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Evaluacija parodontalnog stanja kod pacijenata nositelja metal-keramičkih i metal-akrilatnih krunica u razdoblju od jedne do pet godina

Periodontal Evaluation of Patients with Ceramic Fused-to-Metal and Acrylate Fused-to-Metal Crowns over a Period of 1 to 5 Years

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Sažetak

Svrha: U ovom radu željeli smo ispitati postoji li razlika između eksperimentalnih (nosača krunica) i kontrolnih (homologni) zuba u skupini pacijenata s metal–akrilatnim krunicama i onoj s metal–keramičkima, te ima li razlika između tih dviju vrsta krunica kad je riječ o indeksu plaka, gingivalnom i retencijskom indeksu, CPITN-u, retrakciji marginalne gingive i resorpciji kosti. Željeli smo doznati i utječe li duljina nošenja metal–akrilatnih i metal–keramičkih krunica na navedene indekse. **Ispitanici i postupci:** U istraživanje je bilo uključeno 80 pacijenata obaju spolova u dobi od 20 do 65 godina s fiksnim protetskim radovima (solo krunicama). Svi potrebni parametri dobiveni su kliničkim pregledom i analizom retroalveolarnih snimki. **Rezultati:** Dokazana je statistički znatna razlika između eksperimentalnih i kontrolnih zuba u skupini pacijenata s metal-akrilatnim krunicama za gingivalni indeks, CPITN, retencijski indeks i retrakciju marginalne gingive, a za ostale praćene indekse nije pronađena. Osim toga rezultati su pokazali da je statistički velika razlika i između eksperimentalnih te kontrolnih zuba u skupini pacijenata s metal-keramičkim krunicama za indeks plaka, gingivalni i retencijski indeks, CPITN i retrakciju marginalne gingive, a nema razlike kod resorpcije kosti. Ustanovljeno je da između metal-akrilatnih i metal-keramičkih krunica postoji statistički znatna razlika samo kao je riječ o indeksu plaka. **Zaključak:** Duljina nošenja fiksnoga protetskog rada (do pet godina) u skupini pacijenata s metal-akrilatnim krunicama utječe na indeks plaka, dubinu periodontalnog sulkusa i retrakciju marginalne gingive, a kod onih s metal-keramičkim krunicama ne djeluje na praćene indekse.

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Uvod

U genezi parodontalne bolesti pitanje etioloških čimbenika je složeno. Takva bolest nastaje kao patološka reakcija parodontalnih tkiva na vanjsku, lokalnu iritaciju, a odgovor tkiva modificiran je sistemskim stanjem organizma. Parodontalna bolest upalni je odgovor na lokalne iritacije koje se klasificiraju kao naslage na zubima i na čimbenike koji ih stvaraju (pretežni čimbenici) (1). Jatrogena oštećenja parodonta, iz skupine pretežnih čimbenika, dosta su česta tijekom izrade protetskih radova. Možemo ih podijeliti u dvije skupine:

1. oštećenja uzrokovana kliničkim postupcima kod izrade protetskih radova;
2. oštećenja uzrokovana neadekvatnim protetskim radovima.

Njihov negativan utjecaj na parodontalna tkiva je dvojak – izravno djeluju mehanički ili kemijski i oštećuju gingivu s kojom su u neposrednom kontaktu, te neizravno pridonose povećanoj akumulaciji dentalnog plaka (2).

Introduction

In terms of genesis of periodontal diseases, the role of etiological factors is a complex one. Periodontal disease appears as a pathological reaction of periodontal tissue to localized external irritation and the periodontal tissue's response is modified by the systemic state of the whole body. Periodontal disease is an inflammation caused by local irritants classified as dental plaque and factors which create them (favorizing factors),(1). As for the favorizing factors, iatrogenous complications are frequent in prosthetic work. They can be divided into two groups:

1) damage caused by clinical procedures during prosthetic work and
2) damage caused by inadequate prosthetic work.

