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# KEFALOMETRIJSKE KARAKTERISTIKE PACIJENATA SA VESTIBULARNOM I PALATINALNOM IMPAKCIJOM OČNJAKA

## CEPHALOMETRIC CHARACTERISTICS OF PATIENTS WITH VESTIBULAR AND PALATAL CANINE IMPACTION

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### Sažetak

**Uvod:** Impakcija očnjaka predstavlja čest ortodontski problem. Da bi terapija bila uspešna, važno je identifikovati etiološke faktore.

**Cilj rada** bio je ispitati i analizirati kefalometrijske karakteristike pacijenata sa impaktiranim stalnim očnjakom.

**Materijali i metode:** Ovom retrospektivnom studijom obuhvaćeno je 70 pacijenata (50 žena i 20 muškaraca) prosečne starosti  $16,1 \pm 4,04$  godine, koji su ispunjavali kriterijume istraživanja. Pacijenti su na osnovu pozicije impaktiranog zuba podeljeni u dve grupe. Analizirani su sagitalni (SNA, SNB, ANB) i vertikalni (FMA) angularni parametri, kao i linerani parametri (dužina korpusa maksile prema kranijalnoj bazi).

**Rezultati:** Rezultati su pokazali da je impakcija očnjaka najčešća u sagitalnom odnosu II klase po Angleu – 44,3%, a najmanje zastupljena u III klasi – 25,7%. Na osnovu vertikalnog obrasca rasta, odnosno vrednosti ugla FMA, najveći broj pacijenata sa impakcijom bio je prisutan u normodivergentnom tipu rasta. Dužina korpusa maksile nije se značajno razlikovala između palatinalne i vestibularne pozicije impaktiranog očnjaka ( $p = 0,405$ ).

**Zaključak:** Sprovedena studija pokazala je da među ispitivanim grupama nije bilo značajne razlike u praćenim kefalometrijskim vrednostima.

**Cljučne reči:** impakcija očnjaka, kefalometrija, etiologija impakcije

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### Abstract

**Introduction:** Canine impaction is a very common orthodontic anomaly. In order to achieve successful results, it is necessary to understand etiological factors.

**Aim** the analysis of cephalometric characteristics of patients with impacted permanent canines.

**Materials and methods:** The study included 70 patients (mean age  $14 \pm 2.04$  years), 50 females and 20 males, who met the study criteria. Based on the position of the impacted tooth, the patients were divided into 2 groups. Sagittal (SNA, SNB, ANB) and vertical (FMA) angular parameters were analysed, as well as linear parameters (the length of the body of the maxilla to the cranial base).

**Results:** In the studied population, 30.0% of the patients comprised Angle Class I, 44.3% of patients Angle Class II, whereas the smallest number of patients, 25.7%, was classified as Angle Class III. By analysing the FMA angle, the  $< 22^\circ$  category (horizontal growth), the  $22-28^\circ$  category (normal growth pattern), and the  $> 28^\circ$  category (vertical growth pattern) included 38.6%, 45.7%, and 15.7% of the patients, respectively. The body of the maxilla did not differ significantly between the palatal and vestibular position of the impacted canine ( $p = 0.405$ ).

