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УНИВЕРЗИТЕТ У БЕОГРАДУ

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**ВЕЋЕ НАУЧНИХ ОБЛАСТИ
МЕДИЦИНСКИХ НАУКА**

Београд, 27.5.2010. год.
Број: 020-1883/35
БТ

На основу чл. 123. став 4. и чл. 128. Закона о високом образовању ("Службени гласник РС", број 76/05, 97/08 и 100/07-аутентично тумачење), чл. 46. ст. 5. тач. 3. Статута Универзитета у Београду ("Гласник Универзитета у Београду", број 131/06, 140/08 и 143/08) и чл. 14. – 21. Правилника о већима научних области на Универзитету у Београду ("Гласник Универзитета у Београду", број 134/07), а на захтев Стоматолошког факултета, број 876/1 од 10.5.2010. године,

Веће научних области медицинских наука, на XXV седници одржаној дана 27. маја 2010. године, донело је

ОДЛУКУ

ДАЈЕ СЕ сагласност на предлог теме докторске дисертације:

Кандидат

мр Јована Милутиновић

Назив теме: "Промене структура меких ткива лица након ортодонтске терапије малоклузије II класе".

ПРЕДСЕДНИК ВЕЋА

Проф. др Велибор Стојић



- Доставити:
- Факултету
 - секретару Већа
 - архиви Универзитета

NASTAVNO-NAUČNOM VEĆU
STOMATOLOŠKOG FAKULTETA
UNIVERZITETA U BEOGRADU

Nastavno - naučno veće Stomatološkog fakulteta Univerziteta u Beogradu, na sednici održanoj 14.10.2014. godine, imenovalo je Komisiju za ocenu i odbranu završene doktorske disertacije dr Jovane Milutinović pod nazivom „PROMENE STRUKTURA MEKIH TKIVA LICA NAKON ORTODONTSKE TERAPIJE MALOKLUZIJE II KLASE“.

Komisija u sastavu:

Doc. dr Angelina Nikodijević - Latinović - Stomatološki fakultet, Klinika za ortopediju vilica, Univerzitet u Beogradu;

Doc. dr Željko Milosavljević - Stomatološki fakultet, Klinika za ortopediju vilica, Univerzitet u Beogradu;

Prof. dr Predrag Vučinić - Medicinski fakultet, Klinika za stomatologiju, Univerzitet u Novom Sadu,

Posle razmatranja priloženog materijala, podnosi sledeći

IZVEŠTAJ

Dr Jovana Milutinović je rođena 23.09.1980. godine u Beogradu. Stomatološki fakultet, Univerziteta u Beogradu, upisala je školske 1999/2000. godine, a diplomirala je 18.04.2005. godine sa prosečnom ocenom 9,21. Pripravnički staž je obavila na klinikama Stomatološkog fakulteta, nakon čega je 31.05.2006. godine položila stručni ispit za doktora stomatologije.

Magistarske studije iz naučne oblasti Ortopedija vilica, upisala je školske 2005/2006. godine i položila sve ispite predviđene planom i programom magistarskih studija, sa prosečnom ocenom 10. Tokom magistarskih studija, od februara 2006. do decembra

2008. godine na Klinici za ortopediju vilica učestvovala je u izvođenju praktične nastave za studente IV i V godine osnovnih studija i obavljala volonterski klinički rad sa pacijentima na Stomatološkom fakultetu u Beogradu. Za vreme magistarskih studija bila je stipendista Ministarstva nauke i tehnološkog razvoja na projektu iz oblasti parodontalne medicine „Primena koncepta aktivne regeneracije u parodontologiji i implantologiji“ (broj projekta 145042), na Stomatološkom fakultetu u Beogradu. 25.12.2008. godine odbranila je magistarsku tezu pod nazivom „Pouzdanost facijalnih proporcija u proceni estetike lica“. Član je Ortodontskog udruženja Srbije i Srpskog lekarskog društva.

Dr Jovana Milutinović je autor i koautor 10 radova u naučnim i stručnim časopisima i naučnim skupovima, od kojih je jedan rad štampan u međunarodnom naučnom časopisu (M21), dva u domaćem stručnom časopisu (M52), šest saopštenja na međunarodnim naučnim i stručnim skupovima (M34), dva studentska rada, od kojih je na jednom bila komentor.

Nastavno - naučno veće Stomatološkog fakulteta, Univerziteta u Beogradu je 2010. godine prihvatilo predlog teme, a 2013. godine odredilo mentora doc. dr Nenada Nedeljkovića za izradu ove doktorske disertacije.

Doktorska disertacija dr Jovane Milutinović izložena je na 205 strana, raspoređenih u 8 poglavlja: Uvod, Pregled literature, Ciljevi istraživanja, Materijal i metod, Rezultati, Diskusija, Zaključci, Literatura. Tekst je dokumentovan sa 13 fotografija, 77 tabela i 43 grafikona.

U **Uvodu i Pregledu literature** predstavljene su i obrazloženi razlozi za sprovođenje ovog istraživanja. Ukazano je na činjenicu da savremena ortodontija ne predstavlja samo način ispravljanja nepravilnosti zagrižaja i dobijanja lepog osmeha, već kao indirektan faktor utiče na podizanje kvaliteta života. Kao rezultat toga, specijalisti medicine zaduženi za regiju lica primećuju porast zahteva za tretmanima uglavnom zasnovanim na estetskim principima. Međutim, sama činjenica da se ortodontskom terapijom mogu izmeniti meke strukture lica, stavlja ortodonte u nezavidan položaj: koliko se zaista izgled pacijenta može promeniti nakon završene terapije, i da li su te promene vidljive u očima posmatrača, bez obzira na njihovu kliničku signifikantnost. Pregled dosadašnje literature opisuje da malokluzije II klase veoma narušavaju facijalnu harmoniju i menjaju izgled pacijenta na gore. Ova vrsta malokluzija predstavlja najčešću u ortodontskim klinikama širom sveta, dostižući udeo od 55% svih malokluzija. Malokluzije II klase, 1. odeljenja utiču na promenu izgleda nosa,

usana, brade, tačnije celog donjeg sprata lica. Smatra se da usled narušavanja izgleda donjeg sprata lica, dolazi do velike diskrepance i u odnosu ovog dela lica sa srednjim i gornjim spratom lica, što indirektno utiče na izgled celog lica, i to delova koji su udaljeni od ortodontskog problema, tj. postojeće malokluzije.

