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Evaluation of *Sella Turcica* Variations in Lateral Cephalometric Radiographs and its Association with Malocclusion

Procjena varijacija turskog sedla na lateralnim kraniogramima i njihova povezanost s malokluzijom

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Abstract

Objectives: Understanding the shape and size of the sella turcica may help predict future orthodontic treatment needs related to skeletal malocclusion. This study aims to assess different morphological types of the sella turcica in lateral cephalometric radiographs and its correlation with malocclusion, as well as the relationship between gender and linear measurements of sella turcica. **Materials and Methods:** The lateral cephalometric radiographs of 410 volunteers (111 men and 299 women) aged 8 to 30 years were evaluated. The patients were divided into three groups based on their skeletal growth patterns (cl I, II, and III). Then the anatomical shape and linear dimensions of sella turcica were assessed. Measurements were made using Adobe Photoshop Version: 20.0.0 software, and data analysis was performed by IBM SPSS Statistics version 25. **Results:** The following morphologies were observed: normal (37.8%), oblique anterior wall (9.3%), double contour of the floor (21.5%), sella turcica bridge (8.8%), irregularity (notching) in the posterior part of sella turcica (16.6%), and pyramidal shape of the dorsum sellae (6.1%). No statistically significant relationship was found between sella turcica variations and skeletal malocclusion. The correlation between female sex with the diameter ($p=0.027$) and depth values ($p=0.035$) of sella turcica was statistically significant. There was no statistically significant difference ($p>0.05$) in length based on gender. **Conclusion:** The most morphological type reported was normal sella turcica (37.8%). Anatomical variations of sella turcica had no association with malocclusion. The most considerable depth and diameter of sella turcica were found in women.

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Introduction

Malocclusion is a developmental malformation that can be of dental or skeletal origin. Malocclusion originating from the craniofacial skeleton is caused by the cranial base, maxilla, and mandible's shape, size, and abnormal position (1, 2). The skeletal growth pattern is a multifactorial issue for which many etiological factors have been proposed. Genetic, environmental, and ethnic factors are the most critical factors in this field (3, 4). The World Health Organization has estimat-

Uvod

Malokluzija je razvojna malformacija koja može biti dentalnoga ili skeletnoga podrijetla. Malokluzija podrijetlom iz kraniofacijalnog skeleta uzrokovana je bazom lubanje, maksilom te oblikom, veličinom i abnormalnim položajem mandibule (1, 2). Obrazac rasta skeleta multifaktorijalni je problem za koji su predloženi mnogi etiološki čimbenici. Genetski, okolišni i etnički čimbenici najkritičniji su u tom području (3, 4). Svjetska zdravstvena organizacija procijenila je

ed malocclusions as the third oral and dental health problem after tooth decay and periodontal diseases(5).

In orthodontics, lateral cephalometric radiography is used to evaluate craniofacial morphology and the relationship between skeletal abnormalities and malocclusion. This radiograph makes it possible to measure the relative position of the maxilla and mandible with the cranium or several landmarks within the skull, including the sella turcica point (located in the center of the sella turcica)(6).

Since the middle cranial base develops earlier, the stability of the middle cranial fossa after 8 years of age makes it an appropriate baseline for studying facial development. Sella turcica, a landmark in this region where neural crest cells play a role in its formation and development, is examined to evaluate craniofacial morphology and developmental changes(7).

The sella turcica is a saddle-shaped depression in the trunk of the sphenoid bone in the middle cranial cavity (8), the anterior part of which is called the *tuberculum sellae*, and the posterior portion is called the *dorsum sellae*. The development of the sella turcica is remarkably related to the pituitary gland. Since the pituitary gland must form before the sella turcica, any deviation in the development of this gland can affect the morphology of the sella turcica (9). Therefore, disorders such as acromegaly or gigantism, Cushing's disease, and hyperthyroidism can affect the morphology of the sella turcica(10).

The sella turcica is U-shaped in the lateral cephalometric radiograph(6). Morphological types of sella turcica fall into 5 categories: normal, oblique anterior wall, double contour of the floor, sella turcica bridge, irregularity (notching) in the posterior part of sella turcica, and pyramidal shape of the dorsum sellae(11).