**Conclusion:** The study did not reveal any statistically significant differences between the studied groups.

**Key words:** canine impaction, cephalometry, etiology of impaction

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## Uvod

Impakcija očnjaka je relativno česta ortodontska anomalija, sa prevalencijom od 0,8% do 3%; smatra se da su, posle trećih molara, maksilarni očnjaci najčešće impaktirani zubi<sup>1</sup>. Impakcije su zastupljenije kod osoba ženskog pola, unilateralno u odnosu na bilateralno i češće su u gornjoj vilici. Prema poziciji, veći broj impaktiranih očnjaka locira se palatinalno (čak 70% njih), dok su bukalne pozicije ređe zastupljene<sup>2</sup>. Impakcija zuba predstavlja odsustvo zuba u zubnom nizu nakon vremena predviđenog za njegovo nicanje, odnosno šest meseci po završetku razvoja korena<sup>3</sup>. Ektopično pozicionirani i impaktirani stalni očnjaci, pored toga što narušavaju estetski izgled, neretko mogu dovesti do nastanka ozbiljnijih komplikacija, poput resorpcije korenova susednih zuba i njihovog posledičnog gubitka<sup>4</sup>. Rano prepoznavanje impakcije očnjaka od velikog je značaja za primenu interseptivnih terapijskih mera i prevenciju ove anomalije, koja iziskuje skup i dugotrajan multidisciplinarni tretman<sup>5</sup>.

Etiologija ove anomalije je multifaktorijalna; kao uzroci njenog nastanka pominju se genetska predispozicija, prekobrojni zubi, odontomi, hipodontija lateralnog sekutića i nedostatak prostora za nicanje. Uprkos tome što se veliki broj radova bavio istraživanjem predisponirajućih faktora, tačan uzrok njenog nastanka još uvek nije jasno definisan<sup>1</sup>. U etiologiji impakcije očnjaka dominiraju dve glavne teorije: genetska, u okviru opštih etioloških faktora, i „navigaciona teorija”, u okviru lokalnih faktora. Veliki broj faktora doveden je u direktnu vezu sa nastankom ove nepravilnosti. Smatra se da se etiopatogeneza bukalnih (BI) i palatinalnih impakcija (PI) očnjaka suštinski razlikuje<sup>6,7</sup>. Bukalno impaktirani očnjaci češće se povezuju sa nedostatkom prostora u gornjoj vilici, sagitalnom i transversalnom nerazvijenošću maksile, teskobom i uskom apikalnom bazom<sup>8</sup>; veći broj palatinalno impaktiranih očnjaka uočen je pak kod pacijenata sa dobro razvijenom gornjom vilicom, prerazvijenom apikalnom bazom, te pacijenata kod kojih nije prisutna teskobnost zubnih nizova<sup>7,9,10</sup>.

**Cilj** rada bio je ispitati i analizirati kefalometrijske karakteristike pacijenata sa impaktiranim stalnim očnjakom.

## Materijali i metode

Ovo retrospektivno istraživanje zasnovano je na analizi kefalometrijskih karakteristika 70 ispitanika lečenih u Službi za ortopediju vilica na Klinici za dentalnu medicinu u Nišu, uzrasta od 12 godina do 32 godine, sa potvrđenom dijagnozom minimum

## Introduction

Canine impaction is a relatively common orthodontic anomaly, with a prevalence of 0.8% to 3%. Maxillary canines are considered to be the most frequently impacted teeth after third molars<sup>1</sup>. They are more common in females, unilateral compared to bilateral, and more often in the upper jaw. Furthermore, based on the position, as much as 70% of impacted canines are located palatally, whereas buccal positions are less common<sup>2</sup>. Tooth impaction represents the absence of a tooth in the dental row after the time provided for its eruption, i.e. 6 months after the root has developed<sup>3</sup>. In addition to impaired aesthetic appearance, ectopically positioned and impacted permanent canines can often lead to more serious complications such as the resorption of roots of neighbouring teeth and their consequent loss<sup>4</sup>. Early recognition of canine impaction is crucial for the application of interceptive therapeutic measures and prevention of this anomaly which requires expensive, long-term multidisciplinary treatment<sup>5</sup>.

The etiology of this anomaly is multifactorial (genetic predisposition, supernumerary teeth, odontomas, hypodontia of the lateral incisor, and lack of space for eruption). However, even though there have been numerous studies on predisposing factors, the exact cause of its occurrence has not been clearly defined yet<sup>1</sup>. The etiology of canine impaction is dominated by two main theories: (1) the genetic theory within the framework of general etiological factors and (2) the "navigational theory", which includes local factors. Many factors are directly associated with the occurrence of this irregularity and it is considered that the etiopathogenesis of buccal impaction (BI) and palatal impaction (PI) of canines is essentially different<sup>6,7</sup>. Buccally impacted canines are more often associated with a lack of space in the upper jaw, sagittal and transverse underdevelopment of the maxilla, tightness, and a narrow apical base<sup>8</sup>, whereas a greater number of palatally impacted canines is observed in patients with a well-developed upper jaw, an overdeveloped apical base, and no tight dental rows<sup>7,9,10</sup>.

