VOLUMEN/VOLUME **34** • BROJ/NUMBER 7**7**• STRANE/PAGES **1793 - 1841**• **JUN/JUNE** 201**8**

ACTA STOMATOLOGICA NAISSI

Zvanični časopis Univerziteta u Nišu, Medicinskog fakulteta i Klinike za stomatologiju

Offical publication of the University of Niš, Faculty of Medicine and Clinic of Dentistry

YU-ISSN 0352-5252 **UDK.616.31 (05)(06)(479.11)**

Acta Stomatologica NAISSI

ASN YU-ISSN-0352-5252
UDK.616.31(05)(06)(479.11)

ZVANIČNA PUBLIKACIJA UNIVERZITETA U NIŠU,
MEDICINSKOG FAKULTETA
I KLINIKE ZA STOMATOLOGIJU

OFFICIAL PUBLICATION OF THE UNIVERSITY OF NIŠ,
FACULTY OF MEDICINE AND
CLINIC OF DENTISTRY

ISSN (electronic version) 1820-1202

ČASOPIS INDEKSIRAN U *ONLINE* BIBLIOTECI
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Časopis se štampa dva puta godišnje u junu i decembru. Pretplata za 2014 godinu je 5000,00 dinara za fizička lica, a za ustanove 10000,00 dinara. Pretplata se uplaćuje na tekući račun – Klinika za stomatologiju u Nišu br. 840-591667-33, sopstvena sredstva.
The Journal is published two times a year in June and December. Subscription for 2014. is 50 € for individuals, and 100€ for institutions. For detailes of payment contact: e-mail: tijanicm@yahoo.com.

Časopis finansiraju / The Journal is financially supported by:
Ministarstvo nauke Republike Srbije
(rešenje br. 451-03-2489/2002-02; 451-03-330/2003-02; 451-03-884/2004-02; 451-03-4180/2005-02;451-03-286/2009/2010-02/1; 451-03-1143/2011-14-2)
Medicinski fakultet i Klinika za stomatologiju u Nišu.
Ministry of Science Republic of Serbia
(decision # 451-03-2489/2002-02; 451-03-330/2003-02; 451-03-884/2004-02; 451-03-4180/2005-02;451-03-286/2009/2010-02/1; 451-03-1143/2011-14-2)
Faculty of Medicine and Clinic of Dentistry Nis

ŠTAMPA / PUBLISHER

GALAKSIJANIS
Lukovo, Svrljig

ELSEVIER

Bibliographic Databases

Univerzitet U Nisu
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Acta Stomatologica NAISSI

Jun / June 2018, vol. 34, br./numb. 77, str./p 1793 - 1841

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Od 1. januara 2012. godine Acta Stomatologica Naissi je u sistemu ELEKTRONSKOG UREĐIVANJA ČASOPISA (e-Ur) .

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http://scindeks-eur.ceon.rs/index.php/asn

Primljen/ Recived on: 18.02.2018
Prihvaćen/ Accepted on :16.03.2018

ORIGINALNI RAD
ORIGINAL ARTICLE
doi: 10.5937/asn1877793M

ALERGIJSKE MANIFESTACIJE U USNOJ DUPLJI

ALLERGIC MANIFESTATIONS IN ORAL CAVITY

Ivan Minić [1], Ana Pejčić[2], Radmila Obradović[2], Dimitrije Mirković[3], Marija Bradić[3]

[1] UNIVERZITET U NIŠU, MEDICINSKI FAKULTET, KLINIKA ZA STOMATOLOGIJU, SLUŽBA ZA PARODONTOLOGIJU I ORALNU MEDICINU, STUDENT NA DOKTORSKIM STUDIJAMA, NIŠ, SRBIJA
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[3] PRIVATNA STOMATOLOŠKA ORDINACIJA "SMILE – DENT", NIŠ, SRBIJA

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Sažetak

Uvod: *Alergija je neuspešan odgovor organizma protiv stranih antigena. Ponovno uvođenje iste strane materije u organizam izaziva reakciju koja dovodi do uništavanja sopstvenog tkiva. Alergijske reakcije se mogu izraziti u različitim organima i u bilo kojoj starosnoj grupi.*
Materijal i metode: *U ovom radu učestvovalo je 84 pacijenta. Dijagnoza je zasnovana na pozitivnoj anamnezi preordiniranja leka, ugriza insekata, ranijih alergijskih reakcija, kao i tipične kliničke slike. Pratile su se varijante alergijskih promena , kao i najčešći uzroci njihove pojave. U potrazi za najčešćim alergenima, lekovi u stomatološkoj praksi takođe su smatrani potencijalnim pokretačima alergijskih događaja.*
Rezultati: *Najčešći oblik alergijske reakcije bio je Stomatitis allergica i Enanthema fixum, sa lokalizacijom na dorzalnoj površini jezika i sluzokožom obraza. Skoro polovina registrovanih pacijenata prijavila je promenu nakon uzimanja odgovarajućeg leka iz grupe sulfonamida i penicilina.*
Zaključak: *Ako je uzrok alergija poznat, prevencija kontrole alergijske reakcije je na prvom mestu. Visoka prevalenca alergijskih bolesti, poboljšane dijagnostičke procedure i tretmani imali su veliki uticaj na pružanje medicinske zaštite pacijentima sa alergijom . Ponekad možda neće biti moguće potpuno izbeći alergijsku reakciju , ali ovi koraci mogu pomoći u sprečavanju budućih alergijskih reakcija . Lekari treba da usvoje jasne nazive alergijskih poremećaja i pridržavaju se nomenklature u njihovoj profesionalnoj i javnoj komunikaciji.*

Ključne reči: *alergija, usna duplja, promene u ustima*

Corresponding author:
Ass. Prof. Ana Pejčič, DDS, MSc, PhD.
Periodontology and Oral Medicine
Faculty of Medicine, University of Niš
Dr. Z. Djindjić 81 Blvd. 18000 Niš, Serbia
+381642572178

Abstract

Introduction: *An allergy is the failed defensive effort of the organism against foreign antigens. Reintroduction of the same foreign substance into the organism causes a reaction that leads to the destruction of one's own tissue. Allergic reactions can express themselves in many different organs and in any age group.*
Material and methods: *In this paper, 84 patients were involved. The diagnosis was based on a positive history of pre-administration of a medicine, an insect bite, earlier allergic reactions, as well as a typical clinical picture. Variants of allergic changes, as well as the most common causes for their occurrence, were monitored. Looking for the most common allergens, dental practice drugs were also considered as potential drivers of allergic events.*
Results: *The most common form of allergic reaction was Stomatitis allergica and Enanthema fixum, with localization on the dorsal surface of the tongue and the mucous membrane of the cheeks. Almost half of the registered patients reported a change after taking the appropriate group of drugs: sulfonamides and penicillins.*
Conclusion: *If the cause of allergies is known, preventive control of an allergic reaction are in the first place. The high prevalence of allergic diseases and improved diagnostic procedures and treatments have had a great impact on the provision of medical care to allergic patients. Sometimes, it may not be possible to completely avoid allergic reaction, but these steps can help to prevent future allergic reactions. Physicians should adopt clear designations of the allergic disorders and adhere to this nomenclature in their professional and public communications.*

Key words: *allergy, oral cavity, oral changes*

Uvod

Brzi, eksplozivni razvoj civilizacije i tehnologije, pored ogromnih prednosti za čovečanstvo, sa sobom nosi i niz neželjenih efekata. Ljudski organizam se sa razvojem tehnologije više nego ikada sreće sa nesagledivim ekološkim problemima i zagađenjem okoline. Hemijski, bakteriološki, fizičko-toksični, radioaktivni i dr. agensi predstavljaju opasnost sveopšteg opstanka na zemlji, ljudskog, životinjskog i biljnog sveta. Svaki živi organizam, s njim i čovek, u biti nosi poriv za održanjem vrste. Postoji period adaptacije više od 400 miliona godina[1] za ćelije, tkiva, organe i sam organizam. U tom evolutivnom periodu stvorili su se mehanizmi prepoznavanja „svojeg od tuđeg“. Ta pojava prepoznavanja sreće se još kod najjednostavnijih životinjskih vrsta (sunđeri, alge). U evolutivnom procesu postoje sve samo složenije i savršenije.

Zdrava individua se može zaštititi od mogućih štetnih mikroorganizama iz okoline efikasnim mehanizmima koje ima još od rođenja. To je tzv. urođeni nespecifični imunitet. Glavni činioci tog urođenog nespecifičnog imuniteta su genetski determinisani. Za razliku od urođenog, postoji i stečeni imunitet, koji zavisi od imunog odgovora na pojedini antigen, i on je specifičan samo za taj antigen[2,3].

Najznačajnije komponente nespecifičnog imuniteta su: intaktna koža, sluzokoža sa lojnim i znojnim žlezdama i njihovim sekretima, kao i lizozimi. To je mehanička barijera za mnoge agense. Određenu ulogu u nespecifičnoj odbrani organizma ima i normalna telesna temperatura, fagociti (mikro i makrofage), serumski komplementi. Ipak, ukoliko agensi (mikroorganizmi) savladaju nespecifični urođeni imunitet, tzv, “prvu liniju odbrane”, organizam pokušava da se brani “drugom linijom odbrane”, odnosno stečenim imunitetom[4].

Za razliku od urođenog, stečeni imunitet zavisi od imunog odgovora na pojedini antigen i specifičan je samo za taj antigen. Da bi do imunog odgovora došlo, potreban je predhodni kontakt organizma, odnosno ćelija imunog sistema (mikrofaga i limfocita) sa antigenom[5,6].

Brzi razvoj farmaceutske industrije omogućio je uvođenje brojnih novih sintetskih i prirodnih medikamenata. Ti medikamenti se koriste za lečenje bolesti, ublažavanje simptoma bolesti, kao i za skraćenje dužine trajanja bolesti.

Introduction

The rapid, explosive development of civilization and technology, besides the enormous benefits for humankind, brings about a number of unwanted effects. With the technology development, the human organism, more than ever, encounters incomprehensible ecological problems and environmental pollution. Chemical, bacteriological, physical-toxic, radioactive, etc. agents pose a threat to the overall survival on the Earth, human, animal and plant life. Every living organism, and the man with it, essentially carries the urge to maintain the species. There is a period of adaptation of more than 400 million years[1] for cells, tissues, organs and the body itself. In this evolutionary period, mechanisms for distinguishing "own" and "someone else’s" were created. This phenomenon of recognition is found even in the simplest animal species (sponges, algae). In the evolutionary process, everything becomes more complex and more perfect.

A healthy individual can be protected from possible harmful microorganisms from the environment with effective mechanisms it develops since birth. This is the so-called innate non-specific immunity. The main factors of this innate non-specific immunity are genetically determined. Unlike innate, there is acquired immunity that depends on the immune response to an individual antigen, and it is specific only to that antigen[2,3].

The most important components of non-specific immunity are intact skin, mucous membrane with sebaceous glands and sweat glands and their secretions, as well as lysozymes. This is a mechanical barrier to many agents. Certain role in the non-specific defence of the organism belongs to normal body temperature, phagocytes (micro and macrophages), serum complements. However, if the agents (microorganisms) overcome non-specific innate immunity, the so-called "first line of defence", the organism tries to defend itself using the "second line of defence" or acquired immunity[4].

Unlike innate, acquired immunity depends on the immune response to an individual antigen and is specific to that antigen only. In order to obtain an immune response, a prior contact of the organism or the immune system cells (microphages and lymphocytes) with antigen[5,6] is required.

The rapid development of the pharmaceutical industry has enabled the introduction of numerous new synthetic and natural medications.

Međutim, svaki od medikamenata može biti potencijalni alergen u smislu stvaranja senzibilizacije organizma[7].

Cilj rada bio je da se iznese broj alergijskih manifestacija u ustima u periodu od tri godine (2014.-2016.) na Klinici za stomatologiju Medicinskog fakulteta u Nišu.

Materijal i metode

U ovom radu obrađeno je 84 pacijenta, koji su se javili Službi za oralnu medicinu i parodontologiju Klinike za stomatologiju Medicinskog fakulteta u Nišu zbog pojave različitih promena u usnoj duplji koje nisu prolazile. Uzimanje anamneze i klinički pregled obavljeni su od strane jednog specijaliste oralne medicine i parodontologije korišćenjem stomatološkog ogledalceta pri veštačkom osvetljenju. Dijagnoza se zasnivala na pozitivnoj anamnezi o prethodnom uzimanju leka, ujedu nekog insekta, ranijim alergijskim reakcijama kao i tipičnoj kliničkoj slici.

Pored broja obolelih, praćene su i varijante alergijskih promena, kao i najčešći uzročnici zaslužni za njihovo pojavljivanje. Tragajući za najčešćim alergenima, u obzir su uzeti i lekovi iz stomatološke prakse, kao mogući pokretači alergijskih zbivanja.

Rezultati rada

U periodu od tri godine, u Službi oralne medicine i parodontologije, registrovano je 84 pacijenta sa alergijskim reakcijama na sluzokoži usne duplje. Od 84 ispitanika, četrdeset i devet je bilo ženskog, a 35 osoba muškog pola, različite starosne dobi (tabela1).

These medications are used to treat diseases, alleviate disease symptoms and shorten disease duration. However, each of the medicines can be a potential allergen in terms of creating organism sensitization[7].

The aim of this paper was to present the number of allergic manifestations in the mouth of patients treated at the Clinic of Dentistry, Faculty of Medicine in Niš during a 3 year period (2014-2016).

Material and methods

In this paper, 84 patients with various lasting changes in the oral cavity who attended the Department of Oral Medicine and Periodontology were investigated.

Taking of a history and clinical examination was performed by a specialist in oral medicine and periodontology using a mouth mirror in artificial lighting. The diagnosis was based on a positive history of pre-administration of a drug, an insect bite, earlier allergic reactions, and a typical clinical picture.

In addition to the number of patients, variants of allergic changes, as well as the most common causes for their occurrence, were monitored. Looking for the most common allergens, dental practice drugs were also considered as potential drivers of allergic events.

Results

In the period of 3 years, 84 patients with allergic reactions on the oral cavity mucous membrane were registered in the Department of Oral Medicine and Periodontology. Out of 84 respondents, 49 were females, and 35 were males of different ages (Table 1).

Tabela 1. Starosna i polna struktura pacijenata
Table 1. The age and gender structure of patients

Ispitanici **Respondents**	**Broj, procenat** **Number, percentage**
Pol Gender	
Muški-male	35 (41.20%)
Ženski-female	49 (58.80%)
Godine Age	
21-40	47 (55.95%)
41-60	26 (30.95%)
> 61	11 (13.10%)
Ukupno Total	84 (100%)

Od toga, 40 pacijenata bilo je sa dijagnozom *Stomatitis allergica*, 34 pacijenta sa dijagnozom *Enanthema fixum*, 6 pacijentata sa dijagnozom *Cheilitis allergica* i 4 pacijenta sa dijagnozom *Oedema Quincke* (tabela 2).

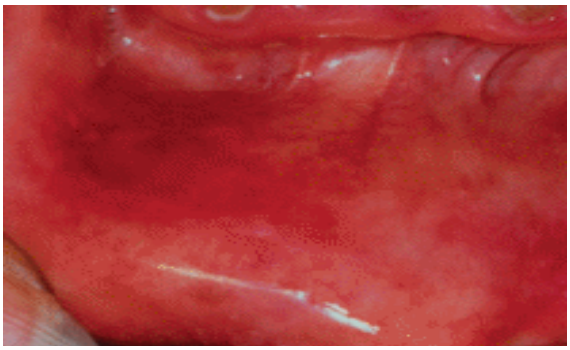
Of these, 40 patients were diagnosed with *Stomatitis allergica*, 34 patients were diagnosed with *Enanthema fixum*, 6 patients were diagnosed with *Cheilitis allergica* and 4 patients were diagnosed with *Oedem Quincke* (Table 2).

Tabela 2. Kliničke manifestacije alergijske reakcije na oralnoj sluzokoži
Table 2. Clinical manifestations of allergic reactions on the oral mucous membrane

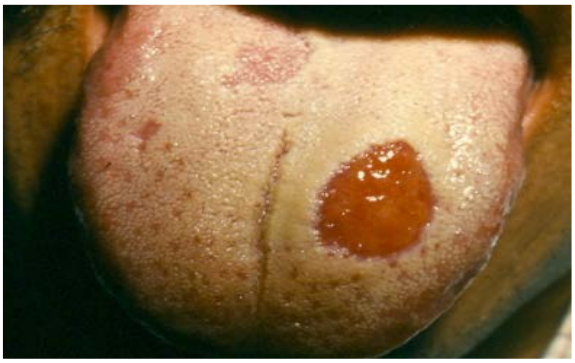
Oboljenje **Disease**	**Muškarci** **Male**	**Žene** **Female**	**Broj, procenat (n,%)** **Number, percentage**
Stomatitis allergica	18	22	40 (47.62%)
Enethema fixum	16	18	34 (40.47%)
Cheilitis allergica	-	6	6 (07.14%)
Oedema Quincke	1	3	4 (04.77%)
Ukupno **Total**	35	49	84 (100%)

Kliničke manifestacije Stomatitis allergica karakteriše polimorfizam promena, što je uslovljeno stepenom senzibilizacije. Pacijenti dolaze sa enetemom i edemom čitave oralne sluzokože i pojavom erozija i ulceracija koje nastaju prskanjem vezikula i bula. Usled edema, na jeziku se vide impresije zuba, a jezik je manje pokretljiv. Promene su praćene subjektivnim tegobama u vidu bola, pečenja i žarenja, što je još više izraženo pri žvakanju i govoru. Kod pacijenata se oseća neprijatan zadah, jer je otežana oralna higijena ili je ona najčešće odsutna (sl.1).

Clinical manifestations of Stomatitis allergica were characterized by the polymorphism of changes, which was conditioned by the degree of sensitization of patients coming with enanthema and edema of the entire oral mucosa and the occurrence of erosions and ulcers resulting from bursting of vesicles and bulla. Due to edema, teeth impressions were visible on the tongue, and the tongue was less mobile. The changes were accompanied by subjective problems in the form of pain and burning sensation, which were even more pronounced when chewing and speaking. Patients had unpleasant breath because oral hygiene maintenance was difficult or often absent (Fig. 1).



Slika 1. / ***Figure 1***. *Stomatitis allergica*



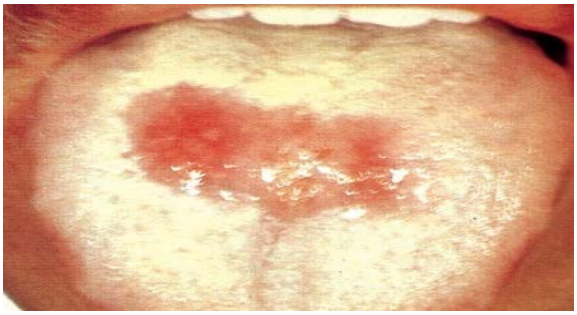
Slika 2. / Figure 2. *Enanthema fixum*

Kod ispitivanih pacijenata čest oblik alergijske reakcije je i *Enanthema fixum*. Promene su uglavnom bile lokalizovane na dorzalnoj strani jezika i sluzokoži nepca. Klinička slika ovih erupcija je takođe polimorfna.

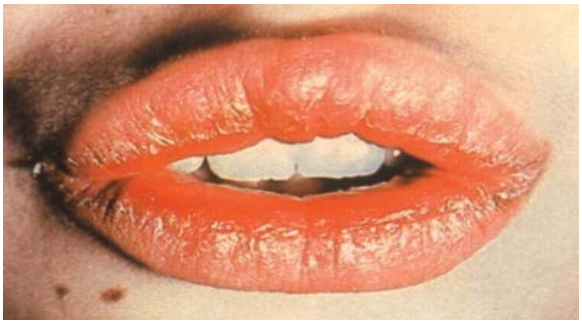
In the examined patients, the frequent form of allergic reaction was *Enanthema fixum*. The changes were mostly localized on the dorsal side of the tongue and the palate mucous membranes.

Bolest može da se javi samo u vidu enantema pravilnog oblika, jasno ograničenog od okoline. Češće se na mestu erupcije javljaju bule ili vezikule, čijim prskanjem ostaju široko erodovane površine pokrivene krpama epitela i fibrinoznim eksudatom žućkasto sive boje. Subjektivne tegobe su u korelaciji sa veličinom i dubinom oštećene oralne sluzokože (sl.2).

The clinical picture of these eruptions was also polymorphic. The disease could only occur in the form of enanthema of the regular form clearly delineated from the environment. More often, at the site of the eruption, bullas or vesicles appeared whose bursting resulted in widely eroded surfaces covered with epithelial cloths and fibrinous exudates of yellowish-gray color. Substantial complaints were in correlation with the size and depth of damaged oral mucosa (Fig. 2).



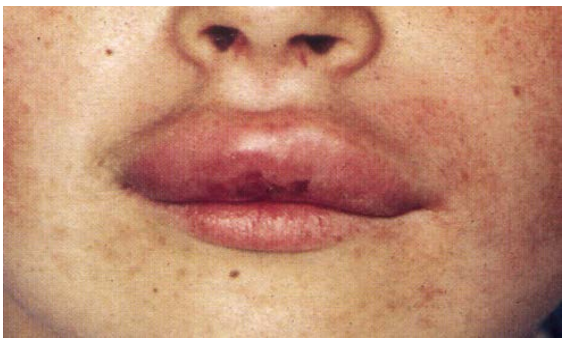
Slika 3. / ***Figure 3.*** *Candida albicans*



Slika 4. / ***Figure 4.*** *Cheilitis allergica*

Moguće su disfagija i hipersalivacija. Usled otoka jezika javljaju se smetnje pri govoru. U hipertrofiji jezičnog pokrivača vidno učešće uzimaju gljivice tipa *Candida.* Dolazi do jasno uočljivog kontrasta između enetema, erozije i belih naslaga na jeziku (sl. 3). Kod 6 pacijenata ženskog pola alergijske reakcije su klinički opisane kao *Cheilitis allergica.* Kod svih je bio prisutan enantem i edem usana i to češće gornje usne. Promene su nastajale naglo sa izraženim subjektivnim tegobama zategnutosti usana, svraba i smanjene pokretljivosti usne (sl. 4).

Dysphagia and hypersalivation were possible. Speech impediments occurred due to tongue swelling. Candida type fungi significantly participated in the hypertrophy of the tongue cover. There was a clearly visible contrast between enanthema, erosion and white deposits on the tongue (Figure 3). In 6 female patients, allergic reactions were clinically described as *Cheilitis allergica*. In all of them, there were lip enanthema and edema, involving more often the upper lip. Changes occurred suddenly with pronounced subjective problems in the form of tension, itching and decreased mobility of the lips (Figure 4).