A specific anatomical type considered unusual is the creation of a bridge in sella turcica(12). Also, partial calcification of the interclinoid ligament is an incomplete bridge(13). The bridge in the sella turcica can be caused by the excessive ossification of the sphenoid bone between the anterior and posterior clinoid processes of the sphenoid bone. Simultaneously, some theories speak of the role of the HOX hedgehog gene mutation in the sella turcica bridge(12). Although other studies on monozygotic twins show that mainly the size of the sella turcica of each individual is equal to that of its twin, in some cases, this size was different between monozygotic twins. These findings showed that the abnormality in sella turcica cannot be only of genetic origin(14).

Completing sella turcica development in early childhood has made it a stable structure for predicting facial growth patterns using its dimensions and morphology. The relationship between the size and shape of the sella turcica with malocclusion helps in the early detection of skeletal patterns and reduces the burden of treatment in the future(15). Therefore, considering the importance of this issue, our goal was to evaluate the sella turcica variations in lateral cephalometric radiographs and their relationship with malocclusion.

Materials and Methods

This descriptive-analytical cross-sectional study was carried out to investigate the variations of sella turcica in lateral

da je malokluzija treći oralni i dentalni zdravstveni problem poslije karijesa i parodontitisa (5).

U ortodontiji se lateralni kranioogram upotrebljava za procjenu kraniofacijalne morfologije i odnosa između skeletnih abnormalnosti i malokluzije. Taj radiološki prikaz omogućuje mjerenje relativnog položaja maksile i mandibule u odnosu na lubanju ili nekoliko orijentira unutar lubanje, uključujući točku *sella turcica* (nalazi se u njezinu središtu) (6).

Budući da se srednja baza lubanje razvija ranije, stabilnost srednje lubanjske jame poslije dobi od 8 godina čini ga prikladnom bazom za proučavanje razvoja lica. *Sella turcica*, anatomska formacija u tom području u kojemu su stanice neuralnoga grebena veoma važne u njegovu formiranju i razvoju, istražuje se za procjenu kraniofacijalne morfologije i razvojnih promjena (7).

Sella turcica je sedlasto udubljenje u trupu sfenoidne kosti u sredini kranijalne šupljine (8). Njezin prednji dio naziva se *tuberculum sellae*, a stražnji *dorsum sellae*. Razvoj *sella turcica* izvanredno je povezan s hipofizom. Budući da se hipofiza mora formirati prije turskoga sedla, svako odstupanje u razvoju te žlijezde može utjecati na morfologiju sedlastoga udubljenja (9). Zato poremećaji kao što su akromegalija ili gigantizam, Cushingova bolest i hipertireoza mogu utjecati na morfologiju *sella turcica* (10).

Sella turcica ima oblik slova U na lateralnome kranioogramu (6). Njezini morfološki tipovi imaju pet kategorija: normalnu, kosu prednju stijenku, dvostruku konturu dna, most sedlastoga udubljenja, nepravilnost (zarezi) u stražnjem dijelu i piramidalni oblik dorzuma *sellae* (11).

Specifičan anatomski tip koji se smatra neobičnim jest stvaranje mosta (12). Također, djelomična kalcifikacija interklinoidnoga ligamenta je nepotpuni most (13). Most *sella turcica* može biti prouzročen pretjeranim okoštavanjem sfenoidne kosti između prednjega i stražnjega klinoidnog nastavka sfenoidne kosti. Istodobno neke teorije govore o ulozi mutacija *HOX* gena u nastanku toga mosta (12). Iako je u drugim istraživanjima na monozygotnim blizancima istaknuto da je veličina sedlastoga udubljenja svake jedinice kod blizanaca uglavnom jednaka, u nekim slučajevima bila je različita između jednojajčanih blizanaca. Ti nalazi pokazuju da abnormalnost u građi *sella turcica* ne može biti samo genetskoga podrijetla (14).

Završetak razvoja *sella turcica* u ranom djetinjstvu učinio ju je stabilnom strukturom za predviđanje obrazaca rasta lica s pomoću njegovih dimenzija i morfologije. Odnos između veličina i oblika *sella turcica* i malokluzije pomaže u ranom otkrivanju skeletnih obrazaca i smanjuje teret liječenja u budućnosti (15). Zato, s obzirom na važnost toga pitanja, naš je cilj bio procijeniti varijacije morfologije *sella turcica* na lateralnom kranioogramu i njihov odnos s malokluzijom.