**The aim** of the study was the investigation and analysis of cephalometric characteristics of patients with impacted permanent canines.

## Material and methods

This retrospective study analysed cephalometric characteristics of 70 subjects, aged 12 to 32, with a confirmed diagnosis of at least one impacted permanent maxillary canine, at the Department of Jaw Orthopedics, the Clinic of Dental Medicine in Niš.

jednog impaktiranog stalnog maksilarnog očnjaka. Istraživanje je odobreno odlukom Etičkog odbora Klinike za dentalnu medicinu u Nišu (broj 14/15-2019-7 EO). Svi ispitanici su podeljeni u dve grupe na osnovu pozicije ispitivanog impaktiranog zuba. Prvu grupu činilo je 38 ispitanika (30 osoba muškog pola i 8 osoba ženskog pola) sa palatinalnom pozicijom očnjaka. Druga grupa obuhvatila je 32 ispitanika (20 osoba ženskog i 12 osoba muškog pola) kod kojih je stalni očnjak bio pozicioniran vestibularno.

Analiza pozicije impaktiranih zuba vršena je na osnovu snimaka kompjuterizovane tomografije (CBCT snimak). Urađeni su profilni telerendgenski snimci (PTS) svih pacijenata. Svi PTS snimci analizirani su na isti način, od strane jednog ispitivača, i to manuelnim načinom analize, koji podrazumeva iscrtavanje kontura mekih tkiva i koštanih struktura grafitnom olovkom na transparentnom acetatnom papiru i merenje određenih linearnih i angularnih parametara. Rendgenkranimetrijska analiza urađena je na osnovu kombinacije većeg broja metoda različitih autora<sup>11</sup>. Pacijenti sa urođenim rasepom usne i/ili mekog i tvrdog nepca i pacijenti sa sindromima bili su isključeni iz istraživanja. U ovom istraživanju analizirani su sledeći kefalometrijski parametri:

a) sagitalni parametri po Steineru: sella-nasion-tačka A (SNA), sella-nasion-B tačka (SNB), tačka A-nasion-tačka B (ANB); na osnovu toga ispitanici su klasifikovani u tri klase po Angleu – I klasa (vrednost ugla ANB od 2° do 4°), II klasa (vrednosti ugla ANB veće od 4°), III klasa (vrednosti ugla ANB manje od 2°);

b) vertikalni parametri (FMA) po Merifieldu: ugao na osnovu kojeg su ispitanici klasifikovani u grupu sa horizontalnim obrascem rasta (ugao FMA < 22°), grupu sa normalnim obrascem rasta (FMA između 22° i 28°) i grupu sa vertikalnim obrascem rasta (vrednost ugla FMA > 28°);

c) linearni parametri: dužina korpusa gornje vilice po Steineru, na osnovu koje se može opisati duži i kraći tip korpusa u odnosu na kranijalnu bazu<sup>11</sup>.

Dobijeni rezultati obrađeni su statistički i prikazani tabelarno i grafički.

### ***Statistička obrada podataka***

Podaci su prikazani u vidu aritmetičke sredine, standardne devijacije, ali i u vidu apsolutnih i relativnih brojeva.

The research was approved by the decision of the Ethics Committee of the Clinic of Dental Medicine in Niš number 14/15-2019-7 EO. Based on the position of the examined impacted tooth, the subjects were divided into two basic groups. The first group consisted of 38 subjects, 30 females and 8 males with the palatal canine position. The second group consisted of 32 subjects, 20 females and 12 males, in whom the permanent canine was positioned vestibularly.

