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Inteligentan čovek je uvek nesiguran.
Jedino vas znanje može učiniti sigurnim.
Osho

Obrazovanje i učenje je kontinuiran proces koji ne prestaje sa završetkom školovanja i sticanjem odgovarajućih diploma. Stručnost u određenoj oblasti ne potiče samo iz knjiga i stečene diplome, već isključivo iz želje i usredsređenosti da se postigne maksimum u sopstvenoj profesiji, kako lični, tako i u društvenoj zajednici.

Svedoci smo činjenice da danas živimo u vremenu gde je sve moguće. Mnogo je „svemogućih" i u društvu, i u nauci, i u struci. Takvi su jedino inferiorni „na delu" i u sopstvenoj sredini, odnosno u svojoj osnovnoj delatnosti. Problemi se, nažalost, ne mogu rešiti ispraznom pričom i demagoškim pristupom onih koji su do svojih diploma „teško" došli. Osobe bez ikakvih vrednosnih potvrda (stručnih, naučnih, ljudskih) obično su simbol bahatosti i bestidnosti i na putu do svog cilja nemaju milosti za prepreke. Zato je pitanje mogućnosti „napredovanja u struci" bez ikakvih moralnih, stručnih i naučnih kvaliteta iluzorno, besmisleno i vrlo moguće. Danas je dovoljno da samo imate „visoko mišljenje o sebi", poveću dozu beskrupuloznosti i malo političke potpore pa da ostvarite sve što poželite. Stručnost – kao temeljni kriterijum za napredovanje – nije neophodna, jer se to lako može nadomestiti intervencijama „svemogućih".

Zato je i stanje u nauci na ovim prostorima prilično maglovito. Iako se u toj magli pojavi poneko svetlo, taj put uglavnom nije ni jasan, ni pravilno trasiran. Zašto je to tako? Odgovor na ovo pitanje nije težak. Naime, kod nas su prilično zapostavljeni sistemi nauke i obrazovanja. Školstvo je neefikasno, a u nauci je previše doktora nauka. O naučnim vrednostima većine tih doktorata nije poželjno čak ni pričati, a kamoli stručno i naučno ih vrednovati. Problem u našoj nauci je u tome što mnoge doktore „proizvode" profesori koji su do svog zvanja takođe došli zahvaljujući „sumnjivim" kriterijumima za napredovanje i u sprezi s političkim uticajima. I kao što reče veliki vladika Nikolaj Velimirović: „Lako je naučiti životinju, lako je naučiti prostaka, ali je teško naučiti onog ko je nenaučen postao učitelj drugima."

Ima li smelosti da se nešto promeni? Iako su promene nasušna potreba, teško ih je realizovati. Reforme u nauci su problem jer ih uglavnom zamišljamo kao zahteve koje treba staviti na papir, a ne kao suštinsku promenu koja u centar mora staviti čoveka s visokomoralnim naučnim i stručnim kriterijumima i bez ikakvog političkog uticaja. Ali mogu li te promene iznedriti oni koji su „najzaslužniji" za ovakvo stanje u društvu? Nije dovoljna samo želja, potreban je i kvalitet.

Ovaj urednički komentar završiću citatom Duška Radovića koji najbolje odslikava stanje u nauci na ovim prostorima i neizbežnu potrebu za odgovarajućim promenama i pravom terapijom: „Bolest je uglavnom mala, a bolesnik mnogo veći."

Prof. dr Slavoljub Živković

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Ultrastructural Analysis of the Surface of Endodontic Instruments after Immersion in Irrigating Solutions

Jelena Popović[1], Goran Radenković[2], Jovanka Gašić[1], Aleksandar Mitić[1], Marija Nikolić[1], Radomir Barac[1], Slavoljub Živković[3]

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SUMMARY

Introduction Separation (fracture) of endodontic instruments in the root canal during chemomechanical instrumentation is a complication that can compromise the final outcome of endodontic treatment. One of the most common factors that cause fatigue of endodontic instruments and consequent fracture is surface corrosion. The aim of this study was to investigate the ultrastructure of surface corrosion of endodontic instruments made of stainless steel and nickel-titanium after immersion in the most commonly used root canal irrigants.

Material and Methods The study included 48 nickel-titanium and stainless steel endodontic hand files. All instruments were immersed in 5.25% sodium hypochlorite, 0.2% CHX and 17% EDTA. Surface corrosion was analyzed using a scanning electron microscope (SEM).

Results Nickel-titanium instruments showed significantly higher susceptibility to corrosion after immersion in 5.25% sodium hypochlorite compared to stainless steel instruments ($p<0,001$). After immersion in 0.2% CHX corrosion damage was observed on both nickel-titanium and stainless steel instruments but the difference was not statistically significant ($p=0.096$). No corrosion was observed in both types of instruments after immersion in 17% EDTA.

Conclusion The use of 5.25% NaOCl and 0.2% CHX as root canal irrigating solutions can cause serious corrosion changes on the surface of nickel-titanium and stainless steel endodontic instruments.

Keywords: corrosion; endodontic instruments; nickel-titanium; stainless steel; SEM

INTRODUCTION

Endodontic instrument separation (fracture) in the root canal during chemomechanical preparation is a complication that can compromise the final outcome of endodontic therapy [1]. Weakening of instruments' structure is one of important factors that affect safety of their use. Numerous studies that have examined clinical use of endodontic instruments have concluded that metal fatigue is the first anomaly which occurs during clinical use and that, combined with sudden loads during root canal instrumentation, may lead to fracture [1, 2]. In addition, the literature data indicate surface corrosion of endodontic instruments as one of the first factors that can cause fatigue of the material [3]. Corrosion can start during chemomechanical instrumentation or chemical disinfection and sterilization of instruments [1]. Corrosion is caused by the contact of metal with different solutions when various electrochemical reactions occur and affect surface integrity making instruments more prone to fracture [4]. Corrosion pits and surface porosity can also reduce the cutting efficiency of endodontic instruments [5].

The aim of this study was to evaluate the ultrastructure of surface corrosion of stainless steel and nickel-titanium endodontic files after immersion in the most commonly used root canal irrigants.

MATERIAL AND METHODS

The study included nickel-titanium (Ni-Ti) („I-FLEX", „IMD", USA) and stainless steel (NTI-Kahla GmbH, Germany) hand endodontic files. New instruments were taken out of the packages, and in order to remove all debris received from manufacturers, the files were cleaned in the ultrasonic bath (JUS-S01, JEOL) with distilled water for 15 minutes at the frequency of 28kHz. Then after, the corrosion behaviour of endodontic instruments was assessed using potentiodynamic metod in the three most commonly used irrigating solutions: 5.25% sodium hypochlorite (NaOCl) (prepared in the laboratory); 0.2% chlorhexidine gluconate (CHX) (R4, Septodont, France, diluted to 0.2%); 17% ethylenediamine tetraacetic acid (EDTA) (prepared in the laboratory).

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Table 1. Endodontic instruments according to the material and irrigating solution
Tabela 1. Podela ispitivanih instrumenata u odnosu na vrstu materijala i rastvor za irigaciju

Material Materijal	Irrigating solution Rastvor za irigaciju			Control Kontrola	Total Ukupno
	NaOCl	CHX	EDTA		
Ni-Ti Ni-TI	6	6	6	6	24
Stainless steel Nerđajući čelik	6	6	6	6	24
Total Ukupno	12	12	12	12	48

Ni-Ti – nickel-titanium; NaOCl – sodium hypochlorite (5.25%); CHX – chlorhexidine gluconate (0.2%); EDTA – ethylenediamine tetraacetic acid (17%)

Ni-Ti – nikl-titanijum; NaOCl – natrijum-hipohlorit (5,25%); CHX – hlorheksidin-glukonat (0,2%); EDTA – etilendiaminotetrasirćetna kiselina (17%)

All solutions used in this study were freshly prepared and stored in adequate conditions.

Forty-eight instruments (24 Ni-Ti and 24 stainless steel instruments) were tested. Instruments were divided into the 6 groups according to the material and used irrigating solution (Table 1).

The experiments were carried out in an ordinary, three-compartment cylindrical glass cell. The counter electrode was a Pt foil and the reference electrode was a saturated calomel electrode (SCE). All potentials were referred to SCE. The working electrode- endodontic instrument was placed into the cell in such way that only working part of the instrument was immersed in the solution, whereas the handle was above the solution. The instruments were immersed 15 seconds before the potential rise as set by the software. Anodic E-I polarization curves were recorded using the software Par Stat by means of the linear sweep technique (sweep rate 0.2mV/s). The potential value that showed sharp rise of the current was assigned as pitting potential. The sharp increase of the current was a result of local dissolution of metal and forming pits. Electrochemical testing was performed at the Department of Production Engineering, Faculty of Mechanical Engineering, University of Niš, and Department of Physical Chemistry and Electrochemistry, Faculty of Technology and Metallurgy, University of Belgrade.

After electrochemical testing (published results) [6], the instruments were prepared for scanning electron microscopic examination (SEM; JEOL-JSM 5300). In order to obtain adequate visualization of the working parts of instruments, the handles of the instruments were cut off, and their working parts were fixed to the aluminum stubs with a fixing agent (Dotite paint xc 12 Carbon JEOL, Tokyo, Japan) and sputter coated with gold/palladium (in the unit JFC 110 Ion Sputter JEOL). SEM examination was completed at the Institute for Biomedical Research of the Faculty of Medicine in Nis.

Ultrastructure of the surface corrosion changes was analysed using modified score presented by Linsuwanont et al. [7]: score 3 – continuous corrosion of the entire surface of the instrument; score 2 – clearly limited corrosion fields; score 1 – individual corrosion pits; score 0 – no visible corrosion changes. Surface of the working parts of the instruments was observed at three levels: apical, middle and coronal. At each level an appropriate score was estimated, and final score represented the mean value of all three scores for each instrument individually and also within the groups.

Statistical analysis was performed using χ^2 and Fisher Exact test, a p value of $p<0.05$ was considered statistically significant.

RESULTS

Ultrastructural analysis of instruments surfaces showed the most intensive corrosion changes on the Ni-Ti instruments after immersion in 5.25% sodium hypochlorite. Erosive metal surfaces were observed along the entire working part of all tested instruments in this group (score 3) (Table 2, Figures 1 and 2). Sensitivity to 5.25% NaOCl was also seen in stainless steel instruments. Continuous surface corrosion and limited fields of corrosion were observed on the working surfaces of these instruments, so the total score of this group was 2.33 (Table 2, Figure 3). Fisher Exact test showed significantly higher sensitivity of Ni-Ti instruments compared to stainless steel after immersion in 5.25% sodium hypochlorite ($p<0.001$).

SEM analysis of the Ni-Ti instruments after immersion in 0.2% CHX showed limited corrosion fields and individual corrosion pits. The total score in this group of instruments was 1.5 (Table 2, Figures 4 and 5). Stainless steel instruments showed higher vulnerability to 0.2% CHX. These instruments had higher number of limited corrosion fields compared to individual corrosion pits, so the total score in this group was 1.83 (Table 2, Figure 6). However, Fisher Exact test did not show statistically significant difference in sensitivity to 0.2% CHX between both types of instruments ($p=0.096$).

Ultrastructural analysis of Ni-Ti instruments after immersion in 17% EDTA did not show corrosion defects on the surface of working parts of the instruments so this group was assigned score 0 (Table 2, Figure 7). Corrosion damages were not observed on the surfaces of the stainless steel instruments after immersion in 17% EDTA, so the average score for this group was also 0 (Table 2, Figure 8).

Nickel-titanium and stainless steel instruments showed different susceptibility to the tested irrigating solutions. Nickel-titanium instruments showed significantly higher susceptibility to 5.25% sodium hypochlorite compared to

Table 2. Average score of corrosion defects on instruments after immersion in endodontic irrigants
Tabela 2. Prosečan skor korozivnih oštećenja na instrumentima posle potapanja u rastvore za irigaciju

Material Materijal	Irrigating solution Rastvor za irigaciju			Control Kontrola
	NaOCl	CHX	EDTA	
Ni-Ti Ni-Ti	3	1.5	0	0
Stainless-steel Nerđajući čelik	2.33	1.83	0	0

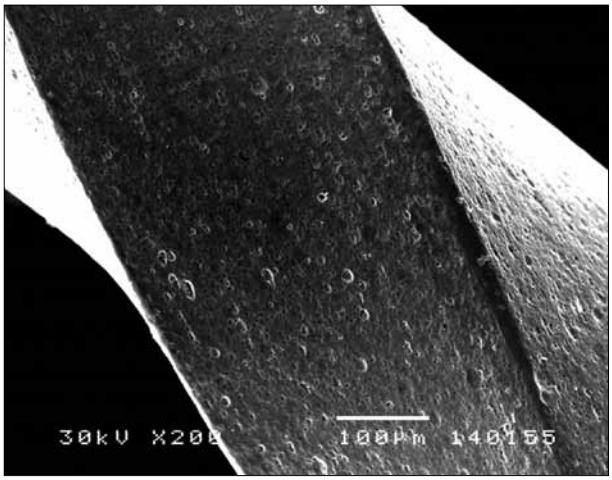

Figure 1. Continuous corrosion damage of the nickel-titanium (Ni-Ti) instrument surface after immersion in 5.25% sodium hypochlorite (NaOCl)
Slika 1. Kontinuirano korozivno oštećenje površine instrumenta od nikl-titanijuma (Ni-Ti) posle potapanja u rastvor natrijum-hipohlorita (NaOCl) u koncentraciji od 5,25%

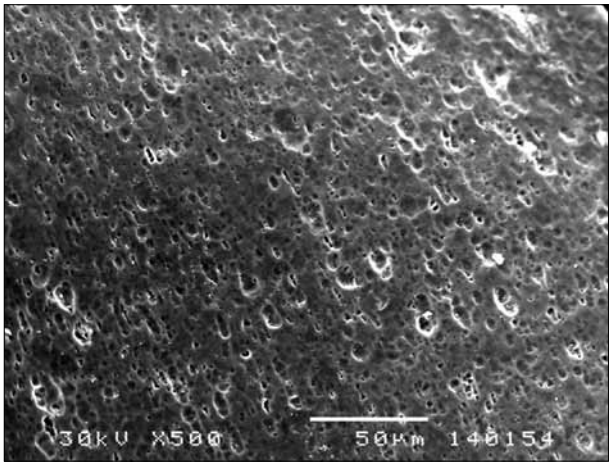

Figure 2. Surface errosion of the Ni-Ti instruments after immersion in 5.25% NaOCl at ×500 magnification
Slika 2. Površinska erozija Ni-Ti instrumenta posle potapanja u 5,25% NaOCl pri uvećenju od ×500

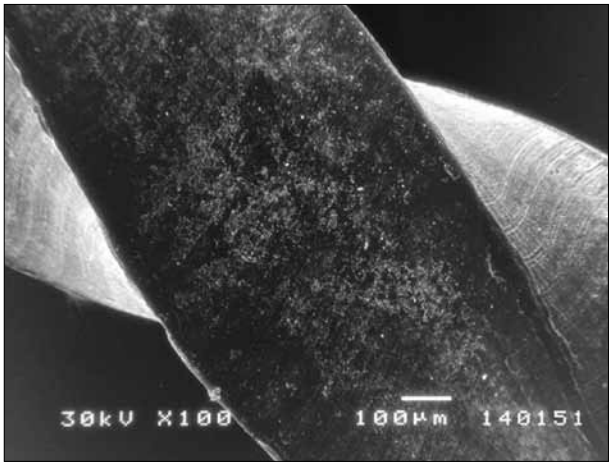

Figure 3. Continuous surface corrosion of the stainless steel instrument after immersion in 5.25% NaOCl
Slika 3. Kontinuirana korozivna površina instrumenta od nerđajućeg čelika posle potapanja u 5,25% NaOCl

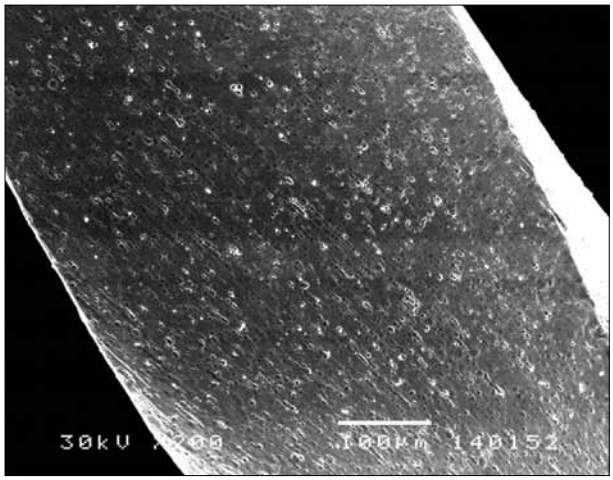

Figure 4. Limited corrosion fields and individual corrosion pits on the surface of the Ni-Ti instrument after immersion in 0.2% chlorhexidine gluconate (CHX)
Slika 4. Ograničena korozivna polja i pojedinačne korozivne jamice na površini Ni-Ti instrumenta posle potapanja u rastvor hlorheksidin-glukonata (CHX) u koncentraciji od 0,2%

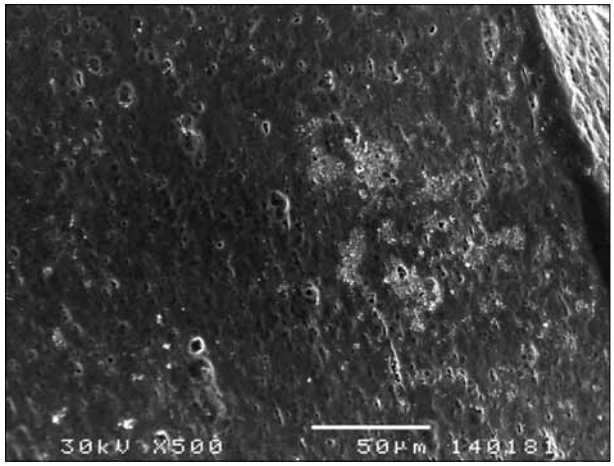

Figure 5. Limited corrosion fields and individual corrosion pits on the surface of the Ni-Ti instrument after immersion in 0.2% CHX at higher magnification
Slika 5. Ograničena korozivna polja i pojedinačne korozivne jamice na površini Ni-Ti instrumenta posle potapanja u 0,2% CHX na većem uvećanju

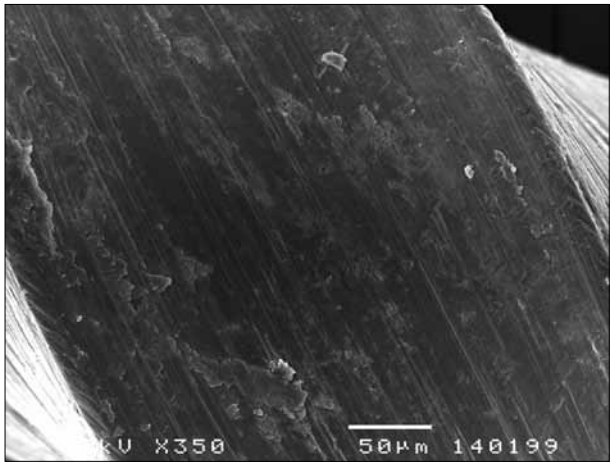

Figure 6. Corrosion in the form of restricted fields on the stainless steel instrument after immersion in 0.2% CHX
Slika 6. Korozija u vidu ograničenih polja na instrumentu od nerđajućeg čelika posle potapanja u 0,2% CHX

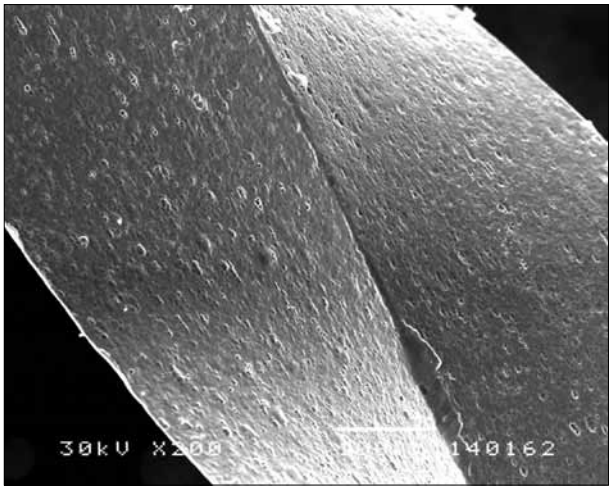

Figure 7. Surface structure of the Ni-Ti instrument after immersion in 17% ethylenediamine tetraacetic acid (EDTA)
Slika 7. Površinska struktura Ni-Ti instrumenta posle potapanja u etilendiaminotetrasirćetnu kiselinu (EDTA) u koncentraciji od 17%

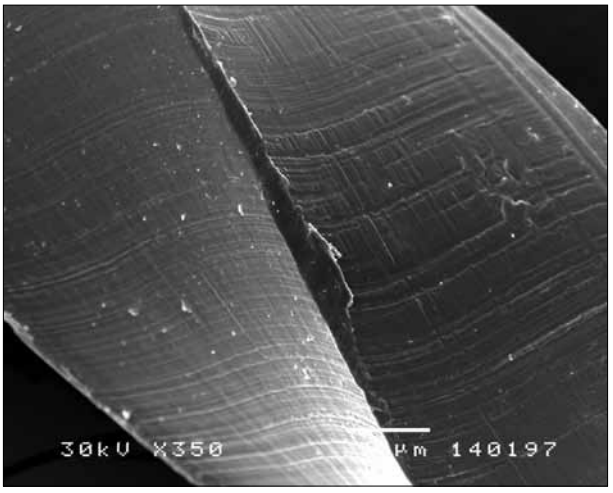

Figure 8. Surface of the stainless steel instrument after immersion in 17% EDTA
Slika 8. Površina instrumenta od nerđajućeg čelika posle potapanja u 17% EDTA

0.2% CHX, χ^2 test showed that this difference was highly statistically significant ($p<0.001$). Stainless steel instruments also showed statistically higher sensitivity to immersion in 5.25% sodium hypochlorite compared to 0.2% CHX ($p<0.05$).

DISCUSSION

Chemomechanical instrumentation of the root canal is essential during endodontic treatment and involves procedures of cleaning and shaping of the root canal space and use of irrigating solutions. Most commonly used irrigation solutions are: sodium hypochlorite (NaOCl), hydrogen peroxide (H_2O_2), citric acid, ethylenediamine tetraacetic acid (EDTA), chlorhexidine gluconate (CHX), saline solution, etc [5]. Although the use of irrigants during root canal preparation is essential, chemical and electrochemical aggressiveness of these solutions can damage surface of the instruments [8].

Electrochemical techniques based on determination of pitting potential and current density can accurately define sensitivity of metals to different solutions [9]. The surface ultrastructure also plays an important role in determining corrosion behaviour of the tested endodontic instruments in certain solutions [10]. Corrosion on the microscopic level is directly related to the weakening of the structure of instruments that reduces cutting efficiency and make instruments more susceptible to fracture [9].

Corrosion behaviour of nickel-titanium and stainless steel instruments can be affected by numerous factors. Stokes et al. [11] investigated corrosive effect on Ni-Ti instruments of five different manufacturers. They reported that both corroding and non-corroding files were present in the same packages and these results confirmed that severity of corrosion could depend on manufacturing process and quality control. The negative impact of sterilization on corrosion has also been demonstrated [10]. The presence of residual protein substances on the surface of endodontic instruments can also increase the severity of surface attack and dissolution of metal surface [9].

Sodium hypochlorite (NaOCl) is the most commonly used solution for root canal irrigation in endodontic practice. It is used in concentration range from 0.5% to 6% [12]. It has a wide spectrum of antimicrobial activity, and due to its ability to dissolve organic part of dentin it is used for removing smear layer as well as pre-soaking solution in the cleaning procedures after clinical use [13, 14]. However, sodium hypochlorite contains active and aggressive Cl^- ions that promote the occurrence of corrosion pits and weakening of the instrument structure [15]. It has been shown that NaOCl is corrosive for many metals and selectively removes nickel from Ni-Ti alloys [16]. Studies have shown measurable release of titanium after immersion of Ni-Ti instruments in NaOCl for 30 to 60 minutes [17]. Sensitivity of nickel-titanium and stainless steel endodontic instruments to NaOCl has been reported in numerous studies [1, 5, 13]. In the study of Stokes et al. [14] corrosion of endodontic instruments was visually confirmed after immersion in 5.25% NaOCl. A significant difference between different manufacturers was observed, but there were no significant differences between nickel-titanium and stainless steel instruments. Berutti et al. [4] found that instruments immersed in NaOCl had significantly reduced resistance to fracture due to early cycle fatigue and occurrence of unexpected fractures in these instruments was significantly higher than in the control group of instruments. SEM analysis of the fractured surface revealed limited corrosion fields, pits and cracks. The effect of Cl^- and F^- ions on the corrosion of Ni-Ti and stainless steel was studied by Amaral et al. [18] and Aboud et al. [19] for the purpose of electrochemical dissolution and removal of fractured endodontic instruments from root canals. The current study revealed intensive continuous corrosion damages of instruments after immersion in 5.25% sodium hypochlorite and this was in accordance with pitting potential values obtained in electrochemical analysis [6].

Chlorhexidine gluconate (CHX) represent frequently used root canal irrigant due to its prolonged antimicrobial effect that may last up to 12 weeks [20]. It is used in a concentration range from 0.1% to 2%. However, literature data indicate the potential for surface corrosion of instruments after immersion in CHX [5, 6]. Corrosion potential of CHX depends on its acidic pH (5.72) as acidic environment increases the corrosion rate [21]. In the current study, a visibly damage of the surface of Ni-Ti and stainless steel instruments was observed after immersion in 0.2% CHX. Such visible damage in the form of limited fields and fissures can act as weak points where further loads on instruments can lead to undesirable cracks that propagate [8].

Ethylenediamine tetraacetic acid (EDTA) is a chelating agent that is used in endodontic practice at concentrations from 15% to 17%. Due to its ability to dissolve inorganic part of dentin, it is used as a lubricant in the preparation of narrow and curved root canals and for removal of inorganic part of the smear layer [22]. The results of SEM analysis from the current study revealed no negative effects of EDTA on the surface structure of Ni-Ti and stainless steel instruments, and that was in accordance with the results of electrochemical testing from previous study [6]. In a study published by Fayyad and Mahran [23] there was no visible change in surface roughness of endodontic instruments after immersion in 17% EDTA. According to Reinhard et al. [24] EDTA has the ability to protect and passivize instruments because it forms complexes with metal ions at pH values less than 4 thus creating an inhibiting barrier for oxidation and corrosion.

CONCLUSION

The use of 5.25% NaOCl and 0.2% CHX as root canal irrigants may cause serious corrosion damage on the surface of Ni-Ti and stainless steel endodontic instruments. The application of 17% EDTA did not cause corrosion changes in both types of instruments. To minimize the risk of damage it is recommended that irrigants should be rinsed out from the files immediately after their use and files should be replaced frequently.

NOTE

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Ultrastrukturna analiza površine endodontskih instrumenata nakon potapanja u rastvore za irigaciju

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KRATAK SADRŽAJ

Uvod Fraktura endodontskih instrumenata u kanalu korena tokom hemomehaničke preparacije je značajna komplikacija koja može ugroziti konačan ishod endodontskog lečenja. Jedan od važnih faktora koji izazivaju zamor materijala endodontskog instrumenta je površinska korozija. Cilj ovog rada je bio da se ispita ultrastruktura površine endodontskih instrumenata od nerđajućeg čelika i nikl-titanijuma nakon potapanja u najčešće upotrebljavane rastvore za irigaciju kanala korena zuba.