Literatura pokazuje da postoji nekoliko načina za lečenje ove vrste malokluzije. Terapija se može podeliti na terapiju funkcionalnim aparatima - pokretnim ili fiksnim (u zavisnosti od uzrasta pacijenata u kom se započne terapija možemo govoriti o modifikaciji i usmeravanju dentofacijalnog rasta), zatim fiksnim ortodontskim aparatima najčešće u kombinaciji sa ekstrakcijom zuba u gornjoj ili obe vilice (takozvana kamuflažna terapija), i kombinovanom ortodontskom i hirurškom terapijom u najekstremnijim slučajevima. Svaka od navedenih vrsta terapije ima svoje prednosti i nedostatke. Glavni razlog aktuelnosti problema je izazov ortodonta da ostvari estetske ciljeve upravo zbog toga što oni često predstavljaju neobjektivne i nemerljive zahteve pacijenata predvođene uglavnom subjektivnom ocenom lepote ili nametnutih društvenih standarda forsiranih od strane okoline i medija.

Terapija malokluzija II klase uz pomoć funkcionalnih ili fiksnih aparata će, u različitoj meri, doprineti da promena skeletnih parametara direktno utiče na promenu položaja struktura mekih tkiva. Pri tome, ne govorimo samo o promeni položaja zuba, gornje i donje usne, na čiji položaj direktno utičemo manje ili više izborom ma kog aparata, fiksnog ili funkcionalnog, već govorimo i o promeni izgleda celog profila i struktura koje se nalaze van viličnog sprata lica. Pri merenju skeletnih i mekotkivnih parametara, posebna pažnja se poklanja merenju na profilnim snimcima glave. Pored toga, poslednjih nekoliko decenija, istraživanja ove vrste obuhvataju i neizostavnu fotogrametriju, tj. merenja mekotkivnih parametara na fotografijama anfasa i profila pacijenata. Za sveukupnu analizu skeletnih i mekotkivnih struktura i njihovih odnosa neophodno je analizirati fotografije anfasa i profila pacijenta. Spominjući ukratko istorijat ortodoncije, može se jasno uočiti stalna potreba za pronalaženjem adekvatnog izbora terapije u raznovrsnim izazovima koje pružaju dentoalveolarne anomalije, sa posebnim akcentom na nedoumicu da li pristupiti ekstrakciji zuba ili pokušati neku alternativnu metodu koja isključuje ekstrakciju zuba. Postavljanje zuba prema postojećim prihvaćenim kefalometrijskim kriterijumima ne mora pod obavezno, a najčešće i neće, podrazumevati da će meka tkiva koja prekrivaju koštane strukture, idealno i harmonično pratiti njihova pomeranja.

Literaturni podaci dokumentuju da je individualnost pacijenata prisutna kako u ortodontskoj anomaliji, izraženoj u vidu dentoalveolarne i/ili skeletne vrste, tako i u izgledu lica, odnosno rasporedu, veličini i međusobnom odnosu facijalnih entiteta. Svemu ovome treba pokloniti podjednaku pažnju; naime, problemu identične ortodontske anomalije će se kod dva pacijenta možda sasvim drugačije pristupiti usled različitog izgleda lica i sledstvenih neželjenih promena na istom. Odluka o ekstrakciji zuba mora biti potkrepljena harmonijom i facijalnim balansom nakon završene ortodontske terapije.

Posebno se obrađuju podaci iz literature koji se odnose na formu i sklad lica koji su direktno povezani sa idealnim proporcijama. Međutim, danas je diskutabilno da li se približavanjem idealnim proporcijama sledstveno menja i percepcija lepote lica. Pre svega, facijalne proporcije se posmatraju združeno, dakle podjednako su važni svi spratovi lica, gornja i srednja trećina, na koje ortodontska terapija nema uticaja. Ipak, donja trećina lica je ono što se nesumnjivo menja nakon ortodontske terapije, i sam odnos sa nepromenjenom srednjom i gornjom trećinom lica je bitan u približavanju nekim propisanim, idealnim vrednostima. Takođe, u literaturi se pominje da upravo donja trećina lica najviše odstupa od idealnih proporcija kod malokluzija II klase. Čak i nakon velike promene, procenjeno bilo kliničkim nalazom, bilo reakcijama okoline, nije uvek izvesno da su se dostigli idealni parametri, i obrnuto, nakon postizanja onoga što zlatna proporcija predstavlja, taj rezultat ne mora biti u saglasnosti sa pozitivnim reakcijama okoline i značajnom kliničkom promenom. Naime, iako ortodontska terapija deluje u sve tri ravni prostora, izgled profila pacijenata je ono što je dokazano najprimetnije promenjeno, i na šta se fokusira pažnja ortodonta tokom terapije, a posledično dolazi svakako do, blage i diskutabilne promene izgleda anfasa na bolje.

Dakle, uspeh ortodontskog tretmana je blisko povezan sa poboljšanjem pacijentovog izgleda, koji podrazumeva izgled mekotkivnog profila.

Na osnovu pregleda literature postavljeni su **Ciljevi istraživanja**. Na prvom mestu je upoređivanje koštanih i mekotkivnih promena pre i posle terapije kod pacijenata lečenih fiksnim funkcionalnim aparatom bez ekstrakcije, i pacijenata lečenih terapijom kamuflaže uz ekstrakciju premolara, merenih na profilnim telerendgenskim snimcima. Potom, ispitivanje koliko je odstupanje vrednosti parametara od idealnih proporcija, posebno u donjoj trećini lica koji su mereni na fotografijama obe grupe pacijenata, te kod kojih angularnih parametara mekotkivnog profila dolazi do najvećih

promena i koliko se novonastale vrednosti parametara približavaju idealnim vrednostima u obe grupe pacijenata.

