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Adresa uredništva
Srpsko lekarsko društvo
Kraljice Natalije 1
11000 Beograd
Srbija

Telefon: +381 (0)11 409 27 76
Email: stomglas@bvcom.net

Address of the Editorial Office
Serbian Medical Society
Kraljice Natalije 1
11000 Belgrade
Serbia

Phone: +381 (0)11 409 27 76
Email: stomglas@bvcom.net

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Čuvaj se vrline kojom se neko sam hvali.
Marija fon Ebner-Ešenhah

Iako ne volim stereotipe, ideju za svoj urednički komentar ponovo sam „isčupao“ iz jedne pozorišne predstave o kojoj sam već pisao. Grad o kome ova predstava govori je paradigma naše aktuelne stvarnosti, jer ni tamo ne funkcioniše nijedan društveni obrazac koji bi društvu dao humani karakter. U tom sistemu ne postoje ni merila vrednosti, ni moralna načela, pa je čak i poštenje prividna kategorija. U odnosu na „teatar života“ ova predstava samo daje odgovore na pitanja koja već znamo i u stvari „resetuje“ aktuelni trenutak u vremenu kulturne, naučne i svekolike regresije.

Ali naš životni teatar je dodatno kontaminiran „estradizacijom“ svega postojećeg u bukvalnom smislu te reči. Naravno, u nauci je to vrlo pogubno jer vodi njenoj kompletnoj destrukciji i pozicionira je na margine društvene stvarnosti. A sistem i društvo, u kojima je sloboda mišljenja „incident“ i koji počivaju na naučnoj inferiornosti, obično nemaju ni perspektivu ni svetlu budućnost.

Misao velikog vladike Velimirovića „Lako je naučiti životinju, lako je naučiti prostaka, ali je teško naučiti onog ko je nenaučen postao učitelj drugima“ toliko je aktuelna da najbolje oslikava našu stvarnost u svim segmentima života. U sistemu gde „neuki“ vladaju, gde „svemogućci“ odlučuju o važnim pitanjima, gde „sveznalice“ bez ikakvog naučnog digniteta uče i obučavaju, gde se nesposobni i moralno diskreditovani pitaju o svemu, prosperitet je uvek pod znakom pitanja. Umesto da širi vidike i otvara beskraj, naučna misao se tada samo „ukopava“, diskredituje i ograničava.

Okruženi smo onima koji bez ikakvih vrednosnih potvrda suvereno vladaju „naučnom estradom“ iako im se često elementarni kvantum znanja bazira na nesigurnim podacima Gugla. Njihova opijenost sobom je toliko velika da često osim sopstvenog lika i ne vide ništa drugo. Neretko njihovo ogledalo i previše uveličava. Ali oni su svuda i najčešće tamo gde ni po čemu ne pristaju, ni po naučnim i stručnim, a ponajmanje po moralnim i etičkim kvalitetima. Njihova narcisoidna potreba da govore i o onome što znaju i o onome što ne znaju je mnogo veća od „provalije“ između realnosti i ličnog doživljaja sebe.

„Estrada“ je suvereni vladar naših života jer dominira u svakom segmentu našeg bitisanja. U utakmici sa besmislenim ishodom oni jedu naše vreme, ali nas i „čuvaju“ i „štite“ od kulture, obrazovanja i nadasve znanja.

Kada se počne poštovati sistem rada, moralnih načela i pre svega odgovornosti za ono što se radi, kada znanje bude naš „vrhovni poglavar“, onda će i naša budućnost biti svetlija. Neko je rekao: „Ko je savijen nad knjigom, taj uspravno hoda“ i time izrekao svu istinu. Marljivo učiti i odgovorno raditi (ono što ste najbolje naučili) jedini je recept koji može „resetovati“ i „Dogvil“ i „estradu“. A nijedan trud nije uzaludan ako ima jasan i vredan cilj.

Ovaj urednički komentar ću završiti slično kao što sam i počeo, ali ovog puta citatom Duška Radovića, koji najbolje oslikava estradizaciju svega: „Ima ljudi koji toliko lepo misle o sebi da ne smeju ništa da rade. Oni znaju da ništa što urade ne bi moglo da potvrdi takvo njihovo mišljenje o sebi“.

Prof. dr Slavoljub Živković

Clinical and radiological analysis of the causes for endodontic treatment failure

Jelena Nešković, Milica Jovanović-Medojević, Slavoljub Živković

University of Belgrade, Faculty of Dental Medicine, Department of Restorative Odontology and Endodontics, Belgrade, Serbia

SUMMARY

Introduction Development of inflammatory lesions or their persistence after primary treatment is considered endodontic failure. The reason for failure can be complex anatomy of the canal system and numerous iatrogenic factors.

The objective of this study was to analyze, clinically and radiographically, the causes of primary endodontic treatment failure and assess possibilities for retreatment of teeth with failed endodontic treatment.

Method The study included 79 teeth (36 multirrooted and 43 singlerooted tooth) indicated for repeated endodontic treatment. Based on the radiographic assessment of the status of periapical structures, teeth were divided into two groups. The first group included teeth without periapical lesions, i.e. the healthy periodontal tissues (PAI score of 1 and 2) in which retreatment was required for prosthodontic reason due to the poor quality of obturation (28 teeth), and the second group included teeth with visible signs of periapical tissue damage (PAI scores 3, 4 and 5) (51 teeth). In both groups, quality of obturation, coronal sealing and the presence or absence of clinical symptoms was analyzed.

Results The most common radiographic finding of definitive obturation was short filling (65.8% of cases); "forgotten" canals (25.3%); non-homogeneous obturation with correct length (5.1%) and fractured instrument (3.8%). There was significant difference between healthy periodontal ligament and adequate restoration ($P < 0.001$). In 95% of patients with symptoms, changes in the periapical tissue were observed. Also, there was significant difference in the presence of symptoms after primary treatments, between the teeth with healthy apical periodontal tissue and teeth with periapical lesions ($P = 0.019$).

Conclusion The outcome of the root canal treatment is significantly affected by the quality (density) of obturation and the presence and quality of coronal restoration. In patients with symptoms there were changes in the periapical tissue.

Keywords: endodontic failure; obturation; coronal restoration; retreatment

INTRODUCTION

Healing of periapical lesions presented as reduction or disappearance of existing periapical radiolucency is expected after adequately conducted endodontic treatment. However, there are situations when bone repair is absent and there is no reduction in periapical radiolucency, often qualified as endodontic failure [1]. The success rate of endodontic treatment ranges from 53% - 97% [2–5]. Higher percentage indicates that almost every endodontic treatment is successful, while lower limit interval suggests that every other is unsuccessful.

Despite the undoubted frequency in everyday clinical practice, there is still no exact definition of endodontic treatment failure. Many clinicians came to the consent that lack of pain and other clinical symptoms or maintained function of endodontically treated teeth are important parameters of successful endodontic treatment [6]. The failure of endodontic treatment includes radiographic appearance of inflammatory lesions in the periapical tissue, which had not existed before or persistence of or enlargement of the radiolucency after undertaken primary treatment [6, 7].

The most common reasons for failure are: inadequate control of aseptic conditions [8–15], small access cavity (making difficult to locate all canals so some of them remain "forgotten"); inadequate instrumentation of the root canal, complications during endodontic treatment in the form of perforation of the root canal or separated instruments [16], inadequate obturation (short, non-homogeneous or overextended) [17–20] or microleakage of temporary or definitive coronal restoration [21, 22, 23].

Sometimes failure can occur even if endodontic treatment was properly managed and all procedures are fully respected. The reason for this is the complex anatomy of the canal system and numerous ramifications and anastomoses between the main and accessory canals that cannot be adequately treated or obturated using contemporary instruments, materials and techniques. Noninstrumented region of endodontic space can contain bacteria and necrotic tissue, even when not visible on the X-ray [12, 24].

There are factors outside the root canal, within the inflamed periapical tissue that could adversely affect post-operative healing of periapical lesions. Persistence of asymptomatic periapical radiolucency after thorough endodontic therapy can be caused by extra-radicular in-

fection, true cysts, foreign bodies, the presence of cholesterol crystals or scar healing of the tissue [25].

The aim of this study was to analyze, clinically and radiographically, the causes of primary endodontic treatment failure and assess possibilities for retreatment of teeth with failed endodontic treatment.

METHOD

The study was conducted at the Clinic of Restorative Odontology and Endodontics, Faculty of Dental Medicine, University of Belgrade, Serbia. All participants signed consent to voluntary participation in the study after introducing with objectives and expected outcomes of the research.

67 patients of both genders, aged 24-79 years, and 79 teeth (36 multirooted and 43 singlerooted tooth) indicated for repeated endodontic treatment were included in the study. One operator carried out clinical trial, while two researchers interpreted the assessment of radiographic outcome.

All 79 teeth had inadequate radiographic obturation and that was the key criterion in the assessment of the

failure of endodontic treatment. 52 teeth had short filling while 4 teeth had non-homogeneous filling. "Forgotten" canals were found in 20 teeth while 3 teeth had separated instruments (Table 1). In 36 teeth restoration was adequate or had valid prosthetic restorations, 5 teeth were without fillings a longer period of time, and 43 teeth had inadequate restoration.

Periapical status of each tooth prior to the re-treatment was assessed radiographically using PAI (periapical index) system as follows [26]:

- 1- PAI normal periapical structures
- 2- PAI small changes in bone structures that is not pathognomonic for apical periodontitis
- 3-PAI changes in bone structure with decalcification, characteristic for apical periodontitis
- 4-PAI periodontitis with clearly defined zone of radiolucency
- 5-PAI advanced periodontitis with signs of exacerbation and expansion of bone.

PAI score was determined for each tooth individually. X rays were analyzed on the light box using magnifying lens. Multirooted teeth were evaluated according to the maximum damage of periodontal structures in any of the roots. Based on the state of periapical structures, teeth

Table 1. Distribution of teeth with endodontic failure in relation to the quality of obturation, coronal restoration and PAI index values.

Tabela 1. Distribucija zuba sa endodontskim neuspehom u odnosu na kvalitet opturacije i restauracije i vrednosti PAI indeksa

P A I	N	Quality of obturation Kvalitet opturacije				Quality of coronal restoration Kvalitet restauracije	
		Short filling Kratko punjenje	Nonhomogenous filling Nehomogeno punjenje	Separated instrument Zalomljen instrument	Missed canals Zaboravljeni kanal	Adequate Adekvatno	Inadequate Neadekvatno
1	14	10			4	12	2
2	14	10			4	9	5
3	29	16	3	1	9	9	20
4	15	11	1	2	1	3	12
5	7	5			2	3	4
Σ	79	52	4	3	20	36	43

Table 2. Distribution of teeth in relation to the presence of clinical symptoms in the group of teeth with healthy periapical tissue and the group with periapical lesions

Tabela 2. Distribucija zuba u odnosu na prisustvo kliničkih simptoma u grupi sa zdravim parodontalnim tkivima i grupi sa periapikalnim lezijama

Clinical symptoms Klinički simptomi		Teeth with healthy periapical tissue Zubi sa zdravim parodontacijom		Teeth with periapical lesions Zubi sa periapikalnim lezijama	
		N	%	N	%
Symptoms present Prisustvo simptoma	Yes Da	0	0,0	9	36%
	No Ne	15	100%	25	64%
Pain Bol	Yes Da	0	0,0	6	24%
	No Ne	15	100%	28	76%
Sensitivity to percussion Perkutorna osetljivost	Yes Da	0	0,0	3	12%
	No Ne	15	100%	31	88%
Swelling Otok	Yes Da	0	0,0	3	12%
	No Ne	15	100%	31	88%
Sinus tract Fistula	Da	0	0,0	3	12%
	Ne	15	100%	31	88%

were divided into two groups. The first group included teeth without periapical changes (PAI score 1 and 2) where retreatment was necessary for prosthetic reasons and poor quality of definitive obturation (28 teeth). The second group included teeth with visible signs of periapical tissue damage (PAI scores 3, 4 and 5) and included 51 teeth.

The second parameter in the analysis was the existence of clinical symptoms after the initial treatment. The first group included cases without clinical symptoms (diagnosed as incidental findings), and the second group included teeth with present clinical symptoms: pain, swelling, sensitivity to percussion, present sinus tract and others (Table 2).

RESULTS

Results are presented in Figures 1-4 and Tables 3-6.

Periodontal tissues were found healthy (PAI 1 and 2) in 35.4% of cases, while some changes in periapical tissue (PAI 3, 4 and 5) were recorded in 64.6% of cases. Short obturation was recorded in 65.8% of cases, while "forgotten" canals that were detected in 25.3% of teeth. Non-homogenous filling with correct length was noted in 5.1% of teeth and fractured instrument was found in the root canal of 3.8% of analyzed teeth (Table 3).

The quality of the coronal seal was inadequate in 54.5% of cases, while in 45.5% of cases coronal restorations had satisfactory quality (Table 4). Most of teeth with healthy



Figure 1. a) Maxillary first molar on the left with inadequate obturation (short, non-homogeneous and forgotten buccomesial canals); b) Final obturation after finished re-treatment; c) After 2 years- complete healing

Slika 1. a) Rendgenografski snimak prvog maksilarnog molara sa leve strane, sa neadekvatnom opturacijom (kratko, nehomogeno punjenje i „zaboravljeni“ bukomnezijalni kanali); b) Definitivna opturacija nakon retretmana; c) Potpuno izlječenje posle dve godine

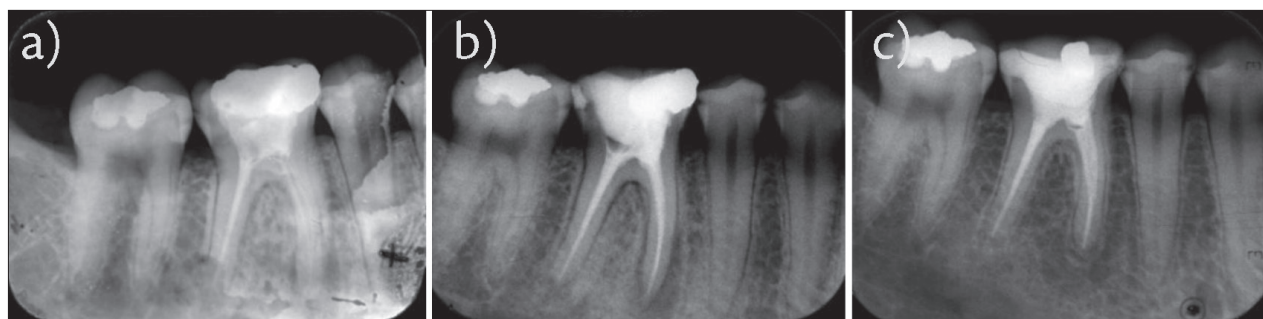


Figure 2. a) Mandibular first molar on the left with inadequate obturation and forgotten mesial canals. The tooth presented clinical symptoms of swelling and tenderness; b) Final obturation after finished re-treatment; c) Complete healing after 2 years

Slika 2. a) Rendgenografski snimak mandibularnog prvog molara sa leve strane (sa neadekvatnom opturacijom i sa „zaboravljenim“ mezijalnim kanalima). Zub je bio sa kliničkim simptomima otoka i bolne osetljivosti; b) Definitivna opturacija nakon retretmana; c) Potpuno izlječenje posle dve godine

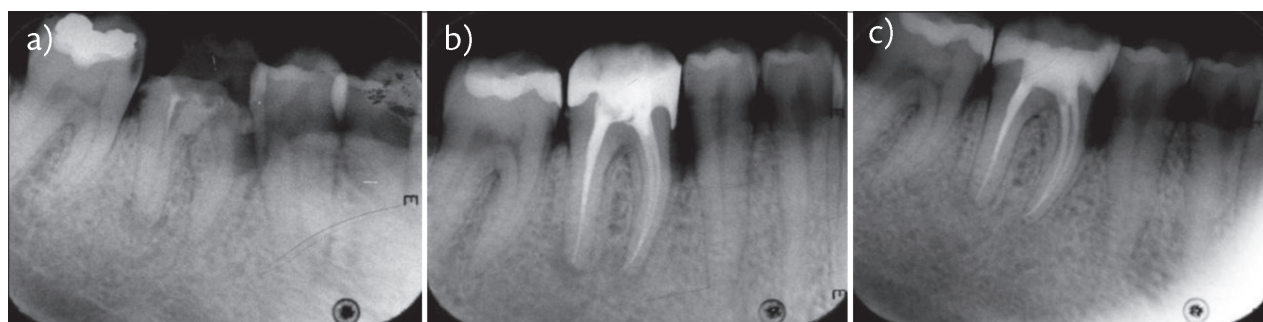


Figure 3. a) Mandibular first molar on the left side with short root canal filling in the distal canal and forgotten mesial canals; b) Final obturation after finished re-treatment; c) Complete healing after 2 years.

Slika 3. a) Rendgenografski snimak mandibularnog prvog molara sa leve strane sa kratkim punjenjem u distalnom kanalu i „zaboravljenim“ mezijalnim kanalima; b) Definitivna opturacija nakon retretmana; c) Potpuno izlječenje posle dve godine

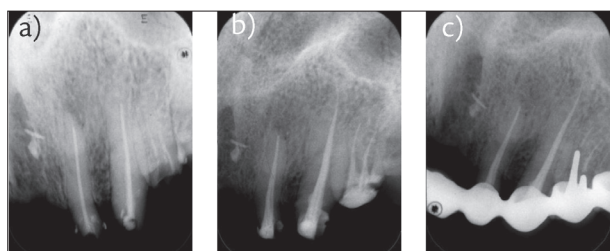


Figure 4. a) Failed endodontic treatment of maxillary lateral incisor, canine and first premolar on the right side. Periapical lesion is visible above the root of lateral incisor; b) Final obturation after finished re-treatment before prosthetic restoration; c) Complete healing after 2 years

Slika 4. a) Radiografski snimak neuspelog endodontskog lečenja na lateralnom sekutiću, očnjaku i prvom premolaru gornje vilice sa desne strane. Periapikalna lezija se uočava iznad korena lateralnog sekutića; b) Definitivna opturacija u okviru preprotetske pripreme pacijenta; c) Potpuno izlečenje nakon dve godine

periapical tissue (1, 2 PAI) were adequately restored (75%), while 70.6% of the teeth with apical periodontitis (PAI 3, 4, 5) had inadequate coronal restoration (Table 5).

χ^2 test showed high association between healthy periodontal tissue and adequate restoration on one side and micro leakage of inadequate restoration and periapical changes ($P < 0.001$) (Table 5)

In regards to the symptoms, 24% of patients had persistence of the symptoms after the initial endodontic therapy, while the remaining 76% of cases were asymptomatic. Out of all asymptomatic patients 95% had some changes in the

periapical tissue. Fisher's exact test showed association between the presence of symptoms after initial treatments and teeth with periapical lesions ($P = 0.019$) (Table 6).

DISCUSSION

This clinical study was conducted with the aim to analyze the outcomes and causes of the failure of primary endodontic treatments and to facilitate planning for clinicians how to perform retreatment. All cases were selected from everyday clinical practice at the Clinic of Restorative Odontology and Endodontics, School of Dental Medicine, University of Belgrade. A single therapist carried out retreatments.

Consent to participate in the study was signed by 37 patients of both genders, aged 24 to 79 years. Based on the clinical and radiographic examination they required repeated endodontic therapy. The study did not include patients with general diseases and those taking antibiotics in the last 3 months, and teeth with extensive decay destruction or poor periodontal status.