Materijal i metode rada U istraživanju je korišćeno 48 instrumenata od nikl-titanijuma i nerđajućeg čelika. Testiranje osetljivosti na koroziju je izvršeno potapanjem u rastvore NaOCl od 5,25%, CHX od 0,2% i EDTA od 17%. Analiza korozivnih oštećenja je urađena pomoću skening elektronskog mikroskopa (SEM) na različitim uveličanjima.

Rezultati Instrumenti od nikl-titanijuma su pokazali statistički značajno veću osetljivost na koroziju nakon potapanja u 5,25% NaOCl u poređenju sa instrumentima od nerđajućeg čelika ($p<0,001$). Nakon potapanja u 0,2% CHX uočeno je korozivno oštećenje instrumenata od nikl-titanijuma i nerđajućeg čelika, ali razlika nije bila statistički značajna. Korozija nakon potapanja u 17% EDTA nije uočena ni kod jedne vrste endodontskih instrumenata.

Zaključak Primena 5,25% NaOCl i 0,2% CHX kao rastvora za irigaciju kanala korena može izazvati ozbiljne korozivne promene na površini instrumenata od nikl-titanijuma i nerđajućeg čelika.

Ključne reči: korozija; endodontski instrumenti; nikl-titanijum; nerđajući čelik; SEM

UVOD

Fraktura endodontskih instrumenta u kanalu korena tokom hemomehaničke preparacije je komplikacija koja može ugroziti konačan ishod endodontskog lečenja [1]. Slabljenje strukture instrumenata je jedan od bitnih faktora koji utiču na bezbednost njihove upotrebe u preparaciji kanala korena zuba. Brojne studije koje su se bavile kliničkom upotrebom endodontskih instrumenata pokazale su da je zamor materijala prva nepravilnost koja se javlja u kliničkim uslovima i koja, udruženo sa naglim opterećenjima tokom preparacije, može dovesti do preloma [1, 2]. Podaci iz literature takođe ukazuju na to da je pojava površinske korozije endodontskih instrumenata jedan od prvih faktora koji uslovljavaju zamor materijala endodontskog instrumenta [3]. Korozija se može javiti tokom hemomehaničke preparacije, hemijske dezinfekcije i sterilizacije endodontskih instrumenata [1]. Mogući fenomen korozije izazvan kontaktom endodontskih instrumenata sa brojnim rastvorima dovodi do različitih elektrohemijskih reakcija i utiče na integritet površine instrumenata, čineći ih time, u uslovima kritičnog zamora, podložnim lomljenju [4]. Istraživanja su pokazala da korozivne jamice i poroznost površine na radnom delu endodontskog instrumenta u velikoj meri mogu smanjiti i njihovu sečivnu efikasnost [5].

Cilj ovog rada je bio da se ispita ultrastruktura korozivne površine endodontskih instrumenata od nerđajućeg čelika i nikl-titanijuma (Ni-Ti) nakon potapanja u najčešće upotrebljavane rastvore za irigaciju kanala korena zuba.

MATERIJAL I METODE RADA

U istraživanju su korišćeni ručni endodontski instrumenti od Ni-Ti („*I-FLEX*“, „*IMD*“, SAD) i nerđajućeg čelika (*NTI-Kahla GmbH*, Nemačka). Novi instrumenti su uzimani iz pakovanja proizvođača i, radi uklanjanja ostataka proizvodnog debrisa, očišćeni u ultrazvučnom kupatilu (*JUS-S01, JEOL*) destilovanom vodom u trajanju od 15 minuta na frekvenciji od 28 kHz. Nakon toga instrumenti su podvrgnuti potenciodinamičkom ispitivanju korozije u tri najčešće upotrebljavana rastvora za irigaciju kanala korena.

U istraživanju su korišćeni sledeći rastvori: natrijum-hipohlorit (NaOCl) u koncentraciji od 5,25% (pripremljen u laboratoriji), hlorheksidin-glukonat (CHX) u koncentraciji od 0,2% (R4, Septodont, Francuska, rastvoren do 0,2%) i etilendiaminotetrasirćetna kiselina (EDTA) u koncentraciji od 17% (pripremljena u laboratoriji). Rastvori su bili sveže pripremljeni i čuvani u odgovarajućim uslovima.

U istraživanju je analizirano ukupno 48 instrumenata: 24 od Ni-Ti i 24 od nerđajućeg čelika. Instrumenti su svrstani u tri grupe od po šest instrumenata u odnosu na vrstu irigansa, dok je preostalih šest instrumenata služilo kao kontrola (Tabela 1).

Eksperiment je izveden u uobičajenoj trodelnoj cilindričnoj staklenoj ćeliji sa dve elektrode. Suprotna elektroda je bila od platine, a referentnu elektrodu je činila zasićena kalomelova elektroda (SCE). Vrednosti potencijala su izražene u odnosu na SCE. Endodontski instrument je predstavljao radnu elektrodu i njegov radni deo je uranjan u ispitivani rastvor, dok su osovina instrumenta i ručica bili iznad nivoa rastvora. Vreme od 15 sekundi, koliko je instrument stajao u rastvoru do početka rasta potencijala, bilo je programski podešeno. Anodne polarizacione krive su snimane korišćenjem softvera Par Stat sa promenom potencijala od 0,2 mV/s. Vrednost potencijala pri kojem je dolazilo do naglog porasta gustine struje označeno je kao potencijal pitinga. Porast struje je bio posledica lokalnog rastvaranja metala i početka formiranja tačkica, koje su pri porastu struje i potencija rasle prvenstveno u dubinu. Ispitivanje je obavljeno

na Katedri za proizvodno-informacione tehnologije Mašinskog fakulteta Univerziteta u Nišu i na Katedri za fizičku hemiju Tehnološko-metalurškog fakulteta Univerziteta u Beogradu.

Nakon elektrohemijskih ispitivanja (objavljeni rezultati) [6], instrumenti su pripremani za skening-elektronmikroskopsko ispitivanje. Da bi se uzorci adekvatno pozicionirali i pričvrstili za cilindrične nosače, osovina i ručica endodontskih instrumenata su odsečene kleštima, a radni delovi sa sečivima i navojima pričvršćeni sredstvom za fiksiranje (*Dotite paint xc 12 Carbon JEOL*, Tokio, Japan) za cilindrične nosače, a potom naparavani solima zlata u aparatu za jonsko raspršivanje (*JFC 1100E Ion Sputter JEOL*). Tako pripremljeni uzorci su posmatrani i analizirani na skening-elektronskom mikroskopu (SEM) (*JEOL JSM-5300*). SEM ispitivanje je obavljeno na Institutu za biomedicinska istraživanja Medicinskog fakulteta u Nišu.

Ultrastruktura površinske korozije je ocenjivana modifikovanom skalom po Linsjuvanontu (*Linsuwanont*) i saradnicima [7]: ocena 3 je označavala kontinuiranu korozivnu površinu celog radnog dela instrumenta; ocena 2 – jasno ograničena korozivna polja; ocena 1 – pojedinačne korozivne jamice; ocena 0 – bez korozivnih promena. Površina radnih delova instrumenata je posmatrana na tri nivoa (apeksni, srednji i koronarni). Na svakom nivou instrument je ocenjen odgovarajućom ocenom, a konačni skor predstavljao je srednju vrednost ocena sve tri trećine pojedinačno za svaki instrument i u okviru grupa.

Statistička analiza je urađena korišćenjem χ^2-testa i Fišerovog (*Fisher*) testa egzaktnosti. Prag značajnosti je bio na vrednosti od $p<0,05$.

REZULTATI

Ultrastrukturna analiza instrumenata je pokazala da su najintenzivnije korozivne promene nastale na Ni-Ti instrumentima nakon potapanja u rastvor 5,25% NaOCl. Veoma erodirana površina metala je zapažena duž čitavog radnog dela svih ispitivanih instrumenata ove grupe (ocena 3) (Tabela 2, Slike 1 i 2). Osetljivost na 5,25% NaOCl su pokazali i instrumenti od nerđajućeg čelika. Na površini radnih delova instrumenata uočene su naizmenično kontinuirane korozivne površine i ograničena polja površinske korozije, tako da je ukupan skor instrumenata ove grupe iznosio 2,33 (Tabela 2, Slika 3). Fišerov test egzaktnosti je pokazao statistički značajno veću osetljivost instrumenata od Ni-Ti u poređenju sa instrumentima od nerđajućeg čelika nakon potapanja u 5,25% NaOCl ($p<0,001$).

SEM analiza Ni-Ti instrumenata nakon potapanja u 0,2% CHX je pokazala ograničena korozivna polja i pojedinačne korozivne jamice na radnom delu instrumenta. Ukupan skor kod ove grupe instrumenata je bio 1,5 (Tabela 2, Slike 4 i 5). Nešto veću osetljivot na 0,2% CHX su pokazali instrumenti od nerđajućeg čelika, na čijoj površini je uočen veći broj ograničenih korozivnih polja u odnosu na pojedinačne korozivne jamice. Ukupan skor kod ove grupe instrumenata je bio 1,83 (Tabela 2, Slika 6). Međutim, Fišerov test egzaktnosti nije pokazao statistički značajnu razliku u osetljivosti između obe vrste instrumenata na 0,2% CHX ($p=0,096$).

Ultrastrukturnom analizom Ni-Ti instrumenata nakon potapanja u 17% EDTA nisu uočena korozivna oštećenja na površinama radnih delova instrumenata, tako da je ovoj grupi dodeljena ocena 0 (Tabela 2, Slika 7). Korozivna oštećenja nisu uočena ni na površinama instrumenata od nerđajućeg čelika nakon potapanja u 17% EDTA, tako da je prosečan skor i kod ove grupe instrumenata bio 0 (Tabela 2, Slika 8).

Instrumenti od nikl-titanijuma i nerđajećeg čelika su pokazali razliku u osetljivosti na ispitivane rastvore za irigaciju. Instrumenti od Ni-Ti pokazali su značajno veću osetljivost na 5,25% NaOCl u poređenju sa 0,2% CHX (χ^2-test je pokazao da je ova razlika bila visoko statistički značajna; $p<0,001$). Instrumenti od nerđajućeg čelika su takođe bili statistički značajno osetljiviji na potapanje u 5,25% NaOCl u odnosu na 0,2% CHX ($p<0,05$).

DISKUSIJA

Hemomehanička preparacija kanala korena je od suštinske važnosti za uspeh endodontskog lečenja i podrazumeva postupke čišćenja i oblikovanja endodontskim instrumentima i rastvorima za irigaciju. Mnogi rastvori se koriste kao intrakanalni irigansi: NaOCl, vodonik-peroksid (H_2O_2), limunska kiselina, EDTA, CHX, fiziološki rastvor i drugi [5]. Iako je primena irigansa tokom preparacije kanala neophodna, mnogi od njih svojim hemijskim i elektrohemijskim delovanjem mogu oštetiti strukturu instrumenata [8].

Elektrohemijske tehnike koje se zasnivaju na određivanju piting potencijala i gustine struje mogu precizno definisati osetljivost metala na rastvore u kojima se nalazi [9]. Analiza ultrastrukturnih karakteristika površine takođe ima važnu ulogu u određivanju korozivne osetljivosti ispitivanih endodontskih instrumenata u određenim rastvorima [10]. Korozija na mikroskopskom nivou je u direktnoj vezi sa slabljenjem strukture instrumenata i smanjenjem efikasnosti sečenja i otpornosti na lomljenje [9].

Na korozivno ponašanje legura nikl-titanijuma i nerđajućeg čelika, kao materijala od kojih se najčešće izrađuju endodontski instrumeni, mogu uticati brojni faktori. Stouks (*Stokes*) i saradnici [11] su ispitivali korozivni efekat novih, nekorišćenih Ni-Ti instrumenata pet različitih proizvođača. Istraživanjem su uočene korodirane i nekorodirane turpije unutar istog pakovanja, čime je potvrđeno da na pojavu korozije može uticati proces proizvodnje instrumenata, odnosno kvalitet kontrole tog procesa. Negativan uticaj sterilizacije na pojavu korozije je takođe dokazan [10], a zastupljenost zaostalih proteinskih materija na površini endodontskih instrumenata može pojačati delovanje rastvora za irigaciju u rastvaranju metalne površine instrumenata [9].

Natrijum-hipohlorit (NaOCl) je najčešće korišćen rastvor za irigaciju kanala korena u endodontskoj praksi. Koristi se u koncentracijama od 0,5% do 6% [12]. Ima širok antimikrobni spektar delovanja, a zbog sposobnosti rastvaranja organskog dela dentina koristi se za uklanjanje razmaznog sloja iz kanala korena, ali i kao sredstvo za natapanje instrumenata u procedurama čišćenja i sterilizacije posle kliničke upotrebe [13, 14]. Međutim, NaOCl sadrži aktivne i agresivne jone Cl^- koji u velikoj meri izazivaju korozivne jamice i slabljenje površinske strukture instrumenata [15]. Dokazano je da je NaOCl korozivan za mnoge metale i da je odgovoran za selektivno uklanjanje nikla iz legure Ni-Ti [16]. Istraživanja su pokazala i merljivo oslobađanje titanijuma nakon potapanja Ni-Ti instrumenata u NaOCl u trajanju od 30 i 60 minuta [17]. Osetljivost endodontskih instrumenata

od Ni-Ti i nerđajućeg čelika na potapanje u NaOCl je dokazano u brojnim studijama [1, 5, 13]. U istraživanju Stouksa i saradnika [11] korozija endodontskih instrumenata je vizuelno dokazana nakon potapanja u rastvor NaOCl u koncentraciji od 5,25%. Uočena je značajna razlika između različitih proizvođača, ali nije bilo statistički značajne razlike između instrumenata od Ni-Ti i nerđajućeg čelika. Beruti (*Berutti*) i saradnici [4] su u svojoj studiji dokazali da su instrumenti potapani u NaOCl imali značajno smanjenu otpornost na lomljenje usled pojave ranog cikličnog zamora. Pojava neočekivane frakture ovih instrumenata bila je značajno veća u odnosu na instrumente kontrolne grupe. SEM analizom u oblasti preloma instrumenata uočena su brojna ograničena korozivna polja, jamice i pukotine. Međutim, uticaj jona Cl^- i F^- na koroziju kod Ni-Ti i nerđajućeg čelika je iskorišćena u studijama Amarala (*Amaral*) i saradnika [18] i Abuda (*Aboud*) i saradnika [19] radi elektrohemijskog rastvaranja i uklanjanja frakturisanih endodontskih instrumenata iz kanala korena. U ovom istraživanju uočene su snažno erodirane kontinuirane korozivne površine duž radnih delova instrumenata posle potapanja u NaOCl u koncentraciji od 5,25%, što je u skladu s vrednostima piting potencijala dobijenim pri elektrohemijskom ispitivanju [6].

Hlorheksidin-glukonat (CHX) je sve češće upotrebljavano sredstvo za irigaciju kanala korena zbog svog produženog antimikrobnog dejstva, koje može trajati i do 12 nedelja [20]. Kao irigans se koristi u opsegu koncentracija od 0,1% do 2%. Međutim, podaci iz literature ukazuju na mogućnost pojave površinske korozije instrumenata nakon potapanja u CHX [5, 6]. Korozivni potencijal CHX zavisi od njegove kisele reakcije (pH 5,72) jer kisela sredina znatno povećava stepen korozije [21]. U ovom istraživanju su uočena korozivna oštećenja na površinama instrumenata od Ni-Ti i nerđajućeg čelika posle potapanja u 0,2% CHX. Ovakva vidljiva oštećenja u vidu ograničenih polja i jamica takođe mogu biti slabe tačke i mesta gde pri povećanom opterećenju instrumenta mogu nastati pukotine s izraženom tendencijom produbljivanja i pojave preloma [8].

Etilendiamintetrasirćetna kiselina (EDTA) je helaciono sredstvo koje se u endodonciji koristi u koncentracijama od 15% do 17%. Zbog svoje osobine rastvaranja neorganskog dela dentina koristi se kao lubrikant u preparaciji uskih i povijenih kanala, odnosno za uklanjanje neorganskog dela razmaznog sloja [22]. SEM analizom u ovom istraživanju nije uočen negativan uticaj EDTA na površinsku strukturu instrumenata od Ni-Ti i nerđajućeg čelika, što je u skladu s rezultatima elektrohemijskog ispitivanja iz prethodnog istraživanja [6]. U istraživanju Fajada (*Fayyad*) i Marana (*Mahran*) [23] nije došlo do promene površinske hrapavosti endodontskih instrumenata nakon potapanja u 17-procentni rastvor EDTA. Prema mišljenju Rajnharda (*Reinhard*) i saradnika [24], EDTA ima sposobnost da štiti i pasivizira instrumente tako što formira komplekse s jonima metala pri pH vrednosti manjoj od 4, čime stvara inhibitornu barijeru za oksidaciju i koroziju.

ZAKLJUČAK

Primena 5,25% rastvora NaOCl i 0,2% rastvora CHX za irigaciju kanala korena može izazavati ozbiljne korozivne promene na površini endodontskih instrumenata od Ni-Ti i nerđajućeg čelika. Primena rastvora EDTA u koncentraciji od 17% nije dovela do korozivnih promena kod ispitanih grupa instrumenata. Da bi se smanjio rizik od oštećenja instrumenata, preporučuje se da se instrumenti odmah po upotrebi očiste, kako bi se efikasno uklonio irigans s njihove površine.

NAPOMENA

Deo rezultata je saopšten u vidu poster-prezentacije na „Drugom regionalnom okruglom stolu: vatrostalstvo, procesna industrija i nanotehnologije Rosov PIN 2014“, koji je održan 23. i 24. oktobra 2014. godine na Fruškoj gori.

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Orthodontic Diagnosis Based on Schwarz Analysis among the Population of Republika Srpska

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SUMMARY

Introduction In order to establish an accurate diagnosis and proper therapy planning in orthodontics, it is necessary to perform the analysis of transverse and sagittal dental arch development in relation to the facial type of the patient. The aim of this study was to determine sagittal and transverse parameters of dental arches in the population of Republika Srpska (Bosnia and Herzegovina) based on Schwarz analysis.

Material and Methods Facial type was determined in 300 patients of both genders, aged 18 to 25, with class I occlusion. After taking impressions of the upper and lower jaw, cast study models were poured and used to determine basic sagittal and transverse parameters of dental arches. The obtained values were compared with the values defined by Schwarz in order to determine the existence of certain variations.

Results Out of 300 subjects, 50.33% were dolichofacial, 30.76% were mesofacial and 19.00% were brachyfacial. The average values of anterior width, posterior width and height of dental arch in patients with all three types of face showed lower range of values compared to the values defined by Schwarz, who determined his values by examining the same parameters in the population of Vienna. These parameters did not show linear proportional increase with the increase of the sum of upper incisors, what is the case with the values defined by Schwarz.

Conclusion The results of this study showed significant differences compared to Schwarz's values. Modification of the size and shape of dental arch leads to changes in the appearance of patient's face. Therefore, an individual approach during orthodontic diagnosis and treatment planning must be present despite the great importance of biometric standards.

Keywords: anterior width; posterior width; arch height; Schwarz's analysis

INTRODUCTION

Orthodontic diagnostics includes various methods to establish a precise diagnosis. Treatment plan and outcome depend on properly implemented methods as they represent proper way to achieve and stabilize functional occlusion, improve aesthetics and quality of patient's life [1, 2]. Determining dental arch development and its shape has a great clinical importance not only in orthodontics, but also in prosthetics and anthropology. A large number of authors have come to conclusion that dental arch width, measured in premolar and molar region, relates to the meziodistal diameters of upper incisors. Based on this correlation the tables of average values for the width and height of dental arches in different populations have been established [3, 4, 5].

The first table with the average values of dental arches was created by Pont [6] in 1909 (Pont's Index). Research was conducted on subjects with neutroocclusion who lived in the area of southern France, characterised by brachyfacial type of face. The study conducted by Linder, Harth and Korkhausin in the population of northern Germany, defined the tables of the average values for the development of dental arches in dolichofacials [7, 8].

Orthodontic treatment often includes modification of dental arch form, i.e. width and height of dental arch. It is necessary to use tables of the average values of dental arch parameters. The most commonly used table for our population and average values for anterior and posterior width and height of the dental arch is defined by AM Schwarz. He established the table after doing measurements in mixed Viennese population. Another values were established in Pont's index, however, many authors have found significant differences between the measured values and the average values defined by Pont. Also, studies of different ethnic groups can be useful. Comparing obtained results with average values determines anthropometric characteristics of the population as well as the degree of craniofacial parameters deviation, including the parameters of face and dental arches, which contributes to precise planning of orthodontic treatment [9, 10, 11].

Studies done in Turkey, based on anthropometric methods, showed significant differences in face types of different populations, as well as sagittal and transversal

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dental arch development in these groups [12, 13]. Similar results were obtained in research conducted in North America that showed significant differences in transversal dental arch development among subjects of different race [14-17]. Some authors of these studies have used relation between individual parameters of maxillofacial complex, especially width of teeth, dental arches and face, for proper planning of orthodontic and prosthetic treatment.

The aim of this study was to determine sagittal and transverse parameters of upper and lower arches in the population of Republika Srpska (Bosnia and Herzegovina) based on Schwarz analysis.

MATERIAL AND METHODS

A total of 1,918 male and female were examined, aged 18 to 25. The study was conducted at the Faculty of Medicine in Banja Luka. After orthodontic dental examination, 300 patients were determined to have class I occlusion (neutrooc-clusion). In patients who met the criteria set (class I occlusion without irregularities that would require orthodontic treatment), using cephalometer, the height and width of face were measured and type of face determined. Then after, the participants were divided into the three groups: brachyfacial (participants with a broad type of face), mesofacial (participants with a medium type of face) and dolichofacial (participant with a narrow type of face). For each subject, preliminary impressions of maxillary and mandibular teeth were taken and study models were poured in gypsum. The analysis of transverse and sagittal dental arch development was carried out on study models using standard procedures. Measurement points were taken from Schwarz's analysis, which is commonly used for diagnostic purposes in our region. Noniusand three-dimensional orthodontic calliper by Korkhaus was used for all measurements.

The following parameters were measured on the study models:

- sum of the upper incisors (SI) – the sum of mesiodistal diameters of upper central and lateral incisors;
- anterior width of the upper dental arch –the distance between the deepest distal points of the fissure of first premolars;
- posterior width of the upper dental arch – the distance between the deepest points of the central fissure of first molars;
- height of the upper and lower dental arch – the shortest distance from labial surface of the most prominent incisor to the line which determines the anterior width;
- anterior width of the lower dental arch – the distance between the middle of bucco-mesial edges of the second premolars;
- posterior width of the lower dental arch – the distance between bucco-medial cusps of the first permanent molars.

To present anterior and posterior width of the upper and lower dental arch and arch height, descriptive statistics was used. Pearson's parametric correlation was used to correlate results of the current study with the results of Schwarz's analysis.

RESULTS

For 300 patients with neutrooccclusion, the facial type was determined by measuring height and width of the face. 50.33% of them were determined as dolichofacial, 30.76% were mesofacial and 19% were brachyfacial. The results of the anterior width, posterior width and height of the dental arch in all subjects are shown in Tables 1, 2, and 3. In dolichofacial patients, the values for the anterior width had strong positive correlation ($r=0.866$; $p<0.001$) with Schwarz's values as well as dental arch height measurements ($r=0.691$; $p<0.019$). Anterior width, posterior width and dental arch height in dolichofacial patients showed significant deviation from Schwarz's results (Table 1).

Table 1. Comparative overview of Schwarz's values for the anterior width, posterior width and height of the dental arch with the same parameters in dolichofacial subjects
Tabela 1. Uporedni prikaz Švarcovih vrednosti za prednju i zadnju širinu i visinu luka s istim parametrima kod ispitanika s uskim tipom lica

Sum of incisors Suma inciziva	Dolichofacial subjects Uski tip lica					
	Anterior width Prednja širina	Values by Schwarz Švarcove vrednosti	Posterior width Zadnja širina	Values by Schwarz Švarcove vrednosti	Dental arch height Visina zubnog luka	Values by Schwarz Švarcove vrednosti
27.0	34.9	33.0	45.6	41.0	21.2	17.0
27.5	35.0	33.5	45.6	41.5	21.2	17.5
28.0	35.1	34.0	45.5	42.0	21.2	17.5
28.5	35.2	34.5	45.5	42.5	21.2	18.0
29.0	35.3	35.0	45.4	43.5	21.2	18.5
29.5	35.4	35.5	45.4	44.0	21.2	18.5
30.0	35.5	36.0	45.3	45.0	21.2	19.0
30.5	35.8	36.5	45.5	45.5	21.3	19.0
31.0	36.0	37.0	45.8	46.5	21.5	19.5
31.5	36.3	37.5	46.0	47.5	21.6	19.5
32.0	36.6	38.0	46.2	48.0	21.7	20.0
32.5	37.0	38.5	46.2	48.5	21.9	20.5
33.0	37.4	39.0	46.1	49.0	22.1	20.5

Correlation between the values of anterior width, posterior width and height of the dental arch obtained in the current study for mesofacial subjects and Schwarz's results was not statistically significant. The values of anterior width, posterior width and height of the dental arch in mesofacial type had smaller range of values compared to the Schwarz's values (Table 2).

In brachyfacial patients strong correlation (r=0.680; p=0.031) was found between the posterior width of dental arch and Schwarz's results, while the value of the anterior width and height of dental arch had no statistically significant correlation with Schwarz's values. The values of the posterior width of dental arch in brachyfacial subjects showed significant deviation from Schwarz's results. For lower values of the sum of incisors, posterior width of dental arch were higher up to 3.5 mm compared to Schwarz's values, while for higher values of the sum of incisors were smaller up to 7 mm (Table 3).

DISCUSSION

In orthodontic practice knowing biometric standards is of great importance and it is the first condition for distinguishing disgnathiae from eugnathia. However, in practice, during diagnosis and treatment planning, errors can happen directly as a result of inadequate use of biometric standards. The current study showed deviation from Schwarz's values for anterior width, posterior width and height of the dental arch in patients with all three types of face. For the sum of incisors (28, 31, 32 and 33) appropriate Schwarz's values are not covered by the intervals of reliability for the average values obtained in the current study.