Their negative impact on periodontal tissue is twofold: they are either mechanical or chemical, damaging the gingiva in direct contact. Indirectly, iatrogenous factors promote an increased accumulation of the dental plaque (2).

Fiksne nadogradnje moraju imati zaštitnu i preventivnu ulogu u čuvanju zdravlja svih dijelova stomatognatog sistema (3,4). Zadatak protetskih metoda liječenja jest sačuvati fini strukturalni oblik marginalnog parodonta, pa je to područje u protetskoj skrbi vrlo važno i mora mu se posvetiti velika pozornost (5). Zdrav parodont osnovna je pretpostavka za funkcionalnu vrijednost fiksnih nadomjestaka. Za sve nadogradnje vrijedi pravilo da su dobre samo ako ne djeluju štetno i funkcionalno se uklapaju u tkiva organizma (6). U literaturi se kao najčešći uzročnici neuspjeha fiksnoprotetskoga rada nakon određenog vremena navode karijes, gingivitis i parodontitis, a uzrokuju ih bakterije u gingivalnom i subgingivalnom plaku koji nastaje zbog nedovoljne higijene (7). Iako postoje mnogi indeksi za procjenu stanja parodonta, najčešće se primjenjuju sljedeći navedeni u literaturi: gingivalni indeks G.I. (Loe i Silness) (8) i CPITN (The Community Periodontal Index of Treatment Needs), a za procjenu oralne higijene indeks plaka P.I. (Silness i Loe) (8).

Krunice mogu biti izrađene od različitih materijala, a u našoj su populaciji najčešće metal–keramičke i metal–akrilatne.

Metal-keramičke nadogradnje predstavljaju standard u rekonstrukcijskoj i estetskoj stomatologiji (9). Metal, naime, daje čvrstoću, a keramika omogućuje oblikovanje prema boji i karakteristikama prirodnih zuba (9). Dentalna keramika je kemijski inertna i kao materijal iznimno biokompatibilna. Mogućnost glaziranja i postizanja visokog stupnja poliranosti nadogradnje onemogućuje retenciju hrane i dentalnog plaka (9). Dentalna keramika je dosta tvrda - tvrđa je od dentina i to joj je veliki nedostatak, jer se kod artikulacije događa abrazija prirodnih zuba. Kod uporabe keramike ima i kontraindikacija, primjerice bruksizam, dubok zagriz i ekstremno sniženi zagriz kada nema dovoljno mjesta za potrebnu debljinu keramike. Zbog osjetljivosti na udarce tim se materijalom ne treba koristiti kod pacijenata koji se bave određenim sportovima (borilačke vještine i dizanje utega itd). Veza između metala i keramike uglavnom je kemijska, pa ako takva faseta pukne, popravak je nepotpun i vrlo skup, što nije slučaj s akrilatnima kod kojih je veza između metala i akrilata uglavnom mehanička (10). Tako su neka indikacijska područja jednostavno predodređena za protetske radove s akrilatnim fasetama. Tu se u prvom redu misli na kombinirane (fiksno-mobilne) protetske radove. Vrlo se često akrilatne fasete upotrebljavaju i iz financijskih razloga, jer su znatno jeftinije u usporedbi s keramičkima, pa se stomatolozi njima koriste za fasetiranje u distalnoj regiji, posebice za vestibularne fasete. Njihov je najveći nedostatak to što nema kemijske veze između metala i akrilata.

Mnogi autori diljem svijeta bavili su se ispitivanjem parodontalnog zdravlja kod pacijenata s fiksnim protetskim radovima (od različitih materijala) koristeći se parodontalnim indeksima za svoja istraživanja (11-18).