Primary endodontic treatment was done in 2 cases within a year, in 17 cases (34.7%) 1-5 years before the diagnosis of failure of previous treatment, while in 30 teeth (61%) primary endodontic treatment was done more than 5 years ago. Endodontically treated teeth have long survival rate in general. In fact, over 60% of root canal treated teeth are functional for more than 5 years. Salehrabi and

Table 3. Quality of obturation of the primary endodontic treatment in relation to the state of periapical tissue as measured by PAI Index
Tabela 3. Kvalitet opturacije primarnog endodontskog tretmana u odnosu na stanje apeksnog parodonticijuma merenog PAI indeksom

P A I	N	%	Quality of obturation Kvalitet opturacije							
			Short filling Kratko punjenje		Missed canals Zaboravljeni kanali		Nonhomogeneous filling Nehomogeno punjenje		Separated instrument Zalomljen instrument	
			N	%	N	%	N	%	N	%
1	14	17.7	10	12.6	4	5.1				
2	14	17.7	10	12.6	4	5.1				
3	29	36.7	16	20.2	9	11.4	3	3.8	1	1.3
4	15	18.9	11	13.9	1	1.3	1	1.3	2	2.5
5	7	8.9	5	6.3	2	2.5				
Σ	79	100	52	65.8	20	25.3	4	5.1	3	3.8

Table 4. Quality of coronal restoration in relation to the state of periapical tissue as measured by PAI Index.

Tabela 4. Kvalitet restauracije u odnosu na stanje apeksnog parodonticijuma izraženo PAI indeksom

P A I	N	%	Quality of coronal restoration Kvalitet restauracije			
			Adequate Adekvatna		Inadequate Neadekvatna	
			N	%	N	%
1	14	17.7	12	15.2	2	2.5
2	14	17.7	9	11.4	5	6.3
3	29	36.7	9	11.4	20	25.3
4	15	18.9	3	3.8	12	15.2
5	7	8.9	3	3.8	4	5.1
Σ	79	100	36	45.6	43	54.4

Rotstein (2004) carried out an extensive epidemiological study in the United States on 1,462,936 teeth. After 8 years, 97% of teeth were still present in the oral cavity [4]. On the other hand, other epidemiological studies [27, 28, 29] in the recent years indicated that over 30% of endodontically treated teeth were diagnosed with chronic periapical lesions (apical periodontitis) or according to Friedman- "post-treatment endodontic disease" [1].

From a total of 79 teeth, 35% of the teeth had no visible signs of periapical bone destruction, while in 65% of teeth the presence of chronic periapical lesions was registered. PCR analysis of the samples taken from the root canals of these teeth after removing old canal filling identified microorganisms in all teeth that had changes

Table 5. Quality of coronal restoration in relation to the periapical tissue health**Tabela 5.** Kvalitet restauracije u odnosu na stanje zdravlja apeksnog parodonticijuma

State of periapical tissue Stanje parodonticijuma	Adequate coronal restoration Adekvatna restauracija		Inadequate coronal restoration Neadekvatna restauracija		Total Ukupno	
	N	%	N	%	N	%
Healthy parodontium Zdrav parodonticijum PAI 1, 2	21	75%	7	25%	28	100
Periapical lesions Periapikalne lezije PAI 3, 4, 5	15	29.4%	36	70.6%	51	100
Σ	36	45.5%	43	54.5%	79	100

Table 6. Presence of symptoms after the initial root canal treatment in relation to the state of periapical tissue as measured by PAI index**Tabela 6.** Prisustvo simptoma nakon primarnog endodontskog lečenja u odnosu na stanje apeksnog parodonticijuma mereno PAI indeksom

State of periapical tissue Stanje parodonticijuma	Existence of symptoms Prisustvo simptoma		Without symptoms Odsustvo simptoma		Total Ukupno
	N	%	N	%	
Healthy parodontium Zdrav parodonticijum PAI 1, 2	1	1.3%	27	34.2%	28
Periapical lesions Periapikalne lezije PAI 3, 4, 5	18	22.8%	33	41.7%	51
Σ	19	24%	60	76%	79

in the periapical tissues. The most frequently identified microorganism, *E. faecalis*, was detected in 94% of the root canals with chronic periapical lesions.

Only 24% of patients had clinical symptoms such as pain, swelling, the existence of a sinus tract, or sensitivity to percussion and pain on biting. Most prevalent symptoms were sensitivity to percussion (59%) as a sign of chronic inflammation of the periapical tissue, and pain (47% of cases) as a sign of acute exacerbation of chronic periapical lesion.

All 79 tooth treated in our study had inadequate obturation. Most frequently registered was short filling in 65% of cases, "forgotten canals" (25%), clinically non-homogeneous filling (5.1%) and the presence of fractured instruments in 3.8% of canals. Whether inadequately obturated root canal is going to cause the failure of endodontic treatment depends primarily on the presence of bacteria in the root canal. If the vital pulp was treated and coronal restoration properly sealed, impermeable to bacteria, changes in the periradicular tissue will most likely not occur. However, if the canal was infected, an empty space in the apical part of the root will probably cause persistent intraradicular infection or maintain periradicular inflammation after completion of endodontic therapy [8–15].

In addition to the length of the apical canal filling, density ie. hermetic canal filling is an important factor for successful endodontic treatment. Unfortunately, micro computed tomographic studies have shown that even the most modern materials and techniques of instrumentation and obturation are not able to obturate root canal non-porously or to be impermeable to bacteria. Hammad i al. (2009) and Zogheib et al. (2013) measured the volume percentage of voids and trapped air in the apical third of the root canal obturated with Thermafil technique (gutta-percha and Topseal) and RealSeal technique (Resilion and RealSeal 1). After scanning and measurement of the volume of voids and unfilled space in obturated root canals, with respect to their total volume, they came to the con-

clusion that no technique of obturation provides absolute hermetic sealing of the endodontic space. Furthermore, the difference in the percentage of empty space between the novel adhesive endodontic materials and gutta-percha as gold standard was not statistically significant [30, 31].

It is obvious that the quality of obturation affects the outcome of endodontic treatment but this is not the only prerequisite for success. In our study all patients with inadequate obturation were referred to endodontic re-treatment, even though 17.7% of teeth did not have any changes in the periapical tissues (PAI 1), while at 17.7% of teeth there was slightly enlarged periodontal membrane (which is not pathognomonic finding of apical periodontitis) (PAI 2). In these cases, the retreatment was needed due to prosthetic reconstruction (intraradicular post). Such teeth were adequately restored in 75% of cases (21 out of 28 teeth) that provided good coronal seal, reduced microleakage and prevented (re) infection of the root canal and periapical tissues. Only one tooth with healthy periapical tissue did not have an adequate restoration and showed signs of acute infection (not visible changes on the x ray). Ray and Trope demonstrated that defective coronal restoration and adequate obturation have higher percentage of failures compared to the teeth with appropriate crown restoration and inadequate obturation [23]. Only 9% of teeth with adequate coronal filling and root canal obturation showed failure, in contrast to the teeth where obturation and coronal restoration were defective where the ratio was 82%. Gillen et al. (2011) conducted a systematic review of available literature about the effect of coronal restoration and root canal obturation and concluded that success of endodontic treatment would be higher if both, endodontic treatment and coronal restoration were done properly [21].

Out of all teeth with changes in the periapical tissue, 84% had inadequate restoration, and 50% of them had symptoms indicating the importance of good marginal seal. Similar findings were reported by Liang et al. (2011)

who used periapical radiography and CBCT to analyze factors required for successful endodontic treatment. Two years after pulpectomy, periapical radiography showed the presence of periapical lesions in 12.6%, while CBCT detected two times more chronic periapical changes (25.9%). Interestingly, 80% of root canal fillings radiographically determined as “short”, on CBCT were up to the apical terminus. They also concluded that density and apical extension of the root canal obturation significantly affected the outcome of endodontic treatment as judged by periapical radiographs. By analyzing data obtained by CBCT, for the success of the root canal treatment critical factors were density of the root canal filling and the quality of the coronal restoration [22].

Teeth with healthy periodontal tissue were sent to endodontic retreatment due to radiographically inadequate obturation (part of the preparation for prosthodontic rehabilitation) or were detected as incidental finding. Dilemma of whether teeth with inadequate obturation, healthy periapical tissue and without clinical signs and symptoms, should be retreated, is always current among endodontists. If tooth has already adequate restoration, it can be monitored by regular check-ups. However, if the tooth is planned to support fixed prosthodontic construction, with intraradicular post, retreatment is strongly recommended [32]. Success of repeated endodontic treatment relies on: proper diagnosis of the endodontic failure (periapical radiography, CBCT), adequate desobturation and repeated cleaning and shaping of the canal (the expertise of the therapist, instruments and materials), high-quality three-dimensional hermetic obturation of the root canal system, and timely and adhesive restoration placement after retreatment is finished.

CONCLUSION

The outcome of the root canal treatment is significantly affected by the quality (density) of root canal obturation and the presence and good quality of the coronal restoration. Most teeth with healthy periodontal tissue at the time of diagnosis of the failure of primary endodontic treatment were adequately restored. However, most teeth with changes in the periapical tissue had inadequate coronal restoration. Teeth in patients who had symptoms mostly had visible changes in the periapical tissue.

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Uzroci neuspeha endodontskog lečenja zuba

Jelena Nešković, Milica Jovanović-Medojević, Slavoljub Živković

Univerzitet u Beogradu, Stomatološki fakultet, Klinika za bolesti zuba i endodonciju, Beograd, Srbija

KRATAK SADRŽAJ

Uvod Neuspehom endodontskog lečenja smatra se pojava radiografskog nalaza inflamatorne lezije, odnosno njeno perzistiranje ili uvećanje posle preduzete primarne endodontske terapije. Razlog za neuspeh mogu biti kompleksna anatomija kanalnog sistema, ali i brojni jatrogeni faktori.

Cilj ovog rada je bio da se kod zuba sa neuspelim endodontskim lečenjem klinički i radiografski analizira uzrok neuspeha primarnog endodontskog tretmana i procene mogućnosti za ponovni endodontski zahvat.

Metod rada U ovo istraživanje je uključeno 79 zuba (36 višekorenih i 43 jednokorena zuba) indikovanih za ponovljeni endodontski tretman. Na osnovu radiografske ocene stanja periapikalnih struktura zubi su podeljeni u dve grupe: prvu grupu su činili zubi bez periapikalnih promena, tj. sa zdravim parodontijumom (PAI skor 1 i 2) kod kojih je tretman bio neophodan iz protetskih razloga – zbog lošeg kvaliteta definitivne opturacije (28 zuba), a drugu zubi sa vidljivim znacima oštećenja apeksnog parodontijuma (PAI skor 3, 4 i 5) (51 zub). U obe grupe analiziran je kvalitet opturacije, kvalitet kruničnog zaptivanja i prisustvo ili odsustvo kliničkih simptoma.

Rezultati Najčešći radiografski nalazi kvaliteta definitivne opturacije kanala bili su: kratko punjenje (65,8% slučajeva), „zaboravljeni“ kanali (25,3%), klinički nehomogeno punjenje uz korektnu dužinu definitivnog punjenja (5,1%) i frakturiran instrument (3,8%). Nađena je statistički visoko značajna razlika između adekvatne restauracije i zdravog parodontijuma, odnosno pojave mikrocurenja zbog neadekvatne restauracije i periapikalnih promena ($p < 0,001$). Kod 95% pacijenata sa simptomima uočene su promene u apeksnom parodontijumu. Takođe, nađena je statistički značajna razlika u prisustvu simptoma nakon primarne endodontske terapije između zuba sa zdravim parodontijumom i zuba sa periapikalnim lezijama ($p = 0,019$).

Zaključak Na ishod endodontskog lečenja značajno utiču kvalitet (hermetičnost) opturacije kanala korena, odnosno prisustvo i kvalitet koronarne restauracije. Kod pacijenata sa simptomima uglavnom su postojale i promene u apeksnom parodontijumu nakon endodontskog lečenja.

Ključne reči: endodontski neuspeh; opturacija; restauracija

UVOD

Nakon adekvatno sprovedenog endodontskog tretmana očekuje se zarastanje, odnosno smanjenje ili iščezavanje postojećeg rasvetljenja iznad vrha korena na kontrolnim radiografijama. Međutim, postoje situacije kada koštana reparacija izostaje i ne dolazi do smanjenja periapikalnog rasvetljenja, pa se to često kvalifikuje kao endodontski neuspeh [1]. Stopa uspešnosti endodontske terapije kreće se od 53% do 97% [2–5]. Viši procenat ukazuje na to da je skoro svaki endodontski tretman uspešan, dok niža granica intervala sugerise da je svaki drugi neuspešan.

Uprkos nesumnjivoj učestalosti u svakodnevnoj kliničkoj praksi, među endodontistima još uvek ne postoji tačna definicija neuspeha endodontskog lečenja. Mnogi kliničari bi se složili da odsustvo bola i drugih kliničkih simptoma, odnosno očuvanost funkcije endodontski lečenog zuba, proglaše važnim parametrom uspeha endodontskog tretmana [6]. Neuspehom endodontskog lečenja se smatra postojanje radiografskog nalaza inflamatorne lezije u apeksnom parodontijumu koja ranije nije postojala, odnosno njeno perzistiranje ili uvećanje posle preduzete primarne endodontske terapije [6, 7].

Istraživanja ukazuju da su najčešći razlozi neuspeha: neadekvatna kontrola aseptičnih uslova rada [8–15], nedovoljno ekstenziran pristupni kavitet (koji onemogućava pronalaženje svih kanala pa pojedini ostaju „zaboravljeni“ i neobrađeni), neadekvatna instrumentacija kanala, komplikacije tokom endodontskog tretmana u vidu perforacije korena ili frakture kanalnih instrumenata [16], neadekvatna opturacija kanalnog sistema (nedovoljna apikalna ekstenzija punjenja, nehomogeno punjenje ili preekstendirano kanalno punjenje) [17–20], odnosno mikrocurenje privremenih ili definitivnih koronarnih restauracija [21, 22, 23].

Ponekad se neuspeh može javiti i onda kada je endodontska terapija korektno vođena i sve procedure potpuno ispoštovane. Razlog za to je kompleksna anatomija kanalnog sistema i brojne ramifikacije i anastomoze između glavnog i akcesornih kanala koje se ne mogu adekvatno obraditi niti opturirati postojećim instrumentima, materijalima i tehnikama. Neinstrumentirane regije endodontskog prostora mogu sadržati bakterije i nekrotično tkivo čak i onda kada se čini da je opturacija kanala radiografski korektna [12, 24].

I na kraju, postoje ekstraradikalni faktori izvan kanala korena, u okviru inflamiranog periapikalnog tkiva koji mogu negativno uticati na postoperativno zarastanje periapikalnih lezija. Asimptomatsko perzistiranje radiografskog rasvetljenja iznad vrha korena nakon adekvatno sprovedene endodontske terapije mogu uzrokovati: ekstraradikalna infekcija, prave ciste, strana tela, prisustvo kristala holesterola ili ožiljno zarastanje tkiva [25].

Cilj ovog rada je bio da se kod zuba sa neuspelim endodontskim lečenjem klinički i radiografski analizira uzrok neuspeha primarnog endodontskog tretmana i procene mogućnosti za ponovni endodontski zahvat.

METOD RADA

Studija je sprovedena na Klinici za bolesti zuba i endodonciju Stomatološkog fakulteta Univerziteta u Beogradu. Nakon što su upoznati sa ciljevima i očekivanim ishodima istraživanja, svi učesnici su potpisali pristanak da dobrovoljno učestvuju u istraživanju.

U ovo istraživanje je uključeno 67 pacijenata oba pola starosti od 24 do 79 godina, odnosno 79 zuba (36 višekorenih i 43 jednokorena zuba) indikovanih za ponovljeni endodontski

tretman. Kliničko ispitivanje je sprovedeno od strane jednog operatera, dok su radiografsku procenu ishoda lečenja tumačila dva istraživača.

Svih 79 zuba imalo je radiografski nalaz neadekvatne opturacije jer je to bio ključni kriterijum u oceni neuspeha endodontskog lečenja. S obzirom na to da su sve opturacije bile nezadovoljavajućeg nivoa, njihov kvalitet je ocenjen kao kratko punjenje (52 zuba), nehomogeno punjenje (četiri zuba), prisustvo „zaboravljenih“ kanala (20 zuba) i zalomljeni instrumenti (tri zuba) (Tabela 1). Kod 36 zuba uočena je adekvatna restauracija ili validna protetska nadoknada, pet zuba je bilo bez ispuna duži vremenski period, a kod 43 zuba je uočena neadekvatna restauracija.

Periapikalni status svakog zuba pre početka tretmana procenjen je radiografski pomoću PAI (periapikalni indeks) sistema za skoriranje na sledeći način [26]:

PAI 1 – normalne periapikalne strukture

PAI 2 – male promene u strukturi kosti koje nisu patognomonične za apikalni periodontitis

PAI 3 – promene u koštanoj strukturi sa dekalifikacijom karakterističnom za apikalni periodontitis

PAI 4 – periodontitis sa jasno definisanom zonom rasvetljenja

PAI 5 – uznapredovao periodontitis sa znacima egzacerbacije i ekspanzije kosti.

PAI skor je određen za svaki zub pojedinačno, a radiografski nalaz je analiziran na negatoskopu uz primenu uveličavajuće lupe. Višekoreni zubi su ocenjivani u skladu sa najvećim oštećenjem parodontalnih struktura na jednom od korenova.

Na osnovu radiografske ocene stanja periapikalnih struktura zubi su podeljeni u dve grupe. U prvu grupu su svrstani zubi bez periapikalnih promena, tj. sa zdravim parodontijumom (PAI skor 1 i 2), kod kojih je tretman bio neophodan iz protetskih razloga – zbog lošeg kvaliteta definitivne opturacije (28 zuba). Drugu grupu, koja je obuhvatila 51 zub, činili su zubi sa vidljivim znacima oštećenja apeksnog parodontijuma (PAI skor 3, 4 i 5).

Drugi parametar u analizi bio je postojanje kliničkih simptoma nakon inicijalnog tretmana. Prvu grupu su činili slučajevi bez kliničkih simptoma (dijagnoza postavljena slučajnim nalazom), a drugu slučajevi sa kliničkim simptomima u vidu bola, otoka, perkutorne osetljivosti, odnosno postojanja fistule (Tabela 2).

REZULTATI

Dobijeni rezultati prikazani su u tabelama 3–6 i slikama 1–4.

Parodontalna tkiva su notirana kao zdrava (PAI 1 i 2) u 35,4% slučajeva, dok su destruktivne promene u periradikularnim parodontalnim tkivima (PAI 3, 4 i 5) zabeležene u 64,6% slučajeva.

Najčešći radiografski nalaz kvaliteta definitivne opturacije kanala zatečen u momentu dijagnostikovanja neuspeha endodontskog lečenja bio je kratko punjenje, koje je zabeleženo u 65,8% slučajeva, a zatim slede „zaboravljeni“ kanali, koji su detektovani u 25,3% zuba. Klinički nehomogeno punjenje uz korektnu dužinu definitivnog punjenja nađeno je kod 5,1% zuba, dok je u 3,8% slučajeva na radiografiji uočen frakturirani instrument u kanalu korena (Tabela 3).

Kvalitet kruničnog zaptivanja, odnosno restauracije zuba u momentu dijagnoze neuspeha endodontskog lečenja je u 54,5%

slučajeva bio neadekvatan, dok su u 45,5% slučajeva krunični ispuni bili zadovoljavajućeg kvaliteta (Tabela 4). Većina zuba sa zdravim parodontijumom (PAI 1, 2) bila je adekvatno restaurirana (75%), dok je 70,6% zuba sa obolelim apeksnim parodontijumom (PAI 3, 4, 5) imalo neadekvatne krunične restauracije (Tabela 4).