U razrešavanju postavljenih zadataka, autor je obavila obimna istraživanja čiju metodologiju obrazlaže u četvrtom poglavlju, **Materijal i metod**. Istraživanje obuhvata dve grupe pacijenata, 25 pacijenata lečenih ekstrakcionom terapijom, i 25 pacijenata lečenih neekstrakcionom terapijom, uz pomoć fiksnih funkcionalnih aparata. Grupa pacijenata lečenih ekstrakcionom metodom terapije, podeljena je na dve podgrupe, u zavisnosti da li su kod pacijenata izvađena dva ili četiri premolara. Prvi deo istraživanja predstavlja merenje skeletnih parametara (parametri baze lobanje, parametri sagitalnog položaja, odnosa i razvijenosti gornje i donje vilice, parametri vertikalnog položaja i odnosa gornje i donje vilice, parametri rasta i rotacije vilica i lica, parametri položaja zuba (molara i sekutića)), i mekotivnih parametara na profilnim telerendgenskim snimcima, pre i posle terapije kod obe grupe pacijenata. Drugi deo studije predstavljalo je merenje linearnih parametara (horizontalne trećine lica, vertikalne petine lica, dužine facijalnih entiteta i proporcije linearnih parametara) i njihovo poređenje sa idealnim proporcijama lica, kao i angularnih parametara na fotografijama anfasa i profila obe grupe pacijenata pre i posle terapije. U trećem delu studije upoređivani su rezultati promena svih skeletnih i mekotivnih parametara merenih na telerendgenskim snimcima pre i posle terapije dve grupe pacijenata. Angularni parametri mekotivnog profila mereni na fotografijama pacijenata upoređivani su kod obe grupe pacijenata, dok parametri anfasa i njihovo približavanje idealnim proporcijama nisu upoređivani između dve grupe pacijenata, zato što je jako teško kvantifikovati lepotu i porediti je u smislu numeričkih parametara. Statistička analiza vršena je pomoću kompjuterskog programa IBM SPSS 21.

Svi **Rezultati** istraživanja su sistematično prikazani pomoću tabela i grafikona i jasno prikazuju prethodno tekstualno objašnjene elemente. Dobijeni rezultati izdvojeni su i sistematizovani po grupama, posebno za parametre merene na profilnom telerendgenskom snimku, skeletne i mekotivne, a posebno za parametre anfasa i profila merene na fotografijama pacijenata. Mereni parametri su upoređivani pre i posle završene terapije unutar grupa, kao i između dve grupe pacijenata, odnosno dva načina lečenja.

Autor u **Diskusiji** tumači dobijene rezultate i vrši poređenje između dva različita načina terapije malokluzija II klase, i sledstvene promene izgleda pacijenata. Komentarisani su dobijeni rezultati istraživanja i pružena odgovarajuća objašnjenja

dobijenih rezultata. Takođe, vršena su upoređivanja rezultata između samih grupa kao i sa rezultatima objavljenim u literaturi. Podaci kojima se kandidat služi u diskusiji su uverljivi, aktuelni i kritički odabrani. Poziva se, i sa sopstvenim rezultatima analizira i poredi, veći broj radova koji govore u prilog dobijenih rezultata, ali i na one čiji su rezultati u suprotnosti sa dobijenim rezultatima. Kandidat dobijene rezultate jasno tumači i uz analizu literaturnih podataka izvlači pravilne zaključke.

Zaključci istraživanja su jasno formulisani i pružaju odgovore na postavljene ciljeve. Na osnovu prezentovanih rezultata istraživanja posebno se izdvajaju zaključci da je došlo je do korekcija međuviličnih odnosa u sagitalnom pravcu i dentoalveolarnih nepravilnosti malokluzije II klase, 1. odeljenja kod obe ispitivane grupe. Takođe, autor dolazi do zaključka da, nakon završene ortodonske terapije, vrednosti antropometrijskih parametara u donjoj trećini lica se približavaju idealnim vrednostima, u obe grupe pacijenata, odnosno da dolazi do promena u smislu poboljšanja facijalne estetike i položaja usana i brade

U poslednjem poglavlju doktorske disertacije (**Literatura**) navode se 212 citirana referentna bibliografska navoda sa brojnim rezultatima domaćih i inostranih istraživanja bitnih za proučavanu tematiku.

Na osnovu svega navedenog, komisija donosi sledeći

ZAKLJUČAK I PREDLOG

Doktorska disertacija predstavlja dobro dokumentovanu studiju koja poredi dva različita metoda terapije malokluzija II klase, 1. odeljenja i prikazuje promene koje nastaju na mekotkivnim strukturama lica pacijenata nakon završene ortodonske terapije. Kompleksnost teme ove doktorske disertacije i dobijeni rezultati upućuju na ozbiljnost i zrelost kandidata u pristupu proučavanja ove problematike.

Uvidom u dostavljeni tekst, komisija je jednoglasno ocenila da doktorska disertacija dr Jovane Milutinović pod nazivom „PROMENE STRUKTURA MEKIH TKIVA LICA NAKON ORTODONTSKE TERAPIJE MALOKLUZIJE II KLASE“ predstavlja samostalno, originalno i dobro dokumentovano istraživanje. Doktorska disertacija zadovoljava sve kriterijume propisane Zakonom o Univerzitetu i statutima Univerziteta i Stomatološkog fakulteta u Beogradu.

Na osnovu iznetog predlažemo Nastavno - naučnom veću Stomatološkog fakulteta da prihvati i oceni kao podobnu za javnu odbranu doktorsku disertaciju dr Jovane Milutinović.

U Beogradu, _____

Članovi komisije:

Doc. dr Angelina Nikodijević - Latinović
Stomatološki fakultet, Univerzitet u Beogradu

Doc. dr Željko Milosavljević
Stomatološki fakultet, Univerzitet u Beogradu

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Medicinski fakultet, Univerzitet u Novom Sadu

Na osnovu člana 49. Statuta Stomatološkog fakulteta Univerziteta u Beogradu, Nastavno naučno veće Stomatološkog fakulteta, na III redovnoj sednici u školskoj 2014/15. godini, održanoj 11.02.2015. godine, donelo je sledeću

O D L U K U

Usvaja se pozitivan izveštaj Komisije za ocenu završene doktorske disertacije **dr Jovane Milutinović**, pod nazivom „PROMENE STRUKTURA MEKIH TKIVA LICA NAKON ORTODONTSKE TERAPIJE MALOKLUZIJE II KLASE“.

Imenovani/a će javno braniti doktorsku disertaciju, ukoliko dobije pozitivno mišljenje Veća naučnih oblasti medicinskih nauka Univerziteta u Beogradu, pred komisijom u sastavu:

1. doc. dr Angeline Nikodijević Latinović
2. doc. dr Željko Milosavljević
3. prof. dr Predrag Vučinić, Medicinski fakultet u Novom Sadu.

