

RADIOLOŠKA VELIČINA SELE TURCIKE KOD RAZLIČITIH MALOKLUZIJA

RADIOLOGICAL MEASURING OF SELLA TURCICA'S SIZE IN DIFFERENT MALOCCLUSIONS

Gordana Filipović,¹ Mirjana Burić,² Mirjana Janošević,¹ Maja Stošić¹

MEDICINSKI FAKULTET U NIŠU, ²KLINIKA ZA STOMATOLOGIJU, ODELJENJE ZA ORTODONCIJU, NIŠ, SRBIJA

MEDICAL FACULTY, NIŠ² CLINIC OF STOMATOLOGY, DEPARTMENT OF ORTHODONTICS, NIS, SERBIA

Kratak sadržaj.

Uvod. Sella turcica je deo kranijalne baze u kome je smeštena hipofiza. Smatra se da postoji korelacija između veličine kranijalne baze a samim tim i sella turcice kao njenog sastavnog dela i malokluzija.

Cilj ovog ispitivanja bio je da radiološkom analizom profilnih snimaka glave osoba sa različitim malokluzijama odrede linearne dimenzije ST, postojanje polnog dimorfizma i povezanost veličine ST sa određenom malokluzijom.

Materijal. Ispitivanjem je obuhvaćeno ukupno 90 osoba koje su na osnovu vrednosti ugla ANB podeljene u tri grupe (po 30 osoba sa malokluzijom I klase, II klase i III klase po Angle-u). Merene su linearne dimenzije (dužina, širina i dijametar) ST.

Rezultati. Ispitivanje je pokazalo da osobe sa malokluzijom II klase imaju najmanje a osobe sa malokluzijom III klase najveće vrednosti linearnih dimenzija sela turcice. Ni u jednoj ispitivanoj grupi nije utvrđen polni dimorfizam ispitivanih parametara.

Zaključak. Na osnovu dobijenih rezultata može se zaključiti da postoji korelacija između veličine sella turcice i određenih malokluzija.

Cljučne reči: sella turcica, malokluzija.

Uvod

Kranijalna baza predstavlja osnovu na kojoj se razvija humano lice i brojna istraživanja pokazuju da dimenzije srednje kranijalne fose utiču na odnose između nazomaksilarnog kompleksa i malokluzija.^{1,2}

U kranijalnoj bazi, u centru sella turcica (ST) nalazi se jedna od najčešće korišćenih kranijalnih tačaka u kefalometriji, pod istoimenim nazivom - sella turcica. U anatomsom delu sella turcice smeštena je hipofiza.

Kefalometrijska ispitivanja osoba sa patologijom hipofize mogu, u nekim slučajevima, po-

Abstract

Introduction. Sella turcica is a part of cranial base where the pituitary is located. It is believed that there is a correlation between the size of the cranial base and thus sella turcica as its integral part and the malocclusions.

The goal of this study was to determine the linear dimensions of ST by radiological analysis of different malocclusions, to determine the existence of sexual dimorphism and to determine the connection between the size of ST with certain malocclusions.

Material. This study is completed upon 90 persons, who were divided into three groups according to the values of ANB angle (30 persons in each group with malocclusion class I, class II and class III according to Angle). The linear dimensions were measured (length, width, diameter) ST.

Results. The study has proven that the persons with the malocclusion of the II class have the lowest and persons with malocclusion class III the highest values of the linear dimensions of sella turcica. In none of the studied groups was sexual dimorphism of the examined parameters present.

Conclusion. According to the results, we may conclude that there is a correlation between the size of sella turcica and certain malocclusions.

Key words: sella turcica, malocclusion.

Introduction

Cranial basis represents the base on which a human face is developed and there is a number of studies which show that the dimensions of the middle cranial fossa influence the relations between the Nasal-Maxillary complex and the malocclusions.^{1,2}

In the cranial basis in the centre of sella turcica (ST) there is one of the most frequently used cranial spots in cephalometry, with the very same name – sella turcica. In the anatomic part of sella turcica, pituitary is located.