U grupi zuba sa zdravim parodontalnim tkivima 75% zuba je imalo adekvatnu koronarnu restauraciju, dok kod 25% krunično rubno zatvaranje nije bilo zadovoljavajućeg kvaliteta. Kod zuba sa hroničnim promenama u apeksnom parodontijumu 70,6% koronarnih restauracija u momentu dijagnostikovanja neuspeha endodontske terapije nije bilo adekvatno, dok je krunično zaptivanje bilo zadovoljavajuće u 29,4% zuba sa HAP-om (Tabela 5).

Analizom kvaliteta kruničnog zaptivanja i pojave promena u apeksnom parodontijumu, χ^2 testom dobijena je statistički visoko značajna razlika između adekvatne restauracije i zdravog parodontijuma, odnosno pojave mikrocurenja zbog neadekvatne restauracije i periapikalnih promena ($p < 0,001$) (Tabela 5).

Kada se sumiraju podaci o pojavi simptoma kod ovih pacijenata, 24% pacijenata je imalo neki od simptoma zabeleženih nakon inicijalne endodontske terapije, dok je preostalih 76% slučajeva bilo asimptomatsko. Među pacijentima koji su imali simptome 95% njih je iz grupe zuba sa promenama u apeksnom parodontijumu. Fišerovim testom tačne verovatnoće dobijena je statistički značajna razlika u prisustvu simptoma nakon primarne endodontske terapije između zuba sa zdravim parodontijumom i zuba sa periapikalanim lezijama ($p = 0,019$) (Tabela 6).

DISKUSIJA

Ova klinička studija je sprovedena sa ciljem da se analizira ju ishod i uzroci neuspeha primarne endodontske terapije i kliničarima olakša planiranje u slučaju neuspeha inicijalnog endodontskog lečenja. Svi tretirani slučajevi su izdvojeni iz svakodnevne kliničke prakse Klinike za bolesti zuba Stomatološkog fakulteta Univerziteta u Beogradu. Ponovni tretman je realizovan od strane jednog terapeuta.

Pristanak da učestvuje u istraživanju potpisalo je 37 pacijenata oba pola, starosti od 24 do 79 godina, kod kojih je pažljivim kliničkim i radiografskim pregledom indikovana ponovljena endodontska terapija. Svi pacijenti kod kojih je bilo potrebe za sanacijom neuspele inicijalne endodontske terapije su klinički i radiografski ispitani kako bi se postavila dijagnoza i indikacija za konvencionalni tretman. U istraživanje nisu uključeni pacijenti sa opštim oboljenjima i oni koji su uzimali antibiotiku terapiju u poslednja tri meseca, kao i zubi sa ekstenzivnim karijesnim destrukcijama ili lošim parodontalnim nalazom.

Primarna endodontska terapija je u dva slučaja sprovedena pre manje od godinu dana, u 17 slučajeva (34,7%) od jedne do pet godina pre dijagnoze neuspeha prethodnog lečenja, dok je kod 30 zuba (61%) primarno endodontsko lečenje urađeno pre više od pet godina. Sa aspekta opstanka zuba u usnoj duplji u funkciji vremena, primarna endodontska terapija se može smatrati dugoročno veoma uspešnom. Naime, preko 60% endodontski lečenih zuba opstalo je u stomatognatnom sistemu vršeći svoju ulogu u mastikaciji duže od pet godina. Salehrabi i Rotstein su 2004. godine sprovedi obimnu epidemiološku studiju u Sjedinjenim državama na 1.462.936 zuba. Nakon osam godina 97% njih je još uvek bilo prisutno u usnoj duplji [4]. S druge

strane, druge epidemiološke studije poslednjih godina (*Boucher* i sar. 2002. godine u Francuskoj [27]; *Duglas* i sar. 2003. godine u Kanadi [28]; *Farzenah* i sar. 2004. godine u Torontu [29]) ukazuju da preko 30% endodontski tretiranih zuba pokazuje postojanje hronične periapikalne lezije (apikalnog periodontitisa) ili, po *Friedmanu*, „post-treatment endodontic disease“ [1].

Od ukupno 79 zuba, 35% zuba nije imalo vidljive znake destrukcije periapikalne kosti, dok je kod 65% zuba registrovano prisustvo hronične periapikalne lezije. PCR analizom uzoraka uzetih iz kanala korena ovih zuba identifikovani su mikroorganizmi u svim uzorcima iz zuba sa promenama u periapikalnim tkivima. Najčešće identifikovani mikroorganizam bio je *E. Faecalis*, detektovan u 94% kanala korena zuba sa hroničnim periapikalnim lezijama.

Ukoliko bi se kao kriterijum (ne)uspeha primarnog endodontskog tretmana uzela pojava kliničkih simptoma u vidu bola, otoka, postojanja fistule, perkutorne osetljivosti ili bolova na zagrižaj, onda bi to obuhvatilo svega 24% pacijenata. Najčešći simptomi su bili osetljivost na perkusiju (59% simptomatskih slučajeva), kao znak hroničnog zapaljenja periodontalnog ligamenta u apikalnoj regiji, i bol (47% slučajeva), kao znak akutne egzacerbacije hronične periapikalne lezije.

Kada je u pitanju kvalitet opturacije kao faktor uspeha endodontske terapije, kod 79 zuba obrađenih u ovom istraživanju registrovani su neadekvatna opturacija u vidu kratkog punjenja kod 65% zuba, „zaboravljeni kanali“ (25% kanala), klinički nehomogeno punjenje (5,1%) i prisustvo frakturiranog instrumenta (3,8% kanala). Da li nedovoljno napunjen kanal vodi u neuspeh endodontske terapije pre svega zavisi od dijagnoze, odnosno prisustva bakterija u kanalu korena. Ukoliko je endodontski tretman sproveden na vitalnoj pulpi, uz dobru koronarnu restauraciju, nepropusnu za bakterije, do promena u periradikularnim tkivima neće doći. Međutim, kada je u pitanju inficiran kanal korena, prazan prostor u apikalnom delu korena zuba podrazumeva perzistiranje intrakanalne infekcije, odnosno održavanje periradikularne inflamacije nakon završene endodontske terapije [8–15].

Osim apikalne ekstenzije kanalnog punjenja, važan faktor uspeha preduzete endodontske terapije je i gustina, tj. hermetičnost kanalnog punjenja. Nažalost, mikrokompjuterizovane tomografske studije su pokazale da ni najsavremeniji materijali i tehnike instrumentacije i opturacije nisu u mogućnosti da kanal neporozno, odnosno nepropusno za bakterije opturiraju. *Ham-mad* i sar. 2009. godine [30], a *Zogheib* i sar. 2013. godine merili su zapreminski procenat praznina i zarobljenog vazduha u apikalnoj trećini kanala korena opturiranih tehnikom Termafil (gutaperka i Topseal) i tehnikom opturacije RealSeal (Resilion i RealSeal 1). Nakon skeniranja i merenja zapremine praznina i zjapova u opturiranim kanalima u odnosu na njihovu ukupnu zapreminu došli su do zaključka da nijedna tehnika opturacije ne omogućava apsolutno hermetičko zaptivanje endodontskog prostora, a da razlika u procentu praznih prostora između novih adhezivnih endodontskih materijala i zlatnog standarda gutaperke nije statistički značajna [31].

Očigledno je da kvalitet opturacije utiče na ishod endodontske terapije, ali da to nije jedini preduslov za uspeh. U ovom istraživanju svi pacijenti sa neadekvatnom opturacijom su upućeni na ponovni endodontski tretman, iako 17,7% (14 zuba) nije imalo promene u periapikalnim tkivima (PAI 1), dok je kod 17,7% (14 zuba) postojala neznatno proširena periodontalna membrana

(čiji nalaz nije patognomoničan za apikalni periodontitis) (PAI 2). U takvim slučajevima je retreatman bio uslovljen potrebom daljeg protetskog zbrinjavanja (kanalnom nadogradnjom) i protetskom nadoknadom, koji onemogućavaju konzervativni retreatman ukoliko se naknadno ukaže potreba za tim. Takvi zubi su bili adekvatno restaurisani u 75% slučajeva (21 od 28 zuba). Na taj način je postignuto dobro krunično zaptivanje, koje je maksimalno redukovalo mikrocurenje i na taj način preveniralo (re) infekciju kanala korena i periapeksnih tkiva. Samo jedan zub sa zdravim parodontcijumom nije imao adekvatan ispun i pokazivao je znake akutne infekcije (koja se na radiografiji nije mogla uočiti). *Ray* i *Trope* [23] pokazali su da defektne restauracije i adekvatna kanalna punjenja imaju veći procenat neuspeha u odnosu na zube sa adekvatnim koronarnim restauracijama i neadekvatnim kanalnim punjenjima. Zubi kod kojih su i ispun i opturacija kanala bili adekvatni ukazali su na samo 9% neuspeha za razliku od zuba kod kojih su i punjenje i restauracija bili defektni, gde je taj procenat iznosio čak 82%. *Gillen* i sar. su 2011. godine sprovedli sistematski pregled dostupne literature na temu uticaja kvaliteta koronarne restauracije i kvaliteta kanalnog punjenja korena endodontski lečenih zuba i metaanalizom podataka došli do zaključka da izgledi za uspeh endodontske terapije rastu ukoliko su i endodontski tretman i krunična restauracija sprovedeni adekvatno, a da kvalitet opturacije kanala i krunične restauracije imaju jednak uticaj na izlečenje [21].

Među zubima sa promenama u apeksnom parodontcijumu bilo je 84% neadekvatnih restauracija, od čega je 50% imalo izraženu simptomatologiju, što takođe ukazuje na značaj dobrog rubnog zatvaranja. Do sličnog zaključka su došli i *Liang*, *Wesselink* i sar., koji su 2011. godine sprovedli radiografsku studiju o preduslovima uspeha poredeći faktore koji se mogu registrovati retroalveolarnom radiografijom i CBCT-om. Na kontrolnom pregledu nakon dve godine od biopulpektomije, retroalveolarnom radiografijom je registrovana pojava periapikalnih lezija u 12,6%, dok je CBCT-om detektovano duplo više hroničnih periapikalnih promena (25,9%). Zanimljivo je da 80% punjenja koja su radiografski proglašena „kratkim“, na CBCT-u su bila do apeksnog terminusa. Zaključili su da gustina i apikalna ekstenzija punjenja na retroalveolarnim radiografijama značajno utiču na ishod endodontske terapije. Analizom podataka dobijenih CBCT-om, za uspeh endodontskog tretmana kao presudni faktori su označeni gustina kanalnog punjenja i kvalitet koronarne restauracije [22].

Grupa zuba sa zdravim parodontcijumom obuhvatila je pacijente koji su poslani na ponovni endodontski tretman zbog radiografski neadekvatne opturacije (a u okviru preprotetske pripreme) ili je neuspeh otkriven slučajnim nalazom. Dilema da li zube sa neadekvatnom opturacijom a zdravim parodontcijumom i bez kliničkih znakova i simptoma treba retreatirati uvek je aktuelna među endodontistima. Ukoliko zub neće biti deo protetskog rada, može se pratiti redovnim kontrolama, ali ukoliko se planira da zub bude nosač fiksne nadoknade sa intrakanalnom nadogradnjom, svakako treba pokušati „uraditi bolje“ [32]. Osnovni preduslovi za uspešnost endodontskog tretmana u ponovljenom zahvatu vezani su za pravilnu dijagnozu endodontskog neuspeha (Rtg, CBCT), adekvatnu dezopturaciju i preparaciju u ponovnom čišćenju i oblikovanju kanala (stručnost terapeuta, instrumentarijum, materijali), odnosno kvalitetnu trodimenzionalnu hermetičnu opturaciju kanalskog sistema i kvalitetnu, pravovremenu i adhezivnu restauraciju endodontski lečenog zuba u ponovljenom tretmanu.

ZAKLJUČAK

Na ishod endodontskog lečenja značajno utiču kvalitet (hermetičnost) opturacije kanala korena, prisustvo i kvalitet koronarne restauracije. Većina zuba sa zdravim parodontcijumom, u momentu postavljanja dijagnoze neuspeha primarnog endo-

dontskog lečenja bila je adekvatno restaurirana, dok je većina zuba sa obolelim apeksnim parodontcijumom imala neadekvatne krunične restauracije. Kod pacijenata sa simptomima uglavnom su postojale promene u apeksnom parodontcijumu endodontski lečenih zuba.

Dental anxiety and the status of first permanent molars in 11 and 15 years old children

Milka Kapuran¹, Svetlana Janković², Bojana Davidović², Jelena Lečić²

¹Primary Health Care Center Rogatica, Rogatica, Republika Srpska, Bosnia and Herzegovina;

²University of East Sarajevo, Faculty of Medicine, Section of Dentistry, Department of Preventive Dentistry and Orthodontics, Foča, Republika Srpska, Bosnia and Herzegovina

SUMMARY

Introduction Fear of dental procedures is one of the main reasons for oral health neglect. The first permanent molars are functionally very important. Dental anxiety may compromise their health as well as the health of all other teeth. The aim of the study was to determine dental anxiety level and the status of first permanent molars in healthy school aged children.

Methods This study included 105 students, 11 and 15 years of age, from two elementary schools in Foca (Bosnia and Herzegovina). Dental Anxiety Scale (DAS), questionnaire was used to determine the level of dental fear in patients. The status of first permanent molars was recorded using Klein-Palmer DMFT (decayed, missing, filling teeth) system. The number of healthy first permanent molars (with or without sealant) was registered as well.

Results More than one third of respondents involved in this study (33.3%), suffered from severe dental anxiety (DAS = 13–20 points). Statistically significant difference in answers to questions was not observed between respondents of different age but higher level of the fear was registered in girls compared to boys ($p < 0.05$). Less than 50% of all examined first permanent molars were healthy and sealed fissures were recorded in 9.4% of them. The percentage of decayed molars was about 11%, 7% extracted and 35% filled.

Conclusion Application of prophylactic measures is beneficial for dental health preservation. They are pain free and can be used to minimize fear by establishing dentist-patient relationship based on confidence.

Keywords: dental anxiety; the fear; the first permanent molar; oral health; decay

INTRODUCTION

In the era of modern dentistry when dental procedures are completely painless, a fear of dentist still exist in children and adults. This fear is one of the main reasons for oral health care neglect. Under the concept “fear of dentist,” it is possible to distinguish dental anxiety, dental fear and dental phobia [1].

Dental anxiety is the mildest form of fear of dentist, and is characterized by patients’ excitation and a sense of control loss [2]. Dental fear presents an active response to a known danger, that is object or situation, and occurs in people who have already had unpleasant dental experience and expect that this will inevitably happen again [3]. Dental phobia is the most intensive fear of dentist and presents narrowly defined diagnosis made by psychologists and psychiatrists. This mental disorder is characterized by a pronounced fear or avoidance of a particular object or situation that significantly interfere with the function or causes considerable emotional stress of a patient [3, 4]. Fear of dental procedures can cause serious health problems, as avoiding dental visits may lead to complications of diseased oral tissues [5]. Fear of dental intervention

is in high fourth rank in relation to other situations that cause fear. It can be the cause of so-called vicious circle, when dental fear leads to dental visits delay, which may further increase present difficulties and already present fear [6]. Otherwise, fear is a subjective category that is not comparable between the two persons. Clinically, it is manifested by dilated pupils, dry mouth, rapid breathing, tachycardia, excessive sweating, cold hands. All of these clinical signs are result of increased adrenocortical hormone - adrenaline, and clinical picture is dominated by the effect of the sympathetic nervous system [7].

The first permanent molars are, in most cases, the first permanent teeth that erupt in children [8]. These functionally important teeth in humans are significant indicators of permanent teeth caries presence as well as preventive prophylactic and therapeutic measures applied [9]. Therefore, the status of first permanent molar health to some extent may be an indirect indicator of dental fear in patients.

The aim of the study was to determine dental anxiety level and the status of first permanent molars in healthy school aged children.

MATERIALS AND METHODS

The study involved pupils from two elementary schools in Foca (Bosnia and Herzegovina), aged 11 and 15 years. Parents of the respondents were informed in details about the nature and the course of the study and gave consent for the inclusion of their children in the study. This study was conducted according to the recommendations of the Helsinki Declaration and the principles of Good Clinical Practice.

Dental Anxiety Scale (DAS) questionnaire was used for to assess the level of fear in patients. The questionnaire was prepared according to the *Corah's Dental Anxiety Scale* that was published in 1969 and considered to be valuable and reliable indicator in clinical trials [10]. The questionnaire consists of four questions about the situations related to dental treatment and every question has 5 answers. The answers were scored according to the five-point Likert scale (a = 1, b = 2, c = 3, d = 4 and e = 5), and the level of anxiety was calculated from the sum of points:

- Between 4–8 – no anxiety
- Between 9–12 – moderate anxiety
- Between 13–14 – high anxiety
- Between 15–20 – severe anxiety

Clinical examination was performed in all subjects. Dental examinations were performed in schools using standard dental instruments, dental explorer and mirror. The status of first permanent molars was recorded using Klein-Palmer DMFT (decayed, missing, filling teeth) system [11]. Also, the number of healthy first permanent molars (with or without sealant) was recorded, while other permanent teeth were not taken into consideration.

Data were presented by standard methods of descriptive statistics (percentage, mean (X), standard deviation (SD)). Differences between groups were tested using *Mann-Whitney U-test* and *t-test*. *SPSS 11.5* for Windows Statistical Program was used for data analysis.

RESULTS

The study involved 105 subjects: 52 girls (49.4%) and 53 boys and (50.5%). The average age of female respondents was 13 ± 1.4 and 13 ± 1.8 for male subjects. The distribution of subjects by gender, age and the frequency of dental visits is presented in Table 1.

More than one third of involved respondents (33.3%, DAS = 13–20 points) had high and severe level of dental anxiety. In almost 40% of respondents fear of dental procedures was not found (DAS = 4–8 points). No statistically significant differences in answers to questions were observed between respondents of different age but higher value of the fear was present in girls (21.9%, DAS = 13–20 points) than boys (11.4%, DAS = 13–20 points). This difference was statistically significant ($p < 0.05$). Table 2 shows detailed relationship between anxiety of dental procedures and behavior of subjects given by the *Corah's Dental Anxiety Scale* questionnaire.

More than 40% of children go to regular dental check-ups several times a year. On the other hand, about 5% of children visited a dentist only once in several years.

