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www.medfak.ni.ac.rs/ASN/

Telefon/Phone: +381 (0)18 453 86 55

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KARIJES RIZIK PROFIL DECE PREDŠKOLSKOG UZRASTA GRADA NIŠA

CARIES RISK PROFILE OF PRESCHOOL CHILDREN IN THE CITY OF NIŠ

Branislava B. Stojković¹, Marija Lj. Igić¹, Olivera R. Tričković Janjić¹, Milica S. Petrović², Predrag N. Janošević³, Marija G. Jovanović⁴, Ana N. Igić⁵

¹ UNIVERZITET U NIŠU, MEDICINSKI FAKULTET, KLINIKA ZA STOMATOLOGIJU, PREVENTIVNA I DEČJA STOMATOLOGIJA, NIŠ, SRBIJA

² UNIVERZITET U NIŠU, MEDICINSKI FAKULTET, ORALNA MEDICINA I PARODNOTOLOGIJA, NIŠ, SRBIJA

³ UNIVERZITET U NIŠU, MEDICINSKI FAKULTET, KLINIKA ZA STOMATOLOGIJU, ORTOPEDIJA VILICA, NIŠ, SRBIJA

⁴ UNIVERZITET U NIŠU, MEDICINSKI FAKULTET, STOMATOLOŠKA PROTETIKA, NIŠ, SRBIJA

⁵ UNIVERZITET U NIŠU, MEDICINSKI FAKULTET, STUDENT DOKTORSKIH STUDIJA, NIŠ, SRBIJA

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³ UNIVERSITY OF NIŠ, FACULTY OF MEDICINE, CLINIC OF DENTISTRY, JAW ORTHOPEDICS, NIŠ, SERBIA

⁴ UNIVERSITY OF NIŠ, FACULTY OF MEDICINE, PROSTHODONTICS, NIŠ, SERBIA,

⁵ UNIVERSITY OF NIŠ, FACULTY OF MEDICINE, PHD STUDENT, NIŠ, SERBIA

Sažetak

Uvod: Primarna prevencija karijesa, od najranijeg detinjstva, ima višestruki značaj. Njena efikasnost je u velikoj meri uslovljena poznavanjem karijes rizik profila subpopulacije u riziku, kao važnog preduslova za razvijanje efikasnih strategija i mera za prevenciju i kontrolu bolesti.

Cilj: Izvršiti procenu karijes rizik profila dece predškolskog uzrasta na teritoriji grada Niša, primenom redukovanih kompjuterskih Cariogram® modela.

Materijal i metode: Za realizaciju postavljenih ciljeva sprovedena je studija preseka, koja je obuhvatila decu predškolskog uzrasta, starosti od 36 do 48 meseci, koja od rođenja imaju stalno prebivalište na teritoriji grada Niša. Prikupljanje podataka izvršeno je anketiranjem majki i kliničkim pregledom ispitanika. Karijes rizik profil ispitanika izrađen je primenom redukovanih Cariogram® modela.

Rezultati: Studijom je obuhvaćeno 276 ispitanika predškolskog uzrasta, prosečne starosti $41,28 \pm 4,4$ meseci. Najveći procenat ispitanika ima umeren rizik od pojave karijesa, sa, u proseku, 50% šansi da u budućnosti izbegnu pojavu nove karijesne lezije. U procjenjenom karijes rizik profilu dece, najugroženiji sektori su „osetljivost“ (18%) i „bakterije“ (14%), koji se odnose na primenu fluorida kod dece ovog uzrasta i njihovu oralu higijenu.

Zaključak: Prema sprovedenoj studiji, važnim karijes rizik faktorima kod dece predškolskog uzrasta, mogu se smatrati nedovoljna izloženost zuba fluoridima i neadekvatana oralna higijena, što treba razmotriti prilikom izbora mera i strategija za prevenciju i kontrolu bolesti. Uz to, neophodno je ponovo razmotriti i vreme dijagnostičkih pregleda, sa ciljem da se prevalencija karijesa i njegove negativne posledice, u ovom uzrastu, svedu na minimum.

Ključne reči: karijes rizik, deca, prevencija karijesa

Corresponding author:

Branislava Stojković, D.D.S.
 Dr Zoran Đindjić 81, Blvd, Niš, Srbija
 E-mail: branislava.stojkovic@medfak.ni.ac.rs

Abstract

Introduction: Primary caries prevention from the earliest childhood has multiple significance. Its efficacy is largely conditioned by the knowledge of the caries risk profile of the subpopulation at risk, as an important prerequisite for developing effective strategies and measures for disease prevention and control.

Aim: To assess the caries risk profile of preschool children in the City of Niš using a reduced computer Cariogram® model.

Material and methods: To realize the set objectives, a cross-sectional study was conducted, which included preschool children, aged 36-48 months, with permanent residence in the City of Niš since birth. The collection of data was done by interviewing mothers, and by the clinical examination of subjects. The caries risk profile of the subjects was performed using a reduced Cariogram® model.

Results: The study included 276 subjects of preschool age, mean age 41.28 ± 4.40 months. The highest percentage of subjects has a moderate caries risk, with an average of 50% chance of avoiding a new carious lesion in the future. In the assessed caries risk profile of children, the most vulnerable sectors are "susceptibility" (18%) and "bacteria" (14%), related to the use of fluoride by children of this age and their oral hygiene. The highest percentage of subjects belongs to the moderate caries risk group.

Conclusion: According to the conducted study, insufficient exposure of teeth to fluoride and inadequate oral hygiene may be considered significant caries risk factors in preschool children, which should be considered when choosing measures and strategies for disease prevention and control. Also, it is necessary to reconsider the time of diagnostic examinations to reduce the prevalence of caries and its negative consequences at this age to a minimum.

Key words: caries risk, children, caries prevention

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Uvod

Karijes ranog detinjstva definiše se kao prisustvo jednog ili većeg broja karijesnih, ekstrahovanih (zbog karijesa) i plombiranih površina mlečnih zuba kod dece do 71 meseca života, što uključuje i decu predškolskog uzrasta, starosti od 3 do 6 godina¹. Epidemiološke studije ukazuju na visoku rasprostranjenost karijesa kod dece u predškolskom uzrastu, koja u pojedinim zamljama dostiže čak i 85,5%². Još uvek aktuelni podaci pokazuju da u Republici Srbiji u uzrastu od 3 godine oko 30% dece ima makar jedan karijesni, ekstrahovani ili plombirani (kep) zub, da učestalost karijesa raste sa uzrastom dece i da u uzrastu od 6 godina čak 89% dece ima makar jedan KEP zub³. Prema ovim podacima, rasprostranjenost karijesa kod dece Nišavskog okruga je u granicama republičkog proseka, pri čemu u ovom uzrastu svako dete u proseku ima 2,3 karijesni, ekstrahovani i/ili plombirani zub⁴.

U mnogim zemljama širom sveta, uključujući i razvijene zemlje, karijes još uvek predstavlja veliki socijalni, ekonomski i zdravstveni problem⁵. U predškolskom uzrastu, karijes je vodeći uzrok oralnog bola i gubitka zuba, sa negativnom reperkusijom na kvalitet života dece, kao i njihovih porodica⁶⁻⁸. Osim toga, istraživanja pokazuju da je karijes ranog detinjstva značajan prediktor karijesa kod dece školskog uzrasta⁹. Stoga primarna prevencija ovog oboljenja od najranijeg detinjstva ima višestruki značaj, a njena efikasnost je, osim identifikacije subpopulacije u riziku, uslovljena i poznavanjem karijes rizik faktora i prediktora karijesa, kao bazičnog preduslova razvijanja efikasnih mera i strategija za prevenciju i kontrolu bolesti¹⁰.

Zbog multikauzalne etiologije karijesa, u oblasti procene karijes rizika veliki broj varijabli može biti od značaja. Utvrđeno je međutim, da nijedna od njih, kao solo faktor, nije pokazala visoku pouzdanost u proceni karijes rizika i da se sigurnost predviđanja pojave budućeg karijesa povećava istovremenom kombinovanom primenom većeg broja varijabli, koje su pokazale značaj u oblasti dijagnostike karijes rizika¹¹. Bratthall i saradnici su 1997. godine razvili Cariogram®, kompjuterski program za procenu rizika od nastanka karijesa, čija je efikasnost testirana za različite starosne grupe ispitanika¹². Ovaj program uzima u obzir interakciju individualno procenjenih faktora rizika za pojavu karijesa, koji su do sada pokazali najveći karijes prediktivni značaj: karijes iskustvo, udružene

Introduction

Early childhood caries is defined as the presence of one or more decayed, missing (due to caries) and filled surfaces of primary teeth in children up to 71 months of age, which includes preschool children aged 3 to 6 years¹. Epidemiological studies indicate a high prevalence of caries in preschool children, which in some countries reaches as much as 85.5%². Current data show that about 30% of children aged 3 in the Republic of Serbia has at least one decayed, missing or filled (dmf) tooth, that the incidence of caries increases with age, and that as many as 89% of children aged 6 has at least one decayed, missing or filled tooth³. According to these data, the prevalence of caries in children in the Nišava district is within the national average, i.e. each child in this age group has an average of 2.31 decayed, missing, and/or filled teeth⁴.

In many countries around the world, including the developed ones, caries is still a major social, economic, and health problem⁵. At preschool age, caries is the leading cause of oral pain and tooth loss, with a negative repercussion on the quality of life of children and their families⁶⁻⁸. Moreover, research has shown that early childhood caries is a significant caries predictor in school-age children⁹. Therefore, primary caries prevention from the earliest childhood has multiple significance, and its efficacy is, in addition to identifying the subpopulation at risk, conditioned by the knowledge of caries risk factors and caries predictors as a basic prerequisite for developing effective measures and strategies for disease prevention and control¹⁰.

Due to the multicausal etiology of caries, a large number of variables may be important in the field of caries risk assessment. However, it was found that none of them as a solo factor showed high reliability in the assessment of caries risk and that the prediction of future caries increases with the simultaneous combined application of the variables that have shown importance in the diagnosis of caries risk¹¹. In 1997, Bratthall et al. developed Cariogram®, a computer program for assessing caries risk, whose efficacy was tested for different subject age groups¹². This program takes into account the interaction between individually assessed caries risk factors which have shown the greatest caries predictive importance: caries experience, associated diseases, dietary composition and frequency of intake, oral hygiene, fluoride

bolesti, sastav ishrane i frekventnost unosa hrane, stanje oralne higijene, primena fluorida, brzina protoka i puferski kapacitet pljuvačke, salivarni nivo kariogenih mikroorganizama. Međutim, nedavno su Petsi i sar.¹³ i Taqi i sar.¹⁴ sugerisali to da primena ovog kompjuterskog programa može biti ograničena u zemljama niskog socio-ekonomskog statusa, jer zahteva upotrebu skupih salivarnih testova. Stoga su ovi autori testirali primenu redukovanih Cariogram® modela, kojim salivarni testovi nisu obuhvaćeni i utvrdili da se uz nešto niži prediktivni značaj može koristiti za efikasnu procenu karijes rizik profila dece.

Uzimajući u obzir značaj poznavanja karijes rizik profila dece predškolskog uzrasta za primarnu prevenciju karijesa, cilj ove studije bio jeda se izvrši procena karijes rizik profila dece predškolskog uzrasta na teritoriji grada Niša, primenom redukovanih kompjuterskog Cariogram® modela.

Materijal i metode

Dizajn studije i ispitanici

Za realizaciju postavljenih ciljeva, sprovedena je studija preseka, koja je obuhvatila decu predškolskog uzrasta, starosti od 36 do 48 meseci. Studija je obuhvatila pacijente Službe za preventivnu i dečju stomatologiju Klinike za stomatologiju Medicinskog fakulteta Univerziteta u Nišu (Srbija), kao i pacijente predškolskih ambulanti Službe za preventivnu i dečju stomatologiju Doma zdravlja u Nišu. Roditelji ispitanika dobili su neophodne informacije i dali pisano saglasnost za učešće dece u ovom istraživanju, čiju je realizaciju odobrio Etički komitet Medicinskog fakulteta Univerziteta u Nišu, odlukom broj 12-14532-2/3.

Selekcija ispitanika vršena je prema bazičnim kriterijumima: 1) zdravi ispitanici bez akutnih i hroničnih sistemskih bolesti u ličnoj anamnezi; 2) ispitanici koji su od rođenja sa stalnim prebivalištem na teritoriji grada Niša (prosečna koncentracija fluorida u vodi za piće iznosi $\leq 0,05$ mg/mL); 3) ispitanici bez dijagnostikovanih strukturalnih defekata na zubima.

Veličina reprezentativnog uzorka određena je na osnovu podataka o populaciji dece uzrasta od 36 do 48 meseci, selektovanoj prema opisanim kriterijmima i prevalenciji karijesa u ovom uzrastu dece, sa nivoom pouzdanosti od 5% i snagom studije 80%. Minimalna izračunata veličina uzorka je 249 ispitanika starosti od 36 do 48 meseci.

use, flow rate and buffer capacity of saliva, and the salivary level of cariogenic microorganisms. However, Petsi et al.¹³ and Taqi et al.¹⁴ have recently suggested that the application of this computer program may be limited in countries of low socioeconomic status, as it requires the use of expensive salivary tests. Therefore, these authors tested the application of a reduced Cariogram® model which did not include salivary tests and found that it could be used with somewhat lower predictive significance to effectively assess the caries risk profile of children.

Considering the importance of the knowledge of the caries risk profile of preschool children for primary caries prevention, this study was aimed at assessing the caries risk profile of preschool children in the City of Niš using a reduced computer Cariogram® model.

Material and methods

Study design and subjects

To achieve the goals set, a cross-sectional study that included preschool children aged 36-48 months was conducted. The study included patients of the Department of Preventive and Paediatric Dentistry of the Dentistry Clinic of the Faculty of Medicine, the University of Niš, Serbia, as well as patients of preschool clinics of the Department of Preventive and Paediatric Dentistry of the Community Health Centre in Niš. The parents of the subjects received all necessary information and gave written consent to the participation of children in this study, whose implementation was approved by decision number 12-14532-2/3 of the Ethics Committee of the Faculty of Medicine, the University of Niš.

The subjects were selected according to the basic criteria: 1) healthy subjects without acute and chronic systemic diseases in personal history; 2) subjects with permanent residence in the City of Niš since birth (average concentration of fluoride in drinking water is $\leq 0,05$ mg/mL); 3) subjects without diagnosed structural defects on the teeth.

The size of the representative sample was determined on the basis of data on the population of children aged 36-48 months, selected according to the described criteria and the prevalence of caries in this age group of children with a confidence level of 5% and a study strength of 80%. The minimal calculated sample size was 249 subjects aged 36-48 months.

Procena karijes rizik profila ispitanika

Karijes rizik profil ispitanika procenjen je upotrebljmom Cariogram® modela. Za realizaciju postavljenih ciljeva, u ovoj studiji upotrebljen je redukovani Cariogram® model, koji su opisali Taqi i sar¹³, koji je od mogućih deset obuhvatio sedam varijabli: karijes iskustvo, udružene bolesti, sastav dijete, frekventnost unosa hrane, količina plaka, primena fluorida, klinička procena. Testovi vezani za pljuvačku i bakterijski testovi isključeni su iz programa.

Prikupljanje podataka izvršio je specijalista preventivne i dečje stomatologije. Majke su popunile upitnik, kreiran za potrebe ovog istraživanja, kako bi se, osim bazičnih demografskih podataka, prikupili i podaci o: (1) zdravstvenom stanju ispitanika; (2) frekventnosti unosa ugljenih hidrata i broju dnevnih obroka (procjenjenom na osnovu unosa namirnica u poslednja tri dana); (3) unosu fluorida putem pasti za zube i tabletica.

Klinički pregled ispitanika izvršen je upotrebljom sonde i stomatološkog ogledala. Stanje zdravlja zuba registrovano je "vizuelno-taktilnom" metodom, prema kriterijumima SZO za epidemiološka istraživanja¹⁵ i iskazano Klein-Palmerovim¹⁶ kep (karijes, ekstrakcija, plomba) sistemom, nakon čega su izračunati kip i kips indeksi. Procena stanja oralne higijene obavljena je uprošćenim indeksom oralne higijene po Greene-Vermilionu¹⁷ (OHI-S), za čije određivanje su korišćene površine šest zuba, reprezentativnih za celu denticiju. U mlečnoj denticiji prema Sowolea i sar.¹⁸ za određivanje indeksa korišćene su vestibularne površine 55, 51, 65, 71 zuba, kao i oralne površine 75 i 85 zuba.

Nakon prikupljanja, podaci su ubaćeni u kompjuterski Cariogram® program (dostupan na www.mah.se/fakulteter-och-omraden/Odontologiska-fakulteten/Avdelning-och-kansli/Cariologi/Cariogram/).

Varijabla „karijes iskustvo“ procenjena je na osnovu podatka o tome da je prosečan kep indeks zuba kod dece predškolskog uzrasta 2,3⁴. Varijabla „klinička procena“ je u skladu sa onom dobijenom pomoću Cariogram® modela, te je za sve ispitanike iznosila¹.

Na osnovu Cariogramom procenjene šanse da se izbegne pojava nove karijesne lezije, izvršena je procena stepena rizika za nastanak karijesa kod dece u ispitivanoj grupi, prema kriterijumima prikazanim u Tabeli 1.

Assessment of caries risk profile of subjects

The caries risk profile of the subjects was assessed using the Cariogram® model. To achieve the set goals, this study used a reduced Cariogram® model described by Taqi et al.¹³, which included seven variables out of the possible ten: caries experience, associated diseases, composition of diet, frequency of food intake, amount of plaque, fluoride use, and clinical assessment. Saliva and bacterial culture tests were excluded from the program.

The collection of data was done by a specialist in Preventive and Paediatric Dentistry. The mothers filled in a questionnaire, created for this study to collect, in addition to basic demographic data, data on (1) the health status of the subjects; (2) the frequency of carbohydrate intake and the number of daily meals (estimated based on food intake in the last three days); (3) fluoride intake through toothpaste and tablets.

The clinical examination of the subjects was performed using a probe and a dental mirror. The condition of dental health was recorded by the "visual-tactile" method following the WHO criteria for epidemiological research¹⁵, and expressed by the Klein-Palmer's¹⁶ dmf (decayed, missing, filled) system, after which the dmf and dmfs indices were calculated. The assessment of the oral hygiene condition was performed using a simplified oral hygiene index according to Greene-Vermilion¹⁷ (OHI-S), for whose determination the surfaces of six teeth, the representative for the entire dentition, were used. In primary dentition, according to Sowole et al.¹⁸, the vestibular surfaces of teeth 55, 51, 65, 71, as well as the oral surfaces of teeth 75 and 85 were used to determine the index.

After collection, the data were entered into the computer Cariogram® program (available at www.mah.se/fakulteter-och-omraden/Odontologiska-fakulteten/Avdelning-och-kansli/Cariologi/Cariogram/).

The variable "caries experience" was assessed based on the fact that the average DMF index of preschool children was 2.3⁴. The variable "clinical assessment" was in accordance with the one assessed by the Cariogram® model, and for all subjects amounted to¹.

Based on the Cariogram®-estimated chance of avoiding new carious lesions, caries risk assessment in the studied group of children was performed, following the criteria shown in Table 1.

Tabela 1. Kriterijumi za procenu stepena rizika za nastanak karijesa
Table 1. Criteria for assessment of caries risk levels

Stepen rizika za nastanak karijesa Caries risk levels	Kriterijum Criteria
Visok / High	0% – 20% šansi da se izbegne pojava karijesa /chance of avoiding caries in the future
Umeren / Moderate	21% – 80% šansi da se izbegne pojava karijesa /chance of avoiding caries in the future
Nizak / Low	81% – 100% šansi da izbegne pojava karijesa/chance of avoiding caries in the future

Statistička obrada podataka

Statistička obrada podataka izvršena je u MS Excell programu.

Učestalost karijesa izražena je statističkim indeksima (karijes indeks osoba (kio)), karijes indeks zuba (kiz), indeksima i merama prosečnih vrednosti (karijes indeks prose (kip)), prosečan broj površina zuba zahvaćenih karijesom (kips)), i pokazateljima strukture karijesa (struktura kep-a).

U okviru deskriptivne statistike, numerički podaci prikazani su merama centralne tendencije (srednja vrednost) i merama varijabiliteta (standardna devijacija). Atributivna obeležja predstavljena su u vidu apsolutnih i relativnih brojeva. Dobijeni podaci prikazani su tabelarno i grafički.

Rezultati

Prema zadatim kriterijumima, selektovano je 276 ispitanika predškolskog uzrasta, starosti od 36 do 48 meseci. Bazične demografske i kliničke karakteristike ispitanika prikazane su u Tabeli 2.

U ispitivanoj grupi dece registrovane su uglavnom umerene vrednosti analiziranih parametara prevalencije karijesa, sa ekstremno nepovoljnom strukturuom KEP-a, u kojoj dominira prisustvo karijesa od čak 99,86% (Tabela 2).

Statistical data processing

Statistical data processing was done in MS Excel program.

The frequency of caries was expressed by *statistical indices* (Caries Index of Persons (pci), Caries Index of Teeth (tci)), *indices and average values measures* (Caries Index Average (aci), *the average number of tooth surfaces affected by caries* (dmfs)), and *indicators of caries structure* (dmf structure).

Within descriptive statistics, numerical data were presented by measures of central tendency (mean value) and measures of variability (standard deviation). Attributive features were presented in the form of absolute and relative numbers. The obtained data are shown in tables and graphs.

Results

According to the set criteria, 276 preschool subjects aged 36-48 months, were selected. The basic demographic and clinical characteristics of the subjects are shown in Table 2.

In the studied group of children, the study recorded mostly moderate values of the analysed parameters of caries prevalence, with an extremely unfavourable DMF structure in which the presence of caries dominates with up to 99,86% (Table 2).

Tabela 2. Bazične demografske i kliničke karakteristike ispitanika
Table 2. Basic demographic and clinical characteristics of the study group

Karakteristika / Characteristic	Mean ±SD
Starost (meseci) /Age (month)	41,28±4,40
Pol/ Sex	
Muški/ Male (N, %)	148 (51,2%)
Zenski /Female (N, %)	128 (48,8%)
OHI-s index/ indeks oralne higijene/ oral hygiene index	1,06±0,42
kio/pci (karijes indeks osoba/ Caries Index of Persons)	30,77%
kiz/tci (karijes indeks zuba/ Caries Index of Teeth)	10,65%
kip/aci (karijes indeks prosek/ Caries Index Average)	2,13
Struktura kep-a/dmf structure	
k/d (karijes/ decayed)%	99,86%
e/m (ekstrakcija/missing) %	0%
p/f (plomba/filled) %	0,14%

Distribucija analiziranih Cariogram® varijabli prikazana je u Tabeli 3. Najveći broj ispitanika predškolskog uzrasta je bez karijesnih, ekstrahovanih i/ili plombiranih zuba. U pogledu navika u ishrani, 69,23% ispitanika ima 4-5 dnevnih obroka, uz, uglavnom, visoku frekventnost unosa rafinisanih ugljenih hidrata. Visoke vrednosti indeksa oralne higijene registrovane su kod skoro polovine ispitanika. U pogledu upotrebe fluorida, najveći procenat ove grupe ispitanika koristi samo paste za zube, dok 12,69% ispitanika ne koristi fluoride.

The distribution of the analysed Cariogram® variables is shown in Table 3. The largest number of preschool subjects was without decayed, missing, and/or filled teeth. In terms of dietary habits, 69.23% of the subjects had 4-5 daily meals, with a generally high frequency of refined carbohydrates intake. High values of the oral hygiene index were recorded in almost half of the subjects. Regarding the use of fluoride, the largest percentage of this group of subjects used toothpaste only. Twelve point sixty-nine percent of the subjects did not use fluoride.

Tabela 3.Cariogram skor i distribucija ispitivanih varijabli u studijskoj grupi
Table 3. Cariogram scores and distribution of variables in the study group

<i>Cariogram varijabla</i>	<i>Uzorak /Sample n (%)</i>
Karijes iskustvo / Caries experience	
0- kip/aci*=0	191 (69,23%)
1- kip/aci< od prosečnog za ispitivani uzrast / average for that age group	14 (5,07%)
2- kip/aci = od prosečnog za ispitivani uzrast / average for that age group	12 (4,34%)
3- kip/aci > od prosečnog za ispitivani uzrast / average for that age group	59 (21,36%)
Udružene bolesti / Related general diseases	
0- Zdravi ispitanici / No disease	276 (100%)
1- Sistemska bolest, bez medikamentozne terapije / Disease/conditions, mild degree, no medication	0,00
2- Sistemska bolest, na medikamentoznoj terapiji / Severe degree, long-lasting, on medication therapy	0,00
Učestalost dijete Diet, frequency	
0- Do 3 obroka dnevno / Up to 3 meals per day	35 (12,68%)
1- 4 –5 obroka dnevno / 4-5 meals per day	191 (69,23%)
2- 6 –7 obroka dnevno / 6-7 meals per day	43 (15,57%)
3- > 7 obroka dnevno / > 7 meals per day	7 (2,52%)
Sastav ishrane / Diet, contents	
0- Nizak unos ugljenih hidrata / Low fermentable carbohydrate intake	2(0,72%)
1- Umeren unos ugljenih hidrata / Moderate fermentable carbohydrate intake	86(31,16%)
2- Visok unos ugljenih hidrata / High fermentable carbohydrate intake	132(47,82%)
3- Ekstremno visok unos ugljenih hidrata / Very high fermentable carbohydrate intake	56(20,30%)
OHI-S indeks**	
0- OHI-S <0,3	20(7,24%)
1- OHI-S 0,3 –1,0	118(42,56%)
2- OHI-S 1,1 –2,0	130(47,10%)
3- OHI-S >2,1	8(2,89%)
Program fluorida / Fluoride programme	
0- Konstantna primena suplementa sa fluoridima / maximum' fluoride programme	0 (0%)
1- Suplementi sa fluoridima povremeno / F supplements infrequently	28 (10,14%)
2- Samo paste sa fluoridima / Only F toothpaste	213 (77,17%)
3- Bez primene fluorida / No fluoride	35 (12,69%)
Klinička procena / Clinical judgement	
1- Nalaz u skladu sa procenjenim / Risk according to the other values entered	276 (100%)

* karijes indeks prosek / Caries Index Average

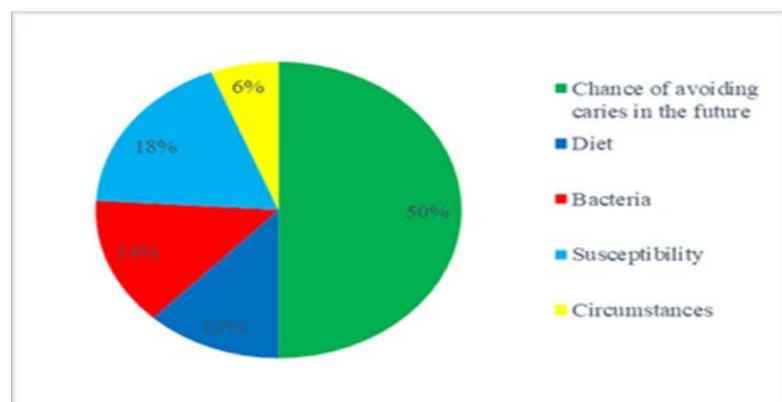
**indeks oralne higijene / oral hygiene index

Prosečan Cariogram® model pokazuje da deca predškolskog uzrasta imaju u proseku 50% šansi da u budućnosti izbegnu pojavu karijesa (Grafikon 1). Najveći procenat ispitanika pripada umerenoj karijes rizičnoj grupi, pri čem najveći broj njih ima između 61 – 80% šansi da u budućnosti izbegne pojavu nove karijesne lezije. Visok rizik od pojave karijesa pokazalo 13,4% dece ispitivanog uzrasta (Grafikon 2).

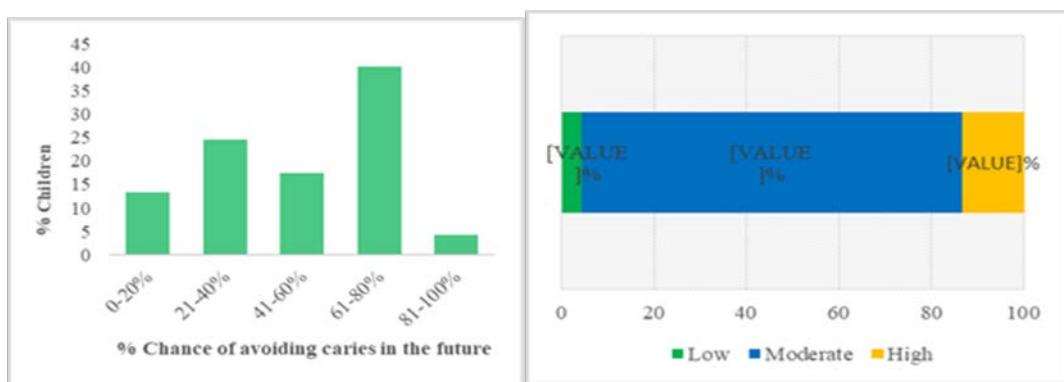
U prosečnom karijes rizik profilu dece ispitivanog uzrasta dominira sektor „osetljivost“ (18%), koji se odnosi na primenu fluorida kod dece ovog uzrasta, iza čega sledi sektor „bakterije“ (14%) (odnosi se na dentalnu higijenu), a zatim sektor „ishrana“ (12%) (odnosi se na varijable vezane za dijetu – sastav i frekventnost unosa hrane).