Cephalometric examinations of persons with pathology of pituitary may in some cases

kazati nenormalni izgled predela sella turcice a moguća je i obrnuta situacija pri čemu osobe sa abnormalnom sella turcicom mogu u stvari imati neotkrivene bolesti³⁻⁵. Promene oblika i veličine turskog sedla mogu se javiti kod rascjepa usne i nepca⁶, urođenih kraniofacijalnih anomalija^{7,8}, akromegalije⁹, poremećaja rada štitne žlezde¹⁰.

Korelacija veličine kranijalne baze i malokluzija je diskutovana od brojnih autora.¹¹⁻¹⁴

Morfološki izgled sella turcica ustanovljen je u u ranom embrionom stadijumu.¹⁵⁻¹⁸

Morfologija sella turcica se ne menja signifikantno posle 12 godine^{19,20} i smatra se da je posle ovog perioda veličina sella turcice kod osoba muškog i osoba ženskog pola gotovo ista.^{21,22}

Iako postoji veći broj radova u kojima su analizirane dimenzije ST, različitim metodama, još uvek nema tačno odredjenih standarda po kojima se može odrediti veličina ST. Premeravanja se mogu vršiti na kadaverima^{23,24}, uglavnom su opisani radovi na telerendgenskim snimcima, mada se mogu koristiti u te svrhe i anteroposteriorni snimci.^{10,25,26}

Cilj rada

Obzirom na pomenutu činjenicu da je sella turcica deo kranijalne baze cilj ovoga rada je bio da se radiološkom analizom profilnih snimaka glave odredi veličina sella turcice kod osoba sa različitim sagitalnim odnosom vilica.

Materijal i metod

Ispitivanje je obavljeno na 90 profilnih snimaka glave osoba oba pola, starosti od 18-22 godine, sa teritorije Niša i okoline, pacijenata Klinike za stomatologiju u Nišu, odeljenje za ortopediju vilica. Prema vrednosti ugla ANB (ugao razlike maksilarnog i mandibularnog prognatizma), svi ispitanici su podeljeni u tri grupe:

1. 30 osoba sa prvom klasom po Angle-u, (vrednost ugla ANB od 2°-4°)
2. 30 osoba sa drugom klasom po Angle-u, (vrednosti ugla ANB veće od 4°)
3. 30 osoba sa trećom klasom po Angle-u, (vrednosti ugla ANB manje od 2°)

show the abnormal look of the sella turcica region. However, exactly the opposite may happen – that persons with abnormal look of sella turcica may in fact have some undiscovered diseases³⁻⁵. The changes in the shape and size of sella turcica may appear when there is cleft lip and palate⁶, inborn cranial anomalies^{7,8}, acromegaly⁹, dysfunction of thyroid¹⁰.

The correlation of the size of the cranial base and malocclusion is discussed by many authors.¹¹⁻¹⁴

The morphological look of sella turcica is established in the early embryo stadium.¹⁵⁻¹⁸

The morphology of sella turcica is not significantly changed after 12 years^{19,20} and it is believed that after this period the size of sella turcica is almost the same in both males and females.^{21,22}

Although there is a great number of studies in which the dimensions of sella turcica have been analyzed, using different methods, there are still no specific standards by which the size of ST is determined. The measurements can be done on cadavers^{23,24}. Mostly the works with tele-X-ray have been described, though there are also anteroposterior records.^{10,25,26}

The aim

Since the mentioned fact, that sella turcica is a part of the cranial base, the aim of our research was to define the size of sella turcica by radiological analysis of profile cephalograms at persons with different sagittal relation of the jaws.