In dolichofacial subjects, for lower values of the sum of incisors the value of anterior arch width varied from Schwarz's values up to 2 mm, while for higher values of the sum of incisors the values were lower for up to 4.5 mm. For lower valuesof the sum of incisors, posterior arch

Table 2. Comparison of Schwarz's values for anterior width, posterior width and height of the dental arch with the same parameters in mesofacial subjects
Tabela 2. Uporedni prikaz Švarcovih vrednosti za prednju i zadnju širinu i visinu luka s istim parametrima kod ispitanika sa srednjim tipom lica

Sum of incisors Suma inciziva	Mesofacial subjects Srednji tip lica					
	Anterior width Prednja širina	Values by Schwarz Švarcove vrednosti	Posterior width Zadnja širina	Values by Schwarz Švarcove vrednosti	Dental arch height Visina zubnog luka	Values by Schwarz Švarcove vrednosti
27.0	33.3	33.5	44.5	41.75	20.4	16.8
27.5	34.0	34.0	45.0	41.25	20.4	17.0
28.0	34.7	34.5	45.5	42.75	20.5	17.3
28.5	35.4	35.0	46.0	43.5	20.6	17.5
29.0	36.1	35.8	46.5	44.5	20.6	18.0
29.5	36.8	36.3	47.0	45	20.7	18.0
30.0	37.5	37.0	47.5	46	20.8	18.5
30.5	37.2	37.5	47.0	46.5	21.0	18.5
31.0	36.8	38.0	46.4	47.5	21.1	19.0
31.5	36.5	38.5	45.9	48.5	21.3	19.0
32.0	36.1	39.0	45.3	49	21.5	19.5
32.5	36.5	39.5	45.7	49.5	21.5	19.5
33.0	36.9	40.3	46.1	50.25	21.5	19.8

Table 3. Comparison of Schwarz's values for the anterior width, posterior width and height of the dental arch with the same parameters in brachyfacial subjects
Tabela 3. Uporedni prikaz Švarcovih vrednosti za prednju i zadnju širinu i visinu luka s istim parametrima kod ispitanika sa širokim tipom lica

Sum of incisors Suma inciziva	Brachyfacial subjects Široki tip lica					
	Anterior width Prednja širina	Values by Schwarz Švarcove vrednosti	Posterior width Zadnja širina	Values by Schwarz Švarcove vrednosti	Dental arch height Visina zubnog luka	Values by Schwarz Švarcove vrednosti
27.0	37.3	34.0	47.0	42.5	19.5	16.5
27.5	37.2	34.5	47.0	43.0	19.7	16.5
28.0	37.1	35.0	47.0	43.5	19.9	17.0
28.5	37.0	36.0	47.1	44.5	20.2	17.0
29.0	36.9	36.5	47.1	45.5	20.4	17.5
29.5	36.8	37.0	47.1	46.0	20.6	17.5
30.0	36.7	38.0	47.1	47.0	20.8	18.0
30.5	36.9	38.5	47.0	47.5	21.0	18.0
31.0	37.1	39.0	46.9	48.5	21.2	18.5
31.5	37.3	39.5	46.7	49.5	21.4	18.5
32.0	37.5	40.0	46.6	50.0	21.6	19.0
32.5	37.7	41.0	46.5	50.5	21.8	19.0
33.0	37.9	41.5	46.3	51.5	22.0	19.0

width in dolichofacial subjects was higher up to 3 mm compared to Schwarz's results, while for higher values of the sum of incisors values were lower up to 5 mm. For lower values of the sum of incisors, the height of dental arch in dolichofacial subjects was higher up to 3.5 mm comparing to Schwarz's results, while for higher values of the sum of incisors it was lower up to 1 mm.

For the values of anterior width, posterior width and height of the dental arch in mesofacial and brachyfacial subjects, significant deviations from Schwarz's values were noticed. Therefore, for higher values of the sum of incisors, the values of anterior width in mesofacial subjects were lower up to 3.5 mm and the values of posterior width were lower up to 5 mm, while the values of the height of dental arch were higher up to 2 mm. In brachyfacial subjects the values of anterior and posterior width were lower up to 7 mm compared to Schwarz's values. Also, for higher values of the sum of incisors the arch height values were lower up to 2 mm.

The values obtained for the development of dental arches in transverse and sagittal direction for the subjects in the current study did not show linear proportional increase with the increase of the sum of upper incisors, as it was the case with Schwarz's values. This is in agreement with the results obtained by Thu et al. [16], who analysed width of upper incisors and width of dental arches in Malaysians and noticed that values of anterior and posterior width of dental arches increased with the values of the sum of incisors, but not linearly. They pointed out that some factors, such as gender, ethnicity, face type and muscles, may affect their relation.

Al-Omari et al. [18] also noticed a correlation between the value of the sum of upper incisors and values of anterior and posterior width of upper and lower dental arch. Their research was carried out on 144 patients with neutroocclusion and different facial types, on the territory of Jordan. Their results showed that the values of anterior and posterior width of dental arches were lower than standard values for the same parameters in European population.

Alvaran et al. [19] compared the values of posterior width with Schwarz's values for 473 Colombian patients with all three types of face and noticed that their values were higher from 2.4 to 4.5 mm than Schwarz's results. The values of posterior width were lower in mesofacial and brachyfacial subjects compared to Schwarz's values while for dolichofacial patients these values were lower only for higher values of the sum of incisors.

Nimkarn et al. [20] examined the possibility of applying Schwarz's analysis to 40 Americans but of European origin and found out that average values of the anterior width by Schwarz were higher from 2.5 to 4.7 mm compared to their values for all three facial types while the average values of posterior width were higher up to 2 mm than Schwarz's values.

A significant deviation from Schwarz's values was noted for the height of dental arches, too. Many authors have concluded that there were significant differences in the size of teeth and basic dimensions of dental arches and faces between male and female participants, as well as among patients of different ethnic origin [21-24]. These factors could cause certain deviations of the average values of width and height of dental arches in our participants in relation to the values given by Schwarz's analysis.

CONCLUSION

The average values for the anterior and posterior width of dental arches in relation to the sum of upper incisors of the tested participants indicated a lower range of values compared to Schwarz's results. Because of these differences and inability to use biometric universal norms, it is necessary to keep an individual approach in planning an adequate orthodontic treatment.

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Primena Švarcove analize u ortodontskoj dijagnostici kod ispitanika Republike Srpske

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KRATAK SADRŽAJ

Uvod Radi postavljanja precizne dijagnoze i pravilnog planiranja ortodontskog lečenja, neophodno je obaviti analizu transverzalne i sagitalne razvijenosti zubnih lukova u odnosu na tip lica pacijenta. Cilj ovog rada je bio da se na osnovu Švarcove (*Schwarz*) analize utvrdi sagitalna i transverzalna razvijenost zubnih lukova u populaciji Republike Srpske (Bosna i Hercegovina).

Materijal i metode rada Kod 300 ispitanika oba pola, uzrasta od 18 do 25 godina, sa I klasom dentoalveolarnih odnosa određen je tip lica. Nakon uzimanja otisaka gornje i donje vilice izliveni su studijski modeli na kojima su ispitivani osnovni parametri sagitalne i transverzalne razvijenosti zubnih lukova. Dobijene vrednosti su potom upoređivane s vrednostima po Švarcu, kako bi se utvrdila određena odstupanja.

Rezultati Od 300 ispitanika njih 50,33% je imalo uski tip lica, 30,76% srednji tip lica, a 19,00% široki tip lica. Prosečne vrednosti prednje širine, zadnje širine i visine zubnog luka kod ispitanika sa sva tri tipa lica pokazali su manji opseg vrednosti u odnosu na vrednosti do kojih je Švarc došao ispitujući iste parametre kod stanovništva Beča. Navedeni parametri nisu pokazali linearno proporcionalan porast s porastom zbira gornjih inciziva, kao što je to slučaj sa vrednostima po Švarcu.

Zaključak Rezultati ovog istraživanja su pokazali značajna odstupanja u odnosu na Švarcove vrednosti. Modifikacija oblika i dimenzija zubnog luka dovodi do promena u izgledu lica pacijenta, pa je zbog toga neophodan individualni pristup pacijentu tokom postavljanja ortodontske dijagnoze i planiranja lečenja.

Ključne reči: prednja širina; zadnja širina; visina luka; Švarcova analiza

UVOD

Ortodontska dijagnostika obuhvata primenu različitih metoda ispitivanja na osnovu kojih se jasno determiniše dijagnoza. Pravilno odabrane i primenjene metode imaju veliki značaj, jer od njih zavise plan i ishod lečenja, odnosno postizanje stabilne funkcionalne okluzije, poboljšanje estetike lica i unapređenje kvaliteta života pacijenta [1, 2].

Određivanje razvijenosti i oblika zubnih lukova je takođe veoma klinički značajno ne samo u ortodonciji, već i u protetici i antropologiji. Veliki broj autora je došao do zaključka da širina zubnog luka, merena u premolarnoj i molarnoj regiji, zavisi od meziodistalnih prečnika gornjih sekutića, pa su na osnovu ove korelacije izrađene tabele prosečnih vrednosti za širinu i visinu zubnih lukova kod različitih populacija [3, 4, 5].

Prve tabele prosečnih mera zubnog niza izradio je Pont (*Pont*) [6] 1909. godine (Pontov indeks). Istraživanja je sproveo na ispitanicima sa neutrookluzijom koji su živeli na području južne Francuske, za koje je tipičan široki (euriprozop) tip lica. Istraživanjima koja su sproveli Linder (*Linder*), Hart (*Harth*) i Korkhauz (*Korkhaus*) kod stanovnika severne Nemačke omogućila su pravljenje tabela prosečnih vrednosti za razvijenost zubnih lukova kod uskih (leptoprozop) tipova lica [7, 8].

Tokom ortodontskog lečenja često je neophodna modifikacija oblika zubnog luka, a samim tim i širine i visine zubnog luka. Ovde se često koriste tabele prosečnih vrednosti navedenih parametara za određenu populaciju. Za potrebe našeg stanovništva najčešće se koristi tabela prosečnih vrednosti za prednju i zadnju širinu zubnog luka, te visinu zubnog luka po Švarcu, koja je izrađena prema uzorku mešovitog stanovništva grada Beča. Nakon objavljivanja ovog indeksa mnogi autori su testirali njegovu primenu na ispitanicima drugih populacija sa neutrookluzijom i utvrdili da postoje značajna odstupanja izmerenih vrednosti u odnosu na prosečne vrednosti po Pontu. Takva istraživanja kod različitih etničkih grupa su i danas aktuelna. Poređenjem dobijenih rezultata s prosečnim vrednostima moguće je utvrditi antropometrijske karakteristike populacije određenog područja, odrediti stepen odstupanja kraniofacijalnih parametara, uključujući i parametre lica i zubnih lukova, što doprinosi preciznom planiranju ortodontske terapije [9, 10, 11].

Istraživanja realizovana na području Turske, zasnovana na antropometrijskim metodama, pokazala su da postoje značajne razlike u tipovima lica različitih populacija, a samim tim i u sagitalnoj i transverzalnoj razvijenosti zubnih lukova kod ispitivanih grupa [12, 13]. Do sličnih rezultata se došlo i na osnovu istraživanja izvedenih na teritoriji Severne Amerike, gde je uočeno da postoje značajne razlike u transverzalnoj razvijenosti zubnih lukova između ispitanika različite rasne pripadnosti [14-17]. Pojedini autori ovih studija su povezanost pojedinih parametara maksilofacijalnog kompleksa (posebno širine zuba, zubnih lukova i lica) iskoristili za pravilno planiranje ortodontskog i protetičkog lečenja.

Cilj ovog rada je bio da se na osnovu Švarcove analize utvrdi sagitalna i transverzalna razvijenost zubnih lukova u populaciji Republike Srpske.

MATERIJAL I METODE RADA

Tokom istraživanja pregledano je ukupno 1.918 ispitanika muškog i ženskog pola, uzrasta od 18 do 25 godina, na Medicinskom fakultetu Univerziteta u Banjoj Luci. Nakon stomatološko-ortodontskog pregleda kod 300 ispitanika je utvrđena I klasa dentoalveolarnih odnosa. Kod svih ispitanika koji su zadovoljili postavljene kriterijume (I klasa dentoalveolarnih odnosa bez nepravilnosti koje bi zahtevale ortodontsko lečenje) kefalome-

trom su izmerene visina i širina lica, te određen tip lica. Nakon toga su ispitanici svrstani u tri grupe: euriprozopi (ispitanici sa širokim tipom lica), mezoprozopi (ispitanici sa srednjim tipom lica) i leptoprozopi (ispitanici sa uskim tipom lica). Svakom ispitaniku je uzet anatomski otisak gornje i donje vilice na osnovu kojih su dobijeni studijski modeli. Na studijskim modelima je obavljena analiza transverzalne i sagitalne razvijenosti zubnih lukova korišćenjem standardnih postupaka. Merne tačke su preuzete iz Švarcove analize, koja se i danas koristi u dijagnostičke svrhe i na ovim prostorima. Merenje je urađeno pomoću dvokrakog ortodontskog šestara i trodimenzionalnog ortodontskog šestara po Korkhauzu.

Na studijskim modelima su izmereni sledeći parametri:

- suma gornjih inciziva (SI) – zbir meziodistalnih prečnika gornjih centralnih i lateralnih sekutića;
- prednja širina gornjeg zubnog luka – rastojanje između distalnih najdubljih tačaka fisure prvih premolara;
- zadnja širina gornjeg zubnog luka – rastojanje između najdubljih tačaka centralne fisure prvih molara;
- visina gornjeg i donjeg zubnog luka – najkraće rastojanje od labijalne površine najisturenijeg sekutića do duži koja određuje prednju širinu;
- prednja širina donjeg zubnog luka – rastojanje između sredina buko-mezijalnih bridova drugih premolara; i
- zadnja širina donjeg zubnog luka – rastojanje između bukosrednjih kvržica prvih stalnih molara.

Za prikaz prednje i zadnje širine gornjeg i donjeg zubnog luka i visine zubnog luka korišćeni su pokazatelji deskriptivne statistike, dok je Pirsonova (*Pearson*) parametarska korelacija korišćena za utvrđivanje povezanosti rezultata iz ovog istraživanja s rezultatima Švarcove analize.

REZULTATI

Kod 300 ispitanika sa neutrookluzijom je merenjem visine i širine lica određen indeks lica. Uski tip lica je bio zastupljen kod 50,33% ispitanika, 30,76% ispitanika imalo je srednji tip lica, a 19,00% široki tip lica. Dobijeni rezultati za vrednosti prednje i zadnje širine i visine zubnog luka ispitanika prikazani su u tabelama 1, 2 i 3. Rezultati ovog istraživanja kod prve grupe ispitanika (s uskim tipom lica) pokazali su da su vrednosti prednje širine u visoko statistički značajnoj i veoma jakoj pozitivnoj korelaciji ($r=0,866$; $p<0,001$) sa Švarcovim vrednostima, dok su rezultati visine luka u jakoj pozitivnoj korelaciji ($r=0,691$; $p<0,019$) sa Švarcovim vrednostima. Za prednju širinu, zadnju širinu i visinu zubnog luka kod ispitanika s uskim tipom lica primetno je značajno odstupanje od Švarcovih rezultata (Tabela 1).

Korelacija rezultata prednje i zadnje širine i visine luka ovog istraživanja za srednji tip lica sa Švarcovim rezultatima nije se pokazala statistički značajnom. Vrednosti prednje i zadnje širine i visine zubnog luka za srednji tip lica kod naših ispitanika bile su manjeg opsega vrednosti u odnosu na vrednosti po Švarcu (Tabela 2).

Kod ispitanika sa širokim tipom lica utvrđena je visoko statistički značajna korelacija ($r=0,680$; $p=0,031$) vrednosti zadnje širine zubnog luka sa Švarcovim rezultatima, dok za vrednosti prednje širine i visine luka korelacija s ovim vrednostima nije imala statistički značaj. Vrednosti zadnje širine zubnog luka kod ispitanika sa širokim tipom lica pokazale su značajno odstupanje od Švarcovih rezultata. Za manje vrednosti sume inciziva, vrednosti za zadnju širinu zubnog luka su bile veće do 3,5 mm od Švarcovih, dok su za veće vrednosti sume inciziva bile manje i do 7 mm (Tabela 3).

DISKUSIJA

U ortodontskoj praksi poznavanje biometrijskih normi je veoma značajno i predstavlja prvi uslov za razlikovanje disgnatije od eugnatije. Međutim, u praksi, prilikom postavljanja dijagnoze i planiranja terapije, često dolazi do grešaka koje direktno proizlaze iz korišćenja neodgovarajućih biometrijskih normi. Tokom ovog istraživanja utvrđeno je da su odstupanja u odnosu na Švarcove vrednosti prednje i zadnje širine i visine luka bile prisutne kod svih grupa ispitanika (sva tri tipa lica). Za veliki broj suma inciziva (28, 31, 32 i 33) odgovarajuće Švarcove vrednosti nisu obuhvaćene intervalima poverenja za prosečne vrednosti dobijene iz ovog istraživanja.

Kod ispitanika s uskim tipom lica, za manje vrednosti sume inciziva vrednosti prednje širine zubnog luka su se razlikovale od Švarcovih vrednosti i do 2 mm, dok su za veće vrednosti sume inciziva dobijene vrednosti bile manje i do 4,5 mm. Za manje vrednosti sume inciziva zadnje širine zubnog luka za uski tip lica su bile veće i do 3 mm od Švarcovih rezultata, dok su za veće vrednosti sume bile manje i do 5 mm. Za manje vrednosti sume inciziva visine zubnog luka za uski tip lica su bile veće i do 3,5 mm od Švarcovih, dok su za veće vrednosti bile manje do 1 mm.

Za vrednosti prednje i zadnje širine i visine luka kod ispitanika sa srednjim i širokim tipom lica utvrđena su značajna odstupanja u odnosu na Švarcove vrednosti. Tako su za veće vrednosti sume inciziva vrednosti prednje širine za srednji tip lica bile manje do 3,5 mm, a vrednosti zadnje širine do 5 mm, dok su vrednosti visine luka bile veće i do 2 mm. Kod ispitanika sa širokim tipom lica utvrđeno je da su vrednosti prednje i zadnje širine bile manje i do 7 mm u odnosu na Švarcove vrednosti pri većim vrednostima sume inciziva, a vrednosti visine luka su bile manje i do 2 mm.

Dobijene vrednosti za razvijenost zubnih lukova u transverzalnom i sagitalnom pravcu kod ispitanika u ovom istraživanju nisu pokazale linearno proporcionalan porast s porastom sume gornjih inciziva, kao što je to slučaj s vrednostima po Švarcu. Ovo je u skladu s rezultatima Tua (*Thu*) i saradnika [16], koji su istražujući povezanost širine gornjih sekutića i širine zubnih lukova kod ispitanika malezijske etničke pripadnosti uočili da se vrednosti prednje i zadnje širine zubnih lukova povećavaju s povećanjem vrednosti sume inciziva, ali da ovaj rast nije linearno proporcionalan. Oni ističu da određeni faktori, kao što su pol, etnička pripadnost, tip lica i muskulatura, mogu uticati na njihovu zavisnost.

Al-Omari (*Al-Olmari*) i saradnici [18] su takođe uočili povezanost vrednosti sume gornjih inciziva i vrednosti prednje i zadnje širine gornjeg i donjeg zubnog luka. Svoje istraživanje su sproveli na 144 ispitanika sa neutrookluzijom na teritoriji Jordana (sa uskim, srednjim i širokim tipom lica), a rezultati su pokazali da su vrednosti prednje i zadnje širine zubnih lukova manje u odnosu na standardne vrednosti za iste parametre evropske populacije.

Alvaran (*Alvaran*) i saradnici [19] su poredeći vrednosti zadnje širine zubnih lukova sa Švarcovim vrednostima kod 473 kolumbijska ispitanika (sa sva tri tipa lica) uočili da su vrednosti u proseku veće 2,4–4,5 mm u odnosu na Švarcove rezultate. U ovom istraživanju vrednosti zadnje širine su bile manje kod ispitanika sa srednjim i širokim tipom lica u odnosu na Švarcove rezultate. Vrednosti zadnje širine kod ispitanika sa uskim tipom lica u ovom istraživanju su takođe bile manje u odnosu na Švarcove, ali samo za veće vrednosti sume inciziva.

Nimkarn (*Nimkarn*) i saradnici [20] su ispitujući mogućnost primene Švarcove analize na 40 ispitanika, Amerikanaca evropskog porekla, zaključili da su prosečne vrednosti prednje širine zubnih lukova po Švarcu veće u proseku 2,5–4,7 mm u odnosu na vrednosti do kojih su oni došli (za sva tri tipa lica). Prosečne vrednosti zadnje širine u tom istraživanju bile su veće do 2 mm u odnosu na Švarcove rezultate.

Značajno odstupanje od Švarcovih vrednosti utvrđeno je i kod prosečnih vrednosti za visinu zubnog luka. Veliki broj autora je zaključio da postoje značajne razlike u veličini zuba i osnovnim dimenzijama zubnih lukova i lica između ispitanika muškog i ženskog pola, kao i između ispitanika različite etničke pripadnosti [21-24]. Navedeni faktori bi mogli uzrokovati i utvrđena odstupanja prosečnih vrednosti širine i visine zubnih lukova ispitanika s ovih prostora u odnosu na vrednosti Švarcove analize.

ZAKLJUČAK

Prosečne vrednosti za prednju i zadnju širinu zubnog luka u odnosu na odgovarajuću sumu gornjih inciziva kod testiranih ispitanika Republike Srpske su ukazali na manji opseg vrednosti u odnosu na Švarcove rezultate. Upravo zbog ovakvih odstupanja i nemogućnosti korišćenja univerzalnih biometrijskih normi, neophodno je zadržati individualni pristup pri planiranju odgovarajuće ortodontske terapije kod svakog pacijenta.

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Dental Anxiety: Etiology and Treatment Options

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SUMMARY

Dental anxiety might be the cause of serious health problems. Avoiding dental visits can lead to complications with functional, esthetic and sociological consequences. In order to have a simple and efficient dental procedure, it is very important to diagnose dental anxiety and to react adequately. The aim of this paper is using available literature to present most frequent causes, consequences as well as treatment options for dental anxiety. Treating dental anxiety and choosing the right treatment is not always easy, however, it is important for dental practitioners to be able to assess patient's behavior, possible causes of such behavior and select adequate therapy methods. Individual approach is very important as well as timely recognition and gradation of dental anxiety in order to apply adequate and successful dental treatment.

Keywords: dental fear; dental anxiety; etiology; therapy

INTRODUCTION

Dental fear is a significant social problem and it is present both in children and adults. Despite technological development and modern approach to prevention and therapy of oral diseases, dental fear is still one of main reasons why people neglect oral health. Fear of dental treatment could be the cause of serious health problems since avoiding dental visits undoubtedly leads to complications regarding the treatment of impaired oral tissue [1]. Relationship between the patient and dental practitioner where patient`s anxiety dominates, might trigger serious issues (for both the patient and the practitioner) that could lead to misdiagnosis and inappropriate dental treatment [2].

The term "fear of dentist" includes dental anxiety, dental fear and dental phobia [3]. Dental anxiety is the most benign type of fear of dentist. It is the state of apprehension that something unpleasant is going to happen in relation to dental treatment and it is coupled with a sense of losing control [3, 4]. It usually precedes facing an object or situation that causes fear. Dental fear is an active reaction to a familiar danger, i.e. object or situation, since it appears among the persons who already had adverse experience with dental treatment and who anticipate the same scenario [5]. Worry and fear could easily trigger dysfunction of psychological, cognitive and emotional components of behavior in these persons [6]. Dental phobia is the most intensive form of fear of dentist. In comparison with excitement and fear, phobia is a clearly defined diagnosis by appropriately skilled psychologists and psychiatrist. It is a mental disorder with very pronounced fear or avoidance of a certain object or situation that significantly obstructs patient's functioning or causes major emotional stress [5, 6].

Relationship between fear and pain is also very important for dental practitioners. Physiological processes usually trigger pain. In addition, it might also have a strong cognitive component so that patients with dental anxiety have exaggerated expectations of pain, i.e. exaggerated pain sensation in general [7, 8, 9]. Therefore, dental practitioners should be aware of pain complexity usually coupled with dental fear.

Due to extreme fear of dental treatment, psychological reactions are very common in dental office. The most common reactions are palpitations, rapid heartbeat, high blood pressure, sweating, feeling of discomfort or stomach sickness, shortness of breath, anxiety and trembling. Psychological reactions usually precede syncope although they can often appear independently, prior dental treatment.

The aim of this paper is using available literature to present the most frequent causes, consequences and treatment options for "dental fear".

PREVALENCE OF DENTAL ANXIETY

Regardless of advances in technology and methods of dental treatment, the prevalence of dental anxiety has not decreased significantly [1, 5, 6, 10]. The prevalence of patients with high anxiety level varies, but it is believed that dental anxiety in North America population ranges from 10% to 20%. Other studies show that prevalence of dental anxiety in different population ranges from 4% to 30% [1, 5, 10-13]. Avoiding dental treatment due to dental fear is present in 6-15% of adult world population [11]. Haiser et al. [11] state that 4-20% of adult patients express high dental anxiety while 2-3% of adults express avoidance of dental treatment similar to phobia. Enkling et al. [14] presented the prevalence of dental treatment fear of 11% in Germany, while Norwegian study showed 10% [5]. Furthermore, every third woman in subpopula-

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tion between 30 and 45 year of age shows high degree of dental fear [12, 13, 15]. Hmud and Walsh [16] stated that fear reduces with age while other studies have not established the correlation between age and fear. Correlation between socioeconomic status, education and fear has also not been clearly defined [16].

CAUSES OF DENTAL ANXIETY

Many studies support the thesis that pain or fear of pain is the primary cause of dental anxiety. This is confirmed by the fact that patients with high degree of anxiety are much more sensitive to pain [17, 18]. Bare and Dundes [19] described numerous causes of dental fear: previous painful experiences, stories heard from other people, fear of pain, fear of needle and anesthesia, fear of sounds produced by dental drills, fear of criticism regarding teeth condition, fear of blood, fear of choking and gagging, feeling of vulnerability, loss of control i.e. impossibility to prevent uncomfortable situation, fear of unknown, some people even feel discomfort caused by distinctive odors in dental office. Even the act of intraoral local anesthesia application is for many anxious patients the most stressful and frightful moment whereas the sound of drill is the major cause of fear [20].

Many psychological conditions include dental anxiety (obsessive-compulsive disorder, fear of microbes, agoraphobia and depression) [21-27]. Increased dental anxiety is characteristical for patients who were the victims of abuse in the past. Children and women who suffered abuse of any kind usually subconsciously keep in their memory feelings related to that horrifying event. Dental treatment might trigger interaction between momentary and repressed event, therefore these patients avoid dental treatment because of negative associations and feeling of losing control. Persons suffering from posttraumatic stress disorder (PTSD) regardless of its cause may show increased dental anxiety as well. These patients might easily develop phobia followed by nightmares where dental practitioner has the leading role.

Even though there is no genetic basis for fear of dentist, it is proved that mutation of gene MC1R decreases the efficiency of anesthetic solution in dentistry. Persons with mutation of gene MC1R, usually characteristic for people with naturally red hair, need 20% larger dose of anesthetics than usual. Therefore, persons with such genetic variations show greater fear of dental treatment [28]. Fear of dental treatment is ranked 4th among other situations that cause fear [29]. Aartman [30] studied various types of dental treatments and reported that tooth extraction causes the greatest level of anxiety among the patients. Tooth extraction is followed by the treatments that include use of handpieces and rotary instruments.

Corah's Dental Anxiety Scale is used to assess patient's level of fear (DAS-R, dental anxiety scale). It consists of four questions, each question containing 5 answers. Answers are scored according to 5-point Likert Scale (a=1, b=2, c=3, d=4, e=5), where the degree of anxiety is calculated according to the sum of scores: 0-9 not at all, 9-12 somewhat, 13-14 very much, 15-20 extremely [31]. Nowadays, the most acceptable scale is modified MDAS scale per Wong [32], which contains 8 questions about various dental procedures (including physiological, cognitive, emotional and behavioral components of dental anxiety). It also uses 5-point scale to assess the anxiety level that ranges from relaxed to very anxious.

Physiological reactions to anxiety during dental treatment include increased blood pressure, rapid breathing, fever, whereas high heart rate is a very useful factor for assessing the level of anxiety [33, 34]. Literature suggests the use of radial immunodiffusion (laboratory technique for determining immunoglobulin concentration) to demonstrate the effectiveness of anxiety treatment methods by measuring the level of antibody known as Secretory Immunoglobulin A (S-IgA) that is considered stress marker in patients with dental anxiety [33].