Slika 5. / ***Figure 5.*** *Oedema Quincke*

Oralne manifestacije alergije javljaju se u sklopu angioneurotičnog edema (Oedema Quincke), što potvrđuje njegov nalaz kod četiri pacijenta. Kod njih je otok naglo nastajao i naglo nestajao. Kod jedne pacijentkinje, prema anamnestičkim podacima, otok je nastao posle uzimanja leka zbog migrenoznih bolova i to po drugi put, dok ostali nisu mogli da objasne njegovu pojavu. Otok je zahvatao usne, obraz i očne kapke (slika 5.). Rezultati pojedinih oblika alergijskih reakcija prema godinama ispitivanja (2014, 2015, 2016) prikazani su u tabeli 3.

Kod 37 pacijenata (44.01%) alergijske reakcije pojavile su se kao reakcija na lekove. Iz anamneze su dobijeni podaci da su lekovi uzimani zbog upale grla, infekcije urinarnog trakata ili nekih bolova, jedan ili više dana. Kod nekoliko pacijentata postojao je i raniji kontakt sa istim lekom i sa sličnom kliničkom slikom. Kod ostalih, promene su se javile po prvi put.

Oral manifestations of the allergy occurred as part of angioneurotic edema (Oedema Quincke), which was confirmed by the findings in 4 patients. In them, the swelling suddenly emerged and suddenly disappeared. According to history data, in one patient, the swelling occurred after taking the migraine pain drug for the second time, while others could not explain its appearance. The swelling covered the lips, cheek and eyelids (Figure 5).

The results of individual forms of allergic reactions by the years of examination (2014, 2015, 2016) are shown in Table 3.

In 37 patients (44.01%) allergic reactions emerged as a reaction to drugs. The history data showed the administration of medicines for throat inflammation, urinary tract infections or some pain for one or more days. In several patients, there was an earlier contact with the same drug and a similar clinical picture. In others, changes were reported for the first time. Table 4 shows the drugs that most often cause allergic reactions on the oral mucous membrane.

Tabela 3. Učestalost alergijskih reakcija u toku ispitivanja
Table 3. Frequency of allergic reactions during testing

Godina Year	Stomatitis allergica	Enanthema fixum	Cheilitis allergica	Oedema Quincke
2014	9	8	1	1
2015	16	15	3	1
2016	15	11	2	2
Ukupno Total	40	34	6	4

Tabela 4. Vrste lekova i oralne manifestacije alergija
Table 4. Types of drugs and oral manifestations of allergies

Lek / promena Drug / change	Stomatitis allergica	Enanthema fixum	Cheilitis allergica	Oedema Quincke	Broj, procenat Number, percentage (n, %)
Bactrim	7	15	-	-	22 (27.29%)
Pentrexyl	2	-	-	2	4 (4.79%)
Cefachor	2	2	-	-	4 (4.79%)
Cliacil	1	2	-	-	3 (3.57%)
Brufen	2	-	-	1	3 (3.57%)
Chloramphenicol	-	-	1	-	1 (1.21%)
Ostali uzroci Other causes	27	11	5	3	46 (54.78%)
Ukupno Total	40	34	6	4	84 (100%)

U tabeli 4. prikazani su lekovi koji najčešće daju klinički manifestne alergijske reakcije na oralnoj sluzokoži.

U 22 slučaja promene su nastale perioralnom primenom kombinacije sulfametaksazol-trimetropina (Bactrim). U četiri slučaja, posle primene fenilaminoacetil-aminopenicilinske kiseline (Pentrexyl) i u 4 slučaja primene cefahlora (Cefaklor), došlo je do pojave fiksnih erupcija, alergijskog stomatitisa i Quinckeovog edema. Fenoksimetilpenicilin-kalijum (Cliacil) je promene po tipu generalizovane oralne alergije i fiksne erupcije izazvao kod tri pacijenta, dok su nesteroidni antireumatici (Brufen) izazvali pojavu fiksne erupcije i Quinckeovog edema (tri pacijenta). Alergijski heilitis se javio kod jednog pacijenta koji je koristio hloramfenikol (Chloramphenicol). Kod preostalih 47 pacijenata pojavu alergijskih reakcija u usnoj duplji izazvali su drugi uzroci.

Diskusija

Analiza rezultata pokazuje da je u periodu od 2014. do 2016. godine registrovano 84 pacijenta sa alergijskim reakcijama na oralnoj sluzokoži. Najčešće alergijske reakcije su oblika Stomatitis allergica i to kod 40 pacijenata (47,61%) i Enanthema fixum kod 34 pacijenta (40,47%). Verovatno je prisutan i veći broj pacijenata sa bilo kojim tipom alergijske reakcije oralne sluzokože koji nisu registrovani. S obzirom da se u svakodnevnoj praksi sa alergijom sreću i lekari opšte prakse, dermatovenerolozi, pediijatri i specijalisti drugih medicinskih disciplina, to je i razlog što taj broj nije mnogo veći.

Kod 37 pacijenata (44,01%) alergijske reakcije su bile posledica uzimanja lekova. Kod ostalih 47 pacijenata (55,9%) promene su bile rezultat drugih uzroka (hrana, ujed insketa, prašina itd.). Rezultati ovog istraživanja pokazali su najveću osetljivost oralne sluzokože nakon primene sulfonamida i antibiotika (penicilinskih preparata). Ove lekove neki pacijenti su više puta konzumirali i kod nekih je već bilo promena, a kod nekih su se prvi put javili.

Od sulfonamidskih preparata, Bactrim je najčešći uzročnik pojava alergijskih reakcija u organizmu[8]. U ovom ispitivanju, kao uzročnik pojave alergije javio se kod 22 pacijenta. S obzirom da se Bactrim najčešće primenjuje u lečenju urinarnih infekcija, verovatno je i najviše registrovanih alergijskih reakcija izazvanih ovim lekom. Većina autora iznosi reakcije na ovaj lek po tipu fiksne erupcije[9 - 11],

In 22 cases, changes were caused by perioral application of the sulfamethaxazol-trimethopine combination (Bactrim). In 4 cases, after the application of phenylaminoacetyl-amino-penicillinic acid (Pentrexyl) and in 4 cases after the application of cefahlor (Cefachlor), fixed eruptions, allergic stomatitis and Quincke's edema appeared. Phenoxymethylpenicillin-potassium (Cliacil) caused changes in the form of generalized oral allergy and fixed eruption in 3 patients, while non-steroidal antirheumatics (Brufen) caused the occurrence of fixed eruption and Quincke's edema (3 patients). Allergic heilitis occurred in one patient using Chloramphenicol. For the remaining 47 patients, allergic reactions in the oral cavity were caused by other causes.

Discussion

The analysis of the results shows that in the period 2014-2016, 84 patients with allergic reactions in oral mucous membranes were registered. The most common allergic reactions are Stomatitis allergica in 40 patients (47.61%) and Enanthema fixum in 34 patients (40.47%).

There is probably a higher number of patients with any type of oral mucous membrane allergic reactions that were not registered. Given that also general practitioners, dermatovenerologists, paediatricians and specialists in other medical disciplines encounter allergies in their everyday practice, this is the reason why this number is not much higher.

In 37 patients (44.01%) allergic reactions were the result of taking medications. In the remaining 47 patients (55.9%) the changes were the result of other causes (food, insect bite, dust, etc.). The results of this study showed the highest sensitivity of oral mucosa after the administration of sulphonamide antibiotics (penicillin preparations). Some of the patients took these medications repeatedly and some of them already faced changes, while in some they appeared for the first time.

Of sulphonamide preparations, Bactrim is the most common cause of allergic reactions in the body[8]. In this study, it emerged as a cause of allergy in 22 patients. Since Bactrim is most commonly used in the treatment of urinary infections, probably, the most commonly reported allergic reactions are caused by this medicine. Most authors report reactions to this medicine by the type of fixed eruption[9 - 11], which is confirmed by the results of this study.

što potvrđuju i rezultati ovog ispitivanja. Pored promena na oralnoj sluzokoži, promene se mogu javiti i na genitalnoj sluzokoži i koži[12,13]. Kožne promene manifestuju se kao makule, eritem ili Erythema exudativum multiforme, koje se javljaju kao reakcije III i IV tipa[14,15].

Analiza rezultata učestalosti alergija prema godinama u ovom ispitivanju nije dala statistički znatne razlike u pojavi alergije u ispitivanom periodu.

Antibiotici su druga grupa lekova koja je dala alergijske reakcije kod pacijenata koji su se javili u Službu oralne medicine i parodontologije. To je još jedna potvrda najčešće opisivanih medikamentoznih alergija na antibiotike, tj. penicilinske preparate [16-18]. Smatra se da je 10% osoba alergično na penicillin[19].

Penicillin može izazvati alergijsku reakciju po bilo kom tipu hipersenzibilnosti. Najteža je anafilaktička reakcija koja se javlja kod oko 20% osoba koje su primile penicillin[20]. Relativno često se javlja urtikarija sa angioedemom[21]. Najčešće su kožne promene po tipu makulopapulozne ospe praćene svrabom, kao i alergijski kontaktni dermatitis[22,23], posledica primene penicilina lokalno u vidu masti, solucije ili praha. Kod 4 osobe alergičnih na penicilin postoji rizik od alergija na cefalosporine. Kliničke manifestacije medikamentozne alergije mogu biti različite. Jedan lek kod različitih osoba može dati različite alergijske manifestacije, odnosno različiti lekovi mogu dati istu alergijsku reakciju kod iste osobe. Reakcija se može javiti i posle duže upotrebe leka ili posle uzimanja više puta istog leka, jer se za to vreme razvio imuni odgovor. Ispoljavanje alergijske reakcije pri prvom kontaktu organizma sa lekom objašnjava se tzv. mehanizmom ukrštene reakcije sa nekim drugim lekom ili sličnim antigenom[24-26]. Kad se jednom ispolji alergijska reakcija, svaka sledeće primena tog leka ili sličnog, u minimalnim količinama, daje iste promene.

Dijagnoza medikamentozne alergije zasniva se na dobroj anamnezi i kliničkom nalazu. Najčešće su pacijenti davali pozitivnu anamnezu o prethodnom uzimanju leka i ranijim alergijskim reakcijama na sluzokoži ili koži. Puno puta je teško doći do definitivne dijagnoze. Treba posumnjati na lek koji pacijent uzima ukoliko se promene jave u toku njegove primene ili registrovati lek ukoliko se pri njegovom prekidu promene povuku. Pojava istih simptoma po ponovnom unošenju istog leka olakšava dijagnozu, što se saznaje iz pozitivne anamneze. Dijagnoza se potvrđuje laboratorijskim testovima.

In addition to changes in oral mucous membranes, changes can occur on genital mucous membrane and skin[12,13]. Skin changes are manifested as macula, erythema or erythema exudativum multiforme, which occur as reactions of III and IV types[14,15].

The analysis of the results of the allergy frequency by age in this study did not give statistically significant differences in the occurrence of allergy in the studied period.

Antibiotics are another group of drugs that have caused allergic reactions in patients who reported to the Department of Oral Medicine and Periodontology. This is another confirmation of the most commonly described medicinal allergies to antibiotics, i.e., penicillin preparations[16-18]. It is thought that 10% of people are allergic to penicillin[19].

Penicillin can cause an allergic reaction of any type of hypersensitivity. The most severe is the anaphylactic reaction that occurs in about 20% of people who have received penicillin[20]. Relatively frequent is urticaria with angioedema[21]. The most common are skin changes of the type of maculopapular rash accompanied by itching, as well as allergic contact dermatitis[22,23] that occur as a consequence of using penicillins locally in the form of ointment, solution or powder. In people who are allergic to penicillin, there is a risk of allergy to cephalosporins in 25% of people. Clinical manifestations of medicinal allergy can be different. One drug can cause different allergic manifestations in different individuals and different drugs can cause the same allergic reaction in the same person. The reaction can occur after prolonged use of the drug or after repeatedly taking the same drug because an immune response has developed during this time. The manifestation of an allergic reaction at the first contact of the organism with a medicine is explained by the so-called cross-reaction mechanism with another drug or a similar antigen[24-26]. Once an allergic reaction is manifested, any subsequent administration of this drug or similar in minimum amounts yields the same changes.

The diagnosis of allergy to a medicine is based on a good history and clinical findings. Most commonly, patients gave a positive history of the previous taking of the drug and previous allergic reactions on the mucous membrane or skin. It is often difficult to reach a definitive diagnosis. There is a need to suspect a medicine the patient takes if changes occur during the course of its use or register a medication if changes disappear after discontinuation of its use.

Međutim, testovi nisu pokazali očekivane rezultate u potvrđivanju alergije na lekove. Oni su često negativni, jer se lekovi biotransformišu u degradacione produkte, pa se u većini slučajeva ne zna aktivna supstanca. Ako se ispitivanja vrše u toku alergijske reakcije mogu se dobiti nespecifično pozitivni rezultati, odnosno negativni, ako su se privremeno utrošili imunoglobulini ili specifični imuni limfociti [3,5].

Visok procenat alergije je posledica istovremene upotrebe različitih lekova, dostupnosti mnogih lekova u slobodnoj prodaji i neznanja o međusobnoj interakciji različitih vrsta lekova.

Znatan broj radova pokazuje na čestu pojavu alergija na lekove[16,17,19,24]. Zabeleženo je nekoliko stotina lekova koji mogu dovesti do neke reakcije preosetljivosti. Lekovi mogu izazvati alergiju na jedan od bilo koja četiri tipa hipersenzibilnosti[2]. Pritom mogu biti odgovrni imunološki mehanizmi humoralnog celularnog imuniteta[4]. Postoji i genetska osnova preosetljivosti na lekove. Poznata je alergijska dijateza na lekove kod mnogih osoba kao i članova čitave porodice[27,28].

Većina lekova deluje kao hapten koji se kovalentno vezuje za proteinski omotač, najčešće za albumin seruma (antibiotici, sulfonamidi, lokalni anestetici, salicilati). Manji broj lekova ima svojstvo kompletnog alergena (vakcine, serum, enzimi)[29,30]. Kao alergeni mogu delovati i metaboliti pojedinih lekova[27].

Smatra se da alergijske reakcije nisu toliko zavisne od njegovih farmakoloških svojstava koliko od brzine kovalentnog vezivanja leka ili njegovih produkata za proteinske omotače[4].

Opisane su i alergijske reakcije na više lekova i materijala koji se koriste u zbrinjavanju zuba i usta[31]. Pored preparata formaldehida, joda, žive, bakra, zlata, najčešće se opisuje alergija na akrilat[32,33]. Akrilat je po hemijskom sastavu metilni estar metakrilne kiseline dobijen na bazi polimerizacije kao polimetilmetakrilat. Smatra se da je mogući senzibilizirajući agens rezidualni monomer pri nedovoljnoj polimerizaciji. Ne isključuje se da i ostale komponente akrilata imaju antigeni potencijal. Promene usled alergije na akrilat klinički se manifestuju u vidu enantema i edema. Klinička iskustva pokazuju da te promene, koje se često javljaju i proglašavaju alergijom na akrilat, mogu biti i reakcije sluzokože na učestale mehaničke, infektivne, toplotne ili hemijske iritacije.

The occurrence of the same symptoms after re-administration of the same drug facilitates the diagnosis which is learned from a positive history. Diagnosis is confirmed by laboratory tests. However, the tests did not show the expected results in confirming the allergy to a medicine.

They are often negative because the drugs are biotransformed into degradation products, so in most cases, the active substance is not known. If tests are carried out during an allergic reaction, non-specific positive or negative results may be obtained if immunoglobulins or specific immune lymphocytes are temporarily depleted[3,5].

A high percentage of allergies to a medication are a consequence of the simultaneous use of various drugs, the availability of many medicines in the free sale to patients themselves and the ignorance of the interaction of different types of drugs.

A significant number of works show a frequent allergy to medication[16,17,19,24]. There are several hundreds of drugs that can lead to a certain hypersensitivity reaction. Drugs can cause allergy to any of the 4 types of hypersensitivity[2].

And here the immune mechanisms of humoral cellular immunity may be responsible[4]. There is also a genetic basis for hypersensitivity to drugs. An allergic diathesis to medicines is known in many people as well as members of the entire family[27,28].

Most drugs work like a hapten that covalently binds to a protein coat, most commonly to serum albumin (antibiotics, sulphonamides, local anaesthetics, salicylates). A smaller number of drugs have the property of a complete allergen (vaccines, serum, enzymes)[29,30]. Metabolites of certain drugs can also act as allergens[27].

It is considered that allergic reactions are not as dependent on its pharmacological properties as on the rate of covalent binding of the drug or its products to protein coats[4].

Allergic reactions to several drugs have been reported for materials used in teeth and mouth care[31]. Apart from allergy to preparations of formaldehyde, iodine, mercury, copper, gold, allergy to acrylate is most often described[32,33]. Acrylate is chemically a methyl ester of methacrylic acid obtained on the basis of polymerization as a polymethylmethacrylate. It is believed that a residual monomer in insufficient polymerization is a possible sensitizing agent.

It is not excluded that other acrylate components have antigenic potential. Changes

Alergijske reakcije u usnoj duplji mogu biti praćene i promenama na koži i drugim sluzokožama. Često se javljaju i hematogene promene: anemija, eozinofilija, limfocitoza, trombocitopenija, smanjen procenat hemoglobina i ubrzana sedimentacija[3,5,15].

Morfološke promene koje prate alergijske reakcije na oralnoj sluzokoži su često modifikovane, što je rezultat traumatskog oštećenja pri mastikaciji, delovanja pljuvačke, mehaničkog dejstva protetskih nadoknada i oralne infekcije Candidom.

Što se tiče terapije, kod većine pacijenata alergičnih na lekove prekida se sa primenom sumnjivog leka. Uz primenu antiseptičnih sredstava promene se za kratko vreme regresiraju. Kod težih promena davani su antihistaminici per os ili parenteralno 2-3 dana. Ređe, kod teških oblika davani su i kortikopreparati.

Zaključak

Posle detaljnog pregleda rezultata i sveopšte analize podataka, može se zaključiti da je za period od tri godine (ispitivani period) registrovan znatan broj pacijenata sa pojavom alergijskih reakcija na sluzokoži usne duplje. Najčešća forma alergijske reakcije bila je Stomatitis allergica i Enanthema fixum, sa lokalizacijom na dorzalnoj površini jezika i sluzokoži obraza. Skoro polovina od registrovanih pacijenata javila se zbog promena nakon uzimanja odgovarajućeg leka i to sulfonamida i penicilina.

Ako se zna uzrok alergija, preventivno sprečavanje alergijske reakcije je na prvom mestu. Ove reakcije se mogu sprečiti izbegavanjem alergena koji utiču na pojavu alergije. Međutim, simptomi se mogu vratiti ako se ponovo dođe u kontakt sa alergenom. Tada se javlja mogućnost pojave burne alergijske reakcije koja može dovesti i do smrti.

Kada se dijagnostikuje uzrok alergije, može se izbegavati izlaganje alergenu, tražiti medicinska nega i ordinirati antihistaminike. Možda se neće moći izbeći alergijska reakcija u potpunosti, ali ovi koraci mogu pomoći da se spreče buduće alergijske reakcije

due to acrylic allergy are clinically manifested in the form of enanthems and edema. Clinical experience shows that these changes, which often occur and are declared an allergy to acrylate, can also be the reaction of mucous membrane to frequent mechanical, infectious, thermal or chemical irritations.

Allergic reactions in the oral cavity can be accompanied by changes in the skin and other mucous membranes. Hematogenic changes of anaemia, eosinophilia, lymphocytosis, thrombocytopenia, decreased haemoglobin and accelerated sedimentation [3,5,15] often occur.

Morphological changes that accompany allergic reactions on the oral mucous membrane are often modified as a result of traumatic damage during mastication, saliva action, and mechanical effect of prosthetic compensations and oral Candida infections.

As for therapy, in most patients with an allergy to the medication, the use of a suspected drug was discontinued. With the use of antiseptic agents, changes regressed in a short time. In severe changes, antihistamines were administered per os or parenterally for 2-3 days. Rarely, corticosteroids were also given in severe forms.

Conclusion

After a detailed review of the results and the overall data analysis, it can be concluded that a significant number of patients with allergic reactions on the oral cavity mucous membrane was registered for a period of three years (examined period). The most common form of allergic reaction was Stomatitis allergica and Enanthema fixum, with localization on the dorsal surface of the tongue and the mucous membrane of the cheeks. Almost half of the registered patients reported changes after taking the appropriate drug: sulfonamides and penicillins.If the cause of allergies is known, preventive control of an allergic reaction is in the first place. These reactions can be prevented by avoiding allergens that affect the allergy. However, symptoms may return if the patient again comes into contact with the allergen. Then, there is the possibility of a severe allergic reaction that can even be fatal.

When the cause of allergy is diagnosed, exposure to an allergen can be avoided. The patient can look for medical care and carry antihistamines. It may not be possible to completely avoid allergic reaction, but these steps can help to prevent future allergic reactions.