Svrha istraživanja bila je ispitati postoji li razlika između eksperimentalnih (nosača krunica) i kontrolnih (homolognih) zuba u skupini pacijenata s metal–akrilatnim krunicama i kod onih s metal–keramičkima, te između metal–akrilatnih i metal–keramičkih krunica za indeks plaka, gingivalni i retencijski indeks, CPITN, retrakciju marginalne

Fixed prosthetics is both a protective and preventive element in preserving the health of all the parts of the stomatognatic system (3,4). The importance of prosthetic methods is in preserving the fine structural form of the marginal periodontium, which is why prosthetic care in this area requires great care and attention (5). Periodontal health is the basic precondition for the functional value of fixed prosthetics. The rule of any prosthetics is that a replacement is good only if it fits into the functional tissue with no damaging effects (6). Caries, gingivitis and parodontitis are often quoted as the most common causes of failures in fixed prosthetics after a certain period. Both these factors are caused by the bacteria in the gingival and subgingival plaque, caused by inadequate hygiene (7). Although different indices are used to assess the state of the parodontium, the most frequently cited are the gingival index – G.I. (Loe and Silness), (8) and CPITN (Community Periodontal Index of Treatment Needs), and plaque index – P.I. (Silness and Loe) (8) to asses oral hygiene.

Crowns may be made of different materials. Our patients usually opt for crowns made of two different materials, either ceramic fused-to-metal (CFM) or acrylate fused-to-metal (AFM).

CFM restorations are the standard of reconstructive and aesthetic dentistry (9). The CFM crowns are manufactured to satisfy numerous requirements for successful prosthetic therapy (9). The metal gives the system its firmness, whereas the ceramics allow for the shape and the colour of natural teeth (9). Dental ceramic is chemically inert and highly bi-compatible. The possibility for glazing it and achieving a high level of polish of such a restoration inhibits food or plaque retention (9). Dental ceramic is hard, harder than dentine – this is a shortcoming, as they abrade natural teeth in articulation. There are also counter-indications for ceramics, such as overbite, bruxism, and an extremely low underbite, which does not allow enough room for the necessary ceramic thickness. Due to its sensitivity to physical shock, it should not be used on patients active in particular sports (martial arts, weightlifting). The bond between metal and ceramics is mostly chemical, and if the ceramic veneer breaks, any repair is incomplete and very expensive. This is not the case with acrylate veneers, where the link between the metal and the acrylate is mostly mechanical (10). Thus, some cases are indicative of prosthetics with acrylate veneers. This is first of all the case in combined prosthetics (fixed and mobile). Acrylate veneers are often used due to financial reasons, as they are much cheaper than ceramics and they are thus used as veneers for distally placed crowns. Their greatest shortcoming is the absence of a chemical bond between the metal and the acrylate. Numerous authors from different regions have examined periodontal health in patients with fixed prosthetics (made of different materials), using periodontal indices for their research (11 - 18).

The purpose of this research was to examine if there is any difference between observed teeth (abutment teeth) and control teeth (homologous) in a group of patients with AFM crowns and those with CFM crowns, and between AFM and CFM crowns in relation to plaque index, gingival index, re-

gingive i resorpciju kostiju. Zatim nam je zadatak bio ispitati utječe li duljina nošenja metal–akrilatnih i metal–keramičkih krunica (do pet godina) na navedene indekse.

Ispitanici i postupci

U istraživanje je bilo uključeno 80 pacijenata (65 % žena i 35 % muškaraca) u dobi od 20 do 65 godina. Svi su imali fiksne protetske radove (solo krunice) - 40 njih s metal- keramičkim krunicama (prva skupina) i 40 s metal-akrilatnima (druga skupina). Sudionici su odabrani prema sljedećim kriterijima: pacijent je morao biti nositelj fiksnoga protetskog nadomjestka (solo krunice na premolarima) najmanje jednu godinu, rub krunice trebao je biti smješten subgingivalno i morao je za usporedbu postojati homologni (istoimeni) zub na kontralateralnoj strani, ili zub iz iste skupine zuba na kontralateralnoj strani, te zub nosač fiksnog protetskog rada i kontrolni zub u okluziji. Osim toga fiksni protetski rad nije smio biti stariji od pet godina.