Materijali i metode

Ovo deskriptivno-analičko presječno istraživanje provedeno je da bi se istražile varijacije morfologije *sella turcica*

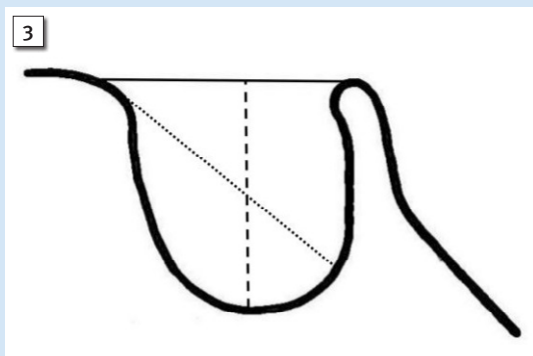
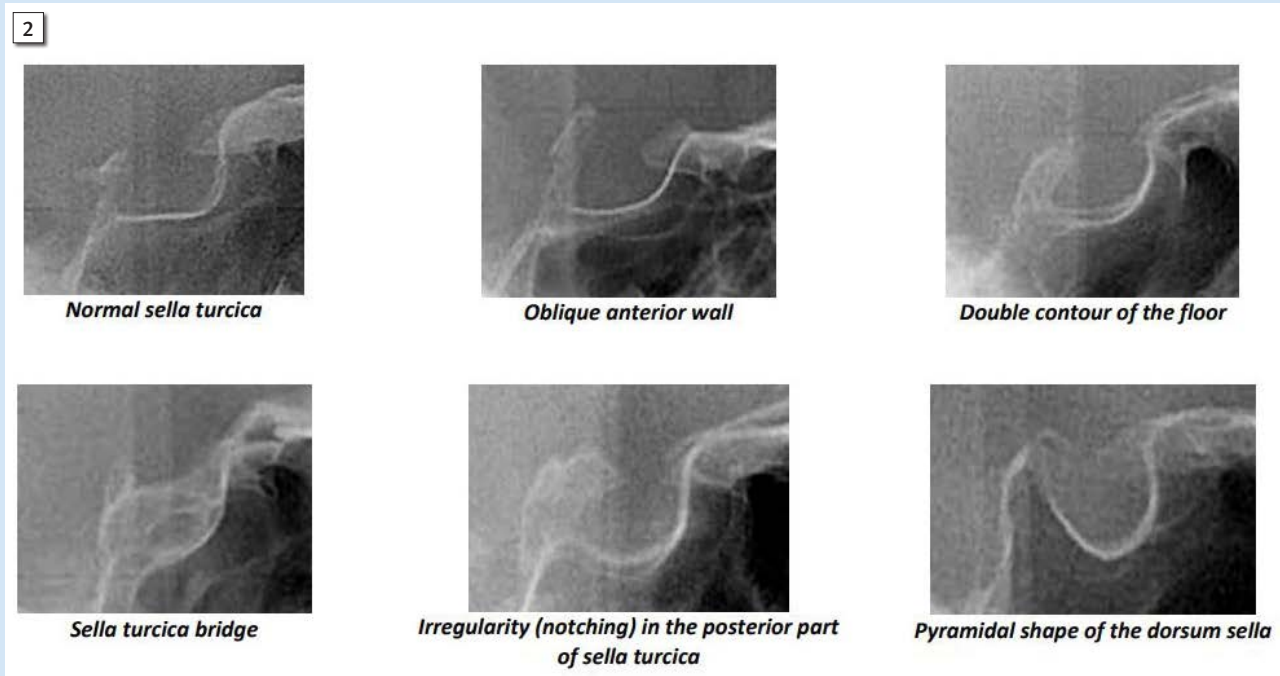
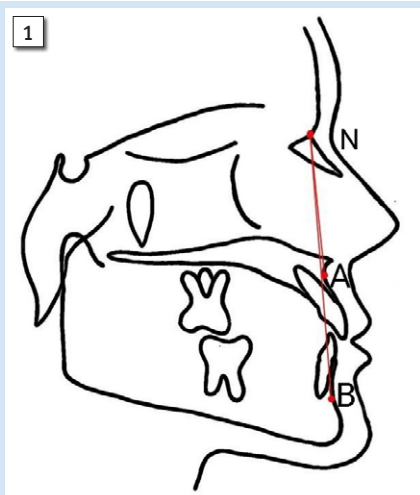


Figure 1 ANB angle in Steiner analysis. N: nasion, A: deepest point between the incisor tooth and the anterior nasal spine on the contour of the premaxilla, B: deepest point between the bony chin and the incisor tooth on the mandible contour.