The analysis of the position of the impacted tooth was determined using computerized tomography images (CBCT images). Profile teleradiographs were taken for all patients and later analysed in the same way by one examiner using the classical method of analysis, which involved drawing contours of soft tissues and bone structures on transparent acetate paper with a pencil and measuring certain linear and angular parameters. The cephalometric analysis was performed using a combination of several methods by different authors<sup>11</sup>. Patients with congenital cleft lip and/or soft and hard palate, as well as patients with syndromes, were excluded from the study. This study analysed the following cephalometric parameters:

a) sagittal parameters: sella - nasion - point A (SNA), sella - nasion - point B (SNB), point A-nasion-point B (ANB), based on which the subjects were classified into 3 Angle classes: Class I (value of the ANB angle from 2° to 4°); Class II (values of the ANB angle greater than 4°); Class III (values of the ANB angle less than 2°)

b) vertical parameters: based on the FMA angle, the subjects were classified as Low Angle (FMA angle < 22°), Normal Angle (FMA angle between 22–28°), High Angle (FMA angle value > 28°)

c) linear parameters: the length of the upper jaw body, based on which two types of the body in relation to the cranial base can be described: longer and shorter<sup>11</sup>.

The obtained results were statistically processed and presented in a tabular form.

### ***Statistical data processing***

The data are presented in the form of arithmetic mean and standard deviation, as well as in the form of absolute and relative numbers. Numerical features between the two groups were compared using the t-test or the Mann-Whitney test in accordance with data distribution. Categorical features were compared using the Chi-square test.

Numerička obeležja između dveju grupa poređena su T-testom ili Mann–Whitney testom, u skladu sa distribucijom podataka. Kategorijska obeležja poređena su Hi-kvadrat testom. Nulta hipoteza testirana je sa pragom značajnosti  $p < 0,05$ . Statistička obrada podataka vršena je u programskom paketu R, version 4.3.0 (2023-04-21 ucrt)<sup>12</sup>.

## Rezultati

U ispitivanoj populaciji, palatinalna pozicija impaktiranog očnjaka zabeležena je kod 38 pacijenata (54,3%), a vestibularna pozicija kod 32 pacijenta (45,7%) (Grafikon 1).

Naime, zastupljenost I klase po Angle-u (vrednost ugla ANB 2-4) potvrđena je kod 30,0% pacijenata, II klasu (vrednost ugla ANB veća od 4) ima 44,3% pacijenata, dok najmanji broj pacijenata, 25,7%, ima III klasu po Angle-u (vrednost ugla ANB manja od 2) (Tabela 1).

U pogledu vertikalnog odnosa na osnovu FMA ugla, u ispitivanoj populaciji kategoriju  $<22^\circ$  (horizontalni obrazac rasta) ima 38,6% pacijenata,  $22-28^\circ$  (normalan obrazac rasta) ima 45,7% pacijenata,  $>28^\circ$  (vertikalni obrazac rasta) ima 15,7% pacijenata (Tabela 2).

Vrednosti uglova SNA, SNB i ANB nisu se razlikovale statistički značajno u odnosu na tip impakcije ( $p = 0,966$ ;  $p = 0,916$ ;  $p = 0,840$ ). U dužini korpusa maksile, optimalnoj dužini i razlici između korpusa maksile i optimalne dužine nisu zabeležene statistički značajne razlike ( $p = 0,526$ ;  $p = 0,754$ ;  $p = 0,498$ ). Vrednosti FMA nisu se statistički značajno razlikovale u odnosu na tip impakcije ( $p = 0,507$ ).

Između grupe pacijenata sa palatinalnom impakcijom očnjaka i grupe pacijenata sa vestibularnom impakcijom očnjaka nije bilo statistički značajne razlike u dužini korpusa maksile ( $p = 0,405$ ).