CONSEQUENCES OF DENTAL ANXIETY

Literature has shown significant correlation between anxiety and poor oral health, poor oral hygiene and esthetics. That inevitably generates poor quality of life in general, coupled with major emotional, psychological and social problems. Dental anxiety is associated with increased level of caries and behavioral management problems in children [19, 35]. The study from 2003 conducted by Norwegian researchers shows that persons with high level of dental anxiety have statistically poorer oral health in terms of decayed and missing teeth, as well as oral dysfunction compared to the patients who do not suffer from dental anxiety [5]. Feared patients find dental visits extremely stressful and decide to avoid them. Often, they turn to "natural remedies" [1]. Such behavior usually leads to irregular dental visits with only emergency dental treatment or even sometimes total avoidance which leads to deterioration of oral and general health as well as associated feelings of anxiety, shame and inferiority.

DENTAL ANXIETY TREATMENT OPTIONS

Due to widespread dental anxiety, clinicians should be trained to recognize predisposition, etiology and dental anxiety treatment options [36]. If dental fear and anxiety are not diagnosed and properly treated, feared patients enter the vicious circle, as avoiding dental visits significantly worsens their problems [20, 30]. Even though dental anxiety questionnaire is highly recommended, its use in everyday practice is limited [36, 37]. In order to respond adequately, it is necessary to properly diagnose dental anxiety [37, 38], since that significantly increases the probability for successful treatment of feared patients [39].

Dental anxiety is the mildest form of fear of dentist that can be easily solved if trusting practitioner-patient relationship is established i.e. if patient is provided realistic information about dental treatment [40]. An additional problem represents the fact that in the age of information, patients usually refer first to magazines and internet

that could cause additional, adverse consequences due to wrong and malevolent information. Through conversation, the patient should be encouraged and explained the necessity of dental procedure. That is usually enough to increase patient's pain threshold that is the main cause of dental anxiety. Greater dental anxiety may require more complex forms of therapy [40]. If conversation is not sufficient to achieve the result, it is necessary to postpone the treatment or apply pharmacological support (nitrogen oxide or oral sedation) or to use various techniques such as distraction, relaxation or other methods. High level of dental anxiety may necessitate some form of cognitive-behavioral interventions (best by referral to psychologists and psychiatrists), such as systemic desensitization, cognitive restructuring or hypnosis [5]. If there is an indication for urgent dental treatment and there is no time for adequate preparation of patient with high dental anxiety level, interventions could be performed with application of intravenous sedation, conscious sedation or even general anesthesia [41, 42]. In some cases, especially if patient's oral status is considerably deteriorated, the first dental treatment under sedation may be indicated [43].

Gaining trust in dental team is according to Bernson et al. [44] very important to successfully neutralize dental anxiety. According to their study, two out of four anxious patients confirmed that trustfull interaction with the dentist and possibility to control the situation helped them complete dental treatment. Good communication between dental practitioner and patient is crucial for productive working relationship that results in adequate clinical care. Studies conducted by Corah et al. [45] and Hamasaki et al. [46] showed that efficient mutual interaction, understanding of patient's concerns, active listening with empathy and adequate, pleasant voice decrease patient's anxiety [47]. Information obtained from practitioner could be two-dimensional i.e. information obtained prior to the treatment explaining the treatment, length of treatment, recovery or information provided by practitioner during the treatment [48]. That information is sensory information explaining patients what they can expect to feel (pressure, vibration), what part of procedure will happen, administration of anesthetics, beginning of cavity preparation. Technique "Tell-Show-Do" has the greatest application in pediatric dentistry, though it is often applied when dealing with anxious patients since it encourages the sense of control and predictability of the treatment [48-52]. During dental treatment, it is necessary to make frequent and longer breaks that would relieve the pressure on patient and enable good quality of care. Patient and practitioner could agree on signaling system used by patient if it is necessary to stop the treatment or if patient feels pain. This builds trusting relationship. "Positive reinforcement" of patients with small, tangible rewards or verbal acknowledgement may provide encouragement for cooperation and appropriate behavior, even though it is not scientifically proved [5]. Verbal reinforcement with short breaks (5-15 seconds) during the treatment often results in calm and cooperative patient [53]. If dental treatment implies painful reaction, an anesthetic solution should be administered to patient, (provided that there are no contraindications), since psychological reactions are often triggered by fear of pain [53].

It has been confirmed that focusing attention on visual and auditory stimuli in dental office or waiting room might be beneficial for patients with mild to moderate dental anxiety. Modern dental office is equipped with video or DVD or even special 3D video glasses for watching movies, video clips or even playing video games during dental treatment. Prabhakar et al. [54], have found that such distractions reduce dental anxiety, while patients who experienced such treatment insisted on having the same treatment during following visits. This program is very popular among younger patients with mild to moderate level of dental anxiety [55]. Music might be an alternate treatment option as it has been used in different medical fields to meet physiological, psychological and spiritual needs of patients. Anxyolitic effect of music has been studied in the last 20 years in a variety of medical patients, mostly surgical, cardiac and oncology patients [1]. It may be used as active musicotherapy or passive listening of soothing, relaxing music in the waiting room or during dental procedure [55, 56, 57].

One of ways to treat dental anxiety in patients could be detailed description of dental procedure, pharmacological strategies including benzodiazepines and antidepressants, application of bioenergy, hypnosis and behavioral therapy [3]. Behavioral therapy is sometimes more benefitial than anxyolitic application, since patients usually prefer nonpharmacological therapy [52, 58]. Most of behavioral treatments include components based on systematic desensitization and use of relaxation to neutralize and reduce fear during gradual exposure to the treatment [59]. Bergen and Kol have presented a study where they described cognitive therapy vs. muscular relaxation to reduce fear [60].

Application of acupuncture prior to dental visit could be an efficient method for reducing anxiety and fear [61]. Acupuncture is traditional Chinese technique (gained acceptance by WHO in 1975) that differentiates 12 main meridians and 361 acupuncture points on human body. Point KI3 located on the inner side of the foot, halfway between the Achilles tendon and the side of the anklebone, is used to reduce pain. For mild anxiety level it is sufficient to perform the treatment prior to dental visit, while in case of severe anxiety and fear, it is necessary to make an assessment and individual treatment plan which consists of 3-10 treatments [61].

There is a study supporting breathing exercise for reducing patient`s anxiety [39]. Physiological changes following relaxation and diaphragmatic breathing are widely used in stressful situations and they are especially efficient in reduction of experienced pain [62]. This is, perhaps, not surprising since dental literature confirms the association between greater anxiety and increased pain perception [63-66]. Fear is under control of sympathetic nervous system that decreases pain threshold [67]. There are controlled breathing techniques; Milgrom et al. [39] described one where patient takes slow but deep breaths holding each breath for approximately 5 seconds before slowly exhaling. Slow and steady breathing for 2-4 minutes reduces patient`s heart rate and makes anxious patients

noticeably more comfortable [5]. Progressive muscle relaxation is proved to reduce dental fear and anxiety, in general [68]. It is basic principle of physiology that explaines when a muscle is tensed, releasing tension causes muscle relaxation (breathing becomes slower and deeper, heart rate and blood pressure decline, vasodilatation in small capillaries of extremities might become noticeable, patient has the sense of calmness and ease) [69]. This procedure is relatively simple, but it requires that patients practice at home (once or twice per day for two weeks) [39].

Cognitive restructuring aims to alter and restructure negative cognitions and enhance individual's control over such thoughts. This process includes identification of wrong and negative thoughts and interpretations often associated with dental fear, challenging patient's evidence for them, and then replacing them with more realistic thoughts [68, 70]. Clinical psychologists use this specific method but dental practitioners can use this technique as well. Systemic desensitization is a method of gradual exposure to fear and involves slowly exposing a patient to the situations that have negative connotation and to which the patient reacts with the sense of fear and discomfort. This method is effective in post-traumatic stress disorder. The patient is exposed to certain situations with intensity defined by patient's therapist, in controlled environment in order to learn how to most effectively control patient's thoughts in given situations. This method implies gradual stress exposure while encouraging patient to use relaxation techniques to reduce fear (e.g. if patient is fearful of needle, dental practitioner gradually and slowly expose patient to the idea of dental anesthesia). Hakeberg et al. [71] conducted a ten-year study that showed systemic desensitization superior to pharmacological treatment with diazepam. The application of this method usually includes the use of computer and video presentations that will gradually expose patients to different procedures. Hypnosis may be applied as a method for reduction of dental anxiety but only with patient`s request and consent. During hypnosis, the therapist enters certain parts of consciousness while focusing on dental anxiety, also change patient's unpleasant experience and make following dental visits easy [20]. In some cases, Freud's phobia therapy is very efficient.

If dental practitioner thinks that the treatment is not possible without sedation, pharmacological method is usually applied. Premedication is commonly performed with sedatives and anxiolytics. Benzodiazepines are preferred since they cause CNS depression. In that case, it is possible to perform dental treatment and keep verbal communication with the patient. Diazepam 5–10 mg is a drug of choice. Diazepam is used 1–2 hours prior to the intervention and it causes mild pre-operative calming of patient and reduction of anxiety immediately prior to intervention [72]. Sedation may be applied orally, nasally, sublingually, intramuscularly, rectally or by inhalation. It is recommended that premedication is performed one hour prior to intervention, in dental office. Inhalation sedation includes the use of inhalation device that mixes two gases – oxygen and nitrous oxide – in small concentrations (20–50%), for 10 to 15 minutes. Inhalation nasal mask is used for application. The application begins with pure O_2, then nitrous oxide, and at the end, pure oxygen again [72]. General anesthesia is indicated in case of pathological fear of dentist (phobia), as well as in case of disabled patients [72]. Anesthesia with intubation is very common and it is usually performed by a team of dental practitioner, anesthesiologist, and sometimes, specialists in medical fields depending on patient`s diagnosis. Naturally, patients with extreme degree of dental fear should first receive psychiatric treatment in non-dental setting. Treating dental phobia, which is the most complicated dental anxiety may be long and difficult. Only psychotherapist and psychiatrist perform it while dental practitioner should recognize and refer patient.

CONCLUSION

Fear of dentist should not cause avoiding dental treatments. Not having regular follow-up examinations may multiply potential oral problems and make them even more complex. Small caries lesions tend to become worse and inevitably damage dental pulp making endodontic intervention necessary, which is more complicated and expensive. Also, gum inflammation not treated adequately and on time could lead to periodontal problems and tooth loss with functional, esthetic and sociological consequences.

Key to success in neutralizing dental fear is trustful relation established between patient and dental practitioner. Therapists should fully understand patient`s stress, have patience and time to listen the patient and recognize the cause of such condition. In addition, dental practitioners have to be skilled and educated to treat such patients. Individual approach to each patient, timely recognition and gradation of dental anxiety are necessary in order to perform adequate and successful treatment.

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Dentalni stres: etiologija i terapijske mogućnosti

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KRATAK SADRŽAJ

Strah od stomatoloških zahvata može biti uzrok težih zdravstvenih problema. Izbegavanje poseta stomatologu neminovno dovodi do komplikacija u lečenju obolelih oralnih tkiva, uzrokujući funkcionalne, estetske i sociološke posledice. Za uspeh stomatološke intervencije i njeno lakše izvođenje veoma su važni pravilno dijagnostikovanje dentalne uznemirenosti i odgovarajuća reakcija stomatologa. Cilj rada je bio da se na osnovu dostupne literature predstave najčešći uzroci, posledice i terapijske mogućnosti u zbrinjavanju ovog vrlo raširenog problema. Tretman dentalnog straha i izbor prave metode nisu uvek laki, pa je zbog toga za stomatologe najznačajnije da razviju veštinu procene ponašanja pacijenta, razloge njihovih problema i traženja odgovarajućih metoda lečenja. Neophodni su individualni pristup svakom pacijentu i pravovremeno prepoznavanje i gradacija dentalnog stresa, kako bi se primenila odgovarajuća i uspešna stomatološka terapija.

Ključne reči: strah od stomatologa; dentalni stres; etiologija; terapija

UVOD

Strah od stomatološke intervencije je značajan društveni problem koji je zastupljen i kod dece i kod odraslih pacijenata. Uprkos tehnološkom razvoju i savremenom pristupu u prevenciji i terapiji oboljenja usta i zuba, jedan od osnovnih razloga zanemarivanja brige o oralnom zdravlju u današnje vreme je i dalje strah od stomatologa. Strah od stomatoloških zahvata može biti uzrok težih zdravstvenih problema, jer izbegavanje poseta stomatologu neminovno vodi do komplikacija u terapiji obolelih oralnih tkiva [1]. Odnos pacijenta i stomatologa u kojem dominira uznemirenost pacijenta može dovesti do teških problema (za pacijenta, ali i za terapeuta), koji mogu otežati postavljanje pravilne dijagnoze i pružanje odgovarajućeg lečenja [2].

Pod pojmom „strah od stomatologa" moguće je razlikovati dentalnu anksioznost, dentalni strah i dentalnu fobiju [3]. Dentalna anksioznost je najblaži oblik straha od stomatologa. To je stanje uzbuđenosti da će se nešto loše desiti u vezi sa stomatološkom intervencijom i obično je udruženo sa osećajem gubitka kontrole [3, 4]. Ono najčešće prethodi susretu s objektom ili situacijom koja je uzrok straha. Dentalni strah je aktivan odgovor na poznatu opasnost, tj. objekat ili situaciju, jer se pojavljuje kod osoba koje su već imale loša stomatološka iskustva i očekuju da se to neminovno ponovi [5]. Zabrinutost i strah mogu često da dovedu do disfunkcije psiholoških, kognitivnih i emocionalnih komponenata ponašanja kod takvih osoba [6]. Dentalna fobija je najintenzivniji oblik straha od stomatologa. U odnosu na uzbuđenost i strah, fobija je usko definisana dijagnoza od strane odgovarajuće obučenih psihologa i psihijatara kao mentalni poremećaj koji sadrži izražen strah ili izbegavanje određenog objekta ili situacije koja značajno ometa funkciju pacijenata ili uzrokuje znatni emotivni stres [5, 6].

Odnos između straha i bola je takođe veoma značajan za stomatologe. Bol je obično aktiviran fiziološkim procesima, ali može imati i snažnu kognitivnu komponentu, pa pacijenti sa dentalnom anksioznošću imaju preterana očekivanja vezana za bol, odnosno uopšte preteran doživljaj bola [7, 8, 9]. Zato je važno da klinički lekari budu svesni kompleksnosti bola koji je obično udružen sa dentalnim strahom.

Zbog preteranog straha od stomatološke intervencije, psihičke reakcije su česta pojava u stomatološkoj ordinaciji. Ove reakcije se manifestuju pojavom palpitacija, povećanim brojem otkucaja srca u minuti, povišenim pritiskom, znojenjem, osećajem nelagodnosti ili mučnine u želucu, osećajem nedostatka vazduha, uznemirenošću i drhtanjem. Psihičke reakcije često prethode pojavi sinkope, mada se često mogu javiti i samostalno, neposredno pred stomatološku intervenciju.

Cilj ovog rada je bio da se na osnovu dostupne literature predstave najčešći uzroci, posledice i terapijske mogućnosti u zbrinjavanju ovog vrlo raširenog problema.

ZASTUPLJENOST DENTALNOG STRESA

Bez obzira na napredak tehnologija i metoda u stomatološkoj terapiji, broj osoba sa dentalnom uznemirenošću se nije značajnije smanjio [1, 5, 6, 10]. Učestalost pacijenata s visokom uznemirenošću je promenljiva, ali se smatra da su dentalna anksioznost i strah od stomatološke intervencije zastupljeni kod 10–20% severnoameričke populacije. Druge studije iznose podatke o zastupljenosti dentalne anksioznosti u različitim narodima u opsegu od 4% do čak 30% [1, 5, 10-13]. Izbegavanje stomatološke intervencije zbog straha beleži se kod 6–15% odrasle svetske populacije [11]. Hajzer (*Haiser*) i saradnici [11] su ustanovili da 4–20% odraslih pacijenata ispoljava visoku dentalnu uznemirenost, a da 2–3% pokazuje fobično izbegavanje stomatološkog lečenja. Enkling (*Enkling*) i saradnici [14] su u svojoj demografskoj studiji nemačke populacije zabeležili zastupljenost straha od stomatološke intervencije kod 11% ispitanika, dok je u norveškoj studiji taj strah zabeležen kod 10% pacijenata [5]. Čak svaka treća žena starosti između 30 i 45 godina ima visok stepen dentalnog straha [12, 13, 15]. Hmud (*Hmud*) i Volš (*Walsh*) [16] su naveli da se strah smanjuje sa godinama, dok se u drugim studijama ne uočava veza između godina i straha. Povezanost socioekonomskog statusa i obrazovanja i straha nije jasno definisana [16].

UZROCI DENTALNOG STRAHA

Mnoge studije podržavaju tezu da je bol ili strah od bola primarni uzrok neodlaska stomatologu, što potvrđuje i činjenica da su pacijenti s višim nivoom anksioznosti znatno osetljiviji na bol [17, 18]. Ber (*Bare*) i Dandis (*Dundes*) [19] kao uzro-

ke straha od stomatološke intervencije navode brojne razloge: prethodna bolna iskustva, priče drugih osoba, strah od bola, igle, anestezije, zvukova stomatoloških aparata, kritike vezane za stanje zuba, krvi, davljenja i gušenja, zatim osećaj ranjivosti, gubitak kontrole, tj. nemogućnost stopiranja nelagodne situacije, strah od nepoznatog, a nekima smeta čak i sam miris stomatološke ordinacije. Sam čin primene intraoralne anestezije je za mnoge anksiozne pacijente najstresniji i najstrašniji trenutak, dok je zvuk bušilice ipak najveći uzrok straha [20].

Mnoga psihološka stanja sa sobom nose i dentalnu anksioznost u sklopu svojih osnovnih oboljenja (opsesivno-kompulsivni sindromi, strah od mikroba, agorafobija, depresija) [21-27]. Pojačan strah od stomatologa javlja se kod pacijenata koji su bili žrtve zlostavljanja. Deca i žene koja su pretrpela zlostavljanje bilo koje vrste obično podsvesno čuvaju taj doživljaj. Tokom stomatološke intervencije može doći do unakrsne reakcije između trenutnog i potisnutog događaja, te ovi pacijenti izbegavaju stomatološke intervencije zbog negativnih asocijacija i osećaja gubitka kontrole. Osobe koje pate od posttraumatskog stresnog poremećaja (PTSP) nezavisno od njegovog uzroka mogu pokazivati pojačan strah od stomatologa. Taj strah kod ovih pacijenata može poprimiti i fobičan karakter, praćen noćnim morama sa stomatologom kao glavnim akterom.

Ne postoji genetska osnova za strah od stomatologa, ali je dokazano da mutacija na genu MC1R dovodi do smanjenja efikasnosti anestetičkih rastvora u stomatologiji. Osobama sa mutacijom na ovom genu, koji se najčešće nalazi kod riđokosih pacijenata, potrebna je 20% veća doza anestetika za isti efekat. Zbog toga osobe koje imaju ovu varijaciju gena pokazuju veći strah od stomatološke intervencije [28]. Strah od stomatološkog tretmana je na četvrtom mestu po jačini u odnosu na druge situacije koje izazivaju strah [29]. Artman (*Aartman*) [30] je istražujući različite vrste stomatoloških intervencija uočio da najveći strah kod pacijenata izaziva vađenje zuba, a potom ga izazivaju intervencije koje zahtevaju korišćenje nasadnih i rotirajućih instrumenata.

Za procenu nivoa straha kod pacijenata koristi se Korahova (*Corah*) skala za procenu anksioznosti (engl. *Dental Anxiety Scale – DAS-R*), koja se sastoji od četiri pitanja, od kojih svako ima pet odgovora. Odgovori se boduju prema petostepenoj Likertovoj skali (a=1, b=2, c=3, d=4, e=5), a stepen anksioznosti se izračunava na osnovu zbira bodova: 0–9 nema anksioznosti; 9–12 umerena anksioznost; 13–14 visok stepen anksioznosti; 15–20 veoma visok stepen anksioznosti [31]. Danas je najprihvaćenija modifikovana skala MDAS po Vongu (*Wong*) [32], koja sadrži osam pitanja u vezi s različitim dentalnim procedurama (uključujući fiziološke, kognitivne, emocionalne i bihejvioralne komponente dentalnog stresa) i takođe koristi skalu od 5 poena da bi procenila nivo anksioznosti koji varira od opuštenog do veoma zabrinutog.

Fiziološki odgovor na anksioznost tokom lečenja zuba uključuje povećan krvni pritisak, ubrzano disanje i povišenje temperature, dok je ubrzani srčani ritam jedan od korisnih faktora za procenu nivoa anksioznosti [33, 34]. U literaturi se predlaže da se efektivnost metoda za terapiju straha može demonstrirati kroz korišćenje radijalne imunodifuzije (laboratorijske tehnike koje se koriste da se odredi koncentracija imunoglobulina), gde se mere antitela poznata kao sekretorni imunoglobulini A (S-IgA), ali i kao markeri za stres kod pacijenata sa dentalnim strahom [33].

POSLEDICE DENTALNOG STRESA

Studije koje su se bavile problemom dentalne anksioznosti iznose značajnu povezanost postojanja straha i lošeg oralnog zdravlja, loše oralne higijene i, naravno, estetike. To neminovno vodi do lošeg kvaliteta života uopšte, s velikim emocionalnim, psihološkim i socijalnim problemima. Takođe se navodi da je dentalni strah povezan s češćom pojavom karijesa kod dece, ali i s problemom njihovog ponašanja [19, 35]. Studija norveških istraživača iz 2003. godine pokazuje da osobe s visokim nivoom straha od stomatološke intervencije imaju statistički značajnije veći stepen narušenog oralnog zdravlja u vidu oštećenja i gubitka zuba i postojanja oralne disfunkcije od pacijenata koji se ne plaše odlaska kod stomatologa [5]. Za uplašene pacijente poseta stomatološkoj ordinaciji je veoma teška i oni je uglavnom odlažu što duže mogu, pa često pribegavaju „narodnim" lekovima [1]. To uglavnom dovodi do neredovnih poseta sa isključivo hitnim dentalnim tretmanima, a nekad čak i do potpunog izbegavanja koje može izazvati pogoršanje oralnog i opšteg zdravlja, kao i pojačanog osećanja uznemirenosti, sramote i inferiornosti.

TERAPIJSKE MOGUĆNOSTI DENTALNOG STRESA

Zbog široko zastupljenog svakodnevnog problema dentalnog straha, neophodno je kliničke lekare dobro informisati o značaju procene za predispoziciju, etiologiju i mogućnost lečenja dentalnog stresa [36]. Ako se dentalni strah i anksioznost ne dijagnostikuju i ne leče pravilno, pacijenti sa strahom mogu ući u začarani krug, jer izbegavanjem stomatologa dodatno pogoršavaju svoj problem [20, 30]. Uprkos preporukama za korišćenje upitnika o dentalnom strahu, oni nisu primenjivani u svakodnevnoj praksi [36, 37]. Za adekvatnu reakciju, neophodno je biti efikasan u otkrivanju dentalnog stresa [37, 38], jer se time značajno povećava verovatnoća uspeha u radu s ovim pacijentima [39].

Dentalna anksioznost je najblaži oblik straha od stomatologa i srazmerno tome lako se može izbeći i umanjiti uspostavljanjem odnosa poverenja s pacijentom, odnosno njegovim dobrim informisanjem o predstojećoj stomatološkoj intervenciji [40]. Ove informacije najbolje bi bilo da pruži sam stomatolog, stičući na taj način pacijentovo poverenje. Dodatni problem je činjenica što u doba informativnih sistema pacijent obično prvo konsultuje časopise i internet, što može uzrokovati i dodatne, negativne posledice, zbog pogrešnih i zlonamernih informacija. Razgovorom treba ohrabriti pacijenta i objasniti mu neophodnost svega što je potrebno uraditi tokom stomatološkog tretmana. To je često dovoljno da podigne pacijentov prag tolerancije na bol, koji je i osnovni uzrok dentalnog straha. Veći nivo dentalnog stresa iziskuje neophodnost primene složenijih vidova terapije ovog problema [40]. Ukoliko razgovor nije doveo do željenih rezultata, potrebno je intervenciju odložiti i eventualno primeniti farmakološku podršku (kao što je azot-oksid ili oralna sedacija), ili koristiti različite tehnike poput odvlačenja pažnje, relaksacije ili nekih drugih metoda. Visok nivo dentalnog stresa zahteva primenu određenih oblika kognitivno-bihejvioralnih intervencija (najbolje upućivanjem specijalistima psiholozima i psihijatrima), kao što su sistematsko smanjivanje osetljivosti, kognitivno restrukturiranje ili hipnoza [5]. Ukoliko postoji indikacija za hitno stomatološko lečenje i nema vremena za

odgovarajuću pripremu pacijenta s visokim nivoom dentalnog stresa, intervencije se mogu izvesti primenom intravenske sedacije, svesne sedacije ili pak u totalnoj anesteziji [41, 42]. U nekim slučajevima, posebno ako je pacijentovo oralno stanje veoma narušeno, indikovano je izvesti prvi tretman pod sedacijom [43].

Sticanje poverenja u stomatološki tim je, prema mišljenju Bernsona (*Bernson*) i saradnika [44], od presudnog značaja za uspeh neutralisanja dentalnog stresa. U njihovoj studiji su dva od četiri anksiozna pacijenta na pitanje šta im pomaže da izdrže kompletan dentalni tretman navela poverenje u interakciji sa stomatologom i mogućnost kontrole. Dobra komunikacija između stomatologa i pacijenta od ključnog je značaja za produktivan rad uz odgovarajuću kliničku negu. Studije Koraha (*Corah*) i saradnika [45], Hamasakija (*Hamasaki*) i saradnika [46] potvrđuju da efikasna dvosmerna interakcija, iskreno razumevanje pacijentove zabrinutosti i aktivno slušanje pacijenta, uz empatiju i pričanje blagim i prijatnim glasom, smanjuju uznemirenost pacijenta [47]. Informacije koje pacijent dobija od stomatologa mogu biti dvojake: informacije koje prethode lečenju i upoznaju pacijenta s načinom izvođenja i trajanja tretmana i oporavka nakon njega, i informacije koje stomatolog saopštava pacijentu tokom samog izvođenja tretmana [48]. To su senzorne informacije o onome šta pacijent može da očekuje (pritisak, vibracija), informacije u kojem delu stomatološke procedure se nalaze, primena anestezije, početak preparacije kaviteta itd. Tehnika „reci–pokaži–uradi" najveću primenu ima u pedijatrijskoj stomatologiji, ali se vrlo često primenjuje i kod anksioznih pacijenata, jer na ovaj način podstiče osećaj kontrole tretmana i njegove predvidljivosti [48-52]. Tokom samog stomatološkog lečenja neophodno je praviti češće i duže pauze koje će smanjiti pritisak na pacijenta i omogućiti kvalitetniji rad. Postoji mogućnost dogovara pacijenta i stomatologa o sistemu signalizacije koje će pacijent pokazivati ukoliko je neophodan prekid rada, ukoliko se javi bol ili neki drugi simptom, što takođe još više izgrađuje odnos pun poverenja. „Nagrađivanje" pacijenta sitnim, materijalnim nagradama ili verbalnim hrabrenjem može imati koristan podsticaj za saradnju ili odgovarajuće ponašanje pacijenta, iako za to nema konkretne naučne potvrde [5]. Verbalna podrška pacijentu uz kraće pauze u (5–15 sekundi) u radu često je nagrađena mirnim i saradljivim pacijentom [53]. Ukoliko se tokom stomatološkog zahvata očekuje bolna reakcija, pacijentu je neophodno primeniti anestetički rastvor (ako nema kontraindikacija), jer psihičke reakcije najčešće nastaju usled straha od bola [53].