Material and method

The study was conducted upon 90 profile cephalograms of persons of both sex, ages between 18-22, from the territory of Nis and the surroundings, all patients of the Clinic of stomatology, Nis, Department of Jaw Orthopedics. According to the values of the ANB angle (the angle of the difference of the maxillar and mandibular prognathism), all the patients were divided into three groups:

1. 30 persons with the first class according to the Angle (the values of ANB angle are from 2° - 4°)
2. 30 persons with the second class according to the Angle (the values of ANB angle higher than 4°)
3. 30 persons with the third class according to the Angle (the values of ANB angle less than 2°)

Za sve pacijente urađeni su, pod istim uslovi-
ma, profilni telerendgenski snimci pomoću apa-
rata marke »Simens«, snage 90 KW i ekspozicijom od 1 sekunde. Glava pacijenta je fiksirana pomoću kefalostata tako da je Frankfurtska horizontala bila paralelna sa podom, a srednja sagitalna ravan je bila paralelna sa kasetom i filmom.

Svi telerendgenski snimci su analizirani na isti način od strane jednog ispitivača klasičnim načinom analize koji podrazumeva iscertavanje kontura koštanih struktura na acetatnom papiru a potom i merenje određenih linearnih parametara. Iscertana je konfiguracija sela turcica koja se sastoji iz tuberculum sella, pod sela turcike, dorsum selle i anteriorni i posteriorni clinoidni processus. (slika 1)

Linearne dimenzije ST su merene po metodi Silverman²⁷ i Kisling.²⁸ Sve referentne linije u ovoj studiji su locirane u srednjoj sagitalnoj ravni. Dužina sela turcike je merena kao razdaljina od tuberculum sele do vrha dorsuma sele. Dubina sela turcike je normala od najdublje tačke na podu sella turcice na liniju koja spaja tangira najvišu tačku tuberculuma i dorsuma selle. Anteroposteriorni dijametar je meren kao rastojanje od tuberculuma sele do najdistalnije tačke na posteriornom zidu fosse.

Greška premeravanja određena je ponovljenim merenjem deset telerendgenskih snimaka odabranih metodom slučajnog uzorka i merenih deset dana posle prvog merenja. Wilcox statistička analiza nije pokazala statistički značajne razlike između dva premeravanja.

Razlike ispitivanih parametara između polova i različitih malokluzija testirane su

Dobijeni rezultati obrađeni su statistički i izračunati su sledeći parametri: X, SD, Cv i min-max. Razlike ispitivanih parametara između polova i različitih malokluzija testirane su Studentovim t-testom.

For all the patients profile tele-X-ray snapshots were made with a device type "Siemens" 90 kW power and explosion of 1 sec. The head of the patient was fixated with cephalostat so that the Frankfurt horizontal was parallel to the floor and the middle sagittal plain was parallel to the cassette and the film.

All tele-X-ray snapshots were analyzed in the same way by one examiner by classical method of analysis which includes contour drawing of the bone structure on the acetyl paper and after that measurement of certain linear parameters. The configuration of sella turcica which was drawn consists of tuberculum sella, the bottom of sella turcica, dorsum sella and anterior and posterior clinoidal processus (pic. 1).

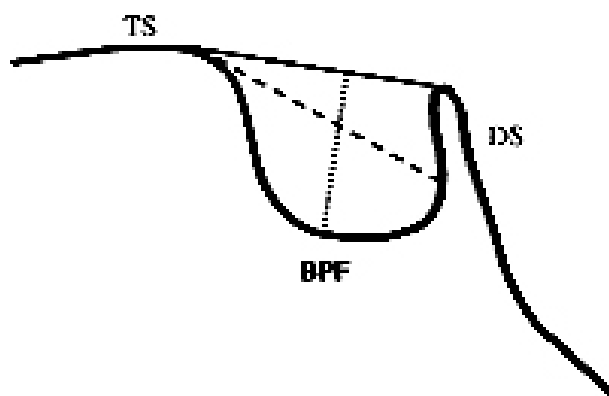
Linear dimensions of ST were measured according to Silverman²⁷ and Kisling²⁸ method. All referent lines in this study are located in the median sagittal plain. The length of sella turcica is measured as the distance from the tuberculum sella to the tip of sella dorsum. The depth of sella turcica is normal from the deepest point on the bottom of sella turcica on the line which connects the highest point tuberculum and dorsum sella. Anteroposterior diameter was measured as the distance from the tuberculum sella to the most distal point of the posterior wall of fosse.