Kod svakog ispitanika pregledan je jedan zub nosač solo krunice i jedan kontrolni homologni zub. Svima je bila objašnjena svrha istraživanja te su potpisali pristanak. Istraživanje je obavljeno na Katedri za stomatološku protetiku Stomatološkog fakulteta u Sarajevu.

Svi parametri istraživanja dobiveni su kliničkim pregledom i analizom retroalveolarnih snimki koje je obavljao jedan istraživač uređajem Optident Oralix 65S tip 980110032504 (snage 220V ~5A, 50/60 Hz, izlaz 65 KVp -7,5 mA; serijski broj 952381 proizveden u tvrtki Gendex dental systems, Milano, Italija). Služio se paralelnom tehnikom snimanja i koristio držačem filma, radi postizanja standardizacije film-fokus distancije. Vrijeme ekspozicije bilo je 0,32 sekunde. Retroalveolarne snimke kontrolnih zuba uzete su iz kartona pacijenata – odabrane su RTG-snimke za planiranje konzervativnog, endodontskog, parodontalnog i/ili protetskog tretmana. Kontrolni zubi nisu imali karijes, ali su većinom imali ispune na aproksimalnim površinama.Ti su ispuni bili u kontaktu s gingivom. Za klinički pregled rabilo se ravno zrcalo i stomatološka sonda, a za CPITN sonda Svjetske zdravstvene organizacije (WHO). To je graduirani uređaj za mjerenje dubine periodontalnog sulkusa s uočljivim područjem od 3,5 do 5,5 mm zbog obojenosti. Svi podaci unosili su se u karton pripremljen posebno za istraživanje, a sadržavao je više dijelova - dio za upisivanje općih podataka o pacijentu, o fiksnom protetskom radu, o stanju denticije – statusu zuba, te dio za podatke dobivene praćenjem parodontoloških indeksa i analizom retroalveolarnih snimki. Za fiksni protetski rad bilježili su se vrsta, materijal i duljina nošenja. Parodontološki status dobiven je praćenjem sljedećih parodontoloških indeksa:

1. *Indeksa PLAKA (autori Silness i Loe -(1964.)(1),*
2. *GINGIVALNOG indeksa (autori Loe i Silness - 1963.) (1),*
3. *RETENCIJSKOG indeksa (autori Bjorby i Loe) (19, 20.),*
4. *CPITN-a – zajedničkog parodontalnog indeksa potrebnih tretmana)(1),*
5. *RETRAKCIJE marginalne gingive (autor Redžepagić) (21)* za zub nosač fiksnoga protetskog rada i za kontrolni (homologni) zub.

traction index, CPITN, marginal gingival retraction and bone resorption. The next stage was to examine if the length of use of AFM and CFM crowns influence the plaque index, the gingival index, the retraction index, CPITN, marginal gingiva retraction and bone resorption.

Subjects and Procedures

The research included 80 targeted examinees patients (65% women and 35% men) aged 20 to 65, with fixed prosthetics (single crowns), 40 of them with CFM crowns (Group 1) and other 40 with AFM crowns (Group 2). The subjects were selected on the basis of the following inclusion criteria: That the patient has had fixed prosthetics (single crowns on premolars) for at least one year; That the margin of the crown is placed sub-gingivally; That there are homologous (parallel) teeth on the opposite side, or teeth of the same group on the opposite side; That the abutment tooth and the control tooth are in occlusion; That the observed fixed prosthetic appliances are not older than five years.

One abutment tooth and a homologous control tooth were assessed for each patient. The purpose of research was presented to all the participants and they provided a written consent. The research was conducted at the Prosthetic Department of the School of Dental Medicine, University of Sarajevo.