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Financial support and sponsorship
None

Conflict of interest
There is no conflict of interest

Patient consent
All involved patients gave their consent forms

Ethics approval
This study is in accordance with the Helsinki Declaration

Primljen/ Recived on: 05.04.2018
Prihvaćen/ Accepted on : 25.05.2018

PRIKAZ SLUČAJA
CASE REPORT
doi: 10.5937/asn1877804P

KORIŠĆENJE NOĆNIH PROTEZA U PROTETIČKOM TRETMANU PACIJENTA SA BRUKSIZMOM - STUDIJA SLUČAJA –

APPLICATION OF NIGHT DENTURES DURING PROSTHETIC REHABILITATION IN A PATIENT WITH BRUXISM - A CASE STUDY

Budima Pejkovska Shahpaska[1], Biljana Kapuševska[2], Stavreva Nataša[2]

[1]UJZ UNIVERZITETSKI STOMATOLOŠKI KLINIČKI CENTAR "SV. PANTELEJMON", KLINIKA ZA MOBILNU STOMATOLOŠKU PROTETIKU, SKOPLJE, MAKEDONIJA
[2]UNIVERIZTET "SV. ĆIRILO I METODIJE", STOMATOLOŠKI FAKULTET, UJZ UNIVERZITETSKI STOMATOLOŠKI KLINIČKI CENTAR "SV. PANTELEJMON", KLINIKA ZA FIKSNU STOMATOLOŠKU PROTETIKU, SKOPLJE, MAKEDONIJA

[1]PHO UNIVERITY DENTAL CLINIC "ST. PANTELEJMON", SKOPJE, CLINIC FOR REMOVABLE DENTAL PROSTHETICS,
[2]UNIVERSITY "ST. CYRIL AND METHODIUS", FACULTY OF DENTISTRY, SKOPJE, MACEDONIA
PHO UNIVERITY DENTAL CLINIC
"ST. PANTELEJMON", CLINIC FOR FIXED DENTAL PROSTHETICS,SKOPJE, MACEDONIA

Sažetak

Uvod: *Bruksizam je okluzalna parfunkcija koja se relativno često sreće. Rana dijagnoza i rana terapija blagovremeno bi prevenirale veća oštećenja stomatognatnog sistema koja su posledica ove parafunkcije.*
Cilj: *Prezentacija izrade i primene individualno dizajniranih proteza – noćnih proteza kod pacijenta sa stanjem delimične bezubosti sa dijagnostifikovanim bruksizmom.*
Studija slučaja: *Kod pacijentkinje stare 63 godine sa bolnom simptomatologijom primenjene su ekstraoralne i intraoralne kliničke metode za dijagnostifikovanje bruksizma. Pojedinačno dizajnirana proteza - noćna proteza izgrađena je pre i posle protetske rehabilitacije uptrebom dve vrste materijala.*
Rezultati : *Izradom fiksno-mobilne konstrukcije, zaštićeni su zubi i parodontalni kompleks. Odgovarajući na individualno dizajnirane proteze, pacijentkinja je osetila smanjenje intenziteta bolova koji potiču od mastikatornih mišića i temporomandibularnog zgloba. Materijali za izradu ovih proteza dozvoljavaju jednostavnu izradu i primenu u kliničkoj praksi.*
Zaključak: *Upotrebom noćnih proteza kod pacijentkinje sa bruksizmom postignut je uspeh u smislu očuvanja protetičke konstrukcije i poboljšanja zdravlja stomatognatnog sistema.*

Ključne reči: *noćne proteze, bruksizam*

Corresponding author:
Ass. Prof. Budima Pejkovska Shahpaska, DDS, MSD, PhD,
PHO University dental clinic St. Pantelejmon,
Mother Teresa 17, Skopje 1000, Republic of Macedonia
mob. phone 0038971230629,
E-mail:budimapejkovska@yahoo.com

Abstract

Introduction: *Bruxism is an occlusal parafunction that is globally quite common. Early diagnosis would lead to early therapy and hence early prevention from damage to the stomatognathic system caused by this parafunctional.*
Aim: *Demonstration of using individually designed dentures - night dentures in a patient with a condition of partial edentulousness with diagnosed bruxism.*
A case study: *In a patient aged 63 with painful symptomatology, we performed extraoral and intraoral clinical examination. An individually designed denture - night denture was constructed of two types of material before and after the prosthetic rehabilitation.*
Results and Discussion: *After making the fixed-mobile construction, the teeth and the periodontal complex were protected. After wearing the individually designed dentures, the patient felt a reduction of pain deriving from the masticatory muscles and the temporomandibular joint. The materials for creating these dentures allow their easy production and application in clinical practice.*
Conclusion: *The success was achieved in preserving the prosthetic construction and improving the health of the stomatognathic system of the patient, thus achieving the goal of justifying the use of this new type of designed denture.*

Key words: *night denthare, bruxism*

Uvod

Bruksizam je okluzalna parafunkcija koja se može definisati kroz nekoliko kategorija različitih poremećaja. To je veoma rasprostranjen, globalni problem koji najverovatnije postoji od početka čovečanstva[1].

Prema De-La-Hoz [2], najstarije refe-rence u vezi sa bruksizmom su zapisane u Bibliji, u kojima je škripanje zubima opisano kao prva Božja kazna.

U većini slučajeva, parafunkcija se detektuje kada pacijent dođe u prvu posetu stomatologu. Jedan od najistaknutijih kliničkih znakova je abnormalno trošenje zuba, uzrokovano škripanjem i stiskanjem zuba. Međutim, to ipak nije odlučujući znak prisustva bruksizma, pošto abnormalno trošenje zuba može nastati posle česte konzumacije kisele hrane ili zbog nepravilnog pranja zuba (erozija i/ili dantalna abrazija). Zato treba uvek uzeti u obzir zub antagonistu, koji je takođe istrošen, oštećen ili umanjen[3].

Postoji više prepoznatljivih etioloških faktora koji dovode do bruksizma. Psihosocijalni faktori kao što su stres i određene lične osobine, kao i patofiziološki faktori (bolesti, traumatologija, genetika, pušenje, kofein, droge i nedozvoljeni lekovi), poremećaji spavanja (apneja i hrkanje pri spavanju) i uključivanje dopaminergičkog sistema često su prisutni u etiologiji bruksizma[4,5]. Sigurno je da ne postoji samo jedan faktor koji je odgovoran za pojavu bruksizma. Ali, takođe je evidentno da ne postoji jedinstveni tretman koji je efikasan za njegovo eliminisanje ili smanjenje[6].

Rana prevencija i lečenje bruksizma uz pomoć okluzalnih aparata deo su su protokola za tretman u svakodnevnoj stomatološkoj kliničkoj praksi[7-12].

Cilj ovog rada je da demonstrira prednosti nošenja individualno dizajniranih proteza - noćnih proteza, pre i posle protetičke rehabilitacije pacijenta u uslovima delimične bezubosti i dijagnostifikovanog bruksizma.

Introduction

Bruxism is an occlusal parafunction that can be difficult for definition in several categories of different parafunctions. It also presents a disturbance in the parafunctional movements of the teeth clenching and grinding. It is a very widespread, global problem that most probably exists from the beginning of mankind[1].

According to De-La-Hoz[2]., the oldest references regarding bruxism are reported in the Bible, in which the gnashing of the teeth is described as the first punishment from God[2].

In most cases, the parafunction is detected when the patient goes to the dentist for the first time. One of the most prominent clinical signs is abnormal tooth wear, caused by teeth grinding and clenching. However, this is also not a decisive sign of the presence of bruxism, since teeth wear can occur when eating sour foods or by incorrect tooth brushing (erosion and/or dental abrasion). For this reason, the antagonist should always be considered because it is also worn out, damaged or diminished during bruxism[3].

There are more recognizable etiological factors leading to the diagnosis of bruxism. Psychosocial factors such as stress and certain personal characteristics, as well as pathophysiological factors (diseases, trauma, genetics, smoking, caffeine intake, drugs and illicit drugs), sleep disorders (sleep apnea and snoring), and involvement of the dopaminergic system are often present in the etiology of bruxism[4,5]. One thing is certain - there is not only one factor responsible for the occurrence of bruxism. But it is also evident that there is no single treatment that is effective for its elimination or reduction[6].

Early prevention and treatment of bruxism with the help of occlusal appliances are part of the treatment protocol in everyday dental clinical practice[7-12].

The aim of this paper is to demonstrate the justification of wearing individually designed dentures – night dentures, before and after the prosthetic rehabilitation of patients with condition of partial edentulousness and diagnosed bruxism.

Studija slučaja

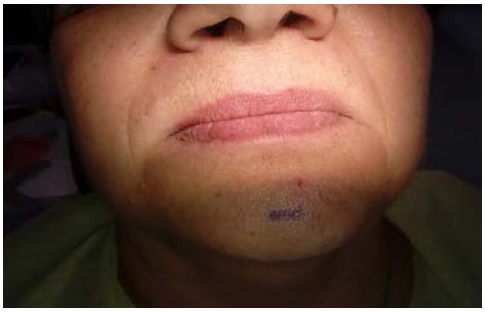
Istraživanje je obavljeno u Ustanovi za javno zdravlje, Univerzitetskog stomatološkog kliničkog centra "Sveti Pantelejmon", na Klinici za stomatološku protetiku u Skoplju. Za istarživanje je dobijena saglasnost Etičkog komiteta Stomatološkog fakulteta "Sveti Ćirilo i Metodije" Univerziteta u Skoplju. Pre početka lečenja, pacijentkinja je dala pisanu saglasnost za učešće u ovoj studiji.

Metodologija rada podrazumevala je: pregled pacijenta, dijagnozu bruksizma pomoću brukso analizatora, procenu stepena abrazije preostalih zuba (indeksima po Smight-u i Knignht-u), procenu stanja parodontalnih dzepova Ramfjord indeksom za dubinu parodontalnih dzepova, izradu individualnog plana za estetsko-funkcionalnu rehabilitaciju kod pacijenta sa dijagnostikovanim bruksizmom Metodologija rada prikazana je na slikama 1-12.

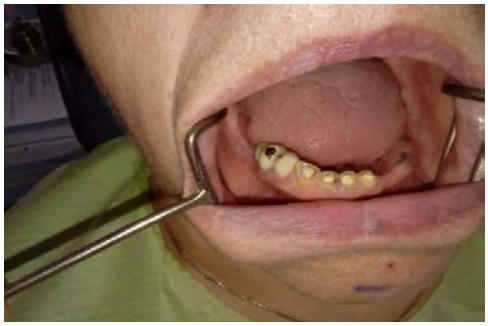
A case study

The research was performed at the Public Health Organization, University Dental Clinical Center "St. Panteleimon", at the Clinic for Dental Prosthetics in Skopje. For this, there was an agreement from the Ethics Committee of the Faculty of Dentistry at the University "Ss. Cyril and Methodius University in Skopje". Before the start of the treatment, the patient signed a consent form for the interventions.

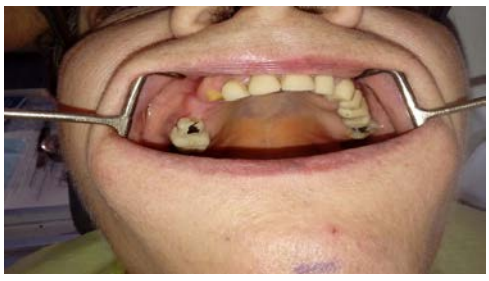
Methodology of study implied:the apperiance of patient, establishing a diagnosis of bruxism with a using a bruxchecker that was made from a special foil ,analysis of the degree of abrasion of the remaining natural teeth (with an index for dental abrasion by Smith and Knight),periodontal pockets depth(with Ramfjord index for depth of periodontal pockets),making an individual plan for aesthetic - functional prosthetic rehabilitation, Methodology of study is shown on the figures 1-12.



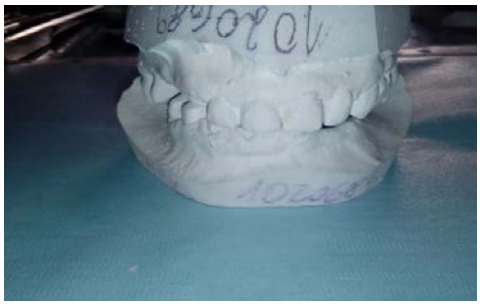
Slika 1. Ekstraoralni pregled pacijenta
Figure 1. Extraoral examination of the patient



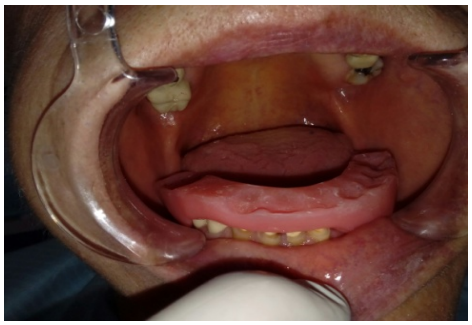
***Slika* 2**. Intraoralni pregled pacijenta - donja vilica
***Figure* 2.** Intraoral examination of the patient - the lower jaw



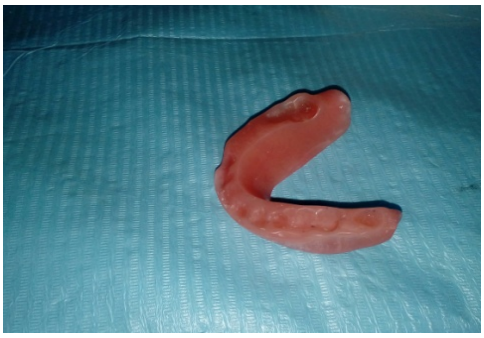
***Slika* 3**. Intraoralni pregled pacijenta - gornja vilica
***Figure* 3.** Intraoral examination of the patient – the upper jaw



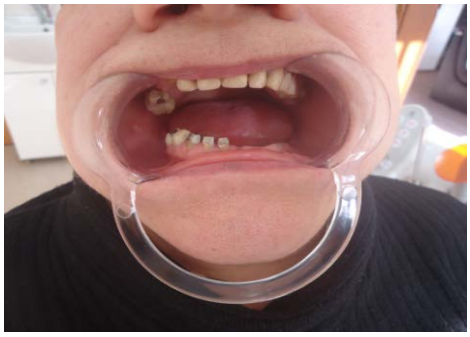
***Slika* 4.** Studijski modeli
***Figure* 4.** Study models



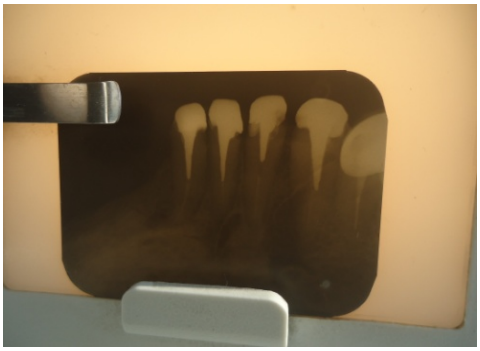
***Slika* 5.** Intraoralni izgled individualno dizajnirane proteze
***Figure* 5.** An intraoral view of the individually designed denture



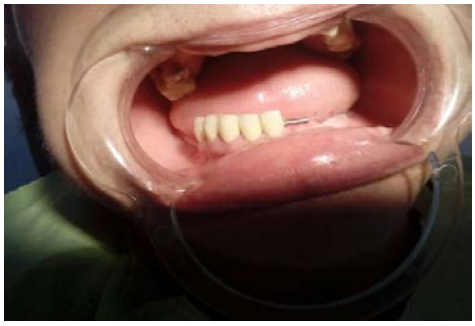
***Slika* 6.** Okluzalni izgled individualne dizajnirane proteze
***Figure* 6.** An occlusal look at the individually designed denture



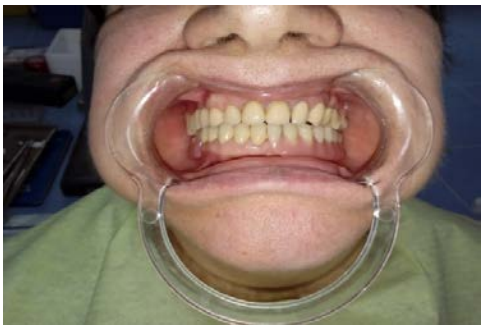
***Slika* 7.** Završen tretman preostalih zuba
***Figure* 7.** Finished treatment of the remaining teeth



***Slika* 8.** Retroalveolarna slika endodontski tretiranih zuba
***Figure* 8.** Retroalveolar picture of the endodontically treated teeth



***Slika* 9.** Intraoralni dentalni most sa Lecodent prečkama
***Figure* 9.** Intraoral dental bridge with Lecodent bars



***Slika* 10.** Završena estetsko-funkcionalna rehabilitacija pacijenta
***Figure* 10.** Completed aesthetic - functional rehabilitation of the patient

***Slika* 11.** Folija prilagođena modelu tehnikom vakuum-presovanja
***Figure* 11.** Foil adapted to the model using a vacuum-press technique

***Slika* 12.** Ministar - Scheu uređaj za promenu toplote u radnoj fazi
***Figure* 12.** Ministar-Scheu heat exchanger

Prikaz slučaja

Pacijentkinja stara 63 godine javila se na Kliniku za Stomatologiju, Ustanove za javno zdravlje, Univerzitetskog Stomatološkog centra u Skoplju, zbog bolova u zubima, u predelu mastikatornih mišića, temporomandibularnom zglobu kao i izrazite glavobolje. Pacijentkinja je je bila svesna navike škripanja zubima, što je dovelo do oštećenja postojećih mostova i abrazije njenih prirodnih zuba.

Ekstraoralnim pregledom utvrđeno je da je donja trećina lica smanjena kao posledica abrazije zuba, što je istaklo nazolabijalni i mentolabijalni sulkus i pacijentkinji dalo starački izgled.

Klinički pregled izveden je metodama palpacije, perkursije i auskultacije, pri čemu je utvrđeno prisustvo bolova u predelu mastikatornih mišića i temporomandibularnog zgloba. Mastikatorni mišići bili su osetljivi i topli na dodir i mekše konzistencije[7].

Intraoralni pregled pokazao je vidljivo oštećenje prirodnih zuba, čija je vrednost prema indeksu Smith i Knight, bila 4 - što ukazuje na afekciju zubne pulpe. Tretman je podrazumevao endodontsku sanaciju i livenu nadogradnju, kao i izradu metalokeramičkog mosta sa lekodentovim prečkama.

Ramfjord indeks za gingivalnu inflamaciju pri prvom pregledu pacijentkinje je bio 1 (srednja vrednost), što ukazuje na blagu upalu gingive, a gingiva oko zuba nije bila pogođena.

Ramfjord indeks za dubinu parodontalnih džepova na prvom ispitivanju pacijentkinje bio je 4 (srednja vrednost), što ukazuje na postojanje parodontalnih džepova do 3 mm.

Case report

A 63-year-old patient with a painful symptomatology reported the presence of pain in her natural teeth, in the area of the masticatory muscles, in the temporomandibular joint as well as headaches. The patient pointed out that she was aware of the existence of grinding of her teeth in which she damaged her existing dental bridges and abraded her natural teeth.

The extraoral examination of the patient revealed that the lower third of the face was reduced as a result of abrasion of the teeth, which further emphasized sulcus nasolabialis and mentolabialis, thus making the patient look prematurely aged.

The clinical examination complemented by using the methods of palpation, percussion and auscultation performed at their respective locations suggested the existence of a painful symptomatology originating from the masticatory muscles and the temporomandibular joint.

Masticatory muscles which were sensitive and warm to touch as well as soft in consistency pointed out to the presence of pain[7].

The intraoral examination indicated a visible damage to the natural teeth, according to the Smith and Knight Index, the value of which was 4 - which means that there is an affection of the dental pulp. For these teeth, complex treatment was taken from the aspect of their endodontic sanation and build up by one-piece cast in metal. This was followed by making a bridge construction of the type of metal-ceramic bridge with Lecodent bars.

The Ramfjord index for gingival inflammation at the first dental examination of the patient was 1 (median value) indicating a mild inflammation of the gingiva, and the gingiva around the tooth was not affected.

Za objektivnu dijagnozu bruksizma konstruisan je bruksoanalizator. Bruksoanalizator služi za očitavanje površina zuba kod kojih je došlo do oštećenja zbog trenja izazvanih bruksizmom[13].

U našem istraživanju uz pomoć bruksoanalizatora dijagnostifikovali smo okluzalne šeme trenja zuba i vizualizovali smer bruksizma. Otkrivene su oštećene površine zuba aktivne u toku bruksizma. Kod pacijentkinje je postavljena dijagnoza horizontalnog oblika bruksizma.

Na početku estetsko-funkcionalne rehabilitacije, postojala je indikacija za izradu individualno dizajnirane proteze, koju bi pacijentkinja nosila tokom noći.

Proteza se koristi da bi pacijentkinju oslobodila bolova koji potiču od zuba, mastikatornih mišića, temporomandibularnog zgloba i glavobolje. Osim toga, cilj je i da se pacijentkinja navikne na novu vertikalnu dimenziju koja je postignuta fiksno- mobilnom konstrukcijom.

U gornjoj vilici napravljen je polucirkularni most, a u donjoj kompleksna fiksno-mobilna konstrukcija.

Rezultati

Kod naše pacijentkinje je dijagnostifikovan težak oblik bruksizma. Smatra se da za ovaj tip bruksizma je potreban kompleksan tretman,sa ciljem da se postigne i održi uspešna protetska rehabilitacija.

Bruksizam kod ove pacijentkinje nije potpuno eliminisan, što je potvrđeno i kontrolom bruksoanalizatora i nakon protetske rehabilitacije. Sledilo je postavljanje indikatora za izradu nove proteze, koja bi se nosila tokom noći, da bismo održali postignuti protetički uspeh. Nova proteza napravljena je u obliku parcijalne proteze sa okluzalnim inserterom. Korišćene su folije iz kompanije Scheu Dental technology - Durasoft pd @ 3 mm[14].

Nakon crtanja oblika individualno dizajnirane proteze na modelu, oblikovana je folija u mašini za vakuum za toplotno presovanje na uređaju Ministar @ Scheu (Slika 13).

Hladni polimerizacijski akrilat je dodat kako bi se dobila definitivna konstrukcija proteze, na modelima fiksiranim u individualnom ili polujediničnom artikulatoru[15].

Na ovaj način, proizvedene proteze od fabričkih folija dobijaju individualni karakter, sa različitim mogućnostima modifikacije. Ako postoje indikacije za promene u vertikalnoj dimenziji, opet postoji mogućnost dodavanja hladnog polimerizirajućeg bezbojnog akrila, koji je hemijski kompatibilan sa noćnom protezom kompanije Durasoft@ pd (Slika 14).

The Ramfjord index for the depth at the first patient examination was 4 (median value), indicating the existence of periodontal pockets of up to 3 mm.

For the objective diagnosis of bruxism, a device was constructed for the patient. A bruxchecker is a paraclinical apparatus for the diagnosis of bruxism. There is an interpretation in the literature that its practical application is simple, by reading surfaces without color at places of friction caused by bruxism movements[13].

In our research, with the aid of a bruxchecker, we came to the realization of the diagnosis of occlusal patterns of the teeth, visualization of the direction of the bruxism patterns in patients who carried it in the evening. Active surfaces from the squeezing and dental clinging were discovered, and also the control of bruxism was established after the prosthetic rehabilitation if there was an indication. A particular diagnosis of the existence of a horizontal form of bruxism was established in the patient.

This denture was to be worn during the night, so it was called a night denture. It was made to reduce painful symptomatology originating from the teeth, masticatory muscles, temporomandibular joint and headaches. The next justification for its design is to accustom the patient to a new vertical dimension which will be reconstructed with the fixed-mobile construction.

A semi-circular bridge was made in the upper jaw, and complex fixed-mobile construction in the lower.