The average Cariogram® model shows that preschool children have an average of 50% chance of avoiding caries in the future (Graphic 1). The highest percentage of the subjects belongs to the moderate caries risk group, with the largest number of them having between 61-80% chances of avoiding the appearance of a new caries lesion in the future. Thirteen point four percent of the children of the studied age showed a high caries risk (Graphic 2).

The average caries risk profile of the children of the examined age was dominated by the "susceptibility" sector (18%), which referred to the use of fluoride in children of this age, followed by the "bacteria" sector (14%) (referred to dental hygiene) and then the "nutrition" sector (12%) (referred to variables related to nutrition - composition and frequency of food intake).



Grafikon 1. Prosečan karijes rizik profil dece predškolskog uzrasta u Nišu
Graphic 1. The average caries risk profile of preschool children in the City of Niš



Grafikon 2. Grafički prikaz šansi da se u budućnosti izbegne pojava karijesa i procenjeni stepen rizika za nastanak karijesa ispitanika
Graphic 2. Chance of avoiding caries in the future and estimated caries risk levels

Diskusija

Polazeći od značaja poznavanja karijes rizik profila subpopulacije u riziku za primarnu prevenciju karijesa, cilj studije bila je analiza karijes rizik profila dece predškolskog uzrasta u Nišu.

U ispitivanoj grupi zdrave predškolske dece u Nišu, starosti od 36 do 48 meseci, registrovana je umerena prevalencija karijesa, sa vrednostima ispitivanih parametara prevalencije karijesa, koji se uglavnom poklapaju sa aktuelnim podacima^{3,4}. Međutim, studija je registrovala nepovoljnju strukturu kep-a, sa izrazitom dominacijom neasniranih, karijesnih zuba, što sugerise to da predškolski uzrast dece ovog regiona treba i dalje smatrati visoko karijes rizičnim periodom.

Studijom je procenjeno da najveći broj ispitivane dece pokazuje umereni rizik od nastanka karijesa, dok 13,4% njih pripada visoko karijes rizičnoj grupi. U procenjenom karijes rizik profilu dece, najugroženiji su sektori „osetljivost“ i „bakterije“, koji se odnose na primenu fluorida kod dece ovog uzrasta i njihovu oranu higijenu.

Dobro je poznato da fluoridi i dalje pokazuju najjači kariostatičan efekat i da je njihova kontrolisana primena još uvek najjača karijes preventivna mera. Programom primene fluorida, koji je Evropska akademija za dečju stomatologiju usvojila 2000. godine, a revidirala 2009. i 2019. godine¹⁹, prednost je data egzogenoj primeni fluorida, koja se smatra sasvim dovoljnom u području u kojem je koncentracija fluorida u vodi za piće optimalna, tj. iznad 0,3 mgF/L. To u Nišu nije slučaj, pa se pored pasti za zube zahteva primena fluorida u vidu suplemenata. Bazirano na rezultatima ove studije, najčešći izvor fluorida kod dece ovog uzrasta su paste za zube, dok suplemente u vidu tabletica povremeno koristi ili je koristilo 10% dece. Oko 12% ispitanih dece ne koristi fluoride ni u kom obliku. Stoga, može se smatrati da je u ovom uzrastu dece izloženost zuba fluoridima nedovoljna i da je, pri razvijanju karijes preventivnih mera i strategija, poželjno razmotriti i sprovođenje programa za primenu fluorida prema predloženom proteokoluod strane Evropske akademije za dečju stomatologiju.

Studijom su utvrđene vioske vrednosti plak indeksa, što sugerise na neophodnost detaljnije analize glavnih kriterijuma za procenu urednosti izvođenja oralne higijene –učestalosti, redovnosti, frekventnosti i tehnike pranja zuba.

Discussion

Starting from the importance of the knowledge of the caries risk profile of a subpopulation at risk for primary prevention of caries, the aim of the study was to analyse the caries risk profile of preschool children in the City of Niš.

In the studied group of healthy preschool children in Niš aged 36 to 48 months, a moderate prevalence of caries was registered, with values of the examined parameters of caries prevalence that are generally in accordance with current data^{3,4}. However, the study registered an unfavourable DMF structure, with a pronounced dominance of untreated, decayed teeth, which suggests that the preschool age of children in this region should still be considered a high caries risk age.

The study determined that the largest number of examined children showed a moderate caries risk, whereas 13.4% of them fell into the high caries risk group. In the assessed caries risk profile of the children, the most vulnerable sectors were "susceptibility" and "bacteria", which referred to the use of fluoride in children of this age and their oral hygiene.

It is widely recognized that fluorides exhibit the strongest cariostatic effect and that their controlled application is still the strongest caries preventive measure. The fluoride application program adopted by the European Academy of Paediatric Dentistry in 2000 and revised in 2009 and 2019¹⁹ gives preference to the exogenous fluoride application, which is considered quite sufficient in areas where the concentration of fluoride in drinking water is optimal, i.e. above 0.3 mgF/L. Since this is not the case in Niš, in addition to toothpaste, the use of fluoride in the form of supplements is required. Based on the results of this study, the most common source of fluoride in children of this age is toothpaste, whereas supplements in the form of tablets are occasionally used or have been used by 10% of the children. About 12% of the subjects does not use fluoride in any form. Therefore, it can be considered that the exposure of teeth to fluoride is insufficient at this age and that, when developing caries preventive measures and strategies, it is desirable to consider the implementation of programs for fluoride application according to the proposed protocol of the European Academy of Paediatric Dentistry.

Stoga, programom zdravstvenog vaspitanja treba, pre svega, obuhvatiti roditelje, budući da je briga o zdravlju zuba dece ovog uzrasta njihov zadatok. Međutim, treba napomenuti da ovaj program ne treba zasnivati na samom pružanju informacija, jer to obično daje kratkoročne rezultate²⁰, te je neophodna i stalna motivacija i remotivacija, sa ciljem da se zdrave navike prihvate i prenesu na decu, što je često složen i dugotrajan proces.

Iako ishrana jeste jedan od primarnih faktora za nastanak karijesa, studije pokazuju da kao faktor karijes rizika ona nije od većeg značaja, odnosno da je njena uloga često maskirana primenom fluorida i frekventnošću izvođenja oralne higijene.

Redukovani Cariogram® program pokazuje da deca predškolskog uzrasta u Nišu u proseku imaju 50% šansi da u budućnosti izbegnu pojavu nove karijesne lezije. Ovakav rezultat sugerira da bi u periodu od godinu dana kod svakog drugog deteta moglo da dođe do porasta učestalosti pojave karijesa. Prateći takav trend, moglo bi se očekivati da će za godinu dana u ovoj grupi dece doći do statistički značajnog porasta u učestalosti pojave karijesa, što se može smatrati realnim ishodom, a na šta sugerira i svakodnevno kliničko pedontološko iskustvo. Nedvosmisleno, ovakav rezultat sugerira na neophodnost intezivnog rada u oblasti primarne prevencije karijesa kod dece ovog uzrasta, sa ciljem da se izbegnu sve negativne posledice koje karijes i njegove komplikacije nose. To se u prvom redu odnosi na bol, dentogene infekcije i prerani gubitak zuba, koji za sobom povlači poremećaj svih funkcija celokupnog mastikatornog aparata, poremećaj socijalne interakcije dece, što uz ekonomsku komponentu značajno doprinosi narušavanje kvaliteta života dece, ali i njihovih čitavih porodica. Osim toga, prerani gubitak jednog zuba ili većeg broja zuba narušava i dalji razvoj orofacialne regije. Da bi se ove negativne posledice mogle izbeći, jedna od rešenja mogli bi da budu i protetska rehabilitacija mlečnih zuba i izrada čuvara prostora, koji u ovom uzrastu mogu biti prilično kompleksna i neprihvatljiva opcija za najmlađe pacijente. Sve ovo potvrđuje značaj primarne prevencije karijesa od najranijeg detinjstva, zbog čega ona predstavlja bazični korak u kliničkom pristupu karijesu.

The study determined high values of plaque index, which suggests the need for a more detailed analysis of the main criteria for assessing the maintenance of oral hygiene - frequency, regularity, frequency and technique of toothbrushing. Therefore, the health education program should primarily include parents, given that taking care of the dental health of their children at this age is their task. However, it should be noted that this program should not be based solely on the provision of information as it usually gives short-term results²⁰, and that constant motivation and remotivation are necessary to adopt healthy habits and transmit them to children, which is often a complex and time-consuming process.

Even though diet is one of the primary caries factors, studies have shown that as a caries risk factor it is not of great importance, i.e. that its role is often masked by the use of fluoride and the frequency of oral hygiene.

The reduced Cariogram® program shows that preschool children in Niš have an average of 50% chance of avoiding the appearance of a new caries lesion in the future. This result suggests that every other child may have an increased incidence of caries over one year. With such a trend, in this group of children in a year, it may be expected there will be a statistically significant increase in the incidence of caries, which can be considered a realistic outcome, as suggested by everyday clinical pedodontological experience. Undoubtedly, this result also suggests the need for intensive work in the field of primary prevention of caries in children of this age to avoid all negative consequences that caries and its complications bring at this age. This primarily refers to pain, dentogenic infections and premature tooth loss, which leads to disruption of all functions of the entire masticatory apparatus, and disruption of social interaction of children, which, along with the economic component, significantly contributes to the impaired quality of life not only of children but of their entire families as well. Also, premature loss of one or more teeth impairs further development of the orofacial region. To avoid these negative consequences, one of the solutions could be prosthetic rehabilitation of primary teeth and making space maintainers, which can be quite complex at this age and unacceptable for the youngest patients. All this confirms the importance of primary prevention of caries from the earliest childhood, which is why it represents a basic step in the clinical approach to caries.

Zaključak

Registrovana umerena prevalencija karijesa u ispitivanoj grupi dece ukazuje na to da se ovaj razvojni period može smatrati visoko karijes rizičnim, te ga treba posebno sagledati u oblasti primarne stomatološke zdravstvene zaštite dece. Bazirano na razultatima studije, najznačajnijim karijes rizik faktorima mogu se smatrati nedovoljna izloženost zuba fluoridima i neadekvatana oralna higijena, što treba razmotriti prilikom izbora mera i strategija za prevenciju i kontrolu bolesti. Uz to, neophodno je ponovo razmotriti i vreme dijagnostičkih pregleda, sa ciljem da se prevalencija karijesa i njegove negativne posledice u ovom uzrastu svedu na minimum.

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Autori izjavljuju da nema sukoba interesa

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Conclusion

The registered moderate prevalence of caries in the examined group of children indicates that this developmental period can be regarded as a high caries risk period, and should be particularly considered in the field of primary dental health care of children. Based on the results of the study, insufficient exposure of teeth to fluoride and inadequate oral hygiene may be considered the most significant caries risk factors, which should be taken into account when choosing measures and strategies for disease prevention and control. Furthermore, it is necessary to reconsider the time of diagnostic examinations to reduce the prevalence of caries and its negative consequences at this age to a minimum.

Conflicts of Interest statement

The authors declare no conflicts of interest.

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PROCENA ESTETIKE OSMEHA I RAZLIČITIH TIPOVA PROFILA LICA

ASSESSMENT OF SMILE ESTHETICS AND VARIOUS TYPES OF FACE PROFILES

Predrag N. Janošević¹, Mirjana Lj. Janošević¹, Tatjana M. Perović¹, Branislava B. Stojković², Simona M. Stojanović³

¹ UNIVERZITET U NIŠU, MEDICINSKI FAKULTET, KLINIKA ZA STOMATOLOGIJU, ORTOPEDIJA VILICA, NIŠ, SRBIJA

² UNIVERZITET U NIŠU, MEDICINSKI FAKULTET, KLINIKA ZA STOMATOLOGIJU, PREVENTIVNA I DEĆJA

STOMATOLOGIJA NIŠ, SRBIJA

³ UNIVERZITET U NIŠU, MEDICINSKI FAKULTET, ORALNA HIRURGIJA, NIŠ, SRBIJA

¹ UNIVERSITY OF NIŠ, FACULTY OF MEDICINE, CLINIC OF DENTISTRY, JAW ORTHOPEDICS, NIŠ, SERBIA

² UNIVERSITY OF NIŠ, FACULTY OF MEDICINE, CLINIC OF DENTISTRY, PREVENTIVE AND PAEDIATRIC DENTISTRY, NIŠ, SERBIA,

³ UNIVERSITY OF NIŠ, FACULTY OF MEDICINE, CLINIC OF DENTISTRY, ORAL SURGERY, NIŠ, SERBIA

Sazetak

Uvod: Nesavršen osmeđ i profil lica nešto su zbog čega se pacijenti najčešće obraćaju ortodontima.

Cilj sprovedenog istraživanja je utvrditi da li postoji razlika u proceni estetike osmeđa i profila od strane različitih ispitivanih grupa.

Materijal i metod: U okviru sprovedenog istraživanja, 15 ortodonta, 15 studenata završne godine stomatologije i 15 osoba van stomatološke struke ocenjivalo je osmeđ 21 osobe (8 osoba muškog i 13 osoba ženskog pola) starosti od 18 do 30 godina. Od ispitivanika je zahtevano da ponudene osmeđe ocene brojevima od 1 do 9 i da za svaki osmeđ zaokruže jedan od ponuđenih faktora koji u najvećoj meri narušavaju estetiku osmeđa. Ortodonti i osobe van stomatološke struke takođe su ocenjivali pravilan, bimaksilarno retrognat i bimaksilarno prognat iste osobe, muškog i ženskog pola, ocenama od 1 do 3, pri čemu je ocenom 3 označavan najlepši profil.

Rezultati: Iako ne postoji statistički značajna razlika u prosečnoj oceni estetike osmeđa od strane svih ispitivanih grupa, osobe van stomatološke struke dale su najnižu prosečnu ocenu. Sve ispitivane grupe su, poređ nepravilnosti pojedinih zuba, navele različite faktore koji narušavaju estetiku osmeđa. Ortodonti i osobe van stomatološke struke, kao najlošiji navode bimaksilarno prognat profil.

Zaključak: Zbog razlika u proceni estetike osmeđa i profila lica od strane ortodonta i pacijenata, potrebno je napraviti estetski protokol za dijagnozu i plan terapije, pri čemu treba uzeti u obzir i studije koje se bave procenom estetike osmeđa i lica od strane pacijenata.

Ključne reči: osmeđ, profil, estetika, procena

Corresponding author:

Ass. Prof. Predrag Janošević, DDS, PhD
 Dr Zoran Đindić 81, Blvd, Niš, Srbija
 E-mail: predragjanosevic82@gmail.com

Abstract

Background: Imperfect smile and face profile is one of the main reasons why patients turn to orthodontists.

Aim was to investigate if there is a difference in perception of smile and profile esthetics between the examined groups.

Subjects and method: In conducted research, smiles of 21 persons (8 male and 13 female), 18 to 30 years old were evaluated by 15 orthodontists, 15 students of dentistry and 15 laypeople. They were to rate esthetics of every smile from 1 to 9 and choose just one main reason that impairs aesthetics. Orthodontists and laypeople should also evaluate male and female normal, bimaxillary prognathic and bimaxillary retrognathic profiles from 1 to 3. The most beautiful profile should be marked with number 3.

Results: Although there was no statistically significant difference in the evaluation of smile esthetics among groups, laypeople gave the lowest evaluation. Apart from irregular position of certain teeth, all investigated groups emphasized different factors that impair smile esthetics. Orthodontists and laypeople marked bimaxillary prognathic male and female profile as less beautiful than the others.

Conclusion: Because of the differences in perception of the smile aesthetics between orthodontists and laypeople, it is necessary to create a new diagnostic plan of treatment protocols that includes studies investigating laypeople perception of smile and facial esthetics.

Key words: smile, profile, esthetics, perception

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Uvod

Lepota osmeha u velikoj meri utiče na lepotu lica.

Nesavršen osmeh je nešto zbog čega se pacijenti najčešće obraćaju ortodontima¹. Doživljaj lepote je subjektivna stvar, koja zavisi o starosti, polu, rase, obrazovanju, iskustvu, ali i uticaju okoline i medija².

Dugo postoji tendencija da se matematički ili geometrijski definiše idealan osmeh. Postoјi mnogo radova koji se bave ovom temom^{3,4}. Pitanje lepote lica, profila i analiza osmeha deo su svakodnevnog rada ortodonta. Ova analiza podrazumeva procenu veličine i boje zuba, vidljivosti gingive, proporcionalnosti zuba, odnosa sredine lica i zubnih nizova, kao i prisustva bukalnih koridora. Na osnovu te analize se, između ostalog, i utvrđuju smernice ortodontske terapije.

U okviru planiranja ortodontske terapije, jako je važno na koji način sam pacijent sagledava svoj problem. Imajući u vidu da su obrazovanje i iskustvo važni faktori koji utiču na procenu lepote, moguće je da ortodonti i njihovi pacijenti ne vide podjednako stvari, pa nemaju ni ista očekivanja od terapije. Pitanje u kojoj meri specijalističko obrazovanje ortodonta utiče na procenu lepote osmeha i lica moglo bi se razjasniti poređenjem procene lepote od strane ortodonta i studenata završne godine stomatološkog fakulteta. Na ovu temu nema mnogo radova u savremenoj literaturi.

Cilj sprovedenog istraživanja je utvrditi da li postoji razlika u proceni estetike osmeha i estetike profila lica između ortodonta, studenata stomatologije i osoba koje su van stomatološke struke.

Ispitanici i metod

U okviru sprovedenog istraživanja, analiziran je osmeh 21 osobe bele rase (8 osoba muškog i 13 osoba ženskog pola) starosti od 18 do 30 godina. Sve osobe koje su učestvovali u studiji detaljno su informisane o tipu istraživanja i potpisale su pristanak i informacioni dokument.

U studiju nisu uključivane osobe koje su podvrgnute ortodontskom tretmanu, osobe sa dentofacialnim deformitetima, kao i osobe sa protetskim radovima.

Za analizu osmeha i profila korišćene su standardizovane frontalne i profilne fotografije. Sve fotografije slikane su Panasonic fotoparatom DMC 27 na standardizованoj beloj pozadini. Pri fotografisanju, od pacijenata je zahtevano da sede i gledaju pravo ispred sebe.

Introduction

The beauty of a smile influences the beauty of one's face to a great extent.

Imperfect smile is one of the main reasons why patients turn to orthodontists¹. Perception of beauty is individual and depends on age, gender, race, education, experience, environment and media².

There is a growing tendency to define a perfect smile both mathematically and geometrically.^{3,4} A great number of papers deal with this topic^{3,4}. The question of the beauty of a face, facial profile and the analysis of a smile represent an integral part of everyday work of every orthodontist. This analysis includes the evaluation of tooth size and color, the visibility of the gingiva, teeth proportionality, the relation between facial and dental midline as well as the presence of buccal corridors. The course of an orthodontic treatment is determined based on this analysis.

Within the process of planning an orthodontic treatment, it is important to know how the patient perceives the problem. Having in mind that education and experience are the key factors which influence the estimation of beauty, it is possible that an orthodontist and a patient do not perceive things in the same manner and therefore have different expectations in terms of a therapy. To what degree the expert knowledge of orthodontists influences the evaluation of beauty could be clarified by the comparison of beauty assessment of orthodontists and final-year students at the Faculty of Dentistry. There are not a lot of papers on this topic in modern literature.

The aim of this research is to determine whether or not there are any differences in the evaluation of a smile and facial aesthetics between orthodontist, dental students and people who do not have expertise in this field (laypeople).

Subjects and methods

The sample comprised 21 smiles of white people (8 males and 13 females) 18 to 30 years of age. All the people who participated in the study were informed about the type of the research in detail and have signed the document of consent.

People who were undergoing any orthodontic treatment, people with dentofacial deformity, as well as those with prosthetic works were not included in this study.

Standardized frontal and ophthalmic photographs were used for the smile analysis. All the photographs were taken by Panasonic camera DMC 27 in front of the standardized white background.

Fotografije namenjene analizi osmeha zatim su isećene, tako da je ostao donji sprat lica, koji uključuje osmeh (slika 1).



Slika 1. Fotografije osmeha
Figure 1. Photos of a smile

Od ispitanika je zahtevano da ponuđene fotografije ocene brojevima od 1 do 9. Ocene od 1 do 3 predstavljaju estetski neprihvatljiv osmeh, od 4 do 6 estetski prihvatljiv osmeh, dok ocene od 7 do 9 predstavljaju lep osmeh. Ispitanici su takođe, za sve fotografije, zaokruživali jedan od ponuđenih razloga ispod svake fotografije, za koji smatraju da je u najvećoj meri odgovoran za naruševanje estetike osmeha.

Fotografije su ocenjivane od strane 15 ortodonta, 15 studenata završne godine stomatologije i 15 osoba van stomatološke struke. Nakon sakupljanja, rezultati su prosleđeni na dalju statističku analizu. Utvrđivane su srednje vrednosti ocena u svakoj ispitivačkoj grupi. Rezultati su obrađeni Bonferroni testom, kako bi utvrdili postojanje razlika među ispitivanim grupama. Rezultati koji se tiču određivanja glavnih faktora koji narušavaju osmehe su, takođe, opisani.

U okviru drugog dela istraživanja, 15 ortodonta i 15 osoba van stomatološke struke ocenjivalo je, na skali od 1 do 3, lepotu pravilnog, bimaksilarnih retrognatih i bimaksilarnih prognatih muških i ženskih profila lica.

Odradene su standardizovane fotografije idealnog profila osoba muškog i ženskog pola. Pravilan profil određivan je na osnovu estetske Z linije. Ova linija dodiruje najistureniju tačku brade i najistureniju tačku usne, i kod idealnog profila seće vrh nosa. Fotografije su potom obrađene u photoshopu, tako da smo dobili bimaksilarno retrognat i bimaksilarno prognat profil za svaku osobu (slika 2).

The selected photographs were cropped so there remained the lower part of a face with a smile (Figure 1).

The respondents were asked to assess the photographs with numbers from 1 to 9. Marks 1-3 represented aesthetically unacceptable smile, 4-6 aesthetically acceptable smile, while 7-9 a beautiful smile. The respondents also circled one of the given answers to the reasons which mostly impair the aesthetics of a smile.

The photographs were evaluated by 15 orthodontists, 15 final-year dental students and 15 laypeople. Collected data were further statistically analyzed. Mean values were determined for each study group. In order to determine the existence of differences among the studied groups, the received results were analyzed by means of Bonferroni test. Results which referred to the main factors which impair a smile were also described.

Within the second part of the research, 15 orthodontists and 15 laypeople evaluated the beauty of balanced, bimaxillary retrognathic (BMR) and bimaxillary prognathic (BMP) male and female facial profile with the numbers from 1 to 3.

Standardized photographs of ideal male and female facial profile were taken and developed. Regular profile was determined according to an aesthetic Z line. This line reaches the most prominent point of the chin and the most prominent lip and in ideal profile cuts through the tip of the nose. The photographs were then processed in photo shop and we got bimaxillary retrognathic and bimaxillary prognathic profile of each (Figure 2).



Slika 2. (A) pravilan profil (B) bimaksilarno retrognat (C) bimaksilarno prognat profil
Figure 2. (A) regular profile (B) bimaxillary retrognathic profile (C) bimaxillary prognathic profile

Rezultati

Rezultati sprovedene studije ukazuju na to da ne postoji statistički značajna razlika u oceni estetike ponuđenih osmeha od strane ortodonta, studenata stomatologije i osoba van stomatološke struke (Tabela 1).

Bonferroni test pokazao je da ne postoji statistički značajna razlika između ocene estetike osmeha brojevima od 1 do 9, koju su dali ortodonti i osobe van stomatološke struke ($p=0,89$), ortodonti i studenti ($p=0,58$) i studenti i osobe van stomatološke struke ($p=0,60$).

Što se tiče pronalaženja konkretnih razloga za remećenje estetike ponuđenih osmeha, rezultati ukazuju na razlike između ispitivanih grupa (grafikoni 1, 2 i 3).

Orthodonti, kao i osobe van stomatološke struke, ocenjuju bimaksilarno prognat profil kao estetski najneprihvatljiviji. Za razliku od ortodonta, osobe van stomatološke struke nisu u stanju da razlikuju pravilan profil od bimaksilarno retrognatog profila i smatraju ih približno atraktivnim (grafikon 4).

The obtained results suggested that there was no statistically significant difference in the evaluation of the aesthetics of the given smiles made by orthodontists, students of dentistry and laypeople (Table 1).

Bonferroni test showed that there was no statistically significant difference between the orthodontists and laypeople ($p=0.89$), orthodontists and students ($p=0.58$) students and laypeople ($p=0.60$) in terms of their evaluation of the aesthetics of a smile with the numbers from 1 to 9.

As far as finding the concrete reasons which impair the given smiles, the results showed that there were differences among the examined groups (Graph. 1, 2 and 3).

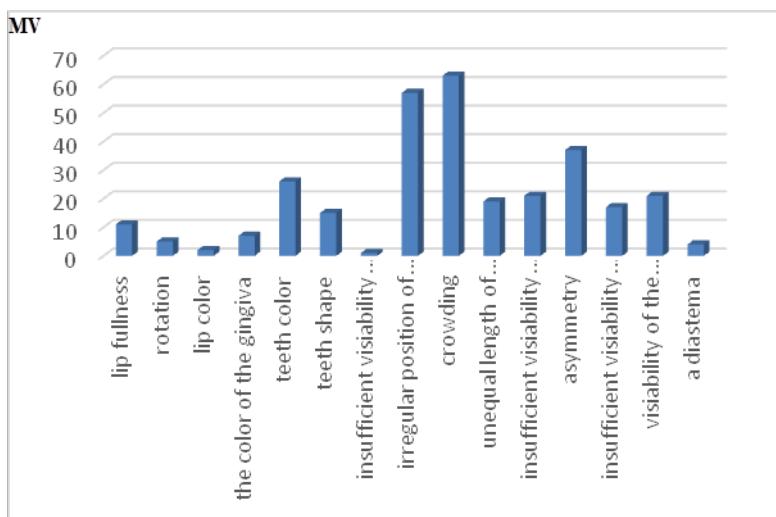
Orthodontists as well as laypeople assessed bimaxillary prognathic profile as aesthetically most unacceptable. Unlike orthodontists, laypeople were not able to make difference between regular and bimaxillary retrognathic profiles and considered them both approximately attractive (Graph. 4).