All the research parameters were obtained by clinical examination and radiographic analysis of retroalveolar images, conducted by a single researcher. Retroalveolar images were made using Optident Oralix 65S type 980110032504 (mains 220V ~ 5A, 50/60 Hz output 65 KVp – 7,5 mA; serial number 952381 manufactured from Gendex dental systems, Milano, Italy), by parallel imaging and using film holders, to achieve a standard film-focus distance. Exposure time was 0.32 seconds. Retroalveolar images of control teeth were selected from patients' files among sets of x-ray images made for planning conservative, endodontic, periodontal and/or prosthetic treatment. Control teeth were without caries and mostly with fillings on aproximal surfaces. Those fillings had contact with gingiva. Clinical examinations were done with flat mirrors and explorers, and the explorer approved by World Health Organisation was used for measuring CPITN. It is a graded explorer for measuring the depth of periodontal sulcus, with a visible 3.5-5.5 mm coloured area. All the data were noted into a patient file used for the research. The file included several segments: general patient data, data on fixed prosthetics, general dental state, and data obtained from examined periodontal indices and radiographic analyses. Fixed prosthetics data included type, material and length of use. Periodontal status was derived from continuous observation of the following periodontal indices:

1) *PLAQUE index (by Silness and Loe (1964))(1),*
2) *GINGIVAL index (by Loe and Silness (1963))(1),*
3) *RETENTION index (by Bjorby and Loe (1967))(19,20),*
4) *CPITN (Common Periodontal Index of Treatments Needed)(1),*
5) *marginal gingiva RETRACTION (by Redžepagić)(21)* for the abutment tooth and for the control (homologous) tooth.

Indeks retrakcije marginalne gingive (Redžepagić) verificira se rezultatima kako slijedi:
0: ne postoji retrakcija marginalne gingive
1: postoji retrakcija marginalne gingive na bukalnoj površini zuba
2: postoji retrakcija marginalne gingive na oralnoj površini zuba
3: postoji retrakcija marginalne gingive na aproksimalnoj površini zuba
4: postoji retrakcija marginalne gingive cirkularno.

Na retroalveolarnim snimkama eksperimentalnih i kontrolnih zuba bila je obavljena nemetrijska analiza - gledalo se postoji li resorpcija alveolarne kosti, te ako postoji, je li horizontalna ili vertikalna.

Podaci su prikazani kao frekvencija, aritmetička sredina i standardna devijacija te komparirani Fisherovim egzaktnim testom, Pearsonovim i Spermanovim koeficijentom korelacije, t – testom za neovisne uzorke za testiranje razlika u indeksu plaka i gingivalnom indeksu i CPITN-u između dviju različitih skupina pacijenata te t – testom za ovisne uzorke za testiranje razlika u indeksu plaka, gingivalnom indeksu i CPITN-u između metal-keramičkih/metal-akrilatnih krunica te kontrolnih zuba.

Rezultati

Pacijenti u obje skupine imali su između 20 i 65 godina te je prosječna dob iznosila 39 godina. Prosječna dob za skupinu s metal–akrilatnim nadogradnjama bila je 45 godina, a za onu s metal–keramičkima 33 godine.

Indeks plaka

Rezultati deskriptivne statistike o indeksu plaka prikazani su u Tablici 1.

Usporedba podataka pokazuje da je prosječna vrijednosti indeksa plaka kod pacijenata s metal-akrilatnim krunicama (0,52±0,51) bila statistički znatno veća (p=0,001) od one s metal-keramičkim krunicama (0,00±0,00) gdje uopće nije ustanovljen plak (Tablica 1-2.).

Marginal gingival retraction index by Redžepagić is verified with scores as follows:
0: no marginal retraction of gingival retraction
1: marginal retraction of gingival retraction on buccal tooth surface
2: marginal retraction of gingival retraction on oral tooth surface
3: marginal retraction of gingival retraction on aproximal tooth surface
4: circular retraction of marginal gingiva.

Retroalveolar radiographs of observed and control teeth were analysed non-metrically for the presence of alveolar bone resorption, and if present, for horizontal or vertical resorption.