O b r a z l o ž e n j e

Veće naučnih oblasti medicinskih nauka, na sednici od 27.05.2010. godine, dalo je saglasnost na predlog teme doktorske disertacije dr Jovane Milutinović, pod nazivom „PROMENE STRUKTURA MEKIH TKIVA LICA NAKON ORTODONTSKE TERAPIJE MALOKLUZIJE II KLASE“.

Imenovani/a je u časopisu „The Scientific World Journal“, objavio/la rad pod nazivom: „Evaluation of facial beauty using anthropometric proportions“ (2013.)

Imajući u vidu napred navedeno, Nastavno naučno veće Stomatološkog fakulteta Univerziteta u Beogradu, rešilo je kao u dispozitivu.

Odluku dostaviti: Imenovanom/oj, Univerzitetu u Beogradu, Odseku za nastavu, Veću, Komisiji (3) i Pisarnici.

Referent kadrovske odseka
Violeta Rastović

Dekan
Stomatološkog fakulteta

Prof. dr Miroslav Vukadinović

Research Article

Evaluation of Facial Beauty Using Anthropometric Proportions

Jovana Milutinovic,¹ Ksenija Zelic,² and Nenad Nedeljkovic¹

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The improvement of a patient's facial appearance is one of the main goals of contemporary orthodontic treatment. The aim of this investigation was to evaluate the difference in facial proportions between attractive and anonymous females in order to establish objective facial features which are widely considered as beautiful. The study included two groups: first group consisted of 83 Caucasian female subjects between 22 and 28 years of age who were selected from the population of students at the University of Belgrade, and the second group included 24 attractive celebrity Caucasian females. The en face facial photographs were taken in natural head position (NHP). Numerous parameters were recorded on these photographs, in order to establish facial symmetry and correlation with the ideal set of proportions. This study showed significant difference between anonymous and attractive females. Attractive females showed smaller face in general and uniformity of the facial thirds and fifths, and most of the facial parameters meet the criteria of the ideal proportions.

1. Introduction

Specialists in charge of the facial region are noticing a growing demand for the treatment mainly based on aesthetic principles. As a result, orthodontists and maxillofacial surgeons should have a great understanding for quantitative, objective facial features, which are widely considered as attractive and beautiful [1, 2].

Recently, many linear and angular measures of soft tissue profile and variety of cephalometric analyses were developed to determine ideal proportions [1–4].

When it comes to making a positive first impression, having an aesthetically pleasing face, including an attractive smile, ranks first among all factors.

Today's society is overwhelmed with the importance of being attractive through a variety of media. That fact brings facial standards together with the perception of beauty associated with a sense of social acceptance [5–9]. It was shown in the results of many studies that confidence is closely related to physical appearance [10–12].

Today's most common reason for seeking orthodontic treatment is enhancement of facial beauty through

orthodontic and orthognathic procedures. Unlike the 1980, when 25% of patients required orthodontic treatment for aesthetic reasons, today this percentage has risen to over 75%, which means that 3 out of 4 patients specifically request an improvement of facial appearance [13].

Beauty is not an exact science but according to some plastic surgeons there is a specific proportion system that includes facial height, width, and symmetry. However, the definition of an attractive and beautiful face is subjective, with many included factors—social, cultural, ethnic, and age [10].

The beauty of the person's face is determined by the harmony of proportions and symmetry [12]. Ideal proportions are directly related to the so-called divine proportions and the most important value in relation to these proportions is 1:1.618 [11–18].

The knowledge of divine proportion exists since ancient Greek sculptor Phidias, and it was firstly scientifically described by Filius Bonacci, discoverer of the numerical value of the divine proportions [19]. More relevant to the dental profession as well as the medical profession (such as plastic surgeons) are the divine proportions of the human face.

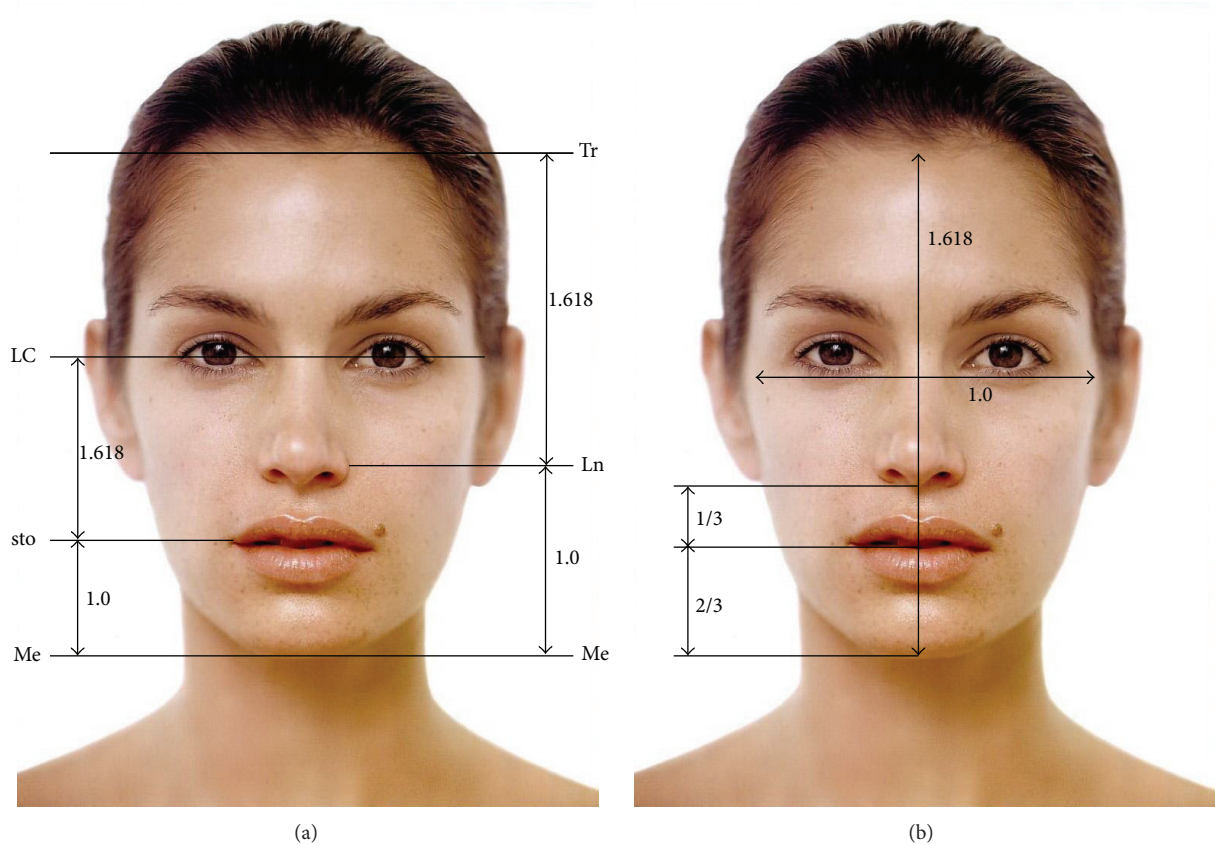


FIGURE 1: Lengths of the face and set of ideal proportions.