The mistake of the measurement was defined by another measuring of ten tele-X-ray snapshots chosen by the method of random sample, which were measured ten days after the first measurement. Wilcox statistic analysis did not show significant statistic differences between the two measurements.

The acquired results were statistically defined and calculated according to the following parameters: X, SD, Cv and min-max. The differences of the examined parameters between sexes and different malocclusions were tested by Student's t-test.

Slika 1. TS-tuberculum selle, DS-dorsum selle, BPF- baza pituitarne fosse, tačkasta linija-dubina selle, isprekidana linija-dijametar selle

Figure 1. Normal sella turcica morphology and reference lines used for measuring sella size: TS, tuberculum sella; DS, dorsum sella; BPF, base of the pituitary fossa; black line, length of sella; dashed line, diameter of sella; dotted line, depth of sella.



Rezultati

Linearne dimenzije ST su prikazane na tabeli 1. Uporedjene su prosečna dužina, širina i dijametar ST kod osoba sa različitim malokluzijama. S obzirom da ne postoje polne razlike ni u jednoj ispitivanoj grupi, grupe su dalje analizirane kao celina.

The results

The linear dimensions of ST are shown in the table 1. The average length, width and diameter of ST were compared at persons with different malocclusions. Baring in mind that there are no sexual differences in any of the examined groups, the groups were analyzed as a whole.

Tab.1 Linearne dimenzije sella turcica kod osoba sa različitim malokluzijama
Table 1. Linear dimensions of sella turcica of persons with different malocclusions

	I kl I class	II kl II class	III kl III class
parametar parameter	X±SD	X±SD	X±SD
Širina width	9,18 ±1,74	8,59 ±1,50	10,11 ±1,70 ^{b*c***}
Dubina depth	8,48 ±1,28 ^{a**}	7,48 ±1,16	9,20 ±1,26 ^{b*c***}
Dijagonala diagonal	10,95 ±1,04	10,45 ±1,70	11,28 ±1,29 ^{c*}

a I vs II, b I vs III, c II vs III

* - p<0,05

** - p<0,01

*** - p<0,001

Prosečna vrednost širine ST kod osoba sa malokluzijom I klase iznosila je 9,18 mm ± 1,74 a kod osoba sa malokluzijom II klase 8,59 mm ± 1,50 . Osobe sa malokluzijom III klase imaju statističko značajno veću vrednost širine ST u odnosu na prethodne dve grupe ispitanika koja iznosi 10,11 mm ± 1,70.

Osobe sa malokluzijom III klase odlikuju se značajno većom prosečnom vrednošću širine ST u odnosu na osobe sa malokluzijom I klase (p<0,05) i II klase (p<0,001).

Dubina ST pokazuje sličnu tendenciju. Prosečne vrednosti dubine ST kod ispitanika sa I, II i III klasom iznose 8,48 mm ±1,28; 7,48mm ± 1,16 i 9,20mm ± 1,26 Takodje je značajno veća kod osoba sa malokluzijom III klase u odnosu na osobe sa I klasom (p<0,05) i II klasom (p<0,001).

Prosečne vrednosti dijagonale ST kod osoba sa malokluzijom I, II i III klase iznose 10,95mm ± 1,04; 10,45mm ± 1,70 i 11,28 mm ± 1,29. Dijagonala je takođe najviša kod klase III, statistički je veća no kod ispitanika II klase (p<0,05).

The average value of the width of ST of persons with malocclusion of class I was 9.18 mm ± 1.74, and of persons with malocclusion class II was 8.59 mm ± 1.50. Persons with malocclusions of the third class, have statistically significantly higher value of the width of ST comparing to the previous two groups, which is 10.11 mm ± 1.70.