Kraći tip bio je prisutan kod 60,5% pacijenata sa palatinalnom i kod 53,1% pacijenata sa vestibularnom impakcijom; duži tip bio je prisutan kod 36,8% pacijenata sa palatinalnom i kod 46,9% pacijenata sa vestibularnom implakcijom (Tabela 3). Utvrđeno je da se skeletne klase na osnovu ugla ANB i obrazac rasta na osnovu ugla FMA ne razlikuju statistički značajno u odnosu na tip impakcije ( $p = 0,918$ , odnosno  $p = 0,983$ ).

The null hypothesis was tested with a significance threshold of  $p < 0.05$ . Statistical data processing was performed in the software package R version 4.3.0 (2023-04-21 ucrt)<sup>12</sup>.

## Results

In the studied population, the palatal position of the impacted canine was present in 38 patients (54.3%), whereas the vestibular position was present in 32 patients (45.7%) (Graph 1).

Furthermore, Angle Class I (ANB angle value 2–4) and Angle Class B (ANB angle value greater than 4) were confirmed in 30.0% and 44.3% of the patients, respectively, whereas Angle Class III (ANB angle value less than 2) was confirmed in the smallest number of patients, i.e., 25.7% (Table 1).

Regarding the vertical relationship based on the FMA angle, 38.6% of the patients comprised the  $< 22^\circ$  category (horizontal growth pattern), 45.7% of the patients the  $22-28^\circ$  category (normal growth), and 15.7% of the patients the  $>28^\circ$  category (vertical growth pattern) (Table 2).

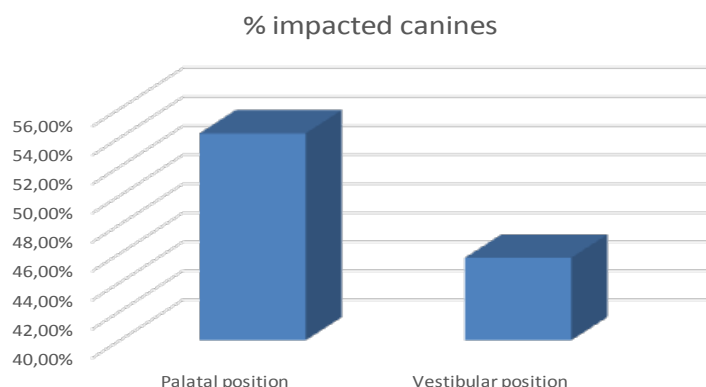
SNA, SNB, and ANB did not differ statistically significantly regarding the type of impaction ( $p = 0.966$ ,  $p = 0.916$ , and  $p = 0.840$ , respectively).

The length of the body of the maxilla, the optimal length, and the difference between the two did not differ statistically significantly ( $p = 0.526$ ,  $p = 0.754$ , and  $p = 0.498$ , respectively) (Table 2). FMA did not differ statistically significantly regarding the type of impaction ( $p = 0.507$ ).

The body of the maxilla did not differ significantly between the palatal and vestibular position of the impacted canine ( $p = 0.405$ ). The shorter type was present in 60.5% of the patients with palatal and 53.1% of the patients with vestibular impaction, whereas the longer type was present in 36.8% of the patients with palatal and 46.9% of the patients with vestibular impaction (Table 3). It was confirmed that the skeletal classes based on the ANB angle and the growth pattern based on the FMA angle do not differ statistically significantly in relation to the type of impaction ( $p = 0.918$  and  $p = 0.983$ , respectively).

## Discussion

Early diagnosis of potential impaction of these teeth is of tremendous clinical importance given that therapy requires an extremely complex multidisciplinary approach: the orthodontist must have good knowledge of orthodontic forces and application of adequate biomechanics<sup>13</sup>.