Table 1. Distribution of patients by gender, age and frequency of dental visits

Tabela 1. Raspodjela ispitanika prema polu, uzrastu, kao i učestalosti poseta stomatologu

	n	(%)
Gender		
Pol pacijenta		
Male/Muški	53	(50.5)
Female/Ženski	52	(49.5)
Total/Ukupno	105	(100.0)
Patient's age		
Uzrast pacijenta		
11 years / godina	51	(48.5)
15 years / godina	54	(51.4)
Total / Ukupno	105	(100.0)
The frequency of dental visits		
Učestalost poseta stomatologu		
Once a year / Jedanput godišnje	23	(21.9)
Twice a year / Dvapat godišnje	32	(30.4)
Several times a year / Nekoliko puta godišnje	45	(42.8)
Once in several years / Jednom u nekoliko godina	5	(4.8)
Total/Ukupno	105	(100.0)
Last visit to the dentist for check-up		
Poslednja poseta stomatologu zbog kontrolnog pregleda		
In the last 30 days / U poslednjih mesec dana	27	(25.7)
In the last 6 months / U poslednjih šest meseci	44	(41.2)
U poslednjih godinu dana / In a last year	30	(28.5)
In the last several years / U poslednjih nekoliko godina	4	(3.9)
Never/Nikad	0	0.0
Total/Ukupno	105	(100.0)

Table 2. Dental anxiety in relation to sex and age at Corah's total score

Tabela 2. Dentalna anksioznost u odnosu na pol i uzrast po Corah's Dental Anxiety Scale

(DAS)/ Norman Corah's scale	Child age Uzrast		Gender Pol		Total Ukupno n (%)
	11 n (%)	15 n (%)	Male Muški n (%)	Female Ženski n (%)	
4–8 No anxiety Nema strah	20 (19.0)	21 (20.0)	24 (22.8)	17 (16.2)	41 (39.0)
9–12 Moderate anxiety Umereni strah	13 (12.4)	16 (15.2)	17 (16.2)	12 (11.4)	29 (27.6)
13–14 High anxiety Izražen strah	12 (11.4)	10 (9.5)	8 (7.6)*	14 (13.3)*	22 (20.9)
15–20 Severe anxiety Veoma izražen strah	6 (5.7)	7 (6.7)	4 (3.8)*	9 (8.6)*	13 (12.4)
X ² P value P vrednost			*p < 0.05		

However, children who visited dentist once a year or less experienced high degree of dental anxiety as confirmed by statistically significant difference ($p < 0.05$) compared to the children without fear who practice regular dental visits.

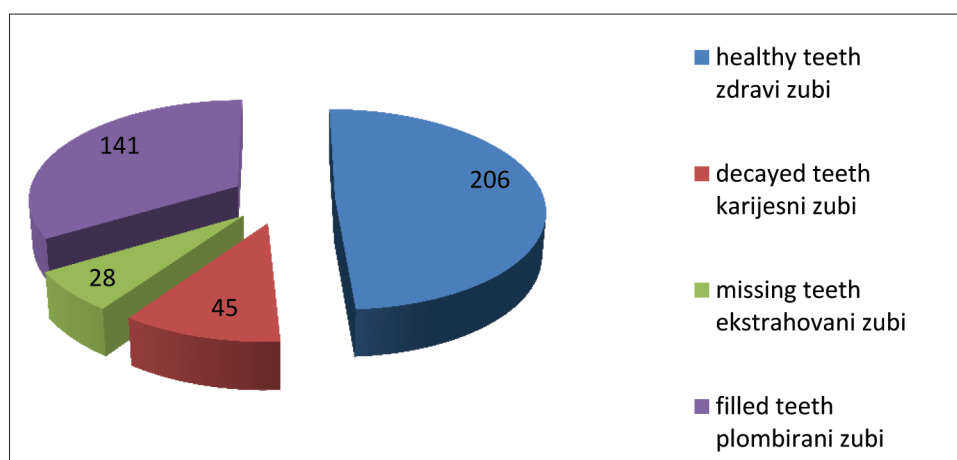


Figure 1. Total number of healthy, decayed, missing and filled teeth
Slika 1. Ukupan broj zdravih, karijskih, ekstrahovanih i plombiranih zuba

Less than 50% of the first permanent molars were completely healthy in both age groups. Percentage of sealed fissures in healthy first permanent molars was 9.4%, the percentage of decayed molars was almost 11%, extracted almost 7%, while the percentage of filled was around 35% (Graph 1). 34 children had all four first permanent molars completely healthy, while in 4 children all four molars have already been extracted. The most frequently extracted tooth was lower right first molar. Eleven years old children had more healthy first permanent molars compared to fifteen years olds, however, the difference between the groups was not statistically significant. Also, boys had higher number of healthy molars, as well as higher percentage of filled teeth compared to girls, but the difference was not statistically significant.

DISCUSSION

The results of the current study indicate the presence of high level of dental anxiety and high prevalence of first permanent molars decay. Therefore, the fear of dental procedures is an important problem in everyday practice, not only in pediatric dentistry but in other fields of dentistry as well. Studies that have investigated this issue indicate that dental anxiety is present at all ages and is not related to gender [12–15].

No anxiety was found in 39% of subjects of this study, moderate anxiety was identified in 27.6% of subjects while high and severe anxiety were registered in more than one third of subjects (33.2%). These results are comparable to similar studies. The study done by Alak et al. (2012) indicated 34% of children, 11 to 15 years of age, had high and severe dental anxiety while 32.4% children showed no fear [12]. For adult subjects, studies showed high and severe dental anxiety present in almost 30% of participants aged 18–82 years while 34.6% of subjects showed no dental anxiety [14].

Dental fear negatively impacts both patients and dentists. It can be avoided or minimized by establishing good dentist-patient relationship based on confidence or by implementation of good introduction about upcoming

dental intervention [16]. Also, in the age of information systems, patient frequently firstly consults newspapers and Internet what could also result in additional negative outcomes due to incorrect information [17]. It is therefore necessary for a dentist to provide proper information, attract sympathy of patients and gain their trust.

Respondents included in the current study were eleven and fifteen years of age, a period of intense shifts of deciduous and permanent teeth, as well as completion of permanent dentition. Dental anxiety was equally present among the respondents. The frequency of dental visits was significantly lower in anxious patients. It has been proven that children who go to the dentist once a year or less, have higher dental anxiety level than those who visit dentists twice a year. The results also showed higher prevalence of dental anxiety in girls and that is in accordance with other studies that also reported women experience greater fear of dental procedures [12,18]. This can be explained by the fact that females are more prone to having higher levels of neuroticism as well, and anxiety is positively associated with neuroticism [19].

Time spent in the waiting room proportionally increases the level of anxiety. Despite relatively frequent occurrence of dental anxiety, dentists often do not have enough understanding and knowledge about the psychological approach to such persons [17]. However, due to increasingly serious legislation treatment of this phenomenon, and the threat of lawsuits, it is necessary to develop special techniques of communication [17]. According to Hmudu (2009) there are four different fear triggers that patients respond to differently, and can be displayed as a "Rule 4 S" [20]:

- *Sights* – visual experience (needles, drills)
- *Sounds* – sounds (slow speed handpiece, high speed handpiece)
- *Sensations* – feelings (vibrations)
- *Smells* – odors (different dental materials)

The results of our study indicated that more than half of all examined first permanent molars had some of DMFT components. Percentage of teeth with sealed fissures (9.4%) was relatively small, and that is one of the fear parameters as fissures sealing process is fast, easy, completely painless and therefore suitable for massive ap-

plication and fear elimination. Our study also indicated the prevalence of first permanent molars decay increased with age of respondents as previously indicated by other authors [21, 22]. Also, due to strong prevention programs, there has been a constant decline in permanent teeth decay prevalence in developed countries [9]. However, in our region, the percentage of extracted first permanent molars continuously increases with the age of respondents. Out of the total number of inspected teeth in this study, about 7% of them have already been extracted, which is devastating fact as the first permanent molar has very important functional significance [8] and its extraction may have many negative consequences [22]. The prevalence of tooth decay in all ages was higher in girls, but without significant difference in comparison to boys.

Some studies showed that socio-economic status and education level might impact the prevalence of dental anxiety in the population [6, 23]. The highest levels of anxiety are registered in adolescents, which are mainly resulted by their own bad childhood experiences or negative experiences of parents or friends [17]. Studies have shown that the average age of about 40 years, both for women and men, is when fear reduction begins. This can be explained by increased tolerance, due to more frequent and prolonged exposure to stressful situations as well as life experiences that shape behavioral characteristics of individuals [18]. Anxious patients require special attention, and DAS questionnaire can be used in dental practise as guidance in decision-making whether a dental treatment requires specific techniques such as sedation or even general anesthesia.

CONCLUSION

Dental anxiety is important reason for dental visits avoidance. It can certainly contribute to poor oral health as well as development of dental complications. Almost every third child from this study experienced noticeable dental anxiety. School age life period is most critical but also the most important for application of preventive and prophylactic measures and procedures that aim oral health preservation. The most efficient prophylactic measure for reduction of tooth decay is fissure sealant application.

Fissure sealant application is completely pain free procedure that can be used as a way to release or reduce fear in patients. Dental anxiety awareness of dentists is also essential for good communication establishment and proper approach to patient in everyday practice.

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Strah od stomatološkog lečenja i zdravlje prvih stalnih molara kod dece uzrasta 11 i 15 godina

Milka Kapuran¹, Svjetlana Janković², Bojana Davidović², Jelena Lečić²

¹Dom zdravlja Rogatica, Rogatica, Republika Srpska, Bosna i Hercegovina;

²Univerzitet u Istočnom Sarajevu, Medicinski fakultet, Odsek Stomatologija, Katedra za dečju i preventivnu stomatologiju sa ortodontijom, Foča, Republika Srpska, Bosna i Hercegovina

KRATAK SADRŽAJ

Uvod Strah od stomatoloških intervencija predstavlja jedan od osnovnih razloga zbog kojeg se zanemaruje briga o oralnom zdravlju. Prvi stalni molari su funkcionalno veoma značajni zubi, a dentalna anksioznost može doprineti da se ugrozi zdravlje kako ovih tako i svih zuba.

Cilj ovog rada je bio da se utvrdi nivo dentalne anksioznosti i stanje zdravlja prvih stalnih molara kod dece školskog uzrasta.

Metode rada Istraživanjem je obuhvaćeno 105 učenika iz dve osnovne škole u Foči (Bosna i Hercegovina), uzrasta 11 i 15 godina. Za procenu nivoa straha kod pacijenata korišćen je upitnik *Dental Anxiety Scale* (DAS). Stanje zdravlja prvih stalnih molara ocenjeno je pomoću *Klajn–Palmerovog* KEP (karijes, ekstrakcija, plomba) sistema, a registrovani su i zdravi i zaliveni prvi stalni molari.

Rezultati Više od trećine ispitanika koji su uključeni u studiju (33,3%) pati od visoke i veoma visoke stomatološke anksioznosti (DAS = 13–20 poena). Nema statistički značajne razlike u odgovorima na pitanja vezanim za uzrast ispitanika, ali su devojčice osećale veći strah u poređenju sa dečacima ($p < 0,05$). Manje od 50% svih pregledanih prvih stalnih molara je bilo potpuno zdravo, a zalivene fisure su registrovane kod 9,4% pregledanih molara. Procenat karioznih molara u ovom istraživanju je bio oko 11%, ekstrahovanih skoro 7%, dok je oko 35% bilo plombiranih.

Zaključak Primena profilaktičkih mera predstavlja dobar način zaštite zdravlja zuba. Njihova primena je potpuno bezbolna i može poslužiti kao način za oslobađanje straha od stomatoloških intervencija i sticanje odnosa poverenja između lekara i pacijenata.

Ključne reči: dentalna anksioznost; prvi stalni molar; zdravlje; karijes

UVOD

U eri savremene stomatologije, kada su stomatološki zahvati potpuno bezbolni, i dalje je kod dece, ali i odraslih osoba, prisutan strah od stomatologa. Upravo taj strah predstavlja jedan od osnovnih razloga zbog kojeg se zanemaruje briga o oralnom zdravlju. Pod pojmom *strah od stomatologa* moguće je razlikovati dentalnu anksioznost, dentalni strah i dentalnu fobiju [1].

Dentalna anksioznost je najblaži oblik straha od stomatologa, a karakteriše je uzbuđenje pacijenata i osećaj gubitka kontrole [2]. Dentalni strah predstavlja aktivan odgovor na poznatu opasnost, tj. objekat ili situaciju, jer se javlja kod osoba koje su već imale loša stomatološka iskustva i očekuju da se to neminovno ponovi [3]. Dentalna fobija je najintenzivniji oblik straha od stomatologa i predstavlja usku definisanu dijagnozu od strane odgovarajućih psihologa i psihijatra. Ovaj mentalni poremećaj karakteriše izražen strah ili izbegavanje određenog objekta ili situacije koja značajno ometa funkciju pacijenta ili uzrokuje znatan emotivni stres [3, 4]. Strah od stomatoloških zahvata može biti uzrok teških zdravstvenih problema, jer izbegavanje poseta stomatologu neminovno vodi do komplikacija u terapiji obolelih oralnih tkiva [5]. Strah od stomatološke intervencije je na visokom četvrtom mestu po rangu u odnosu na ostale situacije koje izazivaju strah. Može biti uzrok takozvanog začaranog kruga prema kome prisutna odontofobija dovodi do odlaganja odlaska u stomatološku ordinaciju, što povećava prisutne tegobe, a što propratno povećava već prisutni novi strah [6]. Inače, strah je subjektivna kategorija koja ne podleže komparaciji između dve osobe. Klinički se manifestuje proširenim zenicama, suvoćom usana, ubrzanim disanjem, tahikardijom, pojačanim znojenjem, hladnim rukama. Svi ovi klinički znaci su posledica pojačanog lučenja hormona kore nadbubrežne žlezde – adrenalina, tako da kliničkom slikom dominira efekat simpatičkog nervnog sistema [7].

Prvi stalni molari su najčešće prvi stalni zubi koji niču u ustima deteta [8]. Ovi funkcionalno značajni zubi čoveka predstavljaju i veoma značajne indikatore za pojavu karijesa stalnih zuba, odnosno značajne pokazatelje uspešnosti primene preventivno-profilaktičkih i terapijskih mera [9]. Samim tim i stanje zdravlja prvog stalnog molara u određenoj meri može biti i indirektni pokazatelj prisutnog straha od stomatološkog lečenja kod pacijenata.

Cilj ovog rada je bio da se utvrdi nivo dentalne anksioznosti i stanje zdravlja prvih stalnih molara kod dece školskog uzrasta.

METODE

Istraživanjem su obuhvaćeni učenici dve osnovne škole u Foči (Bosna i Hercegovina), uzrasta 11 i 15 godina. Roditelji ispitanika su bili detaljno informisani o prirodi i toku istraživanja i dali su svoj pristanak za uključivanje dece u studiju. Istraživanje je obavljeno prema preporukama Helsinške deklaracije i principima Dobre kliničke prakse.

Za procenu nivoa straha kod pacijenata korišćen je upitnik *Dental Anxiety Scale* (DAS). Upitnik je bio pripremljen prema uzoru na *Corah's Dental Anxiety Scale*, koji je objavljen 1969. godine i koji se smatra vrednim i pouzdanim pokazateljem u kliničkim istraživanjima [10]. Upitnik se sastoji od četiri pitanja koja se odnose na situacije vezane za stomatološki tretman, a svako pitanje ima pet odgovora. Odgovori su bodovani prema petostepenoj Likertovoj skali ($a = 1, b = 2, c = 3, d = 4$ i $e = 5$), a stepen anksioznosti je izračunavan na osnovu zbira bodova:

- 4–8 – nema anksioznosti
- 9–12 – postoji umerena anksioznost
- 13–14 – postoji visoki stepen anksioznosti
- 15–20 – postoji veoma visok stepen anksioznosti

Kod svih ispitanika je urađen klinički stomatološki pregled. Pregledi su obavljani u školama uz pomoć standardnih stomatoloških instrumenata, sonde i ogledalca. Stanje zdravlja prvih stalnih molara registrovano je upotrebom Klajn–Palmerovog KEP (karijes, ekstrakcija, plomba) sistema [11]. Takođe su registrovani i zdravi prvi stalni molari (sa zalivačima i bez njih), dok ostali stalni zubi nisu uzimani u obzir.

Podaci su prikazani standardnim metodama deskriptivne statistike (procentualna zastupljenost, srednja vrednost (X), standardna devijacija (SD)). Za testiranje razlika između dve grupe korišćen je *Mann–Whitney* U-test i t-test. Za analizu podataka korišćen je *SPSS 11.5 za Windows*, a dobijeni rezultati prikazani su tabelarno i grafički.

REZULTATI

U istraživanju je učestovalo ukupno 105 ispitanika: 52 devojčice (49,4%) i 53 dečaka (50,5%). Prosečna starost ispitanika ženskog pola je $13 \pm 1,4$, a ispitanika muškog pola $13 \pm 1,8$. Raspodela ispitanika prema polu, uzrastu, kao i učestalosti poseta stomatologu prikazana je u Tabeli 1.

Rezultati ovog istraživanja pokazuju da više od trećine ispitanika koji su uključeni u studiju (33,3%, DAS = 13–20 poena) ima visok stepen i veoma visok stepen stomatološke anksioznosti. Kod skoro 40% ispitanika je utvrđeno da ne postoji strah od stomatoloških intervencija (DAS = 4–8 poena). Nije bilo statistički značajne razlike u odgovorima na pitanja između testiranih uzrasta ispitanika, ali su devojčice osećale veći strah (21,9%, DAS = 13–20 poena) u poređenju sa dečacima (11,4%, DAS = 13–20 poena). Ova razlika je bila statistički značajna ($p < 0,05$). Tabela 2 pokazuje detaljniju povezanost između straha od stomatoloških intervencija i ponašanja ispitanika koja je data u Korahovoj skali, tj. upitniku.

Rezultati ukazuju da više od 40% dece odlazi na redovne stomatološke preglede nekoliko puta godišnje. Međutim, treba napomenuti da je u ovom uzrastu oko 5% dece posetilo stomatologa samo jednom tokom nekoliko godina. Analiza rezultata je takođe pokazala da deca koja kod stomatologa odlaze jednom godišnje ili ređe imaju visok stepen anksioznosti, što je potvrdila statistički značajna razlika u odnosu na decu koja se ne plaše i idu na redovne kontrole ($p < 0,05$).

Rezultati pokazuju da je nešto manje od 50% prvih stalnih molara bilo potpuno zdravo u oba uzrasta. Na zdravim molarima procenat zalivenih fisura je iznosio 9,4, procenat karioznih molara skoro 11, ekstrahovanih oko 7, dok je procenat plombiranih bio oko 35 (Grafikon 1). U ovom istraživanju 34 dece je imalo sva četiri prva stalna molara potpuno zdrava, dok su kod četiri deteta sva četiri molara bila ekstrahovana. Najčešće vađeni zub je bio donji desni prvi molar. Jedanaestogodišnjaci su imali više zdravih prvih stalnih molara u odnosu na petnaestogodišnjake, ali razlika između ispitivanih grupa nije bila statistički značajna. Pokazalo se da dečaci imaju zdravije molare, kao i veći procenat plombiranih zuba u poređenju sa devojčicama, ali bez statističke značajnosti.

DISKUSIJA

Sprovedeno istraživanje, kojim su bila obuhvaćena deca uzrasta 11 i 15 godina na teritoriji opštine Foča, ukazuje na povećan

stepen anksioznosti, kao i visoku prevalencu karijesa prvih stalnih molara. Zato je strah od stomatoloških intervencija važan problem u svakodnevnoj praksi, ne samo u dečjoj stomatologiji već u svim granama stomatologije. Studije koje su ispitivale ovu tematiku ukazuju da je dentalna anksioznost prisutna u svim uzrastima i da je nezavisna od pola [12–15].

U ovom istraživanju odsustvo anksioznosti ustanovljeno je kod 39% ispitanika, umerena anksioznost kod 27,6% ispitanika, dok je visok i veoma visok stepen anksioznosti bio prisutan kod više od trećine ispitanika (33,2%). Ovi podaci su uporedivi sa rezultatima sličnih studija. Tako Alaki i sar. 2012. ukazuju da 34% dece uzrasta 11–15 godina ima visoku i veoma visoku dentalnu anksioznost, dok kod 32,4% dece nije bio prisutan strah [12]. Kada su odrasli u pitanju, studije ukazuju na visoku i veoma visoku dentalnu anksioznost u uzrastu 18–82 godine kod skoro 30% ispitanika, dok kod 34,6% ispitanika ona nije uočena [14].