The results

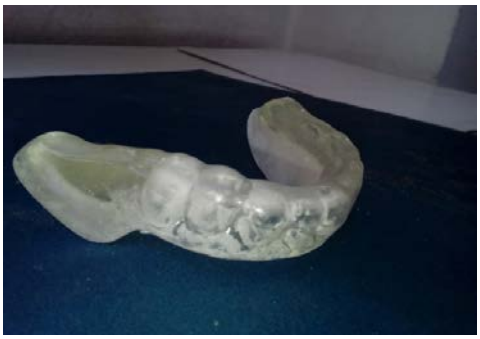
The patient was diagnosed with a severe form of bruxism. It is considered that this type of bruxism requires a complex treatment, with the idea that once the prosthetic rehabilitation is performed, simultaneously the very same should be preserved.

Bruxism as a condition in this patient was not completely eliminated even after the prosthetic rehabilitation, which was confirmed at the follow-up using a bruxchecker. Setting up indication for making a new designed denture that would be worn in the evening followed in order to protect the achieved prosthetic success.

A plan of therapy was developed. Before the start of the aesthetic-functional rehabilitation, the patient was diagnosed and indicated for making an individually designed denture to protect the achieved prosthetic success. The new designed denture was made in the form of a partial denture with an occlusal

Diskusija

U ovom radu utvrđeno je da su snage bruksizma bile najizraženije u večernjim satima, tj. u toku spavanja kada su na nesvesnom nivou, zbog čega smo izabrali upravo period za nošenje preventivnih proteza. Upotrebom noćnih proteza, pacijentkinji su smanjeni bolovi, očuvan je parodontalni stautus i fiksne konstrukcije.



***Slika* 13.** Pregled individualno dizajnirane proteze
***Figure* 13.** An overview of the individually designed denture

Ovakav nalaz je u korelaciji sa nalazom Baba i sar[8] koji su takođe napravili noćnu protezu i dobili zadovoljavajuće rezultate.

U svom članku Pipa i Shetty[9] imali su interesantnu prezentaciju uspešne upotrebe intraoralnih splintova kod pacijenata sa bruksizmom. Sličan uspeh postigli su i Michael J. i sar[11] sa specijalnim protezama za bruksizam. Korišćeni materijali su laki za rukovanje i obradu. Oni se hemijski vezuju, što olakšava modifikaciju i prevenira prelome proteza, što je vrlo značajno kod ovakvih stanja stomatognatog sistema.

Komplikacije koje bruksizam ostavlja na ljudsko zdravlje mogu biti u paleti od najlakših do teških.

Nekontrolisani bruksizam može uzrokovati prelome krunice zuba, frakture korena zuba, prelome fiksnih restauracija i resorpciju koštanih struktura vilica.

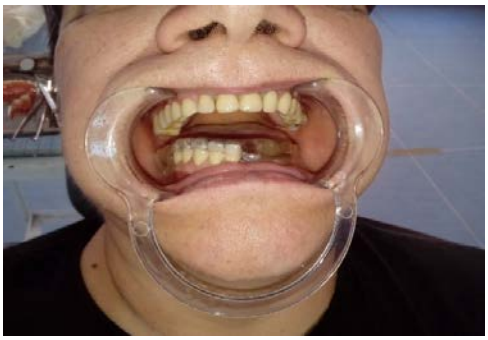
Zaključak

Kod pacijentkinje sa dijagnostifikovanim bruksizmom, sprovedena je protetička rehabilitacija i izrađene su individualno dizajnirane proteze, čija upotreba ima više prednosti:

inserter. Foils from the company Scheu Dental technology were used - Durasoft pd @ 3 mm[14].

After drawing the shape of the individually designed denture on the model, the molding of the foil in the heat vacuum press machine Ministar @ Scheu followed. (Figure 13)

Cold polymerization acrylate was added to obtain the definitive construction of the dentures, on models fixed in an individual or semi-individual articulator[15].



***Slika* 14.** Intraoralni pregled specijalno dizajnirane proteze
***Figure 14*.** An intraoral examination of the specially designed denture

In this way, the manufactured dentures from factory-purchased foils receive an individual character, with different modification options. If there are indications of changes in the vertical dimension there is again the possibility of adding a cold polymerizing colorless acrylate which is compatible chemically with the night denture made by Durasoft @ pd.(Figure 14)

Discussion

The forces of bruxism in this patient are the most present in the evening, precisely during sleep, on an unconscious and subconscious level and that is the time interval when these new dentures act preventively.

This finding is in accordance with Baba et al.[8], who made the night denture and had satisfying results.

Pipa and Shetty[9] had very interesting presentation of intraoral splints in patients with bruxism in their work. Michael J. et al. achieved similar success with specially designed dentures for bruxism. Materials that are used are comfortable and easy for handling and proccessing. They make chemical conduction that is enabling modification and preventing breaking of dentures so it is significant for this state of the stomatognathic system.

1. Nakon kliničkog ispitivanja simptomatologije koja potiče iz zuba, mastikatornih mišića, temporomandibularnog zgloba i glave, posle protetske rehabilitacije i nošenja preventivih proteza, zaključuje se da su se bolovi u navedenim regijama smanjili ili čak prestali.

2. Protetske konstrukcije konstrukcija na svim kontrolnim pregledima bile su bez vidljivih oštećenja, što ide u prilog nošenju ove proteze.

3. Parodontalni kompleks pacijentkinje se nalazio u zadovoljavajućem stanju, što potvrđuju parodontalni indeksi po Ramfjordu za gingivalnu inflamaciju i dubinu parodontalnih džepova.

4. Postoji jednostavna mogućnost pripreme i izrade, kao i mogućnost jednostavne popravke preventivnih noćnih proteza u slučaju abrazije koja je posledica sila u bruksizmu, zahvaljujući osobinama korišćenih materijala - mekih i tvrdih materijala Durasoft@ pd i mekih i tvrdih akrilata, koji smanjuju rizik od preloma noćnih proteza.

5. S obzirom na uspeh u našem slučaju, pojedinačno dizajnirane proteze ili noćne proteze su savremena sredstva za prevenciju i terapiju pacijenata sa bruksizmom i mogu se preporučiti kao preventivna mera za ostale pacijente sa bruksizmom.

Complications which bruxism leaves on human health can range from mild in the easiest to moderate and catastrophic in severe form. The severe form of bruxism, if not placed under control, can cause fractures of the crowns of teeth, tooth root fractures, fractures of fixed restorations, and even resorption of the bone structure with prolonged trauma.

Conclusion

After a comprehensive clinical treatment of the patient with partial edentulous condition and diagnosed bruxism in which prosthetic rehabilitation was carried out and night dentures were made, it is concluded that their preparation and production is justified for several reasons:

1. After the clinical examination of symptomatology originating from the teeth, masticatory muscles and the temporomandibular joint, the head, and after the overall prosthetic approach and wearing the designed dentures, the conclusion is that the symptoms are reduced, even some of them are disappeared;

2. The bridge structures of all control checks were with absence of any evident damage which is in favor of wearing this kind of denture;

3. The periodontal complex of the patient is cared for and preserved in a satisfactory condition, as confirmed by the Ramfjord indices for gingival inflammation and the depth of the periodontal pockets;

4. There is a simple possibility of preparation as well as for the repair of the night denture after abrasion from bruxism, resulting from the properties of the materials used - soft and hard material of durasoft @ pd, and soft and hard acrylate which the risk of fractures of night dentures;

5. The individually designed dentures or night dentures are modern means of prevention and therapy of patients with bruxism, as the treatment was well received by the patient in this study, and can be recommended as a method for other patients with bruxism.

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Financial support and sponsorship
None

Conflict of interest
There is no conflict of interest

Patient consent
All involved patients gave their consent forms

Ethics approval
This study is in accordance with the Helsinki Declaration

Primljen/ Recived on: 04.04.2018
Prihvaćen/ Accepted on :20.05.2018

PRIKAZ SLUČAJA
CASE REPORT
doi: 10.5937/asn1877813S

KONTROLA KVARENJA, PREVENCIJE INFEKCIJA I PRIMENA ANESTETIKA U EGZODONCIJI NATALNIH ZUBA

HEMORRHAGE CONTROL, INFECTION PREVENTION AND APPLICATION ON ANESTHETICS IN EXODONTIA OF NATAL TEETH

Dušan Šurdilović[1], Walid El Sayed[1,2], Tatjana Ille[3], Mohamed Said Hamed[1], Pooja Narain Adtani[1], D Prabhu Manickam Natarajan[1]

[1] MEDICINSKI UNIVERZITET GULF, STOMATOLOŠKI FAKULTET, AJMAN, UAE
[2]UNIVERTZITET SUECKI KANAL ,EGIPAT
[3]MEDICINSKI UNIVERZITET GULF, MEDICINSKI FAKULTET, AJMAN, UAE

[1]GULF MEDICAL UNIVERSITY, COLLEGE OF DENTISTRY, AJMAN, UAE
[2]SUEZ CANAL UNIVERSITY, EGYPT
[3]GULF MEDICAL UNIVERSITY, COLLEGE OF MEDICINE, AJMAN, UAE

Sažetak

Uvod: *Zubi koji se pojavljuju u trenutku rođenja zovu se natalni zubi Najčešći natalni zubi su donji mlečni sekutići.Tačan uzrok nastanka natalnih zuba nije poznat, ali se kao mogući faktori pominju infekcije, trauma, hormonska stimulacije itd.Imajući u vidu da postoji mogućnost aspiracije kao i otežana ishrana bebe, najčešće su indikovani za ekstrakciiju.*
Prikaz slučaja: *Novorođenče staro jedan dan sa zubima u donjoj vilici poslato je na Odeljenje za dečiju stomatologiju u Thumbay u Dubaiju., u Ujedinjenim Arapskim Emiratima. Konstrukcija krunice bila je pričvršćena za desni sa mobilnošću II stepena (Millerova klasifikacija) Školjkasta gleđna struktura natalnih zuba je uklonjena parodontalnom kiretom, obazrivo, da se ne povredi zametak mlečnog sekutića. Vitamin K u dozi od 1 mg dat je IM u anterolateralni predeo butine novorođenčeta dva sata pre hirurškog tretmana.Postoperativni tok protekao je uredno*
Zaključak: *Natalni zubi su retka pojava, međutim, nisu nepoznati kod novorođenčadi,Ekstrakcija je prva opcija tretmana, što je pre moguće, uzimajući u obzir sve komplikacije, uz obaveznu administraciju vitamina K .*

Ključne reči: *natalni zubi,krvarenja,infekcije*

Corresponding author:
Ass. Prof Dušan Šurdilović, DDS,MSD,PhD
Gulf Medical University
United Arab Emirate
E-mail: surdilovic74@gmail.com

Abstract

Introduction: *The teeth that appear at the time of birth are called Natal teeth. The exact cause of its appearance is unknown, but possible causes for this condition include infections, trauma, hormonal stimulation etc. There is a possibility to aspirate the tooth and difficulty with feeding.*
Case report: *A one day old baby born with teeth in the lower jaw was referred to our dental department, Thumbay Hospital, Dubai, UAE. The crown structure was attached to the gums with grade 2 mobility (Millers classification). The shell like crown was removed with a periodontal curette and care was taken not to injure the underlying tooth. Vitamin K injection 1mg IM was given in the anterolateral thigh 2hours before the procedure.*
Conclusion: *The appearance of natal teeth is a rare case however it is not uncommon in the newborns. Extraction as the first treatment choice should be performed as soon as possible considering all possible complications. Vitamin K administration is a mandatory step in the treatment.*

Key words: *natal teeth,hemorage,infection*

Uvod

Razvoj ljudskih zuba je složen proces koji proizilazi iz sekvencijalne i recipročne interakcije između oralnog ektodermalnog i mezenhimalnog tkiva (nalazi se ispod ektodermalnog tkiva). Ova interakcija rezultira različitim putevima u kojima se koriste mnogi specifični medijatori[1]. Dokazano je da sekrecija ovih specifičnih medijatora počinje od oralnog epitela, zatim dolazi do difuzije u ektomezenzim, a potom indukuje ekspresiju transkripcionih faktora. Ovaj prelaz između epitela i vezivnog tkiva reguliše i kontroliše razvoj zuba i vreme kada kasnije počnu da niču zubi[2]. Međutim, zubi se ponekad, iz nepoznatih razloga, pojavljuju rano u oralnoj duplji. Zubi koji se pojavljuju u trenutku rođenja zovu se natalni zubi, dok se zubi koji izbijaju u prvih 30 dana nakon rođenja zovu neonatalni zubi. Pored toga, zubi koji niču izvan natalnog perioda od 30 dana obično se nazivaju rani predmlečni zubi [3]. Natalni zubi se javljaju češće nego neonatalni zubi [4]. Natalni zubi se zovu još i Dentitia praecox, dens connatalis, kongenitalni zubi, fetalni zubi, zubi novorođenčeta, prethodni zubi i rani zubi[5,6]. Prevalentni opseg je od 1:11 do 1:30000, u zavisnosti od vrste studije , a najčešći natalni zubi su donji mlečni sekutići[5,7]. Postoji nekoliko razloga koji uzrokuju ovakvo stanje, uključujući određene vrste infekcije, febrilnost, traumu, neuhranjenost, površinski položaj zubne klice, hormonsku stimulaciju i porodičnu anamnezu, ali tačan uzrok nije poznat[6,8].

Može se smatrati da je stanje natalnih i neonatalnih zuba od fundamentalnog značaja, jer njihovo prisustvo može dovesti do brojnih komplikacija. Ove komplikacije mogu biti manje komplikacije, kao bolni ugriz ili krvarenje bradavice tokom dojenja. Međutim, mogu se dogoditi ozbiljne komplikacije usled postojanja natalnog/neonatalnog zuba, kao što su inhalacija ovakvog zuba, dehidratacija, neuhranjenost, mala veličina, koja dovodi do usporavanja napretka. Dakle, veoma je preporučljivo rano otkrivanje i lečenje ovih zuba[5,6,8].

Introduction

Human teeth development is a complex process resulting from sequential and reciprocal interaction between oral ectodermal and the underlying mesenchymal tissues. This interaction results in different pathways in which so many signaling mediators are used[1]. These signaling mediators have been shown to be secreted first by the oral epithelium, diffuse into the underlying ectomesenchyme and then induce expression of the transcription factors. This cross talk between the epithelium and connective tissue regulates and controls the tooth development and subsequent tooth eruption time[2]. However, the teeth sometimes, due to unknown reasons, appear early in the oral cavity. The teeth that appear at the time of birth are called Natal teeth, while the teeth erupting within first 30 days after birth are called Neonatal teeth. In addition to that, teeth erupting beyond the natal period of 30 days are usually referred to as early infancy teeth[3]. Natal teeth are most common than neonatal teeth[4]. Natal teeth have other different synonyms such as Dentitia praecox, dens connatalis, congenital teeth, fetal teeth, infancy teeth, predeciduous teeth, and precocious dentition[5,6]. Prevalence of natal teeth ranges from 1:11 to 1:30000 depending on the type of the stud and the most common natal teeth are lower primary central incisors[5,7]. Several reasons have been attributed as the cause for this condition including certain types of infection, febrile status, trauma, malnutrition, tooth germ superficial position, hormonal stimulation and family background, however the exact cause is unknown[6,8].

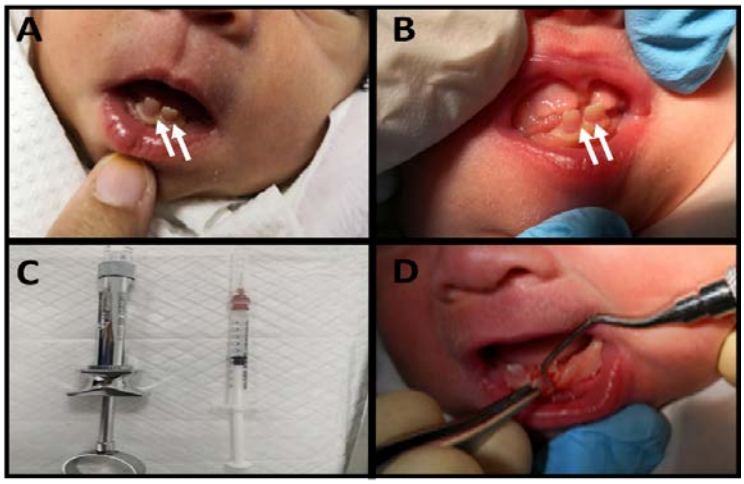
It must be considered that natal and neonatal teeth are conditions of fundamental importance since their presence may lead to numerous complications. These complications can be minor complications as painful bite or bleeding nipples in case of breast feeding. However, serious complications can happen due to natal/neonatal teeth such as inhalation of the natal tooth, dehydration, malnutrition leading to low weight, small size that may lead to failure to thrive. So, early detection and treatment of these teeth are highly recommended[5,6,8].

Prikaz slučaja

Pedijatar je uputio novorođenče staro jedan dan sa zubima u donjoj vilici na Odeljenje za dečiju stomatologiju u Thumbay bolnici u Dubaiju (Ujedinjeni Arapski Emirati), radi preduzimanja odgovarajućeg medicinskog tretmana. Na pregledu je utvrđeno da je novorođenče imalo dva natalna centralna sekutića (slika 1). Pažljivim kliničkim pregledom ustanovljeno je da zubi zapravo imaju samo gleđnu strukturu. Majka je potvrdila da su zubi prisutni od rođenja, tako da se smatraju natalnim zubima. Takođe, majka se žalila zbog poteškoća tokom dojenja.

Case presentation

A one day old baby born with teeth in the lower jaw was referred to our dental department, Thumbay Hospital, Dubai by the pediatrician for appropriate management. On examination, the baby was found to have two premature central incisors (Figure 1). A careful clinical examination revealed that the teeth have a shell like crown structure. The mother confirmed that the teeth were present at birth so these were considered natal teeth. Furthermore, the mother complained about difficulty during breastfeeding.



Slika 1. Kliničke slike i procedura hirurškog tretmana natalnih zuba; A: centarlni i bočni sekutić prisutni su od prvog dana u usnoj duplji (bele strelice); B: još jedna klinička slika koja pokazuje da natalni zubi uzrokuju traumu do gornje vilice (bele strelice); C: slika pokazuje iglu i anesteziju koja se koristi u hirurškom tretmanu; D: korišćenjem parodontalne kirete uklonjeni su natalni zubi

Figure 1. Clinical pictures and surgical extraction procedure of the natal teeth: A) center and lateral incisors are present from day one in the oral cavity (white arrows), B) another clinical picture showing that natal teeth are causing trauma to the upper jaw (white arrows), C) the needle and the anesthesia used in the surgical procedure, D) using periodontal curette to remove the Natal teeth.

Konstrukcija krunice bila je pričvršćena za desni sa mobilnošću II stepena (Millerova klasifikacija). Pošto je krunasta struktura bila dobro pričvršćena za desni , mogućnost aspiracije smatrana je minimalnom. Isto objašnjenje je dato roditeljima novorođenčeta. Oni su bili obavešteni da se natalni zubi moraju ukloniti, ako majka oseća bol ili neugodnost tokom dojenja ili ako postoji povreda jezika ili usana novorođenčeta.

Dva dana nakon otpusta, roditelji novorođenčeta su se vratili u bolnicu sa žalbom da majka ne može da doji zbog bola koji oseća. Nakon razgovora sa roditeljima, odlučeno je da se natalni zube uklone.

The crown structure was attached to the gums with grade 2 mobility (Miller's classification). As the crown structure was well attached to the gums, the possibility of aspiration was considered minimal. The same was explained to the baby's parents. They were informed that the natal teeth had to be removed if the mother felt pain or discomfort while feeding or if there was a self-inflicted injury to tongue or lips.

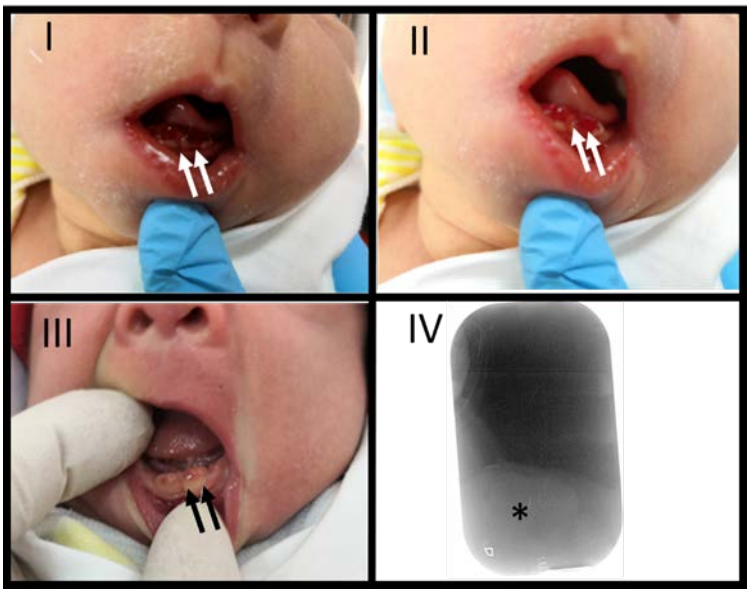
Two days after discharge, the parents returned back to hospital because of the mother's inability to breastfeed due to pain. After discussion with parents, it was decided

Analiza krvi , uključujući kompletnu krvnu grupu, PT, INR i aPTT, je urađena i svi parametri su bili u granicama normale. Vitamin K u dozi od 1 mg dat je IM u anterolateralni predeo butine novorođenčeta dva sata pre hirurškog tretmana.

Za ekstrakciju natalnih zuba upotrebljena je infiltraciona anestezija lidokainom. Pažnja je bila usmerena ka tome da se ne povredi zametak mlečnog sekutića, a školjkasta gleđna struktura natalnog zuba je uklonjena parodontalnom kiretom (slika 1). Zarastanje postekstrakcionih rana je bilo neujednačeno. Propisan je paracetamolni sirup zbog moguće pojave subjektivnih simptoma bola. Nakon dva dana od hirurškog tretmana, novorođenče je pregledano, a praćeno je tokom sledećih mesec dana. Pošto je postignuta postoperativna hemostaza, novorođenče je otpušteno, a roditeljima su data postoperativna uputstava odmah nakon postizanja hemostaze. Na slici 2 je prikazan pacijent opozvan nakon dva dana za pregled (slika 2).

to remove the natal teeth. Blood investigation including complete blood count, PT, INR and aPTT was done and was within normal limits. Vitamin K injection 1mg IM was given in the anterolateral thigh 2hours before the procedure.