**Grafikon 1.** Procentualna zastupljenost impakcija ocnjaka prema položaju  
**Graph 1.** Percentage representation of the canine impactions in relation to the position

**Tabela 1.** Procentualna zastupljenost različitih položaja impaktiranog ocnjaka prema sagitalnom odnosu vilica  
**Table 1.** Percentage representation of different positions of the impacted canine in relation to the sagittal relationship

	Procentat osoba sa skeletnom klasom I / % Class I	Procentat osoba sa skeletnom klasom II / % Class II	Procentat osoba sa skeletnom klasom III / % Class III	p <sup>1</sup>
Impakcija maksilarnih ocnjaka / Maxillary canine impaction	30.0%	44.3%	25.7%	0.918
Palatinalna impakcija / Palatal position	31.6%	42.1%	26.3%	
Vestibularna impakcija / Vestibular position	28.1%	46.9%	25%	

<sup>1</sup>Chi-square test <sup>1</sup>Hi-kvadrat test

**Tabela 2.** Procentualna zastupljenost različitih položaja impaktiranog ocnjaka prema obrascu rasta

**Table 2.** Percentage representation of different positions of the impacted canine in relation to the vertical relationship (growth pattern)

	Normalan obrazac rasta / Normal growth (FMA 22° – 28°)	Vertikalni obrazac rasta / Vertical growth (FMA > 28°)	Horizontalni obrazac rasta / Horizontal growth (FMA < 22°)	p
Impakcija maksilarnih ocnjaka / Maxillary canine impaction	45.7%	15.7%	38.6%	0.983
Palatinalna impakcija / Palatal position	44.7%	15.8%	39.5%	
Vestibularna impakcija / Vestibular position	46.9%	15.6%	37.5%	

<sup>1</sup>Chi-square test <sup>1</sup>Hi-kvadrat test

**Tabela 3.** Procentualna zastupljenost različitih položaja impaktiranog ocnjaka prema dužini korpusa maksile

**Table 3.** Percentage representation of different positions of the impacted canine in relation to the maxilla length

Dužina korpusa maksile po Steineru / Maxilla body length according to Steiner	Kraći korpus / Shorter maxilla length	Duži korpus / Longer maxilla length	Normalna dužina korpusa / Normal maxilla length	p
Palatinalna impakcija / Palatal position	60.5%	36.8%	2.6%	0.405
Vestibularna impakcija / Vestibular position	53.1%	46.9%	0%	

<sup>1</sup>Chi-square

test

<sup>1</sup>Hi-kvadrat

test

## Diskusija

Mogućnost rane dijagnoze potencijalne impakcije ovih zuba od velikog je kliničkog značaja, s obzirom na to da njihova terapija zahteva izuzetno kompleksan multi-disciplinarni pristup; potrebno je da ortodont dobro poznaje ortodontske sile i da primeni adekvatnu biomehaniku<sup>13</sup>, koja mora biti pažljivo isplanirana i izvedena u skladu sa fiziološkim principima kako bi se rizik od resorpcije korenova okolnih zuba i gubitak vitaliteta impaktiranog zuba sveo na minimum<sup>14,15</sup>. Ukoliko se rizik od impakcije prepozna u ranoj fazi, primena interceptivnih mera, poput ekstrakcije mlečnog očnjaka<sup>16,17</sup> i upotrebe aparata za rapidnu ekspanziju palatuma<sup>18</sup>, može umnogome doprineti nicanju ovih zuba. Mnogi autori su pokušavali da ispitivanjem i analiziranjem dentoskeletnih karakteristika predvide rizik od nastanka impakcije maksilarnog očnjaka<sup>1,6,8,19,20</sup>. Kada je reč o sagitalnim parametarima, analiza ANB ugla sprovedena u okviru ove studije ukazala je na najveću zastupljenost impaktiranog očnjaka u grupi pacijenata II klase po Angleu (44,3%), dok je najmanji broj ispitanika u grupi pacijenata III klase po Angleu (25,7%). Ovakvi rezultati nisu u skladu sa rezultatima Cernochove i sar.<sup>21</sup>, koji su naveli da je najveća zastupljenost palatinalnih impakcija očnjaka ustanovljena kod pacijenata sa skeletnom klasom I. Međutim, u ovoj studiji takođe je istaknuto da je bukalna pozicija očnjaka najčešće bila zastupljena kod pacijenata sa klasom III<sup>21</sup>. Pojedini autori naveli su da je bilateralna impakcija češće zastupljena kod pacijenata sa skeletnom klasom III<sup>22</sup>. To odstupa od naših rezultata, koji su pokazali da je vestibularna impakcija takođe najzastupljenija među ispitanicima sa II klasom po Angleu, kao i da nema statistički značajne razlike među ispitivanim grupama. Međutim, treba uzeti u obzir da postoji nekoliko morfoloških varijacija III klase, od kojih se jedna karakteriše deficitarnim rastom maksile i nedovoljno razvijenom apikalnom bazom, kao i činjenicu da je ovaj tip malokluzije zbog nedostatka prostora za nicanje stalnog očnjaka često povezan sa ometanjem njegovog nicanja u vestibularnom pravcu<sup>23</sup>. Rezultati ove studije odgovaraju rezultatima Basdre i sar., koji su ukazali na to da je najveća zastupljenost impakcije povezana sa malokluzijama II klase 2. odeljenja, kao i na to da je najmanja zastupljenost prisutna kod pacijenata sa III klasom po Angleu (9%)<sup>24</sup>. Ipak, treba pomenuti da se ova studija nije bavila analizom inklinacije sekutića, pa II klasa nije bila podeljena po odeljenjima.