Data were presented using frequencies, mean and standard deviation, and compared using Fisher exact test, Pearson and Spearman correlation coefficients, t-test for independent samples for testing differences in plaque index, gingival index and CPITN index between two different groups of patients, and t-test for dependent samples for testing differences in plaque index, gingival index and CPITN index between AFM/CFM and control teeth.

Results

Age of the patients ranged from 20 to 65 in both groups. The average age of the patients was 39 years. The average age for the AFM group was 45 and 34 for the CFM group.

Plaque Index

Results of descriptive statistics regarding plaque index are presented in Table 1. Data comparison demonstrated that the average value of the plaque index in patients with AFM crowns (0.52±0.51) was statistically higher (p=0.001) compared with patients with CFM crowns (0.00±0.00) where there was no presence of plaque established, as presented in Tables 1-2.

Tablica 1. *Frekvencija, aritmetička sredina i standardna devijacija* za indeks plaka, gingivalni indeks i CPITN, ovisno o vrsti protetskoga rada.
Table1. Frequencies (N), mean (X) and standard deviation (SD) of plaque index, gingival index and CPITN in relation to the type of prosthetics.

	Vrsta protetskoga rada • Type of prosthetics	N	X	SD
Plak indeks • Plaque index	MAK • AFM	40	.52	.51
	Kontrolni MAK • Control AFM	40	.38	.49
	MKK • CFM	40	.00	.00
	Kontrolni MKK • Control CFM	40	.38	.49
Gingivalni indeks • Gingival index	MAK • AFM	40	1.53	.72
	Kontrolni MAK • Control AFM	40	.63	.71
	MKK • CFM	40	1.45	.68
	Kontrolni MKK • Control CFM	40	.63	.84
CPITN	MAK • AFM	40	1.95	1.01
	Kontrolni MAK • Control AFM	40	1.30	1.11
	MKK • CFM	40	2.00	.96
	Kontrolni MKK • Control CFM	40	1.35	1.35

MAK –metal-akrilatne krunice • AFM – acrylate fused to metal crowns
Kontrolni MAK – kontrolni zubi kod pacijenata s metal-akrilatnim krunicama • Control AFM – control teeth in patients with AFM crowns
MKK – metal-keramičke krunice • CFM – ceramic fused to metal crowns
Kontrolni MKK – kontrolni zubi kod pacijenata s metal-keramičkim krunicama • Control CFM – control teeth in patients with CFM crowns

Tablica 2. Vrijednosti T- testa, stupanj slobode i signifikantnost
Table 2 T test values, degree of freedom and significance

Testirani indeksi • Tested index	Testirane varijable • Tested variable	T test	t	df	Sig.
PLAK INDEKS • PLAQUE INDEX	MAK – MKK • AFM – CFM	T test za nezavisne uzorke • T test for independent sample	**6.565**	39	**.001**
	MAK – kontrolni zubi • AFM – control tooth	T-test za zavisne uzorke • T test for dependent sample	**1.43**	39	**.16**
	MKK – kontrolni zubi • CFM – control tooth	T-test za zavisne uzorke • T test for dependent sample	**-4.84**	39	**.001**
GINGIVALNI INDEKS • GINGIVAL INDEX	MAK – kontrolni zubi • AFM – control tooth	T-test za zavisne uzorke • T test for dependent sample	**7.03**	39	**.001**
	MKK – kontrolni zubi • CFM – control tooth	T-test za zavisne uzorke • T test for dependent sample	**5.30**	39	**.001**
CPITN	MAK – kontrolni zubi • AFM – control tooth	T-test za zavisne uzorke • T test for dependent sample	**5,12**	39	**.001**
	MKK – kontrolni zubi • CFM – control tooth	T-test za zavisne uzorke • T test for dependent sample	**3.05**	39	**.001**

t – vrijednost T-testa • t test values; df – stupanj slobode • degree of freedom; Sig.- signifikantnost • significance
MAK –metal-akrilatne krunice • AFM – acrylate fused to metal crowns
Kontrolni MAK - kontrolni zubi kod pacijenata s metal-akrilatnim krunicama • Control AFM – control teeth in patients with AFM crowns
MKK –metal-keramičke krunice • CFM – ceramic fused to metal crowns
Kontrolni MKK – kontrolni zubi kod pacijenata s metal-keramičkim krunicama • Control CFM – control teeth in patients with CFM crowns