This particularly applies to the orthodontic treatment given that the objectives to be achieved at the end of the treatment are not only functional stability, but also facial esthetic improvement [20].

The aim of our paper was to try to establish objective facial features which are widely considered as beautiful. Therefore, specific aims of this paper were the following:

- (1) to compare the facial proportions of two groups of females (anonymous and attractive) in order to establish the difference between them,
- (2) to determine the deviation from the values of ideal proportions (ratio 1 : 1.618) in both groups,
- (3) to compare the difference between facial parameters representing facial height and width in both groups.

2. Methods

The study comprised two groups. First group consisted of 83 female subjects between 22 and 28 years of age who were selected from the population of medical and dental students at the University of Belgrade, and the second group included 24 attractive celebrity females (popular models and actresses). Celebrities whose photos were used in this study were mostly models and actresses whose facial beauty was studied closely by the experts in the field of plastic surgery, and among them are those who were named as

most beautiful and most proportional faces by the beauty and fashion magazines (such as Vogue, Cosmopolitan, and New Woman). The en face facial photographs were taken in natural head position (NHP), using camera Canon Power Shot G6, 7.1 MP, with the same distance of 1.2 m. After training and calibration, all measurements on photographs were performed by the first author (Jovana Milutinovic). In order to test the feasibility and reproducibility of the measurements, 12 photographs (10% from each group) were selected and reassessed by the same author, two months after the initial assessment. Therefore, to evaluate intra-observer agreement, Cohen's Kappa test was applied following the instructions by Landis and Koch [21].

The soft tissue points used for obtaining linear distances which were measured are shown in Table 1.

In the photographs, the following parameters were measured:

- (1) lengths of the face (Figures 1(a) and 1(b)):

- (i) (Tr-Me): height of the face,
- (ii) (lchk r-lchk l): width of the face,
- (iii) (Me-sto): the lowest point on the chin and the point where the upper and lower lip merge,
- (iv) (sto-LC): the point where the upper and lower lip merge and corner of the eye,

TABLE 1: Soft tissue points.

Point	Clarification
Trichion (Tr)	The beginning of the forehead when one lifts the eyebrow
Glabella (Gl)	The most prominent point of the forehead at the superior aspect of the eyebrows
Subnasale (subN)	Point in the midsagittal plane where the nasal septum merges into the upper lip
Menton (Me)	The most inferior point on the soft tissue chin
Stomion (sto)	Midpoint of the intralabial fissure
Postaurale (pa)	The most posterior point on the helix (outer rim of the ear)
Exocanthion (ex)	Most lateral point of the palpebral fissure at the outer canthus of the eye
Endocanthion (en)	Most medial point of the palpebral fissure at the inner canthus of the eye
Cheilion (ch)	Corner of the mouth
Lateral canthus (LC)	Lateral canthus of the eye
Lateral nose (Ln)	Lateral side of the nose
Lateral cheek (lchk)	Lateral border of the cheeks

(v) (Me-Ln): the lowest point on the chin and the outer edge of the nostril,

(vi) (Ln-Tr): the outer edge of the nostril and highest point of the forehead;

(2) division of the face:

(a) the horizontal thirds of the face (Figure 2):

- (1) upper third: Tr-Gl,
- (2) middle third: Gl-subN,
- (3) lower third: subN-Me;

(b) vertical fifths of the face (Figure 3)

- (1) pa r-ex r,
- (2) ex r-en r,
- (3) en r-en l,
- (4) en l-ex l,
- (5) ex l-pa l;

(3) the ideal proportions: after marking and connecting points needed to obtain adequate lengths, measured parameters were compared with the ideal set of proportions (1 : 1.618):

- (i) the ratio lchk r-lchk l : Tr-Me is expected to be 1 : 1.618 (Figure 1(b)),
- (ii) the ratio sto-Me:sto-LC is expected to be 1 : 1.618 (Figure 1(a)),
- (iii) the ratio Me-Ln : Ln-Tr is expected to be 1 : 1.618 (Figure 1(a)),
- (iv) the ratio subN-sto:subN-Me should be 1:3 [19], lower facial third index, that could also be shown in percentage (30 : 70%) [22] (Figure 1(b)).

For each and every parameter the ratio between them was used, so that the actual length of the measured parameters was of no importance.

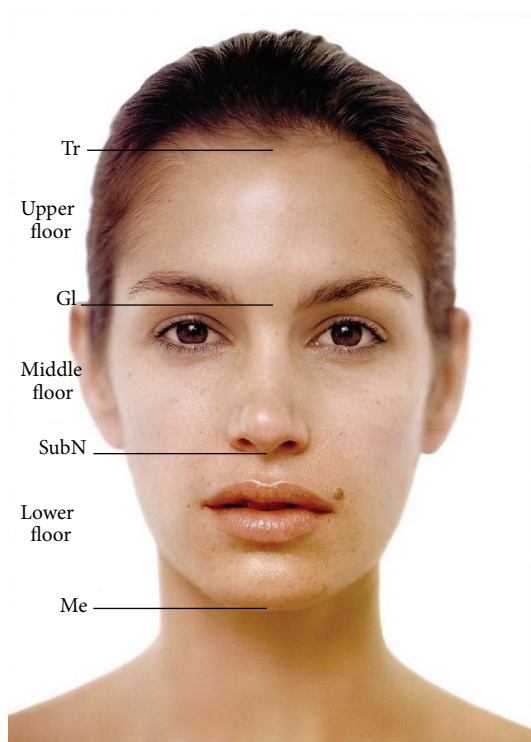


FIGURE 2: Division of the face into horizontal thirds.