Strah negativno utiče kako na pacijenta tako i na stomatologa. Može se izbeći ili umanjiti uspostavljanjem poverenja između stomatologa i pacijenta, odnosno dobrim informisanjem pacijenta o predstojećoj stomatološkoj intervenciji [16]. Dodatni problem je činjenica što u doba informativnih sistema pacijent obično prvo konsultuje časopise i internet, što takođe može imati negativne posledice usled sticanja mogućih pogrešnih informacija [17]. Zbog toga je potrebno da informacije pruži sam stomatolog, koji uz to može zadobiti i simpatije pacijenta, odnosno steći njegovo poverenje.

Ispitanici uključeni u ovu studiju su uzrasta od 11 i 15 godina, a to je period intenzivne smene mlečnih i stalnih zuba, ali i kompletiranja stalne denticije. Dentalna anksioznost bila je podjednaka i nije bilo statistički značajne razlike između ispitanika. Učestalost odlaska stomatologu bitno je manja kod anksioznih pacijenata. Dokazano je da deca koja odlaze kod stomatologa jednom godišnje i ređe imaju veći stepen anksioznosti u odnosu na onu koji ga posećuju dva i više puta u toku godine. Rezultati takođe ukazuju da je dentalna anksioznost prisutnija kod devojčica, što je u skladu sa rezultatima drugih studija koje ukazuju da pacijenti ženskog pola imaju veći strah od stomatoloških intervencija [12, 18]. Ova veza može biti objašnjena činjenicom da su žene sklonije i većem stepenu neuroticizma, a anksioznost je pozitivno povezana sa neuroticizmom [19].

Vreme provedeno u čekaonici proporcionalno povećava nivo straha. Uprkos relativno čestoj pojavi dentalne anksioznosti, iznenađuje činjenica da stomatolozi nemaju uvek dovoljno razumevanja, ali ni znanja o psihološkom pristupu takvim osobama [17]. Međutim, i zbog zakonske regulative koja počinje ozbiljnije tretirati ove pojave, te opasnosti od tužbi, potrebno je razviti posebne tehnike komunikacije [17]. Prema Hmudu, postoje različiti okidači straha na koje pacijenti različito reaguju, a mogu se prikazati kao *pravilo 4 S* (na engleskom jeziku) [20]:

- *sights* – vizuelni doživljaj (igle, boreri)
- *sounds* – zvukovi (mikromotor, turbina)
- *sensations* – osećaji (vibracije)
- *smells* – mirisi (različiti stomatološki materijali)

Rezultati ovog istraživanja ukazuju da više od pola svih pregledanih prvih stalnih molara ima neku od komponenti KEP-a. Procenat zalivenih fisura (9,4%) relativno je mali, što je takođe jedan od parametara straha. Naime, postupak zalivanja fisura je brz, jednostavan i potpuno bezbolan i zbog toga vrlo pogodan za masovnu primenu i eliminaciju straha. Rezultati dobijeni ovim istraživanjem pokazuju da prevalenca karijesa prvih

stalnih molara raste sa uzrastom ispitanika, na šta su i ranije ukazali drugi autori [21, 22]. S druge strane, zahvaljujući jakim preventivnim programima, u zemljama razvijenog sveta beleži se konstantno opadanje prevalence karijesa stalnih zuba [9]. Međutim, u našoj regiji procenat ekstrahovanih prvih stalnih molara se kontinuirano povećava sa uzrastom ispitanika. Od ukupnog broja pregledanih zuba u ovoj studiji, oko 7% je već bilo izvađeno. Inače, prvi stalni molar ima izuzetno važan funkcionalni značaj [8], tako da ekstrakcije ovog zuba mogu imati mnogobrojne negativne posledice [22]. Prevalenca karijesa ispitivanih zuba u svim uzrastima ispitanika bila je veća kod devojčica, ali bez statističke značajnosti u odnosu na dečake.

Pojedine studije su pokazale da socioekonomski status i nivo edukacije stanovništva može imati uticaja na stepen prisustva dentalnog straha u populaciji [6, 23]. Najveći nivo anksioznosti imaju adolescenti, što je uglavnom rezultat vlastitih loših iskustava u detinjstvu ili negativnog iskustva roditelja ili prijatelja [17]. Istraživanja su pokazala da je prosečna dob, i za žene i za muškarce, u kojoj počinje redukcija straha oko 40 godina. To se može objasniti povećanom tolerancijom zbog sve češćeg i dužeg izlaganja stresnim situacijama, te životnim iskustvom koje oblikuje bihevioralne karakteristike pojedinca [18]. Anksiozni pacijenti zahtevaju posebnu pažnju, a DAS upitnik može

poslužiti stomatolozima u lakšem odlučivanju o tome da li će pacijentima predložiti posebne tehnike kao što su sedacija ili u određenim slučajevima opšta anestezija.

ZAKLJUČAK

Dentalna anksioznost i danas predstavlja veoma važan razlog izbegavanja odlaska kod stomatologa. To svakako može doprineti lošem oralnom zdravlju, kao i razvoju komplikacija dentalnih oboljenja, što je veoma zabrinjavajuće, s obzirom na činjenicu da skoro svako treće dete iz ove studije ima izraženu dentalnu anksioznost. Period školskog uzrasta dece je najkritičniji, ali ujedno i najznačajniji za primenu preventivno-profilaktičkih mera i postupaka koje imaju za cilj očuvanje zdravlja kako tvrdih tako i svih oralnih tkiva. Jedna od najefikasnijih profilaktičkih mera u redukciji karijesa i zaštiti prvenstveno prvih stalnih molara od delovanja kariogenih agenasa je zalivanje fisura.

Zalivanje fisura je potpuno bezbolna tehnika i može poslužiti kao način za oslobađanje ili smanjenje straha kod pacijenata. Razumevanje dentalne anksioznosti od strane stomatologa je takođe neophodan uslov za uspostavljanje dobre komunikacije, kao i pravilnog pristupa pacijentu u svakodnevnoj praksi.

Relationship between Molar Incisor Hypomineralization and dental caries at eight-year-old children

Ljiljana Marković Đurić¹, Olivera Dolić², Marija Obradović², Mirjana Tošić³, Maja Ernaut⁴

¹Primary Health Care Center, Knežev, Bosnia and Herzegovina;

²University of Banja Luka, Faculty of Medicine, Banja Luka, Bosnia and Herzegovina;

³Primary Health Care Center, Gradiška, Bosnia and Herzegovina;

⁴Primary Health Care Center, Srbac, Bosnia and Herzegovina

SUMMARY

Introduction The aim of the present study was to determine the relationship between Molar Incisor Hypomineralization (MIH) and caries in school children from Banja Luka region, Republic of Srpska.

Materials and methods One calibrated dentist evaluated a sample of 529 schoolchildren, eight years old, according to the European Academy of Pediatric Dentistry (EAPD) criteria on MIH presence. Dental caries was assessed using the DMFT (Decayed, Missing, Filled Teeth) criteria.

Results DMFT/dmft was significantly higher in children with MIH than without MIH ($p < 0.001$). In the MIH group of children, high values of caries indices (%DMFT/%dmft and mean DMFT/dmft) were found.

Conclusion Significant association between MIH and dental caries in eight-year-olds was found.

Keywords: molar incisor hypomineralization; dental caries; children

INTRODUCTION

Oral health is an essential part of the overall health. Regardless the knowledge of dental caries causes, it is still the most widespread disease of civilization and global problem. During the past decades in many developed countries it has been noticed a decline in caries prevalence of children and adolescents. Opposite to reduced prevalence of dental caries, developmental anomalies of enamel are increasingly drawing attention in clinical practice and becoming more prominent public health problem [1].

An increased frequency of structural anomalies of enamel has been noticed in the past years mainly affecting first permanent molars and incisors. For better understanding of these changes and their impact on overall oral health, Karin Werheijm et al. (2001) suggested a single term - Molar Incisor Hypomineralization (MIH), which was accepted at the meeting of the European Academy of Paediatric Dentistry in Athens in 2003 [2]. This condition is characterized by hypomineralization of systemic origin that affects one or more first permanent molars in association with defects of permanent incisors [3].

Beside clinical implications of MIH (thermal, chemical and mechanical hypersensitivity, lack of esthetics - appearance of white, yellow or brown opacity), hypomineralized changes are strong predictors of dental caries. Affected teeth, in particular first permanent molars, are susceptible to dental caries, not only because of enamel porosity, but also increased teeth sensitivity that make effective oral hygiene difficult [4]. Furthermore, low sali-

vary flow rates and low pH have been observed in MIH children, as another factor that could possibly contribute to higher caries risk [5]. In more severe cases, hypersensitivity may be increased to the level that is hard to achieve efficient dental analgesia during preparation. What is even worse is that children with this type of defect require extensive and often repeated restorative treatments. Conservative treatments of these teeth are challenging for both, a patient and a dentist. In many cases, dental fear and anxiety is present which complicate treatment additionally [6, 7]. For these reasons, monitored tooth eruption, adoption of timely and accurate diagnosis of MIH is crucial for proper selection of therapeutic procedures and prevention of further damage.

The aim of the present study was to determine the prevalence of dental caries in children with MIH, and relationship between MIH and caries development in permanent and primary teeth.

MATERIALS AND METHODS

A cross-sectional study was conducted in Banja Luka region, where 540 school children, aged 8 years were screened for MIH and decayed, missing and filled teeth (DMFT). Study was conducted between September 2015 and March 2016. Age of eight was chosen because first permanent molars and incisors erupted recently, so caries prevalence should still be low and therefore lower possibility for caries lesion to mask hypomineralisation [2].

The Ethical Committee of the Institute for Clinical Dentistry of Banja Luka and the Ethical Committee of Public Health Centre, Banja Luka approved the study.

Two stage sampling procedure was adopted for sample selection. In the first stage, 9 schools of all 30 were selected by random sampling. In the second stage, children were recruited, from the selected schools, by proportionate stratified random sampling. Children without parental informed consent signed and children with fixed orthodontic appliances were excluded from the study. A written informed consent was obtained from parents before clinical examination of their children.

One calibrated dentist, using a dental mirror and a probe, examined children in dental chair under artificial light. If necessary, cotton rolls were used to remove any residual debris. The criteria proposed by the European Academy of Pediatric Dentistry (EAPD) were used for the diagnosis of MIH, which included the presence of demarcated opacities, post-eruptive enamel breakdown, atypical restorations and extraction due to MIH of at least one first permanent molar [3]. Tooth lesions that were less than 1 mm in diameter were not included in the study, the opacities that were only observed on the incisors without the involvement of the molars were not diagnosed as MIH. The cases of excessive caries lesions haloed with opacities were diagnosed as MIH.

Dental caries experience was recorded using the WHO (World Health Organization) criteria for diagnosis of decayed (D), missing (M) and filled (F) teeth (DMFT/dmft Index) [8]. The caries prevalence was expressed in statistical coefficients: %DMFT/%dmft index and mean DMFT/dmft index. The examination of dental caries included all permanent and primary teeth. According to clinical features of MIH, required treatment needs were presented in five groups: no treatment required, one-surface filling, two- or multi-surface filling, endodontic treatment and tooth extraction.

The data were analyzed using the IBM SPSS Statistics 21.0. A comparison between groups was carried out using the Pearson's correlations and Mann-Whitney U-test. For all tests the *P*-value of 0.05 or less was considered statistically significant.

RESULTS

Out of 540 children, nine did not have signed permission by their parents and therefore were not examined. Two children had partially erupted or unerupted all four permanent molars and were excluded as well. Finally, a total of 529 (97.96%) children (254 boys and 275 girls) were included in the study. Analysis of results about the prevalence of dental caries showed DMFT/dmft in permanent and primary teeth was significantly higher in children with MIH than without MIH ($p < 0.001$) (Table 1). In the examined groups, high values of analyzed parameters for caries prevalence %DMFT/dmft and mean DMFT/dmft were found, but both significantly higher in the group with MIH (Table 2). Table 3 shows evaluation of the need for dental treatment of teeth affected by hypomineralization changes.

DISCUSSION

Our study evaluated the relationship between MIH and dental caries in school children of Banja Luka region, Republic of Srpska. Increased porosity of tooth structure and consequently reduced mechanical resistance of hypomineralized changes pose great risk for dental caries, even in populations with low caries prevalence.

Statistically significant correlation between DMFT (1.41 ± 1.62) and hypomineralized changes was found. This finding is consistent with the research of most au-

Table 1. Relation of DMFT/dmft median in MIH and non MIH- group

Tabela 1. Odnos medijane KEP/kep-a između grupa sa MIH promenama i bez MIH promena

Compared groups Komparirane grupe	DMFT KEP		dmft kep		p-value p-vrednost
	SD SD	Median Medijana	SD SD	Median Medijana	
MIH group Grupa sa MIH promenama	2.43 ± 1.70	2.0	7.40 ± 3.08	8.0	p < 0.001
Non-MIH group Grupa bez MIH promena	1.23 ± 1.54	0.0	5.52 ± 3.47	6.0	
Total Ukupno	1.41 ± 1.62	1.0	5.80 ± 3.48	6.0	

Table 2. Relation of %DMFT/dmft and mean DMFT/dmft in MIH and non-MIH group

Tabela 2. Odnos KIO i KIP indeksa u grupama sa MIH promenama i bez MIH promena

Compared groups Komparirane grupe	%DMFT/dmft Karijes indeks osoba (KIO)	Mean DMFT/dmft Karijes indeks prosek		p-value p-vrednost
		Permanent teeth Stalni zubi	Primary teeth Mlečni zubi	
MIH group Grupa sa MIH promenama	80%	2.3	7.4	p < 0.001
Non-MIH group Grupa bez MIH promena	50.3%	1.2	5.5	

Table 3. Distribution of MIH by treatment need**Tabela 3.** Distribucija zuba sa MIH-om prema potrebi za tretmanom

TREATMENT TRETMAN	TEETH WITH MIH ZUBI SA MIH-om	
	N	%
No treatment Nije potreban	230	72.33%
One surface restoration Jednopršinski ispun	46	14.47%
Two or more surfaces restoration Dvopršinski ili višepopršinski ispun	17	5.34%
Endodontic treatment Endodontski tretman	5	1.57%
Tooth extraction Ekstrakcija zuba	20	6.29%
TOTAL UKUPNO	318	100%

thors who found positive correlation between hypomineralized changes of teeth and dental caries [9, 10]. In agreement with our results, the study conducted in Spain in 2014, also reported higher values of DMFT in children with MIH (0.513) in comparison to children without MIH (0.273) [11]. Muratbegović et al. in their study about oral health indices and hypomineralization of first permanent molars and incisors in 12-year-olds reported higher caries prevalence associated with hypomineralization changes [12]. Jeremias et al. in their study about the association between caries and MIH also demonstrated larger DMFT index in children with hypomineralization changes (0.89 ± 1.18) in comparison to children without hypomineralized changes (0.43 ± 1.01) [13].

These results are on the other hand in contrast to a recent study of Heitmüller et al. where the association between dental caries and MIH in children aged 10 years was not found. However, the authors did not consider atypical restorations (due to hypomineralized changes) as restorations associated to caries and as such were not part of DMFT, which probably resulted in such finding [14].

The present study found statistically significant correlation between dmft (5.80 ± 3.48) and hypomineralized changes. This is not consistent with the majority of scientific research, where higher caries experience in permanent teeth with hypomineralized changes was found, but not in primary teeth [5,13].

Further analysis showed that 80% of our respondents with hypomineralized changes had at least one DMFT, compared to 50% in the group of children without MIH, which clearly implicate increased tendency for caries development in teeth with hypomineralization changes. A study conducted in India in 2015, by Tadikonde et al. demonstrated positive correlation between dental caries and MIH, where the prevalence of caries was 27% in children with MIH [15].

In the present study, mean DMFT/dmft in children with hypomineralized teeth was 2.3, which was statistically significant compared to the group of children without hypomineralization (1.2). Keeping in mind that the study included eight years old children who had small number of permanent teeth recently erupted, this result can be considered very high. This is in accordance with

other studies [10, 16]. Kirthiga et al. in their study found that the mean DMFT value in respondents affected with MIH was 3.2, which was significantly higher than the mean DMFT value of controls (0.8) [17].

MIH is associated with structural weakness and tooth hypersensitivity; therefore, there is high chance for performing poor oral hygiene and subsequently more chance for dental caries development. Histological examinations of hypomineralized teeth showed that oral bacteria can get embedded deeper into dentin of affected teeth, which obviously increase risk for dental caries [18].

Since dental treatment of MIH can pose a lot of difficulties, in our study the need for dental treatment of teeth affected by hypomineralized changes was estimated. It was determined that more than 70% of teeth with hypomineralized changes did not require treatment. This result can be interpreted as moderate and in accordance with similar results of other authors [19, 20]. The study conducted in Spain in 2014 recognized the need for treatment in eight-year-old children with MIH in accordance with WHO criteria classifying them as examinations, urgent treatment and necessary treatment-but not urgent. They found that 3.8% of children with MIH required urgent treatment because of the severity of defects, while 27.9% required some type of treatment that was not an emergency [11].

CONCLUSION

Significant association between MIH and caries was found in the current study. Dental caries was more common in hypomineralized teeth, thus playing role in further deterioration of affected teeth. This finding implicates need for increased awareness in regards to hypomineralization, early dental treatment and adequate prevention.

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Povezanost hipomineralizacije sekutića i kutnjaka sa pojavom karijesa kod osmogodišnjaka

Ljiljana Marković Đurić¹, Olivera Dolić², Marija Obradović², Mirjana Tošić³, Maja Ernaut⁴

¹JZU Dom zdravlja, Kneževu, Bosna i Hercegovina;

²Univerzitet u Banjoj Luci, Medicinski fakultet, Banja Luka, Bosna i Hercegovina;

³JZU Dom zdravlja, Gradiška, Bosna i Hercegovina;

⁴JZU Dom zdravlja, Srbac, Bosna i Hercegovina

KRATAK SADRŽAJ

Uvod Cilj ovog istraživanja je bio utvrditi odnos između pojave hipomineralizacije sekutića i kutnjaka i karijesa školske dece u regiji Banja Luka, Republika Srpska.

Materijal i metode Epidemiološka studija preseka je sprovedena na teritoriji banjalučke regije i uključivala je 540 dece uzrasta osam godina, kod kojih je registrovano prisustvo MIH-a. Stanje zdravlja zuba ocenjivano je upotrebom sistema KEP.

Rezultati Analiza rezultata prevalencije karijesa je pokazala da je KEP/kep statistički značajno veći u grupi dece s MIH-om u odnosu na grupu dece bez MIH-a ($p < 0,001$). U ispitivanoj grupi dece utvrđeni su visoke vrednosti ispitivanih parametara prevalencije karijesa, karijes indeks osoba (KIO) i karijes indeks proseka (KIP).

Zaključak Istraživanje pokazuje značajnu povezanost između pojave hipomineralizacije sekutića i kutnjaka i karijesa.

Cljučne reči: hipomineralizacija sekutića i kutnjaka; karijes; deca

UVOD

Oralno zdravlje je bitan deo opšteg zdravlja. Bez obzira na poznatu etiologiju, karijes je još uvek najraširenija bolest civilizacije i globalni problem, iako je tokom proteklih decenija u mnogim razvijenim zemljama primećen pad prevalencije ovog oboljenja kod dece i adolescenata. Nasuprot smanjenju kariozne patologije, razvojni poremećaji gleđi sve više skreću pažnju u kliničkoj praksi i kao takvi postaju izraženiji javnozdravstveni problem [1].