Slika 1. ANB kut u Steinerovoj analizi. N: nasion, A: najdublja točka između sjekutića i prednje nosne bodlje na konturi premaksile, B: najdublja točka između kosti brade i sjekutića na konturi mandibule

Figure 2 Sella turcica morphology(29)

Slika 2. Morfologija sella turcica (29)

Figure 3 Linear measurements of sella turcica. Solid line: length, square dots: diameter, and dashed line: depth

Slika 3. Linearna mjerenja sella turcica. Puna linija: duljina, kvadratne točke: promjer i isprekidana linija: dubina

Table 1 Skeletal malocclusion type based on ANB angle (all numbers in degrees)
 Tablica 1. Tip skeletalne malokluzije na temelju ANB kuta (svi brojevi u stupnjevima)

Skeletal malocclusion pattern • Tip skeletalne malokluzije	Class I	Class II	Class III
ANB angle • ANB kut	0-4	>4	<0

cephalometric radiographs and its relationship with malocclusion. For this purpose, 532 lateral cephalometric radiographs of patients who attended the dental clinic of Qazvin University of Medical Science, Iran in 2020 and 2021 for orthodontic treatment were observed by two dentistry students. These radiographs were obtained by Cranex 3D x-ray system (Sordex, Finland). Eventually, the lateral cephalometric views of all 410 attendees that volunteered (111 men and 299 women) in the age range of 8 to 30 years were selected by an oral and maxillofacial radiologist only if images showed a clear view of the middle cranial fossa. Patients with a history of maxillofacial trauma, craniofacial clefts, history of maxillofacial surgery, and craniofacial abnormalities were excluded from this study. All patients entered the study with consent, knowing their information would remain confidential (IR.QUMS.REC. 1400.350).

According to a similar study (8), considering type 1 error equal to 0.05 ($Z = 1.96$) with the standard deviation for depth of the sella turcica equivalent to 2.67 and the estimation error 0.27, at least 376, samples were required to determine the index using the following formula:

$$n = \frac{Z^2 \cdot SD^2}{d^2}$$

The facial skeletal pattern was divided into three types based on the ANB angle (Steiner analysis), Figure 1, Table 1. Then the Wits analysis was conducted, and an orthodontist confirmed the skeletal pattern.

In this study, sella turcica was divided into six groups based on morphology: Normal, Oblique anterior wall, Double contour of the floor, Sella turcica bridge, Irregularity (notching) in the posterior part of sella turcica, Pyramidal shape of the dorsum sella, Figure 2, (16). The distance between the tuberculum sellae and dorsum sellae was measured as length, the greatest anteroposterior distance of the sella turcica from the tip of the tuberculum sellae to the posterior wall was measured as diameter, and the deepest point of the floor of the sella turcica was measured as the depth (17, 18) by Adobe Photoshop Version: 20.0.0 software to evaluate their relationship with malocclusion, Figure 3.

Statistical data analysis was performed using the IBM SPSS Statistics version 25 (Armonk, NY: IBM Corp). To describe the morphology of the sella turcica and the skeletal pattern, frequency and percentage were used. Mean and standard deviation was reported for describing the length, depth and diameter of sella turcica. Skeletal malocclusion classes and the shape of sella turcica were compared to its dimensions by one way ANOVA. The Independent T-test and chi square were also employed. P-values lower than 0.05 were considered statistically significant.

Results

In the present study, 410 lateral cephalometric views (%27.1 males, %72.9 females) were interpreted to analyze the shape and size of the sella turcica. Sella turcica dimensions are represented in Table 2. The length, diameter, and depth of sella turcica did not show a statistically significant difference

na lateralnom kraniogramu i njihov odnos s malokluzijom. U tu svrhu dva su studenta stomatologije analizirala 532 lateralna kraniograma pacijenata koji su 2020. i 2021. godine bili na ortodontskoj terapiji u Stomatološkoj klinici Qazvin Sveučilišta medicinskih znanosti u Iranu. Rendgenske snimke dobivene su s pomoću rendgenskog uređaja Cranex 3D (Sordex, Finska). Na kraju su lateralni kraniogrami svih 410 dobrovoljaca (111 muškaraca i 299 žena) u dobi od 8 do 30 godina odabrani poslije pregleda radiologa i to samo ako su snimke omogućile jasan prikaz srednje lubanjske jame. Pacijenti s poviješću maksilofacijalne traume, kraniofacijalnih rascjepa, maksilofacijalnih kirurških zahvata i kraniofacijalnih abnormalnosti, isključeni su iz istraživanja. Znajući da njihove informacije ostaju povjerljive, svi su pacijenti pristali sudjelovati u istraživanju (IR.QUMS.REC. 1400.350).