The extraction of natal teeth was performed under lidocaine infiltration anesthesia. Care was taken not to injure the underlying tooth bud and the shell like crown was removed with a periodontal curette (Figure 1). Post extraction healing was uneventful. Plain paracetamol syrup was prescribed for possible subjective symptom of pain. Patient was recalled after 2 days for review and followed up for a month. Postoperative hemostasis was achieved and the patient was dismissed after giving the postoperative instructions immediately after the achievement of hemostasis. The patient was recalled after two days for a follow up. (Figure 2).



Slika 2. Praćenje posle hirurškog tretmana; I: neposredna klinička slika nakon hirurškog tretmana; II; praćenje dva dana nakon hirurškog tretmana; III: praćenje nakon četiri nedelje i IV: radiografska slika koja prikazuje zubne zametke mlečnih sekutića (crna zvezdica)

Figure 2. Follow up after surgical procedure. In this figure: I) Immediate clinical picture after the surgical procedure, II) Follow up after 2 days from the surgical procedure, III) Follow up after 4 weeks and IV) radiographic image showing tooth germ of the deciduous incisors (black asterisk).

Diskusija

Većina novorođenčadi dobija svoje prve zube između 4 i 7. meseca života. Prvi zubi koji se pojavljuju iz gingive alevolarnog grebena su donji centralni sekutići. Dok većina novorođenčadi dobija svoje prve zube nekoliko meseci nakon rođenja, neke bebe su rođene sa jednim ili više zuba. Oni se nazivaju natalni zubi. Pojava natalnih zuba je relativno retka, zastupljena je u jednom od svakih 2000 novorođenčadi[3].

Izveštaji o incidenciji natalnih i neonatalnih zuba su objavljeni u brojnim studijama i kreću se u rasponu od jednog u 50 slučajeva (2%) na uzorku od 2000 novorođenčadi pregledanih u Meksiku u prvih 20 sati od rođenja, do odnosa 1:30000, u rezimeima objavljenih istraživanja u periodu od 1976. do 1991. godine. Međutim, mnoge studije pokaziju incidencije u rasponu 1:2000 do 1:3500 slučajeva živorođene dece[3,6].

Učestalost verovatno varira u zavisnosti od rase, gde izvesna indijanska plemena u Sjedinjenim Američkim Državama smatraju normalnom pojavom prisustvo natalnih zuba.

Učestalost natalnih zuba je tri puta veća nego pojava neonatalnih zuba. Muško-ženska relacija varira u različitim studijama, u kojima neke od njih ističu predominaciju kod muškog pola, dok druge studije ističu ravnomernu distribuciju ili dominaciju ženskog pola. Natalni i neonatalni zubi se retko mogu javljaju kod prevremeno rođenih beba[9].

Izgleda da postoji i nasledna tendencija ka razvoju natalnih zuba, jer 60% slučajeva ukazuju na pozitivnu porodičnu anamnezu, sa autozomno dominatnim obrascem nasleđivanja (što znači da se kod oko polovine dece koja imaju porodičnu anamnezu natalnih zuba oni i pojavljuju)[10].

Natalni zubi su često povezni sa slučajevima rascepa usana i nepca: 10% dece rođene sa bilateralnim rascepom usne/nepca imaju natalne zube, dok 25% dece sa unilateralnim rascepom usne/nepca imaju natalne zube[11]. Rascepi usne/nepca mogu biti zastupljeni u značajnom broju sindroma u kojima se takođe pojavljuju natalni zubi, kao sto su Meckel-Gruber sindrom (MIM249000) i Pierre-Robin sindrom (MIM261800). Nastavljajući ovaj niz sindroma u kojima se pojavljuju natalni zubi treba ukljuciti i: Ellis-Van Creveld sindrom (hodroektodermalna displazija, MIM225500), Jackson-Lawler sindrom (pachynuchia congenita2, MIM 1672100), Steatocystoma multiplex sa natalnim zubima (MIM184510) i Hallerman-Streiff (ovulomandibulofacialni sindrom sa hipotrihosom, MIM234100)[5].

Discussion

Most babies get their first tooth between 4 and 7 months of age. The first teeth that poke through the gums are the central incisors, which are located on the bottom front. While most infants get their first teeth months after birth, some babies are born with one or more teeth. These are called natal teeth. Natal teeth are relatively rare, occurring in about 1 out of every 2000 births[3].

The incidence of natal and neonatal teeth has been reported in a number of studies, ranging from 1 in 50 (2%) in a series of over 2000 babies examined within 20 hours of birth in Mexico to 1 in 30000, in a summary of studies published between 1876 and 1991. Most studies however give an incidence between 1 in 2000 to 1 in 3500 live births[3,6]. The incidence probably varies between different racial groups, with some American Indian tribes reported to commonly present with natal teeth.

Natal teeth are said to be three times more common than neonatal teeth. The male to female ratio varies in different studies with some reporting a male predominance and others no difference or a female predominance. Natal and neonatal teeth are rarely seen in very premature babies[9].

There appears to be an inherited tendency to developing natal teeth with up to 60% of cases reporting a positive family history with an autosomal dominant pattern (meaning about half the children of an affected individual are affected)[10].

Natal teeth are associated with cleft lip/palate: 10% of children with bilateral cleft lip/palate have natal teeth and 25% of children with unilateral cleft lip/palate have natal teeth[11]. Cleft lip/palate can be a feature of a number of syndromes in which natal teeth have also been reported such as Meckel-Gruber syndrome (MIM249000) and Pierre Robin sequence (MIM261800). Furthermore, there are some syndromes in which natal teeth are a recognized feature: Ellis-van Creveld syndrome (chondro-ectodermal dysplasia, MIM225500), Jackson-Lawler (pachyonychia congenita 2, MIM167210), Steatocystoma multiplex with natal teeth (MIM184510) and Hallerman-Streiff (oculo-mandibulofacial syndrome with hypo-trichosis, MIM234100)[5].

The exact etiology of natal teeth is unknown, however maternal factors reported to be associated with an increased risk of natal teeth include: babies born to mothers exposed to high levels of poly-chlorinated biphenyls and dibenzofurans during the Yusheng environmental accident in Taiwan

Egzaktna etiologija pojave natalnih zuba je nepoznata, međutim, uticaj faktora, koji su posledica stanja majke, uočeni su i povezani sa povećanim rizikom za pojavu natalnih zuba. Ta stanja su uočena kod novorođenčadi čije su majke bile izložene visokim nivoima polihlorinizovanih bifenila idibenzofurana usled ekološkog incidenta u Yushengu, Tajvan. Tada je uočen 10% veći rizik za pojavu natalnih zuba. Na pojavu ovih zuba utiču i febrilna stanja tokom trudnoće, poremećaji ishrane povezani sa neuhranjenošću, hipovitaminozom i traumom.

Ekstrakcija kao terapijska procedura se razmatra ukoliko su: natalni zubi prekobrojni, veoma pokretljivi, sa slabom vezom sa gingivalnim tkivom ili imaju interakciju sa nazoalveolarnim ortodontskim terapijskim pomagalima. Ekstarakcija (ili spontano ispadanje) mogu biti iskomplikovani razvojem "rezidualnih neonatalnih zuba", za koje se smatra da se mogu pojaviti u 9% slučajeva, što bi zahtevalo još jednu hirurško intervenciju.

Vitamin K je važan koagulacioni faktor koji može nedostajati novorođenim bebama[13,14]. Ovaj nedostatak vitamina K može biti veći usled endogenih faktora, kao što su nedovoljna bakterijska kolonizacija, egzogenih faktora, poput male koncentracije vitamina K u majčinom mleku i slabim placentarnim transportom[13]. Poznato je da nizak nivo vitamina K kod novorođenčadi izaziva krvarenje (VKDB). Zbog toga je 0,5 mg (porođajna težina 1500 g ili manje) ili 1 mg (porođajna težina preko1500 g) vitamina K preporučena doza za intramuskularnu administraciju za svu novorođenčad u prvih 6 sati posle rođenja, čime se postiže inicijalna stabilizacija koagulacije, odobrena od strane Kanadskog pedijatrijskog udruženja[15].

Prilikom procene rezultata laboratorijskih parametara krvi novorođenčeta, uočen je povećan nivo aPTT (44,7), u poređenju sa normalnim referentnim vrednostima (26,0-40,0). Povećan nivo aPTT ukazuje na nedostatak ili smanjeni nivo faktora koagulacije krvi. Imajući to u vidu, u prikazanom slučaju, pacijentu je intramuskularno bila data dodatna doza od 1 mg vitamina K, dva sata pre hirurške intervencije[14].

Antibiotska terapija nije bila indikovana za ovu hiruršku intervenciju, jer je novorođenče hranjeno majčinim mlekom.

Majčino mleko je rezervoar nutritijenata i biološki aktivnih supstanci. Najpoznatije imuno protektivne komponente majčinog mleka su imunoglobulini, IgA je prisutan u velikim količinama, praćen prisustvom IgM i

were found to have a 10% risk of natal teeth, infection and febrile states, malnutrition including hypovitaminosis, and trauma[8].

As treatmentis considered if teeth are luxale or because of the interference with the nasoalveolar molding appliance. Extraction (or spontaneous loss) can be complicated by the development of 'residual neonatal teeth', said to occur in approximately 9% and necessitating a second surgical procedure[12].

Vitamin K in an important coagulation factor that is found to be deficient in newborns/neonates[13,14]. This deficiency state arises due to endogenous factors like insufficient bacterial colonization and exogenous factors such as low concentration of vitamin K in breast milk and poor placental transport[13]. Low levels of Vitamin K in neonates is known to cause vitamin K deficiency bleeding (VKDB), therefore 0.5 mg (birthweight 1500 g or less) or 1 mg (birthweight greater than 1500 g) of vitamin K is the recommended dosage administered intramuscularly to all newborns within the first 6 hours after birth for initial stabilization as approved by the Canadian pediatric Society[15].

On evaluating the patient's laboratory report, it was observed that the aPTT was higher (44.7) when compared to the normal reference range (26.0 – 40.0). A higher aPTT refers to lack of or low level of blood clotting factors. Therefore, in the present case the patient was administered an additional dose of 1mg of vitamin K IM, 2 hours prior to the extraction procedure[14].

No antibiotic coverage was suggested prior to the extraction as the child was on breast milk. Human breast milk is a reservoir of nutrients and biologically active compounds. The most recognized immune protective components in human breast milk are immunoglobulins, IgA being present in large quantities followed by IgM and IgG. IgA provides protection against infection by blocking the contact of the pathogen with the intestinal epithelial layers and entrapping the pathogen within the mucin layers. Immune cells in the breast milk produce cytokines such as transforming growth factor beta (TGFβ), interleukin 1 (IL1) and interleukin 13 (IL13) which help in suppressing inflammation[16].

For newborns, the amount of L.A to be administered is calculated based on the child's body weight, medical history, duration of the dental procedure, need for hemorrhage control, it should comply with the American Academy of Pediatric Dentistry (AAPD) recommendations and never exceed the maximum total dosage[17].

IgG. IgA obezbeđuje zaštitu od infekcije blokiranjem kontakata patogena sa intestinalnim epitelom, istovremeno okružujući patogene slojem mucina. Imune ćelije majčinog mleka produkuju citokine, kao sto su transformišući faktor rasta beta (TGFβ), interleukin 1 (IL1) i interleukin 13 (IL13), koji pomažu redukciju inflamacije[16].

U slučaju doziranja i davanja lokalne anestezije kod novorođenčadi, količina anestetika se računa na osnovu težine novorođenčeta, medicinske istorije, dužine stomatološke intervencije i potrebe za kontrolom krvarenja, što sve treba da je u saglasnosti sa preporukama Američke akademije za dečiju stomatologiju (AAPD), pri čemu maksimalne preporučene doze nikada ne treba premašiti[17]. Preporučena doza je 7 mg/kg telesne mase za pedijatrijske bolesnike. U prikazanom slučaju, težina novorođenčeta je bila 2,5 kg, shodno tome, ukupna doza od 1,5 ml lokalnog anestetika (2% Lidokaina sa adrenalinom, 1:100000) infiltraciono je aplikovana novorođenčetu.

Podaci iz literature ukazuju da je mandibularna bukalna infiltraciona anestezija isto tako efikasna kao i blok anestezija mandibularnog inferiornog nerva[17].

Zaključak

Studija hirurškog tretmana natalnih zuba sa stanovišta kontrole krvarenja, prevencije infekcije i aplikacije anestetika ističe sledeće zaključke:

1.natalni zubi su retka pojava, međutim, nisu nepoznati kod novorođenčadi,

2.ekstrakcija je prva opcija tretmana, što je pre moguće, uzimajući u obzir sve komplikacije,

3.administracija vitamina K je neophodni korak u tretmanu,

4.odgovarajuća količina lokalnog anestetika datog tokom hirurške intervencije, mora biti tačno izračunata u skladu sa telesnom težinom novorođenčeta i

5.u ovom slučaju, primena antibiotske terapije nije bila neophodna.

The recommended dosage is 7 mg/Kg body weight for pediatric patients, in the present case the child weighed 2.5 kg, therefore, a total of 1.5 ml of L.A (2% lidocaine with adrenaline 1:100,000) was administered as infiltration.

Literature studies state that a mandibular buccal infiltration is as effective as an inferior alveolar nerve block[17].

Conclusion

This study is about surgical treatment of natal teeth from the standpoint of hemorrhage control, infection prevention and application on anesthetics that highlights:

1. The occurrence of natal teeth is a rare case however it is not uncommon in the newborns,

2. Extraction as the first treatment choice should be performed as soon as possible considering all possible complications,

3. Vitamin K administration is a mandatory step in the treatment,

4. Proper calculation of the amount of the local anesthesia given during the treatment should be carefully determined according to the body weight of the newborn,

5. Administration of the antibiotic is not necessary in such case.

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Financial support and sponsorship
None

Conflict of interest
There is no conflict of interest

Patient consent
All involved patients gave their consent forms

Ethics approval
This study is in accordance with the Helsinki Declaration

Primljen/ Recived on: 06.04.2018
Prihvaćen/ Accepted on :25.05.2018

INFORMATIVNI RAD
INFORMATIVE ARTICLE
doi: 10.5937/asn1877821P

FORMIRANJE BIOFILMA NA STOMATOLOŠKIM MATERIJALIMA

BIOFILM FORMATION ON DENTAL MATERIALS

Jana Pešić Stanković[1], Milena Kostić[2], Marko Igić[2], Vukica Đorđević[1]

[1]UNIVERZITET U NIŠU, MEDICINSKI FAKULTET, KATERDRA ZA MIKROBIOLOGIJU I IMUNOLIGIJU
[2]UNIVERZITET U NIŠU, MEDICINSKI FAKULTET, KATEDRA ZA STOMATOLOŠKU PROTETIKU

[1]UNIVERSITY OF NIŠ, FACULTY OF MEDICINE, DEPARTMENT OF MICROBIOLOGY AND IMMUNOLOGY
[2]UNIVERSITY OF NIŠ, FACULTY OF MEDICINE, DEPARTMENT OF PROSTHODONTICS

Sažetak

Uvod:*Stomatološki materijali igraju ulogu morfološkog i funkcionalnog supstituenta oralne sredine, te se od njih očekuje da nesmetano obavljaju svoju funkciju ne izazivajući neželjene efekte. Na površini stomatoloških materijala se kao i na tkivima usne duplje formira se biofilm. S obzirom da stomatološki materijali svojom strukturom, u najvećem broju slučajeva, omogućavaju lako nakupljanje ostataka hrane i infektivnog sadržaja, uporedni pregled mogućih posledica i mera njihove prevencije od velikog je značaja.*
Cilj rada *bio je analiza stvaranja biofilma na površinama različitih stomatoloških materijala na osnovu publikovanih istraživanja. Poznavanje strukture stomatoloških materijala i njihovog ponašanja u oralnoj sredini osnov je za pravilno postavljanje indikacije za njihovu upotrebu. Kontrola formiranja biofilma na materijalima najjednostavnije se sprovodi kroz dobru oralnu higijenu i održavanje zubnih nadoknada.*
Zaključak:*Formiranje biofilma na stomatološkim materjalima može doprineti razvoju oboljenja usne duplje.Kontrola formiranja biofilma najbolje se sprovodi kroz dobru oralnu higijenu.*

Ključne reči: *stomatološki materijali, biofim*

Abstract

Introduction:*Dental materials play a role of morphological and functional substituent of the oral environment and they are expected to perform their function without causing adverse effects. A biofilm is formed on the surface of dental materials, as well as on other oral tissues. Considering that dental materials due to their structure, in most cases, allow accumulation of food residues and infectious content, a comparative review of possible consequences and the way of their prevention is of great importance.*
The aim *of this manuscript was the analysis of biofilm formation on different dental materials surfaces based on published investigations and literature data. Knowing the structure of dental materials and their behavior in oral environment is a base for proper setting of indication for their use. The simplest way to control biofilm formation on materials is good oral hygiene and maintaining dentures.*
Conclusion:*The formation of biofilm in dental materials lead to development of same deseases of oral cavity.The simplest way to control the development of biofilm is to maintain a ligh lovel of oral higiene.*

Key words: *dental materials, biofilm*

Corresponding author:
Jana Pešić Stanković,MD,PhD,student
Faculty of Medicine in Niš
E-mail:janapesic1990@gmail.com

Definicija i formiranje oralnog biofilma

Biofilm je struktuirana zajednica jedne ili više vrsta mikroorganizama, imobilisanih u supstratu i obmotanih matriksom koji proizvode članovi zajednice. Prema definiciji Donlan i Costerton (2002) biofilm je komuna mikroorganizama koji su ireverzibilno vezani za površinu ili međufazu, uklopljeni u ekstracelularne polimerne supstance i pokazuju izmenjeni fenotip u odnosu na brzinu rasta i transkripciju gena[1]. Biofim može da se formira na svim biotskim i abiotskim površinama, na površini mekih tkiva u organizmu, mineralnim površinama, kao i na svim biomaterijalima korišćenim u medicinske svrhe[2]. Uslov je dovoljna količina tečnosti i nutrienata. Njegovo formiranje je složen proces koji se sastoji iz više faza:

-kondicioniranja površine (taloženje organskih i neorganskih polimera iz okoline na površinu, što je i osnova za nakupljanje mikroorganizama),

-reverzibilne adhezije bakterija za površinu Van der Waals i elektrostatičkim silama, kao i hidrofobnim interakcijama-faza spajanja (*docking stage*)[3]

-ireverzibilnog vezivanja bakterija i supstrata usled produkcije ekstrapolimerne celularne supstance, glikokaliksa i matriksa biofilma – faza zaključivanja (*locking phase*)[4].

- stvaranja kompleksne asocijacije vrsta sa malo novih kolonizatora: zajednica biofilma raste ostvarujući trodimenzionalnu formu – zreli stadijum. Biofilm se vremenom nagomilava adherencijom novih plaktonskih ćelija u kombinaciji sa kontinuiranim rastom već vezanih ćelija, a proces njegovog sazrevanja traje 24 časa[2].

Naravno, biofilm ne treba shvatiti kao nepokretnu gomilu ćelija, već je to jedna funkcionalna životna zajednica u kojoj postoji visoka vrednost organizovanosti i aktivnosti, kao i međusobne zaštite[5]. Bez obzira da li su sastavljeni od jedne ili više vrsta bakterija, biofilmovi se razvijaju po obrascima više-ćelijskog, odnosno kolektivnog ponašanja[6].

Značaj kontrole formiraja biofilma vezuje se za razvoj različitih infekcija u organizmu čoveka. Bakterije oralnog biofilma odgovorne su za razvoj lokalnih infekcija u usnoj duplji: gram pozitivne koke za razvoj karijesa, a gram negativna anaerobna flora za razvoj parodontalnih oboljenja. *Candida albicans* je, sa druge strane, najčešći uzročnik proteznog i angularnog stomatitisa[7,8].

Definition and biofilm formation

The biofilm is a structured community of one or more species of microorganisms, immobilized in substrate and wrapped by matrix which is produced by members of the community. According to Donlan and Costerton's definition (2002), the biofilm is a commune of microorganisms which are irreversibly connected to the surface or interphase, incorporated in extracellular polymer substances and show modified phenotype in accordance to growth speed and gene transcription[1]. The biofilm can be formed on all biotic and abiotic surfaces, on soft tissue surfaces in organism, mineral surfaces, as well as all biomaterials used in medical purposes[2]. The condition is enough amount of liquid and nutrients. Its formation is a complex process which consists of several stages:

- Surface conditioning (precipitation of organic and inorganic polymers from environment on surface, which is basis for accumulation of microorganisms)

- Reversible adhesion of bacteria to surface by Van der Waals and electrostatic forces, as well as hydrophobic interactions - *docking stage*[3]

- Irreversible binding of bacteria and substrate due to the production of extrapolymer cellular substance, glycocalyx and biofilm matrix - *locking phase*[4]

- Formation of complex association of species with few new colonizers: biofilm community grows achieving three dimensional form – mature stage. The biofilm is eventually accumulated by the adherence of new planktonic cells in combination with the continuous growth of already bound cells, and the process of its maturation lasts 24 hours[2].

Of course, the biofilm should not be understood as a fixed bunch of cells, but it is a functional living community in which there is a high degree of organization and activity, as well as mutual protection[5]. Whether they are composed of one or more types of bacteria, biofilms develop according to patterns of multicellular or collective behavior[6].

The importance of controlling the biofilm formation is associated with the development of various infections in the human organism. Bacteria of oral biofilm are responsible for the development of local infections in the oral cavity: a gram positive coccus for the development of caries, and gram negative anaerobic flora for the development of periodontal disease. *Candida albicans*, on the other hand, is the most common cause of prosthetic and angular stomatitis[7,8].

Biofim na stomatološkim materijalima

Svojom biološkom integracijom stomatološki materijali postaju morfološki i funkcionalni deo tkiva usne duplje. Princip upotrebe stomatoloških materijala je nesumnjivo baziran na uzajamnom dejstvu njihovih svojstava i komponenti mikobiološki složene oralne sredine. S tim u vezi, analogno zubnim tkivima i oralnoj sluzokoži, na površini stomatoloških materijala implementiranih u usnu duplju formira se biofilm[9]. S obzirom da stomatološki materijali svojom strukturom u najvećem broju slučajeva omogućavaju lako nakupljanje ostataka hrane i infektivnog sadržaja, uporedni pregled mogućih posledica i mera njihove prevencije od velikog je značaja.

