

Medjuzavisnost dentalne i hronološke starosti kod devojčica i dečaka uzrasta od 7-14 godina

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Correlation of Dental and Chronological Maturity in Girls and Boys Aged 7 to 14 Years

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KRATAK SADRŽAJ

Cilj ovog istraživanja bio je da se na uzorku dece naše populacije utvrdi medjuzavisnost dentalne od hronološke zrelosti u odnosu na pol ispitanika. **Materijal i metod:** Ovom studijom je obuhvaćeno 320 devojčica i dečaka uzrasta od 7-14 godina. Dentalna starost je određena metodom po Demirijanu. Dobijeni rezultati su statistički obrađeni uz izračunavanje prosečne vrednosti i standardne devijacije za dentalnu zrelost za uzrast 7,8,9,10,11,12,13 i 14 godina, i to posebno za devojčice i za dečake. Ispitivana je zavisnost dentalne i hronološke starosti, kod devojčica i dečaka izračunavanjem jednačine linearne regresije, i određivanjem koeficijenta determinacije i korelacije. **Rezultati i zaključak:** Na osnovu dobijenih rezultata može se zaključiti da prosečne vrednosti dentalne starosti ne odstupaju mnogo u odnosu na hronološku zrelost kod svih osam grupa i da postoji visoka zavisnost dentalne i hronološke zrelosti (za dečake 78,6%, a za devojčice 79,6%).

Ključne reči: biološka starost, dentalna starost

Jedan od osnovnih zadataka ortopedije vilica predstavlja usmeravanje razvitka orofacijalnog sistema i uspostavljanje ravnoteže u odnosima između delova orofacijalnog sistema. Razvitoj zuba je integralni deo kraniofacijalnog sistema. To je dug i dinamičan proces koji započinje intrauterino, i završava se oko 17. godine (drugi molar) i još kasnije, ako se uzmu u obzir treći molari.

Za pravilno planiranje ortodontske terapije, od velikog značaja je procenjivanje stepena razvitka orofacijalnog sistema. Zbog toga se uvodi koncept biološke ili

SUMMARY

The aim of the study was to assess correlation level of dental and chronological maturity related to gender in a group of children of our population. **Material and method:** Total number of 320 girls and boys, 7 to 14 years old, participated in the study. Dental age assessed by Demirjian's method. Statistical data were analysed by mean value and SD for dental maturity in age groups of 7, 8, 9, 10, 11, 12, 13 and 14 years for girls and boys, respectively. Calculating the equation of linear regression and the determination and correlation ratio assessed correlation level of dental and chronological age.

Results and conclusion: According to the results obtained, it can be concluded that mean values of dental age are coinciding with the chronological maturity in all 8 age groups which is confirmed by high interdependence of dental and chronological maturity (78.6% for boys and 79.6% for girls).

Key words: biological age, dental age

One of the main goals in front of orthodontists is directing the development of oro-facial system and establishing balanced relations among parts of the oro-facial system. Development of dentition is the integral part of cranio-facial system. It represents a long and dynamic process that is initialised during intrauterine period and is completed by age of 17 years (second permanent molar) and later if considering third molars eruption.

For a good orthodontic treatment plan, it is of great importance to evaluate developmental level of the oro-

razvojne zrelosti, koja se procenjuje na osnovu konstitucije, telesne težine i visine, kao i procene dentalnog, skeletnog i mentalnog razvitka svakog pacijenta¹.