Potvrđeno je da usmeravanje pažnje na vizuelne i audio nadražaje u stomatološkoj čekaonici i ordinaciji može povoljno uticati na pacijente sa blagim i srednjim nivoom straha. Savremene stomatološke ordinacije su opremljene video ili DVD uređajima, ili čak posebnim 3D naočarima, što omogućava pacijentima gledanje filmova, muzičkih spotova i igranje kompjuterskih igrica tokom samog tretmana. Prabakar (*Prabhakar*) i saradnici [54] su dokazali u svojoj studiji da se ovim odvraćanjem pažnje smanjuje dentalni strah, a pacijenti koji su bili podvrgnuti ovakvim uslovima rada su insistirali na istoj primeni i u narednim posetama. Ovaj program je posebno omiljen kod mlađih pacijenata sa nižim i srednjim nivoom dentalnog stresa [55].

Muzika može biti alternativna terapijska metoda koja se koristi na raznim poljima medicine i utiče na fiziološke, psihološke i duhovne potrebe pacijenata. Anksiolitički efekat muzike je obrađivan poslednjih 20 godina u različitim studijama i na različitim medicinskim pacijentima, najčešće hirurškim, kardiološkim i onkološkim [1]. Može se koristiti u aktivnom vidu kao muzikoterapija ili kao pasivno slušanje prijatne, opuštajuće muzike u čekaonici ili tokom izvođenja samog stomatološkog zahvata [55, 56, 57].

Prepoznavanje i lečenje dentalne anksioznosti pacijenata može biti kroz detaljan opis dentalne procedure, farmakološku podršku koja podrazumeva uključivanje benzodiazepina i antidepresiva, primenom bioenergije, hipnoze i bihejvioralne terapije [3]. Često bihejvioralna terapija može biti delotvornija od primene anksiolitika, jer pacijenti uglavnom preferiraju nefarmakološku terapiju [52, 58]. Većina bihejvioralnih tretmana uključuje komponente zasnovane na sistematskoj desenzitaciji i korišćenju relaksacije za neutralisanje i slabljenje straha tokom postepenog izlaganja tretmanu [59]. Bergen i Kol su u svojoj studiji prikazali kako trening muskularne relaksacije dovodi do veće redukcije straha od kognitivne terapije [60].

Primena akupunkture pre odlaska stomatologu se pokazala kao efikasna metoda u smanjenju anksioznosti i straha [61]. Akupunktura je tradicionalna kineska metoda lečenja (prihvaćena od strane Svetske zdravstvene organizacije 1975. godine) koja na telu razlikuje 12 glavnih meridijana i 361 akupunkturnu tačku. Za smanjenje bola se koristi tačka KI3, koja se nalazi na unutrašnjoj strani stopala, na pola puta između Ahilove tetive i zgloba. Kod blažih oblika je dovoljno sprovesti tretman neposredno pre odlaska stomatologu, a kod jače anksioznosti i straha potrebno je napraviti procenu i individualni plan lečenja koji uključuje 3–10 tretmana [61].

Postoji studija koja zagovara vežbu disanja u funkciji smanjenja anksioznosti pacijenata [39]. Fiziološke promene koje prate opuštajuće ili dijafragmalno disanje široko se koriste u svim stresnim situacijama, a posebno su delotvorne u redukciji doživljenog bola [62]. Ovo možda ne iznenađuje, jer je povezanost većeg straha i jače bolne percepcije potvrđena u stomatološkoj literaturi [63-66]. Strah je pod uticajem simpatičkog nervnog sistema koji smanjuje prag nadražaja bola [67]. Postoji nekoliko tehnika kontrolisanog disanja. Tako Milgrom (*Milgrom*) i saradnici [39] opisuju postupak gde pacijent sporo i duboko udiše pri čemu zadržava svaki udisaj oko pet sekundi pre nego što polako izdahne. Sporo i ravnomerno disanje 2–4 minuta smanjuje srčani ritam pacijenta i pruža mu vidnu prijatnost [5]. Progresivna mišićna relaksacija dokazano značajno uopšte smanjuje stres, pa i dentalni strah [68]. Ona se zasniva na osnovnim fiziološkim principima gde kod napetih mišića smanjenje tenzije izaziva njihovo opuštanje (disanje postaje sporije i dublje, smanjuju se krvni pritisak i broj otkucaja srca, primećuje se vazodilatacija malih krvnih sudova u ekstremitetima i pacijent ima osećaj toplote i lakoće) [69]. Ovaj postupak je relativno jednostavan, ali iziskuje vežbanje pacijenta kod kuće (jednom ili dva puta dnevno u toku dve nedelje) [39].

Cilj kognitivnog restrukturiranja je ne samo da izmeni i restrukturira negativne sadržaje spoznaje, već i da poveća kontrolu pojedinca nad takvim mislima. Ovaj proces uključuje identifikaciju pogrešnih, negativnih misli i tumačenja koje su često u vezi sa dentalnim strahom, njihovo osporavanje i zatim menjanje pozitivnim realnim mislima [68, 70]. Ovom specifičnom metodom se bave klinički psiholozi, iako postoji mogućnost obuke ovom veštinom i samih stomatologa. Sistemska desenzitacija je

metoda postepenog izlaganja strahu i podrazumeva oblik terapije kod koje se pacijent postepeno izlaže situacijama koje imaju loše delovanje i na koje reaguje osećajem straha i nelagodnosti. Ova metoda je delotvorna kod posttraumatskog stresnog poremećaja. Pacijent se izlaže određenim situacijama čiji intenzitet određuje njegov terapeut u kontrolisanim okolnostima, da bi zatim naučio kako da na najbolji način kontroliše svoje misli u datim situacijama. Ova metoda podrazumeva postepeno izlaganje stresu uz ohrabrenje za korišćenje tehnika opuštanja, da bi se smanjio strah (npr. ukoliko se pacijent plaši igle, stomatolog ga postepeno i polako navikava na dentalnu anesteziju). Hakeberg (*Hakeberg*) i saradnici [71] su u svojoj desetogodišnjoj studiji dokazali njenu superiornost u odnosu na farmakološku terapiju sa diazepamom. Ova metoda se najčešće primenjuje pomoću kompjutera i prikazivanjem video-prezentacija koje polako navikavaju pacijente na procedure. Hipnoza se može primeniti kao metoda smanjenja dentalnog straha, naravno uz zahtev i saglasnost pacijenta. Tokom hipnoze terapeut ulazi u određene delove svesti usmeravajući pažnju na dentalnu anksioznost, menjajući pacijentova loša iskustva i olakšavajući naredne stomatološke tretmane [20]. U ovakvim slučajevima vrlo se efikasno primenjuje terapija na osnovu Frojdove terapije fobija.

Ukoliko stomatolog proceni da tretman nije moguć bez sedacije, najčešće primenjuje farmakološku metodu. Premedikacija se može izvesti sedativima ili anksioliticima. Prednost imaju benzodiazepini, koji dovode do depresije centralnog nervnog sistema. U tom slučaju je moguće izvođenje stomatološkog tretmana, a održana je verbalna komunikacija s pacijentom. Lek izbora je diazepam, i to 5–10 mg. Diazepam se primenjuje sat-dva pre intervencije, kada dovodi do blagog preoperacionog smirenja pacijenta i smanjenja straha neposredno pre intervencije [72]. Sedacija se može izvoditi peroralnim putem, nazalno, sublingvalno, intramuskularno, rektalno i inhalacionom metodom. Preporučuje se premedikacija u stomatološkoj ordinaciji sat vremena pre intervencije. Inhalaciona sedacija podrazumeva korišćenje inhalacionog aparata koji meša smesu dva gasa – kiseonika i azotnog oksidula – u niskim koncentracijama (20–50%) u vremenu od 10 do 15 minuta. Za aplikaciju se koristi inhalaciona nazalna maska i prvo se počinje sa čistim kiseonikom, potom smesom azotnog oksidula, i na kraju se opet daje čist kiseonik [72]. Opšta anestezija je indikovana kod patološkog straha od stomatologa (fobičnih stanja), kao i kod hendikepiranih pacijenata [72]. Najčešće se koristi intubaciona anestezija, a izvodi je ceo tim koji sačinjavaju stomatolog, anesteziolog i eventualno specijalisti medicinskih grana u zavisnosti od dijagnoze pacijenta. Naravno, najbolje je pacijente s visokim nivoom dentalnog straha prvo podvrgnuti psihoterapiji u nestomatološkom okruženju. Terapija dentalne fobije, kao najkomplikovanijeg dentalnog stresa, može biti dugotrajna i mukotrpna. Sprovode je isključivo psihoterapeut i psihijatar, a zadatak stomatologa je da prepozna i uputi pacijenta na adekvatnu pripremu.

ZAKLJUČAK

Strah od stomatologa ne sme biti razlog za izbegavanje stomatoloških zahvata. Neodlaskom na redovne kontrolne preglede potencijalni oralni problemi mogu se samo uvećati i postati sve komplikovaniji. Manje karijesne lezije postaju sve teže i neminovno dovode do oštećenja zubne pulpe i neophodnosti izvođenja endodontske intervencije, čime produžavaju i poskupljuju stomatološko lečenje. Takođe, upale gingive koje se ne leče na pravi način i pravovremeno dovode do paradontoze i gubitka zuba, koji potom uzrokuju funkcionalne, estetske i sociološke probleme.

Ključ uspeha u neutralisanju straha od stomatološke intervencije leži u poverenju koje pacijent može steći u svom stomatologu. Terapeuti moraju imati puno razumevanja za pacijentov stres, ogromno strpljenje i vremena da saslušaju pacijenta, prepoznaju tačan uzrok ovakvog stanja, ali i stručno znanje za lečenje ovakvih pacijenata. Neophodni su individualni pristup svakom pacijentu i pravovremeno prepoznavanje i gradacija dentalnog stresa, kako bi lečenje bilo adekvatno i uspešno.

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History of Medicine in Jagodina District

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SUMMARY

The first record of scientific medicine in Serbia has been found in the early of 12th century. For centuries lifestyle, nutrition, natural environment, armies passing through, cultural heritage, and prejudice have affected healthcare in Serbia. Until 1820, Serbia has not had any educated doctor. Fourteen district physicians from 1839 and Dr. Karlo Beloni, to the last one, Dr. Selimir Djordjević – have spent part of their professional careers in Jagodina. All of them have had influence on raising health culture of Jagodina and its population and helped to overcome easily and quickly all existing diseases and epidemics. The Jagodina Hospital has been working without interruption for 147 years and represents one of the oldest healthcare institutions in Serbia.

Keywords: health care centre; community medical service; history of medicine; development

True men of science revere the past.
Everything we do and everything we are
is the result of a hundred year's labor.

Ernest Renan (1823–1892)

INTRODUCTION

Since creation of mankind, the history of medicine has been studying the origin and development of diseases and their treatment. The history and origin of medicine is an outcome of human instincts to protect and defend its species. Along with scientific medicine, animistic or magical medicine has developed with spiritual character that was built on the belief that cure exists in nature, spirits, plants, animals and objects. Religious medicine interpreted diseases as the consequence of evil spirits who were undermining the existing balance in the body. Apocryphal medicine, found in indigenous peoples of Balkan by the Slavs, was a mixture of various oriental and ancient cults, as well as philosophical systems of the Ancient history. Church has not recognized it for its nature and belief in negative effects of the evil forces of nature. The treatments consisted of prayers and divinations [1].

The present study is a descriptive research of development of medicine in Serbia and Jagodina district. We observed development of medicine from the medieval period until nowadays. Methods used were: documentation analysis and desk research of secondary information. Furthermore, historical data were gathered through interviews and analyzed.

DEVELOPMENT OF MEDICINE DURING MEDIEVAL PERIOD

The first record of the existence of scientific medicine in Serbia comes from the early of 12th century, representing the medicine of Hippocrates, Galen, Aristide and other ancient physicians, just like European medicine. It was on the rise between the 12th and 15th century. Purveyors of medical knowledge from Byzantium to Serbia were mostly monks in Serbian or Byzantine colonies in Athos, Sinai and Jerusalem, while western medicine was passed on by doctors and pharmacists trained in western medical schools. The founders of first hospitals were Stefan Nemanja and St. Sava in Hilandar Monastery in 1191. St. Sava in Studenica founded the first hospital in Serbia in 1208. He later founded a few more (Ravanica, Visoki Dečani), all of which operated until the downfall of Serbian medieval states [2]. However, scientific medicine of the medieval Serbia was cut in its further development, it was stagnating more and more, and at the end of the 17th century it was reduced to traditional medicine and, to a certain extent, to the religious one.

Healthcare situation of Serbian people was affected by various factors, such as lifestyle, nutrition, natural environment, armies passing through, cultural heritage, and prejudice. The treatments were primitive; hence, people in larger towns would turn for a cure to traditional doctors: berbers – the Turks: they let blood out by horns and leeches, pooled teeth out and performed minor surgeries; hakims – the Greeks, originally from Epirus, residing in certain cities, also called *kaloyatri* ("good doctors"), who had family inheritance of medical knowledge; self-taught

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doctors – ethnic Greeks, Serbs or Turks; and folk healers (men and women) – Greeks, Jews and Roma, passing on their skills from generation to generation [3].

Outside major towns, in villages, people were treated in monasteries by the monks who knew the secret of medicinal herbs treatment from medical books, the content of which they occasionally revised and extended, while the priests treated patients with prayer, i.e. by reading and drawing a cross onto the affected area. Traditional physicians, found in almost every village, would treat people using plants, ointments, medicinal herbs and chanting. These were mostly older women who had stopped giving birth and who were trained in preparing these cures. They would pass on their knowledge to younger female family members (until the age of 12).

Quackery did not exist in its usual sense, since there were no educated doctors. In stores in larger towns people were able to buy all known drugs, some of which were toxic and sold without control. Measures to suppress quackery were carried out in the 1830s, but, for a very long time, people were not able to get rid of superstition and ingrained convictions.

DEVELOPMENT OF MEDICINE DURING THE UPRISINGS

During the centuries of Turkish reign, Serbia was underdeveloped in every cultural aspect. It had no doctors, not only during the Uprisings, but years and years later as well. The lack of enlightenment among people, Turkish lootings and men losses in the Uprisings did not provide cultural and material conditions for foreign doctors to come and work in the country. The first doctors, who were visiting Serbia rarely and autonomously, would come as personal doctors of the Belgrade's Pasha and, later on, in the service of the Prince and his court. Subsequently, those doctors entered the military service as military doctors in the army that had just began to form [1].

With the beginning of struggle for national liberation, Serbia started paying more attention to organizing its healthcare system. During the First and Second Serbian Uprisings, the wounded soldiers were treated in monasteries or at their homes. Karadjordje's government built two hospitals in Serbia – one in Belgrade and the other one in Šabac by the end of their ruling. The doctors were mostly foreign physicians and few physicians from Vojvodina who joined military and civil service. This was a period when Serbia – as a country where young intellectuals were coming after their studies abroad - was trying to change its conservative and patriarchal way of life [4].

In the early decades of the 19th century, Serbia was still an incompletely formed part of the Ottoman Empire, without trained local personnel, poor and underdeveloped in all aspects. Centuries of Turkish govern in Serbia prevented any cultural and medical development [5].

DEVELOPMENT OF MEDICINE IN LIBERATED SERBIA

Until 1820, there were no educated doctors in Serbia. The first graduated doctor was Constantin Alexandridi, the second was Dr. Vito Romita, whose compatriot, Dr. Bartolomeo Silvestar Kunibert, accepted Dr. Romita's invitation to come to Serbia in 1826 as the third educated doctor, where he worked as Prince's personal doctor until 1839 [6].

The first Serbian doctor in Prince's Serbia was Dr. Jovan Stejić. He was born in Arad in 1803 and obtained his PhD in Vienna in 1829 with the help of Jevrem Obrenović. He moved to Serbia to work with Jevrem, but not long after Prince Miloš engaged him as his personal doctor and a mentor to his sons, Milan and Mihailo. Due to disagreements with Prince Miloš, Dr. Stejić moved to Zemun, which was outside Serbian borders at that time. When the prince left Serbia in 1840, Dr. Stejić returned to Belgrade and together with Dr. Karlo Pacek formed the Serbian Civil Ambulance. In 1845, he was appointed as the State Soviet Secretary of the highest administrative and political body, where he remained until his death in 1853 [7]. Apart from them, there were other doctors working in Serbia as foreigners until 1839:

- Dr. Nestor Mesarović from Irig, who was Prince's physician in Kragujevac
- Dr. Karlo Pacek from Budapest, a great friend and advisor to the Obrenović dynasty who had a very important role in the formation of healthcare service in Serbia
- Dr. Djordje Pantelić, the Prince's family doctor in Požarevac, and later the Guard's military doctor
- Dr. Maksim Nikolić-Miškovičev from Sremski Karlovci, a military doctor
- Dr. Emmerich Lindenmaier from Banat, the first Military Medical Department Chief and Chief of the military and civil healthcare services
- Dr. Josip Rabrić from Sremski Karlovci, a quarantine physician in Aleksinac and Kragujevac
- Dr. Herman Mainert from the Czech Republic, who arrived in Serbia in 1836 [1].

DEVELOPMENT OF MEDICINE IN JAGODINA AFTER THE LIBERATION FROM TURKS

The first hastily trained doctor came to Jagodina after the Second Serbian Uprising. According to the letter of Janićije Radović, a head of Jagodina's *mezulhana* (a kind of post office and tavern for couriers, where they would switch horses and continue their way to Istanbul or Pest) addressed to Prince Miloš in 1824, there was a certain fellow named Guido, an Italian, who travelled through the Balkan region on his way to Istanbul, and he was accompanied by Tristan, the pharmacist, and Peter, his companion who spoke Turkish besides Italian [8].

In 1829, a historian and itinerary writer Oto Dubislav Pirh in his book *A travel through Serbia in 1829* mentioned only six doctors, one of which, Djordje Novaković or Leo-

nid Ehrlich, lived in Jagodina. He was a Christianized Jew, born in Poland, a doctor in the Austrian army, from where he transferred to Šabac. One of the first surgeons in Serbia and Jagodina had been working there since 1826 [9]. In the 18th and 19th centuries, a great part of Europe was under the outbreak of various diseases that spread to Serbia from Turkey. In 1830s, frequent infections and risk of epidemic pervasion across the borders led to the formation of quarantine stations at major border crossings, as well as to setups of the medical and police border cordons. The most dangerous were cholera and plague epidemics, which had repeatedly affected the population of Serbia of that time [3]. During the last plague outbreak on Serbian and European territory, which came from Turkey in 1837, Jagodina was most severely affected, as it was the center of infection. Dr. Karlo Nadj from Zemun's quarantine was invited as the leading expert, while his advisors were Dr. Pacek, Dr. Lindenmaier and Dr. Kunibert. Prince Milos fully authorized Dr. Karlo Nadj and sent him to Jagodina. The plague was stopped in three and a half months.

On April 17 1839, the Ministry of Internal Affairs with the Medical Department, which governed medical professions in founding (doctors, district physicuses, pharmacies and pharmacists, hospitals and midwives), proposed appointing one doctor to every district in Serbia: medical doctors to Šabac, Belgrade, Smederevo, Jagodina, Čačak and Užice; surgeons to Valjevo, Belgrade, Milanovac, Zaječar, Soko Banja, Kruševac and Kraljevo; existing military doctors to Kragujevac and Pozarevac. On July 24, 1839, by the order of Djordje Protić, the Minister of Internal Affairs, and Dr. Karlo Pacek, the Interim Chief of the Principality of Serbia's Medical Department, medical centers were established in the country and district physicuses were appointed in Šabac, Belgrade, Smederevo, Jagodina, Čačak and Užice, and surgeons in Valjevo, Belgrade, Milanovac, Zaječar, Banja, Knjaževac and Kraljevo, while military doctors were sent to Kragujevac and Požarevac since Prince's Guard units resided there.

Following Dr. Pacek's instructions, the district physicuses' task was to vaccinate the population, prevent the use of unhealthy food and beverages, prevent quackery, monitor the trade in medicaments, teach people about hygiene habits, perform medical and court tasks (perform medical examinations and give opinions on a person's ability to work and be married, or on murdered, poisoned and beaten persons), perform autopsies and necessary veterinary tasks to prevent disease spreading among animals. Purely medical activities were as follows: medical examination of the sick persons; giving opinions on the ability of an individual to have a particular profession, especially civil service, and the ability to marry; expertise in cases of murder, poisoning and fights; individual treatment and treatment in hospitals; issuance of drugs from pharmacy kits in places where public pharmacies did not exist; and submitting work reports. At the same time, in the absence of county or village doctors, they needed to treat the sick in their homes and hospitals, as well as to carry drugs in pharmacy kits if a pharmacy did not exist in their towns.

Important healthcare legal acts were brought before physicuses were appointed to counties. The first one, dating from July 8 1839, was on the obligation of vaccination against chickenpox with a detailed description of all doctor's procedures [10].

Lindenmaier's list of doctors and medical staff from 1839 contains as follows:

1. Dr. Pacek – court and personal Prince's doctor
2. Dr. Nikolić Mišković – Prince's family court doctor
3. Dr. Emerich Lindenmaier – Guard's doctor in Kragujevac
4. Dr. Karlo Beloni – command doctor in Čačak
5. Dr. Rebrić – private doctor in Belgrade
6. Dr. Mainert – Guard's doctor in Belgrade
7. Dr. Mušicki – quarantine doctor in Aleksinac
8. Dr. Mihajlović – quarantine doctor in Svilajnac
9. Dr. Slavuj – Master of Surgery and Guard's second doctor in Belgrade
10. Dr. Djordje Novaković – surgeon
11. Dimitrije Kaparis – in the Guard in Požarevac, but without official diploma
12. Sava Jovanović – in quarantine
13. Mata Ivanović – private pharmacist in Belgrade
14. Pavle Ilić – court pharmacist and Guard's pharmacist in Kragujevac
15. Dr. Šteker – doctor of Turkish garrison in Belgrade Fortress
16. Dr. Florian Birg – Master of Surgery, the second doctor of Turkish garrison and pharmacist of Turkish hospital [11].

It is believed that Dr. Karlo Pacek and Dr. Jovan Stejić composed the rules of work of future physicuses, modeled after the Austro-Hungarian regulation on engrafting cowpox. In 1842, the Law on Compulsory Vaccination was extended and amended and was even stricter. A written certificate of vaccination was requirement for a person to enter into marriage, receive scholarship to continue one's education or perform public service (police, education and clergy). The "Rules of Work for Future Physicuses" or the "Instructions for District Doctors and Physicuses" were adopted on August 21, 1839. This rulebook consisted of 23 articles and represented the first Medical Department's law [10].

DEVELOPMENT OF ORGANIZED HEALTHCARE SYSTEM IN JAGODINA IN THE 19TH CENTURY

Dr. Karlo Beloni was appointed as the second district physicus of Jagodina (Figure 1), who, until that moment, was the Guard's doctor and the doctor of Moravian command in Čačak, where he served for four and a half years for the annual salary of 300 thalers [12]. In 1839, the Jagodina District, where Dr. Beloni was sent to as only doctor, had 6,674 households: 3,471 in the County of Temnik, 3,155 in the County of Levac, and 546 in Jagodina and its surroundings. During his stay in Jagodina District, Dr. Beloni was submitting monthly work reports to his superiors. Dr. Beloni was born in 1812 in the village of Levica at the Hungarian territory Barš Marmedja. He came from a Catholic family. He graduated from the University of Pest with the title of Doctor of Medicine and Master of

Figure 1. Dr. Karlo Beloni
Slika 1. Dr Karlo Beloni

Figure 2. Dr. Josif Pančić
Slika 2. Dr Josif Pančić

Ophthalmology and Obstetrics (midwifery). However, he practiced medicine when he moved to Serbia during 4 years and 7 months. Most of this period (3 years and 5 months) he spent as a military doctor in Čačak, Karanovac, Belgrade, Kragujevac and Ćuprija. He spoke and wrote Serbian quite well. In his reports, Dr. Beloni stated that, during his visits to patients, he came across good general health of people and livestock, that there were no severe epidemics and that the patients asked for help "moderately". The patients mostly complained of catarrhal and rheumatic inflammations, as well as fever, liver inflammation and rheumatism. There were no diseases in cattle, except rabies, which was, in his opinion, a result of severe winters. However, the district chief emphasized that Dr. Beloni faced a series of difficulties on the field, which were a consequence of people's ignorance of health in general, thus the patients ran away from his services even at the risk of punishment from the authorities. Otherwise, he aspired to accurately perform police and medical duties, particularly when examining the deceased, and to be diligent in grafting cowpox, but parents were still reluctant to vaccinate their children.

Regarding the issuance of certificates, he tended to be precautious, impartial and truthful. He carried a sizeable pharmacy kit that contained all needed drugs at all times, which he donated to the poor and charged to the wealthy people. He was successful in treating diseases, particularly more serious cases of dysentery and fever, but there was a lack of trust in his work due to people's fear and superstition. In addition, he was gentle, thus he had good relationship with the healthy, and patience with the sick. In the spring of 1841, Dr. Beloni once again took over the general examination of the district's inhabitants, but it ended without visible results. He went in vain three times to Kavadar, the village in Levac County that suffered from smallpox epidemic, accompanied by the county mayor and the police, but never found sick children in their homes because their parents were hiding them in the woods. Disappointed by such behavior and personal failure, Dr. Beloni requested to be transferred to Čačak district in May 1841. He believed that he would be more useful there because he had received greater confidence of the people there and had much more success in his work during earlier service in that area [10].

While waiting a new physicus to be appointed in Jagodina, periodical treatments were in the hands of physicuses from surrounding areas. Dr. Dimitrije Kaparis, a physicus of Požarevac County, worked on suppressing smallpox epidemic in some villages of Jagodina district starting from December 1841. Gligorije Rybakov performed the duty of county physicus until the beginning of 1844, without formal appointment, but with a permission of Dr. Jovan Stejić, the Head of Medical Department, who replaced Dr. Karlo Pacek in this position.

On January 10, 1844, Dr. Andrej Ivanović was appointed the second county physicus by the decree of Prince Alexandar Karadjordjević. He held this position until 1847, when he resigned and became physicus of Negotin County. He was a physicus in Jagodina for three years and fifteen days. In addition to his regular duties, Dr. Andrej Ivanović requested digging new wells to supply potable water, removing garbage from yards and cleaning them, applying hygienic measures, and cover the town streets with stones (cobblestones). He also performed veterinary tasks and founded the first hospital in Jagodina, which was at the level of a clinic [13].

The third physicus was Dr. Josif Pančić (Figure 2), who came to Jagodina on January 31, 1847, at the invitation of

Avram Petronijević, the owner of glassworks, because of the epidemic of typhoid among the workers of the factory. He managed to stop the epidemic among workers, as well as among the population of the surrounding villages. Due to his success, the population of Jagodina demanded that Josif Pančić becomes appointed as the county physicus. Dr. Josif Pančić worked notably on health education of the people, especially by writing instructions on prevention and treatment of certain diseases, as well as by verbal advices. He pointed to dietary habits as the cause of many diseases [13].