Results

Tabela 1. Vrednosti dobijene deskriptivnom statističkom analizom (srednja vrednost, standardna devijacija), koje se tiču subjektivne ocene estetike osmeha

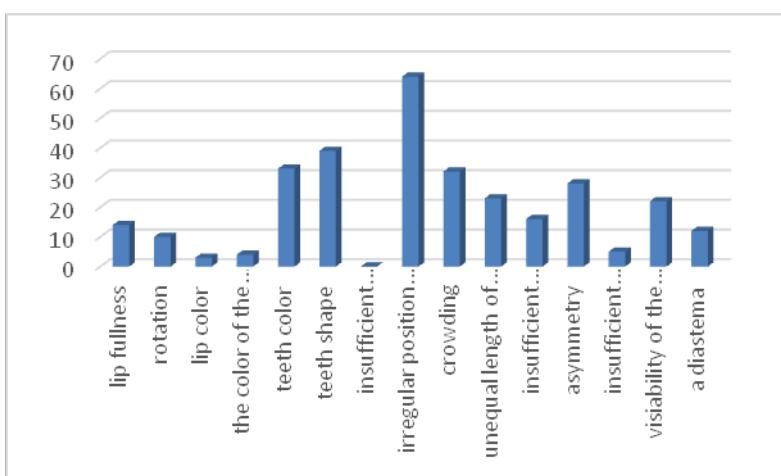
Table 1. Values obtained by the descriptive statistical analysis (mean values, standard deviation) which are concerned with the subjective evaluation of smile aesthetics

	ortodonti orthodontists	studenti students	osobe van stomatološke struke laypeople
Srednja vrednost Mean value	5,1	5,15	4,86
SD MV	2,17	2,12	2,47



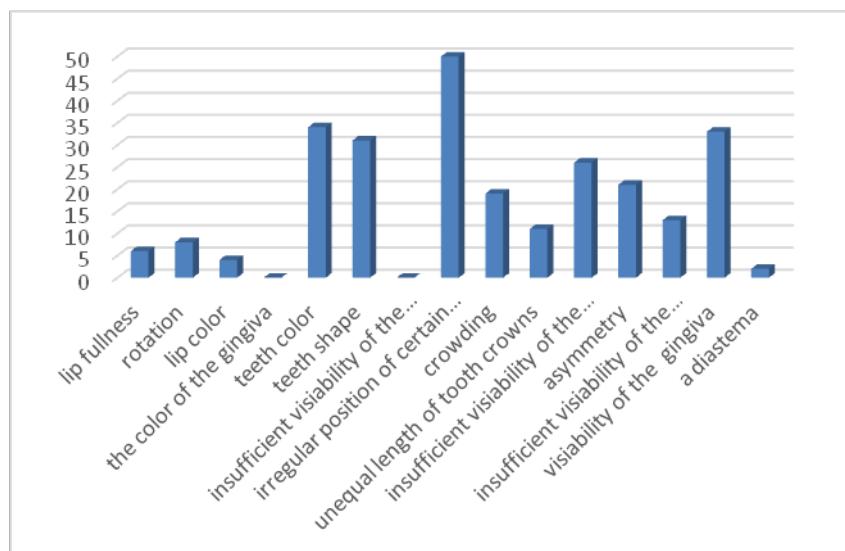
Grafikon 1. Prevalencija faktora koje su ortodonti navodili kao glavne razloge za remećenje estetike ponuđenih osmeha

Graph. 1. The prevalence of factors that the orthodontists listed as the main reasons which impair the aesthetics of given smiles



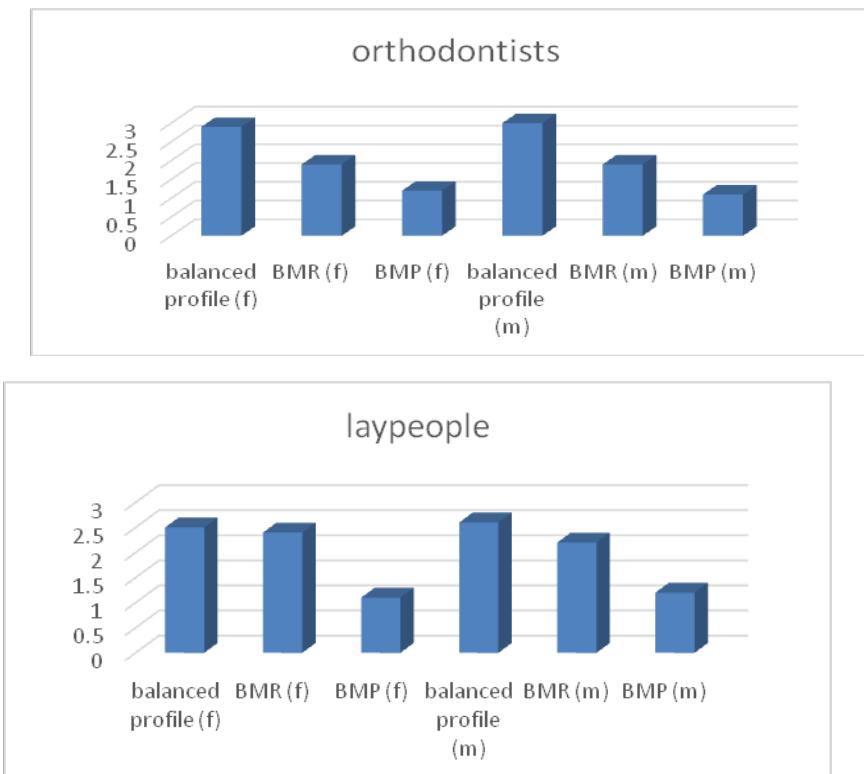
Grafikon 2. Prevalencija faktora koje su studenti navodili kao glavne razloge za remećenje estetike ponuđenih osmeha

Graph. 2. The prevalence of factors which the students listed as the main reasons which impair the aesthetics of given smiles



Grafikon 3. Prevalencija faktora koje su osobe van stomatološke struke navodile kao glavne razloge za remećenje estetike ponuđenih osmeha

Graph. 3. The prevalence of factors which the laypeople listed as the main reasons which impair the aesthetics of given smiles



Grafikon 4. Prosečne ocene estetike pravilnog, bimaksilarno retrognatog (BMR) i bimaksilarno prognatog (BMP) muškog i ženskog profila, od strane ortodonta i osoba van stomatološke struke

Graph. 4. Average mark of a regular, bimaxillary retrognathic (BMR) and bimaxillary prognathic (BMP) male and female profile by orthodontists and laypeople

Diskusija

U sprovedenoj studiji, ocene estetike osmeha u svim ispitivanim grupama blizu su broja 5, što znači da je najveći broj osmeha, sa ponuđene liste, označen kao estetski prihvatljiv. Ne postoji značajna statistička razlika u oceni estetike osmeha od strane ispitivanih grupa. Ipak osobe van stomatološke struke dale su najmanju prosečnu ocenu. To znači da su osobe koje su van stomatološke struke, i najčešće naši pacijenti, nešto oštije u proceni estetike osmeha.

Svaka grupa ispitanika sagledala je osmehe iz svog ugla, naglašavajući različite nedostatke kao glavne uzročnike kvarenja estetike osmeha.

Iz ugla ortodonta, teskoba, asimetrija osmeha i nepravilan položaj pojedinih zuba glavni su uzročnici remećenje estetike osmeha, dok osobe van stomatološke struke, pored nepravilnog položaja zuba, naglašavaju vidljivost gingive i boju zuba, kao glavne uzročnike remećenja estetike osmeha. Studenti završne godine stomatologije, pored nepravilnog položaja pojedinih zuba, navode boju i oblik zuba, kao faktore koji u najvećoj meri remete estetiku osmeha.

Na osnovu dobijenih rezultata, možemo zaključiti da je lepota stvar subjektivne procene i da je, zbog razlika u percepciji estetike od strane ortodonta i pacijenata, potrebno napraviti estetski protokol za dijagnozu i plan terapije, pri čemu treba uzeti u obzir i studije koje se bave percepcijom estetike osmeha i lica od strane pacijenata.

Rezultati takođe pokazuju na to da specijalističko ortodontsko znanje menja percepciju estetike osmeha u odnosu na studente stomatologije, koji su približniji ljudima van stomatološke struke, u pogledu označavanja konkretnih nepravilnosti koje remete estetiku osmeha.

Svakako je poželjno, pre početka terapije, detaljno informisati pacijenta o tome šta se može postići, kao i detaljno ispitati pacijenta o tome šta za njega predstavlja glavni estetski problem zbog koga želi ortodontsku terapiju.

U dostupnoj literaturi nema mnogo radova na temu procene estetike osmeha od strane različitih ispitivanih grupa. Cotrim R. i sar.² i Rodrigues i sar.⁵ došli su do zaključka da se ocena estetike osmeha ljudi van stomatološke struke razlikuje od ortodontskih estetskih normi, što se donekle poklapa sa rezultatima našeg istraživanja. U svom istraživanju Van der Geld i sar.⁶ ističu da su vidljivost cele krune sekutića, kao i umerena

Discussion

In the conducted study, marks used for the evaluation of smile aesthetics in all the groups is close to number 5 which means that the majority of given smiles is marked as aesthetically acceptable. There is no statistically significant difference in the evaluation of the aesthetics of a smile between the groups, however the group consisting of laypeople gave the lowest average mark. This means that people who do not have expertise in dentistry, and who are most often our patients, are harsher in the assessment of the aesthetics of a smile.

Each group of respondents saw smiles from their perspective and stressed out various imperfections as main causes that impair the aesthetics of a smile.

From a standpoint of an orthodontist, crowding, asymmetry and irregular position of teeth are the main causes that impair the aesthetics of a smile, while laypeople apart from irregular teeth position stress out the visibility of the gingiva and teeth color. Besides the irregular teeth position, students also identify teeth color and shape as the key factors which impair the aesthetics of a smile.

Based on the obtained results we can conclude that beauty is a matter of a subjective assessment and should keep in mind that because of the differences in the aesthetic perception of orthodontists and patients there is a need for an aesthetic protocol for making the diagnosis and a plan of treatment, taking into consideration studies which deal with the aesthetic perception of a smile and face by patients as well.

The results also show that orthodontic knowledge changes the perception of smile aesthetics in comparison with the students of dentistry who are more similar to laypeople in terms of stating the facts that impair smile aesthetics.

It is necessary to inform the patient about what it is possible to achieve in detail before the treatment as well as ask the patient what the main aesthetic problem is and at the same time the reason why he or she wants to undergo an orthodontic treatment.

There are not a lot of papers on the aesthetics of a smile from the viewpoint of different groups of people in the literature, Cotrim R et al.² and Rodrigues C de D et al.⁵ came to the conclusion that the assessment of

vidljivost gingive pri osmehu poželjni i estetski privlačni faktori, što se ne poklapa sa našim rezultatima, s obzirom na to da ispitivane osobe van stomatološke struke navode vidljivost gingive kao jedan od tri glavna faktora koji remete estetiku osmeha. Ova činjenica još jedan je u nizu dokaza da ortodonti i osobe koje su van stomatološke struke različito gledaju na estetiku osmeha.

Evidentna je i razlika u proceni estetike profila između ispitanika pomenutih grupa. Osobe van stomatološke struke ne uočavaju razliku između pravilnog i retrognatog profila. Pomenuti rezultati poklapaju se sa rezultatima Falkensammer F. i sar.⁷, koji ističu to da i ortodonti i maksilofacijalni hirurzi drugačije percipiraju lepotu lica u odnosu na osobe van stomatološke struke. Sa druge strane I. Manevska i sar.⁸ navode konkavni profil kao estetski najneprihvatljiviji, što se ne poklapa sa našim rezultatima.

Zaključak

- Najoštije u proceni estetike osmeha su osobe van stomatološke struke, iako nije pronađena značajna statistička razlika u ocenama između ispitivanih grupa.
- Ortodonti navode da pored nepravilnosti pojedinih zuba, teskoba i asimetrija osmeha u velikoj meri remete estetiku osmeha. U svojoj proceni studenti stomatologije bliži su osobama van stomatološke struke nego ortodontima i navode da su oblik i boja zuba jako važan faktor koji remeti estetiku osmeha.
- Zbog razlika u proceni estetike osmeha od strane ortodonta i pacijenata potrebno je napraviti estetski protokol za dijagnozu i plan terapije, pri čemu treba uzeti u obzir i studije koje se bave procenom estetike osmeha i lica od strane pacijenata.
- Ortodonti i osobe van stomatološke struke navode bimaksilarno prognat profil kao etetski najmanje prihvatljiv, što je važan podatak, s obzirom na to da ortodontska terapija može uticati na promenu profila pacijenata.

the aesthetics of a smile by laypeople is not in accordance with orthodontic norms, which is similar to the results of our study to a certain extent.

Van der Geld et al.⁶ point out that the visibility of the whole incisor crown and moderate visibility of the gingiva while smiling are aesthetically desirable which does not coincide with our results, since laypeople in our study state that the visibility of the gingiva is one of the main factors that impair the aesthetics of a smile. This fact is yet another proof that orthodontists and laypeople perceive the aesthetics of a smile differently.

The difference in the assessment of the facial profile aesthetics is evident between the mentioned groups. Laypeople cannot see the difference between a balanced and retrognathic profile. These results coincide with the results of Falkensammer F et al.⁷ who stress out that orthodontists and maxillofacial surgeons perceive the beauty differently from laypeople. On the other hand Manevska I. et al.⁸ define a concave profile as aesthetically least acceptable which does not concur with the results of our study.

Conclusion

- The most severe assessments of the aesthetics of a smile were those done by laypeople even though there was no statistically significant difference between the groups.
- Orthodontists state that besides irregularity of certain teeth, crowding and asymmetry impair the aesthetics of a smile to a great extent. Dental students are closer to laypeople in their evaluation and claim that shape and teeth color represent important factors which undermine the aesthetics of a smile.
- Because of the differences in the aesthetic assessment of orthodontists and patients, it is necessary to establish an aesthetic protocol for making the diagnosis and treatment plan while taking into account studies on aesthetic assessment of a smile and face by patients.
- Orthodontists and laypeople identify the bimaxillary prognathic profile as least acceptable which is an important piece of information having in mind that orthodontic treatment can influence the change in the profile of a patient.

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POTENCIJALNI FAKTORI KOJI UTIČU NA PERCEPCIJU ESTETIKE OSMEHA KOD ODRASLIH PACIJENATA STOMATOLOŠKE KLINIKE UNIVERZITETA JAZAN

THE POTENTIAL FACTORS AFFECTING THE PERCEPTION OF AESTHETIC SMILE AMONG ADULT PATIENTS ATTENDING DENTAL CLINICS OF JAZAN UNIVERSITY

Fawzia I. Shaabi¹, Bandar MA. Al-Makramani¹, Fuad A. Al-Sanabani¹, Mohammed Abdo Alraawi², Nasser M. Al Ahmari³, Mohammed M. Al Moaleem¹

¹ UNIVERZITET JAZAN, STOMATOLOŠKI FAKULTET, ODELJENJE ZA STOMATOLOŠKU PROTETIKU, SAUDIJSKA ARABIA

² UNIVERZITET MUSTAFA KEMAL, STOMATOLOŠKI FAKULTET, ODELJENJE ZA ORTODONCIJU, ANTAKIA, TURSKA

³ UNIVERZITET KING KHALID, STOMATOLOŠKI FAKULTET, ABHA, SAUDIJSKA ARABIA

¹ JAZAN UNIVERSITY COLLEGE OF DENTISTRY, DEPARTMENT OF PROSTHETIC DENTAL SCIENCE, SAUDI ARABIA

² UNIVERSITY OF MUSTAFA KEMAL, COLLEGE OF DENTISTRY, DEPARTMENT OF ORTHODONTICS, ANTAKYA, TURKEY

³ KING KHALID UNIVERSITY COLLEGE OF DENTISTRY, DEPARTMENT OF PROSTHODONTICS, ABHA, SAUDI ARABIA

Sažetak

Uvod: Lep osmeđe je važan deo izgleda svakog pacijenta, jer igra vitalnu ulogu u ličnosti, samopouzdanju i samopoštovanju osobe. **Cilj:** Proceniti odnos potencijalnih faktora koji utiču na percepciju lepote osmeđa kod odraslih pacijenata, zadovoljstvo pacijenata sopstvenim osmeđom kao i otkrivanje najčešćih faktora za nezadovoljstvo svojim osmeđom.

Materijali i metode: 100 muškaraca i 100 žena su procenjivali prisustvo ili nedostatak lepote sopstvenog osmeđa. Kliničko ispitivanje se odnosiло на лиčne estetske faktore osmeđa. Goldsteinov upitnik od 15 pitanja je korišćen z a p r ocenu p a cijentove s a m oprocene i ličnog zadovoljstva. Prikupljeni podaci su analizirani, i smatrani statistički značajnim za $p < 0.05$.

Rezultati: Postoji razlika u paraleli interpupilarne linije koja se poklapa sa središnjom dentalnom i središnjom linijom lica kod estetski lepog i neestetskog osmeđa, kao i u simetriji maksilarnih centralnih i lateralnih sekutika i očnjaka sa njihovom akcijalnom inklinacijom ($p < 0.05$). U pojedinim grupama pitanja detektovana je značajna razlika u odgovirima ženskih i muških ispitanika. Neka pitanja su bila blizu statističke značajnosti, dok neka pitanja nisu pokazala značajne razlike između odgovora muškaraca i žena.

Zaključak: Dentalni i licejni faktori pokazuju izuzetno značajnu vezu sa estetskim osmeđom, tako da njih treba ispitivati od strane adekvatnog stomatologa kako bi se obezbedio pravilan plan lečenja u odnosu na potencijalne faktore percepcije lepote osmeđa merenjem ličnog zadovoljstva pacijenta svojim osmeđom.

Ključne reči: dentalna estetika, stomatološki stav, dentalna kozmetika

Corresponding author:

Ass. Prof. Mohammed Al Moaleem
 Kingdom of Saudi Arabia
 College of Dentistry, 114 Jazan
 E-mail: drmoaleem2014@gmail.com

Abstract

Introduction: Aesthetic smile is an important part for every patient since it plays a vital role in his personality, selfconfidence and self-esteem.

Aim: To assess the relationship between the potential factors affecting the perception of aesthetic smile among adult patients, to evaluate the patient's satisfaction toward their smile and to find the most common factors for their dissatisfaction caused by smile.

Materials and methods: A 100 males and 100 females were evaluated for the presence or absence of aesthetic smile. The clinical examination was included categories related to personal aesthetic factors of the smile. A questioner designed by Goldstein to measure the patient's self-perception and satisfaction of their smiles was used. The data were pooled for analysis, statistical significance was set to p -value > 0.05 .

Results: There was a significant differences in the parallel interpupillary line and coincided of dental midlines alone and with facial midlines in the aesthetic and non-aesthetic choices, also between the symmetry of maxillary central and lateralincisors, and canines with their axial inclinations choices ($p < 0.05$). Some group of questions showed significant differences among female and male subjects while, the male subjects Some questions were near to the statistical significant differences, while others showed no significace between males and females choices.

Conclusion: Dental and facial factors showed highly significant relationship with aesthetic smile. So, it should be observed by a dental specialist to provide a proper treatment plan with respect to the potential factors of the aesthetics to help for self-satisfaction measurement.

Key words: Dental aesthetics, Dental attitude, Dental cosmetic

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Uvod

Reč estetika potiče od grčke reči *aisthetikos*, što znači proučavanje lepote. Smatra se kombinacijom umetnosti i nauke gde je umetnost u funkciji nauke¹. Dentalna lepota je definisana kao dinamična percepcija koja se razlikuje u različitim populacijama, regionima, vremenima, zemljama, pa čak i kontinentima². Različite kulture na različite načine izražavaju brigu za lepotu svojih zuba. Drevni Azijati bojili su zube crnom bojom ili ih ukrašavali dragim kamenjem kao znak prestiža^{3,4}. U prvom veku, Rimljani su prali zube ureom, da bi im dali belju boju⁵. Od 1960-ih do 1970-ih dijastema se smatrala znakom lepote, dok danas većina pacijenata traži stomatološki tretman radi zatvaranja dijasteme⁶.

Svest o estetici pomaže stomatologu da dostigne prihvatlji zadovoljavajući izgled. Posmatranje i znanje pacijenta o estetskoj stomatologiji su poslednjih godina znatno povećani zbog ekspanzije u medijima. Danas bi ljudi voleli da imaju zube kao njihovi omiljeni glumci ili glumice, njihov popularni lider ili političar^{7,8}.

U skladu s tim, jasno razumevanje faktora koji utiču na privlačnost osmeha važno je u stvaranju atraktivog osmeha. Zbog toga je bolje razumevanje standarda i normi lepote od suštinske važnosti kako bi klinčari mogli stvoriti željeni „zlatni osmeh“ primenom ovih normi i standarda na osnovu dijagnoze kao i na plan estetskog lečenja⁴. Osnovna kontura prednjih maksilarnih zuba je centar vizuelne privlačnosti. Njihov položaj daje privid da su zubi u ustima najsvetlij i najveći, pa ih čine dominantnim u osmehu^{9,10}. Estetski prihvatljiv osmeh zavisi od položaja gornjih zuba i gornje usne, boje, veličine, oblika, vidljivosti zuba i dela gingive koja se prikazuje tokom osmeha¹¹. Ostali faktori koji utiču na izgled zuba uključuju i samopouzdanje, ličnu motivaciju, polne i kulturološke razlike^{12,13}. Iako se svaki faktor može posmatrati pojedinačno, sve komponente moraju delovati zajedno kako bi se stvorio konačan estetski efekat⁷.

Literarni podaci sugerisu da su različiti faktori uključeni u uspostavljanje estetskog osmeha⁹. Dunn i sar., zaključili su da je nijansa zuba najvažniji faktor u estetici osmeha, nakon čega sledi prisustvo prirodnih zuba bez restauracije i broj prikazanih zuba⁶.

Drugi su smatrali da stepen pomeranja srednje linije može uticati na privlačnost

Introduction

The word aesthetic is derived from the Greek root *aisthetikos*, which means the study of beauty. It is considered as a combination of art and science where art is in its form of science¹. Dental beauty is defined as a dynamic subject which differs across different populations, regions, times, countries and even continents². Different cultures express their concern about the beauty of their teeth in different ways. Ancient Asians stained their teeth with black or inlaid them with precious stones as a sign of nobility^{3,4}. In the first century, Romans used to brush their teeth with urea to give them a whiter color⁵. From the 1960s - 1970s, diastema was considered as a sign of beauty, while nowadays, the majority of patients want dental treatment for diastema closure⁶.

The awareness of aesthetics helps the dental practitioner to achieve an acceptable pleasing appearance. Patient's perception and knowledge about aesthetic dentistry have been markedly increased in recent years due to media exposure. Nowadays, people would like to have their teeth resemble those of their favorite actor or actress, their popular leader or politician^{7,8}.

Accordingly, a clear understanding of the factors that alter the attractiveness of a smile is important in creating attractive smile. Therefore, the better understanding of the standards and norms of beauty is essential to guarantee that clinicians can create the desirable “golden smile” by applying these norms and standards to the diagnosis as well as to the aesthetic treatment plans⁴. The basic contour of the anterior maxillary teeth is the center of visual attraction. Its position gives the illusion of being the lightest and largest teeth in the mouth, thus, making them the dominant teeth in the smile^{9,10}. The aesthetically pleasing smile was proposed to depend on the teeth and upper lip positions, color, size, shape, visibility of teeth and amount of part of gingiva displayed during smiling¹¹. Other factors influencing dental appearance include body and self-image, personal motivation, gender and cultural differences^{12,13}. Although each factor may be considered individually, all components must act together to create a final aesthetic effect⁷.

A study has suggested different factors to be involved in establishing an aesthetic smile⁹. Dunn et al., concluded that tooth shade was the most important factor for an aesthetic smile, followed in sequence by the presence of natural teeth without restorations and number of teeth displayed⁶.

osmeha, i da se on razlikuje u zavisnosti od stomatološke specijalnosti, stomatologa i njihovih pacijenata. Ortodonti, protetičari, ali i nestručne osobe imaju različitu percepciju estetike osmeha prilikom procene maksilarnih sekutića i izloženosti gingivе^{14,15}.

Pinho i sar, u svojoj studiji zapazili su da ortodont opaža pomak od samo 1 mm, protetičar opaža pomak od 3 mm, dok nestručna osoba ne primećuje pomak srednje linije do 4 mm¹⁶. Drugi važan faktor koji treba primeniti na dizajn osmeha je da širina maksilarnog bočnog sekutića, gledano sa prednje strane, treba da bude u „zlatnoj“ proporciji sa širinom centralnog sekutića maksile¹⁷. Mnogi kontradiktorni rezultati istraživanja pokazuju da većina lepih osmeha nije imala proporcije koje se podudaraju sa formulom „zlatne proporcije“^{7,18}. Kokich i sar¹⁹, zaključili su da asimetrične izmene čine zube neprivlačnijim i za stomatologe i za nestručne osobe. Lako se može primetiti i promena u percepciji estetike ako je udaljenost od gingive do linije usana 3 mm¹⁹. Rodrigues i sar, zaključili su da je linija obrnutog osmeha postigla najmanji stepen privlačnosti zbog odstupanja od estetskih principa jedinstva, sklada i ravnoteže⁴. Drugi navode da se osmeh sa osećajem jedinstva smatra važnijim i privlačnijim od ostalih estetskih principa u određivanju privlačnosti osmeha^{10,20,21}.

Nekoliko studija procenjivalo je percepciju lica, zuba i estetiku osmeha, privlačnost osmeha i odnos prema oralnoj estetici, među saudijskim stomatolozima, studentima stomatologije, nestručnim osobama oba pola i odraslim pacijentima u Rijadu^{3,22-24}, u Džazanu^{25,26}, u Džedi²⁷, Taifu²⁸ i Albahi²⁹.

Idealan osmeh ne postoji. Međutim, najvažniji estetski cilj je postizanje izbalansiranog osmeha, koji se može opisati kao adekvatno pozicioniranje zuba u odnosu na meka tkiva gingive^{17,30}. Zbog toga je ova studija sprovedena kako bi se procenila veza između potencijalnih faktora koji utiču na percepciju estetskog osmeha kod odraslih pacijenata koji dolaze na stomatološku kliniku Univerziteta Jazan. Analizirano je zadovoljstvo pacijenata prema njihovom osmehu i najčešći faktori njihovog nezadovoljstva.

Others considered the degree of the midline shift that can affect the smile attractiveness, which differs according to the dental specialty and between dentists and their patients. Orthodontist, prosthodontics, and layperson have different perceptions of smile esthetics when evaluating maxillary incisors and gingival exposure^{14,15}.

Pinho et al, in their study, found that as little as 1 mm shift is perceived by the orthodontist, a 3 mm shift is perceived by a prosthodontist, whereas layperson does not notice the midline shift when it is less than 4 mm¹⁶. Another important factor to be applied to smile design states that the width of the maxillary lateral incisor, as viewed from the front, should be in golden proportion to the width of the maxillary central incisor¹⁷. Many conflicting reports indicate that the majority of beautiful smiles did not have proportions coinciding with the golden proportion formula^{7,18}. Kokich et al¹⁹, concluded that asymmetric alterations make teeth more unattractive to both dental professionals and the lay people. They can easily notice the change in the perception of aesthetics if the distance from gingiva to lip line is 3 mm¹⁹. Rodrigues et al, concluded that the reverse smile line scored the least degree of attractiveness due to deviation from aesthetic principles of unity, harmony and balance⁴. Other report that a smile with a sense of unity is considered more important and attractive than other aesthetic principles in the determination of the attractiveness of a smile^{10,20,21}.

A group of local studies evaluated the perception of facial, dental, and smile aesthetics, smile attractiveness, and attitude to oral aesthetic among Saudi dentists, dental and non-dental students, lay people, and adult patients form both genders in Riyadh^{3,22-24}, in Jazan^{25,26}, in Jeddah²⁷, in Taif²⁸, and in Albaha²⁹.

An ideal smile does not exist. However, the most important aesthetic objective is achieving a balanced smile, which can be described as an adequate positioning of the teeth with respect to gingival soft tissues^{17,30}. Therefore, this study was conducted to assess the relationship between the potential factors affecting the perception of an aesthetic smile among adult patients attending dental clinics of Jazan University. The patients' satisfaction toward their smile and the most common factors for their dissatisfaction were evaluated.

Materijal i metode

Sprovođenje ove studije je odobreno od strane Etičkog odbora Stomatološkog fakulteta Univerziteta u Jazanu. Izvedena je nakon potpisivanja obrasca saglasnosti onih pacijenata koji su ispunili uključujuće kriterijume za učešće u ovoj studiji. Izvedeni su interni i intra kalibracioni pregledi za ispitivanje kako bi se povećala pouzdanost studije. Veličina uzorka je bila 200 ispitanika (100 muškaraca i 100 žena).

Uključujući kriterijumi su : pacijenti starosti od 18-40 godina, prisutnost svih zuba u estetskoj zoni, zubi bez ikakvih restauracija, pacijenti bez ortodontske ili terapije maksilofacialne traume ili bilo koje operacije u regiji lica. Prisustvo gingivalne recesije, parodontalnog oboljenja, ozbiljne promene boje i nasledne mane u estetskoj zoni pacijenta bili su kriterijumi za isključivanje iz studije. Ispitanici su bili bez ikakvih kraniofacijalnih anomalija. Specijalista protetike ocenjivao je prisustvo ili odsustvo estetskog osmeha među svim ispitanicima.

Prvi klinički deo ispitivanja obuhvatio je tri dela koja se tiču ličnih podataka i svih estetskih faktora osmeha. Prva kategorija je uključivala interpupilarne linije i linije osmeha, idealnu liniju usana i podudaranje središnje linije zuba i lica. Druga kategorija obuhvatala je vidljivost gingivalne linije prilikom osmeha i vidljivost inciziva (u mirovanju 2-4 mm), incizalnu liniju, konveksnost incizalne ravni i Gullwing-ovu konfiguraciju. Treća kategorija odnosila se na simetriju maksilarnog centralnog sekutića (MCS), maksilarnih bočnih sekutića (MBS), maksilarnih očnjaka (MO) i aksijalnog nagiba MCS, MBS, MO. Drugi deo ispitivanja predstavljen je kao upitnik koji su dizajnirali Goldstein i sar. 1997. godine za merenje pacijentove percepcije i zadovoljstva u pogledu njihovih osmeha. Sačinjen je od 15 pitanja³¹.

Podaci prvog i drugog dela ispitivanja (merenja i upitnika) su analizirani Za statističku analizu korišćen je IBM statistički paket za društvene nauke V 20.1 (SPSS IBM, Inc., Chicago, Illinois, SAD). Deskriptivna analiza uključivala je učestalost i procenat za sve parametre. Pored toga, odgovori ispitanika iz svake grupe parametara uključivali su: (a) odnos i položaj interpupilarog osmeha, osmeh, liniju usana sa zubnim i zglobnim linijama lica; (b) vidljivost gingive i inciziva tokom funkcije, status incizalne ravni i (c) analizirana je i simetrija i nagib maksilarnih zuba u estetskom i neestetskom osmehu.

Material and methods

The present cross-sectional study was approved from Ethics Committee at College of Dentistry, Jazan University. It was taken after a signed consent form from those patients who satisfy the inclusion criteria of this study. Inter and intra examiner calibration training sessions were performed to maximize the reliability of the study. The sample size was 200 subjects (100 male and 100 female).

The inclusive criteria were; patients should be 18-40 years-old, all teeth in the aesthetic zone are present, the teeth of the subjects are without any restoration, and no history of orthodontic treatment or maxillofacial trauma and surgery. Also, patients should have absence of the gingival recession or advanced periodontal disease, severe discoloration or hereditary defect in the aesthetic zone. Respondents were without any craniofacial anomalies. A prosthodontist evaluated the presence or absence of esthetic smile among all study subjects.