Određivanje jedne karakteristike biološke zrelosti na osnovu druge, može se matematički prikazati kao kvadrat korelacionog koeficijenta poznate karakteristike. Istraživanja nekoliko autora pokazala su da je korelacija između hronološke i dentalne starosti relativno niska. Po istraživanjima Profita i Fildsa², sa verovatnoćom od 50% može se predvideti dentalni razvoj na osnovu hronološke zrelosti. Ni drugi parametri ne pokazuju bolje rezultate. Tako, na primer, Hag i Tarandzer³ smatraju da stadijumi nicanja zuba ne mogu biti upotrebljeni kao pouzdani indikatori maksimalnog pubertetskog rasta, zbog velike varijabilnosti. Roberts⁴ je utvrdio da je dentalni razvitak usporen u odnosu na hronološki uzrast kod dece sa idiopatskim pubertet precoc-om. Garn i sar.⁵ smatraju da su deca, koja su napredna somatski, naprednija i po pitanju dentalnog razvitka. Studija Luisa i Garna⁶ dokazala je da je niska korelacija između mineralizacije zuba i drugih parametara fizičkog razvitka.

Obzirom da su sva ova istraživanja rađena na uzorku dece sa drugih područja, javila se potreba da se takvo istraživanje uradi i za decu naše populacije.

Cilj ovog istraživanja bio je da se na uzorku dece naše populacije utvrdi zavisnost dentalne od hronoloske zrelosti u odnosu na pol ispitanika.

Materijal i metod

Ovom studijom bilo je obuhvaćeno 320 devojčica i dečaka uzrasta od 7-14 godina, pacijenata Klinike za ortopediju vilica Stomatološkog fakulteta u Beogradu. Deca su pripadala različitim ekonomsko socijalnim strukturama, i većinom su sa područja Beograda.

Metod prikupljanja i obrade podataka obuhvatio je:

1. Anamnezu. Deca su po anamnestičkim podacima imala normalnu medicinsku prošlost.
2. Klinički nalaz. Vodio se računa da uzorak ne obuhvati decu sa anodoncijama, hiperdoncijama, teskobom težeg stepena, ekstrahovanim stalnim zubima.
3. Ortopantomografske snimke

Stadijum formiranja zuba određivan je sa ortopantomografskih snimaka, a prema metodi po Demirjaniu i sar.⁷.

Po Demirjaniu, postoji devet stadijuma dentalnog razvoja (Sl. 1):

- 0 Zubni zametak bez znakova kalcifikacije;
- A Kalcifikacija pojedinih delova okluzalne površine ali bez njihove fuzije;
- B Fuzija delova okluzalne površine, kontura okluzalne površine prepoznatljiva;

facial system. That is why biological or developmental maturity concept has been introduced, by which body shape, weight and height are measured, as well as dental, skeletal and mental status of each patient can be estimated. Assessment of the one characteristic of biological maturity in relation to another can be presented as the square of correlation coefficient of the known characteristic. Proffit and Fields² have reported that dental development can be predicted with up to 50% of reliability on the basis of chronological maturity. Other investigated parameters are not expressing better results either. Hagg and Taranger³ believe that stages of teeth eruption cannot be used as reliable indicators of the maximal development in adolescence for their significant variability. Roberts⁴ has estimated that dental development is slower when compared to chronological age in children with premature puberty (pubertas praecox). Garn et al.⁵ have reported that children, who are more progressive by somatic means, are also progressing more rapidly in dental development. By studies of Lewis and Garn⁶ it was proven that correlation between dental mineralization and other parameters of physical growth is low. Considering that all analysed studies were undertaken in children from different geographical regions, a need for a study in our region was evident.

The aim of this study was to assess correlation between dental and chronological maturity in relation to gender in a group of children in our population.

Material and method

Total number of 320 girls and boys, aged 7 to 14 years old, patients at the Clinic of orthodontics, Faculty of Dentistry in Belgrade, participated in the study. Children had different socio-economic background and most of them were living in Belgrade.

Methods used for collecting and further analysis of data were:

1. Anamnesis
2. Clinical examination. Children with anodontia, hyperodontia, overcrowded teeth, extracted permanent teeth were excluded from the study.
3. OPT radiographs.