Prema sličnom istraživanju (8), uzimajući u obzir pogrešku tipa 1 jednaku 0,05 ($Z = 1,96$) sa standardnom devijacijom za dubinu *sella turcica* ekvivalentno 2,67 i pogreške procjene od 0,27, najmanje 376 uzoraka bilo je potrebno za određivanje indeksa s pomoću sljedeće formule:

$$n = \frac{Z^2 \cdot SD^2}{d^2}$$

Skeletni obrazac lica podijeljen je u tri tipa na temelju ANB kuta (Steinerova analiza) (slika 1., tablica 1.). Zatim je provedena Witsova analiza, a ortodont je potvrdio skeletalni uzorak.

U ovoj studiji *sella turcica* podijeljena je u šest skupina na temelju morfologije: normalna, s kosim prednjim zidom, dvostrukom konturom dna, mostom, nepravilnošću (zarezi) u stražnjem dijelu i piramidalnim oblikom dorzuma *sellae* (slika 2.) (16). Udaljenost između *tuberculum sella* i *dorsum sella* izmjerena je kao duljina, najveća anteroposteriorna udaljenost *sella turcica* od vrha *tuberculum sella* do stražnje strane zida izmjerena je kao promjer, a najdublja točka dna *sella turcica* izmjerena je kao dubina (17, 18) s pomoću softvera Adobe Photoshop verzija 20.0.0 radi procjene njihova odnosa s malokluzijom (slika 3.).

Statistička analiza podataka obavljena je u softveru IBM SPSS Statistics verzija 25 (Armonk, NY: IBM Corp). Za opis morfologije *sella turcica* i skeletnoga uzorka korištene su frekvencije i postotci. Srednje vrijednosti i standardne devijacije navedene su za opisivanje duljine, dubine i promjera *sella turcica*. Analiza klasa skeletne malokluzije i oblika *sella turcica* u usporedbi s dimenzijama obavljena je s pomoću jednosmjernog ANOVA-e. Također su korišteni nezavisni T-test i hi-kvadrat test. P-vrijednosti niže od 0,05 smatraju se statistički značajnima.

Rezultati

U ovom istraživanju 410 lateralnih kraniograma (27,1 % muškaraca, 72,9 % žena) interpretirano je u svrhu analize oblika i veličine *sella turcica*. Njezine dimenzije prikazane su u tablici 2. Duljina, promjer i dubina nisu pokazali statistički značajne razlike ($p > 0,05$) između triju klasa malokluzi-

Table 2 Sella turcica dimension values
Tablica 2. Vrijednosti dimenzija *sella turcica*

	Minimum • Minimalna	Maximum • Maksimalna	Mean • Srednja vrijednost	Std. Deviation • Std. devijacija
Length (mm) • Duljina (mm)	3.80	15.00	8.42	1.92
Diameter (mm) • Promjer (mm)	7.10	15.80	11.05	1.50
Depth (mm) • Dubina (mm)	3.90	12.90	7.46	1.36

Table 3 Comparison of length, diameter and, depth variables based on malocclusion classes
Tablica 3. Usporedba varijabli duljine, promjera i dubine na temelju klasa malokluzije

Variable • Varijabla	Malocclusion • Malokluzija	Mean • Srednja vrijednost (mm)	Std. Deviation • Std. devijacija	P-value* • P-vrijednost*
Length • Duljina	Class I • Klasa I	8.63	2.01	0.269
	Class II • Klasa II	8.30	1.87	
	Class III • Klasa III	8.55	2.09	
Diameter • Promjer	Class I • Klasa I	11.15	1.64	0.456
	Class II • Klasa II	10.98	1.42	
	Class III • Klasa III	11.26	1.59	
Depth • Dubina	Class I • Klasa I	7.50	1.41	0.254
	Class II • Klasa II	7.48	1.35	
	Class III • Klasa III	6.94	1.15	

Table 4 Sella turcica morphologies and their dependence on malocclusion classes
Tablica 4. Morfologije *sella turcica* i njezina ovisnost o klasama malokluzije