This must be carefully planned and applied following physiological principles to minimize the risk of root resorption of surrounding teeth and loss of vitality of the impacted tooth<sup>14,15</sup>. If the risk of impaction is recognized at an early stage, the application of interceptive measures, such as milk canine extraction<sup>16,17</sup> and the application of the appliance for rapid palatal expansion<sup>18</sup>, may lead to the eruption of these teeth.

Many authors have tried to predict the risk of maxillary canine impaction by examining and analysing dentoskeletal characteristics<sup>1,6,8,19,20</sup>. In terms of sagittal parameters, by analysing the ANB angle, the results of this study indicate the highest incidence of impacted canines in Angle Class II (44.3%), whereas the smallest number of subjects belongs to Angle Class III (25.7%). These results are not in agreement with the results of a study by Cernochova et al.<sup>21</sup> which suggest that the highest incidence of palatal impaction of canines is in Class I patients. However, this study also states that the buccal position of canines is most often represented in Class III<sup>21</sup>. Some authors stated that bilateral impaction is more common in patients with skeletal class III<sup>22</sup>. This deviates from our results, which show that vestibular impaction was the most prevalent among subjects with Angle Class II and that no statistically significant difference was observed between the studied groups. However, it should be considered that there are several morphological variations of Class III, one of which is characterized by deficient growth of the maxilla and an insufficiently developed apical base. Due to spatial limitations, this type of malocclusion is often associated with the obstruction of permanent canine eruption in the vestibular direction<sup>23</sup>. The results of this study correspond to the results of Basdra et al., who state that the highest prevalence of impaction is associated with Angle Class II - 2nd subclass malocclusions, i.e., the lowest prevalence is associated with Angle Class III (9%)<sup>24</sup>. It should be noted that our study did not deal with the analysis of incisor inclination, thus Class II was not divided into subclasses.

In contrast, Mercuri et al. stated that the highest percentage of maxillary canine impaction was reported in Angle Class I and that this anomaly was the only orthodontic problem in a large number of subjects<sup>6</sup>. The same authors state that in terms of vertical parameters in patients affected by this anomaly, the horizontal type of growth and prognathism of the maxilla are more common,

Nasuprot tome, Mercuri i sar. istakli su da je najveći procenat impakcije maksilarnog očnjaka zabeležen kod osoba sa skeletnom klasom I po Angleu, te da je kod velikog broja ispitanika ova anomalija bila jedini ortodontski problem<sup>6</sup>.