Stages in dental formation were related to radiographic appearance by use of Demirjian et als. method.⁷

According to Demirjian, there are 9 stages of dental development (Fig.1):

- 0 Dental bud without signs of calcification
- A Observed calcified areas of occlusal surface without their fusion
- B Fusion of the calcified areas occlusally, occlusal surface contours recognisable
- C Calcification of the crown completed, dentine accumulation can be observed

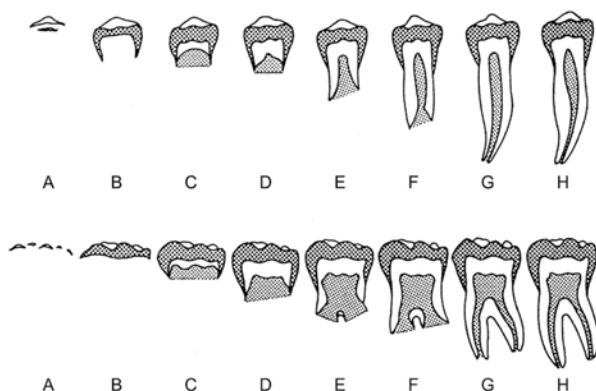
- C Kalcifikacija krunice je kompletna, počinje nagomilavanje dentina;
- D Potpuno formirana krunica zuba do cementno gledjne granice;
- E Dužina korena kraća nego visina krunice;
- F Dužina korena duža nego visina krunice;
- G Koren formiran. Apikalni otvor još uvek otvoren;
- H Apikalni otvor zatvoren.

Prema stadijumu razvoja, svaki zub dobija određenu ocenu. Sabiranjem brojevanih ocena za sve zube u donjem levom kvadrantu na ortopanografskom snimku, dobija se broj na osnovu koga se iz tabele odredi dentalna starost.

Uzorak formiran za ovo ispitivanje podeljen je na osam grupa od po 40 ispitanika na osnovu hronološkog uzrasta (7-14 godina). U okviru svake grupe, formirane su po dve podgrupe u zavisnosti od pola ispitanika (20 devojčica i 20 dečaka).

Dobijeni rezultati su statistički obradjeni uz izračunavanje:

- 1) prosečne vrednosti i standardne devijacije dentalne starosti kod dečaka i devojčica,
- 2) koeficijenta determinacije i korelacije između dentalne i hronološke starosti, kod devojčica i kod dečaka.
- 3) Jednačine regresione linije u grupi devojčica i dečaka.



- D Crown formation is completed to the enamel-cemental junction
- E Radicular length is shorter than height of the crown
- F Radicular length is longer than height of the crown
- G Root formation is completed, apical opening is wide
- H Apical opening is closed.

Each tooth is marked according to the developmental stage. Value for dental age is obtained from the table and presents the sum of numerical marks for all teeth in lower left quadrant at the OPT.

The sample formed for this investigation was divided in eight groups with 40 examinees each related to the chronological age (7-14 ys). Every group was further subdivided in two by gender (20 boys and 20 girls).

Data obtained were statistically analysed by calculating for the group of boys and the group of girls, respectively:

- 1) mean values and SD of dental age
- 2) determination and correlation coefficient of dental and chronological age
- 3) equation of linear regression.

Slika 1. Razvojni stadijumi jednokorenih i višekorenih zuba.
Figure 1. Developing stages of single-root and multi-root teeth

Rezultati

Rezultati, dobijeni statističkom analizom, prikazani su u tabelama 1 i 2, i grafikonima 1 i 2.

U tabeli 1 se uočava da dentalna starost u najvećoj meri prati hronološku starost kod dečaka. Značajnije razlike se uočavaju kod hronološkog uzrasta od 10 i 13 godina (dentalna starost prednjači u odnosu na hronološku oko 12 meseci).

Sličan je nalaz i kod devojčica (tab.2), sa najvećom razlikom između dentalne i hronološke starosti u uzrastu od 12 godina (9 meseci).