The first clinical examination sheet included three parts regarding the personal data and all aesthetic factors of the smile. The first category included interpupillary and smile lines, ideal lip line, and coincident of dental and facial midlines. The second category included gingival display during smile and incisal displays at rest (2-4 mm), incisal embrasure form, convexity of the incisal plane and Gullwing configuration. The third category was about the symmetry of maxillary central incisor (MCI), maxillary lateral incisors (MLI), maxillary canine (MC) and the axial inclination of MCI, MLI, MC. The second part was introduced as a questionnaire designed by Goldstein et al 1997, to measure the patients' self-perception and satisfaction regarding their smiles. It consisted of 15 questions³¹.

Data from the examination sheet and questionnaire were pooled for analysis. IBM Statistical Package for the Social Sciences V 20.1 (SPSS IBM, Inc., Chicago, Illinois, USA) was used for statistical analysis. Descriptive analysis included frequency and percentage were calculated for all parameters. In addition, responses of respondents from each group of parameters included (a), relationship and position of interpupillary, smile, lip lines with dental and facial midlines, (b), amount of gingival and incisal display during function, status of incisal plane, and (c), symmetry and inclination of the maxillary teeth in the aesthetic and non-aesthetic choices were analyzed.

Upitnik koji su dizajnirali Goldstein i sar.³¹ iz 1997. godine rađen je radi procene ispitanika i upoređivan između različitih parametara koristeći Chi-kvadrat test. Statistička značajnost je smatrana za $p>0,05$.

Rezultati

I-Procena odnosa između potencijalnih faktora koji utiču na percepciju estetskog osmeha

Prisustvo paralelizma između interpupilarne linije i jedne ili obe frontalne incizalne ravni i gornje maksilarne frontalne ivice gingive iznosilo 81,6% kod slučajeva sa estetskim osmehom i 61,9 % kod slučajeva sa neestetskim osmehom. P-vrednost je bila izuzetno značajna ($p<0,002$). Linija osmeha predstavljena je kao „paralela sa unutrašnjom zakrivljeničcu donje usne“, i bila je prisustna u 91,3% slučajeva sa estetskim osmehom i u 87,6% slučajeva sa neestetskim osmehom. P-vrednost nije bila značajna $p<0,402$.

Procenat slučajeva estetskog i neestetskog osmeha podudarnih srednjih linija zuba i lica zabeležen je u 80,6% slučajeva sa estetskim osmehom i 61,9% slučajeva sa neestetskim osmehom. Pored toga, bio je izuzetno visok u parametru „podudaranje srednjih linija zuba i lica“ i predstavljen je u 90,3% slučajeva sa estetskim osmehom i 82,5% slučajeva sa neestetskim osmehom (Tabela 1).

U Tabeli 2 prikazan je broj i procenat vidljivosti gingive tokom osmeha (1-2 mm), koji su bili su izuzetno visoki i predstavljeni u 87,4% slučajeva sa estetskim osmehom i 82,5% slučajeva sa neestetskim osmehom. Vidljivost inciziva u mirovanju (2-4 mm) takođe je bila prilično visoka i registrovana u 86,4% slučajeva sa estetskim osmehom i 81,4% slučajeva sa neestetskim osmehom. Učestalost i procenat incizalne zakrivljenosti i konveksitet incizalne ravni zabeleženi su kao 90,3% kod estetskih i 86,6% kod neestetskih osmeha, ali konveksitet incizalne ravni bila je 91,3% za estetske i 71,1% za neestetske osmehe. Konačno, oblik galebovih krila zasnovan je u manjem broju i frekvenciji 65% kod estetskog osmeha i 41,2% kod neestetskog osmeha. Sve promenljive p vrednosti su bile neznatne $p<0,05$.

Tabela 3 prikazuje odnos prednjih zuba maksile u odnosu na njihovu simetriju i aksijalne nagibe.

The questionnaire designed by Goldstein et al³¹ 1997 was followed to evaluate the subjects and compared between the different parameters using the Chi-Square test. Statistical significance was set to the p-value of $p> 0.05$.

Results

I -Assessment of the relationship between the potential factors affecting the perception of aesthetic smile

The presence of parallelism between interpupillary line and one or both of anterior Incisal plane and maxillary anterior gingival margin was 81.6% among the cases with aesthetic smile and 61.9% among cases with non-aesthetic smile. The p-value was highly significant $P < .002$. The smile line was presented 'Parallel with inner curvature of lower lip in was 91.3% of cases with aesthetic smile and 87.6% in cases with non-aesthetic smile. The p-value was not significant $p < 0.402$.

The percentages of aesthetic and non-aesthetic smile cases of coincided dental and facial midlines were recorded in 80.6% and 61.9% among cases with aesthetic and non-aesthetic smile respectively. In addition, it was extremely high in the "Coincided of dental and facial midlines" parameter and presented in 90.3% and 82.5% cases among the aesthetic and non-aesthetic choices, respectively (Table 1).

Table 2, showed the number and percentage of the gingival display during smile (1-2mm.) were extremely high and represented in 87.4%, and 82.5% cases, also the incisal display at rest (2-4 mm) was quite high and registered in 86.4%, and 81.4% cases in the aesthetic and non-aesthetic choices, respectively. The frequency and percentage of the incisal embrasure form and convexity of the incisal plane were recorded as 90.3% and 86.6%, in the esthetic and non-aesthetic choices, but convexity of the incisal plane was 91.3% and 71.1% for the aesthetic and non-aesthetic choices, respectively. Finally, the gull-wing configurations were founded in less number and frequency 65% among the aesthetic and 41.2% in the non-aesthetic zone. All the variable p-values were non-significant $p < 0.05$.

Table 3 shows the relation of the maxillary anterior teeth in relation to their symmetry and axial inclinations.

Simetrija MCS, MLS i MO bila je velika, kao i njena zastupljenost u visokom broju i procentu kod pacijenata sa estetskim osmehom i zastupljena je u 81,6%, 84,5% i 94,2%. Procenti i broj nagiba MCS, MLS i MO bili su izuzetno visoki kod pacijenata sa estetskim osmehom i zabeleženi su 95,1%, 97,1% i 96; 93,2%. Svi parametri su bili značajni sa p-vrednostima ($p<0,05$; $p<0,05$, osim u osovinskom nagibu MO koji nije bio značajan i zabeležen ($p<0,304$).

The symmetry of MCI, MLI and MC was high as well as presented in high number and percentage among aesthetic patients and represented in 81.6%, 84.5%, and 94.2%, respectively. The percentages and numbers of the inclinations of MCI, MLI, and MC were extremely high in patients with aesthetic choice and recorded as 95.1%, 97.1%, and 93.2%, respectively. All the parameters were significant with p-values $p < 0.05$, except in the axial inclination of MC which was non-significant and recorded ($p < 0.304$).

Tabela 1. Frekvecija i procenat intrapupilarne , linije osmeha i linije usana, središnje dentalne i facijalne linije, i njihov uticaj naizbor estetskog i neestetskog osmeha

Table 1. The frequency and percentage of interpupillary, smile, lip lines, dental and facial midlines and its relation to aesthetic and non-aesthetic choices

Parameters/ Parametri	Aesthetic/Estetski N (%)	Non-aesthetic/Neestetski	Total/Ukupno N %	P value/ P vrednost
Interpupillary line / Intrepupilarna linija				
Absent / Odsutna	4 (3.9)	9 (9.3)	13 (6.5)	P <0.002*
Parallel with anterior Incisal plane/Paralelna sa prednjom incizalnom ravnim	3 (2.9)	0 (0.00)	3 (1.5)	
Parallel with maxillary anterior gingival margin/Paralelna sa maksilarnom frontalnom ivicom gingive	12 (11.7)	28 (28.9)	40 (20)	
Both / Oba	84 (81.6)	60 (61.9)	144 (72)	
The smile line / Linija osmeha				
Parallel with inner curvature of lower lip/ Paralelna sa sa unutrašnjom zakrivljenošću donje usne	94 (91.3)	85 (87.6)	179 (89.5)	P <0.402
Not parallel with inner curvature of lower lip/Nema paralele sa unutrašnjom zakrivljenošću donje usne	9 (8.7)	12 (12.4)	21 (10.5)	
Ideal lip line (75-100%) of MAT) / Idealna linija usana(75-100%) MPZ				
Present / Prisutna	77 (74.8)	70 (72.2)	147 (73.5)	P <0.727
Absent / Odsutna	26 (25.2)	27 (27.8)	53 (26.5)	
Coincidence of dental midlines / Poklapanje sa sredinom zuba				
Present / Prisutna	83 (80.6)	60 (61.9)	143 (71.5)	P <0.003*
Absent / Odsutna	20 (19.4)	37 (38.1)	57 (28.5)	
Coincidence of dental and facial midlines / Poklapanje sa sredinom zuba i sredinom lica				
Present / Prisutna	93 (90.3)	80 (82.5)	173 (86.5)	P <0.047*
Absent / Odsutna	10 (9.7)	17 (17.5)	27 (13.5)	

*Significant MAT; maxillary anterior teeth

*Značajnost MPZ, maksilarni prednji zubi

Tabela 2. Broj i procenat vidljivosti gingive i inciziva tokom osmeha, stanje incizalne ravni u mirovanju i njihov uticaj na izbor estetskog i neestetskog osmeha

Table 2. The frequency and percentage of the amount of gingival & incisal display during function, status of incisal plane and its relation to present or absent of aesthetic and non-aesthetic choices

Parameters / Parametri	Aesthetic / estetski N %	Non Aesthetic / neestetski N %	Total / Ukupno N %	P value / P vrednost
Gingival display during smile (1-2mm) / Vidljivost gingive prilikom osmeha (1-2mm)				
Present / Prisutna	90 (87.4)	80 (82.5)	170 (85)	P <0.434
Absent / Odsutna	13 (12.6)	17 (17.5)	30 (15)	
Incisal display during rest (2-4mm) / Vidljivost inciziva u pauzi osmeha (2-4mm)				
Present / Prisutna	89 (86.4)	79 (81.4)	168 (84)	P <0.077
Absent / Odsutna	14 (13.6)	18 (18.6)	32 (16)	
Incisal embrasure form / Forma incizalne krivine				
Present / Prisutna	93 (90.3)	84 (86.6)	177 (88.5)	P <0.367
Absent / Odsutna	10 (9.7)	13 (13.4)	23 (11.5)	
Convexity of Incisal plane / Konveksitet incizalne ravni				
Present / Prisutna	94 (91.3)	69 (71.1)	163 (81.5)	P <0.001
Absent / Odsutna	9 (8.7)	28 (28.9)	37 (18.5)	
Gull-wing configuration / Izgled galebovih krila				
Present / Prisutna	67 (65)	40 (41.2)	107 (53.5)	P <0.001
Absent / Odsutna	36 (35)	57 (58.8)	93 (46.5)	

Tabela 3. Učestalost i procenat prisustva i odsustva simetrije i aksijalne inklinacije prednjih zuba i povezanost sa estetskim i neestetskim osmehom

Table 3. The frequency and percentage of the presence and absence of symmetry and axial inclination of maxillary anterior teeth in relation to aesthetic and non-aesthetic choice

Parameters / Parametri	Aesthetic/ Estetski N %	Non Aesthetic/ Neestetski N %	Total /Ukupno N %	P value / P vrednost
Symmetry of MCI / Simetrija maksilarnih centralnih sekutića MCS				
Present/ Prisutna	84 (81.6)	46 (47.4)	130 (65)	P <0.000*
Absent / Odsutna	19 (18.4)	51 (52.6)	70 (35)	
Symmetry of MLI / Simetrija maksilarnih lateralnih sekutića MLS				
Present / Prisutna	87 (84.5)	60 (61.9)	147 (73.5)	P <0.000*
Absent / Odsutna	16 (15.5)	37 (38.1)	53 (26.5)	
Symmetry of MC / Simetrija maksilarnih očnjaka MO				
Present / Prisutna	97 (94.2)	72 (74.2)	169 (84.5)	P <0.000*
Absent / Odsutna	6 (5.8)	25 (25.8)	31 (15.5)	
Axial inclination MCI / Aksijalna inklinacija MCS				
Present / Prisutna	98 (95.1)	77 (79.4)	175 (87.5)	P <0.001*
Absent / Odsutna	5 (4.9)	20 (20.6)	25 (12.5)	
Axial inclination MLI / Aksijalna inklinacija MLS				
Present / Prisutna	100 (97.1)	82 (84.5)	182 (91)	P <0.002*
Absent / Odsutna	3 (2.9)	15 (15.5)	18 (9)	
Axial inclination MC / Aksijalna inklinacija MO				
Present / Prisutna	96 (93.2)	85 (87.7)	181 (90.5)	P <0.304
Absent / Odsutna	7 (6.8)	12 (12.3)	19 (9.5)	

*Significant (MCI); maxillary central incisor (MLI); maxillary lateral incisors (MC); maxillary canine

*Značajnost (MCS) maksilarni centralni sekutići (MLS) maksilarni lateralni sekutići (MO) maksiliarni očnjaci

II - Procena zadovoljstva pacijenta prema njegovom osmehu i najčešći faktori za njihovo nezadovoljstvo

Analiza odgovora iz upitnika na koje su odgovorili učesnici koji su učestvovali u ovoj studiji pokazala je veliku varijaciju. Neka pitanja su pokazala izuzetno značajnu razliku u odgovorima, dok su druga pokazala malu značajnu razliku, dok većina pitanja nije pokazala statistički značajnu razliku između odgovora. Pitanja sa najvećom značajnom razlikom bila su : „Da li, kada listate časopis, poželite da imate lep osmeh kao i modeli?“ gde je većina ispitanika odgovorila pozitivno 79%, a ostalih 21% je odgovorilo ne; na drugo pitanje: „Kada čitate modni časopis da li su vam oči uperene u osmeh modela?“, 83% žena odgovorilo je sa „da“; a samo 17% sa „ne“. Rezultati muških ispitanika pokazuju najveći procenat pozitivnih odgovora na pitanje „Da li su vam zubi preširoki ili suviše uski?“, 17% je odgovorilo sa da; i 15% sa ne; 83% i 85%. P-vrednosti su bile 0,000. Odgovori sa malom značajnom razlikom; 77% muškaraca i 90% žena u ovoj studiji bili su na pitanju: „Da li mislite da neko ima bolji osmeh od vas?“ i „Da li želite da vaši zubi budu beliji?“ sa p-vrednostima jednakim $p<0,011$ i $p<0,001$. Pored toga, procenat muških i ženskih negativnih odgovora na pitanje „Da li su vam zubi previše kockasti ili previše okrugli?“ bili su 87% i 71%, sa p-vrednostima od $p<0,008$. Sva preostala pitanja (7,12,10,3) bila su blizu značajnih razlika, dok odgovori na pitanja (1,2,9,11) nisu pokazala značajnu razliku između muškaraca i žena sa p-vrednostima jednakim ili manjim od $p<0,05$ (Tabela 4).

Diskusija

Ljudi su još u dalekoj istoriji tragali za savršenim osmehom. Na pitanje estetskog osmeha utiču mnogi kulturni, obrazovni i socioekonomski faktori. Poslednjih godina, mediji su stavljali veliki akcenat na važnost lepog estetskog osmeha, a filmske zvezde su postale uzori za estetski osmeh^{32,33}.

Procena odnosa između potencijalnih faktora koji utiču na percepciju estetskog osmeha

Osnovno i vitalno pitanje postoji, a to je ko bi trebao da sudi o stomatološkoj estetici, kliničar ili pacijent, kada se njihovi stavovi često razilaze^{34,35}. Zbog ovih različitih stavova, pacijenti i stomatolozi zajedno, kao i Zubni tehničari, trebalo bi da budu zajedno uključeni u bilo koji estetski rad.

II - Evaluation of the patient's satisfaction toward their smile and the most common factors for their dissatisfaction

Analysis of the results of the questionnaire answered by the subjects participating in the present study showed great variation. Some questions showed a highly significant difference in the answers whereas others showed a low significant difference, yet more questions showed no statistically significant differences between the answers. Of the questions with the highest significant difference is the question about “Do you look at magazines and wish you had a smile as pretty as the models?” where most of the female subjects answered yes 79% and only 21% answered No. The second question was “When you read a fashion magazine, are your eyes drawn to the model’s smile?” with 83% female having the answer Yes; and only 17% scored NO. Male subjects results show the highest percentages when asked “if they think that their teeth are too long or too short, too wide or too narrow”, 17% scored Yes; and 15 % scored No; 83% and 85%, respectively. The p-values were 0.000. Questions with a low level of significant differences; 77% of males and 90% of females subjects in this study answered Yes when asked “Is there someone you believe has a better smile than you? “ or “Do you wish your teeth were whiter?” with p-value equal to 0.011 and 0.001, respectively. In addition, the percentage of both male and female subjects in relation to the answer No for the question “Are your teeth too square or too round”? were 87% and 71%, respectively, with p-value equal to 0.008. All the remaining questions (7,12,10,3) were near to the significant differences, while questions (1,2,9,11) showed no significant differences between males and females with p values equal to or less than 0.05 (Table 4).

Discussion

Since the early years of history, humans have been looking for what they consider as the perfect smile. The issues of the aesthetic smile are influenced by many cultural, educational and socioeconomic factors. In recent years, the media has put great stress in the importance of having a beautiful aesthetic smile and movie stars have become the role models for an aesthetic smile^{32,33}.

Ova studija dizajnjirana je tako da sveobuhvatno ispita potencijalni faktor koji može imati ulogu u prikazu takozvanog estetskog osmeha. Ukupno je 16 faktora podeljeno u tri kategorije kako bi se istražila percepcija pacijenata, a zatim su rezultati statistički analizirani. Značajna razlika u ovoj studiji zabeležena je u prvoj kategoriji iz prvog dela koja je uključivala, podudaranje srednje linije zuba i simetriju maksilarnih zuba. Isti nalazi zabeleženi su studiji koju su sproveli Alhammadi i sar.²⁶, uključujući muškarce i žene. Pored toga, rezultati ove studije bili su slični i sa rezultatima koje su zabeležili Aamassi i sar.²⁴ i Mokhtar i sar.²⁷ u istraživanjima koja su ispitivala 130 stomatologa i studenata stomatologije završne godine. Međutim, pronađena je mala značajna razlika prilikom ispitivanja podudaranja srednjih linija lica u estetskom i neestetskom osmehu. Ostali faktori nisu pokazali značajnu razliku (linija osmeha, linija gornje usne, vidljivost gingive i inciziva, incizalni oblik embrasure i aksijalni nagib maksilarnog očnjaka). Ovi rezultati su u suprotnosti s onima koje su ranije izvestili Vander i sar.¹¹, koji su istakli važnost linije gornjih usana i vidljivosti inciziva.

U ovoj studiji, nivo zadovoljstva bio je visok u pogledu vidljivosti gingive, širine i dužine krunice zuba, kao i broja zuba koji su se videli tokom osmeha i kod estetskog i kod neestetskog. Ovi rezultati bili su u suprotnosti sa rezultatima Alharthi i sar.²⁸, koji su se mogli objasniti iz ispitivanja njihovih izabranih grupa studenata medicine i stomatologije. Ove grupe su uvek zabrinute zbog svog izgleda. Rezultati iz ovog istraživanja su se takođe poklopili sa rezultatima koje su prikazali Talic i sar.²² u odnosu na drugu kategoriju prvog dela koji su uključivali vidljivost gingive tokom osmeha (1-2 mm) i tokom odmora (2-4 mm), kao i incizalni oblici embrasure. Svi parametri nisu značajni u obe istraživačke studije ($p>0.077$ i $p>0.367$).

U ovoj studiji, treća kategorija prvog dela obuhvatala je promenljive koje su pokazale najveću statistički značajnu razliku između ispitanika sa estetskim osmehom u odnosu na one sa neestetskim osmehom, a koje su se odnosile na simetriju MCI, MLI i MO gde je $p<0.000$ (Tabela 3). Slični rezultati prijavljeni su u studijama Talic i sar., Rosenstiel i sar., i Goncalges i sar.^{22,36,37}.

Assessment of the relationship between the potential factors affecting the perception of aesthetic smile

An essential and vital question does exist, that is who should be the judge of dental aesthetics, the clinician or the patient when their views diverge frequently^{34,35}. So patients and dentists together, as well as dental technicians, should be involved during any aesthetic work.

The current study was designed to comprehensively examine the potential factor which might play a role in projecting and influencing the so-called aesthetic smile. A total of 16 factors were divided into three categories to investigate the patients' perception, and then the results were subjected to both descriptive and analytical analysis. A significant difference was recorded in the current study in the first category from the first part which included, coincided of dental midlines and symmetry of maxillary teeth, there were the same findings in a study carried by Alhammadi et al²⁶, including male and female subjects in their study. In addition, our finding was near and on the border to the finding recorded by Aamassi et al²⁴ and Mokhtar et al²⁷ in a study examining 130 dentists and final year dental students. However, a low significant difference was detected when examining the coincidence of dental facial midlines in both aesthetic and non-aesthetic smiles. The rest of the factors showed no significant difference (the smile line, maxillary lip line, gingival display, incisal display, incisal embrasure form and axial inclination of the maxillary canine). These results are in contrast to those reported earlier by Vander et al¹¹, who stressed the importance of the maxillary lip line and incisal display.

In our study, the level of satisfaction was high in term of gingival display, crown width and length, and the number of teeth showed during smiling in both aesthetic and non-aesthetic area. This finding was in contrast with the finding of Alharthi et al²⁸, which could be explained by his selected groups which were from medical fields, and dental students. These groups of subjects are always concerned about their look. Also, our findings agreed with the results mentioned by Talic et al²² in relation to the categories of the second parts which involved the amount of gingival displays during smile (1-2mm) and during rest (2-4mm), as well as incisal embrasure forms. All parameters were not significant in both research studies($p>0.077$ and $p>0.367$).

Zadovoljstvo pacijenata njihovim osmehom i najčešći faktori za njihovo nezadovoljstvo

Varijacije u veličini zuba i njihovom odnosu prema licu mogu uticati na estetski izgled. Stoga zubi moraju biti u proporciji jedan s drugim i biti proporcionalni veličini i obliku lica kako bi se postigao estetski ugodan osmeh^{11,36}. Potreba za razumevanjem pacijentovog mišljenja o njihovoj estetici može poboljšati komunikaciju između stomatologa i samih pacijenata tokom stomatološkog lečenja, što može pozitivno uticati na estetski ishod³⁸.

U drugom delu studije koji se sastojao od ocene zadovoljstva pacijenata zbog njihovog osmeha (Tabela 4), pitanje sa najvećom značajnom razlikom bilo je : „Da li, kada listate časopis, poželite da imate lep osmeh kao i modeli?“ ($p<0.000$). Na pitanje: "Kada čitate modni časopis, da li su vam oči uperene u osmeh modela?" 83% žena odgovorilo je pozitivno, a samo 17% negativno. Slične nalaze zabeležili su Silva i sar.³⁹, koji su sproveli opservacionu studiju među studentima stomatologije u Brazilu. Ova studija imala je za cilj da potvrdi estetsku samopercepciju u pogledu njihovih osmeha. Generalno, rezultati ove studije bili su u skladu sa njihovim nalazima da su žene bile više nezadovoljne svojim osmehom nego muškarci. Rezultati ove studije poklopili su se s njihovim rezultatima vezanim za vrlo značajne razlike u pitanju broj 5: „Da li, kada listate časopis, poželite da imate lep osmeh kao i modeli? i pitanje broj 6: „Kada čitate modni časopis, da li su vam oči uperene u osmeh modela?“ Međutim, rezultati ove studije nisu bili u skladu sa njihovim rezultatima sa pitanjem broj 3: „Da li na fotografiji bolje izgledate slikani s jedne strane lica?“, što se može objasniti činjenicom da je samosvest kod žena uvek veća od muškaraca . Pored toga, rezultati ove studije bili su podudarni sa njihovim rezultatima za pitanja (1,2,9,11) sa nesignifikantnom razlikom i za pitanja (3,7,10,12) koja su bila blizu značajne razlike.

Na osnovu rezultata ove studije jasno je da su registrovani procenti neznatno veći od rezultata koje su spomenuli Alharthi i sar.²⁸, u studiji izvedenoj među studentima univerzitetskih medicinskih fakulteta na Univerzitetu Taif. Međutim, rezultati ove studije u vezi sa pitanjima koja su bila blizu značajne razlike (pitanje br. 3:

In the current study, the third category of the first part which involved the variables which showed the highest statistically significant difference between subjects with aesthetic smile against those with non-aesthetic smile included the symmetry of MCI, MLI and MC where $p<0.000$ (Table 3). Similar results were reported in studies by Talic et al, Rosenstiel et al, and Goncalges et al^{22,36,37}.

Patients' satisfaction with their smile and the most common factors for their dissatisfaction

Variation in the size of the teeth and their relation to the face may affect the aesthetic appearance. Therefore, the teeth must be in proportion to one another and be in proportion to the size and shape of the face to achieve an aesthetically pleasant smile^{11,36}. The need for understanding patients' opinion regarding their aesthetics might improve the communication between dentist and patients during dental treatment which may have a positive effect on the aesthetic outcome³⁸.

In the second part of the study comprising the patients' satisfaction for their smile (Table 4), the question with highest significant difference was the question about "Do you look at magazines and wish you had a smile as pretty as the models?" having p -value 0.000. In the question "When you read a fashion magazine, are your eyes drawn to the model's smile?" 83% female scored Yes; and only 17% scored NO. Similar findings were recorded by Silva et al³⁹, who conducted a cross-sectional observational study among undergraduate dental students in Brazil. This study was aimed to verify the aesthetic self-perception regarding their smiles. In general, our result was in agreement with their findings in that, females were more dissatisfied about their own smiles than males. The results of the current study coincided with their results regarding highly significant differences in question number 5 "Do you look at magazines and wish you had a smile as pretty as the models? and question number 6 "When you read a fashion magazine, are your eyes drawn to the model's smile? However, our finding was not in agreement with their finding in the question number 3" Do you photograph better from one side of your face?, which can be explained by the fact that self-awareness among females is always higher than male. In addition, our findings were parallel to their recorded results in the questions with non-significant difference 1,2,9,11, and in questions which were near to the significant (3,7,10,12).

Tabla 4. Zadovoljstvo pacijenata svojim osmehom i najčešći uzroci njihovog nezadovoljstva

Table 4. Patients' satisfaction toward their smile and the most common factors for their dissatisfaction

Questions / Pitanja	Descriptive Results / Deskriptivni rezultati				Analytical Results /Analitički rezultati	
	Male / Muškarci		Female / Žene			
	Yes / Da	No/Ne	Yes / Da	No /Ne		
1. Are you self-confident about smiling? / Da li ste zadovoljni svojim osmehom?	79%	21%	73%	27%	P<0.204	
2. Do you ever put your hand over your mouth when you smile? / Da li nekada stavljate ruku preko usta kada se smejete?	42%	58%	37%	63%	P<0.282	
3. Do you photograph better from one side of your face / Da li se radije slikate sa jedne ili druge strane?	56%	44%	45%	55%	P<0.079	
4. Is there someone you believe has a better smile than you / Da li postoji neko čiji vam se osmeh više dopada od vašeg?	77%	23%	90%	10%	P<0.011	
5. Do you look at magazines and wish you had a smile as pretty as the models / Da li gledate u novine i želite da imate osmeh kao neko od zgodnih modела iz časopisa?	46%	54%	79%	21%	P<0.000	
6. When you read a fashion magazine, are your eyes drawn to the model's smile / Kada čitate modne magazine, da li su vaše oči uperene u osmeh modela?	48%	52%	83%	17%	P<0.000	
7. When you look at your smile in the mirror, do you see any defects in your teeth or gums Kada gledate u svoj osmeh u ogledalu, da li vidite ikakve defekte na desnima ili na zubima?	45%	55%	58%	42%	P<0.045	
8. Do you wish your teeth were whiter / Da li bi ste voleli da su vam zubi belji?	89%	11%	71%	29%	P<0.001	
9. Are you satisfied with the way your gums look / Da li ste zadovoljni izgledom vasih desni?	74%	26%	77%	22%	P<0.498	
10. Do you like the way your teeth are shaped / Da li vam se dopada oblik vasih zuba?	70%	30%	80%	20%	P<0.071	
11. Do you show too many or too few teeth when you smiled / Da li vam se vidi previše ili premalo zuba dok se sмеjete?	Many/ Mnogo	Few/ Malo	Many/ Mnogo	Few/ Malo	P<0.335	
	61%	38%	54%	46%		
12. Do you show too much or too little gum when you smile / Da li vam se previše ili premalo vide desni dok se sмеjete?	Much/ Mnogo	Little/ Malo	Much/ Mnogo	Little/ Malo	P<0.070	
	8%	91%	18%	82%		
13. Are your teeth too long or too short / Da li su vam zubi prekratki ili predug?	Long/Dugi	Short/ Kratki	Long/ Dugi	Short/ Kratki	P<0.000	
	17%	83%	43%	57%		
14. Are your teeth too wide or too narrow / Da li su vam zubi previše široki ili uzani?	Wide/ Široki	Narrow/ Uzani	Wide/ Široki	Narrow/ Uzani	P<0.000	
	15%	85%	68%	32%		
15. Are your teeth too square or too round / Da li su vam zubi previše zaobljeni?	Round/ Zaobljeni	Square/ Četrvasti	Round/ Zaobljeni	Square/ Četrvasti	P<0.008	
	12%	87%	29%	71%		

„Da li na fotografiji bolje izgledate slikani s jedne strane lica?“, pitanje br. 7: „Kada se osmehnete i pogledate u ogledalo, da li vidite nedostatke na vašim zubima ili desnima?“ i pitanje br. 9: „Da li ste zadovoljni izgledom vaših desni?“ ($p<0.079$, $p<0.045$, $p<0.049$), su u potpunoj suprotnosti sa njihovim rezultatima ($p<0.037$, $p<0.0001$, $p<0.008$) koje su bile veće od njihovih p-vrednosti za ista pitanja bez signifikantne razlike. Sva pitanja koja se odnose na oblik, veličinu i dužinu zuba ili izgled desni tokom osmeha (pitanja od broja 12 do broja 15) pokazala su podudarne rezultate sa rezultatima ovog istraživanja, ali nisu bili podudarni sa rezultatima koje su zabeležili Silva i sar.³⁹. To bi moglo biti zbog njihovih ispitanika koji su studenti.