3. Statistical Analysis

Statistical analyses were performed using SPSS for Windows, version 15.

The Kolmogorov-Smirnov test was applied in order to test whether the data distribution fits probability density function also known as Gaussian function or bell curve. Subsequently, if test had not rejected the assumed normal distribution, the parametric tests would have been used. For testing the differences in all parameter values between groups, independent sample *t*-test was used. For analyzing the similarity of vertical thirds and horizontal fifths of the face, in each group one-way ANOVA test was applied and in cases where ANOVA showed statistically significant

TABLE 2: Length parameters of the face for attractive and anonymous females.

	Group	Mean (mm)	Std. dev.	Std. error mean	t-test
Trichion-glabella	Anonymous females	47.4759	6.90568	0.75800	0.144
	Attractive females	43.7500	11.57302	2.36233	
Glabella-subnasale	Anonymous females	44.6506	6.77366	0.74351	0.010
	Attractive females	38.1458	10.97772	2.24082	
Subnasale-menton	Anonymous females	49.6084	6.59039	0.72339	0.001
	Attractive females	42.5625	8.78402	1.79303	
Subnasale-stomion	Anonymous females	17.2169	2.47573	0.27175	0.001
	Attractive females	14.2708	3.69776	0.75480	
Menton-stomion	Anonymous females	32.4398	4.58816	0.50362	0.002
	Attractive females	28.3333	5.43472	1.10936	
Stomion-lateral canthus	Anonymous females	50.8735	7.18393	0.78854	0.071
	Attractive females	45.9375	12.26635	2.50386	
Menton-lateral nose	Anonymous females	57.3675	7.92229	0.86958	0.001
	Attractive females	48.6250	10.33067	2.10874	
Lateral nose-trichion	Anonymous females	84.3554	11.91293	1.30761	0.056
	Attractive females	75.7500	20.16292	4.11574	
Lateral nose-lateral nose	Anonymous females	28.2048	3.79830	0.41692	0.006
	Attractive females	23.9792	6.68789	1.36516	
Cheilion-cheilion	Anonymous females	38.5241	4.89145	0.53691	0.174
	Attractive females	35.8125	9.14237	1.86618	
Lateral canthus-lateral canthus	Anonymous females	72.7952	9.30547	1.02141	0.065
	Attractive females	66.1250	16.25894	3.31884	
Lateral cheek-lateral cheek	Anonymous females	97.0120	11.25209	1.23508	0.132
	Attractive females	90.2083	20.56533	4.19788	
Trichion-menton	Anonymous females	141.7229	18.82530	2.06634	0.013
	Attractive females	124.4583	30.17086	6.15860	

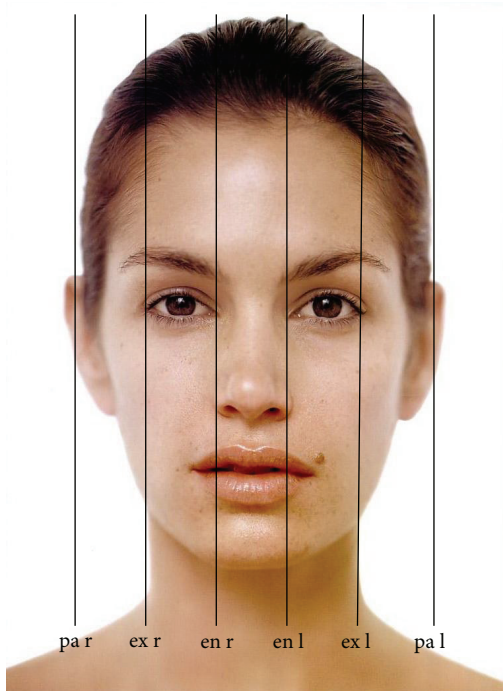


FIGURE 3: Division of the face into vertical fifths.

difference between parameters post hoc Bonferroni test for multiple comparison was applied. To compare differences between ideal proportions and obtained proportions of the facial parameters, the authors applied paired samples *t*-test which analyzed the both values in each subject according to the concept where every particular value has its own paired "control" value. In all analyses, the significance level was set at 0.05.

4. Results

The Kolmogorov-Smirnov test showed normality of distribution of the obtained data in both groups. The Kappa coefficient ranged from 0.715 to 0.899 which is considered to be substantial to almost perfect agreement [21].

The mean measurement values representing length parameters of the face for both groups are shown in Table 2 as well as the differences between two groups. Almost all parameters were significantly smaller in the group of attractive females.

Tables 3(a) and 3(b) show the divisions of the face into horizontal thirds and vertical fifths for both groups. One-way ANOVA showed difference between horizontal thirds and between vertical fifths in the group of anonymous females,

TABLE 3: (a) Division of the face into horizontal thirds. (b) Division of the face into vertical fifths.

(a)						
Horizontal thirds						
	Mean	Std. dev.	ANOVA	Post hoc multiple comparison	Bonferroni test	Sig.
Anonymous females						
1	47.4759	6.90568	0.000	1 versus 2	5.60417	0.162
2	44.6506	6.77366		1 versus 3	1.18750	0.919
3	49.6084	6.59039		2 versus 1	5.60417	0.162
				2 versus 3	4.41667	0.319
Attractive females						
1	43.75	11.57302	0.158			
2	38.1458	10.97772				
3	42.5625	8.78402				

1: trichion-glabella, 2: glabella-subnasale, and 3: subnasale-menton.

(b)						
Vertical fifths						
	Mean (mm)	Std. dev.	ANOVA	Post hoc multiple comparison	Bonferroni test	Sig.
Anonymous females						
1	16.9096	2.58884	0.000	1 versus 2	7.21687*	0.000
				1 versus 3	7.07229*	0.000
				1 versus 4	7.36145*	0.000
				1 versus 5	-1.21084	0.114
2	24.1265	3.37841		2 versus 1	7.21687*	0.000
				2 versus 3	0.14458	0.998
				2 versus 4	-0.14458	0.998
				2 versus 5	6.00602*	0.000
3	23.9819	3.52296		3 versus 1	7.07229*	0.000
				3 versus 2	-0.14458	0.998
				3 versus 4	-0.28916	0.978
				3 versus 5	5.86145*	0.000
4	24.2711	3.38243	4 versus 1	7.36145*	0.000	
			4 versus 2	0.14458	0.998	
			4 versus 3	0.28916	0.978	
			4 versus 5	6.15060*	0.000	
5	18.1205	3.20403	5 versus 1	-1.21084	0.114	
			5 versus 2	6.00602*	0.000	
			5 versus 3	5.86145*	0.000	
			5 versus 4	6.15060*	0.000	
Attractive females						
1	21.7083	4.94737	0.947			
2	22.5833	5.66965				
3	21.3125	5.43302				
4	22.1208	5.63938				
5	22.0833	5.58271				

1: postaurale right-exocanthion right, 2: exocanthion right-endocanthion right, 3: endocanthion right-endocanthion left, 4: endocanthion left-exocanthion left, and 5: exocanthion left-postaurale left.