Sella turcica morphology • Morfologija <i>sella turcica</i>	Class I • Klasa I	Class II • Klasa II	Class III • Klasa III	Total • Ukupna	P-value* • P-vrijednost *
Normal • Normalna	51 (32.9%)	97 (62.6%)	7 (4.5%)	155 (37.8%)	0.697
Oblique anterior wall • Kosi prednji zid	16 (42.1%)	19 (50.0%)	3 (7.9%)	38 (9.3%)	
Double contour of the floor • Dvostruka kontura dna	30 (34.1%)	56 (63.6%)	2 (2.3%)	88 (21.5%)	
Sella turcica bridge • Most <i>sella turcica</i>	10 (27.8%)	23 (63.9%)	3 (8.3%)	36 (8.8%)	
Irregularity in the posterior part • Nepravilnost u stražnjem dijelu	21 (30.9%)	44 (64.7%)	3 (4.4%)	68 (16.6%)	
Pyramidal <i>dorsum sellae</i> • Piramidalni <i>dorsum sellae</i>	7 (28.0%)	18 (72.0%)	0 (0.0%)	25 (6.1%)	
Total • Ukupno	135 (32.9%)	257 (62.7%)	18 (4.4%)	410 (100.0%)	

*Chi square test • Hi-kvadrat test

($p > 0.05$) between the three malocclusion classes, Table 3. The frequency and percentage of different sella turcica morphology in different malocclusion classes are displayed in, Table 4. The Chi square test showed no statistically significant correlation between sella turcica shape and facial skeletal pattern. Yet the most accounted anatomical variation in each class I, II, and III group was normal. Although there was no statistically significant connection between sella turcica length and gender ($p > 0.05$), the greatest diameter and depth values of sella turcica were considerably reported more in females ($p = 0.027$; $p = 0.035$, respectively), Figure 4.

Discussion

It is said that the sella turcica, a saddle-shaped depression within the cranial base, is related to facial malformations, in-

je (tablica 3.). Učestalost i postotak različite morfologije *sella turcica* u različitim klasama malokluzije prikazani su u tablici 4. Hi-kvadrat test nije pokazao statistički značajnu korelaciju između oblika *sella turcica* i skeletalnog obrasca lica. Ipak, najvažnija anatomska varijacija u klasama I, II i III bila je normalna. Iako nije bilo statistički značajne povezanosti između duljine *sella turcica* i spola ($p > 0,05$), najveće vrijednosti promjera i dubine turskoga sedla bile su znatno veće kod žena ($p = 0,027$; $p = 0,035$) (slika 4.).

Rasprava

Smatra se da je *sella turcica*, udubina u obliku sedla unutar baze lubanje, povezana s facijalnim malformacijama, uk-



Figure 4 Comparison of length, diameter, and depth variables based on gender
Slika 4. Usporedba varijabli duljine, promjera i dubine na temelju spola

cluding malocclusion, which is not far-fetched considering the common embryological origin (15). The question arises whether sella turcica is an appropriate predictive factor for facial growth patterns. In this study, we tried to answer this question by assessing the morphology and size of the sella turcica and evaluating its relationship with skeletal malocclusion.

In this study, the most commonly morphological type reported was normal sella turcica (37.8%), and the lowest was pyramidal sella turcica (6.1%). Valizadeh et al. reported normal sella turcica in 24% of their cases(19). In comparison, Alkofide et al. reported normal sella turcica in 67% of cases in their study about the evaluation the shape and size of sella turcica in different patterns of skeletal malocclusion(10).

The results of our study showed that normal morphology of sella turcica was the most frequent morphology in each malocclusion group. Although the most frequent normal morphology was reported in class 2 patients (62.6%), Öktem et al evaluated sella turcica variations in Turkey and found a statistically significant correlation between normal shape and class I malocclusion(20). This contradiction can be affected by the fact that most of the patients in this study had a class II skeletal pattern. Although the pyramidal shape of *dorsum sellae* was the least frequent among the examined variations, no case of it was reported in class III patients. Nevertheless, this result could be influenced by the small number of these patients who participated in our study (4.4%).