Poslednjih nekoliko godina primećena je učestala pojava strukturnih promena u gleđi koje zahvataju prve stalne kutnjake i sekutiće. Radi boljeg razumevanja ovih promena i uticaja na celokupno oralno zdravlje, 2001. godine od strane *Karina Werheijma* i saradnika predložen je jedinstven termin – Molarno-incizivna hipomineralizacija (MIH), koji je usvojen na sastanku Evropske akademije za dečju stomatologiju održanom u Atini 2003. godine [2]. Definiše se kao hipomineralizacija sistemskog porekla koja zahvata jedan ili više prvih stalnih kutnjaka, često uključujući i stalne sekutiće [3].

Osim kliničkih implikacija MIH-a (preosetljivost zuba na termičke, hemijske i mehaničke nadražaje, estetski nedostaci – kredasta, žučkasta ili braonkasta zatamnjenja), hipomineralizovane promene su bitne kao jaki prediktori karijesa. Povećan rizik za razvoj karijesa kod zuba zahvaćenih hipomineralizovanim promenama posledica je ne samo meke i porozne gleđi već i otežane oralne higijene usled povećane osjetljivosti zuba na nadražaje [4]. Faktor koji bi takođe mogao da doprinese većem riziku od karijesa, utvrđen kod dece s MIH promenama, jeste smanjena salivacija i niži pH pljuvačke [5]. Neretko, osjetljivost može biti izražena do mere da se teško postiže zadovoljavajuća analgezija prilikom preparacije. Podaci iz literature pokazuju da deca sa ovom vrstom defekata zahtevaju obimnije i često ponovne restaurativne tretmane. Restaurativni tretmani ovih zuba predstavljaju izazov i za pacijenta i za stomatologa. U mnogim slučajevima strah i teskoba kod deteta pogoršavaju i otežavaju tretman [6, 7].

Iz navedenih razloga, rane kontrole, praćenje zuba tokom nicanja, donošenje pravovremene i tačne dijagnoze MIH-a su ključ za pravilan odabir terapijskih postupaka i prevenciju daljnjih oštećenja.

Cilj istraživanja je bio utvrditi prevalenciju karijesa kod dece sa MIH-om, te utvrditi postoji li povezanost između pojave hipomineralizovanih promena i karijesa mlečnih i stalnih zuba.

MATERIJAL I METODE

Epidemiološka studija preseka je sprovedena na teritoriji banjalučke regije i uključivala je 540 dece uzrasta osam godina, kod kojih je registrovano prisustvo MIH-a i stanje zdravlja zuba ocenjeno upotrebom KEP sistema. Istraživanje je sprovedeno između marta 2015. i septembra 2016. godine. Uzrast osam godina odabran je zato što se u datom periodu prvi stalni kutnjaci i sekutići nalaze u ranom posterupcionom periodu, kada je incidencija karijesa niža, čime se smanjuje mogućnost maskiranja hipomineralizacije karioznom lezijom [2]. Istraživanje je obavljeno uz saglasnost Etičkog odbora JZU Zavod za stomatologiju u Banjoj Luci i Etičkog odbora JZU Dom zdravlja Banja Luka. Pre početka istraživanja roditelji su potpisali saglasnost za učešće dece u istraživanju.

Uzorkovanje je sprovedeno kroz dve faze. U prvoj fazi metodom slučajnog izbora od ukupno 30 škola odabrano je devet, a u drugoj fazi metodom stratifikovanog uzorka izabrana su deca iz odabranih škola. Pre početka istraživanja roditelji su potpisali informisani pristanak o saglasnosti za učešće u istraživanju. Deca čiji roditelji nisu dali svoj pismeni pristanak isključena su iz istraživanja, kao i deca sa fiksnim ortodontskim aparatom, koji ometa adekvatan pregled zuba. Pregled dece obavljen je u stomatološkoj stolici, pod veštačkim osvetljenjem, od strane jednog kalibrisanog stomatologa, korišćenjem standardnog stomatološkog ogledalca i sonde. Po potrebi su korišćene pamučne vatiće za uklanjanje dentalnog biofilma. MIH je klinički dijagnostikovao na osnovu kriterijuma koje je opisao *Weerheijm*

2003. godine: ograničena zamućenja gleđi, posteruptivni prekid gleđi, atipična restauracija, ekstrakcija molara zbog MIH-a, retencija, nenicanje molara i sekutića [3]. Lezije zuba koje su bile manje od 1 mm nisu uključivane u studiju; opaciteti koji su uočavani samo na sekutićima, bez zahvaćenosti kutnjaka, nisu dijagnostikovani kao MIH. Slučajevi većih karijesnih lezija oivičeni zamućenjima po ivicama kaviteta dijagnostikovani su kao MIH.

Iskustvo karijesa zuba je registrovano na osnovu KEP/kep indeksa (K – karijes, E – ekstrakcija, P – plomba) u skladu sa kriterijumima Svetske zdravstvene organizacije (SZO) [8]. Prevalencija karijesa je izražena statističkim koeficijentima: karijes indeks osoba (KIO), karijes indeks proseka (KIP) i pokazateljem strukture karioznih, ekstrahovanih i plombiranih zuba (struktura KEP). Klinički pregled je obuhvatio sve mlečne i stalne zube.

Distribucija zuba sa MIH-om prema potrebi za tretmanom prikazana je u pet grupa: nije potreban tretman, jednopovršinski ispun, dvopovršinski ili višepovršinski ispun, endodontski tretman i ekstrakcija zuba.

Za statističku analizu korišćen je softver *IBM SPSS Statistics 21.0*. Za upoređivanje razlika u učestalosti posmatranih obeležja prema grupama ispitanika korišten je *Pearsonov χ^2 test* kontingencije i *Mann-Whitney U test*. Kao statistički značajne uzimane su vrednosti u kojima je $p < 0,05$.

REZULTATI

Od ukupno 540 dece uključene u istraživanje, devetoro dece nije dobilo pisanu saglasnost od roditelja, dok dvoje dece nije imalo potpuno iznikla sva četiri prva stalna molara, te su isključeni iz istraživanja. Pregledano je ukupno 529 (97,96%) dece (254 dečaka i 275 devojčica).

Analiza rezultata prevalencije karijesa je pokazala da je KEP/kep statistički značajno veći u grupi dece s MIH-om u odnosu na grupu dece bez MIH-a ($p < 0,001$). (Tabela 1)

U ispitivanoj grupi dece utvrđene su visoke vrednosti ispitivanih parametara prevalencije karijesa, karijes indeks osoba (KIO) i karijes indeks proseka (KIP). (Tabela 2)

Rezultati u Tabeli 3. pokazuju analizu podataka potrebe za tretmanom zuba zahvaćenih hipomineralizovanim promenama.

DISKUSIJA

Naša studija je imala za cilj da utvrdi povezanost između karijesa i MIH-a kod dece školskog uzrasta na teritoriji banjalučke regije, u Republici Srpskoj. Zbog povećane poroznosti strukture zuba i posledično smanjene mehaničke otpornosti, hipomineralizovane promene se smatraju faktorom rizika za karijes, čak i u populacijama sa niskom rasprostranjenošću karijesa.

Rezultati ove studije pokazuju značajnu povezanost između karijes indeksa stalnih zuba ($1,41 \pm 1,62$) i hipomineralizovanih promena. Ovaj nalaz je u skladu sa istraživanjima većeg broja autora, koji su pronašli pozitivnu korelaciju između hipomineralizovanih promena i karijesa [9, 10]. U skladu sa našim nalazom, studija sprovedena u Španiji 2014. takođe je ustanovila veće vrednosti KEP-a kod dece s MIH-om (0,513) u odnosu na decu bez MIH-a (0,273) [11]. Studija Muratbegovića i saradni-

ka o indeksima oralnog zdravlja i hipomineralizaciji kutnjaka i sekutića kod dece uzrasta 12 godina utvrdila je visoku prosečnu vrednost KEP indeksa – od $4,16 \pm 2,92$ [12]. U skladu sa rezultatima ove studije, *Jeremias* i saradnici u svojoj studiji o povezanosti karijesa i MIH-a ustanovili su veći KEP indeks kod dece sa hipomineralizovanim promenama – $0,89 \pm 1,18$ u odnosu na decu bez hipomineralizovanih promena, gde je KEP indeks iznosio $0,43 \pm 1,01$ [13].

Rezultati ove studije su u kontrastu sa nedavnom studijom *Heitmüllera* i saradnika, koja nije ustanovila vezu između karijesa i MIH-a kod dece uzrasta 10 godina; međutim, autori u ovoj studiji atipične restauracije nastale kao posledica hipomineralizovanih promena gleđi nisu tretirali kao restauracije koje su povezane sa karijesom i kao takve nisu bile deo KEP indeksa, što je verovatno uticalo na takav rezultat [14].

U ovoj studiji je utvrđena statistički značajna korelacija između hipomineralizovanih promena i KEP-a ($5,80 \pm 3,48$). Ovaj nalaz je u suprotnosti sa izveštajima većine autora koji su utvrdili veću rasprostranjenost karijesa kod stalnih zuba dece sa hipomineralizovanim promenama, ali ne i kod mlečnih zuba [5, 13].

Analiza rezultata je pokazala da 80% dece sa hipomineralizovanim promenama ima bar jedan KEP, u odnosu na 50% u grupi dece bez MIH-a, što upućuje na povećanu sklonost ka razvoju karijesa kod zuba sa hipomineralizacijom. Studija sprovedena u Indiji 2015. godine, od strane *Tadikonde* i saradnika, ustanovila je pozitivnu korelaciju između karijesa i MIH-a, pri čemu je prevalenca karijesa iznosila 27% kod dece s MIH-om [15].

KIP u ovoj studiji iznosi 2,3, što je statistički značajno u odnosu na grupu dece bez hipomineralizovanih promena (1,2). S obzirom na to da su u studiji zastupljena deca uzrasta osam godina, koja imaju manji broj izniklih stalnih zuba, ovaj podatak je dosta ozbiljan. Ovakav rezultat je u skladu sa nalazima drugih istraživanja [10, 16]. Istraživanje *Kirthige* i saradnika u Indiji, 2015. godine, ustanovilo je KIP 3,2 kod dece sa MIH-om, što je znatno više od KIP vrednosti u kontrolnoj grupi (0,8) [17].

Ovakvi rezultati su očekivani s obzirom na to da je MIH povezan sa oslabljenom strukturom zuba i hipersenzitivnošću. Deca s MIH-om neće moći da održavaju dobru oralnu higijenu, te će se zbog toga i razviti karijes. Histološka ispitivanja hipomineralizovanih zuba su pokazala da oralne bakterije mogu biti ugrađene duboko u dentin zahvaćenih zuba, te postoji očigledna mogućnost za povećan rizik od karijesa na zubima zahvaćenim tim promenama [18].

Imajući u vidu poteškoće koje se javljaju u lečenju dece sa hipomineralizovanim promenama, u studiji je urađena i procena potrebe za stomatološkim tretmanom na zubima zahvaćenim hipomineralizovanim promenama. U ovom istraživanju je utvrđeno da kod više od 70% zuba sa hipomineralizovanim promenama nije potreban tretman. Ovaj nalaz se može tumačiti kao umeren, u skladu sa sličnim rezultatima drugih studija [19, 20]. Studija sprovedena u Španiji 2014. godine istraživala je potrebu za tretmanom kod dece osmogodišnjeg uzrasta sa hipomineralizovanim promenama kutnjaka i sekutića, u skladu s preporukama SZO, klasifikujući ih na preglede, hitan tretman i neophodan tretman, ali koji nije hitan. Ustanovili su da je kod 3,8% dece sa MIH-om potreban hitan tretman zbog teških defekata, dok je kod 27,9% potrebna neka vrsta lečenja koja nije hitna [11].

ZAKLJUČAK

Istraživanje je pokazalo da postoji visoka prevalencija karijesa kod dece sa MIH-om, kao i značajna povezanost između MIH-a i karijesa. Veća učestalost karijesa na hipomineralizovanim zu-

bima upućuje na to da kariozno oboljenje igra značajnu ulogu u pogoršanju zdravstvenog stanja zuba zahvaćenih hipomineralizovanim promenama, te da postoji potreba za podizanjem svesti o molarno-incizivnoj hipomineralizaciji, pravovremenom tretmanu i prevenciji karijesa.

Minimally invasive restorative treatment with direct composite veneers – case report

Sonja Apostolska¹, Vasilka Rendzova¹, Marina Eftimoska¹, Vesna Filipovska¹, Sasho Elenchevski², Nadica Janeva²

¹University “Ss. Cyril and Methodius”, Faculty of Dental Medicine, Department of Restorative Dentistry and Endodontics, Skopje, Republic of Macedonia;

²University “Ss. Cyril and Methodius”, Department of Mobile Prosthodontics, Faculty of Dental Medicine, Skopje, Republic of Macedonia

SUMMARY

Esthetic and minimally invasive restorative techniques are current topics in dentistry. Introduction of modern composite materials and adhesive technology provided numerous options for design of esthetic restorations without invasive teeth preparation common for traditional prostodontic restorations. Modern esthetic dentistry can provide solutions for simple as well as complex cases by implementation of various alternatives.

Keywords: veneers; adhesive technique; composite materials

INTRODUCTION

Esthetic and minimally invasive restorative techniques are current topics in dentistry. Introduction of modern composite materials and adhesive technology provided numerous options for design of esthetic restorations without invasive teeth preparation common for traditional prostodontic restorations. Modern esthetic dentistry can provide solutions for simple as well as complex cases by implementation of various alternatives [1, 2].

The need for esthetic treatment emerges from different systemic preconditions as well as various genetic, dental and traumatic reasons [3, 4, 5]. Key factors for treating these cases are composite materials and adhesive systems. Layered technique using different shades produces excellent bio-mimetic restorations. By utilizing positive characteristics of these materials high esthetic and functional effects can be achieved [6].

Modern composites allow reconstruction of the outer forms and colors but also reproduce inner tooth structure. Esthetic restoration mimics optical characteristics of natural tooth [7, 8]. Nano-technology of composite materials has simpler color structure and very intense ‘chameleon effect’. It allows excellent modeling of the filling and complex teeth restoration in anterior and posterior regions. Clinical procedure for direct composite restoration involves: respecting individual morphological characteristics of teeth, choosing appropriate shades, proper teeth preparation, anatomic layered technique and final finishing and polishing. Applying layered technique provides anatomical teeth form, however, requires long application time. On the other hand, layered technique sometimes traps air causing voids in the composite that later became stained. That lowers esthetical characteris-

tics of restorations over time [9, 10]. These problems can be overcome with new composite systems that allow easy restoration of anterior teeth by the application of already-made composite veneers. This is convenient when changing shape of the tooth is also required. Excellent results have been reported in restoring fractured and destroyed teeth, morphological and structural deviations, discolored teeth and diastema, caries, trauma, erosion, abrasion, fractures and minor orthodontic deviations [11, 12]. Direct composite systems offer treatment that is both for the patient and dentist more economical and can be finished during only one visit.

The aim of this is to present two clinical cases of anterior teeth reconstruction using Composeer system.

Case 1

A female patient, 40 years old, visited the Clinic for Restorative Dentistry and Endodontics dissatisfied with the appearance of her teeth in the upper anterior region. During the clinical check up of her teeth 13, 12, 11, 21, 22, 23 inadequate morphology and restorations were found (Figure 1). Proposed treatment included restoring teeth



Figure 1. Teeth before the procedure
Slika 1. Izgled zuba pre početka terapije



Figure 2. Form selected with ComposeerTM Contour Guide that is unique, transparent, precise contour in order to select proper tooth form

Slika 2. ComposeerTM Contour Guide za precizno određivanje kontura i oblika zuba



Figure 3. Composite veneer

Slika 3. Kompozitna faseta



Figure 4. Veneer correction using round disk (Swiss Flex, Coltene)

Slika 4. Korekcija fasete okruglim diskom (Swiss Flex, Coltene)

with the Composeer system. After cleaning the teeth surface, dentin and enamel colors were selected using the color key under the natural light. ComposeerTM Contour Guide is unique and transparent precise contour for the selection of the proper tooth form and size L was chosen in this case (Figures 2, 3). Further on, the selected enamel veneer was modified using round disk (Swiss Flex, Coltene) with low rotation without any water due to the marginal adaptation (Figure 4). Afterwards,



Figure 5. Minimal tooth preparation

Slika 5. Minimalna preparacija zuba



Figure 6. Removal of previous restorations

Slika 6. Uklanjanje starih restoracija



Figure 7. BRILIANT EverGlow A2/B2 enamel color

Slika 7. Gledna boja BRILIANT EverGlow A2/B2

minimal preparation was done on the teeth, as the veneer thickness was only 0.3 mm. Old restorations were also removed (Figures 5 and 6). One Coat Bond was applied on the inner surface of the Composeer veneer and left without light polymerization. The teeth were etched with 35% phosphoric acid for 30 seconds and rinsed, and then One Coat Bond on the teeth surface was applied, dried and polymerized for 20 seconds. Composite color BRILIANT EverGlow A2/B2 was applied on the teeth, whereas the enamel color was applied on the inner surface of Composeer veneer with a specialized spatula without any pressure. The composite veneer was hold with a specially designed holder. Then it was applied to the tooth by putting pressure on a specialized silicone instrument (Figures 7, 8). After checking the position, occlusion and the central line of incisors the palatal side was polymerized first (due to lowering polymerization stress) and then labial side. Polymerization was 40 seconds long both on

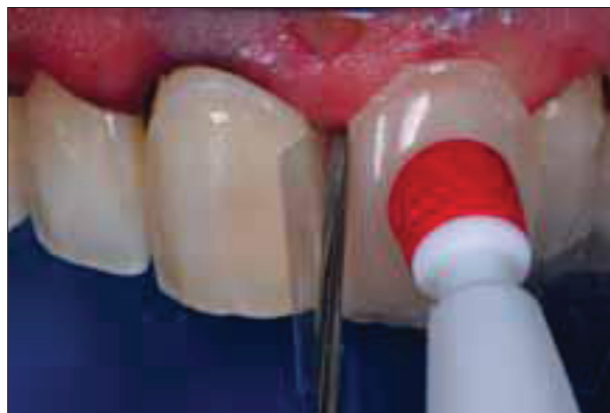


Figure 8. Silicone instrument used for adaptation of composite veneer

Slika 8. Silikonski instrument koji se koristi za adaptaciju kompozitne fasete

the palatal and labial side. Final polishing was done using flexible aluminium disks.

Case 2

The patient aged 23 visited the Clinic for Restorative Dentistry and Endodontics dissatisfied with the appearance of one of her teeth in the anterior region. During the clinical check up of the tooth 12, a deviation of the lateral incisor was found (Figure 9). The decision was to reconstruct her tooth with the Componeer system. After cleaning the tooth surface, the shade of dentin and enamel was determined using the shade key under the daylight. Size M of Componeer™ Contour Guide that is unique and transparent precise contour for the proper form of teeth was chosen. One Coat Bond was applied on the inner surface of the composite veneer and left without light polymerization. The tooth was etched with 35% phosphoric acid for 30 seconds and rinsed, and then bond applied, dried and polymerized for 20 seconds. Following was the application of the composite color BRILLIANT EverGlow A1/B1 (Coltene/Whaledent) and the color Componeer was applied with a specialized spatula on the inner surface of the veneer without any pressure. The composite veneer was held with a specially designed holder and then applied on the tooth using specialized silicone instrument (Figure 10). Polymerization was applied 40 seconds on both palatal and labial surface. Polishing and finishing was done with flexible aluminium disks. High esthetic results were achieved with the use of composite BRILLIANT EverGlow (Coltene/Whaledent) that correspond to the composite veneer color (Figure 11).