The persons with malocclusion of the third class have significantly higher average value of the width of ST compared to the persons with the first class malocclusions (p<0.05) and the second class (p<0,001).

The depth of ST shows similar tendency. The average values of the depth of ST of the patients with I, II and III class are 8.48 mm ±1.28; 7.48 mm ± 1.16 and 9.20 mm ± 1,26. Also, the depth is significantly higher with persons with the malocclusion of the III class compared to the I class (p<0,05) and II class (p<0,001).

The average values of the diagonal of ST of persons with malocclusion of I, II and III class are 10.95 mm ± 1.04; 10.45 mm ± 1.70 and 11.28 mm ± 1.29. The diagonal is also the highest with the III class, statistically it is higher than that of the patients of the II class (p<0.05).

Diskusija

Rezultati ovog ispitivanja idu u prilog prethodnim istraživanjima koja tvrde da osobe sa različitim skeletnim odnosom vilica pokazuju razlike u veličini sela turcika.

Širina ST merena je po metodi Silvermana²⁷ i Kisling²⁸ kao rastojanje od tuberculum selle do dorzuma selle. Silverman²⁷ nije objavio vrednosti ovog parametra ali je pokazao postojanje korelacije između godina ispitanika, pola i dimenzija ST.

Između rezultata našeg ispitivanja i rezultata prethodnih ispitivača mogu se uočiti određene razlike. Quakinine i Hardy²⁴ radili su premeravanja dimenzija ST na kadaverima različite uzrastne dobi. Njihovi rezultati pokazuju je širina ST 12 mm, anteroposteriorni dijametar 8 mm a dubina 6 mm, što su značajno manje vrednosti od naših. Slične rezultate objavili su Axelsson i sar.²⁹ na ispitivanom uzorku u Norveškoj.

Našim ispitivanjem nisu dobijene polne razlike ni u jednoj ispitivanoj grupi, što se poklapa sa nalazima Israel i sar.²¹, Alkofide³⁰, Andredaki³¹, Philipp Meyer-Marcotty i sar.³² a ne poklapa sa nalazima Axelsson i sar.²⁹ koji su utvrdili postojanje razlika u širini sella turcice između polova. Jones i sar.⁸ su merili širinu ST kod osoba kod kojih je planirana ortodontsko-hirurška terapija i kod osoba koje su tretirane samo ortodontski. Ovi autori nisu našli statističke razlike za vrednosti širine ST između ove dve ispitivane grupe.

Rezultati našeg ispitivanja pokazali su da dubina ST ima najmanje vrednosti kod osoba sa malokluzijom II klase a najveće vrednosti kod osoba sa malokluzijom III klase. De Chiro²⁵ i Nelson⁶ objavili su da je srednja vrednost dubine ST kod odraslih osoba 8 mm što je približno rezultatima našeg ispitivanja za osobe sa malokluzijom I klase. Nešto niže vrednosti dobili su Axelsson i sar.²⁹ (vrednost dubine ST kod osoba muškog pola bila je 7,4 mm a kod osoba ženskog pola 7,1 mm.)

Ispitivanja Jones i sar.⁸ pokazuju da je prosečna vrednost dubine ST 8,6mm i ne pokazuje značajnu razliku između ispitivanih grupa (osobe sa ortodontsko-hirurškim tretmanom i osobe sa samo ortodontskom terapijom).

Discussion

The results of this research verify the former researches which state that persons with different skeletal relation of jaws have significant differences in the size of sella turcica.

The width of ST is measured according to Silverman²⁷ and Kisling²⁸ method as the distance from the tuberculum sella to dorsum sella. Although, Silverman²⁷ has not published the values of this parameter, he has shown the existence of the correlation between the age of the patient, their sex and the dimensions of ST.

