sa suradnicima i Eto sa suradnicima nisu potvrdili povezanost između kronološke dobi i dentalnog razvoja trećih kutnjaka (41, 42, 43).

Zaključak

Na temelju ove studije možemo preporučiti analiziranje trećih kutnjaka pri procjeni dentalne dobi metodama prema Olzeu i Demirjiju, te metodom prema Solariju i Abramovitchu u bosansko-hercegovačkoj populaciji.

U svakom slučaju, vrlo je važno imati na umu da na razliku između dentalne i kronološke dobi mogu utjecati različiti čimbenici poput preciznosti metode, vještine i iskustva istraživača, veličine i strukture uzorka (dob, spol, etnička i nacionalna pripadnost, socijalni status itd.) te statistički pristup dobivenim rezultatima.

Sukob interesa

Nije ga bilo.

Sažetak

Sažetak: Razvoj trećih kutnjaka koristan je pri procjeni dentalne dobi u adolescentnom i ranom adultnom razdoblju. **Svrha:** Ispitali smo ponovljivost i točnost triju radiografskih metoda za određivanja dentalne dobi (Olze, Demirjian, Solari i Abramovitch) i procijenili koja je učinkovitija. Također smo obavili testiranje kako bismo pronašli povezanost između procijenjene dentalne i kronološke dobi s pomoću tih triju metoda. **Materijal i metode:** Ortopantomograme (OPG-e) 1007 pojedinaca (8 – 25 godina) podijelili smo u dvije skupine (oko 500 OPG-ova) – jedna skupina sadržavala je sva četiri treća kutnjaka, a u drugoj su se nalazile OPG snimke s hipodoncijom jednoga, dvaju ili triju trećih kutnjaka. Te su snimke analizirane kako bi se potvrdila točnost svih triju metoda (Olze, Demirjian te Solari i Abramovitch) za procjenu dobi na temelju razvoja trećeg kutnjaka. **Rezultati:** Zabilježena je visoka statistička značajnost Spearmanova koeficijenta korelacije između razvojnih stadija trećeg kutnjaka i kronološke dobi ispitanika. **Zaključak:** Na temelju dobivenih rezultata preporučuje se korištenje trećih kutnjaka pri procjeni dentalne dobi metodama prema Olzeu, Demirjiju te prema Solariju i Abramovitchu na populaciji iz Bosne i Hercegovine.

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Ključne riječi

treći kutnjak; procjena dentalne dobi, adolescenti; Bosna i Hercegovina

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