Brojne *in vitro* i *in vivo* studije pokazale su da se stomatološki materijali razlikuju po njihovoj podložnosti adheziji oralnih bakterija[10-12], što se najčešće pripisuje razlikama u hrapavosti podloge i u slobodnoj energiji[13,14]. Teorijski, hrapavost površina stomatoloških materijala treba smanjiti ispod 0,2μm[14,15]. Hidrofobne površine nakupljaju manje biofilma od hidrofilnih[16]. Bakterijski sojevi sa visokom površinskom slobodnom energijom, kao što je *Streptococcus mutans*, obično adheriraju za hidrofilne supstrate koji pokazuju visoke vrednosti površinske slobodne energije[17,18].

Cilj rada bio je analiza formiranja biofilma na površinama različitih stomatoloških materijala na osnovu publikovanih istraživanja.

Biofilm i akrilatni materijali

Akrilatni materijali (poli (metil metakrilat)-PMMA) se u stomatološkoj struci prevashodno koriste za izradu zubnih proteza i njihovu reparaciju, kao i za izradu mobilnih ortodontskih aparata.

Problem protetskog stomatitisa javlja se kod 60 do 65% nosilaca akrilatnih zubnih proteza[7,8]. Iako je protetski stomatitis multikauzalne etiologije, njegova pojava se najčeće vezuje za gljivice roda kandida, posebno za *C. albicans*, bimorfnu gljivu i komensala gastrointestinalnog i reproduktivnog sistema, koja ima sposobnost višećelijske forme rasta[19]. Prelazak vrste *C.albicans* u micelijumsku formu rasta omogućava laku adherenciju za akrilatni materijal.

Biofilm on dental materials

By their biological integration, dental materials become a morphological and functional part of the oral cavity tissue. The principle of the use of dental materials is undoubtedly based on the interaction of their properties and components of the microbiologically complex oral environment. In this regard, analogously to dental tissues and oral mucous membranes, the biofilm is formed on the surface of dental materials implanted in the oral cavity[9]. Since dental materials with their structure in most cases enable easy accumulation of food residues and infectious contents, a comparative overview of possible consequences and measures of their prevention is of great importance.

Numerous *in vitro* and in vivo studies have shown that dental materials differ by their susceptibility to adhesion of oral bacteria[10-12], which is most often attributed to differences in the roughness of the substrate and in free energy[13,14]. Theoretically, the roughness of the surfaces of dental materials should be reduced below 0.2μm[14,15]. Hydrophobic surfaces accumulate less biofilm than hydrophilic[16]. Bacteria strains with high surface free energy, such as *Streptococcus mutans*, usually adhere to hydrophilic substrates showing high values of surface free energy[17,18].

The aim of the paper was the analysis of the formation of biofilms on the surfaces of various dental materials, based on published research and literature data.

Biofilm and acrylate materials

Acrylic materials (poly (methyl methacrylate) -PMMA) are primarily used in the dental profession for the production of dental prostheses and repairing them, as well as for manufacturing of orthodontic appliances.

The problem of prosthetic stomatitis occurs in 60 to 65% of carriers of acrylic dental prostheses[7,8]. Although prosthetic stomatitis has a multi casual etiology, its occurrence is most commonly associated with fungi of the genus Candida, especially *C. albicans*, a dimorphic fungus, commensal in the gastrointestinal and reproductive systems, which has the ability of a multicelled form of growth[19]. Transition of the *C. albicans* species into the mycelium form of growth allows easy adherence to the acrylic material.

Ubrzo nakon uvođenja akrilata u stomatološku praksu, Lyon i Chick su dokazali da više kandide ima na akrilatnoj protezi nego na oralnoj sluzokoži pacijenata obolelih od protetskog stomatitisa[20]. Coco i sar. su dokazali predominaciju *C.albicansa* na zubnim protezama (75%), ali i prisustvo *C. glabrata (30%), C. dubliniensisa, C. parapsilosis, C. tropicalisa i C. krusei*[21]. Ove vrste kandide, iako ne poseduju sposobnost bifaznog rasta, tokom rasta produkuju filamentozne forme, pseudohife. Hife i pseudohife doprinose boljoj adherenciji gljiva za površinu zubne proteze i kao filamentozne forme utiču na lakše formiranje biofilma na akrilatu. Dokazano je da kandida može da napravi biofilm na površini biomaterijala u uslovima *in vitro*[22]. Gljivice se za inertnu površinu polimera vezuju hidrofobnim interakcijama i elektrostatičkim silama[23-25].

Akrilatne nadoknade su u ustima pacijenta obložene salivarnom pelikulom, omotačem koji nastaje međusobnom interakcijom materijala i sastojaka pljuvačke[26-29]. Ključnu ulogu u njenom formiranju igra precipitacija mucina i glikoproteina pljuvačke koju kolonozuju mikroorganizmi sa posebnim receptorima za gljivice iz roda *Candida*[30]. U biofilmu zubnih proteza nađeni su različiti sojevi bakterija: *Strepococcus, Veillonella, Lactobacillus, Prevotella, Actinomyces*[31]. Bakterije se na površini zubnih proteza mogu naći nekoliko sati nakon njene predaje pacijentu[32], dok se gljive mogu izolovati nakon nekoliko dana[33]. Oralni komensal *Streptococcus* poseduje antigen I/II, proteinski receptor u svom zidu, koji ima sposobnost vezivanja specijalnih partnerskih mikroorganizama, uključujući i *C.albicans*[34].

Gljivice se vremenom inkorporiraju u samu strukturu nadoknade ometajući ili potpuno onemogućavajući terapiju kandidijaze[35,36]. Kandidu je sa zubne proteze teško ukloniti mehanički ili hemijski, s obzirom na njenu jaku adherenciju i poroznost akrilatnog materijala[37]. Hrapavost materijala srazmerno povećava adherenciju ove gljivice[38]. Wu i sar. su upoređivali bazalnu i poliranu površinu zubne proteze, uočavajući značajne arhitektonske razlike u mikroorganizmima sa glatke i hrapave površine[39]. Količina i protok pljuvačke utiču na smanjenje adhezije gljivica na površinu akrilata[40,41]. Ramage i sar. su ukazali na češću pojavu protetskog stomatitisa od nosioca gornjih zubnih proteza, posebno ukoliko su bili oslabljenog imunološkog statusa[42].

Shortly after the introduction of acrylate in dental practice, Lyon and Chick have proven that there is more Candida on acrylic denture than in the oral mucous membrane of patients suffering from prosthetic stomatitis[20]. Coco et al. have proven the predominance of *C. albicans* on dental prostheses (75%), but also the presence *C. glabrata* (30%), *C. dubliniensis*, *C. parapsilosis*, *C. tropicalis* and *C. krusei*[21]. These types of Candida, although they do not have biphasic growth ability, produce filamentous forms, pseudohyphae during growth. Hyphae and pseudohyphae contribute to a better adherence of fungi to the surface of the dental prosthesis and as filamentous forms affect the easier formation of biofilm on acrylate. Candida has been proven to make a biofilm on the surface of biomaterials under in *vitro conditions*[22]. The fungi are bound to the inert surface of the polymer by hydrophobic interactions and electrostatic forces[23-25].

In the mouth of the patient, acrylate restorations are coated with salivary pellicle, a coat formed by the interaction of the material and components of the saliva[26-29]. A key role in its formation is played by the precipitation of salivary mucin and glycoproteins colonized by microorganisms with special Candida species receptors[30]. In the biofilm of dental prostheses, various strains of bacteria were found: *Streptococcus, Veillonella, Lactobacillus, Prevotella, Actinomyces*[31]. Bacteria can be found on the surface of the denture several hours after it is given to the patient[32], while fungi can be isolated after a few days[33]. The oral commensal *Streptococcus* possesses antigen I/II, a protein receptor in its wall, which has the ability to bind special partner microorganisms, including *C. albicans*[34].

The fungi eventually get incorporated into the structure of restoration, thus obstructing or completely disabling the candidiasis therapy[35,36]. It is difficult to remove the Candida from the dental prosthesis mechanically or chemically, given its strong adherence and the porosity of the acrylate material[37]. The roughness of the material proportionally increases the adherence of this fungus[38]. Wu et al. compared the basal and polished surface of the dental prosthesis, noting the significant architectural differences in microorganisms from the smooth and rough surface[39]. The amount and flow of saliva affect the reduction of adhesion of fungi to the surface of acrylate[40,41]. Ramage et al. pointed to the frequent occurrence of denture stomatitis in carriers of upper dentures, especially if they have a weakened immune status[42].

Oralni *streptococci* povezani su razvojem karijesa kod nosioca zubnih proteza[43,44]. Dokazane su češće aspiracione pneumonije i intestinalne infekcije kod ovih pacijenata[45,46].

Analiza mogućnosti pripreme površine akrilatnih materijala u cilju smanjenja adhezije gljivica i mikrobnog plaka uopšte, predstavlja značajan doprinos poboljšanju njihove biokompatibilnosti. Brojna istraživanja imala su za cilj unapređenje površinske strukture PMMA u cilju sprečavanja akumulacije mikroorganizama. Gocke i sar. i Puri i sar. su predložili modifikaciju akrilatnih polimera dodatkom komponenti kao što su fosfatne grupe, koje bi privukle pozitivno naelektrisane antimikrobne proteine pljuvačke sprečavajući adsorpciju i rast kandide[47,48]. Ryan je, međutim, dokazala da inkorporacija negativnih fosfatnih grupa u matriks PMMA ne utiče značajno na kolonizaciju kandide[49]. Park i sar. su adheziju kandide na površinu PMMA sprečili modifikacijom akrilata karboksilnim grupama, odnosno kopolimerizacijom metil metakrilata i metakrilne kiseline. Ovako dobijen kopolimer ima negativno naelektrisanu površinu ali i značajno lošija mehanička svojstva[25,50]. Inkorporacijom flukonazola, hlorheksidina, amfotericina B, nistatina i dr. pokušavaju se poboljšati antimikrobna svojstva akrilata i onemogućiti proces formiranja biofilma na zubnoj protezi[51]. Dodatak nanočestica srebra u akrilatima mogla bi se poboljšati antimikrobna svojstva ovog materijala[52,53]. Neka istraživanja ukazuju na značaj potpune polimerizacije PMMA na adherenciju bakterija za njihovu površinu[29]. Takahashi i sar. potvrđuju da oslobađanje etilen glikol dimetakrilata iz akrilata stimuliše rast *Streptococcus sorbinus i Streptococcus sangius*[54].

Dobra oralna higijena i dezinfekcija akrilatnih nadoknada uslovljava njihovo kvalitetno korišćenje bez posledica po zdravlje pacijenta[55]. Redovnim pranjem zubnih proteza na vreme se uklanja biofilm streptokoka i prevenira formiranje znatno patogenijeg biofilma gljivica[21,32]. Terapija proteznog stomatitisa obuhvata dezinfekciju proteza i širok opseg fungicida. U velikom broju slučajeva indikovana je izrada novih proteza usled ireverzibilne kontaminacije akrilatnog materijala, uz obavezno lečenje sluzokože usne duplje[56].

Oral *streptococci* are associated with the development of caries with dental prostheses[43,44]. Aspiration pneumonia and intestinal infections have been demonstrated more frequently in the carriers of dental proteases [45,46].

The analysis of preparation possibilities of acrylate material surface in order to reduce the adhesion of fungi and microbial plaque in general, is a significant contribution to improving their biocompatibility. Numerous studies were aimed at improving the surface structure of PMMA in order to prevent the accumulation of microorganisms. Gocke et al. and Puri et al. proposed the modification of acrylate polymers by the addition of components such as phosphate groups that would attract positively charged antimicrobial salivary proteins preventing adsorption and Candida growth [47,48]. Ryan, however, proved that the incorporation of negative phosphate groups into the PMMA matrix does not significantly affect the colonization of Candida[49]. Park et al. prevented Candida adhesion to the PMMA surface by modification of acrylate by carboxylic groups and copolymerization of methyl methacrylate and methacrylic acid. The resulting copolymer has a negatively charged surface, but also significantly worse mechanical properties [25,50]. Incorporation of fluconazole, chlorhexidine, amphotericin B, nystatin and others is an attempt to improve the antimicrobial properties of acrylate and disrupt the process of forming a biofilm on the dental prosthesis[51]. The addition of silver nanoparticles to acrylic can improve the antimicrobial properties of this material [52,53]. Some studies indicate the importance of complete PMMA polymerization on bacterial adherence to their surface[29]. Takahashi et al. confirmed that the release of ethylene glycol dimethacrylate from acrylate stimulated the growth *of Streptococcus sorbinus* and *Streptococcus sangius*[54].

Good oral hygiene and disinfection of acrylic restorations condition their quality use without consequences for the patient's health[55]. Regular cleaning of dental prostheses eliminates streptococci biofilm and prevents the formation of significantly more pathogenic biofilms of fungi[21,32]. Therapy of prosthetic stomatitis includes prosthesis disinfection and a wide range of fungicides. In a large number of cases, the production of new prostheses is indicated by irreversible contamination of the acrylic material, with mandatory treatment of the oral mucosa[56].

Biofilm i metali u stomatologiji

Biofilm se formira i na legurama koje se koriste u stomatologiji. Smatra se da je za adheziju bakterija za metalne površine odgovoran transfer elektrona[57]. Naime, nakon prvog kontakta negativno naelekrisanih bakterija i provodnog materijala, stvaraju se elektrostatske privlačne sile[58]. Hashiguchi i sar. su ukazali na manju plak-prijemčivost dentalnih legura u odnosu na akrilat[59].

Amalgami predstavljaju leguru tečne žive (Hg) sa jednim ili mešavinom više čvrstih metala. Po svom sastavu dentalni amalgami su legura žive sa srebrom (Ag), kalajem (Sn), bakrom (Cu) i eventualno cinkom (Zn). Na amalgamskim površinama se formira tanak sloj biofilma (11-17 μm), sa veoma malom vijabilnošću bakterija (>8%) u poređenju sa biofilmom na gleđi (41-56%) ili na legurama titanijuma (oko 20%)[60,61]. Smanjena vijabilnost biofilma objašnjava se oslobađanjem toksičnih supstanci i jona srebra iz amalgamske legure. Ready i sar. su zaključili da bakterije vremenom postaju rezistentne na živu[62].

Sa druge strane, dokazana je izuzetno mala vijabilnost i na zlatu (<2%) koje je bioinertno[60]. Verovatno je da mala debljina biofima onemogućava njegovo adekvatno snabdevanje nutrientima[9]. Yamane i sar. su ispitivali plak-prijemčivost abatmenta i zaključili da legura Au-Pt legura akumuliše manje plaka u odnosu na ostale ispitivane legure[63].

Titanijumska legura je pokazala manji alergeni potencijal u odnosu na druge legure za izradu metalne baze skeletiranih proteza[64,66]. Urushibara i sar. su dokazali da je hrapavost dentalnih legura ispod 0,05μm, što obećava malu plak-prijemčivost[67]. Isti autori su na svim legurama našli sojeve *Actinomyces*, *Fusobacterium*, *Haemophilus*, *Mycoplasma* i *Peptostreptococcus*, i bakterije odgovorne za razvoj parodontalnih bolesti: *Porphyromonas gingivalis*, *Porphyromonas Intermedia*, *Treponema denticola* i *Treponema forsythia*. Zhu i sar. su pokazali adheziju *S. mutans* za Co-Cr leguru[68]. Manja adhezija za Ag-Pd-Au je posledica prisustva srebrnih jona[67].

Pojava malih karioznih lezija oko ortodontskih bravica je jedna od najčešćih komplikacija terapije koja se javlja kod 50% i povezuje se akumulacijom dentalnog plaka na metalu i kompozitu koji ga vezuje za zub[69].

Biofilm and metals in dentistry

The biofilm is also formed on the alloys used in dentistry. It is believed that the transfer of electrons is responsible for adhesion of bacteria to metal surfaces[57]. Namely, after the first contact of negatively-isolated bacteria and conductive material, electrostatic attractive forces are created[58]. Hashiguchi et al. pointed to a lesser plaque susceptibility of dental alloys compared to acrylate[59].

Amalgams represent an alloy of liquid mercury (Hg) with one or a mixture of more solid metals. In their composition, dental amalgams are alloys of mercury with silver (Ag), tin (Sn), copper (Cu), and possibly zinc (Zn). A thin layer of biofilm (11-17 μm) is formed on the amalgam surfaces, with very low bacterial viability (> 8%) compared to the biofilm on the enamel (41-56%) or on titanium alloys (about 20%)[60,61]. The reduced biofilm viability is explained by the release of toxic substances and ions of silver from amalgam alloys. Ready et al. concluded that bacteria eventually become resistant to mercury[62].

On the other hand, extremely low viability on the gold is proven (<2%), which is bioinert[60]. It is probable that a small thickness of biofilm prevents its adequate supply with nutrients[9]. Yamane et al. examined the plaque susceptibility of abutments and concluded that the Au-Pt alloy accumulates less plaque compared to other tested alloys[63].

The titanium alloy showed lower allergenic potential compared to other alloys for the production of a metal skeleton denture base[64-66]. Urushibara et al. have proven that the dental alloy's roughness is below 0,05 μm, which promises a low plaque susceptibility[67]. The same authors found the strains of *Actinomyces*, *Fusobacterium*, *Haemophilus*, *Mycoplasma* and *Peptostreptococcus* on all alloys, and the bacteria responsible for the development of periodontal disease: *Porphyromonas gingivalis*, *Porphyromonas Intermedia*, *Treponema denticola* and *Treponema forsythia*. Zhu et al. showed the *S. mutans* adhesion for the Co-Cr alloy[68]. The lower adhesion for Ag-Pd-Au is due to the presence of silver ions[67].

The occurrence of small carious lesions around orthodontic locks is one of the most common complications of the therapy that occurs in 50% and is associated with the accumulation of dental plaque on the metal and the composite that binds it to the tooth[69].

Bakterije u usnoj duplji uzrokuju infekcije koje mogu dovesti od odbacivanja dentalnih implantanata. Najčešći uzročnici odbacivanja implantanata jesu *Staphylococcus epidermidis* i *Staphylococcus aureus*. Mogu da ostanu u stanju mirovanja i nekoliko godina nakon ugradnje u organizam čoveka, da bi u imunodeficijentnom stanju razvili kliničke znake infekcije[70]. U cilju prevencije ovih stanja mogu da se oblože srebrom, kvaternarnim amonijumskim komponentama i polimernim omotačima[71,72]. Omotači implantanata su monofunkcionalni: sprečavaju formiranje biofilma ili povećavaju integraciju implantanata sa tkivom. Moguća je i bifunkcionalna uloga omotača: poli (etilen glikol) sprečava formiranje biofilma i arginin-glicin-asparginska kiselina održava veze implantata i tkiva[73].

Biofilm na kompozitnim materijalima

Kompozitne restauracije akumuliraju više plaka u odnosu na druge vrste stomatoloških materijala[74,75].

Nepolimerizovani monomer kompozitnog materijala pospešuje rast kariogenih bakterija[76]. Hansel i sar. i Schmalz i sar. su dokazali da je rast streptokoka i laktobacila na kompozitnom materijalu stimulisan oslobađanjem etilen glikol dimetakrilata, trietilen glikol dimetakrilata i hidroksietil dimetakrilata iz njihove strukture[77,78].

Takođe, nepotpuna obrada i konsekutivna hrapavost kompozitnih materijala značajno doprinose nakupljanju biofilma na površini kompozita[79,80]. U uslovima oralne sredine kompozitni materijali se vremenom degradiraju, što uslovljava srazmerno povećanje njihove hrapavosti i adherencije biofilma. Ne treba zanemariti ni nanometrijske promene uslovljene dejstvom bakterijskog plaka (*S. mutans*) na površinu kompozita, što celokupnom fenomenu daje karakteristike začaranog kruga[79].

Kolonizacija prostora između zuba i kompozitne restauracije smatra se glavnim uzrokom nastanka sekundarnog karijesa[81].

Biofilm i keramički materijali

Keramika je estetski materijal za izradu fiksnih protetskih radova. Nakupljanje biofilma na keramičkim krunicama i inlejima može rezultovati oštećenjima potpornog aparata zuba i razvojem karijesa, te je održavanje oralne higijene kod pacijenata sa ovim vrstama nadoknada imperativ.

Bacteria of the oral cavity are also associated with infections that can cause the rejection of dental implants. The most common causes of implant rejection are *Staphylococcus epidermidis* and *Staphylococcus aureus*. They may remain idle for several years after incorporation into the human organism in order to develop clinical signs of infection in the immunodeficiency state. In order to prevent these conditions, they can be coated with silver, quaternary ammonium components and polymer envelopes[71,72]. Implant covers are monofunctional: they prevent the formation of biofilms or increase the integration of implants with tissue. The bifunctional role of the cover is also possible: poly (ethylene glycol) prevents the formation of biofilm, and arginine-glycine-aspartic acid maintains the connection of implants and tissues[73].

Biofilm on composite materials

Composite restorations accumulate more plaque compared to other types of dental materials [74,75].

The unpolymerized monomer of the composite material promotes the growth of cariogenic bacteria[76]. Hansel et al. and Schmalz et al. have shown that the growth of Streptococcus and Lactobacilli on the composite material is stimulated by the release of ethylene glycol dimethacrylate, triethylene glycol dimethacrylate and hydroxyethyl dimethacrylate from their structure[77,78].

Also, incomplete processing and consecutive roughness of composite materials significantly contribute to the accumulation of biofilm on the surface of the composite[79,80]. In conditions of the oral environment, composite materials degrade eventually, which results in a proportionate increase in their roughness and adherence to biofilm. Further, nanometric changes conditioned by the effect of the bacterial plaque (*S. mutans*) on the surface of the composite should not be ignored, which gives the entire phenomenon the characteristics of the vicious circle[79].

The colonization of the space between the tooth and composite restoration is considered the main cause of secondary caries[81].

Biofilm and ceramic materials

Ceramics is an aesthetic material for the production of fixed prosthetics. The collection of biofilm on ceramic crowns and inlays can result in damage to the tooth support tissue and caries development, and the maintenance of oral hygiene in patients

Veća verovatnoća za razvoj infekcije postoji kod subgingivalne demarkacije preparacije. Veličina njene površinske energije manja je nego kod zubne gleđi, te se očekuje i slabija adherencija biofilma za keramičke nadoknade[82].

Auschill i sar. su opisali formiranje tankog biofilma (1-6μm) pet dana nakon aplikacije keramičke nadoknade, sa vijabilnošću komponenata od 34-86%, što opovrgava tvrdnju da tanak biofim ne obezbeđuje dovoljno nutrijenata[60]. Različite keramike imaju i različiti potencijal za akumilaciju biofilma, pa je najotpornija cirkonijum keramika[82].