Zabeleženi rezultati u ovoj studiji su u saglasnosti sa rezultatima koje su prikazali Al Moaleem i sar.²⁵, Maghaireh i sar.⁴⁰, ali nisu u saglasnosti sa rezultatima istraživanja Alghamdi ASA²⁹, koji su izvestili da je većina stomatoloških pacijenata u gradu Albaha nezadovoljna izgledom njihovih zuba, koji može biti povezan sa godinama starosti nezadovoljnih pregledanih pacijenata.

Zaključak

Na osnovu rezultata ove studije može se zaključiti da dentalni i facialni faktori koji pokazuju visoko signifikantnu vezu sa estetskim izgledom pacijenata treba da budu sagledavani od strane protetičara, ortodonata i zubnih tehničara istovremeno u cilju određivanja pravilnog terapijskog plana u pogledu potencijalnih faktora percepcije estetskog osmeha uz pomoć samoprocene pacijentovog zadovoljstva.

From our results, it is clear that the registered percentages were slightly higher than the results mentioned by Alharthi et al²⁸, in a study among university medical colleges students at Taif University. However, we totally disagree with their results in relation to questions that were near to the significant difference (Question # 3 “Do you photograph better from one side of your face”, Question # 7 “When you look at your smile in the mirror, do you see any defects. difference which were questions numbers (3,7,10,12). in your teeth or gums? and Question # 9 “Are you satisfied with the way your gums look? with p values 0.079, 0.045, 0.049, respectively which were higher than their p values for the same questions 0.037, 0.0001, 0.008 in non-significant questions. All questions related to the shape, size and length of teeth or appearance of gum during smiling (Questions from # 12 to 15) showed coinciding results with the results in our research, but were not parallel to the results recorded by Silva et al³⁹. This might be due to their subjects who were all university students.

Overall our recorded results agreed with the results mentioned by Al Moaleem et al²⁵, Maghaireh et al⁴⁰, but disagreed with Alghamdi ASA²⁹, those reported that majority of the dental patients in Albaha city were dissatisfied with their dental appearance, which may be related to the elder age of the dissatisfied examined patients.

Conclusion

Based on results of the present study it could be concluded that dental and facial factors which showed high significance relationship with aesthetic smile should be observed by prosthodontists, orthodontists and laboratory technicians to provide a proper treatment plan in respect of the potential factors of the aesthetics smile perception with the help of self-satisfaction measurement.

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LICHEN PLANUS: ORALNE MANIFESTACIJE, DIFERENCIJALNA DIJAGNOZA I TERAPIJA

LICHEN PLANUS: ORAL MANIFESTATIONS, DIFFERENTIAL DIAGNOSIS AND TREATMENT

*Marija Bradić-Vasić¹, Ana S. Pejčić², Milena M. Kostić³, Ivan Z. Minić¹,
 Radmila R. Obradović², Ivana V. Stanković¹*

¹ UNIVERZITET U NIŠU, MEDICINSKI FAKULTET NIŠ, STUDENT DOKTORSKIH STUDIJA, NIŠ, SRBIJA

² UNIVERZITET U NIŠU, MEDICINSKI FAKULTET NIŠ, KLINIKA ZA STOMATOLOGIJU, SLUŽBA ZA ORALNU MEDICINU I PARODONTOLOGIJU

³ UNIVERZITETA U NIŠU, MEDICINSKI FAKULTET NIŠ, KLINIKA ZA STOMATOLOGIJU, SLUŽBA ZA STOMATOLOŠKU PROTETIKU

¹ UNIVERSITY OF NIŠ, FACULTY OF MEDICINE, DEPARTMENT OF DENTISTRY, PHD STUDENT, NIŠ, SERBIA

² UNIVERSITY OF NIŠ, CLINIC OF DENTISTRY, DEPARTMENT OF ORAL MEDICINE AND PERIODONTOLOGY, NIŠ, SERBIA

³ UNIVERSITY OF NIŠ, CLINIC OF DENTISTRY, DEPARTMENT OF PROSTHODONTICS, NIŠ, SERBIA

Sažetak

Uvod: Neka od tipičnih kožnih oboljenja, kao što su *Pemphigus vulgaris*, *Pemphigoid mucosae oris*, *Erythema exudativum multiforme*, *Sclerodremia*, *Dermatitis herpetiformis-Duhring* i *Lichen planus*, lokalizuju se i u usnoj duplji.

Cilj: Cilj rada je da se precizira dijagnoza i terapija *Lichen planusa* sa manifestacijama u usnoj duplji.

Metode: Analizom literature i na osnovu kliničkog iskustva lekara ispitivane su najčešće oralne manifestacije *Lichen planusa*.

Rezultati: Ovo oboljenje najčešće se javlja kod pacijenata srednjih godina (30 – 60 godina) i češće je kod žena nego kod muškaraca. Oralni *Lichen planus* retko se vidi kod dece. Bolest se javlja kod 0,5% – 2% populacije. Klinička istorija potvrđuje vezu između oralnog *Lichen planusa* i oralnog karcinoma, stoga ovo oboljenje treba smatrati kao prekanceroznu ležiju.

Zaključak: Dermatoze u ustima najčešće se lokalizuju na obraznoj sluzokoži, i to u visini okluzalne linije i na sluzokoži retratomolarnog predela, ali se mogu javiti i na sluzokoži jezika, poda usne duplje i usana.

Ključne reči: *Lichen planus*, *oralne manifestacije*, *usna duplja*

Corresponding author:

Marija Bradić-Vasić D.D.S.
 Gogoljeva 17, 21 000 Novi Sad, Serbia
 E-mail:marijabradić89@gmail.com

Abstract

Introduction: Some of the typical skin diseases, such as *Pemphigus vulgaris*, *Pemphigoid mucosae oris*, *Erythema exudativum multiforme*, *Sclerodremia*, *Dermatitis herpetiformis-Duhring* and *Lichen planus*, can cause swelling and irritation in mucous membranes of the oral cavity.

Aim: The aim of the study was to precise diagnosis and treatment of oral *Lichen planus* manifestations.

Methods: Analyzing the literature data and the experience of clinicians, the most common oral *lichen planus* manifestations were investigated.

Results: This disease most commonly occurs in middle-aged patients (30-60 years) and is more common in women than in men. Oral *Lichen planus* is rarely seen in children. The disease presents in 0.5% to 2% of the population. Clinical history established the relation between oral *Lichen planus* and oral carcinoma, and therefore this disease should be considered a precancerous lesion.

Conclusion: Dermatoses in the mouth are localized most often in the oral mucosa, both at the height of the occlusal line and in the mucous membrane of the retramolar area, but they can also occur in the mucous membranes of the tongue, the floor of the mouth and lips.

Key words: *Lichen planus*, *oral manifestations*, *oral cavity*

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Uvod

Lichen planus, pored virusnih infekcija i aftoznih lezija, zauzima treće mesto među oboljenjima na oralnoj sluzokoži. Od prvih kožnih opisa *Lichen planus-a*, koje je objavio Wilson 1869. godine, notirane su i sluzokožne promene od strane drugih autora¹. Mogućnost da se pojave oralne lezije, bez kožnih manifestacija, prvi je opisao Audry 1894. godine², a posebno su istaknute od strane Dubreuilha 1906. godine², koji je ukazao na to da patohistološka slika oralnih lezija odgovara patohistološkoj slici kožnih promena. Zatim su sledili brojni autori, koji su pored belih papula i plakovnih lezija u usnoj duplji, počeli da opisuju i brojne varijante bolesti, počevši od Poora 1905. godine³, koji je prvi opisao vezikulo-bulozne lezije, pa do opisa ulcerozne i atrofične lezije, koje su posebno obradili Lortat-Jacob i sar. 1929. godine³.

Etiologija

- **Stres** – nervosa i emotivna nestabilnost veoma često su prisutne kod osoba sa ovim oboljenjem. Kliničkim pregledima utvrđeno je da se bolest javlja nedelju do dve nedelje nakon jakog emocionalnog stresa (smrt bliskog člana porodice, napetost na poslu, psihička premorenost, itd)^{5,6}, tako da se neurogeno poreklo najviše dovodi u vezu sa ovim oboljenjem.
- **Autoimunost** – mnoge studije pokazale su da antibazalne ćelije antitela (anti-BCA), koje perzistiraju mesecima ili godinama kod pacijenata sa oralnim *Lichen planus-om*, mogu biti autoantitela, koja organizam stvara u borbi protiv alteriranih antibazalnih ćelija antitela^{7,8,9}. U kožnim i oralnim promenama nađeni su depoziti imuno-globulina klase IgG, IgM i komplementa C3¹⁰.
- **Genetska predispozicija** – bolest je kosmopolitska, ali je dokazano da se češće javlja kod osoba sa HLA-A₃, B₅, A₂₈, B₇-B₈-DRW₉^{11,12}. Podaci o HLA markerima za oralni *Lichen planus* u mnogome zavise od ispitivane populacije^{12,13}. Žene oboljevaju češće nego muškarci, a starosnot u kojoj se oboljenje javlja je između 30 i 60 godina¹⁴. U retkim slučajevima i deca mogu oboleti.
- **Pušenje** – Gorsky i sar.¹⁵ razmatrali su mogućnost korelacije između različitih kliničkih manifestacija lihena i pušenja, gde je

Introduction

Lichen planus, in addition to viral infections and aphthous ulcers, ranks third place among oral mucosal diseases. The first skin descriptions of *Lichen planus* were published by Wilson in 1869, but mucous changes were also noted by other authors¹. The possibility of the appearance of oral lesions without skin manifestations was first described by Audry in 1894, and especially highlighted by Dubreuilh in 1906², who indicated that the pathohistological changes of oral lesions corresponds to the pathohistological changes of skin changes. This was followed by a number of authors who, in addition to white papules and plaque lesions in the oral cavity, began to describe numerous variants of the disease, starting with Poor in 1905³, who first described vesicular-bullous lesions, then ulcerative and atrophic ones, which were specifically described by Lortat-Jacob et al. in 1929³.

Etiology

The exact etiology is unknown, but several predisposing factors can be the cause of oral *Lichen planus* (OLP)⁴. The most important factors in the onset of this disease are:

- **Stress** - nervousness and emotional instability are very common in people with this disease. Clinical examinations indicate that the disease occurs one to two weeks after severe emotional distress (death of a close family member, tension at work, mental fatigue, etc.)^{5,6}, so that the neurogenic origin is most associated with this disease.
- **Autoimmunity** - Many studies have shown that anti-basal antibodies (anti-BCA), which persist for months or years in patients with oral *Lichen planus*, may be autoantibodies that occur against altered anti-basal antibodies^{7,8,9}. Deposits of IgG, IgM and complement C3-class immunoglobulins were found in skin and oral changes¹⁰.
- **Genetic predisposition** - this disease is cosmopolitan, but has been shown to occur more frequently in people with HLA-A₃, B₅, A₂₈, B₇-B₈-DRW₉^{11,12}. Data on HLA markers for oral *Lichen planus* are highly dependent on the studied population^{12,13}. Women are affected more often than men, with an onset time between ages 30 and 60¹⁴. In rare cases, children may be affected.

primećeno da je osetljivost sluzokože povezana sa pušenjem. Neumann-Jensen i sar.¹⁶ naveli su da je OLP bio ređi kod pušača nego kod nepušača¹⁷, tako da se pušenje ne može zasigurno obeležiti kao jedan od faktora koji su izazivači OLP.

- **Stomatološki materijali** – amalgam, zlato, kompozitni ispuni, kao i metali (kobalt, nikl, paladijum), koji se otpuštaju iz određenih dentalnih ispuna, tj. iz slojeva samih materijala ispuna, dovode do lichenoidnih reakcija i inflamacije gingive^{18,19}. Ranija istraživanja ukazuju na lichenoidne reakcije koje nastaju kao produkt galvanske struje, koja se stvara između metala u ustima^{19,20}. Međutim, skorašnja istraživanja ukazuju na to da inflamacija nastaje kao rezultat interakcije ćelija medijatora i samih materijala kod pacijenta koji su duže vreme bili izloženi ovoj reakciji.

Klinička slika

Oralni *Lichen planus* pojavljuje se kod 0,1% – 4% osoba, u zavisnosti od pregledane populacije. Generalno je oboljenje koje se vezuje za ljude srednje i starije životne dobi, od koga češće oboljevaju žene nego muškarci, u odnosu 2:1. Mada postoji određeni procenat pacijenata sa oralnim promenama koji su stariji od 60 godina, rang godina je sličan godinama pacijenata koji imaju samo kožne promene. Postoji i mali broj pacijenata kojima su potvrđene oralne promene u ranom životnom dobu – najmladi je imao 7 godina². Ovo predstavlja retkost u slučajevima kožnih promena. Oralne lezije obično su bilateralne i zahvataju bukalnu mukozu (nivo okluzalne linije i retromolarni predeo) u oko 90% svih slučajeva²¹. Mesta najfrekventnijih pojavljivanja oboljenja su jezik (njegove ivice i dorzalna površina), semimukoza usana, pod usne duplje, gingiva, alveolarni greben i najređe nepce²². *Lichen planus* se u ustima može pojaviti u šest različitih oblika. Najčešće forme su retikularna, u obliku plaka, erozivna forma i atrofični tip²³. Bulozni i papilarni tipovi obično se nalaze u kombinaciji sa drugim oblicima. Pacijenti sa oralnim *Lichen planus*-om mogu imati periode remisije i egzacerbacije.

- **Smoking habits** - Gorsky et al.¹⁵ considered the possibility of a correlation between different clinical manifestations of lichen and smoking, where it was observed that mucosal sensitivity was associated with smoking. Neumann-Jensen et al.¹⁶ stated that OLP was less frequent in smokers than in non-smokers¹⁷ so that smoking could not be linked as one of the contributing factors to OLP with certainty.

- **Dental materials** - amalgam, gold, composite fillings, as well as metals (cobalt, nickel, palladium) released from certain dental fillings, i.e., from the layers of the filling materials themselves lead to lichenoid reactions and gingival inflammation^{18,19}. Earlier research indicates that lichenoid reactions occur as a product of galvanic potential between metals in the mouth^{19,20}. However, recent research indicates that inflammation occurs as a result of mediator cells and the materials themselves in patients who have been exposed to this reaction for a long time.

Clinical feature

Oral *Lichen planus* occurs in 0.1-4% of individuals depending on the population examined and is generally a disease of middle and older-aged people, more frequently in women than in men with a ratio of 2:1. Although there is a certain percentage of patients with oral changes that are older than 60 years, the range of the years is similar to the age of patients who have only skin changes. There is also a small number of patients with oral changes that occur at an early age—the youngest patient was 7 years old². This is a rare case. Oral lesions are usually bilateral and involve the buccal mucosa (occlusal line level and retromolar area) in about 90% of all cases²¹. The most frequently it appears on the tongue (its edges and dorsal surface), the submucosa of the lips, the floor of the mouth, the gingiva, the alveolar ridge and the most rarely in the palate²². *Lichen planus* can occur in the mouth in six different forms. The most common forms are reticular, plaque-shaped, erosive and atrophic²³. Bullous and papillary types are usually found in combination with other forms. Patients with oral *Lichen planus* may have periods of remission and exacerbation.

Retikularna forma Lichen planus-a

Ovo je najčešća forma *Lichen planus-a* u ustima. Bolest se javlja u vidu beličastih papula veličine čiodine glave. Uočavaju se u vidu beličastih linija ili traka. Pojedinačno, papule se mogu videti jedino lupom. Ovaj oblik često se vidi na obraznoj sluzokoži u obliku belih niti, koje su blago uzdignute iznad sluzokože. Ove linije se nazivaju i Vikamove strije²⁴. Ova forma oboljenja lokalizuje se u predelu okluzalne linije, na retromolarnom predelu, na ivicama jezika, na labijalnoj i bukalnoj površini fiksne gingive, na semimukozi usana i tvrdom nepcu²⁴. Najređe se javlja na mekom nepcu i podu usne duplje. U subepitelnom tkivu uvek se vidi gusta infiltracija limfocitima. Ovaj oblik *Lichen planus-a* retko prelazi u maligni oblik. Često se javlja zajedno sa drugim oblicima.

Lichen planus u obliku plaka

Lichen planus u ovom obliku može se videti kao tanak sloj plaka različitih veličina, glatke i nešto svetlijе površine, u odnosu na lokalno tkivo. Najčešće lokalizacije su obraz, nepce, jezik i gingiva, a retko pod usne duplje i rumeni deo usana. Kada je reč o histološkoj slici površinskih slojeva epitela prisutne su parakeratoza i hiperkeratoza, a u subepitelnom sloju limfocitni infiltrat²⁵. Ovaj tip *Lichen planus-a* načešće se sreće kod pušača¹⁶. *Lichen planus* u plakovnoj formi često alterira u malignu formu zajedno sa erozivnim i atrofičnim oblicima²⁵.

Papilarna forma Lichen planus-a

Papilarna forma *Lichen planus-a* klinički se vidi kao mala bela papula veličine 0,5 mm, a može se pojavljivati zajedno sa ostalim oblicima *Lichen planus-a*. Papule se javljaju simetrično, na obraznoj sluzokoži, ali i na dorzalnoj strani jezika i tvrdom nepcu²⁶. Obično su pojedinačne, ali mogu i da konfluiraju stvarajući bele tvorevine. Prisutna je inflamacija sluzokože. Histološki, izražena je parakeratoza i hiperkeratoza u gornjim slojevima, dok je subepitelno prisutna difuzna infiltracija limfocitima²⁶. Bolest počinje bez simptoma, a ukoliko se i javi, smetnje su veoma blage i javljaju se u vidu zatezanja i hrapavosti sluzokože, suvoće, blagog peckanja i žarenja u ustima. Prognoza je dobra, mada retko može doći do spontanog povlačenja promena. Kod ovih varijanti, epiteljalne promene su hiperkeratotične ili obično hiperortokeratotične²⁷.

Reticular form of Lichen planus

This is the most common type of *Lichen planus* in the mouth. The disease occurs in the form of whitish papules the size of a chiodine head. They are seen as whitish lines or bands. Individual papules can only be seen with a magnifying glass. This type is often seen in the facial mucosa, in the form of white filaments slightly raised above the mucosa. These lines are also called Wickham's striae²⁴. They are localised in the area of the occlusal line, the retromolar area, the edges of the tongue, the labial and buccal surfaces of the fixed gingiva, to the submucosa of the lips and the hard palate²⁴. It occurs most rarely in the soft palate and the floor of the mouth. Subepithelial tissue always has a thick lymphocyte infiltration. This type of *Lichen planus* rarely goes into a malignant form. It often occurs along with other forms.

Plaque form of Lichen planus

It is seen as a thin layer of plaque of various sizes, a smooth and slightly more tangled surface than the surrounding tissue. The most common localizations are the cheek, palate, tongue, and gingiva, and rarely in the floor of the mouth. In the histological feature of the superficial layers of the epithelium, parakeratosis and hyperkeratosis are present, and in the subepithelial layer a lymphocytic infiltrate²⁵. This type of *Lichen planus* is most commonly seen in smokers¹⁶. The *Lichen planus*, in plaque form, often alters to malignant form along with erosive and atrophic forms²⁵.

Papillary form of Lichen planus

This form is characterized by small white pinpoint papules size of 0.5 mm that are asymptomatic. It can occur along with other forms of *Lichen planus*. Papules occur symmetrically on the facial mucosa, but also on the dorsal side of the tongue and the hard palate²⁶. They are usually individual, but can also produce white creases. Mucosal inflammation is present. Histologically, parakeratosis and hyperkeratosis are expressed in the upper layers, while diffuse lymphocyte infiltration is present in subepithelial layer²⁶. The disease starts without symptoms, and if they do occur, the disturbances are very mild in the form of tightness and roughness of the mucous membranes, dryness, gentle burning and burning in the mouth. The prognosis is good, although there may rarely be a spontaneous withdrawal of changes. In these variants, the epithelial changes are hyperkeratotic²⁷.

Nema atrofije epitelijuma, pa, prema tome, ni ulceracija. Kod nekih pacijenata lezije mogu biti konfluentne i podsećati na leukoplakiju, gde, po redu, može biti papularni, linearni ili prstenasti raspored belih područja²⁸. Pošto su generalno ove lezije asimptomatske, često se otkrivaju slučajno od strane pacijenta ili pri redovnim stomatološkim kontrolama od strane stomatologa.

Erozivno-ulcerozna forma Lichen planus-a

Ovo je veoma česta forma oboljenja. Lokalizuje se na obraznoj sluzokoži, gingivama, jeziku, nepcu i podu usne duplje. Najfređe se javlja na rumenom delu usana. Ovu formu Lichen planus-a karakteriše destrukcija oralnog epitela²⁹. Jayljaju se bule, a njihovim prskanjem nastaju erozivno-ulcerozne površine nepravilnog oblika i različite veličine. Ulcerozne površine prekrivene su žućastim fibrinoznim eksudatom i okružene su inflamiranim zonom. Erozivno-ulcerozne promene uglavnom nastaju kao posledica prskanja bula, ali postoje slučajevi kada one nastaju i bez predhodnog obrazovanja buloznih eflorescenci³⁰.

Subjektivne tegobe bolesnika su izrazite, praćene bolom koji prati ishranu, govor i konzumiranje tečnosti. Nelagodnosti i bolovi mogu biti prisutni i spontano²⁹. Mukoza je osjetljiva na mehaničke iritacije i dentalnu traumu, pre nego što se druge karakteristične lezije javi. Ove lezije imaju sjajne površine i tendenciju da se odvoje od susedne mukoze jasnom demarkacionom ivicom^{29,30}.

Histološki se vide degenerativne promene bazalnog sloja epitela sa znacima atrofije i pojmom erozija i ulceracija³¹. Oko erozivno-ulceroznih promena u epitelu izražena je čelijska infiltracija sa dominacijom neutrofilnih granulocita, dok je u subepitelu prisutna limfocitna infiltracija.

Erozivno-ulcerozna forma *Lichen planus-a* može se transformisati u maligni proces zbog moguće lichenoidne degeneracije³⁰. Postoje tri oblika erozivnog *Lichen planus-a*: bulozni, atrofični i ulcerozni oblik.

Bulozni oblik karakteriše pojava vezikula i bula ispunjenih bistrim seroznim sadržajem, sa mogućom eritrocitnom hemoragijom. Ovi oblici oboljenja nastaju nagomilavanjem tečnosti u subepitelnom vezivnom tkivu³².

Zbog tankog omotača samih vezikula, pri govoru i jelu, one pucaju i dolazi do bolnih senzacija³².

There is no epithelial atrophy and therefore no ulceration. In some patients, the lesions may be confluent and resemble leukoplakia, where there may be a papular, linear, or annular arrangement of white areas²⁸. As these lesions are generally asymptomatic, they are often detected accidentally by the patient or at regular dental checkups by the dentist.

Erosive-ulcerative form of Lichen planus

This is a very common form of the disease. It localizes to the buccal mucosa, gingiva, tongue, palate and floor of the oral cavity. Most rarely, it occurs on the lips vermillion. This form of Lichen is characterized by the destruction of the oral epithelium²⁹. When bullae occur, their bursting results in irregularly shaped erosive-ulcerative surfaces of varying sizes. The ulcerative surfaces are covered with a yellowish fibrinous exudate and are surrounded by an inflamed zone. Erosive-ulcerative changes mainly occur as a consequence of bullae bursting, but there are cases when they occur without prior formation of bullous efflorescence³⁰.

Patients' subjective ailments are pronounced, with the pain accompanying diet, speech and fluid consumption. Discomfort and pain can also be present spontaneously²⁹. The mucosa is sensitive to mechanical irritation and dental trauma before other characteristic lesions appear. These lesions have glossy surfaces and tend to separate from the adjacent mucosa with a clear demarcation border^{29,30}.

Histologically, degenerative changes of the basal layer of the epithelium with signs of atrophy and the appearance of erosions and ulceration are seen³¹. Around the erosive-ulcerative changes in the epithelium, cellular infiltration with the dominance of neutrophilic granulocytes is pronounced, while lymphocytic infiltration is present in the subepithelium.

The erosive-ulcerative form of *Lichen planus* could be transformed into a malignant one due to the possible lichenoid degeneration³⁰. There are three forms of erosive lichen planus: the bullous, atrophic, and ulcerative form.

The bullous form is characterized by the appearance of vesicles and bullae filled with clear serous content with possible erythrocyte hemorrhage. They are formed by the accumulation of fluid in the subepithelial connective tissue³². Due to the thin coating of the vesicles, they burst when speaking and eating and lead to painful sensations³².

Ovaj oblik najčešće se vidi na bukalnoj sluzokoži. U bazalnom sloju epitelia izražena je hidropsna degeneracija. Dominantna je infiltracija limfocitima, koja se povećava posle prskanja bula^{32,33}. Subjektivne smetnje su jako izražene i postoje bolovi prilikom užimanja hrane, a prisutni su i spontani bolovi. Ove dve forme moraju se redovno kontrolisati zbog mogućnosti maligne alteracije.

- Atrofični oblik (eritematozni oblik) predstavlja redi oblik *Lichen planus-a*. Najčešće se javlja na dorzalnoj strani jezika i gingivi. Epitel jezika je atrofičan, istanjuje se uz izrazito crvenilo i inflamaciju. Filiformne i fungiformne papile nestaju, a jezik je gladak i kao poliran (*Lingua glabra*)¹⁰. Ova atrofična forma može se javiti i kao rezultat zarastanja erozivno-ulceroznih oblika i manifestovati se epitelnom atrofijom. Promene na gingivi najčešće su izražene u gornjoj vilici u predelu fiksne gingive u obliku ograničenih atrofičnih pora. Gingivalni epitel postaje tanak i suv, pa je sklon povredama, dok u bazalnom sloju postoji hidropsna degeneracija, a u subepitelnom sloju uočava se gusta infiltracija limfocitima^{10,19}.

- Ulcerozni oblik – ovu formu *Lichen planus-a* karakteriše destrukcija oralnog epitelia. Ulcerozne površine su pokrivene beličasto-žućkastim fibrinoznim eksudatom, a okružene su zonom inflamacije na delu sluzokože koji odgovara zoni inflamacije. Ulcerozne lezije posledica su oštećenih bula, ali one mogu nastati i bez stvaranja buloznih eflorescencija.

Kao posebna dva oblika, koja se javljaju u okviru ovog oboljenja, postoje i Grinspanov sindrom i lichenoidne reakcije.

- Grinspanov sindrom predstavlja oblik oralnog *Lichen planus-a* koji se javlja zajedno sa Diabetes mellitus-om i hipertenzijom. Često su izražene i kožne promene, a u ustima su promene najčešće na bukalnoj sluzokoži³⁴.

- Lichenoidne reakcije mogu biti izazvane lekovima ili nekim drugim supstancama. Brojni lekovi mogu da učestvuju u lichenoidnim erupcijama (LDEs) uključujući i nesteroidne antiinflamatorne lekove (NSAIDs), antihipertenzivne lekove (naročito angiotenzinski konvertirni enzimski ((ACE)) inhibitori), antimalariske, fenilamino-pirimidinske derivata (Imatinib) i injekcije zlata (Tabela 1)^{35,36}. Lokalizovane lichenoidne reakcije mogu biti udružene sa hipertenzivnim reakcijama na merkurijalne soli oslobođene iz amalgamskih nadogradnj²⁰. Ovako nastale lichenoidne reakcije mogu se svrstati u IV tip reakcija hipersenzitivnosti³⁷.

Kod lichenoidne reakcije, erupcije imaju tendenciju ka unilateralnoj pojavi.

This form is most commonly seen on buccal mucosa. Hydropic degeneration is expressed in the basal layer of the epithelium. Lymphocyte infiltration is dominant, which increases after bursting of bullae^{32,33}. Subjective ailments are very pronounced, pain is aggravated by eating, and also a spontaneous pain is present. These two forms must be regularly monitored for the possibility of malignant alteration.

- **The atrophic form** (erythematous form) is a less common form of *Lichen planus*. It most commonly occurs on the dorsal side of the tongue and gingiva. The epithelium of the tongue is atrophic, becoming thin with pronouncedly redness and inflammation. Filiform and fungiform papillae disappear and the tongue is smooth and polished (*Lingua glabra*)¹⁰. This atrophic form can also occur as a result of the healing of erosive-ulcerative forms and manifest itself with epithelial atrophy. Gingival changes are most commonly expressed in the upper jaw in the fixed gingival area, in the form of limited atrophic pores. The gingival epithelium becomes thin and dry so it is prone to injuries, while in the basal layer there is a hydropic degeneration, and dense lymphocyte infiltration is observed in the subepithelial layer^{10,19}.