Ispitujući oblik i stepen zavisnosti između hronološkog uzrasta ispitanika i njihove dentalne starosti utvrđeno je da i kod dečaka i devojčica (grafikon 1 i 2) oblik zavisnosti dentalne od hronološke starosti ispitanika linearan,

Results

Results, that were statistically analysed, are presented in tables 1 and 2, and graphs 1 and 2. Dental age is coinciding with chronological age in boys and it is obvious from the table 1. More significant discrepancies occur in chronological ages 10 to 13 years (dental age is advancing when compared to chronological for more than 12 months). In girls (tab.2), the highest level of difference between dental and chronological age was observed at 12 years of age (9 months time advantage for dental age).

When form and level of interdependence between chronological age of examinees and their dental age were studied, it was clear that the correlation is linear and statistically highly significant, both in boys and girls (graphs 1

i visoko statistički značajan. Sa verovatnoćom od 78,6% kod dečaka i 79,6% kod devojčica dentalna starost može biti utvrđena na osnovu hronološke starosti.

and 2). Dental age can be evaluated in relation to chronological age with 78.6% reliability in boys and 79.6% in girls, respectively.

Tabela 1. Prosečna vrednost dentalne starosti kod dečaka 7-14 godina

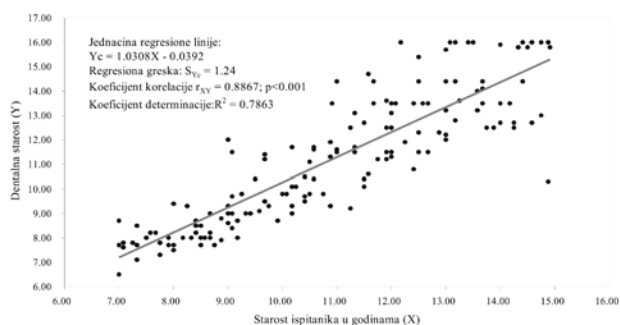
Table 1 Mean values of dental maturity in boys aged 7-14 years.

DEČACI								
Hronološka starost	7	8	9	10	11	12	13	14
Dentalna starost	7.8±0.5	8.2±0.5	9.6±1.1	10.5±1.1	12.1±1.5	12.8±1.4	14.0±1.3	14.5±1.7

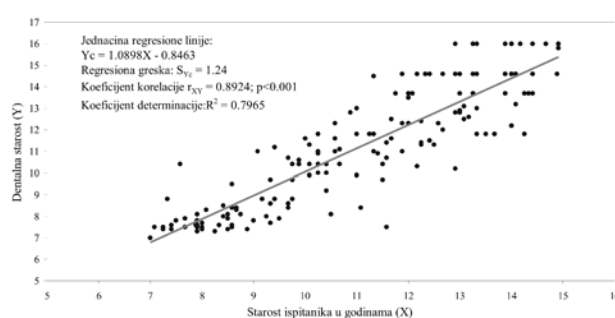
Tabela.2. Prosečna vrednost dentalne starosti kod dečaka uzrasta 7-14 godina

Table 2. Mean values of dental maturity in girls aged 7-14 years.

DEVOJČICE								
Hronološka starost	7	8	9	10	11	12	13	14
Dentalna starost	7.8±0.7	7.9±0.5	9.3±1.2	10.8±1.1	11.4±1.8	12.9±1.6	13.7±1.4	14.8±1.3



Grafikon 1. Zavisnost dentalne i hronološke starosti kod dečaka
Chart 1. Dental maturity dependence on the age of boys examined



Grafikon 2. Zavisnost dentalne i hronološke starosti kod dečaka
Chart 2. Dental maturity dependence on the age of girls examined

Diskusija

Rast ljudskog organizma, pa i rast lica, karakteriše se značajnom varijabilnošću, kako u iznosu rasta tako i u napredovanju različitih osoba ka biološkoj zrelosti^{8,9}. Procenjivanje dentalne starosti je od velikog značaja za određivanje stepena zrelosti deteta u trenutku kada se planira ortodonska terapija.