DISCUSSION

Contemporary esthetic dentistry can treat simple and complex cases with various alternatives. Prior to doing esthetic restoration, indication and proper diagnosis must be carefully determined [13]. Every case is different and treatment planning must be based on individual needs. In



Figure 9. Final look of the teeth after restoration with the Componeer system

Slika 9. Finalni izgled zuba po završetku restorativnog postupka



Figure 10. Deviated aesthetics and morphological deviation of lateral incisor

Slika 10. Narušena estetika i morfološka nepravilnost lateralnog inciziva



Figure 11. Final restoration with Componeer

Slika 11. Definitivna restauracija kompozitnom fasetom

both presented cases, new composite system was chosen over direct restoration due to shorter chair time and easier technique. Compared to direct restorations, prefabricated composite veneers have advantages, such as reduced polymerization stress, lower gap formation, post-operation hypersensitivity, micro-leakage and optimum marginal adaptation [14]. Strong adhesion of two composites was optimally obtained with the micro-retentive surface of the composite veneer (2 nm). The Componeer veneer (Coltene/Whaledent) premade of nano-hybrid composite not only makes esthetic restoration faster but also offers new optimal, functional and economical esthetics. Enamel composite veneers are available in various sizes, from small, medium, large to extra-large, and two transparent colors: neutral (universal) and light (white transparent). With the appropriate dentin color that is under the enamel composite veneer, various combinations of colors can be achieved. The composite veneer is made of composite material so additional esthetics can be achieved with regular composite material. Also, if veneer is damaged, it can be easily restored with composite material as well.

Clinical technique described in this article shows that it can be done routinely on anterior teeth, for correction of malpositioned teeth, diastema and discoloration [15, 16]. Prefabricated composite veneers present acceptable esthetic solution that is more acceptable than traditional porcelain veneers.

CONCLUSION

New composite system Composeer is easy to use and restoration can be done during only one visit. Excellent esthetic results with optimal adjustment of colors, forms and structures can be achieved without the need for laboratory work. Composeer composite veneers provide new options of functionality, economy and esthetics.

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Minimalno restaurativni tretman direktnim kompozitnim fasetama – prikaz slučaja

Sonja Apostolska¹, Vasilka Rendžova¹, Marina Eftimoska¹, Vesna Filipovska¹, Sašo Elenčevski², Nadica Janeva²

¹Univerzitet „Sv. Kiril i Metodij“, Stomatološki fakultet, Klinika za bolesti zuba i endodonciju, Skoplje, Republika Makedonija;

²Univerzitet „Sv. Kiril i Metodij“, Stomatološki fakultet, Klinika za mobilnu protetiku, Skoplje, Republika Makedonija

KRATAK SADRŽAJ

Estetska i minimalno invazivna tehnika su danas dve vrlo značajne teme restaurativne stomatologije. Estetski zahtevi sa savremenim kompozitnim materijalima i moderna adhezivna tehnologija omogućavaju dizajniranje estetskih restauracija bez invazivnih preparacija zuba, koje su uobičajene za protetske nadoknade. Savremena estetska stomatologija danas rešava i jednostavne i kompleksne slučajeve različitim tehnikama restauracije.

Cljučne reči: kompozitne fasete; adhezivna tehnika; estetika

UVOD

Estetska i minimalno invazivna tehnika su danas dve glavne teme restaurativne stomatologije. Restaurativna tehnika, koja koristi savremene kompozitne materijale i modernu adhezivnu tehnologiju, pruža brojne opcije za dizajniranje estetske restauracije bez invazivnih preparacija zuba [1, 2]. Potreba za estetskim tretmanom proizilazi kako iz različitih sistemskih preduslova, tako i iz različitih genetskih, dentalnih i traumatoloških razloga [3, 4, 5]. Ključni faktori za rešavanje ovih slučajeva su kompozitni materijali i adhezivni sistemi. Slojevit tehnika, primenom različitih nijansi, omogućava odlične biomimetičke restauracije. Zbog toga je neophodno poznavati karakteristike materijala, kako bi se ostvario maksimalan estetski i funkcionalni efekat [6]. Moderni kompoziti omogućavaju rekonstrukciju spoljašnjeg oblika i boje, kao i reprodukciju unutrašnje strukture zuba. Estetska restauracija danas može imitirati optička svojstva prirodnog zuba [7, 8]. Nanotehnologija u proizvodnji kompozitnih materijala omogućava veliki izbor boja i dosta izražen „kameleonski efekat“. Omogućava dobro modelovanje ispuna i izradu složenih restauracija zuba i u frontalnoj i u posteriornoj regiji.

Klinički postupak izrade direktnih kompozitnih restauracija uključuje: poštovanje individualnih morfoloških karakteristika zuba, izbor odgovarajuće nijanse materijala, pravilnu i minimalnu preparaciju zuba, slojevit tehniku aplikacije i završno finiranje i poliranje. Primenom slojevite tehnike dobija se odlična anatomska forma zuba, ali je problem što je za to potrebno mnogo vremena. Isto tako, kao problem se nameće i činjenica da se tokom vremena pojavljuju tamna polja, zbog vazdušnih mehurića pri aplikaciji kompozitnog materijala, što kasnije dovodi do promene boje cele restauracije [9, 10].

Svi ovi problemi su danas prevaziđeni novim kompozitnim sistemom, koji kombinuje prednosti direktnih kompozitnih restauracija. To je novi sistem koji omogućava restauraciju anteriornih zuba pomoću gotovih kompozitnih faseti. Ovaj sistem omogućava da se zubi ne samo restauriraju već i da se promeni njihov oblik. Primenom ovog sistema obezbeđuju se izvanredne mogućnosti za restauraciju frakturiranih i destruiranih zuba, morfoloških i strukturnih nepravilnosti, diskoloriranih zuba i dijastema u frontalnoj regiji, odnosno karijesa, trauma, erozija, abrazija, fraktura i manjih ortodontskih nepravilnosti [11, 12]. Direktni kompozitni sistem nudi novu i zanimljivu dimenziju

tretmana, koji je za pacijenta i za stomatologa ekonomičniji, jer se izvodi u tokom jedne posete.

Cilj ovog rada je bio da se na osnovu prikaza slučaja objasni anteriorna rekonstrukcija zuba primenom sistema Componeer.

PRIKAZ SLUČAJA 1

Pacijentkinja starosti 40 godina došla je na Kliniku za bolesti zuba i endodonciju jer nije bila zadovoljna izgledom svojih zuba u frontalnoj regiji. Kliničkim pregledom zuba 13, 12, 11, 21, 22, 23 uočene su neadekvatna morfologija i neadekvatne restauracije (Slika 1). Odlučili smo da zube estetski rekonstruišemo primenom direktnih kompozitnih faseti sistemom Componeer. Nakon čišćenja površine zuba određena je gleđna i dentinska boja pomoću ključa pod dnevnim svetlom. Pomoću ComponeerTM Contour Guide izabrani su veličina i oblik zuba (izabrali smo veličinu L) (Slika 2 i 3). Posle selekcije veličine i oblika uzeli smo odgovarajuću gleđnu fasetu, koju smo minimalno korigovali diskom (Swiss Flex, Coltene), sa malim brojem obrtaja, bez upotrebe vode, zbog marginalne adaptacije (Slika 4). Zatim je urađena minimalna preparacija (jer je debljina fasete svega 0,3 mm) i odstranjena stara restauracija (Slika 5 i 6). One Coat Bond smo naneli na unutrašnju površinu Componeera i ostavili bez svetlosne polimerizacije. Zube smo nagrizali sa 35-procentnim rastvorom fosforne kiseline 30 sekundi i isprali, zatim naneli One Coat Bond na površinu zuba, osušili i polimerizirali 20 sekundi. Nakon toga naneli smo dentinsku kompozitnu boju BRILIANT EverGlow A2/B2 na površinu zuba, a gleđna boja je aplikovana na unutrašnju površinu Componeera bez prekomernog pritiska, pomoću specijalne špatule. Kompozitna faseti je držana specijalno dizajniranim držačem, a zatim smo je adaptirali na zub pritiskom sa specijalnim silikonskim instrumentom (Slika 7 i 8). Posle provere okluzije i centralne linije inciziva urađena je polimerizacija prvo sa palatinalne strane (u cilju smanjenja stresa od polimerizacije), a zatim labijalno. Polimerizacija je trajala 40 sekundi i sa palatinalne i sa labijalne strane. Definitivna obrada je urađena fleksibilnim aluminijumskim diskovima.

PRIKAZ SLUČAJA 2

Pacijentkinja starosti 23 godine takođe je bila nezadovoljna izgledom svojih zuba u frontalnoj regiji. Na kliničkom pregledu

zuba uočena je morfološka nepravilnost lateralnog inciziva (Slika 2). Odлучili smo da zub estetski rekonstruišemo primenom sistema Componeer. Nakon čišćenja površine zuba određena je gleđna i dentinska boja pomoću ključa pod dnevnim svetlom. Pomoću ComponeerTM Contour Guide izabrali smo srednju veličinu. Posle selekcije veličine i oblika One Coat Bond je nanet na unutrašnju površinu kompozitnog laminata i ostavljen bez svetlosne polimerizacije. Zub smo nagrizali sa 35-procentnim rastvorom fosforne kiseline tokom 30 sekundi i isprali, zatim naneli bond na površinu zuba, osušili i polimerizirali 20 sekundi. Nakon toga dentinsku kompozitnu boju A1/B1 BRILIANT EverGlow (Coltene/Whaledent) naneli smo na površinu zuba, a gleđna boja je naneta na unutrašnju površinu Componeera, bez prekomernog pritiska, specijalnom špatulom. Kompozitna faseta je držana specijalno dizajniranim držačem (Slika 3), a zatim je adaptirana na zub pritiskom specijalnim silikonskim instrumentom. Nakon provere aplikacije fasete urađena je polimerizacija, u trajanju od 40 sekundi, i sa palatinalne i sa labijalne strane. Definitivna obrada je urađena sa fleksibilnim aluminijumskim diskovima. U cilju postizanja odgovarajuće estetike preporučuje se upotreba kompozita BRILIANT EverGlow (Coltene/Whaledent), jer odgovara boji kompozitne fasete (Slika 2 a).

DISKUSIJA

Savremena estetska stomatologija danas rešava i jednostavne i kompleksne slučajeve različitim alternativama. Pre izrade estetske restauracije potrebno je definisati indikaciju i odrediti dijagnostički cilj [13]. Ne treba se uvek odlučiti za najbolje rešenje, već treba izabrati perfektnu soluciju za svaki pojedinačan slučaj. Direktna kompozitna restauracija bi mogle biti dobar izbor za oba slučaja, međutim, mi smo se odlučili za novi kompozitni sistem zbog skraćenog vremena rada i jednostavnije tehnike

izrade. Kada uporedimo direktne restauracije, prefabrikovane kompozitne fasete imaju prednosti jer se redukuje polimerizacioni stres, smanjuje formiranje mikropukotine na spoju zuba i restauracije i eliminiše postoperativna hipersenzitivnost i mikropropuštanje [14]. Dobra adhezivna veza dva kompozita postiže se primenom mikroretentivne površine kompozitne fasete (2 nm). Kompozitni sistem Componeer (Coltene/Whaledent) izrađen je od nanohibridnog kompozita i estetsku restauraciju čini lakšom i efikasnijom, ali i funkcionalnom i ekonomičnom. Gleđne kompozitne fasete su dostupne u različitim veličinama (od malih, srednjih, velikih do ekstravelikih) i u dve različite transparentne boje ((neutralna (univerzalna) i svetla (transparentno bela)). Odgovarajućom dentinskom bojom, koja se nalazi ispod gleđnih kompozitnih faseta, mogu se kreirati različite kombinacije boja. Zbog toga što je kompozitna faseta izrađena od kompozitnog materijala ovde se mogu kreirati mamelomi na površini zuba i ako nastanu oštećenja, mogu se jednostavno restaurirati kompozitom. Klinička tehnika koja je opisana u ovim slučajevima ukazuje da se korekcija može raditi rutinski kod anteriornih zuba (korekcija malpozicioniranih zuba, dijestema i korekcija diskoloracija) [15, 16]. U ovoj kliničkoj studiji akcent je dat na primeni onih kompozitnih faseta koje daju zadovoljavajući estetski izgled i koje su prihvatljivije od tradicionalnih porcelanskih faseta.

ZAKLJUČAK

Naše kliničko iskustvo daje nam pravo da zaključimo da primena kompozitnih faseta omogućava laku i efikasnu primenu, i uz samo jednu posetu obezbeđuje kvalitetne dentalne restauracije sa odličnim estetskim rezultatima. Primena kompozitnih faseta obezbeđuje optimalnu i jednostavnu restauraciju i pruža nove opcije za funkcionalnu, ekonomičnu estetiku, koja je najveća olakšica za pacijente.

Implant retained nasal epithesis – case report

Ana Todorović¹, Igor Đorđević¹, Vitomir Konstantinović², Danica Popović¹, Vojkan Lazić¹

¹University of Belgrade, Faculty of Dental Medicine, Department of Prosthodontics, Belgrade, Serbia;

²University of Belgrade, Faculty of Dental Medicine, Department of Maxillofacial Surgery, Belgrade, Serbia

SUMMARY

Nasal defects can occur as a result of head and neck trauma, or due to partial or complete ablation or resection of the tumor in the nasal area and surroundings. Smaller defects can be reconstructed surgically while large defects are mainly reconstructed combined surgically and prosthetically.

The aim of this paper was to present prosthetic reconstruction of the nasal defect by colored vinyl polysiloxane prosthesis retained with craniofacial basal disc implants.

An adequate aesthetics and stability of the prosthesis was achieved during mandible and mimic muscles movements.

Keywords: nasal defects; craniofacial disk implants; nasal prostheses; A-silicone

INTRODUCTION

Surgical defects secondary to malignant tumors (squamous cell carcinoma or basal carcinoma), and traumatic causes can result in facial disfigurement and dysfunction. Smaller facial defects can be reconstructed surgically with microvascular flaps but larger defects need to be reconstructed combined surgically and prosthetically. Poor quality or insufficient quantity of hard and soft tissue often limits treatment options. Radiation therapy especially with higher dose (70 Gy) in the treatment of malignant tumors commonly compromises bone quality and produces significant morbidity, and its consequences are unique tissue management problems [1, 2]. Prosthetic restorations are important in the rehabilitation of such defects. However, stability and retention of nasal prosthesis can be limited due to the upper lip movement and function of mimic muscles. Retention of nasal prosthesis could be achieved through eyeglasses, skin adhesives or craniofacial implants [1].

In 1977, Branemark et al. introduced the concept of endosseous implants as anchorage for facial prosthetic devices [3]. This concept was upgraded until today and used to retain almost all facial prosthesis. These extraoral implants are shorter than the ones used intraorally, which, therefore, allow their placement in pericranial bone [3, 4, 5]. Rehabilitation of patients with bone-anchored prosthesis has several advantages over conventional methods, where use of skin adhesives is necessary for retention. Adhesives can cause skin irritation, allergic reaction, discoloration of prosthetic material, and accidental detachment [6, 7]. Another option for extraoral implantology is the use of disc implants (Basal Osseointegration Implants) via basal osseointegration in compact bone that is resistant to resorption. Advantages of these implants include cortical anchorage, ability to add more bone screws for stabilization, and

modest demand for vertical (axial) bone. In the midface area, anchorage of screw-type implants is difficult because axial bone supply is limited and only thin plates of cortical bone are present. The only locations for screw implant placement are glabella and upper (basal) alveolar crest of maxilla. If vertical or even horizontal bone dimensions are limited in the alveolar crest due to atrophy or after resection, axial implants often cannot be used [8]. The most commonly used material for producing facial prosthesis is colored methyl methacrylics or RTV (Room Vulcanisation Silicone) vinyl polysiloxane colored silicone [1].

The aim of this article was to present a clinical report of a patient who underwent facial reconstruction with nasal epithesis anchored on disk implants after ablation of midface due to the present squamous cell carcinoma.

CLINICAL CASE

A 65-year-old woman with a large nasal tumor was referred to the Clinic for Maxillofacial surgery at the Faculty of Dental Medicine, University of Belgrade. The patient stated that first observation of the slow-growing tumor happened a year before the admission for surgery. Histopathological diagnosis of squamous cell carcinoma was obtained after an incisional biopsy. When nasal pyramid was amputated and tumor entirely removed due to limited bone substance basal (disk) implants were indicated as the optimal solution. In surgical stage, basal implants (Diskos; Dr. Ihde Dental AG, Switzerland) were inserted for anchorage of the nasal prosthesis in the nasal floor and glabellar region (Figures 1, 2). The main advantage of basal (disk) implants is relatively small diameter of the vertical part (2.3 mm) and bicortical implantation technique for achieving excellent primary implant stabilization. After an unloaded osseointegration phase of 3

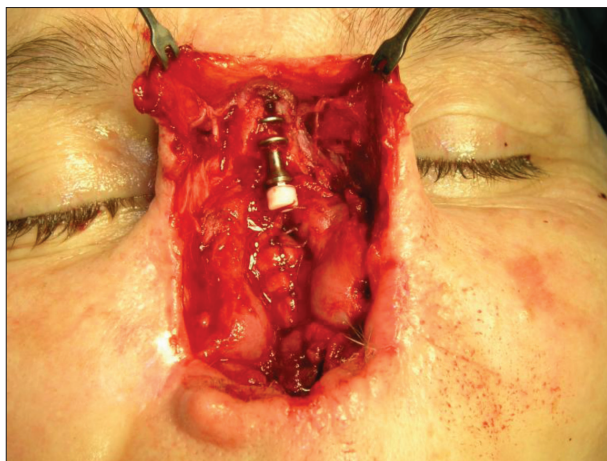


Figure 1. Surgical insertion of BOI implant in glabella region
Slika 1. Hirurška ugradnja bazalnog disk implantata u predelu glabele

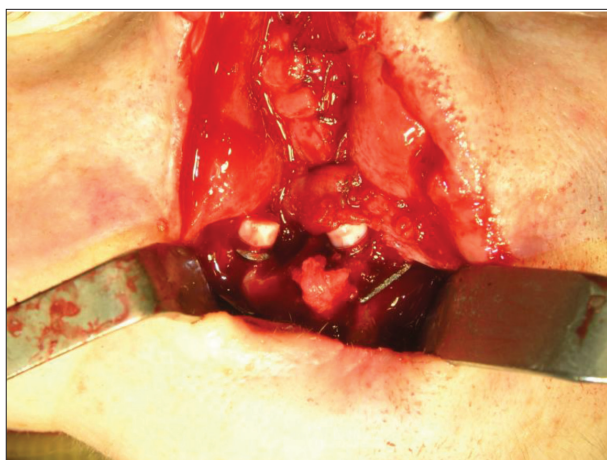


Figure 2. Surgical insertion of two BOI implants in the nasal floor
Slika 2. Hirurška ugradnja dva bazalna disk implantata u predelu poda nosa



Figure 3. Control X ray after period of osseointegration of BOI disc implants
Slika 3. Kontrolni RDG snimak oseointegracije implantata



Figure 4. Inserted implant transfers on BOI disc implants
Slika 4. Postavljeni transferi disk implantata BOI

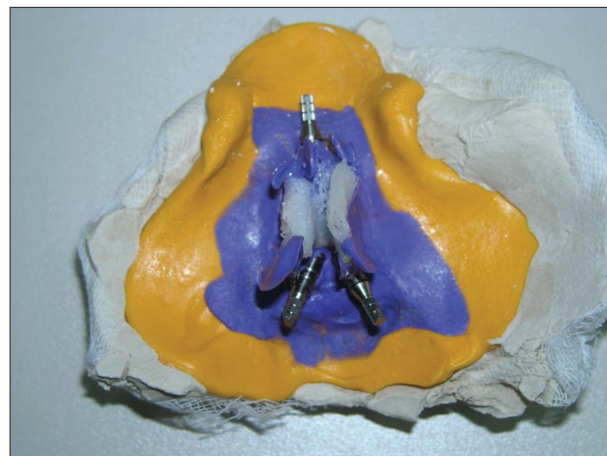


Figure 5. VPS impression with inserted implant analogues
Slika 5. Otisak VPS otisnim materijalima sa postavljenim analogima implantata

months, all implants appeared well integrated according to the radiologic criteria and clinical stability (Figure 3). At the end of the osseointegration process, the final nasal prosthesis was produced. Before taking the impression of the defect implant position transfers were placed and implant level impression taken with A-silicones (Figures 4, 5). Epithesis was anchored through Hader bars that were fabricated to provide better retention and stability of the prosthesis (Figure 6). Hader bars were casted from chromium-cobalt alloy through prefabricated plastic models (CEKA, Netherlands). Acrylic resin substructures housing with the plastic retentive clips were designed and fabricated for better support of silicone prosthesis (Figure 7). The wax sculpting of the prosthesis was prepared and evaluated on the patient, ensuring that the pattern truly restored contour and symmetry (Figure 8). Nasal prosthesis was made from A-silicone material with intrinsic and extrinsic coloration procedures (Epithetik Set; Bredent, Germany). Plastic clips on the acrylic resin substructure bars screwed on the double-plate disc implants retained the silicon nasal prosthesis. The prosthesis was finally delivered to the patient (Figure 9) and hygiene instructions provided in the usual manner. After 3, 6 and 12 months,



Figure 6. Hader bar on BOI implants
Slika 6. Postavljena prečka Hader na implantate BOI



Figure 7. Acrylic base of silicone nasal prosthesis with matrices
Slika 7. Akrilatna baza proteze nosa od silikona sa matricama

on the control visits, the patient was satisfied with aesthetic and functional characteristics of the prosthesis.