Isti autor predočio je da su, u pogledu vertikalnih parametara kod pacijenata pogođenih ovom anomalijom, češće bili zastupljeni horizontalni tip rasta i prognatizam maksile, mada nije uočena značajna razlika između grupe ispitanika sa palatinalnom i grupe ispitanika sa bukalnom pozicijom<sup>6</sup>. Ovi rezultati odstupaju od rezultata ovog ispitivanja, koji su kod najvećeg broja ispitanika zabeležili normalni tip rasta na osnovu analize FMA ugla; međutim, u skladu su sa podatkom da nije pronađena statistički značajna razlika među ispitivanim grupama. Sacerdoti i sar. takođe su uočili najveću prevalenciju hipodivergentnog tipa rasta, u poređenju sa kontrolnom grupom ispitanika kod kojih nije bila prisutna impakcija maksilarnog očnjaka<sup>25</sup>. Za razliku od navedenih rezultata, u pojedinim studijama ova anomalija dovedena je u vezu sa vertikalnim tipom rasta<sup>20</sup>. Pored sagitalnih i vertikalnih parametara, brojne studije ukazuju na povezanost impakcije očnjaka sa transverzalnom i vertikalnom razvijenošću maksile, kao i na to da je palatinalna pozicija ovog zuba povezana sa prerazvijenom maksilom, dok je vestibularna pozicija zastupljenija kod nerazvijenih maksilarnih zubnih nizova<sup>26</sup>. U našoj studiji analizirana je i dužina korpusa maksile; zanimljivo je istaći rezultat da je, nasuprot podacima iz literature prema kojima je vestibularna impakcija bila zastupljenija kod sagitalno i transverzalno nerazvijene maksile<sup>20</sup>, kraći korpus maksile bio je nešto više zastupljen kod palatinalne impakcije, s tim što da nije uočena statistički značajna razlika između ispitivanih grupa.

### **Zaključak**

Kod pacijenata sa impakcijom maksilarnog stalnog očnjaka najčešće su zastupljeni II klasa po Angleu i normodivergentni tip rasta. Budući da nisu uočene statistički značajne razlike u pogledu angularnih i linearnih parametara među ispitivanim grupama, ima prostora za dalju analizu ove populacije pacijenata, uz uvođenje većeg broja morfoloških parametara, s obzirom na relativno čestu zastupljenost ove anomalije.

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but that no significant difference was observed between the palatal and buccal position groups<sup>6</sup>. These results are not in agreement with the results of our study, considering that the largest number of subjects in the studied group exhibited the normal growth type based on the analysis of the FMA angle. Nevertheless, they match in the fact that no statistically significant difference was found between the studied groups. Furthermore, Sacerdoti et al. also found the highest prevalence of the hypodivergent growth type, compared to the control group of subjects without maxillary canine impaction<sup>25</sup>. Contrary to these results, some studies have associated this anomaly with the vertical growth type<sup>20</sup>. In addition to sagittal and vertical parameters, numerous studies emphasize the association of canine impaction with transverse and vertical development of the maxilla, as well as that the palatal position of this tooth is associated with an overdeveloped maxilla, i.e., that the vestibular position is more common in undeveloped maxillary tooth rows<sup>26</sup>.

This study dealt with the analysis of the length of the body of the maxilla and it is interesting to point out that, contrary to literature data that vestibular impaction is more prevalent in sagittally and transversely undeveloped maxilla<sup>20</sup>, the shorter body of the maxilla was somewhat more prevalent in palatal impaction, but it should be noted that no statistically significant difference was observed between the studied groups.

### **Conclusion**

In patients with permanent maxillary canine impaction, Angle Class II and the normodivergent growth type are the most common. No statistically significant differences were found regarding angular and linear parameters between the studied groups, which requires further analysis with more morphological parameters, considering the relatively frequent incidence of this anomaly.

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