There are certain differences between the results of our study and the previous studies. Quakinine i Hardy²⁴ have measured the dimensions of ST on cadavers of different ages. Their results show that the width of ST 12 mm, anteroposterior diameter 8 mm and the depth 6 mm, which are significantly smaller values than ours. Similar results were published by Axelsson at al²⁹ on the examined sample in Norway.

Our research does not show sexual differences in any of the age groups, which is the same with the results of Israel and team.²¹, Alkofide³⁰, Andredaki³¹, Philipp Meyer-Marcotty at al.³² However, it is not the same with the results of Axelsson at al²⁹, who claimed that there was a difference in the width of sella turcica with different sexes. Jones at al.⁸ have measured the width of ST of persons who have had orthodontic surgery planned and of persons who have been orthodontically treated. These authors have not found statistic differences in the values of the width of ST between these two examined groups.

The results of our study show that persons with malocclusion II class has lower values of the depth of ST, and persons with malocclusion III class have the highest values. De Chiro²⁵ and Nelson⁶ have published that the average value of the depth of ST of adults is 8 mm, which is close to the results of our research for persons with malocclusion of I class. Somewhat lower values were published by Axelsson at al.²⁹ (the value of the depth of ST with male was 7.4 mm and female 7.1 mm). The research by Jones and al⁸ shows that the average value of the depth of ST is 8.6 mm and there is no significant difference between the examined groups (persons with orthodontic surgery and persons with orthodontic therapy).

Zaključak

Osobe sa malokluzijom II klase imaju najmanje vrednosti a osobe sa malokluzijom III klase najveće vrednosti linearnih dimenzija sela turcike što ukazuje na postojanje korelacije između veličine selle turcike i određenih malokluzija.

Conclusion

Persons with malocclusion of II class have lower values and persons with the malocclusion of III class have the highest values of the linear dimensions of sella turcica, which points out the existence of the correlation between the size of sella turcica and certain malocclusions.