Rashid i Kawai i sar. su zaključili da glazirana keramika usled postojanja mikrohrapavosti nakuplja više plaka u odnosu na keramiku poliranu dijamantskom pastom[83-85].

Zaključak

Formiranje biofilma na stomatološkim materijalima može biti favorizujući faktor za razvoj pojedinih oboljenja usne duplje. Poznavanje njihove strukture i ponašanja u oralnoj sredini osnov su za pravilno postavljanje indikacije njihove upotrebe. Sa druge strane, nauka stalno razvija nove materijale i usavršava već postojeće, kako bi se integrisali u biološki sistem usne duplje bez neželjenih efekata.

Kontrola formiranja biofilma na stomatološkim materijalima najjednostavnije se, ipak, sprovodi kroz dobru oralnu higijenu i održavanje zubnih nadoknada.

with these types of restorations is imperative. A greater probability of developing infection exists in the subgingival demarcation of the preparation. The size of its surface energy is less than that of dental enamel, so a poorer biofilm adherence to ceramic restorations is expected as well[82].

Auschill et al. described the formation of thin biofilm (1-6μm) five days after the application of ceramic restoration, with the viability of the components of 34-86%, which disproves the claim that thin biofilm do not provide enough nutrients[60]. Different ceramics have different potential for the accumulation of biofilm, and the most resistant is zirconium ceramic[82].

Rashid and Kawai et al. concluded that glazed ceramics due to the existence of micro-roughness accumulates more plaque compared to ceramics polished with diamond paste[83-85].

Conclusion

The formation of biofilm on dental materials can be a favorable factor for the development of certain diseases of the oral cavity. Knowing their structure and behavior in the oral environment is the basis for the correct indication of their use. On the other hand, science constantly develops new materials and perfects existing ones, in order to integrate them into the biological system of the cavity without any adverse effects.

The simplest way to control biofilm formation on materials is good oral hygiene and maintaining dentures.

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Financial support and sponsorship
None

Conflict of interest
There is no conflict of interest

Patient consent
All involved patients gave their consent forms

Ethics approval
This study is in accordance with the Helsinki Declaration

Primljen / Recived on: 20.03.2018
Prihvaćen / Accepted on : 07.04.2018

INFORMATIVNI RAD
INFORMATIVE ARTICLE
doi: 10.5937/asn1877832S

ZNAČAJ I MOGUĆNOSTI PROCENE RIZIKA ZA NASTANAK KARIJESA KOD DECE

SIGNIFICANCE AND POSSIBILITIES OF CARIES RISK ASSESSMENT IN CHILDREN

Branislava Stojković [1,2], Marija Igić [1,2], Olivera Tričković-Janjić [1,2], Simona Stojanović [3], Marija Topalović [4]

[1] UNIVERZITET U NIŠU, MEDICINSKI FAKULTET NIŠ, SRBIJA
[2] KLINIKA ZA STOMATOLOGIJU, DEČJA I PREVENTIVNA STOMATOLOGIJA, NIŠ, SRBIJA
[3] UNIVERZITET U NIŠU, MEDICINSKI FAKULTET, PREDMET ORALNA HIRURGIJA, NIŠ, SRBIJA
[4] UNIVERZITET U NIŠU, MEDICINSKI FAKULTET, STUDENT NA DOKTORSKIM STUDIJAMA

[1] UNIVERSITY OF NIŠ, FACULTY OF MEDICINE IN. NIŠ SERBIA
[2] CLINIC FOR DENTISTRY, CHILD AND PREVENTIVE DENTISTRY, NIŠ, SERBIA
[3] UNIVERSITY OF NIŠ, FACULTY OF MEDICINE, ORAL SURGERY DEPARTMENT, NIŠ, SERBIA
[4] UNIVERSITY OF NIŠ, FACULTY OF MEDICINE, PHD STUDENT

Sažetak

Uvod: *Procena rizika za nastanak karijesa se definiše kao proces utvrđivanja verovatnoće da će se kod neke osobe tokom određenog vremena razviti nova karijesna lezija, i/ili kao verovatnoća da će kod postojećih lezija doći do promene u težini i/ili aktivitetu, i predstavlja osnovni preduslov efikasne prevencije karijesa. Poslednjih decenija akcenat je stavljen na individualizovanom preventivnom pristupu, a samim tim i na individualnoj proceni rizika za pojavu karijesa.*
Cilj: *ovog rada bio je da ukaže na značaj i mogućnosti procene rizika za nastanak karijesa u dečjem uzrastu.*
Zaključak: *Dalja istraživanja iz ove oblasti treba usmeriti na identifikaciji jedinstvenog faktora rizika za pojavu karijesa, odnosno kombinacije ovih faktora koji bi pokazali visok prediktivni značaj, i omogućiti veoma ranu identifikaciju pojedinca / populacione grupe u riziku pre kliničke manifestacije bolesti.*

Ključne reči: *procena karijes rizika, deca*

Corresponding author:
Branislava Stojković, DDS,
Medicinski fakultet Niš,
Bulevar Dr Zoran Đinđić 81, Niš, Srbija
E-mail:sbranislava@gmail.com

Abstract

Introduction: *as a process of determining the likelihood of developing a new carious lesion in a given person within a specific period of time and/or the likelihood of changes occurring in severity and/or activity within existing lesions. In the last decades, the emphasis has been put on personalized preventive approach that provides individual estimation of caries risk.*
The aim: *The aim of this study was to emphasize the significance and possibilities of caries risk assessment in children.*
Conclusion: *Further research in this field should be aimed at distinguishing unique caries risk factor or the combination of factors that would show high caries predictive importance, and to allow very early identification of an individual/population group at risk before a clinical manifestation of the disease*

Key words: *caries risk assessment, children*

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Uvod

Karijes je najučestalije progresivno oboljenje tvrdih zubnih tkiva, kompleksne i multikauzalne etiologije. Epidemiološke studije pokazuju da je poslednjih godina prevalencija karijesa u porastu, i da se kod dece školskog uzrasta kreće u rasponu 60-90%[1,2], dok se prevalencija karijesa u ranom detinjstvu, u zavisnosti od uzrasta i ispitivane populacije, kreće u rasponu od 28 do 82%[3]. Rezultati istraživanja sprovedenog u Srbiji prema principima i metodologiji Svetske zdravstvene organizacije pokazuju da prevalencija karijesa kod trogodišnjaka u Srbji iznosi 30,3%, kod dvanaestogodišnjaka 86%, a kod petnaestogišnjaka 88,7%[4]. Istim istraživanjem je utvrđeno da svaki dvanaestogodišnjak u Srbiji u proseku ima 2,8, a svaki petnaestogodišnjak 5,56 stalnih zuba sa KEP-om.

Zbog visoke prevalencije i činjenice da u mnogim zemljama sveta karijes još uvek predstavlja veliki finansijski i javno-zdravstveni problem[1], primarna prevencija ovog oboljenja predstavlja imperativ savremene stomatologije. U skladu sa tim, širom sveta se usvajaju i/ili revidiraju postojeći Nacionalni programi preventivne stomatološke zdravstvene zaštite stanovnika kojima se uređuju aktivnosti usmerene na očuvanje oralnog zdravlja stanovnika. U Republici Srbiji ovakav program je usvojen 2009. godine[4], i njime je jasno istaknut značaj procene rizika za nastanak karijesa kao osnovnog preduslova efikasne prevencije ovog oboljenja.

Značaj procene rizika za nastanak karijesa

Procena rizika za nastanak karijesa predstavlja proces utvrđivanja verovatnoće da će se kod neke osobe tokom određenog vremena razviti nova karijesna lezija i/ili kao verovatnoća da će kod postojećih lezija doći do promene u težini i/ili aktivitetu[5–7]. Sprovodi se sa ciljem rane identifikacije pojedinca i/ili populacione grupe koja je u povećanom riziku, kako bi se preventivne i profilaktičke mere sprovele pre kliničke manifestacije bolesti.

Značaj procene rizika za nastanak karijesa najbolje ilustruju rezultati studije koju su 1993. godine sproveli Axelsson i saradnici[8], koji su u jednoj oblasti Švedske konstantnim određivanjem rizika za pojavu karijesa, uz odgovarajuću primenu preventivno-profilaktičkih mera i postupaka, uspeli da za nekoliko godina KIP kod dece snize sa 6,5 na 1.

Introduction

Dental caries is most commonly a progressive disease of hard dental tissue of complex and multifactorial aetiology. Epidemiological studies show that prevalence of caries has been rising in recent years and that in school-aged children it ranges from 60-90%[1,2], while prevalence of early childhood caries, depending on age and population surveyed, ranges from 28 to 82%[3].The results of the research conducted in Serbia, according to the principles and methodology of World Health Organization, show that prevalence of caries in three-year-olds in Serbia is 30.3%, in twelve-year-olds is 86%, and in fifteen-year-olds is 88.7%[4]. The same research has shown that every twelve-year-old in Serbia has an average of 2.8, and every fifteen-year-old has an average of 5.56 permanent teeth with DMF.

Due to high prevalence and the fact that caries still represents huge financial and public health problem[1] in many countries of the world, primary prevention of this disease is the imperative of modern dentistry. Accordingly, the existing National Programs of preventive dental health care for residents that regulate activities aimed at preserving the oral health of citizens are being adopted and/or revised around the world. The Republic of Serbia adopted this program in 2009[4], which clearly emphasizes the importance of assessing the risk of developing caries as a basic precondition for effective prevention of this disease.

Importance of caries risk assessment

Caries risk assessment is a process of determining the likelihood of developing a new carious lesion in a given person within a specific period of time and/or the likelihood of changes occurring in severity and/or activity within existing lesions[5–7]. The aim of the assessment is early identification of an individual and/or a population group with increased risk in order to conduct preventive and prophylactic measures prior to clinical manifestation of the disease.

The significance of caries risk assessment is best illustrated by the results of a study conducted in 1993 by Axelsson and associates[8]. Constantly determining the risk of caries with appropriate application of preventive prophylactic measures and procedures in one area of Sweden, they managed

Efikasnost procene rizika za nastanak karijesa u prevenciji ovog oboljenja dokazana je i drugim studijama[9].

Osim pomenutog, određivanje rizika za nastanak karijesa sa individualizovanom prevencijom predstavlja prvi korak u savremenom kliničkom pristupu karijesu, iza čega slede rana dijagnoza bolesti, minimalna invazivna sanacija i na kraju restauracija većih kaviteta i lečenje obolele pulpe[10].

Utvrđivanje rizika za nastanak karijesa

Proces procene rizika za nastanak karijesa obuhvata identifikaciju faktora rizika za nastanak karijesa, ispitivanje njihovog uticaja na zdravlje zuba i predviđanje progresije/stabilizacije karijesnog procesa praćenjem incidencije i/ili promena u aktivitetu karijesnih lezija[6,7,11].

Kako je karijes multikauzalno oboljenje, kompleksne etiopatogenze, utvrđeno je da svi faktori koji su direktno ili indirektno uključeni u nastanak karijesa mogu biti od značaja u određivanju verovatnoce da će u budućnosti doći do njegove pojave, a koje su Fontana i sar.[5] klasifikovali na kliničke (prethodno karijes iskustvo, gleđni defekti, otrodontske anomalije), biološke (genetski uticaj, sastav i osobine dentalnog biofilma, sastav i osobine pljuvačke), socioekonomske i demografske faktore (pol, rasa, etnička pripadnost, ekonomski standard pojedinca, obrazovni profil, uslovi života), sredinske (klima, izloženost fluoridima), bihejvioralne faktore (temperament pojedinca, tip roditeljstva, higijensko-dijetetske navike) i faktore koji su vezani za roditelje/staraoce dece, a koji mogu biti od značaja za procenu karijes rizika kod dece (karijes roditelja /staraoca). Korišćenjem ovih varijabli u proceni rizika za nastanak karijesa može se utvrditi da li osoba pripada niskom, umerenom i visokom riziku za pojavu karijesa.

Istraživanja iz oblasti procene rizika za nastanak karijesa su usmerena na pronalaženje takvog karijes rizik biomarkera i takve metodologije, čija bi primena bila jednostavna, efikasna i ekonomična, a što bi istovremeno omogućilo preciznu i ranu identifikaciju visoko karijes-rizičnih pojedinca ili populacionih grupa pre kliničke manifestacije bolesti. U tom smislu, posebnu pažnju privukla je uloga pljuvačke, koja se zbog lake dostupnosti i činjenice da sadrži mikroorganizme i njihove produkte, sastojke hrane, ali i brojne odbrambene faktore, može koristiti kao medijum za praćenje sva tri primarna faktora u nastanku karijesa[12].

to lower the number of children with carious teeth from 6.5 to 1 in only a few years. The efficacy of caries risk assessment in the prevention of this disease has been proven in other studies as well[9].

In addition to the aforementioned, determining the risk of caries development with personalized prevention represents the first step in modern clinical approach to caries, followed by early diagnosis of the disease, minimal invasive repair and finally, restoration of large cavities and treatment of diseased pulp[10].

Determining the risks of developing caries

The process of caries risk assessment includes identification of caries risk factors, examination of their influence on health of teeth and prediction of progression/stabilization of the caries process by following incidence and/or changes in celiac lesion activity[6,7,11].

Since caries is multifactorial disease with complex etiopathogenesis, it has been determined that all the factors, directly or indirectly involved in the development of caries, can be important in determining the likelihood of its development in the future. The factors have been classified by Fontana and associates[5] into: clinical (previous experience of caries, enamel defects, orthodontic anomalies), biological (genetic influence, composition and characteristics of dental biofilm, composition and characteristics of saliva), socioeconomic and demographic factors (gender, race, ethnicity, economic standard of an individual, educational profile, living conditions), environmental (climate, exposure to fluoride), behavioural factors (individual temperament, parenting type, hygienic-dietary habits) and factors regarding parents/guardians, which can be significant for caries risk assessment in children (caries in parents/legal guardians). Use of these variables in caries risk assessment can help us determine whether a person belongs to a low, moderate or high caries risk.

The research in the field of caries risk assessing is aimed towards finding such caries risk biomarker and such methodology that would have simple, efficient and economical application and that would, simultaneously, enable precise and early identification of individuals or population groups with high caries risk, prior to clinical manifestation of the disease.

Analiziran je veliki broj različitih salivarnih komponenti kao biomerkara zubnog kvara, koje su Gao i saradnici[12] podelili na: funkcionalnalne osobine pljuvačke (pH i protok pljuvačke), salivarne mikroorganizame (nivo S. mutansa i Lactobacillus spp.), elektrolite i proteine. Posebna pažnja je usmerena na otkrivanje salivarnih komopnenti koje bi pokazale visok prediktivni nivo karijesa i omogućile veoma ranu identifikaciju pojedinca koji je u riziku od nastanka ovog oboljenja. Uzimajući u obzir infektivnu etiologiju karijesa, sugerisano je da bi u proceni rizika za nastanak karijesa od velikog značaja mogle da budu i brojne antimikrobne komponente pljuvačke, ali su neophodne dobro dizajnirane longitudinalne studije koje bi ovo i potvrdile.

I pored ogromnog napretka učinjenog u ovoj oblasti karijesologije, do sada nije utvrđen nijedan faktor koji kao samostalni faktor ima visok prediktivni značaj. Zbog multikauzalne etiologije karijesa, ali i kompleksnosti etiopatogeneze ovog oboljenja, čiji tok umnogome može biti određen faktorima odbrane organizma, utvrđeno je da se stepen predvidljivosti povećava korišćenjem kombinacije većeg broja varijabli[13,14]. Iako je istaknut veliki broj faktora značajnih u proceni rizika za nastanak karijesa, za sada se najznačajnijim smatraju prisustvo aktivnih karijesnih lezija, KEP/kep osobe, navike u ishrani, dnevna produkcija plaka, kvalitet i količine izlučene pljuvačke, puferski kapacitet pljuvačke, nivo S. mutansa i nivo Lactobacilla u pljuvački, primena fluorida, opšte zdravstveno stanja pacijenata, stanje oralnog zdravlja roditelja/staraoca, kao i socioekonomskog statusa osobe. Međutim, istraživanja su pokazala da i među ovim faktorima postoji razlika u pogledu njihove prediktivne vrednosti, a da su najviši prediktivni nivo pokazali prethodno iskustvo sa karijesom, nivo S. mutansa u pljuvački, unos fluorida i puferski kapacitet pljuvačke, dok to nije bio slucaj sa sastavom i ferkventnošću unosa hrane, nivoom Lactobacillus spp, količinom plaka i sekrecijom pljuvačke[15]. Osim toga, prediktivnu moć u proceni rizika za nastanak karijesa može imati i celokupni utisak koji pacijent ostavlja na stomatologa[16].

Further, special attention was drawn to saliva which can, due to its availability and the fact that it contains microorganisms and their products, food content as well as numerous defence factors, be used as a monitoring medium for all three primary factors in caries development[12]. A number of different salivary components have been analysed as biomarkers of dental decay, which Gao and associates[12] divided into: functional characteristics of saliva (pH and saliva flow), salivary microorganisms (level of S. mutans and Lactobacillus spp.), electrolytes and proteins. Special attention is paid to the detection of salivary components that would show high predictive level of caries and enable early identification of an individual who is at risk. Bearing in mind infectious aetiology of caries, it has been suggested that a number of antimicrobial components of saliva may be of great importance in the caries risk assessment, but well-designed longitudinal studies are necessary to confirm this.

In spite of enormous progress made in this field, not one factor has been singled out as a solo factor with high predictive significance. Due to multifactorial aetiology of caries, but also to complexity of etiopathogenesis of this disease, whose course can largely be determined by organism defence factors, it has been determined that the degree of predictability is increased by using the combination of a large number of variables[13,14]. Although a number of factors is significant for caries risk assessment, currently, the most important are presence of active caries lesions, DMF people, nutrition habits, daily production of plaque, quantity and quality of saliva, buffer capacity of saliva, level of S. mutans and level of Lactobacillus in saliva, application of fluoride, general health condition of the patient, oral health condition of the parent/legal guardian, as well as socioeconomic status of the person. However, research has shown that these factors differ regarding their caries predictive value and that the highest predictive level is seen in previous caries experience, level of S. mutans in saliva, intake of fluoride and buffer capacity of saliva. This was not the case with the content and frequency of food intake, level of Lactobacillus, quantity of plaque and saliva secretion[15]. In addition, overall impression that a patient leaves on a dentist can have predictive power in assessing the risk of caries development[16].

Poslednjih decenija akcenat je stavljen na individualizovani preventivni pristup, a samim tim i na individualnu procenu rizika za pojavu karijesa. To je proizašlo iz masovne primene fluorida, čime je često maskirana uloga pojedinih faktora u procesu procene rizika za nastanak karijesa, ali i činjenice da značaj mnogih u velikoj meri zavisi i od uzrasta pacijenta.

Specifičnosti procene rizika za nastanak karijesa u dečjem uzrastu

Procena rizika za nastanak karijesa treba da bude neizostavni deo procene celokupnog zdravlja, i treba je izvršiti u toku prve godine života, pre ili u vreme nicanja prvih mlečnih zuba, a zatim je periodično ponavljati[5]. U skladu sa time, Zakonom o zdravstvenom osiguranju Republike Srbije regulisano je da procenu rizika za nastanak karijesa treba obaviti u toku prve godine života, a zatim je kontinuirano ponavljati na godinu dana.

Kod odojčadi i male dece prethodna pojava karijesa, iako ima visok prediktivni nivo, nije od velikog od značaja u proceni rizika za pojavu karijesa, budući da je osnovni cilj utvrditi rizik pre kliničke manifestacije bolesti. Osim toga, smatra se da salivarni faktori (pH pljuvačke, protok pljuvačke) nisu od velike pomoći, kao ni frekventnost unosa ugljenih hidrata, što autori objašnjavaju unosom fluorida, koji, pre svega, imaju preventivni značaj. Istraživanjima je utvrđeno da su u ovom uzrastu najviši karijes prediktivni značaj pokazali produženi noćni obroci bočicom, akumulacija dentalnog biofilma na zubima, izbegavanje primene fluorida, nizak socio-ekonomski standard porodice, kao i loše stanje zdravlja zuba majke/staraoca. Iako mnogi faktori kod odojčadi i male dece nisu pokazali visok prediktivno nivo, nikako se ne smeju zanemariti u praksi pri proceni rizika za nastanak karijesa.

Kod dece predškolskog uzrasta je utvrđeno da je sa pojavom karijesa snažno povezana akumulacija dentalnog biofilma i nivo *S. mutansa* u pljuvački[17,18]. Pojava jednog ili većeg broja zuba sa karijesom u ovom uzrastu je znak značajnog rizika za razvoj novih lezija i zahteva hitnu i sveobuhvatnu intervenciju. Istraživanja pokazuju da su značajni karijes prediktori u ovom uzrastu obrazovanje i stavovi roditelja[19]. Navike u ishrani su takodje od značaja, ali je njihov prediktivni nivo nešto manji od pomenutih faktora, i maskiran upotrebom

In the last decades, the emphasis has been put on a personalized preventive approach that provides individual estimation of caries risk. This resulted from the massive use of fluoride that often masks the role of some factors in the process of caries risk assessment, but also from the fact that the importance of many risk factors, apart from race, ethnicity and cultural habits, largely depends on patient's age.

Specificities of caries risk assessment in children's age

Caries risk assessment should be inevitable part of the overall health assessment and should be conducted within the first year of life, prior to or during teething and should also be repeated periodically[5]. Accordingly, the Law on Health insurance of Republic of Serbia specifies that the risk assessment should be conducted within the first year of life and that should be continually, annually repeated.

Even though it has high predictive level, prior caries experience is not so much important for caries risk assessment in infants and young children, because the main goal is to determine the risk prior to clinical manifestation of the disease. Additionally, salivary factors (pH of the saliva, saliva flow) are not considered as great help, nor is the frequency of carbohydrates intake. Authors explain this by fluoride intake, which, above all, has significance in caries prevention. The research has confirmed that prolonged night meals on a bottle, accumulation of dental biofilm on teeth, avoidance of fluoride intake, and low socioeconomic standard of the family as well as poor health of teeth in mother/legal guardian had the most caries predictive influence in this age. Although many factors have not shown high predictive level in infants and toddlers, they should not be neglected in practice when assessing the risk of caries development.