Simultaneously with the appointment of Josif Pančić in Kragujevac, on November 20, 1847, Dr. Djordje Malać was appointed the fourth physicus of Jagodina County. He was originally from Osijek in Slavonia and graduated medicine in Budapest. In addition to treatments, physicuses dedicated a major part of their activities to the continuous efforts in fighting against the underdevelopment, but without much success. In his reports, Dr. Djordje Malać states that Jagodina had district offices, district court, elementary school and an improvised hospital. He also mentions undeveloped streets and yards, lack of potable water, and describes cattle that wandered freely. He wrote that, during 1848, he treated a total of 280 persons, as well as that certain diseases occurred with the change of seasons. Most patients were glass factory workers in Belica. He said that in Jagodina, but mostly in villages, people turned to witchcrafts and traditional remedies more often. Prohibition of selling toxic substances in commercial shops was not fully complied with, not only in Jagodina, but throughout the entire Principality.

After Dr. Djordje Malać resignation in 1849, Bogomir (Godfried Anton) Šulek from Czech Republic became new district physicus. He graduated medicine from Vienna and resided in Jagodina District from March 1851 to June 1852. The next one was Dr. Jovan Valenta, also Czech, who graduated medicine in Prague. He served in the District from August 1852 to September 1852, when Spiridon Jeftimijades came, who was originally from Turkey, and he remained at this position until 1860 [13].

According to the announcement of the Ministry of Internal Affairs of March 8, 1852, the district chiefs – with the help of district physicuses and municipal committees – were given assignments to find a suitable building, with at least two rooms and a kitchen, to equip it with necessary inventory and open as a hospital. The President of the Court of First Instance, Stevan Stevanović, with the clerk Aleksandar Jakovljević and informal help of a group of benefactors, directed the founding of the Jagodina Hospital. Village craftsmen donated 3,761 Groschens and a smallish building equipped with six beds was taken under lease. The hospital was opened in late summer of 1852. In March 1858, the press released the news that a new building was purchased for the hospital and a few patients were gathered there, however, professional care and reliable incomes was still lacking. In the early 1860, the district physicus, Dr. Spiridon Jeftimijades, wrote in his report: "the town barely has any hospitals, there is only one little house owned by the County, on the outskirts of the town, near the cemetery, where some crippled people are residing". In October of the same year (1860), the newly appointed physicus, Dr. Mladen Janković, wrote to the authorities that nobody had visited the "municipal hospital" for the entire month. According to his report from the beginning of the following year, the hospital was in poor condition, unequipped and lacking expert care, thus it resembled more a sanctuary for crippled and weak individuals without caretakers than a healthcare institution [14]. He spent a year and a half at the position of physicus. In 1884 he was elected the Interim Chief of the Medical Department within the Ministry of Interior. He was one of the founders and the President of Serbian Medical Society, where he worked for full eight years (from 1873) [15].

Dr. Mladen Janković was replaced in 1862 by Dr. Milosav Pavlović, the first trained doctor in Moravian region, who remained physicus for 11 years. Dr. Pavlović was born in 1827 in the Dražimirovac village, near Jagodina. He started high school in Belgrade in 1845/46, and graduated medicine in Istanbul. He spent a year in Paris at postgraduate studies. He spoke Turkish, Greek, Russian, and French. In 1860, he worked as a doctor in Raška, and on October 20, 1861 he became the district physicus in Jagodina, with the status of "extraordinary physicus at disposal" at that time [16].

The Law on Hospitals Founding and Organization was adopted in 1865. The Ministry of Interior Affairs sent a request on November 16, 1866 to district offices in Drina, Užice, Aleksinac, Timočka Krajina, Smederevo, Valjevo, Jagodina, Rudnik, and Ćuprija districts to find private houses for temporary hospitals or municipal houses for rent for municipal hospitals. The hospital was formed in the house of Avram Petronijević, the Minister of Foreign Affairs and owner of the glass factory in Belica, whose family lived in Jagodina. The house was built in 1833, and rented by Avram's successor from Belgrade.

The District Hospital in Jagodina was founded on November 1, 1867 (Figure 3). Its founder was the district physicus, Dr. Milosav Pavlović. On average, 10-15 patients were treated in this hospital in the summer and 30-35 patients in the winter. Upon its opening, the hospital was named "The District Hospital". After Dr. Milosav Pavlović, the hospital's directors, since its establishment until the end of the 19th century, were as follows: Dr. Leopold Levi, municipal doctor (1873-1874), Dr. Kazimir Staniševski, district physicus (1875-1883), Dr. Franja Ribnikar, municipal doctor (1883-1888), Dr. Stevan Siber, district physicus (1889-1891), Dr. Jovan Danić, district physicus (1891-1892), Dr. Venceslav Steiskal, county doctor (1892-1893), Dr. Pera Dobri, district physicus (1893-1898), Dr. Zarije Popović, district physicus (1898-1900), Dr. Selimir Djordjević, district physicus (1900-1908), and Dr. Živojin Milenković, county doctor (1908-1914) [17]. After joining Jagodina and Ćuprija districts in Moravian District, with the seat in Ćuprija, in 1891, the hospital had the function of a district hospital for Belica, Temnik and Levac counties. In 1907, it finally acquired the status of a county hospital, but was brought back to the district level in 1909.

According to the Law on the Regulation of Medical Profession and Preservation of Public Health from 1881, every district and county should have a county doctor

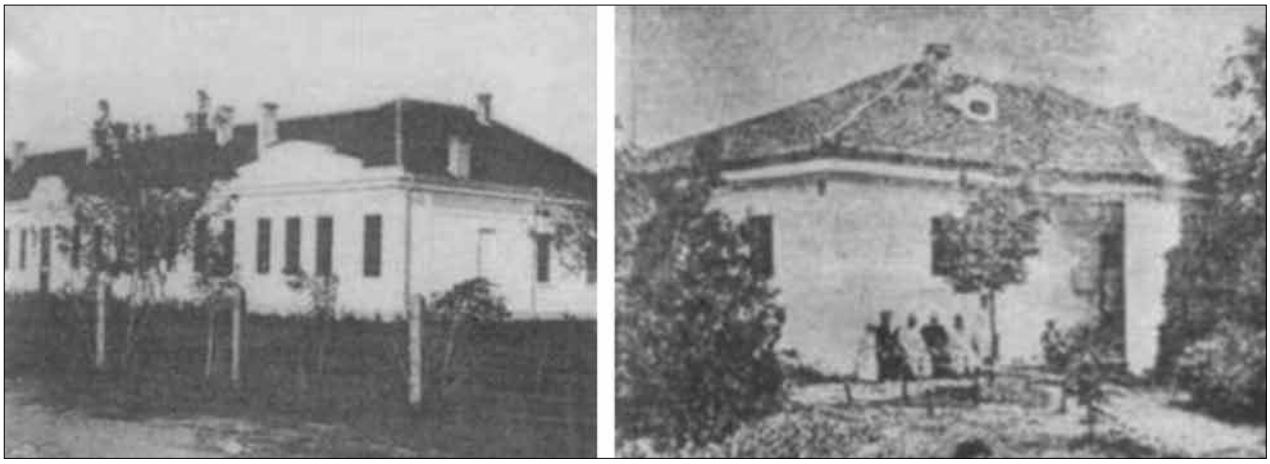

Figure 3. The first hospital in Jagodina
Slika 3. Prva bolnica u Jagodini

with the same qualifications as a physicus. He should be appointed by Prince's decree upon the proposal of the Minister of Interior Affairs, as acting doctor (if Serbian citizen) or contractual one (if foreign citizen). Jagodina District comprised the following three counties at that time: Belica, Levac and Temnik. The doctors in Belica County were: Dr. Josif Vidaković (1890), Dr. Veneslav Steiskal (1891-1892), Dr. Dragoljub Djordjević (1895-1898), Dr. Živojin Milenković (1901-1902), Dr. Kosta Ristić (1903-1904), Dr. Djordje Hadi (1905) and Dr. Živojin Milenković (1906-1914). The doctors of Levac County were: Dr. Ilija Jovanović (1896), Dr. Dragoljub Djordjević (1897), Dr. Ilija Ivanović (1898-1903), Dr. Vladimir Popović (1907), Dr. Svetislav Šohajević (1908-1910), etc [1].

By the law, each municipality in Serbia with 10,000 inhabitants was obliged to financially support, through the municipal tax, one municipal doctor, who was also a member of the municipal administration. All issues regarding people's health and veterinary tasks could not be solved without his presence. In the event of war, the doctors performed their medical duties at military hospitals.

Municipal doctors in Jagodina were: Dr. Gligorije Ribakov (1835), Dr. Lepold Levi (1875-1879), Dr. Franja Ribnikar (1883-1889), Dr. Gorgije Zinoviev (1889-1890), Dr. Radivoje Vukadinović (1891-1898), Dr. Venceslav Steiskal Sr. (1899-1900), Dr. Vojislav Stefanović (1904), Dr. Svetislav Stefanović (1905) and Dr. Damnjan Tufegdžić (1910-1914) [1]. In 1873 and 1874 there were no physicuses. During the Serbian Turkish war (1876-1878) Jagodina had a district hospital and a town pharmacy. Dr. Kazimir Staniševski was the district physicus and District Hospital Director, while Dr. Franja Ribnikar performed the duty of the municipal doctor. In 1891, Dr. Stevan Siber became a physicus for one year. The eleventh physicus was Dr. Jovan Danić, in 1892 and 1893. The twelfth was Dr. Pera Dobri, for five years, until 1897. Dr. Zaharija Popović became physicus in 1898 and 1899, and was succeeded by Dr. Selimir Djordjević, who worked until 1908. He was the last physicus of the 19th and the first one of the 20th century [10].

Since 1908, there had been one physicus for the entire Moravian District, based in Ćuprija. From 1908 until the World War I, seven hospital directors, or district physicuses, worked in Ćuprija: Dr. Mihajlo Cvijetić (1899-1900), Dr. Josif Vidaković (1900-1902), Dr. Radivoje Vukadinović (1902-1904), Dr. Mita Nikolić (1904-1906), Dr. Djordje Petrović (1906-1907), Dr. Djoka Jovanović (1907-1914), and Dr. Nikolai Semashko (1914-1915), while Dr. Radivoje Vukadinović (1893-1902), Dr. Vojislav Vukomanović (1909-1910), Dr. Ilija Mirčić (1910-1912), and Dr. Franja Danilović (1912-1914) worked as secondary doctors of the hospital [18].

CONCLUSION

Dynamic changes that took place in Serbia and among Serbian people in the 19th century (population composition and growth, industrial development, institutions-buildings and civilizational progress) were visible even in Jagodina, which was changing equally and simultaneously with the entire society. Fourteen district physicuses of the 19th century, from 1839 and Dr. Karlo Beloni, to the last one, Dr. Selimir Djordjević, spent part of their professional careers in Jagodina. All of them left their humane and human mark on raising health culture of Jagodina and its population and helped overcoming more easily and quickly all existing diseases and epidemics. The Jagodina Hospital has been working without interruption for 147 years and represents one of the oldest healthcare institutions in Serbia.

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Istorija medicine u Jagodinskom okrugu

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KRATAK SADRŽAJ

Prvi zapis o postojanju naučne medicine u Srbiji potiče iz ranog 12. veka. Stolećima je zdravstveno stanje srpskoga naroda bilo pod uticajem faktora kao što su način života, ishrana, prirodno okruženje, vojske koje prolaze, kulturno nasleđe i predrasude. Do 1820. godine u Srbiji nije bilo obrazovanih lekara. Četrnaest okružnih fizikusa od 1839. godine i dr Karla Belonija, do poslednjeg, dr Selimira Đorđevića, proveo je deo svoje profesionalne karijere u Jagodini. Svi oni su ostavili svoj humani i profesionalni trag na podizanju zdravstvene kulture Jagodine i njenog stanovništva, te pomogli lakše i brže prevazilaženje svih postojećih bolesti i epidemija. Bolnica u Jagodini radi bez prekida 147 godina i jedna je od najstarijih zdravstvenih ustanova u Srbiji.

Ključne reči: dom zdravlja; javna zdravstvena služba; istorija medicine; društveni razvoj

Pravi ljudi od nauke duboko poštuju prošlost.
Sve što radimo i sve što jesmo rezultat je stogodišnjeg rada.
Ernest Renan (1823–1892)

UVOD

Još od praistorije i nastanka čoveka istorija medicine proučava postanak i razvitak bolesti, kao i njihovo lečenje. Smatra se da su bolesti nastale kada i čovek, i da otada i počinje potreba za njihovim lečenjem. Poreklo i nastanak medicine su posledica ljudskih nagona za zaštitu i odbranu. Uporedo s empirijskom (iskustvenom) medicinom razvila se anemistička ili magijska medicina, koja je imala duhovni karakter i nastala na verovanjima u svet duhova prirode, biljaka, životinja i predmeta. Verska medicina je bila najčešća u Starom i Srednjem veku, a bolesti su tumačene kao posledica delovanja zlih duhova, koji su narušavali postojeću ravnotežu u organizmu čoveka. Apokrifna medicina, koju su Sloveni zatekli kod starosedelačkog stanovništva Balkana, nastala je kao rezultat ukrštanja različitih orijentalnih i antičkih kultova, kao i filozofskih sistema Starog veka. Zvanična crkva je nije priznavala zbog njene prirode i verovanja u negativno dejstvo zlih sila iz prirode. Lečenje se vršilo molitvama i gatanjem [1].

Ova studija je opisno istraživanje razvoja medicine u Srbiji i Jagodinskom okrugu. Pratili smo razvoj medicine od srednjovekovnog perioda do danas. Kao metode korišćeni su analiza dokumentacije i prikupljanje i analiza sekundarnih podataka. Istorijski podaci su prikupljeni kroz intervjue i analizirani.

RAZVOJ MEDICINE U SREDNJEM VEKU

Prvi pomen o postojanju naučne medicine u Srbiji postoji još od početka 12. veka i predstavljala je, kao i evropska, medicinu Hipokrata, Galena, Aristida i drugih antičkih lekara. Bila je u velikom usponu od 12. do 15. veka. Prenosioci medicinskih znanja iz Vizantije u Srbiju mahom su bili kaluđeri u srpskim ili vizantijskim kolonijama na Atosu, Sinaju i u Jerusalimu, dok su zapadnu medicinu prenosili lekari i apotekari školovani u zapadnim medicinskim školama. Osnivači prvih bolnica su bili Stefan Nemanja i Sveti Sava 1191. godine u manastiru Hilandaru, a prvu bolnicu na teritoriji Srbije osnovao je Sveti Sava 1208. godine u Studenici. Kasnije ih je osnovano još nekoliko (Ravanica, Visoki Dečani) i one su radile do propasti srpskih srednjovekovnih država [2]. Naučna medicina srednjovekovne Srbije je prekinuta u daljem razvoju, sve više je stagnirala, da bi na kraju 17. veka bila svedena samo na narodnu i donekle versku medicinu.

Zdravstvene prilike u srpskom narodu bile su uslovljene različitim faktorima kao što su način života, ishrana, prirodna sredina, prolazak vojski, nasleđe i predrasude. Lečenje je bilo primitivno i narod se po većim mestima lečio kod narodnih lekara: berbera – Turaka, koji su puštali krv rogovima i pijavicama, vadili zube i vršili manje operacije; hećima – Grka poreklom iz Epira, koji su bili nastanjeni u pojedinim mestima, nazivani su i „kalojatri" (gr. dobri lekari), koji su znanje porodično nasleđivali; samoukih lekara (po narodnosti Grci, Srbi ili Turci) i narodnih vidara i vidarica (Grci, Jevreji i Romi), koji su veštinu lečenja prenosili s kolena na koleno [3].

Narod van većih mesta, po selima, lečio se u manastirima, kod kaluđera koji su znali tajne lečenja lekovitim biljem iz knjiga „lekaruša", koje su vremenom menjane i dopunjavane, i kod popova, koji su obolele lečili čitanjem molitvi i „utiskivanjem krsta" na obolelo mesto. Narodni lekari, kojih je bilo u skoro svakom selu, lečili su biljkama, melemima, lekovitim travama i bajanjem. To su uglavnom bile starije žene koje su prestale s rađanjem i bile upućene u njihovu pripremu. Znanje su prenosile na mlađu žensku osobu iz porodice (uzrasta do 12 godina).

Nadrilekarstvo nije postojalo u klasičnom smislu, jer školovanih lekara nije ni bilo. U radnjama po većim mestima mogli su da se kupe svi poznati lekovi, od kojih su neki bili i otrovni i prodavani bez kontrole. Tridesetih godina 19. veka se sprovode i mere za suzbijanje nadrilekarstva, ali narod nije dugo mogao da se oslobodi sujeverja i ukorenjenih shvatanja.

RAZVOJ MEDICINE U DOBA USTANAKA

Srbija je pod viševekovnom turskom upravom bila zaostala u svakom kulturnom napretku i bez lekara, ne samo u vreme ustanaka, već i mnogo godina kasnije. Neprosvećenost naroda, turska plačkanja i gubici u ustancima nisu pružali kulturne i materijalne uslove za dolazak i rad stranih lekara. Prvi lekari, koji su dolazili retko i samostalno, bili su lični lekari beogradskog paše, a potom u službi Kneza i njegovog dvora. Kasnije su

ti lekari primani u vojnu službu kao vojni lekari u vojsci koja se tek počela stvarati [1].

Tokom Prvog i Drugog srpskog ustanka ranjenici su lečeni po manastirima i kod svojih kuća. Pri kraju Karađorđeve vlade u Srbiji su postojale i dve bolnice – jedna u Beogradu, druga u Šapcu. Lekarski stalež je bio ograničen na lekare strance i retke lekare Vojvođane primljene u vojnu i građansku službu. To je vreme kada Srbija, u koju se vraćaju mladi intelektualci sa studija iz inostranstva, pokušava da promeni konzervativni i patrijarhalni način života [4].

Srbija je u prvim decenijama 19. veka bila još nedovoljno formiran deo Turskog carstva, bez domaćih školovanih kadrova, siromašna i u svakom pogledu nerazvijena [5].

RAZVOJ MEDICINE U OSLOBOĐENOJ SRBIJI

Do 1820. godine u Srbiji nije bilo školovanih lekara. Prvi diplomirani lekar u Srbiji bio je Konstantin Aleksandridi, drugi je Italijan Vita Romito, na čiji poziv je 1826. godine kao treći došao njegov zemljak dr Bartolomeo Silvester Kunibert, koji će do 1839. raditi kao lični lekar kneza Miloša [6].

Prvi Srbin lekar u Miloševoj Srbiji bio je dr Jovan Stejić. Rođen je 1803. godine u Aradu. Doktorirao je u Beču 1829. godine zahvaljujući pomoći Jevrema Obrenovića. Kao lekar prešao je u Srbiju kod Jevrema, ali ga je ubrzo preuzeo knez Miloš za svog ličnog lekara i vaspitača svojih sinova Milana i Mihaila. Zbog neslaganja s Milošem, on prelazi u Zemun, koji je tad bio van granica Srbije. Po Miloševom odlasku iz Srbije 1840. godine vratio se u Beograd i zajedno sa dr Karlom Pacekom osnovao Srpski građanski sanitet. Godine 1845. postavljen je za sekretara Državnog sovjeta, najvišeg upravnopolitičkog tela, i na tom mestu ostao do svoje smrti 1853. godine [7].

Osim njih, kao lekari u Srbiji su do 1839. godine kao stranci radili i:

- dr Nestor Mesarović, iz Iriga, knjažev lekar u Kragujevcu;
- dr Karlo Pacek, iz Budimpešte, veliki prijatelj i savetnik Dinastije Obrenovića, imao je veliki značaj u formiranju zdravstvene službe u Srbiji;
- dr Đorđe Pantelić, lekar kneževe porodice u Požarevcu i kasnije vojni lekar garde;
- dr Maksim Nikolić Miškovičev, iz Sremskih Karlovaca, službovao kao vojni lekar;
- dr Emerih Lindenmajer, iz Banata, prvi šef Vojnog saniteta, načelnik vojne i građanske zdravstvene službe;
- dr Josip Rabrić, iz Sremskih Karlovaca, karantinski lekar u Aleksincu i Kragujevcu;
- dr Herman Majnert, iz Češke, došao u Srbiju 1836. godine [1].

RAZVOJ MEDICINE U JAGODINI PO OSLOBOĐENJU OD TURAKA

Prvi priučeni lekar došao je u Jagodinu po okončanju Drugog srpskog ustanka. Prema pismu Janićija Radovića, starešine Jagodinske mezulhane (pošte, gostionice za kurire, gde su oni menjali konje i nastavljali put ka Carigradu ili Pešti), upućenom Knezu Milošu 1824. godine, bio je izvesni Gvido, Italijan, na putu za Carigrad. Sa sobom je vodio i apotekara Tristana i pratioca Petra, a osim italijanskog, znao je i turski jezik, te su uz njegovu pomoć putovali kroz balkanske krajeve [8].

Istoričar i putopisac Oto Dubislav Pirh 1829. godine pominje u svojim „Putovanjima po Srbiji u godini 1829." samo šest lekara, od kojih jedan, Đorđe Novaković, ili Leonid Erlih, živi u Jagodini. On je bio pokršteni Jevrejin rođen u Poljskoj, lekar austrijske vojske, iz koje je prešao u Šabac. Jedan je od prvih hirurga u Srbiji, a u Jagodini je radio od 1826. godine [9]. U 18. i 19. veku veliki deo Evrope često su zahvatale epidemije raznih bolesti. U Srbiju su se širile preko Turske. Česte zaraze i opasnost prodiranja epidemija preko granica dovele su da se tridesetih godina 19. veka krene sa podizanjem karantina na glavnim graničnim prelazima i da se istovremeno osnuju pogranični sanitetsko-policijski kordoni. Najopasnije su bile epidemije kolere i kuge koje su u nekoliko navrata pogađale stanovništvo tadašnje Srbije [3]. Prilikom poslednjeg širenja kuge na teritoriju Srbije i Evrope iz Turske, 1837. godine glavna borba je vođena u Jagodini, jer je ona bila i centar zaraze. Bio je pozvan dr Karlo Nađ iz Zemunskog karantina kao glavni ekspert, a kao savetnici sarađivali su dr Pacek, dr Lindenmajer i dr Kunibert. Knez Miloš mu je dao svu moć i vlast i uputio ga u Jagodinu. Epidemija je zaustavljena za tri i po meseca.

Dana 17. aprila 1839. godine Ministarstvo unutrašnjih dela sa Sanitetskim odeljenjem, pod čiju nadležnost je spadala sanitetska struka u osnivanju – lekari, okružni fizikusi, apoteke i apotekari, bolnice i babice, predlagalo je da se za svaki okrug u Srbiji postavi po jedan lekar, i to: sa doktorima medicine Šabac, Beograd, Smederevo, Jagodina, Čačak i Užice; sa hirurzima Valjevo, Beograd, Milanovac, Zaječar, Soko Banja, Kruševac i Kraljevo; sa postojećim vojnim lekarima Kragujevac i Požarevac. Dana 24. jula 1839. godine, naredbom Đorđa Protića, ministra unutrašnjih dela, i dr Karla Paceka, privremenog načelnika Saniteta Kneževine Srbije, ustanovljeni su zdravstveni punktovi u zemlji i postavljeni: okružni fizikusi u Šapcu, Beogradu, Smederevu, Jagodini, Čačku i Užicu, a hirurzi u Valjevu, Beogradu, Milanovcu, Zaječaru, Banji, Knjaževcu i Kraljevu, dok su vojni lekari pridodati Kragujevcu i Požarevcu, jer su se u njima nalazile jedinice kneževe garde.

Prema uputstvu dr Paceka, zadatak okružnih fizikusa je bio da vakcinišu stanovništvo, zabranjuju upotrebu nezdravih jela i pića, sprečavaju nadrilekarstvo, nadziru trgovanje lekovima, poučavaju narod o higijenskim navikama, obavljaju sudsko-lekarske dužnosti (vrše vizitiranje i daju mišljenje o sposobnosti lica za službu, ženidbu i brak, ili o ubijenim, otrovanim i tučenim), vrše obdukcije i obavljaju potrebne veterinarske poslove na sprečavanju širenja bolesti među životinjama. U čisto lekarske poslove ubrajali su se: poseta bolesnicima, davanje mišljenja o sposobnosti pojedinca za određeno zanimanje, naročito državnu službu, i sposobnosti za ženidbu, veštačenje u slučajevima ubistva, trovanja i tuča, lečenje pojedinačno i u bolnicama, izdavanje lekova iz ručne apoteke u mestima gde nema javnih apoteka i podnošenje izveštaja o radu. Istovremeno je trebalo, u nedostatku sreskih i varoških lekara, da leče obolele u kućama i „špitaljima" (bolnicama), kao i da nose lekove u ručnim apotekama ukoliko u njihovom mestu još nije bila otvorena apoteka.

Pre nego što su postavljeni fizikusi po okruzima, doneta su važna pravna akta u zdravstvenoj kulturi. Prvi je bio iz 8. jula 1839. godine o obavezi vakcinisanja stanovništva protiv velikih boginja, sa detaljnim opisom svih postupaka lekara [10].

Lindenmajerov spisak lekara i medicinskog kadra iz 1839. godine glasio je ovako:

1. Dr Pacek – dvorski i lični lekar kneza Miloša;
2. Dr Nikolić Mišković – dvorski lekar kneževe porodice;
3. Dr Emerih Lindenmajer – gardijski lekar u Kragujevcu;
4. Dr Karlo Beloni – lekar komande u Čačku;
5. Dr Rebrić – privatni lekar u Beogradu;
6. Dr Majnert – gardijski lekar u Beogradu;
7. Dr Mušicki – karantinski lekar u Aleksincu;
8. Dr Mihajlović – karantinski lekar u Svilajncu;
9. Dr Slavuj, magistar hirurgije – drugi gardijski lekar u Beogradu;
10. Dr Đorđe Novaković – hirurg;
11. Dimitrije Kaparis – bez zvanične diplome pri gardi u Požarevcu;
12. Sava Jovanović – pri karantinu;
13. Privatni apotekar Mata Ivanović u Beogradu;
14. Pavle Ilić – dvorski apotekar i apotekar vojne garde u Kragujevcu;
15. Dr Šteker – lekar turskog garnizona u Beogradskoj tvrđavi;
16. Dr Florijan Birg, magistar hirurgije – drugi lekar turskog garnizona i apotekar turske bolničke ustanove [11].

Smatra se da su pravila o radu budućih fizikusa napisali dr Karlo Pacek i dr Jovan Stejić po ugledu na Austrougarski pravilnik o kalemljenju kravljih boginja. Godine 1842. Zakon o obaveznom vakcinisanju je proširen i dopunjen i bio je još stroži. Zahtevao je pisanu potvrdu o vakcinisanju za stupanje u brak, dobijanje stipendije za nastavak školovanja, za obavljanje državnih poslova u policiji, prosveti i sveštenstvu. Dana 21. avgusta 1839. godine doneta su Pravila u radu za buduće fizikuse, ili *Nastavlenia za okružne lekare i fizikuse*. Pravilnik je imao 23 tačke i predstavljao je prvi sanitetski zakon [10].