Pri formiranju uzorka pacijenata za ovo istraživanje, vodilo se računa da ne budu obuhvaćena deca sa anodoncijama, hiperdoncijama, teskobom većeg stepena, sa ekstrahovanim stalnim zubima i lošim rendgenskim snimcima. Bez obzira na to, ispitivanje je izvedeno na snimcima dece sa različitim malokluzijama. To, svakako, može da utice na preciznost određivanja dentalne zrelosti, posebno ako se uzmu u obzir nalazi Gvozdrenović¹⁰, koja je utvrdila da deca sa izrazitim uskostima ili dubokim zagrižajem imaju usporen dentalni razvitak u odnosu na vršnjake bez malokluzija.

Discussion

Growth of the human body and growth of face are characterized by significant variability, both in growth rate and individual progression toward biological maturity.^{8,9} Evaluation of dental age is of great importance for assessment of child's stage of maturity when orthodontic treatment is planned.

All children with anodontia, hyperodontia, overcrowded teeth, permanent teeth extracted and with irregular radiographs in their records were excluded from the studied sample. However, included in the study was analysis of radiographs of children with various malocclusions. It was of certain influence on the accurate dental maturity assessment, particularly when having in mind findings that Gvozdrenovic¹⁰ has published on decreased dental development in children with severely narrow jaws and excessive overbite depth comparing to age-matched controls without malocclusions.

Na osnovu rezultata ovog istraživanja, zavisnost dentalne zrelosti od hronološke je izuzetno visoka, i kod dečaka ta zavisnost iznosi čak 78,6%, a kod devojčica 79,6%. To znači, da sa verovatnoćom od 78,6% kod dečaka i 79,6% kod devojčica, možemo predvideti dentalni razvoj na osnovu hronološke zrelosti. Ovo istraživanje nije u skladu sa istraživanjima Proffita i Fildsa², kod kojih je ta zavisnost manja i iznosi samo 50%. Ovo neslaganje u rezultatima može se objasniti činjenicom da su istraživanja rađena na različitim geografskim prostorima, kao i činjenicom da je ovo istraživanje izvedeno na snimcima dece sa različitim malokluzijama, što može imati uticaja na brzinu mineralizacije stalnih zuba¹⁰.

Zaključak

Na osnovu rezultata ovog istraživanja može se zaključiti da na dentalni razvoj u velikoj meri utiče geografsko područje i prisustvo različitih malokluzija. Korišćenje parametara za procenu dentalne starosti, a koji su dobijeni analiziranjem osoba drugih populacija, dalo bi rezultate koji mogu biti netačni i dovesti do pogrešnih zaključaka pri procenivanju biološkog uzrasta dece sa ovih prostora. Zavisnost dentalne i hronološke starosti kod pacijenata u našoj populaciji je veoma visoka i za dečake iznosi 78,6%, a za devojčice 79,6%.

Zahvala: Rad je finansiran (projekat br. 1542) od strane Ministarstva za nauku i tehnologiju Republike Srbije.

According to the results obtained in this study, there is a significantly high dependence of dental age on the chronological age. In boys correlation level is 78.6% and in girls is 79.6%. It means that with 78.6% reliability in boys and 79.6% in girls, we are able to predict further dental development in relation to chronological maturity. These findings are not coinciding with the work of Proffit and Fields² whose results are suggesting correlation level not higher than 50%. This discrepancy can be interpreted by the fact that two studies were conducted in different geographic regions, and also to the fact that our study included radiographs of children with various malocclusions which can influence mineralization course in permanent teeth.¹⁰

Conclusion

Following the results from this study, it can be concluded that dental development is influenced in a great extent by geographic region and the presence of various malocclusions. The use of different evaluation parameters obtained from other populations by data analysis could lead to incorrect results and conclusions when biological age of children from our region is estimated. Dental and chronological correlation level in patients in our population is very high and values 78.6% in boys and 79.6% in girls.

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