Regarding preschoolers, it has been determined that developing caries is closely connected with accumulation of dental biofilm and level of S. mutans in saliva[17,18]. Developing caries on one or more teeth in this age is a sign of significant risk for the development of new lesions and demands urgent and comprehensive intervention. The research has also shown that parents' education and attitudes play significant role in predicting caries[19].

fluorida. Smatra se da u ovom uzrastu najbolji model za procenu rizika za pojavu karijesa treba da obuhvati socio-ekonomski status porodice, socio-demografske karakteristike i prethodnu iskustvu karijesa[19]. I kod dece školskog uzrasta i adolescenata utvrđeno je da je najbolji samostalni prediktor prethodna pojava karijesa, dok je uloga salivarne koncentracije S. mutansa, upotrebe ugljenih hidrata manje precizna nego kod dece predškolkog uzrasta. Puferski kapacitet pljuvačke u ovom uzrastu ne doprinosi predikciji karijesa[19]. Međutim, pojedine studije su istakle značaj morfologije zuba, kao faktora rizika za nastanak karijesa, s obzirom da su prvih nekoliko godina nakon erupcije zuba period visokog rizika za nastanak karijesa, o čemu treba voditi računa.

Modeli za procenu rizika za nastanak karijesa

Iako je pri rutinskom stomatološkom pregledu, intervjuisanjem roditelja i kliničkim pregledom moguće dobiti podatke za sasvim korektnu procenu rizika za nastanak karijesa kod dece, javila se potreba za kreiranjem papirnih formi, modela i kompjuterskih programa koji bi kliničarima olakšali procenu rizika za nastanak karijesa u svakodnevnoj praksi. Ova potreba proizašla je iz činjenica da je rizik za nastanak karijesa podložan promenama tokom vremena, i da se registrovanjem podataka omogućava praćenje njihovog uticaja u nastanku karijesa svake individue tokom dužeg vremenskog perioda. Osim toga, sve to bi istovremeno imalo i motivacionu ulogu na pacijenta i značajno doprinelo prevenciji karijesa. Polazeći od svega navedenog, ali i već istknutih činjenica da nijedan faktor kao samostalni ne pokazuje visok prediktivni nivo, da se stepen predvidljivosti povećava korišćenjem kombinacije većeg broja varijabli, i da značaj mnogih faktora u proceni rizika za pojavu karijesa zavisi od uzrasta, odnosno starosti pacijenta, ekspertske grupe su kreirale gotove modele za procenu rizika za nastanak karijesa, čija je efikasnost testirana za različite starosne i populacione grupe.

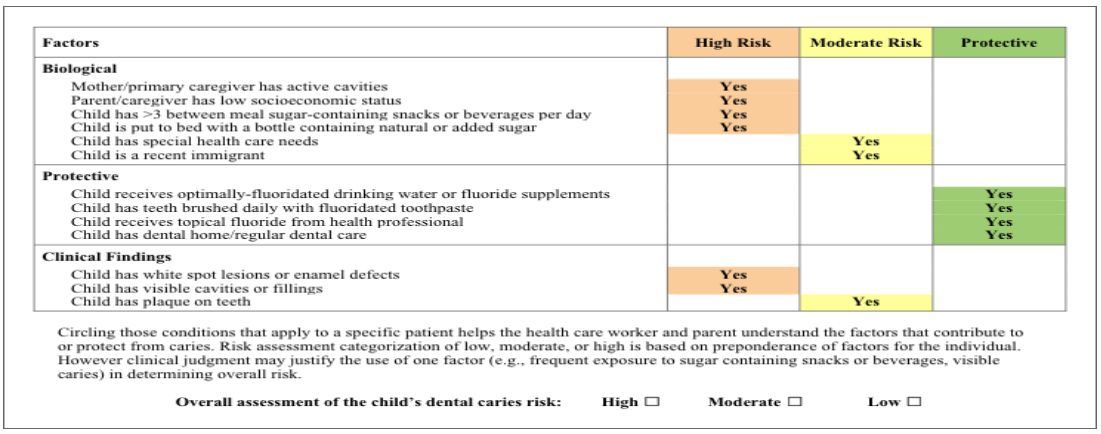
Američka akademija dečjih stomatologa (AAPD) je 2002. godine usvojila i periodično revidirala modele za procenu rizika za nastanak karijesa, posebno za decu do tri godine starosti, za decu do 6 i starije od 6 godina[20] (Slika 1).

Eating habits are also important, but their predictive level is slightly lower and it is masked by the use of fluoride. It is believed that the best model for assessing caries risk in this age should include socioeconomic status of the family, sociodemographic characteristics and previous caries experiance[19]. It has also been determined that the best solo predictor in school children and adolescents is previous caries experience while the role of salivary concentration of S. mutans and use of carbohydrates is less accurate than in preschoolers. The buffer capacity of saliva in this age does not contribute to caries prediction[19]. However, some studies have emphasized the significance of teeth morphology as a risk factor for developing caries since the first few years after teething are the period of high risk for developing caries, which people should pay attention to.

Models for assessing the risk of developing caries

Although the routine dental examination, which includes interviewing the parents and clinical examination, provides data for appropriate caries risk assessment, there is still the need for creation of paper forms, models and computer programs that would alleviate caries risk assessment in everyday practice. This need has arose from the fact that the risk of caries development is susceptible to changes over time, and registering the data would enable monitoring their influence in caries development in every person over a longer period of time. Besides, it would simultaneously have a motivational role in a patient and would significantly contribute to prevention of caries. Taking everything into account, together with the fact that none of the factors show high predictive level as solo factor, that the level of predictability rises with the use of combination of larger number of variables and that the importance of many factors in caries risk assessment depends on patient's age, expert groups have created ready models for caries risk assessment, whose efficiency is tested on different age and population groups.

In 2002, American Academy of Paediatric Dentistry (AAPD) adopted and periodically revised models for assessing the



Factors	High Risk	Moderate Risk	Protective
Biological			
Mother/primary caregiver has active cavities	Yes		
Parent/caregiver has low socioeconomic status	Yes		
Child has >3 between meal sugar-containing snacks or beverages per day	Yes		
Child is put to bed with a bottle containing natural or added sugar	Yes		
Child has special health care needs		Yes	
Child is a recent immigrant		Yes	
Protective			
Child receives optimally-fluoridated drinking water or fluoride supplements			Yes
Child has teeth brushed daily with fluoridated toothpaste			Yes
Child receives topical fluoride from health professional			Yes
Child has dental home/regular dental care			Yes
Clinical Findings			
Child has white spot lesions or enamel defects	Yes		
Child has visible cavities or fillings	Yes		
Child has plaque on teeth		Yes	

Circling those conditions that apply to a specific patient helps the health care worker and parent understand the factors that contribute to or protect from caries. Risk assessment categorization of low, moderate, or high is based on preponderance of factors for the individual. However clinical judgment may justify the use of one factor (e.g., frequent exposure to sugar containing snacks or beverages, visible caries) in determining overall risk.

Overall assessment of the child's dental caries risk: **High** ☐ **Moderate** ☐ **Low** ☐

Slika 1. Forma Američke akademije za dečju stomatologiju za procenu rizika za nastanak karijesa kod dece uzrasta 0-5 godina[20]

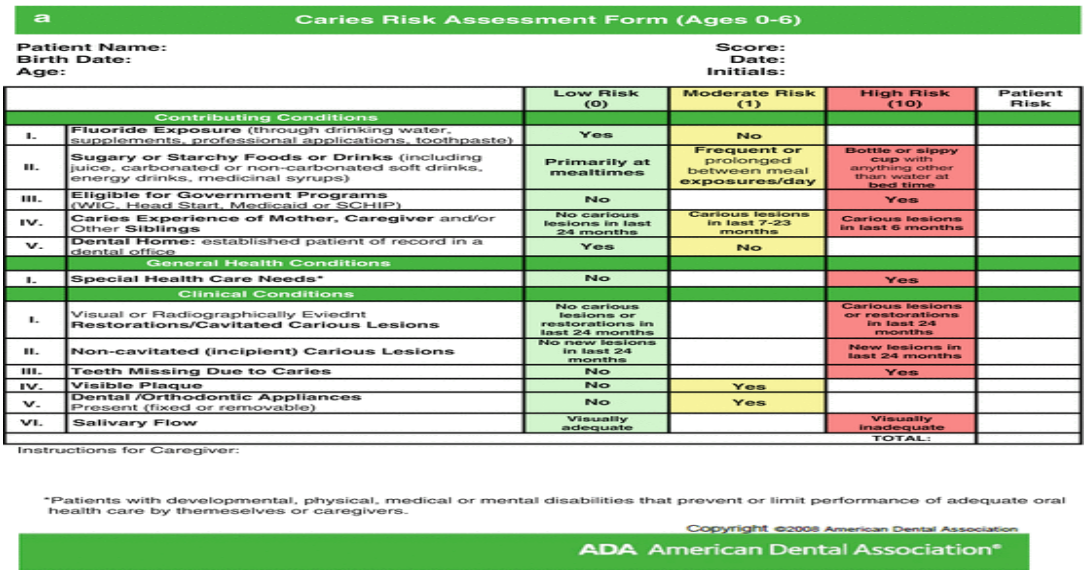
Figure 1. American Academy of Pediatric Dentistry form for caries risk assessment for children aged 0-5 years[20]

Ovim modelima pridodati su sledeći faktori: sadašnje i prošlo iskustvo u pojavi karijesa, upotreba fluorida, ishrana, salivarni status, opšte zdravstveno stanje, socio-ekonomski status, medicinske i druge faktore. Ova asocijacija je istovremno uz modele za procenu krijes rizika dala i kliničku preporuku za upravljanje karijesom na osnovu utvrđenog rizika za datu starosnu grupu, što predstavlja veliku prednost korišćenja ovog modela.

Slično predhodnoj asocijaciji, Američko udruženje stomatologa je kreiralo formulare za procenu rizika za nastanak karijesa, za uzrast od 0 do 6 godina, i uzrast preko 6 godina[21,22] (Slika 2).

risk of caries development, especially for 3-year-olds, 6-year-olds and children over six years of age[20] (Figure 1). These models include following factors: current and previous caries experience, use of fluoride, nutrition, salivary status, general health condition, socio-economic status, medical and other factors. Together with caries risk assessment models, this association provided clinical recommendation for managing caries based on determined risk for given age group, which presents huge advantage of using this model[20].

Similar to previous association, American association of dentists has created forms for caries risk assessment for the age from 0 to 6 years and the age of over six years[21,22] (Figure 2).



a **Caries Risk Assessment Form (Ages 0-6)**

Patient Name: **Score:**
Birth Date: **Date:**
Age: **Initials:**

		Low Risk (0)	Moderate Risk (1)	High Risk (10)	Patient Risk
	Contributing Conditions				
I.	**Fluoride Exposure** (through drinking water, supplements, professional applications, toothpaste)	Yes	No		
II.	**Sugary or Starchy Foods or Drinks** (including juice, carbonated or non-carbonated soft drinks, energy drinks, medicinal syrups)	Primarily at mealtimes	Frequent or prolonged between meal exposures/day	Bottle or sippy cup with anything other than water at bed time	
III.	**Eligible for Government Programs** (WIC, Head Start, Medicaid or SCHIP)	No		Yes	
IV.	**Caries Experience of Mother, Caregiver** and/or Other **Siblings**	No carious lesions in last 24 months	Carious lesions in last 7-23 months	Carious lesions in last 6 months	
V.	**Dental Home:** established patient of record in a dental office	Yes	No		
	General Health Conditions				
I.	**Special Health Care Needs***	No		Yes	
	Clinical Conditions				
I.	Visual or Radiographically Evident **Restorations/Cavitated Carious Lesions**	No carious lesions or restorations in last 24 months		Carious lesions or restorations in last 24 months	
II.	**Non-cavitated (incipient) Carious Lesions**	No new lesions in last 24 months		New lesions in last 24 months	
III.	**Teeth Missing Due to Caries**	No		Yes	
IV.	**Visible Plaque**	No	Yes		
V.	**Dental /Orthodontic Appliances** Present (fixed or removable)	No	Yes		
VI.	**Salivary Flow**	Visually adequate		Visually inadequate	
				TOTAL:	

Instructions for Caregiver:

*Patients with developmental, physical, medical or mental disabilities that prevent or limit performance of adequate oral health care by themeselves or caregivers.

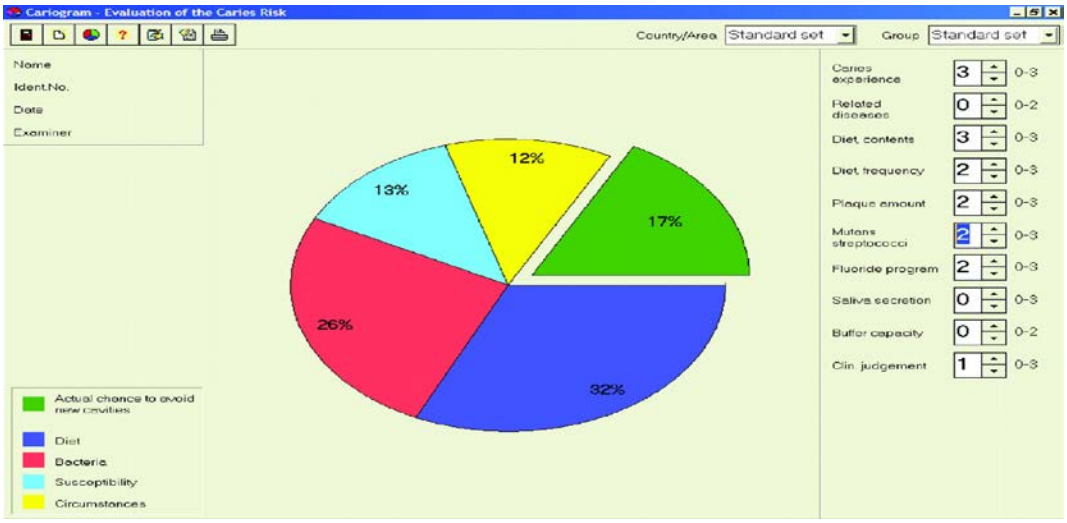
ADA American Dental Association®

Slika 2. Forma Američke dentalne akademije za procenu rizika za nastanak karijesa kod dece uzrasta 0-6 godina[21]

Figure 2. American Dental Association form for caries risk assessment for children aged 0-6 years[21]

Bratthall i saradnici[23] su 1997. godine razvili Cariogram, kompjuterski program za procenu rizika za nastanak karijesa (Slika 3). Program uzima u obzir interakciju između individualno procenjenih faktora rizika za pojavu karijesa, a sastoji se iz pet sektora. Prva četiri čine:“ ishrana”, koja predstavlja kombinaciju sastava i frekventnosti unosa hrane, “bakterije” koje predstavljaju kombinaciju količine plaka i količine S.mutansa u pljuvački, “osetljivost”-kombinacija programa fluorida, količine i puferskog kapaciteta pljuvačke i “okolnost” koja predstavlja kombinaciju prethodnog iskustva sa karijesom i sistemskih bolesti.

In 1997, Bratthalland associates[23] developed Cariogram - computer program for caries risk assessment (Figure 3). Program considers the interaction between individually assessed caries risk factors and is composed of five sectors. The first four are: “nutrition”, which presents combination of content and frequency of food intake, “bacteria” which presents combination of plaque and the quantity of S.mutans in saliva, “sensitivity”-combination of fluoride program, quantity and buffer capacity of saliva and “circumstance” which presents combination of previous caries experience and systemic diseases.



Slika 3. CARIOGRAM- Kompjuterski program za procenu rizika za nastanak karijesa[23]

Figure 3. CARIOGRAM-Computer program for caries risk assessment[23]

Peti sektor je označen kao “šansa da se u bliskoj budućnosti izbegne karijes”. Ovaj kompjuterski program, zapravo, pokazuje u kojoj meri različiti faktori utiču na šansu da dođe do pojave nove karijesne lezije. Program je kreiran sa ciljem da da grafičku demonstraciju rizika za pojavu karijesa, za datog pacijenta, iskazanu kao “šansa da se izbegne novi karijes” u bliskoj budućnosti. Smatra se da je primena ovog programa u proceni rizika za nastanak karijesa efikasnija kod dece školskog u odnosu na decu predškolskog uzrasta[24,25].

Vulović i saradnici[26] su predložili da se u oblasti dijagnostike rizika za nastanak karijesa dece našeg podneblja koriste provereni parametri, kao što su test kvaliteta i načina ishrane, test nivoa dnevne produkcije plaka, test kvaliteta i količine izlučene pljuvačke, test puferskog kapaciteta pljuvačke, određivanje nivoa S. mutansa u pljuvački, određivanje

The fifth sector is marked as “the chance to avoid caries in the near future”. This computer program actually shows to what extent various factors influence the chance of developing new caries lesion. The aim of the program is to provide graphic demonstration of caries risk for a given patient, shown as “the chance to avoid new caries” in the near future. It is believed that the use of this program in assessing the risk of caries development is more efficient in school children compared to preschoolers[24,25].

Vulović and associates[26] have suggested the use of proven parameters in the field of diagnosing the risk of developing caries in children in our area. They include tests of nutrition and nutrition quality, level of daily plaque production test, test of quality and quantity of saliva, test of buffer capacity of saliva, determining the level of S. mutans in saliva, determining the level of

saliva, in DMF person. nivoa laktobacila u pljuvački, KEP/kep osobe. Međutim, i pored ove preporuke, procena rizika se u svakodnevnom radu najčešće vrši na osnovu podataka dobijenih od roditelja o navikama u ishrani, održavanju oralne higijene, primeni fluorida, kao i kliničkom pregledu deteta, budući da su pojedini testovi, kao što su testovi određivanje nivoa S. mutansa i Lactobacilla u pljuvački, za naše uslove skupi i za većinu pacijenata ekonomski nedostupni. U našoj zemlji za sada ne postoji vodič za procenu rizika za nastanak karijesa, iako je prevalencija karijesa u dečjem uzrastu u Republici Srbiji visoka.

Zaključak

Budući da procena rizika za nastanak karijesa predstavlja osnovni preduslov efikasne primarne prevencije karijesa, ali i prvi korak u savremenom kliničkom pristupu karijesa, neophodno je njeno kontinuirano sprovođenje od prve godine života, i na dalje, tokom čitavog detinjstva i života osobe. Identifikovan je veliki broj faktora rizika za pojavu karijesa i kreiran veliki broj modela-vodiča koji olakšavaju kliničarima procenu rizika za nastanak karijesa u svakodnevnoj praksi uz monitoring uticaja pojedinih faktora za svakog pacijenta ponaosob, što omogućava adekvatnu, individualnu primenu preventivno-profilaktičkih mera. Dalja istraživanja iz ove oblasti treba usmeriti na pronalaženje jedinstvenog faktora rizika za pojavu karijesa, odnosno kombinacije ovih faktora koji bi pokazali visok prediktivni značaj, počevši od najranijeg detinjstva, pa na dalje, a u cilju primarne prevencije ovog vodećeg oralnog oboljenja u dečjem uzrastu.

Lactobacilli in saliva, in DMF person. However, apart from this suggestion, everyday risk assessment is mostly based on data provided by parents regarding nutrition habits, oral hygiene, fluoride application as well as clinical examination. This is because the tests, as the test of determining the level of S. mutans and Lactobacilli in saliva, are very expensive for our conditions and are financially unavailable for most patients. Our country does not have a guide for assessing the risk of caries development even though the caries prevalence in child's age is high in Republic of Serbia.

Conclusion

Since caries risk assessment is basic precondition for efficient primary prevention of caries, but also the first step in modern clinical approach to caries, its continuous implementation from the first year of life is necessary as further implementation through childhood and life. A number of caries risk factors have been identified and a number of models-guides have been created in order to ease the risk assessment of caries development in everyday practice together with monitoring the influence of some factors for each patient individually, which enables adequate, individual application of preventive-prophylactic measures. Further research in this field should be aimed at distinguishing unique caries risk factor or the combination of factors that would show high caries predictive importance from the earliest childhood on, with the goal of primary prevention of this, leading oral disease in children.

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Financial support and sponsorship
None

Conflict of interest
There is no conflict of interest

Patient consent
All involved patients gave their consent forms

Ethics approval
This study is in accordance with the Helsinki Declaration

UPUTSTVA AUTORIMA

Acta Stomatologica Naissi je naučni časopis Stomatološke klinike, Medicinskog fakulteta Univerziteta u Nišu, koji publikuje radove iz svih oblasti stomatologije i srodnih medicinskih grana.

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Svi predati radovi za štampanje moraju biti napisani na srpskom i engleskom jeziku. Apstrakti treba da budu pripremljeni pored srpskog i na preciznom i gramatički ispravnom engleskom jeziku (US engleski stil) (videti niže). Izbegavati korišćenje latinskih izraza; ako su potrebni staviti ih u zagrade.

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2. Organizacija kao autor: Federation Dentaire Internationale. Technical Report No. 28. Guidelines for antibiotic prophylaxis of infective endocarditis for dental patients with cardiovascular disease. Int Dent J 1987;37:235.

3. Nije dat autor: Coffee drinking and cancer of the pancreas (editorial).BMJ 1981;283:628

4. Volumen sa suplementom: Magni R, Rossoni G, Berti R, BN52021 protect guinea pig from heart anaohylaxis. Pharmacol Res Commun 1988; 20 Suppl 5:75–8.

Knjige ili druge monografije

5. Lični autor (i): Tullman JJ, Redding SW. Systemic Disease in Dental Treatment. St.Louis: The CV Mosby Company;1983:1–5.

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Ostali publikovani materijal

8. Novinski članak: Shaffer RA.Advances in chemistry are starting to unlock mysteries of the brain. The Washington Post 1989 Ang 7; Sect. A:2 (col. 5).

Reference-elektronski citati

9. On line časopisi bez podataka o volumenu i strani. Berlin JA , Antman EM. Advantages and limitations of metaanalytic regressions of clinical trials data. Online J Curr Clin Trials (serial online). June 4;doc 134. Accessed July 20, 2000.

10. Online časopisi sa podacima o volumenu i strani. Fowler EB, Breault LG. Ridge augmentation with a folded acellular dermal matrix allograft: A case Report. J Contemp Dent Pract (serial online). 2001;2(3):31–40. Available from: Procter&Gamble Company, Cincinnat, OH. Accessed December 15, 2001.

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ACKNOWLEDGEMENTS

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6. Chapter in a book: Rees TD. Dental management of the medically compromised patient. In: McDonald RE, Hurt WC, Gilmore HW, Middleton RA, eds. Current Therapy in Dentistry, vol. 7. St. Louis: The CV Mosby Company; 1980:3–7.

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11. World Wide Web.Centers for Disease Control and Prevention. Preventing emerging infectious diseases: Addressing the problem of antimicrobial resistance. Available at: http://www.cdc.gov/ncidod/emergplan/antiresist/. Accessed November 5, 2001.

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