*Statistical significance.

TABLE 4: The differences between ideal proportions and obtained proportions of the facial parameters.

	Group	Paired differences between measured and ideal values		Paired samples <i>t</i> -test
		Mean (mm)	Std. dev.	Sig.
Subnasale-stomion	Attractive females	0.087	1.332	0.751
	Anonymous females	0.685	1.253	0.000
Stomion-lateral canthus	Attractive females	0.100	6.549	0.941
	Anonymous females	-1.597	4.655	0.003
Lateral nose-trichion	Attractive females	-2.929	9.031	0.126
	Anonymous females	-8.466	7.995	0.000
Lateral canthus-lateral canthus	Attractive females	3.358	3.953	0.000
	Anonymous females	-1.041	4.390	0.034
Cheilion-cheilion	Attractive females	-2.983	3.353	0.000
	Anonymous females	-7.112	3.192	0.000
Trichion-menton	Attractive females	-21.500	7.251	0.000
	Anonymous females	-15.237	6.669	0.000

while in the attractive females group facial thirds and fifths were equal, with no statistical difference.

Using multiple comparison test in the group of anonymous females (Tables 3(a) and 3(b)), distance postaurale-exocanthion (pa-ex), or the most lateral fifth of the face presented by the earlobe section of the face, was found to be significantly smaller than medial three vertical fifths of the face. However, 1st and 5th vertical fifths were not significantly different one from another. Likewise, the significant difference for the middle third in comparison with the 1st and 3rd thirds of the face was found in the group of anonymous females as it was also significantly smaller. There was no significant difference between 1st and 3rd thirds.

Parameters representing division of the lower third of the face into two lengths, upper distance from the point subnasale to stomion, or the thickness of the upper lip, and lower distance from the point stomion and menton, which are supposed to be in relation 1/3 : 2/3, satisfied this criterion in the group of attractive females but not in the group of anonymous females.

Table 4 refers to the comparison of the differences between ideal proportions and obtained proportions of the facial parameters. To compare these values, the authors applied paired samples *t*-test. All analyzed parameters were found to be statistically different from the ratio 1:1.618 in the group of anonymous females. However, in the group of attractive females, three out of six parameters (subN-sto, sto-LC, and Ln-Tr) correspond to ideal ratio.

5. Discussion

The aim of this investigation was to evaluate the difference in facial proportions between attractive and anonymous Caucasian females.

Comprehension and analysis of facial parameters are necessary in different fields of medicine and dentistry, especially among specialists like plastic surgeons, maxillofacial surgeons, orthodontists, and prosthodontists [23, 24].

Keeping that in mind, there is a need for clinicians who work in a maxillofacial region to understand and become familiar with guidelines for esthetic standards and parameters of the soft tissue [22, 25, 26].

Bashour [10] found that there are four most important cues determining attractiveness: averageness, sexual dimorphism, youthfulness, and symmetry. He pointed out that a surgeon who is planning facial cosmetic, plastic, or reconstructive surgery can potentially gain both profound comprehension and better quality surgical results by appreciating these findings.

Division of the face into thirds and fifths is commonly used photogrammetric method for assessing facial symmetry. In our study, all of these measures were uniform in the group of attractive females. In 2009, Sforza et al. examined the difference between two groups of women, 24 attractive ones with 71 "normal" (healthy reference women), and obtained similar results [6]. Attractive females had several "neonatal" characteristics, such as relatively large forehead and a rounded and smaller face in general; they stated that "babyfacedness" is the characteristic that separates them from the normal group. In our research, attractive females also had a smaller face, considering majority of parameters of the face.

Mack [27] was the first to demonstrate the practical application of ideal proportions for improving facial aesthetics. He discussed the importance of treating the dentition to the face based on the divine proportion. According to him, the lower 1/3 of the face significantly influences facial appearance. As proof, he stresses the public's preoccupation with fullness of the lips and the importance of a pleasing smile. These so-called Vitruvian thirds [22] in the lower face have to be adjusted to a 30% upper lip, 70% lower lip-chin proportion. In our study, attractive group showed harmonized lower third of the face, with lower facial index (subnasale-stomion, stomion-menton) in accordance with this beauty canon (30% : 70%). Therefore, this ideal ratio should be suitable in planning concept for treatment in facial region [22]. These distances and divisions in the lower third of the face are one of the most important in the evaluation of facial beauty, given

the fact that the lips and the chin highly determinate female beauty [12, 28].

Women lips are very impressionable feature of the face and have a strong influence on facial beauty perception. Various studies (Bisson and Grobbelaar, 2004, Ward, 1989, Torsello et al., 2010, Mommaerts and Moerenhout, 2010, and Anic-Milosevic, 2010), in which authors analyzed the lower third of the face and the lips, stated that these are one of the five important characteristics in female facial aesthetics [29–32].

Ferrario et al. (1995) reported that attractive women share several similar characteristics, such as increased upper facial third (forehead), smaller face, and more voluminous (thicker) lips than nonattractive ones. In addition, it was stressed that the length of the nose was therefore smaller in attractive group. In their research, they compared 10 attractive and 40 normal women and stated that facial characteristics of attractive females showed uniformity, while facial parameters in a normal group differed from ideal proportions [24]. In the study of Hall et al. [33] it was shown that thickness of the lips was one of the main features in the beauty perception based on a poll among orthodontists and lay public. Perseo [34] stated that, in some cases, standard camera distortions in cinema images made certain female faces appear more beautiful because they are overall “shortened.”

The studies of several authors have obtained the same results [35–37].