- **The ulcerative form** is characterized by destruction of the oral epithelium. The ulcerative surfaces are covered with whitish-yellowish fibrinous exudates and are surrounded by an inflammation zone on the part of the mucosa corresponding to the zone of inflammation. Ulcerative lesions are the result of damaged bullae, but they can also occur without the formation of bullous efflorescences.

The two particular forms that occur in this disease are Grinspan syndrome and lichenoid reactions.

- **Grinspan syndrome** is a form of oral *Lichen planus* that occurs with Diabetes mellitus and hypertension. Often, skin changes are also pronounced, and changes in the mouth are most common in the buccal mucosa³⁴.

- **Lichenoid reactions** can be induced by drugs or other substances. Numerous drugs can participate in lichenoid eruptions (LDEs) including non-steroidal anti-inflammatory drugs (NSAIDs), antihypertensive drugs (especially angiotensin converting enzyme (ACE) inhibitors), antimarialials, phenylaminopyrimidine derivatives (Imatinib) and gold injections (Table 1)^{35,36}. Localized lichenoid reactions may be associated with hypertensive reactions to mercury salts released from amalgam superstructures²⁰.

Dijagnoza se postavlja na osnovu biopsije i hematološki indirektne imuno-fluorescencije, gde se vidi niz od perli, kao potvrda lichenoidne erupcije³⁷. U nalazu se vidi obilje difuznog lichenoidnog infiltrata sa dubokim perivaskularnim limfocitnim infiltratom.

Za razliku od pravog *Lichen planus*-a, lekom izazvane lichenoidne erupcije nestaju nakon ukidanja leka. Lichenoidne erupcije izazvane lekovima izuzetno retko napadaju bukalnu sluzokožu, kada se javlja bela trakasta šara³⁸. Mišljenje je da lekovi samo prikrivaju latentno oboljenje *Lichen planus* ili širenje predhodnog poremećaja, pre nego što indukuju novo oboljenje³⁸.

The resulting lichenoid reactions can be classified as type IV hypersensitivity reactions³⁷. In lichenoid reactions, eruptions tend to be unilateral.

The diagnosis is made based on biopsy and hematologically indirect immunofluorescence, where a series of beads is seen as confirmation of a lichenoid eruption³⁷. A diffuse lichenoid infiltrate with deep perivascular lymphocytic infiltrate is also noticed.

Unlike the real *Lichen planus*, the medication-induced lichenoid eruptions disappear after the discontinuation of the medications. Medication-induced lichenoid eruptions extremely rarely attack buccal mucosa when a white stripe pattern occurs³⁸. It is thought that medications only mask the latent disease of *Lichen planus* or the spread of a previous disorder, before inducing a new disease³⁸.

Tabela 1. Lekovi koji mogu izazvati lichenoidnu reakciju
Table 1. Medications that can trigger a lichenoid reaction

Lekovi koji mogu izazvati lichenoidnu reakciju Medications which trigger a lichenoid drug eruption		
Allopurinol	Furosemide	Penicillamine
Angiotensin	Zlatne smeše	Polycarbonate
Arsenične smeše	Mepacrine	Propranolol
Amalgam	Methyldopa	Quinidine
β-blokatori	Nickel	Streptomycin
Bizmut	NSAIDs	Tetracycline
Chloroquine	Nylon	Tolbutamide

Dijagnoza oralnog *Lichen planus*-a

Dijagnostika OLP-a sastoji se od kliničkog pregleda, uzimanja uzoraka za patohistološku dijagnozu i histohemiske ili imunohistohemiske analize tkiva.

Patohistološka ispitivanja – na histološkom preparatu biopsiranog uzorka vide se tri glavne karakteristike:
 -hiperkeratoza i parakeratoza gornjih slojeva;
 -hidropsna degeneracija bazalnog sloja epitelia;
 -gusta infiltracija limfocita u gornjem korijumu ispod epitelia;
 -kod kožnih lezija moguća je pojava i tzv. "testerastih zuba"²⁴.

Diagnosis of oral *Lichen planus*

The diagnosis of OLP consists of clinical examination, sampling for pathohistological diagnosis, histochemical or immunohistochemical analysis of the tissue.

Pathohistological examination - the histological preparation of a biopsied specimen shows three main characteristics:
 -hyperkeratosis and parakeratosis of the upper layers,
 -hydropic degeneration of the basal layer of the epithelium,
 -dense infiltration of lymphocytes in the upper corium beneath the epithelium,
 -“shaped teeth” may occur with skin lesions²⁴.

Imunofluorescentna ispitivanja rade se iz lihenskih papula gde se uočavaju agregati IgG-a, IgM-a i komponente komplementa C₃. Čelijski infiltrat u *lamini proprii* sastoji se od T-limfocita, i to većeg procenta T₄ limfocita u odnosu na T₈ limfocite³⁸. Čistu predominaciju T₄ limfocita u odnosu na T₈ limfocite u *lamini proprii* kod *Lichen planus*-a, u odnosu na njihov odnos u normalnoj mukozi (npr. kod Leucoplakie), treba podvući, zato što ovo može biti važan diferencijalno-dijagnostički podatak. Aktivirani T-limfociti sekretuju interferon, koji zauzvrat indukuje sintezu HLA-DR od strane keratocita⁴⁰. Producija interleukina od strane T₄ limfocita aktiviraju T₈ limfocite, koji svoju citotoksičnost usmeravaju na keratocite. Citotoksičnost može biti povećana prisustvom HLA-DR klase II antiga na membrani keratocita⁴⁰. Kod *Lichen planus*-a, brojni keratociti, pozitivni za HLA klasu II antiga, bili su prisutni u nivou bazalne membrane⁴¹. Takođe se u epitelu može naći znatna količina Langerhansovih ćelija⁴¹. Ovo povećanje Langerhansovih ćelija i bazalnih keratocita, pozitivnih za HLA klasu II antiga, može imati dijagnostičku značajnost kada se upoređuju lezije *Lichen planus*-a sa drugim oralnim lezijama^{40,41}.

Diferencijalna dijagnoza *Lichen planus*-a

Diferencijalno-dijagnostički, u obzir dolaze sve bele lezije koje imaju oralnu manifestaciju:

- **Leucoplakia** – promene kod leukoplakije su asimetrične i predstavljaju objedinjenu površinu bele boje, dok okolna sluzokoža nije inflamirana²⁸. Kod *Lichen planus*-a promene su simetrične, mrežastog izgleda, sa inflamiranom okolnom sluzokožom. U nejasnim slučajevima dijagnoza se utvrđuje biopsijom.
- **Sunderasti nevus obraz** – javlja se na sluzokoži obraza odmah nakon rođenja. Sluzokoža je beličasta, sunđerasta i zgusnuta⁴². Nekada je moguće beličaste naslage mehanički ukloniti, pa se vide i delovi normalne sluzokože⁴², što je kod *Lichen planus*-a nemoguće odraditi. U postavljanju dijagnoze pomažu i histološka ispitivanja – karakterističan je nalaz hiperplazije, a *lamina propria* je normalna, sa blagom infiltracijom ćelija inflamacije u subepitelu.

Immunofluorescence examination is performed with lichen papules where the aggregates of IgG, IgM, and the C₃ complement component are observed. The cellular infiltrate in *lamina propria* consists of T-lymphocytes, with a higher percentage of T₄ lymphocytes compared to the T₈³⁸. An evident predominance of T₄ lymphocytes with compared to T₈ lymphocytes in lamina propria in *Lichen planus* relative to their ratio in normal mucosa (e.g. Leucoplakia) should be examined because this may be an important differential diagnostic information. Activated T-lymphocytes secrete interferon, which in turn induces HLA-DR synthesis by keratocytes⁴⁰. Interleukin production by T₄ lymphocytes activates T₈ lymphocytes, which direct their cytotoxicity to keratocytes. Cytotoxicity can be increased by the presence of HLA-DR class II antigens on the keratinocyte membrane⁴¹. When it comes to *Lichen planus*, a numerous keratocytes positive for HLA class II antigens were present at the basement membrane level⁴¹. A considerable amount of Langerhans cells can also be found in the epithelium⁴¹. This increase of Langerhans cells and basal keratocytes, positive for HLA class II antigens, may have diagnostic significance when comparing *Lichen planus* lesions with other oral lesions^{40,41}.

Differential diagnosis of *Lichen planus*

Differential diagnosis includes all white lesions that have an oral manifestation:

- **Leukoplakia** - in leukoplakia, the changes are asymmetrical and represent a united white surface, while the surrounding mucosa is not inflamed²⁸. In *Lichen planus*, the changes are symmetrical, reticulate, with inflamed surrounding mucosa²⁸. In ambiguous cases, the diagnosis is established by the biopsy.
- **Sponge cheek nevus** - appears on the mucous membranes of the cheeks immediately after birth. The mucous membrane is whitish, with spongy like tissue and high density⁴². It is sometimes possible to remove the whitish plaque mechanically, so that parts of normal mucosa can also be seen⁴², which is impossible to do in *Lichen planus*. Diagnosis is done through histological examination - finding of hyperplasia is characteristic, and *lamina propria* is normal with a slight infiltration of inflammatory cells in the subepithelium.

Erythematodes – oboljenje koje se prvo isključuje zbog prisustva karakterističnih promena na licu. Kod *Erythematodes*-a lezije su na sluzokoži u obliku lako uzdignutih belih površina, okruženih karakterističnim radijalnim teleangiektatičnim proširenjima krvnih sudova, koji grade karakteristični haloo⁴³. U histološkoj slici *Erythematodes*-a postoje hiperkeratoza, hidropsna degeneracija bazalnog sloja epitela, degeneracija kolagenih vlakana u vezivnom tkivu sa perivaskularnom infiltracijom limfocita⁴³. Histološka slika *Lichen planus*-a bitno se razlikuje.

Mehanička oštećenja oralnog epitela nastaju kod neurotičnih osoba zbog grickanja obrazne sluzokože. Klinički i po lokalizaciji liče na *Lichen planus*. Dijagnoza se postavlja na osnovu anamneze i kliničkih razlika. Polje koje je mehanički oštećeno u obliku je nepravilnih beličastih zgrušavanja sa diskretnim erozijama⁴³. Lokalizacija je uvek u predelu okluzalne linije. Ova mehanička oštećenja ne pokazuju polimorfnost u obliku belih mrežastih formacija, linija ili plaka, kao što je slučaj kod *Lichen planus*-a²⁵.

Kandidoza – hronične forme, lokalizovane na sluzokoži obraza, mogu da se javе u obliku belih linija. Moguća je izražena suvoća i gubitak fleksibilnosti epitela, pa nastale promene pokazuju sličnost sa *Lichen planus*-om⁴⁴. Patohistološkim nalazom, kod kandidoze vide se spongioza i infiltracija epitela neutrofilnim granulocitima, kao i hiperplazija epitela⁴⁴.

Pemphigus vulgaris – diferencijalno-dijagnostički u obzir dolaze samo erozivno-ulcerozne i vezivno-bulozne forme *Lichen planus*-a³⁰. Dijagnostička razlika uočava se mikroskopskim nalazom segregovanih Cankovih ćelija, kojih nema kod *Lichen planus*-a, kao i nalazom akantolitičnih ćelija u intraepitelijalnim bulama⁴⁵.

Pemphigoid mucosae oris – ova dermatоза koristi se u diferencijalnoj dijagnozi buloznih formi *Lichen planus*-a, jer je karakteriše prisustvo keratotičnih belih lezija, kao i činjenica da je prisutnija kod starijih osoba ženskog pola⁴⁶.

Lingua geographica – diferencijalno-dijagnostički, ova pojava je akutnog, benignog toka, a promene se spontano javljaju i gube. Nisu fiksног karaktera, već migriraju na druga područja jezika⁴⁷, za razliku od *Lichen planus*-a, koji je hronično i na terapiju rezistentno oboljenje, dok su promene koje se javljaju na jeziku fiksног karaktera⁴⁷.

Erythematodes - A disease that is first excluded by the presence of characteristic changes on the face. In *Erythematodes*, lesions on the mucous membranes are in the form of slightly raised white surfaces, surrounded by characteristic radial telangiectatic extensions of blood vessels, which build characteristic halo⁴³. In the histological picture of *Erythematodes* there is hyperkeratosis, hydropic degeneration of the basal layer of the epithelium, degeneration of collagen fibers in connective tissue with perivascular infiltration of lymphocytes⁴³. The histological picture of *Lichen planus* differs significantly.

Mechanical damage to the oral epithelium - occurs in neurotic persons due to the chewing of the facial mucosa. Clinically and locally, it resembles *Lichen planus*. The diagnosis is made on the basis of history and clinical differences. The field that is mechanically damaged is in the form of irregular whitish coagulation with discrete erosion⁴³. Localization is always in the area of the occlusal line. These mechanical defects do not show polymorphism in the form of white mesh formations, lines or plaque as is the case with *Lichen planus*²⁵.

Candidosisa - Chronic forms, localized to the buccal mucous membranes, can occur in the form of white lines. Extreme dryness and loss of flexibility of the epithelium are possible, so the resulting changes show a similarity to *Lichen planus*⁴⁴. Spongiosis and infiltration of the epithelium by neutrophilic granulocytes are seen in the pathohistological findings in candidosis, as well as epithelial hyperplasia⁴⁴.

Pemphigus vulgaris – Differential-diagnostic, only the erosive-ulcerative and connective-bullous forms of *Lichen planus* are considered³⁰. Diagnostic difference is observed by microscopic findings of segregated Tzanck cells, which are absent in *Lichen planus*, as well as by finding of acantholytic cells in intraepithelial bullae⁴⁵.

Pemphigoid mucosae oris – This dermatosis is used in the differential diagnosis of bullous forms of *Lichen planus* as it is characterized by the presence of keratotic white lesions, as well as by the fact that it is more present in older women⁴⁶.

Lingua geographica – differential-diagnostic, this phenomenon is acute, benign, and the changes occur and disappear spontaneously. They are not of a fixed character, but migrate to the other areas of the tongue⁴⁷, unlike *Lichen planus*, which is a chronic and therapy-resistant disease, while changes occurring in a tongue are of a fixed character⁴⁷.

Erythema exudativum multiforme – diferencijalna dijagnoza je uglavnom klinička. Po potrebi je virusološka (isključivanje primarne infekcije HSV). Biopsija nije indikovana. Imunohistohemijska ispitivanja mogu ukazati na prisustvo imunoloških reakcija u zoni bazalne membrane (fibrinogen, IgM, C₃)⁴⁸.

Stomatitis allergica – diferencijalno-dijagnostički, može se razlikovati od erozivno-ulcerozne forme *Lichen planus*-a na osnovu anamneze, kliničke slike i izvođenjem testova *in vivo* (test ekspozicije, epikutani – Patch test, proba ubodom – Prick test, test multipnih uboda, intradermalni testovi, Prausnitz-Küstnerov test)⁴⁹ i *in vitro* (precipitinske reakcije, dvostruka difuzija u gelu, imunoelektroforeza, test degranulacije bazofila, Sholliev test, test limfocitne transformacije).

Terapija oralnog *Lichen planus*-a

Lečenje se sastoji u interdisciplinarnom postupku uklanjanja predisponirajućih faktora za OLP. U terapiji oralnog *lichen planus*-a ordiniraju se kortikosteroidi topikalno i sistemski, uz koje se primenjuje i lokalna administracija antisептика⁵⁰⁻⁵². Kortikosteroidi za oralnu aplikaciju koriste se u tečnom stanju⁵⁰. Oralnim putem, kortikosetroidi aplikuju se u obliku tečnosti⁵⁰. Veoma efikasno se primjenjuje i penicilin u visokim dozama. Ova terapija se zasniva na delovanju penicilina na samu adherenciju streptokoka na oralne epitelne ćelije, koje se smatraju mogućim pokretačima antigene aktivnosti keratinocita⁵².

Hiruška ekskizija, krioterapija, CO₂ laser i ND:YAG laser koriste se u terapiji OLP-a⁵³. U principu, hirurgija se ostavlja za visoko rizične slučajeve, kada je u pitanju maligna alteracija, tj. za uklanjanje visko rizičnog displastičnog područja⁵³. Fotohemoterapija je nova metoda uklanjanja rizičnih područja lihena u okviru koga se koriste ultraljubičasti A (UVA) talasi, dužine od 320 nm do 400 nm⁵⁴. Od novijih metoda, danas se sve više uvodi i relaksacija, meditacija i hipnoza, koje takođe imaju, pokazalo se, dosta uticaja na osnovnu terapiju ovog oboljenja⁵⁵.

Erythema exudativum multiforme – differential diagnosis is mainly a clinical one. If necessary, it is virological (exclusion of primary HSV infection). A biopsy is not indicated. Immunohistochemical studies may indicate the presence of immune responses in the basement membrane area (fibrinogen, IgM, C₃)⁴⁸.

Stomatitis allergica – may be different from the erosive-ulcerative form of *Lichen planus* on the basis of anamnesis, clinical picture and in vivo tests (exposure test, epicutaneous Patch testing, puncture test - Prick test, multiple stab test, intradermal tests, the Prausnitz-Küstner test)⁴⁹ and in vitro (precipitin reactions, double diffusion in gel, immunoelectrophoresis, basophil degranulation test, Shelly's test, lymphocyte transformation test).

Oral *Lichen planus* therapy

The treatment consists of an interdisciplinary procedure for eliminating predisposing factors for OLP. In oral lichen planus therapy, corticosteroids are administered topically and systemically, with the use of topical administration of antiseptics⁵⁰⁻⁵². Oral administration of corticosteroids is conducted in the form of a liquid⁵⁰. Penicillin is administered very effectively in high doses⁶. This therapy is based on the effect of penicillin on the adherence of streptococci to the oral epithelial cells, which are considered to be possible drivers of antigenic activity of keratinocytes⁵².

Surgical excision, cryotherapy, CO₂ laser, and ND: YAG laser is used in OLP therapy⁵³. In general, surgery is performed only for high-risk cases of malignant alteration, i.e., to remove the high-risk dysplastic area.⁵³ Photochemotherapy is a new method of removing lichen risk areas using ultraviolet A (UVA) waves, 320 to 400 nm in length⁵⁴. Relaxation, meditation, and hypnosis are increasingly being used as the new methods today, which also appear to have a significant impact on the underlying therapy of the disease⁵⁵.

Lečenje retikularnih i papuloznih formi oralnog Lichen planus-a

Terapija ovakvih oralnih manifestacija simptomatskog je karaktera. Koriste se sedativi, antimalarici, ignipunkcija, vitamini sa lokalnom obradom usne duplje i posebnim higijensko-dijjetetskim režimom⁵⁶.

Sedativi su indikovani kod neurotičnih bolesnika⁵⁷. Daje se heksahidroadifen-hlorid (benifen) 2 do 3 puta dnevno, po jedna dražeja posle jela⁵⁷. Indikovan je i diazepam (apaurin) u dozi od 3 dražeje od 2 mg do 5 mg dnevno⁵⁷. Antimalarici (resorchin i dr.) uz neslanu dijetu u izveznim slučajevima daju dobre rezultate. Primenjuju se u tebletama od 25 mg 3 puta dnevno po jedna tableta. Lečenje traje sedam dana⁵⁶. Ukoliko nema gastrointestinalnih smetnji, lečenje resorchinom nastavlja se na sledeći način: bolesnici sledećih 7 dana piju 2 puta dnevno po jednu tabletu. U poslednjoj turi od 7 dana bolesnici ordiniraju po jednu tabletu dnevno. U sledećih mesec dana bolesnici primaju samo doze za održavanje od ½ tablete dnevno⁵⁰.

Ignipunkcija se izvodi pod lokalnom anestezijom i može dati dobre rezultate⁵⁰.

Vitamini A, B i D lokalno se koriste za premazivanje obolelih mesta ili parenteralno²².

Lokalno, stomatolog odstranjuje zubne naslage – dentalni plak, zubni kamenac i izvršava korekciju neprikladnih radova (loše plombe i protetski radovi). Higijensko-dijjetetski režim obuhvata zabranu upotrebe žestokih pića, ljute i jako začinjene hrane, kao i pušenja.

Lečenje bulozno-vezikuloznih i erozivno-ulceroznih formi oralnog Lichen planus-a

Terapija za ove oblike oralnog *Lichen planus*-a ciljana je i ima u vidu oslobođanje od nelagodnosti, zarašćivanje erozivnih lezija i povećanje epitelijalne istanjenosti na područjima atrofije. Kod ovih formi oralnog *Lichen planus*-a primenjuju se kortikosteroidi, tuberkulostatici, vrši se hirurški zahvat, a ređe se koristi i ultravioletno zračenje^{50,53,54}.

Kortikosteroidi aplikuju se u vidu spreja, parenteralno i intralezijski.

Kada govorimo o upotrebi u obliku spreja, koristi se polusintetski kortikosteroid triamcinolom sa halkinolom – poznat kao Kenalog S. Aplikuje se nekoliko puta dnevno.

Treatment of reticular and papular forms of oral Lichen planus

Therapy of such oral manifestations is symptomatic. Sedatives, antimalarials, ignipuncture, vitamins with local treatment of the oral cavity and a special hygienic-diet regime are used⁵⁶.

Sedatives are indicated in neurotic patients⁵⁷. Hexahydrodiphene chloride (Benifen) is given 2-3 times a day after each meal⁵⁷. Diazepam (Apaurin) from 2-5 mg 3 times a day is also indicated⁵⁷. Antimalarials (Resorchin et al.) with unsalted diets in certain cases produce good results. It is administered 3 times a day (25 mg tablets). The treatment lasts for seven days⁵⁶. If there are no gastrointestinal disorders, treatment with Resorchin is continued as follows: patients take 2 times a day one tablet for the next 7 days. In the last round of 7 days, patients take 1 tablet per day. For the next month, patients only receive maintenance doses of ½ tablet per day⁵⁰.

Ignipuncture is performed under local anesthesia and can produce good results⁵⁰.

Vitamins A, B, and D are used topically to coat affected areas or parenterally²².

Locally, the dentist removes dental plaque, calculus and corrects inappropriate fillings and prosthetic work. The hygiene and diet regimen includes a ban on the use of booze, hot and spicy foods, as well as smoking.

Treatment of vesicular-bullous and erosive-ulcerative forms of oral Lichen planus

Therapy for these forms of oral *Lichen planus* is targeted and involves relief from discomfort, healing of erosive lesions and increasing the thinness of the epithelial barrier in areas of atrophy. Corticosteroids and tuberculostatics are administered and surgical procedure is performed with these forms of oral *Lichen planus*, and ultraviolet radiation is rarely used^{50,53,54}.

Corticosteroid sprays are administered parenterally and intralesionally.

Semi-synthetic corticosteroid triamcinolone spray - known as Kenalog Spray is administered several times a day. Retinoic acid (0.9%) may also be administered in the form of a spray in order to reduce keratinization⁵⁸.

U obliku spreja može se dati i retinoidna kiselina (0,9%) sa ciljem da redukuje keratinizaciju⁵⁸. Neki pacijenti reaguju i na terapiju grizeofulvinom⁵⁹. Za uporne lezije preporučuju se i betametazon (0,1%) i fluocinonid (0,01%), za lokalnu upotrebu⁵⁹. Može se savetovati i briancinolon acetonid (0,1%), za ispiranje pre uzimanja sistemskog prednisona od 40 mg⁶⁰.

Parentralno, daju se prednison, dexamethason i drugi polusintetski kortikosteroidi⁵³. Parentralna terapijska doza prepisuje se na sledeći način: prve dve nedelje terapije, radi smanjenja akutnih simptoma, ordiniraju se visoke doze kortiko preparata (1 mg/kg), a zatim se doza postepeno smanjuje (po 10 mg) na svaka tri dana, sve do odgovarajuće doze održavanja pomoću koje će promene stagnirati ili potpuno nestati⁶¹.

Intralezijsko davanje kortikosteroida primenjuje se da bi se izbegla ili ublažila njihova sporedna dejstva, pa se Kenalog 40 ili Kenalog 10 aplikuju u same erozivno-ulcerozne površine. Inicira se najviše do 3 mg, a ukupna doza ne sme biti veća od 80 mg⁶¹.

Hirurško lečenje je indukovano ako histopatološki nalaz pokazuje značajan stepen displazije, a sastoji se u odstranjivanju obolelih mesta, uz česte recidive⁵³.

U okviru terapije uključuju se i antiseptične vodice za ispiranje usta (sa dodatkom za kontrolu plaka i redukciju sekundarne infekcije)⁶² i analgetične vodice (za redukciju nelagodnosti)⁶².

Upotreba raznih topikalnih preparata – solubilne betametazonske tablete (koriste se rastvorene u vodi i služe za ispiranje usta), sprejevi (beklometason), jake steroidne pomade (npr. fluocinonid) pomešane sa nekom adhezivnom bazom – mogu dovesti do pojave oralne kandidoze i zakomplikovati tretman bolesti⁶³. Topikalna antifungicidna terapija često je indikovana kod bolesnika sa simptomatskim oralnim *Lichen planus*-om⁶⁴. Superinfekcija oralnom kandidom može egzacerbirati oralne simptome *Lichen planus*-a, pa zbog toga treba na vreme početi sa lečenjem oralne kandidoze. Nystatin ili amphotericin odgovarajući su medikamenti, ali mogu biti neprihvatljivi kod pacijenata sa soričnom atrofičnom mukozom⁶⁵. Zbog toga su miconasol gel i sistemski fluconasol više indikovani⁶⁶.

Some patients also respond to Griseofulvin therapy⁵⁹. Betamethasone topical 0.1% and Fluocinonide topical 0.01% are recommended for the treatment of persistent lesions. Triamcinolone acetonide (0.1%) in a form of a rinse may be advised before taking systemic Prednisone of 40 mg⁶⁰.

Prednisone, Dexamethason, and other semi-synthetic corticosteroids are administered parenterally⁵³. The parenteral dosage is as follows: for the first two weeks of therapy in order to reduce acute symptoms, high doses of cortico-preparations (1mg/kg) are administered, and then the dose is gradually reduced (by 10 mg) every three days until the appropriate maintenance dose is achieved within which changes will stagnate or disappear completely⁶¹.

Intralesional administration of corticosteroids is used to avoid or alleviate their side effects, so Kenalog-40 or Kenalog-10 is applied to the erosive-ulcerative surfaces. The maximum injection is up to 3 mg and the total dose should not exceed 80 mg⁶¹.

Surgical treatment is induced if the histopathological findings indicate a significant degree of dysplasia and consist of the removal of affected areas, but relapses are common⁵³.

A therapy also includes antiseptic mouthwash (with plaque control and secondary infection reduction supplement)⁶² and analgesic mouthwash (for discomfort reduction)⁶².

The use of various topical preparations - betamethasone soluble tablets (used dissolved in water for mouthwashing), sprays (beclomethasone), strong steroid pomades (e.g. fluocinonide) mixed with an adhesive base - can lead to the oral candidiasis and complicate the treatment of the disease⁶³. Topical antifungal therapy is often indicated in patients with symptomatic oral *Lichen planus*⁶⁴. Oral candida superinfection may exacerbate the oral symptoms of *Lichen planus*, so oral candidiasis should be treated promptly. Nystatin or Amphotericin are appropriate medicines but may be inadequate in patients with soric atrophic mucosa⁶⁵. Therefore, miconazole gel and systemic fluconasol are more indicated⁶⁶.

Zaključak

Većina manifestnih oblika u usnoj duplji ovog oboljenja ima kompletну benignu prirodu, tako da mogu ući u remisiju i nakon nekoliko godina. Međutim, kod malog procenta slučajeva (0,4% do 3,3%) oralne lezije prelaze u maligne promene. Iz ovog razloga, dugotrajne tokove ovog oboljenja treba pratiti i treba raditi rebiopsije, ako postoji bilo koja sumnjičiva promena, kao što su nodularne, verukozne, mrljaste ili "somotno-crvene" pojave na mukozi. Pacijenta treba savetovati da prijavi bilo koje specifične promene na lezijama ili simptome. Idealno je napraviti i fotografiski zapis pacijentovih promena prilikom svakog narednog kontrolnog pregleda.

Postoje sugestije, da ako ima erozivnih i atrofičnih formi oralnog *Lichen planus-a*, postoji veća šansa za malignom transformacijom i da te slučajevе treba nadzirati kontinuirano u narednom periodu.

Oralni *Lichen planus* je često oralno oboljenje sa kojim se susreću stomatolozi prilikom pregleda pacijenta. Neophodno je da se prisutne lezije precizno identifikuju i primeni adekvatna terapija. Pravilno uzimanje anamneze, razumevanje patogeneze i kliničke slike veoma je važno za sprovođenje adekvatnog lečenja svih oralnih manifestacija ovog, danas, veoma čestog kožnog oboljenja.

Conclusion

Most of the manifestations in the oral cavity of this disease have a complete benign nature, so they can go into remission after several years. However, in a small percentage of cases (0.4-3.3%), oral lesions undergo malignant changes. For this reason, the long-term course of this disease should be monitored and a rebiopsy should be performed if there is any suspicious change, such as nodular, verrucous, or "velvet-red" in the mucosa. The patient should be advised to report any specific lesion changes or symptoms. It is also ideal to make a photographic record of the patient's changes at each subsequent checkup.