Even though the superimposition of radiopaque structures within the middle cranial fossa can be falsely interpreted as a sella turcica bridge, Beक्टर et al. stated that patients with severe craniofacial deviations are more likely to have fused sella turcica(21). Also, further studies demonstrated an increased occurrence of sella turcica bridge in individuals with dental anomalies (22). In our research, sella turcica bridge was observed in 8.8% of subjects, which fits within the range of 5.5-22% as reported by Sinha et al.(23), Axelsson et al.(16), and Kantor et al.(24).

ljučujući malokluziju, što i nije nevjerojatno s obzirom na embriološko podrijetlo (15). Postavlja se pitanje je li *sella turcica* prikladan prediktor obrasca rasta lica. U ovom istraživanju pokušali smo odgovoriti na to pitanje procjenom morfologije i veličine *sella turcica* i njezine povezanosti sa skeletnom malokluzijom.

U ovom je istraživanju najčešće prijavljeni morfološki tip bila normalna *sella turcica* (37,8 %), a najrjeđa je bila piramidalna (6,1 %). Valizadeh i suradnici zabilježili su normalnu morfologiju turskoga sedla u 24 % slučajeva (19). Za usporedbu, Alkofide i suradnici uočili su normalnu građu *sella turcica* u 67 % slučajeva u svojem istraživanju o procjeni njezina oblika i veličine u različitim obrascima skeletne malokluzije (10).

Rezultati našeg istraživanja pokazali su da je najčešća normalna morfologija *sella turcica* u svakoj skupini malokluzija. Iako je normalna morfologija najčešće ustanovljena kod pacijenata klase II (62,6 %), Öktem i suradnici procjenjivali su njezine varijacije u Turskoj te su pronašli statistički značajnu korelaciju između normalnog oblika i malokluzije klase I (20). Na takvu kontradikciju može utjecati činjenica da je većina pacijenata u ovom istraživanju imala skeletni obrazac klase II. Iako je piramidalni oblik dorzuma turskoga sedla kod ispitanika bio najrjeđi među varijacijama, nijedan slučaj nije prijavljen kod pacijenata klase III. Ipak, na taj je rezultat mogao utjecati mali broj pacijenata koji su sudjelovali u našem istraživanju (4,4 %).

Iako superpozicija radiološki neprozirnih struktura unutar srednje lubanjske jame može biti lažno protumačena kao most *sella turcica*, Beक्टर i suradnici navode da pacijenti s teškim kraniofacijalnim devijacijama češće imaju sraslo tursko sedlo (21). Također, daljnja su istraživanja pokazala češću pojavu mosta *sella turcica* kod osoba s dentalnim anomalijama (22). U našem istraživanju taj je most uočen kod 8,8 % ispitanika, što se uklapa u raspon od 5,5 do 22 % kako su izvjestili Sinha i suradnici (23), Axelsson i suradnici (16) i Kantor i suradnici (24).

Several studies have assessed the relationship between anatomical shape and the skeletal malocclusion class of sella turcica. Some authors reported that sella turcica bridging is more frequent in type III malocclusion (15, 19, 25, 26); however, Dasgupta et al. found an increased prevalence of sella turcica bridge in class II subjects. The results of our study demonstrated none of the anatomical types were statistically related to the facial skeletal pattern.

Based on the results of the present study, no significant relationship was found between the length, diameter, and depth of sella turcica with malocclusion. Contrary to our results, Valizadeh et al. stated that the length of sella turcica in skeletal class III patients was significantly larger (19). In their studies, Alkofide et al. (10) and Sinha et al. (23) found a significant correlation between the diameter of sella turcica and class II and class III skeletal malocclusion. Although Yassir et al. (27) and Shah et al. (13), which is in line with this study, did not find a significant association between the skeletal pattern and the size of the sella turcica.

In their study, Rai et al. evaluated the shape of the sella turcica and stated that the size of the sella turcica is more significant in women than in men (28). In the current study, the most considerable depth and diameter of sella turcica were observed in women. However, another study found no significant relationship between gender and sella turcica linear measurements (20).

This study was conducted by assessing 2D lateral cephalometric radiographs. Any superimposition of structures within the skull can lead to misinterpretation. Also, most of our cases belonged to the class II malocclusion group (62.7%), and only 4.4% of subjects had a class III pattern. Therefore, the authors suggest that larger 3D sample sizes are required to supplement and confirm the results of our study.

Conclusions

The following can be concluded from the present study:

- 1) The most common sella turcica morphology reported in this study was normal.
- 2) Greater values of the diameter and depth of sella turcica were found in women. There was no statistically significant difference in length based on gender.

No statistically significant relationship was found between sella turcica morphology and facial skeletal pattern.