In the present investigation, the values for vertical length parameters, such as distance between points Me-ch and ch-LC as well as Me-Ln and Ln-Tr, which should be in relation determined by ideal proportions, differed in the group of anonymous female group. Therefore, faces of famous attractive females who represent contemporary canons of beauty are closer to the ideal proportions [5].

The question that always seems to intrigue scientists dealing with facial beauty is timelessness of the beauty principles established centuries ago. Torsello et al. (2010) found that some of the neoclassical canons can be considered still valid, while others seem to be changed over centuries. According to their research, it seems that reductions in facial medium third, in distance between eyes, and in nose dimensions have occurred as well as relative enlargement of eyes and mouth width [31].

Mommaerts and Moerenhout (2010) showed in their research that some of the ancient and neoclassical canons of beauty are still unchanged, despite the fact that some of these canons were established 2500 years ago.

These guidelines considering facial beauty can be used for improving patient’s facial appearance. Clinicians must be aware that each and every person has their own beauty perception, so these results should be viewed with caution.

6. Conclusions

Facial beauty and its determiners are one of the most arguable topics among surgeons, dentists, and orthodontists. They can all agree about some objective guidelines concerning facial proportions, symmetry, and ratio between specific

facial parameters. However, more subjective understanding of beauty is still immeasurable and lies in the eye of beholder.

This study showed significant difference between anonymous and attractive females. Attractive females showed smaller face in general and uniformity of the facial thirds and fifths, and most of the facial parameters meet the criteria of the ideal proportions.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

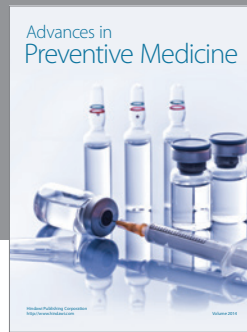
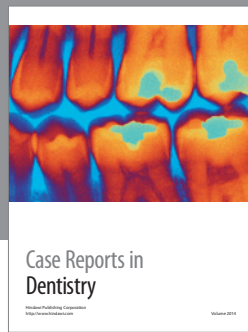
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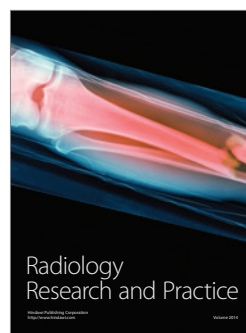
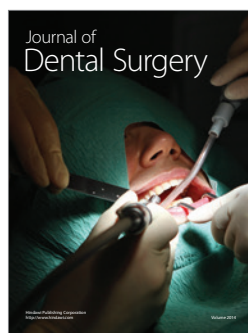
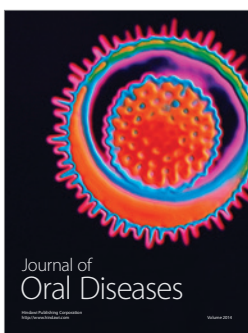
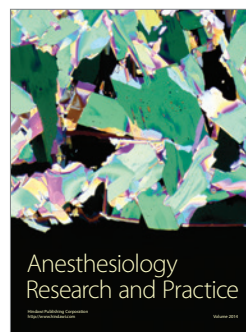
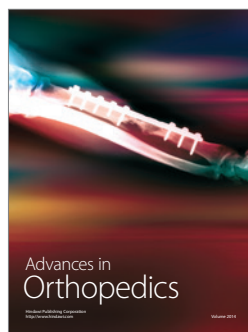
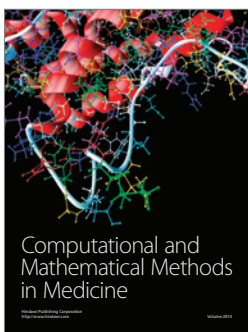
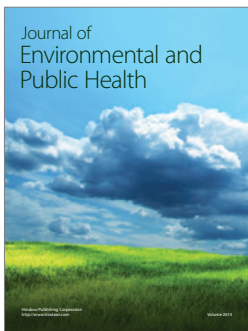
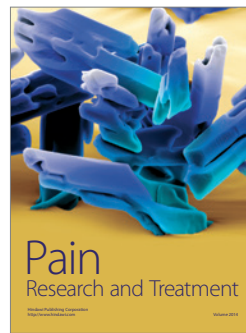
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čl.6 Statuta Univerziteta u Beogradu i čl. 7. st.1
ovog pravilnika)

_____.god.
(Datum)

ZAHTEV

za davanje saglasnosti na izveštaj o urađenoj doktorskoj disertaciji

Molimo da, shodno članu 68. st.3. Zakona o univerzitetu ("Službeni glasnik RS" br. 20/98), date saglasnost na

izveštaj o urađenoj doktorskoj disertaciji kandidata MILUTINOVIĆ MILUTIN JOVANA
(ime, ime jednog od roditelja i prezime)

KANDIDAT MILUTINOVIĆ MILUTIN JOVANA prijavio je doktorsku disertaciju pod nazivom
(ime, ime jednog od roditelja i prezime)

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KLASE“

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„PROMENE STRUKTURA MEKIH TKIVA LICA NAKON ORTODONTSKE TERAPIJE MALOKLUZIJE II
KLASE“

Komisija za ocenu i odbranu doktorske disertacije kandidata MILUTINOVIĆ MILUTIN JOVANA
(ime, ime jednog od roditelja i prezime)

obrazovana je na sednici održanoj 14.10.2014 odlukom fakulteta pod br. 3/96
u sastavu:

ime i prezime člana komisije:	zvanje:	naučna oblast:
<u>ANGELINA NIKODIJEVIĆ LATINOVIĆ</u>	<u>DOCENT</u>	<u>KLINIČKE STOM. NAUKE</u>
<u>ŽELJKO MILOSAVLJEVIĆ</u>	<u>DOCENT</u>	<u>KLINIČKE STOM. NAUKE</u>
<u>PREDRAG VUČINIĆ</u>	<u>PROFESOR</u>	<u>KLINIČKE STOM. NAUKE</u>

Nastavno-naučno veće fakulteta prihvatilo je izveštaj Komisije za ocenu i odbranu doktorske
disertacije na sednici održanoj dana 11.02.2015.

DEKAN FAKULTETA

Prof. dr Miroslav Vukadinović

- Prilog:
1. Izveštaj komisije sa predlogom
 2. Akt Nastavno-naučnog veća fakulteta o usvajanju izveštaja
 3. Primedbe date u toku stavljanja izveštaja na uvid javnosti, ukoliko je takvih primedbi bilo.