There is also suggestion that if there are erosive and atrophic forms of oral *Lichen planus*, there is a greater chance of malignant transformation and that these cases should be monitored continuously over the coming period.

Oral *Lichen planus* is a common oral disease encountered by dentists when examining a patient. It is imperative that the present lesions are accurately identified and an appropriate therapy should be administered. Proper anamnesis, understanding of pathogenesis and clinical presentation is very important for the adequate treatment of all oral manifestations of this, nowadays, very common skin disease.

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UGROŽENOST STOMATOLOŠKOG OSOBLJA SARS-CoV-2 VIRUSOM TOKOM STOMATOLOŠKIH INTERVENCIJA

OCCUPATIONAL HAZARD FOR DENTAL STAFF EXPOSED TO THE SARS-CoV-2 VIRUS DURING DENTAL PROCEDURES

Nina N. Burić¹, Simona M. Stojanović²

¹ UNIVERZITET U NIŠU, MEDICINSKI FAKULTET, NIŠ, KLINIKA ZA STOMATOLOGIJU, LEKAR NA STAŽU, SRBIJA
² UNIVERZITET U NIŠU, MEDICINSKI FAKULTE NIŠ, ODELJENJE ZA ORALNU HIRURGIJU, NIŠ, SRBIJA

¹ UNIVERSITY OF NIŠ, FACULTY OF MEDICINE, CLINIC OF DENTISTRY, INTERN, NIŠ, SERBIA
² UNIVERSITY OF NIŠ, FACULTY OF MEDICINE, CLINIC OF DENTISTRY, ORAL SURGERY, NIŠ, SERBIA

Sažetak

Uvod: Stomatološka profesija je visokorizična profesija, sa aspekta mogućeg inficiranja, od skoro 100% u toku stomatoloških intervencija, od strane pacijenata koji su nosioci bakterijskih, virusnih i gljivičnih bolesti.

Cilj rada: Analiza svih podataka koji objašnjavaju mogućnost inficiranja SARS-CoV-2 virusom u stomatološkoj praksi.

Materijal i metode: Analizirana je literaturna o zastupljenosti SARS-CoV-2 virusa, njegove karakteristike i ponašanje u spoljašnjoj sredini i u živim tkivima. Korišćene su baze podataka iz biblioteka Medline, Cochrane Library, Science-Direct, EMBASE, and Google scholar, kao i drugi izvori informacija o ovom virusu.

Rezultati: SARS-CoV-2 je RNK virus, koji ima submikronsku veličinu i mogućnost da opstane u raznim sredinama. Zadržavanje virusa SARS-CoV-2 u vazduhu/aerosolu traje prosečno 3 sata, dok je poluživot ovog virusa 5 do 6 sati na nerđajućem čeliku i 6 do 8 sati na plastici. Inficirani pacijenti SARS-CoV-2 virusom razvijaju COVID-19 bolest, koja se manifestuje kroz presimptomatski, simptomatski i postsimptomatski period bolesti.

Zaključak: SARS-CoV-2 virus moguće je identifikovati u aerosolu, koji stvaraju stomatološke mašine, korišćenjem kompresorskog vazduha i radu. Zaštita stomatologa i osoblja od inficirajućeg virusa je moguća, košćenjem N95 respiratore maske sa stepenom zaštite 2 i 3, koje imaju efikasnost filtracije, tj. zadržavanja submikronskih čestica sa efikasnošću od $\geq 98\%$. Treba koristiti vodonepropusne zaštite naocare sa zaštitnim vizijom ili industrijski posebno dizajnirani facialni vizir u vidu maske za celo lice, koji ima sopstveni motor za dotok filtriranog vazduha u masku i koji sprečava kontaminaciju mukoze oka, nosa i usta putem stvorenog tečnog ili čvrstog aerosola u vazduhu. Ostala jednokratna zaštitna oprema takođe treba da bude vodonepropusna.

Ključne reči: Stomatološko osoblje, SARS-CoV-2, rizik

Corresponding author:

Nina Burić, D.M.D.
 Jovana Ristića 4
 18000 Niš, Srbija
 E-mail: ninaburic@yahoo.com

Abstract

Introduction: The dental profession is a high-risk profession, considering the aspect of a possible 100% infection from patients who are carriers of bacterial, viral and fungal diseases during dental interventions.

Aim: To perform the analysis of all data that explain the possibility of a SARS-CoV-2 virus infection in dental practice.

Material and Methods: The literature data on the presence of SARS-CoV-2 virus, and its characteristics and behavior in the external environment and in living tissues was analyzed. Databases from the Medline, Cochrane Library, Science-Direct, EMBASE, and Google scholar libraries were used, as well as other sources of literature information about this virus.

Results: SARS-CoV-2 is an RNA virus, which has a submicron size and the ability to survive in various environments. The retention of SARS-CoV-2 virus in air / aerosol lasts an average of 3 hours, while the half-life of this virus is 5 to 6 hours on stainless steel and 6 to 8 hours on plastic. Infected patients with SARS-CoV-2 virus develop COVID-19 disease, which manifests itself through presymptomatic, symptomatic and post-symptomatic periods of the disease.

Conclusion: The SARS-CoV-2 virus can be found in aerosols generated by dental equipment, which uses compressed air for its work. Protection of dentists and staff from infection with the virus is possible by wearing an N95 respiratory mask with protection levels 2 and 3, which has a filtration efficiency, i.e. retention of submicron particles with an efficiency of $\geq 98\%$. Waterproof goggles with a protective visor or a special industrially designed facial visor in the form of a full face mask, which has its own motor for the supply of filtered air to the mask, and which prevents the contamination of the mucous membranes of the eyes, nose and mouth from liquid or solid aerosol in the air, need to be used. Other disposable protective equipment also must be waterproof.

Key words: Dental staff, SARS-CoV-2, risk

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Uvod

Stomatološka profesija je visokorizična profesija, sa aspekta mogućeg inficiranja, od skoro 100% od strane pacijenata, koji su nosioci bakterijskih, virusnih i gljivičnih bolesti, na kojima se izvodi stomatološka intervencija¹. Stomatološko osoblje, standardno, može biti izloženo i ugroženo sledećim patogenim mikroorganizmima i virusima: *Mycobacterium tuberculosis*, bakterijama grupe *Streptococcus* i *Staphylococcus*, citomegalovirusom (CMV), herpes virusom tipa 1 i 2, virusom hepatitis B i C, kao i drugim patogenim izazivačima različitih bolesti².

Način prenošenja ovih mikroorganizama i inficiranje stomatološkog osoblja, od strane oboleleg pacijenta, dešava se preko: direktnog kontakta sa krvlju, pljuvačkom ili preko drugog infektivnog biloškog izvora; indirektnim putem, preko kontaminiranih instrumenata, radnih površina nameštaja u ordinaciji ili preko kontamirane opreme; preko kontakta sa infektivnim kapljicama iz konjuktive oka, oralne i nazalne sluzokože, koje sadrže patogene mikroorganizme i virusе i koje se izbacuju u spoljašnju sredinu (na kratku razdaljinu) pričanjem, kijanjem ili kašljanjem; inhalacijom patogena koji borave u vazduhu u dužem vremenskom periodu³.

U ovom trenutku, od posebnog je interesa razmotriti neke činjenice koje se odnose na pandemiju novog korona virusa, koju je proglašila Svetska zdravstvena organizacija krajem prošle godine⁴, kao i na masovno zaražavanje stanovništva novim korona virusom. S obzirom na ove dramatične zdravstvene događaje, odluka o proglašenju vanrednog stanja u Republici Srbiji, zbog epidemije korona virusa, doprinela je tome da se stomatološke intervencije sprovode u specifičnim i veoma otežavajućim okolnostima za stomatološke zdravstvene radnike i pacijente, kojima je potreban stomatološki tretman.

Biologija korona virusa

Korona virus izaziva prehladu kod ljudi, koja ima uobičajne simptome prehlade gornjih respiratornih puteva; zahvata nosnu šupljinu, a ponekad se širi i na ždrelo, larinks i sinuse^{5,6,7}. Sa druge strane, SARS-CoV-2 virus, koji je izazivač masovne/globalne virusne infekcije, ima sličnosti sa druga dva korona virusa –beta korona virusom (SARS-CoV-1) i virusom srednjeistočnog respiratornog sindroma (MERS-CoV).

Introduction

The dental profession is a high-risk profession, considering the aspect of a possible 100% infection from patients who are carriers of bacterial, viral and fungal diseases, and who are undergoing a dental procedure¹. The dental staff may standardly be exposed to and jeopardized by the following pathogenic microorganisms and viruses: *mycobacterium tuberculosis*, *streptococcus* and *staphylococcus* bacteria, *cytomegalovirus* (CMV), *herpesvirus* types 1 and 2, hepatitis B and C virus, as well as other pathogens which cause various diseases².

The transmission mode of these microorganisms and infection of dental staff by the patient who carries the disease occur through: direct contact with blood, saliva or through another infectious biological source; indirectly through contaminated instruments, equipment or work surfaces of the furniture in the office; contact with infectious droplets from the conjunctiva of the eye, oral and nasal mucosa containing pathogenic microorganisms and viruses which are released into the external environment (over a short distance), talking, sneezing or coughing; by inhaling pathogens residing in the air over an extended period of time³.

At this moment, it is of special interest to consider some facts related to the pandemic with the new coronavirus declared by the World Health Organization at the end of last year⁴, as well as the mass infection of the population with the new coronavirus. Considering these dramatic health events, the decision to declare a state of emergency in the Republic of Serbia owing to the coronavirus epidemic has contributed to dental interventions being performed in specific and highly aggravating circumstances for dental health workers and patients in need of dental care.

Biology of the coronavirus

In people, the coronavirus causes colds which have the usual symptoms of a cold of the upper respiratory tract, affecting the nasal cavity, and sometimes spreading to the pharynx, larynx and the sinuses^{5,6,7}.

On the other hand, the current coronavirus, which has caused a mass/global viral infection, is similar to two other viruses: the beta-coronavirus (SARS-CoV 1).

Ovi virusi imaju sposobnost da izazovu tešku pneumoniju i otkazivanje respiratorne funkcije pluća i na kraju dovedu do smrti pacijenta⁶.

SARS-CoV-2 virus, novi tip korona virusa, koji ima sposobnost da izazove teški akutni respiratori sindrom, sa mogućim smrtnim ishodom, dobio je početni naziv 2019-nCoV⁸, da bi ubrzo dobio i zvaničan naziv koji označava "teški akutni respiratori sindrom izazvan korona virusom 2" (eng. *severe acute respiratory syndrome coronavirus 2/ CORONA VIRUS 2(SARS-CoV-2)*)⁸, koji izaziva korona virus bolest (COVID-19)⁹. Značajno je istaći da SARS-CoV-2 pripada RNK virusima¹⁰ i da ima sličnosti sa korona virusom SARS-CoV-1.

Dimenzije SARS-CoV-2 virusa manje su od 1 mikrona i iznose 125nm, odnosno 0,125μm^{11,12}. Ova submikronska dimenzija SARS-CoV-2 virusa značajno smanjuje mogućnosti zaštite od transmisije virusana stomatološko osoblje, u toku svakodnevnog rada.

Načini prenošenja korona virusa

Korona virus (SARS-CoV-1) je takav tip virusa koji može da inficira slepe miševe, cibetke iz roda viverida, koji su slični mungosima, i ljude, kod kojih izaziva teški akutni respiratori sindrom (eng. *severe acute respiratory syndrome-SARS*)^{13,14}. Ovaj virus napada epitelijalne ćelije pluća kod ljudi^{15,16}, u koje ulazi putem vezivanja za ACE2 receptore (eng. *angiotensin-converting enzyme*)^{15,16}. ACE2 receptori nalaze se u bubrežima, srcu i endotelialnim ćelijama i njihova glavna uloga je regulacija renin-angitenzin sistema (RAS)¹⁷. Poslednja saznanja ukazuju na to da ACE2 reaguje sa transmembranoznom proteazom serina 2 (TMPRSS2), koji je odgovoran za aktivaciju virusnog "S" proteina SARS-CoV-2, koji reaguje sa površinskim ACE2 enzimom, skoro identično kao kod virusa SARS; aktivirani virusni material SARS-CoV-2 ulazi u citoplazmu zaražene osobe i odvija se proces umnožavanja virusa preko ćelijskih mehanizama domaćina^{16,18,19,20}.

Još uvek postoje neslaganja oko toga kako se aktuelni korona virus (SARS-CoV-2) prenosi; putem velikih respiratornih kapljica, kao virus influence ili preko fine vodene izmaglice zvane aerosol, kao kod rubeola boginja²¹. Smatra se, ipak, da se SARS-CoV-2 virus primarno širi, kod ljudi, preko respiratornih kapljica (eng. *droplets*), koje nastaju kada osoba koja je inficirana

and the Middle Eastern Respiratory Syndrome Virus (MERS-CoV). These viruses have the ability to cause severe pneumonia and the failure of the respiratory function of the lungs, eventually leading to the death of the patient⁶.

The current new type of coronavirus, which has the ability to cause severe acute respiratory syndrome with a possible fatal outcome, was given the initial name 2019-nCoV⁸, and soon received the official name of: "**SEVERE ACUTE RESPIRATORY SYNDROME CORONAVIRUS 2" / CORONA VIRUS 2 (SARS-CoV-2)**"⁸, which causes the coronavirus disease (COVID-19)⁹. It is important to note that SARS-CoV-2 belongs to RNA viruses¹⁰ and that it is similar to the coronavirus SARS-CoV-1.

The size of the SARS-CoV-2 virus is less than 1 micron, and is 125 nm or 0.125 μm^{11,12}, and this submicron size of the SARS-CoV-2 virus significantly reduces the possibility of protection against virus transmission in dental staff during their daily work.

Ways of coronavirus transmission

Coronavirus (SARS-CoV-1) is a type of virus that can infect bats, civets of the genus viverida that are similar to mongooses, and people, in whom it causes severe acute respiratory syndrome (SARS)^{13,14}. This virus attacks human epithelial cells in the lungs^{15,16}, which it enters by binding to ACE2 receptors (*angiotensin-converting enzyme*)^{15,16}. ACE 2 receptors are also found in the kidneys, heart and endothelial cells, and their main role is the regulation of the renin-angitensin system (RAS)¹⁷. Recent findings indicate that ACE2 reacts with transmembrane protease-serine 2 (TMPRSS2), responsible for the activation of the viral "S" protein SARS-CoV-2, which reacts with the surface ACE2 enzyme almost identically to the SARS virus; activated viral material SARS-CoV-2 enters the cytoplasm of an infected person, and the process of virus replication takes place through cellular host mechanisms^{16,18,19,20}.

There are still disagreements over how the current coronavirus (SARS-CoV-2) is transmitted; through large respiratory droplets as an influenza virus, or through a fine water mist called aerosol, as in the case of rubella²¹. However, the SARS-CoV-2 virus is thought to spread to humans primarily through respiratory droplets which occur when a person infected with the SARS-CoV-2 virus

SARS-CoV-2 virusom energično govor, kašlje ili kija i na taj način izbacuje sekret, tj. respiratorne kapljice u vazduh i to nekoliko metara u daljinu; smatra se da je minimalna sigurna razdaljina, koja otežava zaražavanje $\geq 1,8$ m – 2m.

Takođe se smatra da je virus, koji aerosoliziran u vazduh, ipak potencijalna opasnost i može da opstane u vazduhu, kada se sprovode neke aktivnosti, kao npr. pevanje²² ili prilikom intubacija/ekstubacije pacijenata u toku opšte anestezije, kada virus može da se zadrži u vazduhu i do 3 sata²³.

Zabrinjavajuća je činjenica da je pokazana mogućnost izolovanja SARS-CoV-2 RNA iz krvi i feca; njegovo prisustvo dokazano je i na kartonu, plastici i nerđajućem čeliku^{23,24}. Poslednja istraživanja pokazala su zadržavanje virusa SARS-CoV-2 u vazduhu/aerosolu u trajanju od prosečno 3 sata; poluživot ovog virusa bio je 5 do 6 sati na nerđajućem čeliku i 6 do 8 sati na plastici²³.

Dokazano je prisustvo SARS-CoV-2 RNA virusa i na nekim drugim predmetima^{22,25}, što izaziva oprez u stručnim krugovima i upućuje na razmatranje i ovakvog načina širenja virusa.

Uticaj kliničkih manifestacija covid-19 bolesti na stomatološki tretman

U svakodnevnom stomatološkom radu postoji velika mogućnost transmisije SARS-CoV-2 virusa, s obzirom na to da stomatološki instrumenti i stomatološka oprema koji se koriste, kao što su nasadni instrumenati (turbine, kolenjaci i nasadnici), ultrazvučni skidači zubnih naslaga, ultrazvučni aparati za hirurgiju koštanog tkiva, itd., stvaraju jedva vidljivi, fini vodeni oblak odnosno izmaglicu, koja može da sadrži infektivne čestice. Korišćenjem ovih instrumenata, kao neminovna posledica javlja se i stvaranje velikih kapljica vode, pljuvačke, krvi, mikroorganizama, virusa kao i drugog mogućeg zaraznog materijala. U toku izvođenja stomatoloških intervencija, nije samo ugrožen stomatolog, koji vrši intervenciju na 30cm–40cm od usne šupljine pacijenta, već i stomatolog asistent, zatim radno angažovana stomatološka sestra i, eventualno, pomoćna sestra. Prskanje mogućih zaraznih čestica u neposrednu okolinu oko pacijenta i stomatologa omogućava da ove infektivne čestice padaju na sam tim koji obavlja stomatološku intervenciju, zatim na pod, radni pult stomatološke mašine, kao i na radni sto, odnosno nameštaj u ordinaciji.

vigorously speaks, coughs or sneezes, and in this way expels secretions, i.e. respiratory droplets, into the air, a few meters away; the minimum safe distance which makes infection difficult between an infected and a healthy person is thought to be ≥ 1.8 – 2m. It is also considered that the virus that is aerosolized in the air is still a potential hazard and can survive in the air when performing certain activities, such as singing²², or during the intubation / extubation of patients during general anesthesia, after which the virus can remain in the air for up to 3 hours²³.

A worrying fact is that it has been proven that it is possible to isolate SARS-CoV-2 RNA from blood and feces; its presence has also been proven on cardboard, plastic and stainless steel^{23,24}.

Recent studies have shown that the SARS-CoV-2 virus remains in the air / aerosol for an average of 3 hours; the half-life of this virus was 5.6 h on stainless steel and 6.8 h on plastic²³.

The presence of the SARS-CoV-2 RNA virus has been proven in some other inanimate organisms as well^{22,25}, which has led to caution in professional circles and the consideration of this way of spreading the virus.

Impact of the clinical manifestations of the covid-19 disease on dental treatment

In everyday dental work, there is a great possibility for the transmission of the SARS-CoV-2 virus, considering the fact that the dental instruments and equipment used, such as handpieces (turbines, contra-angle handpieces and straight handpieces), ultrasonic dental plaque removers, ultrasound devices for bone tissue surgery, etc., create a barely visible, fine water cloud or haze, which may contain infectious particles. When using these instruments, an inevitable consequence is the creation of large droplets of water, saliva, blood, microorganisms, viruses and other possible infectious material. During the performance of dental interventions, not only is the dentist who performs the intervention at 30-40 cm from the patient's oral cavity threatened, but also the dental assistant, the dental nurse who is involved in the process and possibly the assistant nurse. Spraying possible infectious particles into the immediate environment around the patient and the dentist allows these infectious particles to fall onto the team performing the dental intervention, onto the floor, the workbench of the dental machine and onto the desk or furniture in the office.

Još veća opasnost je i moguća pojava aerosola, koji može da sadrži infektivni patogeni mikroorganizam. Poznata je činjenica da hirurške maske koje nosi osoblje u toku opisanih intervencija uglavnom štiti mukozu usne šupljine i nosa od kapljica koje dolaze do zaštitne maske; medicinski problem je to što nema sigurne zaštite od udisanja iz vazduha stvorenih kontaminiranih oblaka, odnosno aerosola, koji potencijalno sadrži virus²⁶.

Sadašnja saznanja o COVID-19 bolesti nam govore da postoje tri nivoa kliničkog stanja zaraženog pacijenta, koji može da bude istovremeno i stomatološki pacijent. Standardizovane su faze razvoja COVID-19 bolesti, koja se razvija kroz presimptomatski period, simptomatski period i postsimptomatski period²⁷. Najveća opasnost od transmisije i zaražavanja SARS-CoV-2 virusom stomatološkog osoblja, tokom izvođenja stomatoloških intervencija, su pacijenti sa SARS-CoV-2 virusom, koji su u asymptomatskoj i/ili presimptomatskoj fazi razvoja bolesti COVID-19²⁸. Inkubacioni period COVID-19 bolesti traje prosečno 5 do 6 dana, mada ima podataka o tome da traje i 14 dana²⁹. Viruletost SARS-CoV-2 virusa omogućava to da 1 dan do 3 dana pre ispoljavanja svih simptoma bolesti COVID-19 pacijent bude infektivan i 40% do 50%; transmisija virusa sa zaražene osobe na zdravu osobu nastaje u toj prvoj i nemoj fazi bolesti, odnosno asymptomatskoj ili presimptomatskoj fazi bolesti^{22,30}. Smatra se da 97,5% pacijenta, koji su u simptomatskoj fazi razvoja COVID-19 bolesti, može razviti simptome bolesti i to 11,5 dana od SARS-CoV-2 infekcije³¹.

Simptomi COVID-19 bolesti su: povišena telesna temperatura, kašalj, bol i suvoća u grlu, malaksalost, bolovi u mišićima, gubitak apetita, mučnina, povraćanje, gubitak čula mirisa i ukusa, gubitak daha(kratak udisaj vazduha)^{32,33,34,35,36}. Laboratorijske analize pojedinih krvnih i biohemijskih vrednosti karakterišu se specifičnim odstupanjima, kao što su: povišena vrednost d-dimera, laktat dehidrogenaze, C-reaktivnog proteina, feritina i prisutnost limfopenija; nije retko da bolesnici imaju normalnu vrednost prokalcitonina; kod teških slučajeva Covid-19 bolesti nastaje leukocitoza sa limfopenijom, produženo protrombinsko vreme i znatno povećanje vrednosti enzima jetre, laktat dehidrogenaze, C-reaktivnog proteina, d-dimera, interleukina-6, C reaktivnog proteina i prokalcitonina^{32,37,38,39,40}.

An even greater danger is the possible appearance of an aerosol that may contain an infectious pathogenic microorganism. It is a well-known fact that surgical masks worn by staff during the described interventions generally protect the mucosa of the oral cavity and nose from the droplets reaching the protective mask; the medical problem is that there is problematic protection against inhalation from the formed contaminated clouds in the air or aerosols that potentially contain the virus²⁶.

Current knowledge of the COVID-19 disease tells us that there are three levels of clinical conditions of an infected patient who may be a dental patient at the same time. The stages of development of the COVID-19 disease that develops through the presymptomatic period, symptomatic period and post-symptomatic period are standardized²⁷. Patients with the SARS-CoV-2 virus that are in the asymptomatic and/or presymptomatic development phase of the COVID-19 disease represent the greatest threat of transmission and infection with the SARS-CoV-2 virus to dental staff during dental interventions²⁸. The incubation period of the COVID-19 disease lasts an average of 5-6 days, although there are data that it lasts 14 days.²⁹ The virulence of the SARS-CoV-2 virus allows the patient to be infectious 1-3 days before the manifestation of all symptoms of the COVID-19 disease, and 40-50% of the virus transmission from an infected person to a healthy person occurs in this first silent phase of the disease, i.e. in the asymptomatic or presymptomatic phase of the disease^{22,30}. It is believed that 97.5% of the patients who are in the symptomatic phase of the COVID-19 disease develop symptoms 11.5 days after the SARS-CoV-2 infection³¹.

The symptoms of the COVID-19 disease are: fever, cough, painful and sore throat, muscle weakness and pain, loss of appetite, nausea, vomiting, loss of smell and taste, shortness of breath^{32,33,34,35,36}. Laboratory analyses of individual blood and biochemical values are characterized by specific deviations, such as: elevated d-dimer value, lactate dehydrogenase, C-reactive protein, ferritin and lymphopenia presence; it is not uncommon for patients to have normal procalcitonin levels; severe cases of the Covid-19 disease involve the occurrence of leukocytosis with lymphopenia, prolonged prothrombin time and a significant increase in liver enzymes, lactate dehydrogenase, C-reactive protein, d-dimer, interleukin-6, C reactive protein and procalcitonin^{32,37,38,39,40}.

Mogući način transmisije SARS-CoV-2 virusa u stomatološkoj praksi

Čekaonice su prva mesta na kojima postoji rizik od prenosa virusa sa zaraženog pacijenta na stomatološko osoblje. Zbog toga se preporučuje minimalni broj pacijenta u čekaonici, sa obaveznim razmakom većim od 1,8 m do 2m. Potrebno je da se u čekaonici nalazi minimalni broj nepotrebnih stvari, a treba ukloniti iz ordinacije časopise, igračke, knjige, itd. Po potrebi, pacijente prvo treba intervjuisati preko telefona, kako bi se utvrdilo da li su bili u kontaktu sa mogućim zaraženim osobama, da li imaju ili su imali simptome i znake COVID-19 bolesti, odnosno treba da postoji dužnost pacijenata da daju takve informacije po dolasku u stomatološku ordinaciju²⁶.

Osoblje stomatološke ustanove u toku radnog dana mora biti, iako nije u kontaktu sa pacijentima, u radnoj, čistoj odeći, a ova radna odeća menja se svakodnevno. U toku celokupnog radnog vremena, stomatološko osoblje u ordinaciji mora nositi hiruršku masku. Ukoliko je potrebno da se maska dodiruje, iz bilo kog razloga, onda pre i posle takve manipulacije treba izvršiti antiseptičko pranje ruku razredenim alkoholom u koncentraciji od 70% do 75%. Zaštita ruku od kontaminacije virusom uobičajno se sprovodi pomoću 2 para jednokratnih rukavica; kada se iz bilo kog razloga potencijalno kontaminiraju ili oštete spoljašnje rukavice, onda se prvo vrši dekontaminacija takvih rukavica razređenim alkoholom u koncentraciji od 70% do 75%, zatim se skinu spoljašnje (druge) rukavice, opet se uradi alkoholna dekontaminacija unutrašnjih (prvih) rukavica i navuku se nove rukavice za jednokratnu upotrebu. Preko radne obuće mogu se nositi zaštitne kaljače. Takođe, stomatološko osoblje koje prvo dolazi u kontakt sa pacijentima, mora da drži sigurnosnu distance od 1,8 m do 2m od pacijenta i mora da ima zaštitne naočare ili zaštitni vizir da bi se sprečila kontaminacija konjuktive ili mukoze kapljicama (eng.droplet transmission) veličine $>5\mu\text{m}$, koje mogu da sadrže virus, koje u vazduhu može da izbacuje zaraženi pacijent. Opisanim merama obezbeđujemo prevenciju transmisije virusa od strane poznatog ili nepoznatog nosioca virusa, odnosno sprečavamo moguću direktnu kontaktну ili kapljicnu transmisiju virusa ili indirektnu transmisiju virusa preko stvari²⁶.

Possible transmission mode of the SARS-CoV-2 virus in the dental practice

Waiting rooms are the first places where there is a risk of transmitting the virus from an infected patient to the dental staff. Therefore, it is recommended that there be a minimum number of patients in the waiting room with a mandatory distance greater than 1.8 to 2m. There should be a minimum number of unnecessary things in the waiting room, and magazines, toys, books, etc. should be removed from the office. If necessary, patients should first be interviewed by telephone to determine if they have been in contact with potentially infected persons, if they have or have had symptoms and signs of the COVID-19 disease, i.e. patients are required to provide such information upon their arrival at the dental office²⁶.

The staff of the dental institution must wear clean clothes intended for work during the working day even if they are not in contact with the patients, and the clothes intended for work are to be changed daily. During the entire working hours, the dental staff in the office must wear a face mask, i.e. a surgical mask. If it is necessary to touch the mask for any reason, hands are to be washed with an antiseptic with diluted alcohol in a concentration of 70-75% before and after such manipulation. Protection of the hands from virus contamination is usually performed with 2 pairs of disposable gloves; when, for any reason, the outer gloves are potentially contaminated or damaged, such gloves are first decontaminated with diluted alcohol in a concentration of 70-75%, then the outer (second) gloves are removed, and the decontamination is done again with alcohol on the inner (first) gloves. Finally, new disposable the outer (second) gloves are put on again. Protective disposable shoe cover can also be worn over the shoes worn at work. Furthermore, dental staff who first come into contact with patients must keep a safety distance of 1.8 to 2 m from the patient, and must wear goggles or a protective visor to prevent the contamination of the conjunctiva or mucosa from droplet transmission $> 5 \mu\text{m}$, which may contain a virus that can be released into the air by an infected patient. With the described measures, the prevention of virus transmission from a known or unknown virus carrier is ensured, i.e. possible direct contact or droplet transmission of the virus, or indirect transmission of the virus from things is prevented²⁶.

Stomatološke pacijente treba razvrstati u 2 grupe: 1. grupa–pacijenti kod kojih prilikom intervencije neće nastati mašinom stvoreni aerosol; i 2. grupa–pacijenti kod kojih će prilikom intervencije nastati mašinski stvoreni aerosol.