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U nekoliko istraživanja autori su procjenjivali odnos između anatomskog oblika *sella turcica* i skeletne malokluzije. Neki su izvijestili da je most *sella turcica* češći kod malokluzije tip III (15, 19, 25, 26); no Dasgupta i suradnici pronašli su povećanu prevalenciju toga mosta kod ispitanika s klasom II. Rezultati našeg istraživanja nisu pokazali da su anatomske tipovi bili statistički značajno povezani sa skeletnim obrascem lica.

Na temelju rezultata ovog istraživanja nije pronađena statistički značajna povezanost između duljine, promjera i dubina *sella turcica* s malokluzijom. Suprotno našim rezultatima, Valizadeh i suradnici tvrde da je duljina turskoga sedla kod pacijenata skeletne klase III značajno veća (19). U svojem istraživanju Alkofide i suradnici (10) i Sinha i suradnici (23) pronašli su statistički značajnu korelaciju između promjera *sella turcica* i klase II i klase III skeletne malokluzije. Iako Yassir i suradnici (27) i Shah i suradnici (13) nisu pronašli statistički značajnu povezanost između skeletnog obrasca i veličine *sella turcica*, što je u skladu s ovim istraživanjem.

U svojem su istraživanju Rai i suradnici procijenili oblik *sella turcica* i navode da je njezina veličina značajnija kod žena nego kod muškaraca (28). U ovom istraživanju najveća dubina i promjer turskoga sedla uočeni su kod žena. Međutim u jednome drugom istraživanju nije otkriven statistički značajan odnos između spola i linearnih mjerenja *sella turcica* (20).

Ovo istraživanje provedeno je 2D procjenom lateralnih kraniograma. Bilo kakva superpozicija struktura unutar lubanje može rezultirati pogrešnim tumačenjem. Također, većina naših slučajeva pripadala je klasi II malokluzije (62,7%), a samo 4,4% ispitanika imalo je obrazac klase III. Zato autori ističu da je potrebno više 3D uzoraka kako bi se dopunili i potvrdili rezultati našeg istraživanja.

Zaključci

Iz ovog istraživanja može se zaključiti sljedeće:

- 1) najčešća morfologija *sella turcica* u ovom je istraživanju bila normalna
- 2) veće vrijednosti promjera i dubine *sella turcica* utvrđene su kod žena; nije bilo statistički značajne razlike u duljini na temelju spola

Nije pronađena statistički značajna povezanost između morfologije *sella turcica* i skeletnog obrasca lica.

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Sažetak

Svrha istraživanja: Razumijevanje oblika i veličine *sella turcica* (tursko sedlo) može pomoći u predviđanju budućih potreba za ortodontskim liječenjem zbog skeletne malokluzije. Cilj ovog istraživanja bio je procijeniti različite morfološke tipove toga sedlastoga udubljenja na sferoidnoj kosti na lateralnom kraniogramu i korelaciju s malokluzijom te odnos između spola i njegovih linearnih mjera. **Materiali i metode:** Procijenjeni su lateralni kraniogrami 410 dobrovoljaca (111 muškaraca i 299 žena) u dobi od 8 do 30 godina. Ispitanici su podijeljeni u tri skupine na temelju obrasca rasta kostura (kl. I, II i III). Zatim su procijenjeni anatomske oblik i linearne dimenzije *sella turcica*. Mjerenja su obavljena u softveru Adobe Photoshop Version: 20.0.0, a analiza podataka u IBM-u SPSS Statistics verzija 25. **Rezultati:** Uočene su sljedeće morfološke građe: normalna (37,8 %), kosa prednja stijenka (9,3 %), dvostruka kontura na (21,5 %), most *sella turcica* (8,8 %), nepravilnost (zarezi) u stražnjem dijelu *sella turcica* (16,6 %) te piramidni oblik dorzuma turskoga sedla (6,1 %). Nije utvrđena statistički značajna povezanost između varijacija morfologije *sella turcica* i skeletne malokluzije. Korelacija ženskoga spola s vrijednostima promjera ($p = 0,027$) i dubine ($p = 0,035$) *sella turcica* bila je statistički značajna. Nije bilo statistički značajnih razlika ($p > 0,05$) u duljini na temelju spola. **Zaključak:** Najčešće je zabilježena normalna *sella turcica* (37,8 %). Anatomske varijacije morfologije nisu bile povezane s malokluzijom. Najveća dubina i promjer turskoga sedla pronađeni su kod žena.

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