LITERATURA / REFERENCES

1. Enlow D, Kuroda T, Lewis A. B The morphological and morphogenetic basis for craniofacial form and pattern. *Angle Orthod* 1971; 41:161-188
2. Enlow D, Mc Namara J. A The neurocranial basis for facial form and pattern. *Angle Orthod* 1973; 43:256-270
3. Weisberg LA, Zimmerman EA, Frantz AG. Diagnosis and evaluation of patients with an enlarged sella turcica. *Am J Med* 1976;61:590-596
4. Friedland B, Meazzini MC. Incidental finding of an enlarged sella turcica on a lateral cephalogram. *Am J Orthod Dentofacial Orth* 1996; 110:508-512
5. Alkofide E. Pituitary adenoma: a cephalometric finding. *Am J Orthod Dentofacial Orthod* 2001; 120:559-562
6. Nielsen BW, Molsted K, Kjaer I. Maxillary and sella turcica morphology in newborns with cleft lip and palate. *Cleft Palate Craniofac J* 2005;42:610-617
7. Bector JP, Einersen S, Kjaer I. A sella turcica bridge in subjects with severe craniofacial deviations. *Eur J Orthod* 2000;22:69-74
8. Jones RM, Faqir A, Millett DT, Moos KF, McHugh S. Bridging and dimensions of sella turcica in subjects treated by surgical-orthodontic means or orthodontic only. *Angle Orthod* 2005;75:714-718.
9. Dostalova S, Sonka K, Smahel Z, Weiss V, Marek J. Cephalometric assessment of cranial abnormalities in patients with acromegaly. *J Craniomaxillofac Surg* 2003;31:80-87
10. Yamada T, Tsukui T, Ikejiri K, Yukimura Y, Kotani M. Volume of sella turcica in normal subjects and in patients with primary hypothyroidism and hyperthyroidism. *J Clin Endocrinol Metab* 1976;42:817-822
11. Renfroe EW. A study of the facial patterns associated with class I, class II division 1, class II division 2 malocclusions. *Angle Orthod* 1948; 18:12-15.
12. Bjork A. Some biological aspects of prognathism and occlusion of the teeth. *Acta Odontol Scand* 1950;8:1-40
13. Moss ML. Correlation of cranial base angulation with cephalic malformations and growth disharmonies of dental interest. *NY state Dent* 1955;24:452-454
14. Ricketts RM. Facial and denture changes during orthodontic treatment as analyzed from the temporomandibular joint. *Am J Orthod* 1955;41:407-34
15. Kjaer I, Wagner A, Madsen P, Blichfeldt S, Rasmussen K, Russell B. The sella turcica in children with lumbosacral myelomeningocele. *Eur J Orthod* (1998) 20:443-448.
16. Kjaer I, Hansen N, Bector KB, Birebaek N, Balslev T. Craniofacial morphology, dentition, and skeletal maturity in four siblings with Seckel syndrome. *Cleft Palate-Craniofacial J* 2001; 38:645-651.
17. Kjaer I, Hjalgrim H, Russell BG. Cranial and hand skeleton in fragile X syndrome. *Am J Med Gen* 2001; 100:156-161.
18. Kjaer I, Keeling JW, Fischer Hansen B, Bector KB. Midline skeletodental morphology in holoprosencephaly. *Cleft Palate-Craniofac J* 2002; 39:357-363
19. Björk A. Cranial base development. *Am J Orthod* 1955; 41:198-225.
20. Melsen B. The cranial base: the postnatal development of the cranial base studied historically on human autopsy material. *Acta Odont Scand* 1974;32:57-71
21. Israel H. Continuing growth in sella turcica with age. *Am J Roentgenol Radium Ther Nucl Med* 1970; 108:516-527
22. Pisaneschi M, Kapoor G. Imaging of the sella and parasellar region. *Neuroimaging Clinics of North America* 2005;15:203-219
23. Karlos GA. Morphological observations on superior surface of body of sphenoid bone in human adults (disertation). Helsinki: University of Helsingfors; 1984
24. Quakinine GE, Hardy J. Microsurgical anatomy of the pituitary gland and the sellar region: the pituitary gland. *Am Surg* 1987; 53:285-290
25. De Chiro G. The width (third dimension) of the sella turcica. *Am J Roentgenol Radium Ther Nucl Med* 1960;84:26-37
26. McLahlan MS, Williams ED, Fortt RW, Doyle FH. Estimation of pituitary gland dimensions from radiographs of the sella turcica. A post mortem study. *Br J Radiol* 1968;41:323-330
27. Silverman FN. Roentgen standards for size of the pituitary fossa from infancy through adolescence. *Am J Roentgen* 1957; 78:451-460.
28. Kisling E. Cranial morphology in Down's syndrome. A comparative roentgencephalometric study in adult males 1966, Thesis, Munksgaard, Copenhagen.
29. Axelsson S, Storhaug K, Kjær I. Post-natal size and morphology of the sella turcica. Longitudinal cephalometric standards for Norwegians between 6 and 21 years of age. *Eur J Orthod* 2004; 26:597-604
30. Alkofide EA. The shape and size of the sella turcica in skeletal Class I, Class II, and Class III Saudi subjects. *Eur J Orthod* 2007;29:457-463.
31. Andredaki M, Koumantanou A, Dorotheu D, Halaizonetis D.J. A cephalometric morphometric study of the sella turcica. *Eur J Orthod* 2007;29:449-456
32. Philipp Meyer-Marcotty Ph, Reuther T, Eisenhauer SA. Bridging of the sella turcica in skeletal Class III subjects. *Eur J Orthod* 2009;32:148-156.

Adresa za korespondenciju:

Ass.dr Gordana Filipović
 Klinika za stomatologiju-Niš
 Bul. dr Zorana Djindjića 52
 18000 Niš
 Srbija
 tel.018 226 216

Address of correspondence:

Gordana Filipović, DDS, MSD, Ph.D
 Clinic of Stomatology
 Dr Zorana Djindjića, 52 Blvd
 18000 Niš
 Serbia