1. grupa– pacijenti kod kojih prilikom intervencije neće nastati mašinom stvoreni aerosol

Prilikom rada sa pacijentima u 1. grupi, na kojima se sprovode stomatološke intervencije, koje ne zahtevaju upotrebu nasadnih instrumenta, koje ne mogu da proizvedu aerosol korišćenjem kompresorskog vazduha za svoj rad, primenju se sledeće zaštitne mere: nošenje respiratornih maski, koje imaju sposobnost zaustavljanja čestica veličine od $0,3\mu$, sa procentom efikasnosti od 95%; ove se maske različito označavaju (i ako su u karakteristikama jednake), u zavisnosti od zemlje porekla: N95 (USA kod), KN95 (Kina kod), KF94 (Koreja kod), i FFP2 (EU kod i UK kod)^{41,42}. Ove maske su za jednokratnu upotrebu i menjaju se svakih 20 do 30 minuta, ako su izložene intezivnom prskanju tečnostima, aerosolima, itd., ili posle 1 sata u normalnim "suvim" radnim okolnostima^{43,44}. Ovaj tip maski takođe ima sposobnost da štiti od aerosola i velikih kapljica tečnosti, koje se inače stvaraju u stomatološkom radu^{2,45,46,47}. Efikasnost zaštite ovim maskama ogleda se i u činjenici da maske zadržavaju čestice veličine od 1μ do 5μ sa 95% uspeha^{2,48}, što ukazuje na to da mogu da osiguraju zaštitu za stomatološko osoblje. Treba istaći da one ne pružaju takvu zaštitu ako se nepravilno stavljuju, ne adaptiraju intimno na lice i ako ih nosi osoba koja ima bradu⁴⁹.

Zaštitni vizir i naočare obavezni su delovi lične zaštitne opreme stomatologa i ostalog osoblja. Poželjno je da zaštitne naočare budu vodonepropusne, a vizir ergonomski oblikovan, budući da je stomatolog u svom radu u veoma bliskom kontaktu sa licem pacijenata, pa zbog toga neadekvatne dimenzije vizira i neadekvatni oblik smetaju u stomatološkom radu. Najfunkcionalnije su kombinacije vodonepropusnih naočara i prema licu oblikovanih vizira (Slika 1).

Ostali zaštitni material za jednokratnu upotrebu obuhvata zaštitni mantil, zaštitnu kapu, 2 para rukavica za jednokratnu upotrebu⁵¹, kao i zaštitne jednokratne navlake za obuću.

Dental patients should be divided into 2 groups: Group 1 – patients for whom there will be no machine-generated aerosol, and Group 2 – patients for whom there will be a machine-generated aerosol.

Group 1 – patients for whom there will be no machine-generated aerosol

For patients in Group 1, where dental interventions are performed that do not require the use of handpieces, which cannot produce aerosol through the use of compressed air for their work, the following protective measures are applied: wearing a respiratory face mask that has the ability to stop particles the size of 0.3μ with an filtration efficiency of 95%; these masks are marked differently (although they are the same in characteristics), dependent on the country of origin: N95 (USA code), KN95 (China code), KF94 (Korea code), and FFP2 (EU code and UK code)^{41,42}. These masks are disposable and changed every 20-30 minutes if exposed to intense spraying with liquids, aerosols, etc., or after 1 hour in normal "dry" working conditions^{43,44}. This type of mask also has the ability to protect against aerosols and large droplets of fluid, which are created in dental work^{2,45,46,47}. The effectiveness of protection with these masks is reflected in the fact that they retain particles the size of $1-5\mu$ with 95% success^{2,48}, and indicates that they can provide protection for dental staff. It should be noted that they do not provide such protection if placed incorrectly, if not applied close-fitting to the face and if worn by a person with a beard⁴⁹. The use of protective visors and goggles are mandatory parts of the personal protective equipment of dentists and other staff. It is desirable that the goggles be waterproof and the visor ergonomically shaped, because the dentist is in very close contact with the patient's face in the course of their work, so the inadequate dimensions of the visor and its shape interfere with dental work. Combinations of waterproof glasses and face-shaped visors are the most functional (Figure 1).

Other disposable protective materials include a disposable protective coat, a protective cap, 2 pairs of disposable gloves⁵¹, as well as protective disposable shoe covers (overshoes).



Slika 1. Vodonepropusne zaštitne naočare i prema licu anatomske oblike oblikovani vizir⁵⁰

Figure 1. Waterproof goggles and anatomically shaped face visor⁵⁰

2. grupa – pacijenti kod kojih će prilikom intervencije nastati mašinski stvoreni aerosol

Stomatološke procedure kao što su: preparacija zuba (brušenje zuba) u protetskim intervencijama, preparacija kavita zuba, restaurativna stomatologija, endodontska terapija kanala korena zuba, korišćenje ultrazvučnih skidača naslaga sa zuba, mašinsko poliranje zuba, parodontalna hirurgija, implantološke operacije, kompleksne operacije iz oralne i maksilofacijalne hirurgije predstavljaju visoko rizične intervencije. U toku izvođenja rizičnih procedura, stvara se obilje tečnosti i aerosola, uz moguću pojavu krvi u aerosolu, koji se potpomognuti vazduhom pod pritiskom iz stomatoloških nasadnih instrumenata i mašina, šire u vazduhu oko stomatološkog tima, na radni sto stomatološke mašine, na enterijer u ordinaciji, ispunjavajući radni prostor ordinacije. Zbog toga je potrebno koristiti N95 respiratorne maske sa najvećim stepenom zaštite, stepenom zaštite 2 i 3, koje imaju efikasnost filtracije, tj. zadržavanja submikronskih čestica, od $\geq 98\%$ ⁴². Maske se menjaju posle svakog pacijenta, posle produženih procedura i nakon svakih 20 minuta, u visoko aerosoliziranim sredinama⁴². Zaštita očiju i lica, odnosno mukoze očiju i nosa, mora biti urađena vodonepropusnim zaštitnim naočarima i, dopunski, zaštitnim vizirom. Moguće je da se zaštita mukoze očiju, nosa i usta, odnosno kompletног lica stomatologa, uradi i industrijski posebno dizajniranim facijalnim vizirom u vidu maske za celo lice, koji ima sopstveni motor za dotok filtriranog vazduha u masku i koji sprečava kontaminaciju mukoze oka, nosa i usta putem stvorenog tečnog ili čvrstog aerosola u vazduhu (Slika 2).



Slika 2. Vodonepropusna zaštitna maska celog lica sa posebnim filterom za vazduh i mikromotorm za ubacivanje filtriranog vazduha u masku⁵²

Figure 2. Specially designed facial visor in the form of a mask for the whole face with a special air filter and a motor for inserting filtered air into the mask⁵²

Group 2 – patients for whom there will be a machine-generated aerosol

Dental procedures, such as: tooth preparation (tooth grinding) in prosthetic interventions, tooth cavity preparation, restorative dentistry, endodontic therapy of tooth root canals, use of ultrasonic dental plaque removers, machine tooth polishing, periodontal surgery, implant surgery, complex oral and maxillofacial surgeries, represent high-risk interventions. During the performance of the described procedures, an abundance of liquid and aerosol or blood in aerosol is formed, which, aided by compressed air from dental handpieces and equipment, under pressure, spreads into the air around the dental team, onto the dental equipment workbench, onto the interior in the office, filling the working space of the office. For this reason, N95 respiratory masks with the highest degree of protection, protection levels 2 and 3, which have filtration efficiency, i.e. retention of submicron particles with an efficiency of $\geq 98\%$, need to be used⁴². Face masks are changed after each patient, after extended procedures and after each 20 minutes in highly aerosolized environments⁴². Protection of the eyes and face, i.e. mucous membranes of the eyes and nose must be done with waterproof goggles and additionally with a protective visor. It is possible to protect the mucous membranes of the eyes, nose and mouth, i.e. the entire face of the dentist with a special industrially designed facial visor in the form of a full face mask, which has its own motor for filtering

Poželjna je i upotreba koferdama²⁶, u cilju smanjenja mogućnosti transmisije virusa, kao i jačih stomatoloških usisnih aspiratora²⁶. Ostali zaštitni materijali za jednokratnu upotrebu obuhvataju vodonepropusni zaštitni mantil, vodonepropusnu kapu, 2 para rukavica za jednokratnu upotrebu⁵¹, kao i zaštitne jednokratne kaljače (nazuvice), koje su takođe vodonepropusne.

Sve ove zaštitne mere odnose se i na asistente, stomatološke sestre i ostalo osoblje koje je u ordinaciji u toku rada sa pacijentima. Poželjno je da se sa pacijentima dogovori više intervencija u toku jedne posete stomatologu, kada god je to moguće^{9,26}.

Skidanje zaštitne opreme

Posle završenog rada sa pacijentom sledi postupak skidanja zaštitne opreme, koji treba sprovesti disciplinovano i po određenom redosledu. Tokom postupka mora biti prisutna osoba koja je zadužena samo za ovaj postupak. Prvo se sestri, koja je učestvovala u radu, prskaju spoljašnje rukavice dezificijensom (alkohol 70% – 75%, 0,5% sveže napravljenim natrijum-hipohlorit-varikinom, benzalkonijum-hloridom-asepsolom $\geq 1\%$), zatim se pozadi otkopčava vodonepropusni zaštitni mantil i svlači u celosti sa spoljašnjim rukavicama i ostavlja u kontejner za kontaminirani material, skidaju se jednokratne zaštitne navlake za obuću (kaljače) i takođe odlažu u kontejner za kontaminirani material. Zatim se skidaju zaštini vizir i naočare i prskaju dezificijensom i odlažu u kontejner za dezinfekciju. Sledi prskanje unutrašnjih rukavica dezificijensom i na kraju se skida maska, i to tako što se otpozadi, iza uva, hvata vrpca maske i skida sa lica i odlaže u kontejner za otpad. Sledi ponovni postupak dezinfekcije prskanjem unutrašnjih rukavica i navlačenje novih spoljašnjih nekontaminiranih rukavica, odlazak u svlačionicu, skidanje rukavica, antiseptičko pranje ruku i presvlačenje angažovanog zdrastvenog radnika u novu, čistu radnu bluzu i čiste radne pantalone, dok se korišćena radna odeća odlaže u kontejner za medicinski veš. Treba napomenuti da zdrastveni radnici koji rade sa rizičnim pacijentima menjaju radnu odeću svakog dana. Isti postupak odnosi se na stomatologa, kao i na svakog od članova stomatološkog osoblja, koje je učestvovalo u radu. U nastavku sledi kompletan dezinfekciju ordinacije i instrumenata, po uobičajnom postupku sprečavanja infekcije putem transmisije mikroba, virusa i gljivica u zdrastvenim ustanovama²⁶.

air into the mask, and which prevents contamination of the mucosa of the eyes, nose and mouth from the liquid or solid aerosol formed in the air (Figure 2).

The use of rubber dams²⁶, as well as stronger dental suction aspirators²⁶, is also desirable in order to reduce the possibility of virus transmission. Other disposable protective materials include a waterproof protective coat, a waterproof cap, 2 pairs of disposable gloves⁵¹, as well as protective disposable shoe cover that need to be water resistant.

All these protective measures also apply to assistants, nurses and other staff who are in the office while working with patients. It is advisable to arrange several interventions with patients during one visit to the dentist, whenever possible^{9,26}.

Removal of protective equipment

After finishing the work with the patient, the procedure of removing the protective equipment follows, which needs to be carried out in a disciplined manner and in a certain order. During this procedure, there must be a person who is responsible only for this procedure. Firstly, the outer gloves of the nurse who participated in the work are sprayed with disinfectant (alcohol 70-75%, 0.5%, freshly made sodium-hypochlorite – bleach, benzalkonium chloride – asepsol $\geq 1\%$), then the back of the protective coat is unbuttoned and fully taken off with outer gloves, and outer shoe cover and disposed of into a container for contaminated material. The protective visor and goggles are then removed, sprayed with disinfectant and placed into a disinfection container. This is followed by spraying the inner gloves with disinfectant. In the end, the mask is removed by taking the tape of the mask behind the ear, removing it from the face and placing it into a waste container. This is followed by a re-disinfection procedure by spraying the inner gloves, removing the inner shoe cover, and disposing of them into a container for contaminated material. This is followed by re-spraying the inner gloves with disinfectant, putting on new uncontaminated gloves, going to the locker room, removing the gloves, antiseptic hand washing and changing into a new, clean work blouse and pants for the health worker involved in the work, while the used work clothes are to be stored in the medical laundry container. It should be noted that health workers who work with high-risk

Zaključak

Od izuzetne je važnosti sprovođenje jedinstvene doktrine zaštite stomatološkog osoblja od mogućeg zaražavanja SARS-CoV-2 virusom, kao i sprečavanje zaražavanja drugim patogenim uzročnicima bolesti, u toku izvođenja stomatoloških intervencija. Ovaj postupak je izuzetno delikatan, s obzirom na to da je stomatološka profesija najugroženija profesija, sa mogućnošću zaražavanja od 100%. Glavne zaštitne mere stomatološkog osoblja odnose se na zaštitu od mašinom stvorenog aerosola, koji može da sadrži SARS-CoV-2 virus zaraženog pacijenta. Korišćenje vodonepropusne jednokratne zaštitne opreme, zajedno sa vodonepropusnim naočarima, zaštitnim vizirima, respiratornim maskama N95, sa visokim stepenom zadržavanja submikronskih čestica, sa efikasnošću od $\geq 98\%$, kao i korišćenje vodonepropusne maske za celo lice, predstavljaju moguće sigurnosne mere u sprečavanju transmisije SARS-CoV-2 virusa na stomatološko osoblje.

patients need to change their work clothes every day. The same procedure applies to the dentist, and to each of the staff members who participated in the work. What follows is a complete disinfection of the office and instruments according to the usual procedure for preventing the transmission of microbes, viruses and fungi in healthcare facilities²⁶.

Conclusion

It is extremely important to implement a unique doctrine for the protection of dental staff from possible infection with the SARS-CoV-2 virus, as well as the prevention of infection with other pathogens that cause diseases during dental interventions. This procedure is extremely delicate, considering the fact that the dental profession is the most endangered profession with the possibility of infection of 100%. The main protective measures of the dental staff are related to the protection against machine-generated aerosols that may contain the SARS-CoV-2 virus of an infected patient. The use of waterproof disposable protective equipment, along with waterproof goggles, protective visors, N95 face respirators with a submicron particle retention rate of $\geq 98\%$, and the use of a full-face waterproof mask are possible safety measures for preventing the SARS-CoV-2 transmission to the dental staff.

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EMICIZUMAB U TERAPIJI HEMOFILIJE A

EMICIZUMAB IN THE TREATMENT OF HEMOPHILIA A

Ivan R. Tijanić¹, Ivana Z. Golubović¹, Miodrag D. Vučić¹, Miloš R. Tijanić²

¹ UNIVERZITET U NIŠU, MEDICINSKI FAKULTET, KLINIKA ZA HEMATOLOGIJU, NIŠ, NIŠ, SRBIJA
¹ UNIVERZITET U NIŠU, MEDICINSKI FAKULTET, PREDMET ORALNA HIRURGIJA, KLINIKA ZA STOMATOLOGIJU, NIŠ, NIŠ, SRBIJA

¹ UNIVERSITY OF NIŠ, FACULTY OF MEDICINE, CLINIC OF HEMATOLOGY, NIŠ, NIŠ, SERBIA
² UNIVERSITY OF NIŠ, FACULTY OF MEDICINE, CLINIC OF DENTISTRY, ORAL SURGERY, NIŠ, NIŠ, SERBIA

Sažetak

Uvod: I pored značajnog napretka u terapiji Hemofilije A poslednjih decenija primenom koncentrovanih preparata osmog faktora, i dalje su povremeno prisutne epizode krvarenja. Pojava inhibitora značajno umanjuje efikasnost tradicionalne zamenske terapije, povećavajući značajno morbiditet i mortalitet kod ovih pacijenata. Emicizumab (HEMLIBRA®) je himerno bispecifično humanizovan antitelo koje premošćava aktivirani FIX i FX i tako ponovo uspostavlja funkciju aktiviranog FVIII koji nedostaje.

Cilj: Analiza literaturnih podataka o delovanju Emicizumaba u terapiji Hemofilije A.

Rezultati: Do sada sprovedene multicentrične randomizovane studije pod nazivom HAVEN su pokazale odlične rezultate ovog leka u lečenju pacijenata sa Hemofilijom A. Inhibitori FVIII se ne vezuju niti neutrališu emicizumab, pa samim tim nemaju uticaj na hemostatičku aktivnost leka. Profilaksa emicizumabom je dala značajnu redukciju lečenih krvarenja od 79% naspram grupe pacijenata na profilaksi bypassing agensima, a nakon dužeg praćenja čak 95%. I ostale studije su potvrđile dobre rezultate u lečenju i siguran bezbednosni profil, kako kod odraslih, tako i kod dece. U slučaju pojave krvarećih dogadaja ili pripreme za neodložnu hiruršku intervenciju, preporuka je davanje rFVII (NovoSeven)® po dosadašnjim vodičima.

Zaključak: Dosadašnji rezultati profilaktičke primene Emicizumaba pokazuju da se možda radi o revolucionarnom preparatu koji može značajno redukovati epizode krvarenja i popraviti kvalitet života pacijenata sa Hemofilijom A. Ipak, potrebno je dalje ispitivanje ovog leka.

Ključne reči: Emicizumab, hemofilija A, terapija

Corresponding author:

Ass. Prof. Ivan Tijanić, MD, PhD
 Dr Zoran Đindić 81, Blvd, Niš, Srbija
 E-mail: tijanic.ivan@yahoo.com

Abstract

Introduction: Despite substantial advances in the treatment of Hemophilia A with the use of concentrated factor VIII preparations during recent decades, bleeding episodes still occur from time to time. The development of inhibitors significantly reduces the efficacy of traditional replacement therapy, seriously increasing morbidity and mortality in these patients. Emicizumab (HEMLIBRA®) is a chimeric bispecific humanized antibody that bridges activated FIX and FX and thus restores the function of missing activated FVIII.

Aim: The aim of the study was to analyze the literature date of the effect of Emicizumab in the treatment of Hemophilia A.

Results: Multicenter randomized studies called HAVEN have shown excellent results of this medication in the treatment of patients with Hemophilia A. FVIII inhibitors do not bind to or neutralize Emicizumab and therefore have no effect on the hemostatic activity of the drug. Emicizumab prophylaxis produced a significant reduction in treated bleedings of 79%, compared to with the group of patients on prophylaxis with bypassing agents, while the rate grew up to even 95% after longer observation. Other studies have also confirmed good treatment results and a favorable safety profile in both adults and children. In the cases of bleeding events or preparation for immediate surgical interventions, it is recommended to user rFVII (NovoSeven)® according to previous guidelines.

Conclusion: The results of the prophylactic use of Emicizumab have so far shown that it may be a revolutionary preparation that can significantly reduce bleeding episodes and improve the quality of life of patients with Hemophilia A. Nevertheless, further testing of this drug is required.

Key words: Emicizumab, hemophilia A, treatment

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 za stomatologiju Niš. Sva prava zadržana.

Uvod

Nedostatak faktora VIII i sklonost ka krvarenju su osnovne karakteristike hemofilije A. Do pojave ove nasledne bolesti dolazi usled mutacije gena za VIII faktor, lociranog na dugom kraku X hromozoma. I pored značajnog napretka u terapiji hemofilije A, poslednjih decenija primenom koncentrovanih preparata osmog faktora, i dalje su povremeno prisutne epizode krvarenja. Naročito je izraženo kod pacijenata koji se leče po potrebi, a manje kod pacijenata na profilaktičkoj terapiji preparatima koncentrovanog VIII faktora. Pojava rekombinantnog preparata faktora VIII unapredila je efikasnost terapije i smanjila rizik od transmisionih bolesti. Takođe, pojava rekombinantnog preparata faktora VIII je, u razvijenim zemljama u poslednjih 25 godina, omogućila produženje prosečnog životnog veka do nivoa opšte muške populacije¹.

Pojava anti-FVIII aloantitela predstavlja najznačajniju komplikaciju terapije i javlja se kod trećine obolelih sa teškom formom bolesti. Pojava inhibitora značajno umanjuje efikasnost tradicionalne zamenske terapije, povećavajući značajno morbiditet i mortalitet kod ovih pacijenata². Dosadašnja terapija krvarećih epizoda kod pacijenata sa inhibitorima podrazumevala je primenu preparata premošćavanja (*bypassing agents*), kao što su koncentrat aktiviranog protrombinskog kompleksa (FEIBA)[®] i rekombinantnog aktivisanog faktora VII (NovoSeven)[®].

Zbog toga se ukazala potreba za razvojem novih i efikasnijih hemostatskih preparata³.

Emicizumab – novi terapijski pristup u lečenju hemofilije a

Emicizumab (HEMLIBRA)[®] je himerno bispecifično humanizovano antitelo, koje premošćava aktivirani FIX i FX i tako ponovo uspostavlja funkciju aktiviranog FVIII, koji nedostaje, a neophodan je kako bi hemostaza bila delotvorna. Fiziološki mehanizam delovanja FVIII, po tipu prekidača uključeno isključeno, dejstvom emicizumaba preveden je u konstantni uključeni položaj⁴. Inhibitori FVIII ne vezuju se za emicizumab, niti neutrališu delovanje ovog antitela, pa samim tim nemaju uticaj na hemostatičku aktivnost leka.

Introduction

Factor VIII deficiency and bleeding tendency are the basic characteristics of Hemophilia A. The appearance of this inherited disease is due to a mutation in the factor VIII gene located on the long arm of the X chromosome. Despite substantial advances in the treatment of Hemophilia A with the use of concentrated factor VIII preparations during recent decades, bleeding episodes still occur occasionally. It is especially pronounced in patients who are treated on-demand, and less so in patients on prophylactic therapy with concentrated factor VIII preparations. The appearance of a recombinant factor VIII preparation has improved the efficacy of treatment and reduced the risk of communicable diseases. In the last 25 years in developed countries, it has also enabled the extension of the average life expectancy to the level of a general male population¹.

The appearance of anti-FVIII alloantibodies is the most significant treatment complication and occurs in one third of patients with a severe form of the disease. The development of inhibitors significantly reduces the efficacy of traditional replacement therapy, seriously increasing morbidity and mortality in these patients². Previous treatment of bleeding episodes in patients with inhibitors has involved the use of bypassing agents such as activated prothrombin complex concentrate (FEIBA) and recombinant activated factor VII (NovoSeven)[®].

Therefore, the need has been felt for the development of new and more efficient hemostatic preparations³.

Emicizumab – a new therapeutic approach in the treatment of hemophilia a

Emicizumab (HEMLIBRA)[®] is a chimeric bispecific humanized antibody that bridges activated FIX and FX and thus restores the function of missing activated FVIII, and it is essential for hemostasis to be effective. The physiological “on-off” switch mechanism of FVIII performance was converted into a constant “on” position by the action of Emicizumab⁴. FVIII inhibitors do not bind to or neutralize Emicizumab and therefore have no effect on the hemostatic activity of the drug.

So far, multicenter randomized studies called HAVEN have shown excellent results of this medicine in the treatment of patients with Hemophilia A.

Rezultati primene emicizumaba

Do sada sprovedene multicentrične randomizovane studije pod nazivom *HAVEN* pokazale su odlične rezultate ovog leka u lečenju pacijenata sa hemofilijom A.

HAVEN 1 studija objavljena 2017. godine uključivala je 109 pacijenata starijih od 12 godina sa visokim titrom inhibitora. Godišnja stopa krvarenja (ABR) iznosila je 2,9 događaja u grupi pacijenata na profilaksi emicizumabom, naspram 23,3 ABR u grupi pacijenata bez profilakse, što predstavlja razliku od 87% u korist profilakse emicizumabom. Profilaksa emicizumabom dala je značajnu redukciju lečenih krvarenja od 79%, naspram grupe pacijenata na profilaksi bypassing agensima, a nakon dužeg pranja redukciju od čak 95%. Ozbiljni neželjeni događaji zabeleženi su kod 3 pacijenta u vidu trombotične miroangiopatije i kod 2 pacijenta sa trombotičnim događajima, ali samo kada je aPCC (FEIBA)[®] uporedno primenjivana u prosečnoj dozi većoj od 100 U/kg dnevno⁵.

HAVEN 3 studija uključila je 152 pacijenta starija od 12 godina bez prisustva inhibitora. Značajna redukcija lečenih krvarenja od 97% postignuta je u grupi pacijenata lečenih emicizumabom, naspram grupe pacijenata lečenih na zahtev preparatima koncentrovanog FVIII. Takođe, zabeležena je značajna redukcija lečenih krvarenja od 68% je iznosila u odnosu na grupu pacijenata na profilaksi koncentrovanim FVIII. Nije bilo ozbiljnijih neželjenih događaja.

I ostale studije su potvrdile dobre rezultate u lečenju i siguran bezbednosni profil, kako kod odraslih, tako i kod dece⁶.

Doziranje leka je u prve 4 nedelje 3 mg/kg (udarna doza), a zatim se nastavlja dozom održavanja od 1,5 mg/kg nedeljno ili 3 mg/kg jednom u 2 nedelje ili 6 mg/kg jednom u 4 nedelje.

Lek je registrovan u više od 90 zemalja. U Srbiji je registrovan za profilaktičko lečenje pacijenata sa hemofilijom A, ali je na pozitivnoj listi samo za pacijente sa prisustvom inhibitora.

U slučaju pojave krvarećih događaja ili pripreme za neodložnu hiruršku intervenciju, preporuka je davanje rFVII (NovoSeven)[®], po dosadašnjim vodičima.

Uticaj leka emicizumab na testove, koji se rutinski primenjuju u hemofiliji, poseban je problem⁷. Emicizumab značajno utiče na rezultate sledećih testova: aktivisano parcijalno tromboplastinsko vreme (aPTT), aktivnost FVIII i titar inhibitora FVIII.

Results of therapeutic approach with emicizumab

The *HAVEN* 1 study published in 2017 included 109 patients older than 12 years with high-titer inhibitors. The annualized bleeding rate (ABR) was 2.9 bleedings in the Emicizumab prophylaxis group, compared with 23.3 ABR in the prophylaxis-free group, which represents a difference of 87% in favor of Emicizumab prophylaxis. Emicizumab prophylaxis produced a significant reduction in treated bleedings of 79%, compared to the group of patients on prophylaxis with bypassing agents, while the rate grew up to even 95% after longer observation. Serious adverse events were reported in 3 patients in the form of thrombotic myopathy and in 2 patients with thrombotic events, but only when aPCC (FEIBA)[®] was co-administered at an average dose higher than 100 U / kg per day⁵.

The *HAVEN* 3 study included 152 patients 12 years of age or older without the presence of inhibitors. A significant reduction of 97% in treated bleedings was achieved in the emicizumab-treated group versus the group treated on-demand with concentrated FVIII preparations. Also, a significant reduction in treated bleedings of 68% was recorded in relation to the group on prophylactic therapy with concentrated FVIII. There were no serious adverse events.

Other studies have also confirmed good treatment results and a favorable safety profile in both adults and children⁶.

The dosage of the medicament is 3 mg/kg (loading dose) in the first 4 weeks, and then it is continued with a maintenance dose of 1.5 mg/kg per week or 3 mg/kg once in 2 weeks or 6 mg/kg once in 4 weeks.

The drug is registered in more than 90 countries. In Serbia, it is registered for the prophylactic treatment of patients with Hemophilia A, but it is in the positive list of medications only for patients with the presence of inhibitors.

In the cases of bleeding events or preparation for unpostponable surgical intervention, it is recommended to use rFVII (NovoSeven)[®] according to previous guidelines.

The effect of Emicizumab on tests routinely applied in hemophilia represents a particular problem⁷. Emicizumab significantly affects the results of the following tests: activated partial thromboplastin time (aPTT), FVIII activity and FVIII inhibitor titers. In order to get the correct results, it is necessary

Da bi se dobili ispravni rezultati, potrebno je raditi hromogene testove, ali je malo laboratorija opremljeno ovim testovima. Radi se na rešenju ovog problema.

Inače, kod pacijenata koji primaju emicizumab profilaktički, nema potrebe za testiranjem u vezi primene leka.

Zaključak

Dosadašnji rezultati profilaktičke primene emicizumaba pokazuju da se možda radi o revolucionarnom preparatu, koji može značajno redukovati epizode krvarenja i popraviti kvalitet života pacijenata sa hemofilijom A. Ipak, potrebno je dalje ispitivanje ovog leka, u smislu njegove efikasnosti i bezbednosti, kao i primene sa drugim lekovima u posebnim situacijama (krvareće epizode, priprema za hirurške intervencije).

to do chromogenic tests, but few laboratories are equipped with these tests. Efforts are being made toward solving this problem.

Apart from that, in patients receiving prophylaxis with Emicizumab, there is no need for testing regarding the use of medication.

Conclusion

Previous results of the prophylactic use of Emicizumab have so far shown that it may be a revolutionary preparation that can significantly reduce bleeding episodes and improve the quality of life of patients with Hemophilia A. However, further testing of this drug is needed, in terms of its efficacy and safety, as well as its co-administration with other drugs in special situations (bleeding episodes, preparation for surgical interventions).

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