DISCUSSION

Facial prostheses can efficiently restore relatively fixed facial structures such as auricular, nasal, or upper lip prostheses. Reconstructed cheek defect by free flaps provides support, stability and retention of maxillary obturator prosthesis while obturator prosthesis on the other hand provide cheek support and allow symmetry of the middle face.

In our case, a decision was made for surgical - prosthetic treatment of nasal defect formed after ablation of complete nose pyramid due to malignant tumor. Reconstruction of large defect of the middle face was not possible with microvascular surgery procedures. The patient



Figure 8. Try in of wax sculpted nasal prosthesis
Slika 8. Voštani model proteze nosa

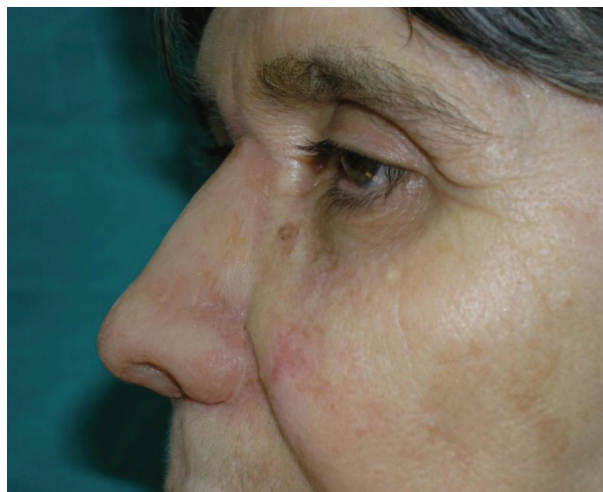


Figure 9. Implant retained silicone nasal prosthesis
Slika 9. Implantatno retinirana proteza nosa od silikona

was presented with a need for implantation of craniofacial implants in the area of glabella and the floor of the nose so that the prosthesis would optimally be retained and stabilized and then produced from RTV silicone with a thin acrylic base as suggested by Roumanas et al. [9]. That kind of prosthesis would be lighter, more aesthetic and it would not move much during oral functions [1, 2, 6, 7, 9].

Several factors should be considered when designing a retention system for facial prosthesis to avoid implant failure or complications. It is desirable to connect all implants with a rigid bar. Consequently, the stress delivered to the implants would be distributed equally among the implants. Also, the retention bars must fit in passive manner and retention system must fit within the confines of the prosthesis without affecting contour or symmetry. Retention must be sufficient to eliminate accidental dislodgement. Basal implants use cortical bone for implant anchorage. The void spaces created by the osteotomy fill with blood, which is later reorganized to become woven bone and, finally, osteonal bone. Thus, basal implants exhibit a dual integration process similar to orthopedic healing patterns after long bone fractures.

CONCLUSION

Excellent stability, retention and outstanding function and aesthetics can be achieved with surgical and prosthetic procedures in the reconstruction of middle part of the face defects by the implant retained silicone nose prosthesis. This treatment is very important for socialization of patients with visible facial defects.

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Retencija proteze nosa pomoću implantata – prikaz slučaja

Ana Todorović¹, Igor Đorđević¹, Vitomir Konstantinović², Danica Popović¹, Vojkan Lazić¹

¹Univerzitet u Beogradu, Stomatološki fakultet, Klinika za stomatološku protetiku, Beograd, Srbija;

²Univerzitet u Beogradu, Stomatološki fakultet, Klinika za maksilofacijalnu hirurgiju, Beograd, Srbija

KRATAK SADRŽAJ

Defekti nosa mogu nastati kao posledica traume glave i vrata ili usled delimične ili potpune ablacije, odnosno resekcije tumora predela nosa i okoline. Manji defekti nosa se rekonstruišu hirurški, dok se veliki defekti uglavnom rekonstruišu kombinovano, kako hirurški tako i protetski.

Cilj ovoga rada bio je da se prikaže protetska rekonstrukcija defekta nosa protezom izrađenom od vinil-polisiloksana u boji sa retencijom preko kraniofacijalnih bazalnih disk-implantata.

Ovakvom protetskom nadoknadom postignute su zadovoljavajuća estetika i stabilnost proteze pri pokretima mandibule i mimičnih mišića.

Ključne reči: defekt nosa; kraniofacijalni disk-implantati; proteza nosa; A-silikon

UVOD

Defekti nosa najčešće nastaju usled kompletne ili delimične ablacije (resekcije) tumora (planocelularni i bazocelularni karcinomi) ili kao posledica traume predela glave i vrata. Manji defekti se uglavnom rekonstruišu hirurški, putem režnjeva sa vaskularnom peteljkom, dok se veliki defekti rekonstruišu hirurški i protetski – protezama nosa. Hirurška rekonstrukcija može biti ograničena stanjem i količinom preostalog koštanog i mekog tkiva lica, odnosno velikom dozom zračenja regiona (70 Gy) kod malignih tumora i značajnim stepenom oštećenja lokalne vaskularne mreže kao posledice zračne terapije [1, 2]. Protetska rekonstrukcija defekata nosa je jedino moguće rešenje, ali može biti limitirana pokretima gornje usne, kao i funkcijom mimičnih mišića, to jest problemom retencije proteza za lice pacijenata. Retencija se može obezbediti preko okvira naočara kod proteza izrađenih od metil-metakrilata, dok se proteze lica od silikona mogu pričvrstiti ili pomoću posebnog lepka za kožu ili putem kraniofacijalnih implantata [1].

Branemark i saradnici su 1977. godine [3] predstavili koncept hirurške ugradnje implantata manjih dimenzija radi retencije aurikularne proteze. Međutim, taj koncept je unapređivan i danas se koristi veoma često prilikom hirurško-protetske rekonstrukcije defekata lica različitim nadoknadama. Ovi ekstraoralni implantati su kraći nego intraoralni i zato ih je moguće ugraditi u perikranijalnu kost [3, 4, 5].

Rehabilitacija pacijenata implantatno-nošenim protezama ima nekoliko prednosti u odnosu na kovencionalni metod, gde je neophodna upotreba adheziva za kožu radi retencije. Adhezivi mogu izazvati iritaciju kože, alergijske reakcije, diskoloraciju protetskog materijala i odvajanje proteze od kože [6, 7].

Drugu mogućnost u ekstraoralnoj implantologiji predstavlja upotreba disk-implantata (Basal Osseointegration Implants) putem bazalne oseointegracije u kompaktnu kost, koja je otporna na resorpciju. Prednosti pri postavljanju ovih implantata uključuju kortikalno sidrenje, mogućnost dodavanja više koštanih šrafova za stabilizaciju i skromne zahteve za prisustvo adekvatne vertikalne (aksijalne) dimenzije kosti. U srednjoj regiji lica sidrenje implantata tipa šrafa je otežano, jer je ograničena raspoloživost vertikalne dimenzije kosti i prisutne su samo tanke ploče kortikalne kosti. Jedine povoljne lokacije za postavljanje ekstraoralnih implantata su glabella i gornji

(bazalni) alveolarni nastavak maksile. Ako su na alveolarnom grebenu ograničene vertikalna ili čak i horizontalna dimenzija kosti zbog atrofije ili nakon resekcije, aksijalni implantati se često ne mogu upotrebiti [8].

Materijal od kojeg se najčešće izrađuju proteze lica je metil-metakrilat u boji ili RTV (Room Temperature Vulcanization Silicone) vinil-polisiloksan (silikon) u boji [1].

Cilj ovoga rada bio je da se na jednom slučaju iz kliničke prakse prikažu protetske rekonstrukcije nosa pomoću implantatno retinirane proteze nakon hirurške ablacije planocelularnog karcinoma srednjeg dela lica.

PRIKAZ SLUČAJA

Pacijentkinja 65 godina starosti, sa tumorom nosa, javila se na pregled na Kliniku za maksilofacijalnu hirurgiju Stomatološkog fakulteta Univerziteta u Beogradu. Pacijentkinja je izjavila da je prvi put primetila spororastući tumor godinu dana pre prijema na hirurgiju.

Histopatološka dijagnoza skvamocelularnog karcinoma je dobijena nakon incizione biopsije. Kada je amputirana nazalna piramida i tumor potpuno uklonjen, zbog male preostale koštane supstance indikovani su bazalni (disk) implantati kao optimalno rešenje. U istoj hirurškoj fazi bazalni implantati (Diskos; Dr. Ihde Dental AG, Switzerland) postavljeni su kao mesto sidrenja nazalne proteze na podu nosa i glabelarnom predelu (Slike 1, 2). Glavne prednosti bazalnih (disk) implantata su relativno mali dijametar vertikalnog dela (2,3 mm) i bikortikalna tehnika ugradnje, za postizanje odlične primarne implantatne stabilnosti. Posle perioda oseointegracije od tri meseca, svi implantati su bili dobro integrisani na osnovu radioloških kriterijuma i kliničke stabilnosti (Slika 3). Na kraju procesa oseointegracije izrađena je definitivna nazalna proteza. Pre uzimanja otiska defekta postavljeni su prenosnici položaja implantata i realizovan je otisak na nivou implantata adicijom silikonom (Slike 4, 5). Epiteza je usidrena pomoću prečki Hader, koje su proizvedene da obezbede bolju retenciju i stabilnost proteze (Slika 6). Prečka Hader je izlivena od legure kobalt-hrom pomoću prefabrikovanih plastičnih modela (CEKA, Netherlands). Akrilatno kućište sa plastičnim matricama za retenciju je dizajnirano i proizvedeno za bolju potporu silikonske proteze (Slika 7). Modelacija proteze u vosku je

pripremljena i evaluirana na pacijentu, kako bi se obezbedilo da model verno restauriše konturu i simetriju (Slika 8). Nazalna proteza izrađena je od adiconog silikona uz korišćenje intrinzičkih i ekstrinzičkih procedura bojenja (Epithetik Set; Bredent, Germany). Nazalna proteza od silikona je retinirana plastičnim matricama na akrilnoj substrukuri prečki ušrafljenih na disk-implantatima. Proteza je predata pacijentkinji (Slika 9) i data su joj uputstva za održavanje higijene. Nakon 3, 6 i 12 meseci, na kontrolnim pregledima, pacijentkinja je bila zadovoljna i estetskim i funkcionalnim karakteristikama proteze.

DISKUSIJA

Protezama lica se veoma efikasno restauriraju strukture koje su relativno pokretne, kao što su aurikularne, nazalne ili proteze koje nadoknađuju gornju usnu. Obraz rekonstruisan slobodnim mikrovaskularnim režnjem pruža potporu, stabilnost i retenciju maksilarne opturator proteze, dok opturacioni segment proteze, s druge strane, takođe pruža potporu rekonstruisanom obrazu i omogućuje simetričnost srednjeg facijalnog masiva. U ovom slučaju doneta je odluka za hirurško-protetsku terapiju defekta nosa nastalog posle ablacije kompletne piramide nosa sa malignim tumorom. Rekonstrukcija velikog defekta srednjeg masiva lica nije bila moguća postupcima mikrovaskularne hirurgije. Pacijentu je predočena potreba ugradnje kraniofacijalnih implantata u predelu glabele i poda nosa kako bi se proteza nosa optimalnije retinirala i stabilizovala, a tada bi mogla da se izradi

od RTV silikona sa tankom akrilatnom bazom, kako se navodi u istraživanju Roumanasa i saradnika [9]. Takva proteza bi bila lakša i ne bi se mnogo pomerala u toku oralnih funkcija, a postigla bi se i visoka estetika [1, 2, 6, 7, 9]. Nekoliko faktora treba uzeti u obzir pri dizajniranju retencionog sistema proteza u predelu lica nošenim implantatima kako bi se izbegle moguće komplikacije gubitka implantata [1]. Neophodno je povezati sve implantate pomoću rigidne konekcije tipa prečke. Posledično, stres koji prihvataju implantati će se distribuirati podjednako između implantata. Retenciona prečka mora nalegati pasivno na implantate, a retencioni sistem se mora ukopiti u okviru granica proteze bez uticaja na njene konture ili simetriju. Retencija mora biti odgovarajuća kako bi se sprečilo akcidentalno odvajanje proteze. Bazalni implantati koriste kortikalnu kost za sidrenje implantata. Prazni prostori koji nastaju posle osteotomije se pune krvlju, što kasnije postaje nezrela vlaknasta kost i konačno zrela lamelarna kost. Na taj način bazalni implantati pokazuju dvostruki proces integracije, koji je sličan ortopedskom zarastanju nakon fraktura dugih kostiju.

ZAKLJUČAK

Hirurško-protetskim postupcima rekonstrukcije defekata srednjeg masiva lica putem implantatno retiniranih proteza nosa od silikona mogu se postići odlična stabilnost, retencija, kao i izvanredna funkcija i estetika, koja je važna za socijalizaciju pacijenata sa vidljivim defektima lica.

Da li ste pažljivo čitali radove?

1. Minimalno invazivna restaurativna tehnika podrazumeva:
 - a) primenu keramičkih faseta
 - b) primenu kompozitnih faseta
 - c) primenu indirektnih ispuna
2. Veliki defekti na licu usled resekcije tumora se:
 - a) rešavaju hirurškim putem
 - b) rešavaju samo protetski
 - c) rešavaju hirurški i protetski
3. Uticaj hipomineralizacije sekutića i kutnjaka na pojavu karijesa je istraživao:
 - a) na području Sarajeva
 - b) na području Beograda
 - c) na području Banjaluke
4. Razlog neuspeha endodontskog lečenja mogu biti:
 - a) nasledni faktori
 - b) faktori vezani za ishranu
 - c) jatrogeni faktori
5. Istraživanje o strahu od stomatološke intervencije je realizovano kod:
 - a) 105 učenika uzrasta 11 i 15 godina
 - b) 105 učenika uzrasta 8 i 11 godina
 - c) 105 učenika uzrasta 13 i 17 godina
6. Retencija proteza koje rekonstruišu defekte nosa se obezbeđuje:
 - a) preko okvira naočara
 - b) preko adhezivnih sistema
 - c) preko hirurškog konca
7. Primena kompozitnih faseta omogućava:
 - a) restauraciju minimalnih preparacija na bočnim zubima
 - b) restauraciju diskoloracija frontalnih zuba
 - c) restauraciju diskoloracija bočnih zuba
8. Materijal od kojih se najčešće izrađuju proteze lica je:
 - a) kalcijum-silikat
 - b) metil-metakrilat
 - c) kompozit
9. Najčešći radiološki nalaz definitivne opturacije je bio:
 - a) preekstendirano punjenje
 - b) nehomogeno punjenje
 - c) kratko punjenje
10. Epidemiološka studija na području Republike Srpske je realizovana kod:
 - a) školske dece
 - b) predškolske dece
 - c) srednjoškolske dece
11. Direktna kompozitna faseta obezbeđuje:
 - a) jednostavniji terapijski postupak restauracije
 - b) komplikovaniji terapijski postupak restauracije
 - c) vrlo skup terapijski postupak restauracije
12. Rezultati KEP-a su bili:
 - a) značajno veći u grupi dece sa MIH-om
 - b) značajno manji u grupi dece sa MIH-om
 - c) identični u grupi dece sa MIH-om i bez MIH-a
13. Veći stepen straha kod dece osnovnih škola u Foči je uočen:
 - a) kod devojčica
 - b) kod dečaka
 - c) i kod devojčica i kod dečaka
14. Protetska rekonstrukcija defekata nosa može biti limitirana:
 - a) pokretima gornje usne
 - b) pokretima donje usne
 - c) pokretima gornje i donje usne

15. Istraživanje neuspeha endodontskog lečenja je obuhvatilo:
 - a) 79 zuba
 - b) 36 zuba
 - c) 43 zuba
16. Istraživanje odnosa između MIH-a i pojave karijesa kod osmogodišnjaka je pokazalo da:
 - a) postoji povezanost
 - b) postoji značajna povezanost
 - c) ne postoji povezanost
17. Kod neuspešnog endodontskog lečenja sa prisutnim simptomima:
 - a) postojale su promene u apeksnom parodontijumu
 - b) nisu postojale promene u apeksnom parodontijumu
 - c) promene su bile neznatnih dimenzija
18. Ugradnju manjih implantata za retenciju aurikularnih proteza predložio je:
 - a) Black
 - b) Branemark
 - c) Cantor
19. Uticaj MIH-a na stanje zdravlja školske dece je proveravan kod:
 - a) 540 dece
 - b) 640 dece
 - c) 380 dece
20. Visok nivo straha od stomatoloških intervencija kod dece osnovnih škola u Foči je imalo:
 - a) 25% dece
 - b) 33% dece
 - c) 43% dece

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Srpsko lekarsko društvo
Uredništvo časopisa „Stomatološki glasnik Srbije“
Ul. kraljice Natalije 1
11000 Beograd
Srbija

Telefon: +381 (0)11 409 27 76

E-mail: stomglas@bvcom.net

Internet-adresa: <http://www.stomglas.org.rs>

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Serbian Medical Society
Editorial Board of the Serbian Dental Journal
Ul. kraljice Natalije 1
11000 Belgrade
Serbia

Phone: +381 (0)11 409 27 76

E-mail: stomglas@bvcom.net

Web site: <http://www.stomglas.org.rs>

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