RAZVOJ ORGANIZOVANOG SISTEMA ZDRAVSTVENE ZAŠTITE U JAGODINI U 19. VEKU

Za drugog okružnog fizikusa Jagodinskog okruga postavljen je dr Karlo Beloni (Slika 1), koji je dotad bio lekar Garde i Moravsko-podrinjske komande u Čačku, sa stažom od četiri i po godine i godišnjom platom od 300 talira [12]. Jagodinski okrug, u koji je upućen dr Beloni kao jedini lekar, imao je 1839. godine 6.674 domaćinstva: Temnićki srez 3.471, Levački srez 3.155, a Jagodina i okolina 546 domaćinstava. Tokom boravka u Jagodinskom okrugu dr Beloni je pretpostavljenim starešinama dostavljao mesečne izveštaje o radu. Dr Beloni je rođen 1812. godine u mestu Levici, u mađarskoj oblasti Barš Marmeđa. Poticao je iz rimokatoličke porodice. Na univerzitetu u Pešti je stekao diplomu sa zvanjima doktora medicine i magistra okulistike i opstetricije (akušerstva). Do prelaska u Srbiju nije nigde službovao na teritoriji mađarske države, već je tokom četiri godine i sedam meseci jedino radio u Srbiji, od čega tri godine i pet meseci kao vojni lekar u Čačku, Karanovcu, Beogradu, Kragujevcu i Ćupriji. Bio je dobrog telesnog stasa i zdravlja. Znao je prilično dobro da govori i piše na srpskom jeziku. U izveštajima dr Beloni piše da je tokom poseta zaticao dobro opšte zdravlje naroda i stoke, da nije bilo težih epidemija i da su mu se bolesnici obraćali za pomoć u „umerenim razmerama". Oboleli su se mahom žalili na kataralna i reumatična zapaljenja i na oboljenja od groznice, zapaljenja „džigerice" i reumatizam. Nije bilo ni „rednji" kod stoke, sem besnila pasa, što je, prema njegovoj oceni, bila posledica jake zime. Okružni načelnik je, međutim, isticao da se dr Beloni sreo na terenu sa nizom poteškoća, koje su proizilazile iz zdravstvene neprosvećenosti naroda, te su oboleli bežali od njegovih usluga čak i po cenu kažnjavanja od vlasti. Inače, težio je da bude tačan u obavljanju policijsko-lekarskih dužnosti, naročito kod vizitacije umrlih, i trudoljubiv kod kalemljenja boginja, ali su roditelji nerado dovodili decu na pelcovanje.

Kod izdavanja uverenja je postupao predostrožno, nepristrasno i istinito. Sa sobom je nosio poveliku apoteku, snabdevenu u svako doba potrebnim medikamentima. Lekove je poklanjao siromašnima, a imućnima naplaćivao. Imao je uspeha u lečenju, posebno težih bolesnika od srdobolje i vrućice, ali opšte poverenje naroda prema njegovom radu, zbog straha i sujeverja, nije bilo dobro. Inače je bio krotke naravi, pa je u ophođenju sa zdravima bio dobar, a sa bolesnicima strpljiv. U proleće 1841. godine dr Beloni je još jednom preuzeo širu vizitaciju okruga, ali je i ona prošla bez vidnijih rezultata. U levačko selo Kavadar, u kojem je vladala epidemija boginja, išao je uzaludno tri puta, čak u pratnji sreskog načelnika i policije, ali nijednom nije zatekao obolelu decu u kućama, jer su ih roditelji krili u šumi. Razočaran ovakvim držanjem naroda i ličnim neuspehom, dr Beloni se odlučio da zatraži premeštaj u neko drugo mesto, gde bi njegov rad dao vrednije rezultate. U maju 1841. godine dr Beloni ja zatražio od nadležnih vlasti premeštaj u Čačanski okrug, navodeći svoje uverenje da će tamo biti korisniji, jer je za vreme ranijeg službovanja u tom kraju zadobio veće poverenje naroda i imao mnogo više uspeha u radu [10]. Do postavljenja novog fizikusa u Jagodini povremena lečenja preduzimali su fizikusi iz okolnih područja. Dr Dimitrije Kaparis, fizikus Požarevačkog okružja, radio je od decembra 1841. godine na suzbijanju epidemije velikih boginja u nekim selima Jagodinskog okruga. Dužnost okružnog fizikusa do početka 1844. godine, bez formalnog postavljenja, ali uz dopuštenje dr Jovana Stejića, načelnika Saniteta, koji je na toj funkciji zamenio dr Karla Paceka, obavljao je Gligorije Ribakov.

Ukazom kneza Aleksandra Karađorđevića, 10. januara 1844. godine za drugog po redu okružnog fizikusa postavljen je dr Andrej Ivanović. Bio je fizikus do 1847. godine, kada podnosi ostavku i prelazi na mesto fizikusa Negotinskog okruga. Bio je fizikus u Jagodini tri godine i 15 dana. Dr Ivanović je pored svojih redovnih obaveza tražio i da se snabdevanje vodom za piće reguliše kopanjem novih bunara, da se đubre ukloni iz dvorišta, dvorišta čiste, vrši higijena, da se ulice u gradu popune kamenom (kaldrmišu). Obavljao je i veterinarske poslove. Osnovao je i prvu bolnicu u Jagodini, koja je bila na nivou privatne ordinacije [13].

Treći fizikus po redu je bio dr Josif Pančić (Slika 2), koji u Jagodinu dolazi 31. januara 1847. godine na poziv Avrama Petronijevića, vlasnika Staklare, zbog pojave epidemije trbušnog tifusa kod radnika fabrike. On je uspeo da zaustavi epidemiju i kod radnika Staklare i kod stanovnika okolnih sela. Zbog uspeha u lečenju, stanovništvo Jagodine je tražilo da se Josif Pančić postavi za okružnog fizikusa. Dosta je radio na zdravstvenom obrazovanju naroda. To je naročito činio pisanim uputstvima o sprečavanju i lečenju pojedinih bolesti, kao i usmenim savetima. Ukazivao je na ishranu kao uzročnika mnogih bolesti [13].

Istovremeno s postavljanjem Josifa Pančića za fizikusa Kragujevačkog okruga, za četvrtog fizikusa Jagodinskog okruga 20. novembra 1847. godine postavljen je dr Đorđe Malać, rodom iz Osijeka u Slavoniji, koji je medicinu završio u Budimpešti. Pored samog lečenja veliki deo svoje aktivnosti fizikusi su posvetili

upornim nastojanjima u borbi protiv zaostalosti, ali bez mnogo uspeha. U svojim izveštajima dr Malać navodi da u Jagodini postoje okružno načelstvo, okružni sud, osnovna škola i improvizovana bolnica. Takođe navodi veliku neuređenost ulica, dvorišta, nedostatak pijaće vode, opisuje stoku koja se slobodno kretala. Navodi da je tokom 1848. godine lečio ukupno 280 lica i da su se određene bolesti pojavljivale s godišnjim dobima. Najviše bolesnika je bilo među radnicima fabrike stakla u Belici, a opisuje i da su se u Jagodini, a najviše po selima, ljudi češće okretali vradžbinama i narodnim lekovima. Zabrana prodaje otrovnih materija u trgovačkim radnjama nije se potpuno poštovala, što nije bio slučaj samo u Jagodini, već i čitavoj Kneževini.

Posle ostavke dr Đorđa Malaća, za novog fizikusa Okruga postavljen je Bogomir (Godfrid Anton) Šulek, iz Češke, koji je medicinu završio u Beču. On je boravio u Jagodinskom okrugu od marta 1851. do juna 1852. godine. Sledeći je bio dr Jovan Valenta, Čeh, koji je medicinu završio u Pragu i koji je službovao u avgustu i septembru 1852, a potom je za fizikusa određen dr Spiridon Jeftimijades, rodom iz Turske, koji se na toj poziciji zadržao do 1860. godine [13].

Prema raspisu Ministarstva unutrašnjih dela od 8. marta 1852. godine, okružni načelnici su dobili zaduženja da – uz pomoć okružnih fizikusa i opštinskih odbora – nađu podesnu zgradu sa najmanje dve odaje i kuhinjom, opreme je nužnim inventarom i otvore bolnicu. Osnivanjem bolnice u Jagodini rukovodio je predsednik Prvostepenog suda Stevan Stevanović, sa pisarem Aleksandrom Jakovljevićem i uz neslužbenu pomoć grupe dobrotvora. Prilozima varoških esnafa je prikupljen 3.761 groš, te je uzeta pod zakup omanja zgrada i opremljeno šest kreveta. Bolnica je otvorena krajem leta 1852. U martu 1858. godine u štampi je objavljena vest da je kupljena nova zgrada za bolnicu i da se u njoj okupilo nekoliko bolesnika, ali je i dalje radila bez stručne nege i pouzdanih prihoda. Početkom 1860. okružni fizikus dr Spiridon Jeftimijades navodi u izveštaju da u varoši „špitalja gotovo nema, samo što opština privatno drži jednu kućicu na kraj varoši blizu groblja, u kojoj se neki sakati nalaze", a u oktobru iste godine novopostavljeni fizikus dr Mladen Janković piše vlastima da „opštinsku bolnicu" nije niko posetio tokom celog meseca. Prema navodima iz njegovog izveštaja s početka naredne godine, bolnica je bila u lošem stanju, bez opreme i stručne nege, pa je više ličila na ubožište za bogalje i nemoćne pojedince bez staratelja, nego na zdravstvenu ustanovu [14]. Na dužnosti fizikusa je ostao oko godinu i po dana. Godine 1884. bio je postavljen za vršioca dužnosti načelnika saniteta u Ministarstvu unutrašnjih dela. Bio je jedan od osnivača Srpskog lekarskog društva i osam godina njegov predsednik (od 1873) [15].

Dr Mladena Jankovića je na mestu fizikusa 1862. godine zamenio dr Milosav Pavlović, prvi školovani lekar iz Pomoravskog kraja, i ostao fizikus narednih 11 godina. Dr Pavlović se rodio 1827. godine u selu Dražimirovcu kod Jagodine. Gimnaziju je počeo da pohađa 1845/46. godine u Beogradu, a medicinu diplomirao u Carigradu. U Parizu je proveo godinu na dopunskim studijama. Znao je turski, grčki, ruski i francuski jezik. Tokom 1860. godine postavljen je za lekara u Raškoj, a 20. oktobra 1861, u to vreme sa statusom „izvanrednog fizikusa na raspolaganju", za okružnog fizikusa u Jagodini [16].

Godine 1865. donet je Zakon o podizanju i ustrojstvu bolnica. Ministarstvo unutrašnjih dela je 16. novembra 1866. uputilo zahtev načelstvima u Podrinjskom, Užičkom, Aleksinačkom, Crnorečkom, Smederevskom, Valjevskom, Jagodinskom, Rudničkom i Ćuprijskom okrugu, da nađu za privremene bolnice neku privatnu kuću ili opštinsku za izdavanje za opštinsku bolnicu. Bolnica je otvorena u kući Avrama Petronijevića, ministra inostranih dela, čija je porodica živela u Jagodini, vlasnika fabrike stakla u Belici, građenoj 1833. godine, koja je uzeta u zakup od njegovog naslednika iz Beograda.

Okružna bolnica u Jagodini je osnovana 1. novembra 1867. godine (Slika 3), a njen osnivač je bio okružni fizikus dr Milosav Pavlović. U bolnici se u proseku lečilo leti 10–15, a zimi 30–35 bolesnika. Bolnica je po otvaranju nazvana Okružni špitalj. Upravnici bolnice od njenog osnivanja do kraja 19. veka bili su, posle dr Milosava Pavlovića, dr Leopold Levi, opštinski lekar (1873–1874), dr Kazimir Staniševski, okružni fizikus (1875–1883), dr Franja Ribnikar, opštinski lekar (1883–1888), dr Stevan Siber, okružni fizikus (1889–1891), dr Jovan Danić, okružni fizikus (1891–1892), dr Venceslav Steiskal, sreski lekar (1892–1893), dr Pera Dobri, okružni fizikus (1893–1898), dr Zarije Popović, okružni fizikus (1898–1900), dr Selimir Đorđević, okružni fizikus (1900–1908) i dr Živojin Milenković, sreski lekar (1908–1914) [17]. Od 1891. godine, nakon spajanja Jagodinskog i Ćuprijskog okruga u Moravski, sa sedištem u Ćupriji, i dalje je zadržala okružni status za Belički, Temnički i Levački srez. Tek 1907. godine dobila je sreski, ali je 1909. ponovo vratila okružni značaj.

Po zakonu o uređenju sanitetske struke i očuvanju narodnog zdravlja iz 1881. godine, svaka oblast, srez, treba da ima svog sreskog lekara, koji treba da ima istu kvalifikaciju kao i fizikus. Njega postavlja Knez ukazom na predlog ministra unutrašnjih poslova – ako je srpski državljanin, za dejstvateljnog, a ako je strani, za kontraktualnog. Jagodinski okrug je u to vreme imao tri sreza – Belički, Levački i Temnički. Lekari Beličkog sreza su bili dr Josif Vidaković (1890), dr Veneslav Steiskal (1891–1892), dr Dragoljub Đorđević (1895–1898), dr Živojin Milenković (1901–1902), dr Kosta Ristić (1903–1904), dr Đorđe Hadi (1905) i ponovo dr Živojin Milenković (1906–1914). Lekari Levačkog sreza bili su: dr Ilija Jovanović (1896), dr Dragoljub Đorđević (1897), dr Ilija Ivanović (1898–1903), dr Vladimir Popović (1907), dr Svetislav Šohajević (1908–1910) i drugi [1].

Prema ovom zakonu, svaka opština u Srbiji sa 10.000 stanovnika bila je dužna da izdržava opštinskim porezom po jednog opštinskog lekara, koji je bio i član opštinske uprave. Sva pitanja koja su se odnosila na zdravlje ljudi i veterinarska pitanja nisu se mogla rešiti bez njegovog prisustva. U slučaju rata, obavljali su svoje lekarske dužnosti u vojnim bolnicama.

Opštinski lekari u Jagodini bili su: dr Gligorije Ribakov (1835), dr Leopold Levi (1875–1879), dr Franja Ribnikar (1883–1889), dr Gorgije Zinovjev (1889–1890), dr Radivoje Vukadinović (1891–1898), dr Venceslav Steiskal stariji (1899–1900), dr Vojislav Stefanović (1904), dr Svetislav Stefanović (1905) i dr Damnjan Tufegdžić (1910–1914) [1]. Godine 1873. i 1874. nije bilo fizikusa. Na početku srpsko-turskih ratova (1876–1878) Jagodina je imala okružnu bolnicu i gradsku apoteku. Dr Kazimir Staniševski je bio okružni fizikus i upravnik Okružne bolnice, a dr Franja Ribnikar je vršio dužnost opštinskog lekara. Godine 1891. za fizikusa je postavljen dr Stevan Siber i na toj dužnosti ostao godinu dana. Jedanaesti fizikus je bio dr Jovan Danić, 1892. i 1893. godine. Dvanaesti je bio dr Pera Dobri, koji je vršio dužnost fizikusa pet godina, do 1897. Dr Zarija Popović je bio na tom mestu 1898. i 1899. godine, a posle njega dr Selimir Đorđević, do 1908. godine. On je bio i poslednji fizikus u 19. i prvi u 20. veku [10].

Od 1908. godine postojao je za ceo Moravski okrug jedan fizikus sa sedištem u Ćupriji. U Ćupriji je od 1908. godine do Prvog svetskog rata radilo sedam upravnika bolnice, ili okružnih fizikusa, i to: dr Mihajlo Cvijetić (1899–1900) , dr Josif Vidaković (1900–1902), dr Radivoje Vukadinović (1902–1904), dr Mita Nikolić (1904–1906), dr Đorđe Petrović (1906–1907), dr Đoka Jovanović (1907–1914) i dr Nikolaj Semeško (1914–1915). Kao sekundarni lekari Bolnice radili su: dr Radivoje Vukadinović (1893–1902), dr Vojislav Vukomanović (1909–1910), dr Ilija Mirčić (1910–1912) i dr Franja Danilović (1912–1914) [18].

ZAKLJUČAK

Dinamične promene koje su se događale u Srbiji i srpskom narodu u 19. veku bile su vidljive i u Jagodini, koja se menjala kao i čitavo društvo oko nje, u pogledu sastava stanovništva, njegovog broja, stepena industrijskog razvoja, izgradnje ustanova i civilizacijskog napretka. Četrnaest okružnih fizikusa u 19. veku, od 1839. i dr Karla Belonija, do poslednjeg, dr Selimira Đorđevića, deo je svoje profesionalne karijere proveo u Jagodini. Svi oni su ostavili svoj humani i profesionalni trag na podizanju zdravstvene kulture Jagodine i njenog stanovništva i pomogli da se sve bolesti i epidemije koje su postojale lakše i brže prevaziđu. Jagodinska bolnica radi bez prekida već 147 godina i ubraja se u najstarije zdravstvene ustanove u Srbiji.

ZAHVALNICA

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CASE REPORT
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Contouring the Emergence Profile of Peri-implant Soft Tissue by Provisionals on Implants – Case Report

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SUMMARY

Aesthetic outcome of implant therapy involves the appropriate architecture of peri-implant soft tissue and interdental papilla. The dynamic compression technique of soft tissue is mentioned in contemporary literature as one of the methods for achieving optimal emergence profile. The aim of this case report was to present soft tissue prosthetic modeling with temporary crowns on implants for obtaining an emergence profile of final restoration. A 25-year-old female patient with missing left maxillary central incisor was referred to the Department of Oral Surgery School of Dental Medicine University in Belgrade for dental implant placement. After detailed planning, implant placement of Straumann Bone level implant NC Ø 3, 3×12 mm (Straumann® Bone Level NC), in the position of 21 was performed. Upon completion of osseointegration period, screw retained laboratory temporary crown was fabricated. During the next 3 months emergence profile was scalloped by creating additional pressure on the soft tissue with periodic adding the composite resin material to a temporary crown. The created emergence profile was transferred to the master cast by using customized impression coping, making possible fabrication of the final implant restoration according to the design made with provisional restoration. Soft tissue conditioning using temporary dental restorations on implants presents a non-invasive method with predictable aesthetic result.

Keywords: dynamic compression; emergence profile; dental implants

INTRODUCTION

Traditionally, one of the main objectives of an implant treatment has been to ensure osseointegration [1-4]. On the other hand, the achievement of implant osseointegration does not always correlate with successful esthetic outcome [5]. In the early period of implant dentistry, implants were placed with a "Bone driven implant placement concept". According to this concept, an implant is placed at the crest of the bone, which has a sufficient amount of the bone, however, this is not always an ideal implant position for the final restoration. Therefore, this could result in an unaesthetic and nonfunctional implant restoration. Recently, with the development of several bone grafting materials, guided bone regeneration (GBR) techniques, and improvement of technology of implant surface treatment, the concept of implant treatment has been changed to "Prosthetically driven implantation" [6]. Consequently, there is now an increased demand for aesthetic restorations with healthy peri-implant soft tissue.

The emergence profile is one of the key factors in the establishment of the optimum hard and soft tissues. In particular, in the esthetic zone, the emergence profile of dental implant restorations should mimic natural teeth [7, 8]. Improperly contoured restorations will cause compromised access for oral hygiene and inflamed soft tissue that can induce unaesthetic results [9]. Accordingly, properly contoured restoration with a natural emergence profile and gingival architecture that harmonizes with adjacent teeth is very important for aesthetic and functional implant therapy [10]. To achieve an optimal emergence profile, several factors need to be considered from the initial to the final stages of the treatment. In the presence of an appropriate tissue base, achieving an optimal emergence profile depends on the selection of implant, healing abutment, and intermediate prosthetic element selection.

The term "emergence profile" was first used in 1977 by Stein and Kuwata [11] to describe tooth and crown contours as they traversed soft tissue and rise toward the contact area interproximally and height of contour buccally and lingually. In 1990, a photographic analysis of natural teeth by Croll [12] confirmed that most emergence profiles are relatively straight as opposed to convex or concave. If a restoration introduced a convexity or concavity where it didn't belong, the unnatural contour might trap plaque or otherwise disrupt gingiva. Since the introduction of dental implants, there has been renewed interest in this concept as dentists attempt to replicate not only the crown but also the entire tooth anatomy. Unnatural emergence contours may trap plaque and be difficult to maintain hygienically. Additionally, human eye may detect a final restoration in the esthetic zone that has not faithfully reproduced what nature originally provided.

Neale and Chee [7] in 1994 were perhaps the first to describe a technique for surgically sculpting soft tissue around an implant to more closely mimic nature. More recent published technique describes modifying provisional crowns incrementally rather than a surgical approach [13].

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Figure 1. Narrow and round appearance of emergence profile after 15 days
Slika 1. Okrugao i isuviše uzan izgled izlaznog profila 15 dana posle otvaranja implantata

Figure 2. Customizable healing cap placed
Slika 2. Postavljena prilagodljiva kapica za zarastanje

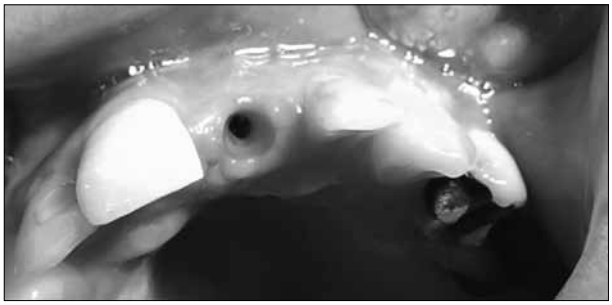

Figure 3. Appearance of soft tissue one month after customizable healing abutment is removed
Slika 3. Izgled mekog tkiva 30 dana po uklanjanju prilagodljive kapice za zarastanje

Figure 4. Insertion of implant-supported screw-retained provisional restoration. Ischemic reaction is visible
Slika 4. Postavljena privremena nadoknada retinirana šrafom. Vidljiva je ishemijska reakcija

Figure 5. Scalloping of emergence profile with periodic adding of composite material on provisional restoration
Slika 5. Oblikovanje izlaznog profila privremenom nadoknadom uz periodično dodavanje kompozitnog materijala

Figure 6. Emergence profile with provisional restoration 90 days later
Slika 6. Izlazni profil s privremenom krunicom posle 90 dana

The aim of this paper was to present gingival recontouring by fabricating and adjusting provisional implant restoration to produce an optimal emergence profile for the final implant restoration.

CASE REPORT

A 25-year-old female patient with missing left maxillary central incisor without periodontal/implant risk factors was referred to the department of Oral Surgery School of Dental Medicine University in Belgrade for dental implant placement. According to the protocol of prosthetically driven implantation, implant placement of Straumann Bone level implant NC Ø 3, 3×12 mm (Straumann® Bone Level NC), in the position of 21 was performed.

After period of oseointegration implant was "opened" and healing abutment was placed (Figure 1). After 15 days, emergence profile was too narrow and customizable healing abutment was positioned (Figures 2 and 3). One month later open tray impression with addition silicone was performed. Laboratory-processed, screw-retained provisional restoration was made on the temporary abutment. The provisional was made from light- and heat-curing microfilled composite (Adoro SR, Ivoclar Vivadent AG). The material was contoured and highly polished to

Figure 7. Customized impression coping for the open tray technique
Slika 7. Postavljen individualizovani transfer pozicije implantata za otisak metodom otvorene kašike

Figure 8. The IPS e.max Press hybrid abutment made of lithium disilicate on the titanium base (Ti base, Straumann)
Slika 8. IPS e.max Press hibridni abatment od litijum-disilikata na bazi titanijuma (*Ti base, Straumann*)

Figure 9. Final all-ceramic screw retained single crown in situ
Slika 9. Definitivna keramička krunica retinirana šrafom *in situ*

minimize plaque accumulation and tissue irritation (Figure 4). During the next 3 months emergence profile was scalloped with periodic creating additional pressure on soft peri-implant tissue by adding material on the provisional restoration (Figures 5 and 6). After completion of soft-tissue conditioning and maturing phase, created emergence profile was transferred to the master cast by using customized impression coping (Figure 7). The identical soft-tissue profile in the master cast was established intra-orally, making possible the fabrication of the final implant restoration according to the design made with the provisional restoration (Figures 8 and 9).

DISCUSSION

Aesthetic result of implant restorations depends on prosthetically and biologically driven implant placement [14], visually satisfying restoration [15, 16] and architecture of the surrounding peri-implant soft tissue [17]. The evolution of concept of the surgical implant therapy has led to improved osseointegration, but even after the successful surgical approach, prosthetic management of soft tissue in the esthetic zone is a challenge.

Techniques that present soft tissue shaping with provisional restorations on implants can not be found in the literature, and only a few case studies on this topic have been published. So far the only presented technique of peri-implant soft tissue modeling is by adding composite resin to a provisional during the period of the soft tissue conditioning [18, 19]. In the initial phase, it is important to squeeze the tissue into the right direction. This is especially important in the papillary region where tissue will not have enough space to mature and fill in the space for papilla due to slightly overcontoured temporary crown after addition of composite material. So the dynamic compression method uses the pressure in the initial stage as round shaped emergence profile is achieved with transmucosal healing cap. Pressure is increased in several steps in order to avoid necrosis, anemia or pain. Pressure with the provisional restoration pushes soft tissue laterally in order to direct it in the right way, but it is also important that temporary restoration is undercontoured, particularly in the area of papilla, so that the tissue could be designed to fill in the created space. The presented modification of temporary crown technique is of crucial importance to finalize the architecture of soft tissue and improve the aesthetic result. Conditioning the soft tissue with provisional restoration represents, compared to the surgical technique, less invasive method with predictable aesthetic outcome. Its primary disadvantage is that it takes a longer time. To confirm the validity of this new technique clinical studies are necessary to examine the long-term stability of peri-implant soft tissue as well as *in vivo* histological analysis that would show precise structure of formed tissue.

Dynamic compression technique in the esthetic zone is a clinical method based on the initial pressure and subsequent modification of provisional restoration by creating space in the papillary region. Our clinical outcome, with a limit of one case report, showed that temporary crown can be used to form the emergence profile of peri-implant soft tissue in harmony with the adjacent teeth, as well as to achieve proper height and width of interdental papilla. Temporary crown also facilitates communication between the patient, dentist and dental technician and provides predictable and extraordinary aesthetic result with final restoration.

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Oblikovanje mekih tkiva privremenim zubnim nadoknadama na implantatima – prikaz slučaja

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KRATAK SADRŽAJ

Estetski uspeh implantološke terapije podrazumeva odgovarajuću arhitekturu periimplantatnih mekih tkiva i interdentalne papile. Tehnika dinamičke kompresije mekih tkiva pominje se u savremenoj literaturi kao jedna od metoda za postizanje optimalnog izlaznog profila. Cilj ovog rada je bio da se predstavi mogućnost protetičkog modelovanja mekih tkiva zubnom nadoknadom na implantatu za dobijanje izlaznog profila definitivne nadoknade. Žena stara 25 godina sa nedostatkom centralnog sekutića u gornjoj vilici s leve strane upućena je na Kliniku za oralnu hirurgiju Stomatološkog fakulteta Univerziteta u Beogradu radi ugradnje implantata. Posle detaljnog planiranja, u predelu zuba 21 ugrađen je Straumann Bone level implant NC Ø 3,3×12,0 mm (*Straumann® Bone Level NC*). Po završenom periodu oseointegracije izrađena je laboratorijska privremena krunica retinirana zavrtnjem. Tokom sledeća tri meseca izlazni profil je oblikovan periodičnim stvaranjem dodatnog pritiska na meka tkiva dodavanjem kompozitnog materijala na privremenu krunicu. Izlazni mekotkivni profil je pomoću individualizovanog transfera pozicije implantata prenet na radni model, što je omogućilo izradu konačne keramičke hibridne krunice prema dizajnu koji je kreiran privremenom nadoknadom. Priprema mekih tkiva privremenim zubnim nadoknadama na implantatima je neinvazivna klinička metoda s predvidljivim estetskim rezultatom i zadovoljavajućom visinom i širinom interdentalne papile.

Ključne reči: dinamička kompresija; izlazni profil; zubni implantati

UVOD

Tradicionalno, jedan od glavnih ciljeva terapije implantatima jeste da se osigura oseointegracija [1-4]. Međutim, s druge strane, ostvarena oseointegracija implantata nije uvek u korelaciji s uspešnim estetskim rezultatom terapije zubnim nadoknadama na implantatima [5]. U ranom periodu stomatološke implantologije važio je koncept „implantologija vođena raspoloživom kosti". Prema ovom konceptu, implantat je postavljan na mestu koje ima dovoljnu količinu kosti, ali to često nije bio idealan položaj implantata za zubne nadoknade. Dakle, ovakav koncept je dovodio do nastanka neestetskih i nefunkcionalnih nadoknada na implantatima. S razvojem materijala za vođenu koštanu regeneraciju (engl. *guided bone regeneration*) i unapređenjem tehnologije izrade površine implantata, koncept terapije implantatima je promenjen u „protetičko vođenje ugradnje implantata" [6]. Shodno tome, sada postoji veća potreba za estetskim nadoknadama na implantatima sa zdravim periimplantatnim mekim tkivom.

Izlazni profil gingive je jedan od ključnih faktora u formiranju optimalnog odnosa tvrdih i mekih tkiva. Konkretno, u estetskoj zoni odgovarajući izlazni profil nadoknada na implantatima treba da potpuno oponaša prirodne zube [7, 8]. Nepravilno konturirane nadoknade će otežati održavanje oralne higijene, što dovodi do upale mekog tkiva i neestetskog ishoda lečenja [9]. Izrada odgovarajućih nadoknada s prirodnim izlaznim profilom i odgovarajućom arhitekturom gingive koja je usklađena sa susednim zubima je važan preduslov za uspešnu estetsku i funkcionalnu implantatnu terapiju [10]. Za postizanje optimalnog izlaznog profila nekoliko faktora treba uzeti u obzir od početka do krajnjih faza lečenja. Postojanje zdravog mekog tkiva je preduslov za postizanje izlaznog profila, koji zavisi od pravilnog izbora implantata, odgovarajuće kapice za zarastanje gingive i pravilnog odabira protetičkih elemenata implantata.

Pojam „izlazni profil" prvi put su upotrebili 1977. godine Stajn (*Stein*) i Kuvata (*Kuwata*) [11] kako bi opisali zub i konture krunice u odnosu na meka tkiva u interproksimalnoj zoni, kao i na visinu konture gingive vestibularno i lingvalno. Fotografska analiza prirodnih zuba koju je uradio Krol (*Croll*) [12] 1990. godine potvrdila je da je većina izlaznih profila relativno ravna nasuprot konveksnim ili konkavnim oblicima. Ukoliko je nadoknada isuviše konveksna ili konkavna, takva neprirodna kontura može da doprinosi većoj prijemčivosti plaka ili poremećaju oblika gingive. Od uvođenja dentalnih implantata teži se protetičkoj restauraciji zubnim nadoknadama anatomskog (prirodnog) oblika. Nepravilan odnos izlaznog profila desni i nadoknade na implantatima (ukoliko nije verno reprodukovano) može se veoma lako, uočiti pogotovo u estetskoj zoni.

Nil (*Neale*) i Či (*Chee*) [7] su 1994. godine prvi opisali tehniku za hirurško estetsko oblikovanje mekog tkiva oko implantata. Novija istraživanja daju prednost tehnici dinamičke kompresije, tj. postepenom modifikovanju privremenih krunica na implantatima, i na taj način postizanju željenog izlaznog profila gingive u odnosu na hirurški pristup [13].

Cilj ovog rada je bio da predstavi klinički slučaj preoblikovanja gingive pomoću postupka postepenog prilagođavanja privremene zubne nadoknade na implantatu radi dobijanja optimalnog izlaznog profila definitivne nadoknade.

PRIKAZ SLUČAJA

Žena stara 25 godina s nedostatkom centralnog sekutića u gornjoj vilici s leve strane, bez faktora rizika za implantološku terapiju, upućena je na Kliniku za oralnu hirurgiju Stomatološkog fakulteta Univerziteta u Beogradu radi ugradnje implantata. Prema protokolu protetičkog vođenja, u predelu zuba 21 izvršena je ugradnja Straumann Bone level implantata NC Ø 3,3×12,0 mm (*Straumann® Bone Level NC*). Posle perioda oseointegracije implantat je otvoren i postavljena je kapica za zarastanje (Slika 1). Nakon 15 dana izlazni profil je bio isuviše uzan, pa je korišćena prilagodljiva kapica za zarastanje (Slike 2 i 3). Mesec dana kasnije realizovan je jednofazni otisak adicionim silikonom i metodom otvorene kašike, kako bi bila izrađena laboratorijska, šrafom retinirana krunica na privremenom abatmentu. Privremena krunica izrađena je od mikropunjenog

kompozita sa dvojnom, toplotno-svetlosnom polimerizacijom (*Adoro SR, Ivoclar Vivadent AG*). Materijal je tako oblikovan i visoko ispoliran, kako bi se smanjili nagomilavanje plaka i iritacija tkiva (Slika 4). Tokom sledeća tri meseca izlazni profil je oblikovan periodičnim stvaranjem dodatnog pritiska na meko periimplantatno tkivo dodavanjem kompozitnog materijala na privremenu nadoknadu (Slike 5 i 6). Posle završene pripreme mekog tkiva dobijeni izlazni profil je prebačen na radni model korišćenjem individualizovanog transfera pozicije implantata (Slika 7). Mekotkivni profil postignut intraoralno prenet na radni model je omogućio izradu definitivne nadoknade prema dizajnu uspostavljenom privremenom nadoknadom (Slike 8 i 9).

DISKUSIJA

Estetski rezultat nadoknada na implantatima zavisi od protetički i biološki vođene ugradnje implantata [14], vizuelno zadovoljavajuće nadoknade [15, 16] i arhitekture okolnog periimplantatnog mekog tkiva [17]. Evolucija hirurškog koncepta implantološke terapije dovela je do poboljšanja oseointegracije, ali čak i nakon uspešnog hirurškog pristupa protetički menadžment mekog tkiva u estetskoj zoni predstavlja izazov.

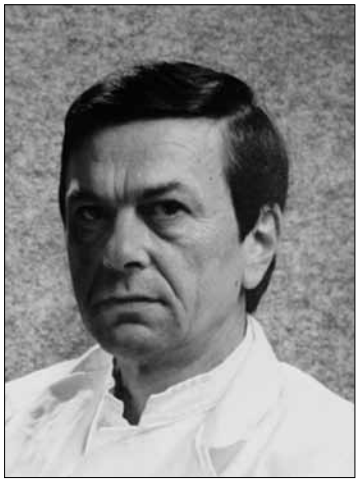
U literaturi se ne mogu pronaći opisi tehnika koje oblikuju meka tkiva privremenim nadoknadama na implantatima, a objavljeno je samo nekoliko prikaza slučaja na ovu temu. Dosad je jedino prikazana tehnika modifikovanja periimplantatnih mekih tkiva dodavanjem kompozita na privremenu nadoknadu tokom perioda kondicioniranja mekog tkiva [18, 19]. U inicijalnoj fazi važno je da se tkivo potisne u pravom smeru. To je naročito važno u papilarnom predelu, gde tkivo neće imati prostora da sazri i ispuni prostor za papilu, jer će privremena krunica biti blago povećana usled dodavanja kompozitnog materijala. Dakle, metoda dinamičke kompresije koristi pritisak u inicijalnoj fazi, jer je transmukoznom kapicom za zarastanje formiran okrugli oblik izlaznog profila. Pritisak se povećava u nekoliko koraka, kako bi se izbegli nekroza, anemija ili bol. Pritisak privremenom nadoknadom potiskuje meko tkivo lateralno, da bi ga usmerila u pravom smeru, a takođe je važno da se privremena krunica redukuje, naročito u predelu papile, kako bi tkivo moglo da ispuni stvoreni prostor. U prikazanoj tehnici modifikacija privremene nadoknade je od ključnog značaja, kako bi se finalizirala arhitektura mekog tkiva i poboljšao estetski rezultat. Kondicioniranje mekog tkiva privremenom nadoknadom predstavlja, u odnosu na hiruršku tehniku, manje invazivnu metodu s predvidljivim estetskim ishodom. Njen osnovni nedostatak jeste to što vremenski duže traje. Da bi se potvrdila validnost ove nove tehnike, potrebne su kliničke studije koje bi ispitale dugoročnu stabilnost periimplantatnog mekog tkiva i histološka analiza *in vivo* koja bi pokazala tačnu strukturu formiranog tkiva.

Tehnika dinamičke kompresije privremenom nadoknadom u estetskoj zoni je klinička metoda koja se zasniva na inicijalnom pritisku i naknadnoj modifikaciji privremene nadoknade stvaranjem prostora u papilarnom predelu. Ovaj klinički rezultat je pokazao da privremene nadoknade na implantatima mogu biti korišćene za oblikovanje izlaznog profila periimplantatnog mekog tkiva, kao i za postizanje odgovarajuće visine i širine interdentalne papile. Privremena nadoknada takođe olakšava komunikaciju između pacijenta, stomatologa i zubnog tehničara i omogućava postizanje predvidljivog i zadovoljavajućeg estetskog rezultata definitivnom nadoknadom.

ZAHVALNICA

Autori duguju zahvalnost zubnom tehničaru Draganu Spasojeviću.

Prof. dr Branislav Dimitrijević (1939–2015)



U julu 2015. godine u Beogradu je preminuo profesor univerziteta, književnik i istoričar medicine Branislav – Brana Dimitrijević.

Rođen je 27. novembra 1939. godine u Beogradu, gde je završio osnovnu i srednju školu. Diplomirao je 1963. godine na Stomatološkom fakultetu Univerziteta u Beogradu s ocenom 8,7. Specijalistički ispit iz predmeta Stomatološka protetika s ortopedijom vilica položio je 1969. godine s odličnim uspehom. Magistarski rad pod nazivom „Poremećaji govora osoba sa stečenim defektima gornje vilice i mekog nepca" odbranio je 1977. Doktorsku disertaciju pod naslovom „Zastupanje fonijatrijskih principa u formiranju gornjovilicnih postresekcionih proteza" odbranio je 1980. godine.

U zvanje stručnog saradnika izabran je 1966, u zvanje asistenta 1970, a reizabran 1974. i 1979. godine. Za docenta je izabran 1982, a reizabran 1988. godine. U zvanje vanrednog profesora izabran je 1989, a reizabran 1994. Penzionisan je 2005. godine.

Objavio je više od 160 naučnih radova iz različitih oblasti stomatologije (maksilofacijalna protetika, forenzička stomatologija, biomaterijali), medicinskog prava, istorije medicine i istorije astronomije. Bio je član Udruženja za medicinsko pravo Srbije i jedan od koautora Medicinskog etičkog kodeksa Srbije.

Brana Dimitrijević je bio stručnjak, literata istančanog stila i senzibiliteta, kritičar, analitičar, rodoljub, borac za sopstvene stavove. Njegova priroda često ga je terala da pliva uz maticu, što je trošilo njegovo telo, ali je jačalo njegov duh i oštrilo um. Delo istoričara medicine Brane Dimitrijevića je amalgam spisateljske obdarenosti, rodoljublja i hipokratovskog poštovanja lekarskih prethodnika, njihovih ljudskih sudbina i delanja u vremenima sumnje i stradanja cele nacije. Snažno se zalagao da se u javnom prostoru obeleži postojanje i rad značajnih ličnosti naše medicine i doprinos članova stranih, lekarskih i humanitarnih misija u lečenju i zbrinjavanju srpskih vojnika i civila u Velikom ratu.

Pronicljiv i lucidan, nadasve jezgrovit u svom pristupu prema pacijentima, beskompromisan kao pedagog, jedan je od stožera Odeljenja za traumatologiju i maksilofacijalnu protetiku, jedinog takve vrste u bivšoj SFRJ.

Pod pseudonimom je publikovao eseje, priče, novele, putopise i dr.: „U kontejneru: zapisi srpskog vojnog hirurga 1916–1918", „Jevrejsko proročanstvo", „Stomatologija i kultura", „Beogradski košmar Mihajla Bulgakova: Pseće srce, drugi deo", „Povrede zuba", „U ravnicama privida: Srpski vojni sanitet 1916. u Dobrudži po svedočenjima dr Milutina Velimirovića i dr Vladimira Stanojevića". Njegova pesma „Umreti u Jermeniji", napisana tokom višemesečnog boravka u ovoj državi krajem osamdesetih godina prošlog veka, privukla je veliku pažnju jermenske čitalačke publike. Bio je scenarista i voditelj nekoliko naučnih i dokumentarnih filmova koje je sam producirao.

Bio je predsednik Sekcije za istoriju medicine Srpskog lekarskog društva od 2009. do juna 2015. godine. Na redovnoj izbornoj skupštini Sekcije (2015) jednodušno je aklamacijom proglašen za njenog četvrtog počasnog predsednika, rame uz rame s velikanima Ristom Jeremićem, Miloradom Dragićem i Slobodanom Đorđevićem.

Doc. dr Milan Petrović

Prof. dr Božidar Jojić (1929–2015)

Trećeg jula 2015. godine zauvek nas je napustio prof. dr Božidar Jojić, doajen i velikan Stomatološkog fakulteta u Beogradu.

Božidar Jojić je rođen na Božić 1929. godine u malom selu Pišče, u podnožju Durmitora. Iako mu je školovanje bilo prekidano okupacijom, uspešno je završio osnovnu školu, a potom i gimnaziju 1949. u Nikšiću. Iz rodnog kraja uputio se u Beograd sa željom da se dodatno usavršava i proširi svoja znanja i vidike.

Njegov izbor bila je stomatologija. S odličnim uspehom diplomirao je 1955. godine na Stomatološkom fakultetu, tada jedinom samostalnom stomatološkom fakultetu u Jugoslaviji. Tokom čitavog studiranja pokazivao je interesovanje za rad sa studentima i bio demonstrator na predmetima Fizika i Ekstrakcije zuba. Na ovaj način dopunjavao je i svoj skromni budžet. Po završetku studija želja za stručnim i naučnim usavršavanjem nadjačala je želju za povratkom u rodni kraj. Po diplomiranju zaposlio se na Odseku ekstrakcije zuba, gde je posle dve godine izabran za asistenta. Zajedno s mlađim kolegama uložio je mnogo vremena i truda kako bi ova jedinica počela samostalno da radi u okviru Stomatološkog fakulteta i izdržava se od sredstava ostvarenih radom u zdravstvu.

Nakon tragične pogibije prof. Keslera 1964. godine, izabran je za rukovodioca Odseka i šefa predmeta Ekstrakcije zuba u okviru Stomatohirurške katedre. Od ovog odseka 1966. godine formirana je samostalna Oralnohirurška klinika, a predmet je dobio naziv Oralna hirurgija.

Prof. Jojić je nastavio svoju akademsku karijeru na ovoj klinici, gde je 1963. godine izabran za docenta, a četiri godine kasnije i za vanrednog profesora. U zvanje redovnog profesora, u kojem je ostao do penzionisanja 1994, izabran je 1971. godine.

Uporedo s ličnim usavršavanjem i napredovanjem u karijeri predano je izgrađivao i Kliniku za oralnu hirurgiju. Dao je lični doprinos i pečat kao upravnik klinike, na čijem čelu se nalazio prvi put od 1973. do 1977. godine, a kasnije ponovo od 1989. do 1993. godine.

Specijalistički ispit iz oralne hirurgije položio je 1975. godine kao prvi specijalista. Iste godine odbranio je i doktorsku disertaciju pod nazivom „Zarastanje rana i pojava bola posle hirurških zahvata u ustima sa posebnim osvrtom na alveolit".

Godine 1977. izabran je za predsednika novoosnovane Sekcije za oralnu hirurgiju Srpskog lekarskog društva, a nedugo zatim osnovano je i Udruženje oralnih hirurga Jugoslavije, čiji je prvi predsednik bio upravo prof. Jojić. Početkom osamdesetih godina prošlog veka formirana je zajednica stomatoloških fakulteta Jugoslavije, a prof. Jojić takođe je bio prvi predsednik u dva mandata.

Kao čovek širokih vidika, učestvovao je u organizaciji stomatoloških odseka u Novom Sadu, Nišu i Prištini i u osnivanju njihovih klinika za oralnu hirurgiju. Bio je jedan od najaktivnijih inicijatora za vraćanje diplome doktora stomatologije, koja je ukinuta saveznim zakonom 1963. godine, a aktivno se borio i za ozakonjivanje privatne stomatološke i medicinske prakse. Njegovi moralni kvaliteti, čovečnost i mudrost doprineli su da se nađe na čelu Stomatološkog fakulteta i bude izabran za dekana u dva mandata u periodu 1979–1983. godine. Prethodno je dva puta biran za prodekana (1969. i 1971).

Pored brojnih stručnih i organizacionih obaveza nijednog trenutka nije zapostavljao naučnoistraživački rad. Tokom karijere objavio je 173 rada u domaćim časopisima i zbornicima i sedam radova u inostranim publikacijama. Jedan je od autora poznatog udžbenika „Oralna hirurgija", koji je imao 10 izdanja i iz kojeg su oralnu hirurgiju učile brojne generacije studenata i specijalizanata. Koautor je i udžbenika „Odabrana poglavlja oralne hirurgije". Pisac je većeg broja tekstova za Medicinsku enciklopediju i Leksikon, kao i poglavlja Oralna hirurgija u Zubnolekarskom priručniku.

Prof. Jojić je odlikovan najvišim priznanjima, nagradama i odlikovanjima za svoj rad i zasluge u struci i nauci. Dobitnik je nagrade Srpskog lekarskog društva za naučnoistraživački rad 1979. godine, kao i brojnih plaketa i zahvalnica. Odlikovan je Ordenom sa zlatnim vencem 1973, a Orden rada sa crvenom zastavom dobio je 1988. na predlog Univerziteta u Beogradu. Godine 1995. dobio je prestižnu Nagradu za životno delo SLD.

Prof. Jojić je bio vrhunski stručnjak, naučni radnik, izuzetan organizator, utemeljivač stomatologije i oralne hirurgije na ovim prostorima. Ipak, pre svega, bio je častan, moralan čovek koji je generacije stomatologa motivisao da se usavršavaju i napreduju, ali i da postanu dobri ljudi. Bio je spreman da pomogne svakome ko mu se obratio za pomoć. Posedovao je iskonsku mudrost i sposobnost da razume ljude oko sebe. Svojim likom i delom obeležio je jednu epohu u razvoju stomatologije na ovim prostorima.

Kada odlaze velikani kao što je prof. Božidar Jojić, oni ne odlaze u zaborav, već se preseljavaju u legendu i ostaju da žive večno u našim srcima i sećanjima.

Neka mu je večna slava i hvala!

Prof. dr Snježana Čolić

Da li ste pažljivo čitali radove?

1. Modelovanje mekih tkiva zubnom nadoknadom je realizovano u predelu zuba:
   a) 33
   b) 21
   c) 11

2. Obrazovanih lekara u Srbiji nije bilo do:
   a) 1840. godine
   b) 1820. godine
   c) 1804. godine

3. Primena Švarcove analize u ortodontskoj dijagnostici je proveravana kod:
   a) 500 osoba
   b) 300 osoba
   c) 400 osoba

4. Površinska korozija instrumenta je značajan faktor koji utiče na frakturu?
   a) Da
   b) Ne
   c) Ponekad

5. Prvi lekar Srbin bio je:
   a) Jovan Stejić
   b) Nestor Mekarović
   c) Đorđe Pantelić

6. Priprema mekih tkiva privremenim zubnim nadoknadama na implantatima je:
   a) neinvazivna klinička metoda
   b) agresivna klinička metoda
   c) invazivna hirurška metoda

7. Ispitanici za primenu Švarcove analize su imali dentoalveolarni odnos:
   a) I klase
   b) II klase
   c) III klase

8. U Republici Srpskoj širi tip lica imalo je:
   a) 50,33% ispitanika
   b) 30,76% ispitanika
   c) 19% ispitanika

9. Prvi zapis o postojanju naučne medicine u Srbiji potiče iz:
   a) 12. veka
   b) 10. veka
   c) 14. veka

10. Priprema mekih tkiva zubnim nadoknadama na implantatima omogućava:
    a) nepredvidljiv estetski rezultat
    b) neadekvatnu visinu i širinu interdentalne pulpe
    c) zadovoljavajući estetski rezultat

11. Površinska korozija je proveravana kod:
    a) 48 instrumenata
    b) 68 instrumenata
    c) 52 instrumenta

12. U Republici Srpskoj uski tip lica imalo je:
    a) 30,76% ispitanika
    b) 50,33% ispitanika
    c) 19% ispitanika

13. Tokom Prvog i Drugog srpskog ustanka ranjenici su lečeni u:
    a) manastirima i kod svojih kuća
    b) poljskim bolnicama
    c) domovima zdravlja

14. Prosečne vrednosti prednje i zadnje širine, odnosno visine zubnog luka kod ispitanika Republike Srpske su bile:
    a) manje u odnosu na Švarcove
    b) veće u odnosu na Švarcove
    c) iste kao i Švarcove

15. Priprema mekih tkiva za prijem nadoknade na implantatima je relizovana kod osobe od:
    a) 25 godina
    b) 35 godina
    c) 45 godina

16. Prvi diplomirani lekar u Srbiji bio je:
    a) Jevrem Obrenović
    b) Vita Romito
    c) Konstantin Aleksandridi

17. U Republici Srpskoj srednji tip lica je imalo:
    a) 50,33% ispitanika
    b) 30,76% ispitanika
    c) 19% ispitanika

18. Testiranje osetljivosti na koroziju je proveravano potapanjem u rastvor NaOCl od:
    a) 5,25%
    b) 1%
    c) 3%

19. Potapanje Ni-Ti instrumenata u rastvor hlorheksidina od 0,2% dovelo je do korozivnih oštećenja?
    a) Da
    b) Ne
    c) Da, i ona su potpuno uništila radni deo instrumenata

20. Primena rastvora EDTA od 17% kod Ni-Ti i čeličnih instrumenata:
    a) dovodi do oštećenja samo Ni-Ti instrumenata
    b) dovodi do oštećenja čeličnih instrumenata
    c) ne dovodi do korozivnih oštećenja nijedne vrste instrumenata

Odgovore slati na email adresu Uredništva časopisa „Stomatološki glasnik Srbije". Tačni odgovori na pitanja će se vrednovati u skladu s Pravilnikom o kontinuiranoj medicinskoj edukaciji zdravstvenih radnika.

Uputstvo autorima za pripremu rada (2015)

Stomatološki glasnik Srbije je časopis Srpskog lekarskog društva osnovan 1953. godine. Časopis objavljuje: originalne naučne i stručne radove, pregledne radove, prikaze iz prakse, saopštenja, informativne i edukativne radove, istoriografske radove, izveštaje s kongresa i stručnih sastanaka, prikaze knjiga, komentare i pisma uredništvu, stručne vesti i društvenu hroniku.

Svi rukopisi se podvrgavaju recenziji. Radove recenziraju dva anonimna stručnjaka i, ukoliko je potrebno, statističar. Konačnu odluku o prihvatanju rada za štampu donosi glavni i odgovorni urednik. Autori se obaveštavaju o prijemu ili odbijanju rada najkasnije osam nedelja od podnošenja rukopisa.

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Radovi se štampaju na engleskom i srpskom jeziku.

Opšta uputstva Tekst rada treba da bude otkucan u programu za obradu teksta *Word*, sa dvostrukim proredom, isključivo fontom Times New Roman i veličinom slova 12 pt. Sve margine treba podesiti na 25 mm, veličinu stranice na A4 format, a tekst kucati s levim poravnanjem i uvlačenjem svakog pasusa za 10 mm, bez deljenja reči. Ako se u tekstu koriste specijalni znaci (simboli), koristiti font Symbol. Podaci o korišćenoj literaturi u tekstu označavaju se arapskim brojevima u uglastim zagradama – npr. [1, 2], i to redosledom kojim se pojavljuju u tekstu. Stranice se numerišu redom u okviru donje margine, počev od naslovne strane.

Naslovna strana Na posebnoj, prvoj strani rukopisa treba navesti sledeće: naslov rada bez skraćenica, puna imena i prezimena autora bez titula, zvaničan naziv ustanova u kojima autori rade, mesto i državu; na dnu stranice navesti ime i prezime, adresu za kontakt, broj telefona i e-mail adresu autora zaduženog za korespondenciju.

Kratak sadržaj i ključne reči Druga strana treba da sadrži kratak sadržaj rada obima 100–250 reči. Kratak sadržaj originalnog rada treba strukturirati na sledeće delove: Uvod (u okviru kojeg se navodi cilj rada), Materijal i metode rada, Rezultati i Zaključak. Navode se najvažniji rezultati, numeričke vrednosti, statističke analize i nivo značajnosti. Ispod kratkog sadržaja navesti od tri do šest ključnih reči. U izboru ključnih reči koristiti *Medical Subject Headings – MeSH* (*http://www.nlm.nih.gov/mesh*).

Struktura rada Originalni rad treba da sadrži sledeće podnaslove: Uvod (sa ciljem rada), Materijal i metode rada, Rezultati, Diskusija, Zaključak i Literatura. Prikaz iz prakse čine: Uvod, Prikaz bolesnika, Diskusija i Literatura. Ne treba koristiti imena bolesnika, inicijale ili brojeve istorija bolesti. Pregledni i informativni rad čine Uvod, odgovarajući podnaslovi, Zaključak i Literatura. Pregledni rad mogu objaviti samo autori koji su izuzetno uspešni u oblasti kojom se bave i koji navedu najmanje pet autocitata radova publikovanih u časopisima s recenzijom.

Tekst rukopisa Koristiti kratke i jasne rečenice, bez stranih reči i neadekvatnih pojmova iz prevoda iz strane literature. Za nazive lekova koristiti generička imena. Skraćenice koristiti samo kada je to neophodno, a ne koristiti ih u naslovu. Za svaku skraćenicu pun termin treba navesti pri prvom pojavljivanju u tekstu, sem ako to nije standardna jedinica mere. Decimalne brojeve u engleskom tekstu pisati sa tačkom, a u srpskom sa zarezom. Kad god je to moguće, broj zaokružiti na jednu decimalu. Sve rezultate hematoloških, kliničkih i biohemijskih merenja navoditi u metričkom sistemu prema Međunarodnom sistemu jedinica (SI).

Obim rukopisa Celokupni rukopis rada – koji čine naslovna strana, kratak sadržaj, tekst rada, spisak literature, svi prilozi, potpisi za njih i legenda (tabele, slike, grafikoni, sheme, crteži) – mora iznositi za pregledni rad do 7.000 reči, za originalni rad do 5.000 reči, a za informativni rad i prikaz iz prakse do 3.000 reči. Provera broja reči u dokumentu može se izvršiti kroz podmeni Tools–Word Count ili File–Properties–Statistics.

Tabele Tabele se označavaju arapskim brojevima prema redosledu navođenja u tekstu, a moraju biti urađene u programu *Word*, kroz meni Table–Insert–Table, uz definisanje tačnog broja kolona i redova koji će činiti mrežu tabele. Korišćene skraćenice u tabeli treba objasniti u legendi ispod tabele.

Grafikoni Grafikoni treba da budu urađeni i dostavljeni u programu *Excel*, da bi se videle prateće vrednosti raspoređene po ćelijama.

Slike Slike se označavaju arapskim brojevima prema redosledu navođenja u tekstu. Primaju se isključivo digitalne fotografije (crno-bele ili u boji) rezolucije 300 dpi i formata zapisa .tiff ili .jpg. Ukoliko autori ne poseduju ili nisu u mogućnosti da dostave digitalne fotografije, onda originalne slike treba skenirati kao Grayscale (ili u boji) u rezoluciji 300 dpi i snimiti ih u originalnoj veličini.

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