T-testom za ovisne uzorke ustanovljeno je da se prosječne vrijednosti indeksa plaka između metal-akrilatnih krunica i kontrolnog zuba statistički znatno ne razlikuju (p=0,16) (Tablica 2. T-test za ovisne uzorke potvrdio je da je prosječna vrijednost indeksa plaka kontrolnog zuba statistički mnogo veća (p=0,001) u usporedbi sa zubom s metal-keramičkim krunicama (Tablica 2.). Prosječna vrijednost indeksa plaka povećava se sa starošću metal-akrilatnih krunica. (Grafikon 1.)

Gingivalni indeks

Rezultati deskriptivne statistike, kad je riječ o gingivalnom indeksu, predstavljeni su u Tablici 1.

Prosječna vrijednost gingivalnog indeksa (GI-a) kod pacijenata s metal-akrilatnim (1,53±0,72) i metal-keramičkim krunicama (1,45±0,68) statistički se znatno ne razlikuju: t-test za neovisne uzorke t = 0,48, p = 0,63 (Tablica 2.).

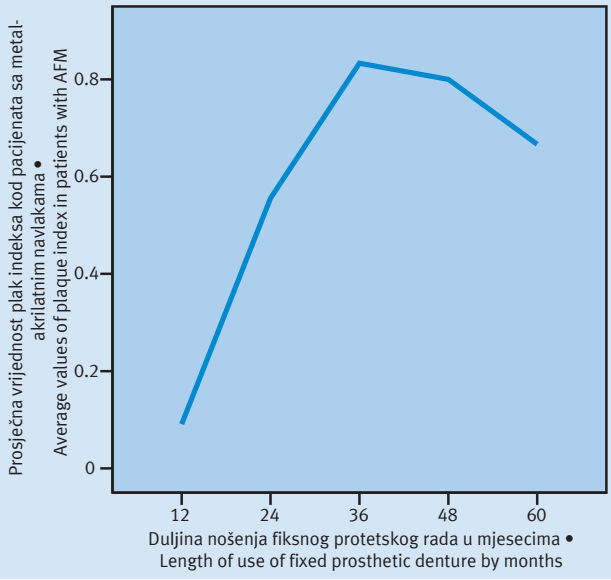
T-test for dependent samples showed that the average value of the plaque index on AFM crowns and control teeth was not significantly different (p=0.16), as presented in Table 2.

T-test for dependent samples showed that the average value of the plaque index on control teeth was statistically significantly higher (p=0.001) compared with teeth with CFM crowns, as presented in Table 2. The average value of the plaque index increased with the time of use of the AFM crowns, as shown in Figure 1.

Gingival Index

Results of descriptive statistics regarding gingival index are shown in Table 1.

The average value of the gingival index (GI) in patients with AFM crowns (1.53±0.72) and CFM crowns (1.45±0.68) do not differ with any statistical significance: T-test for independent samples t = 0.48, p = 0.63 (Table 2).



Slika 1. Kovarijacija prosječnih vrijednosti indeksa plaka kod pacijenata s metal-akrilatnim krunicama i duljine nošenja fiksnoga protetskog rada.
Figure 1 Variation in average plaque index values in patients with AFM and the length of use of the prosthetic fixture.

Tablica 3. Crosstabs-retencijski indeks ovisno o vrsti protetskoga rada
Table 3 Crosstabs-retention index in relation to the type of prosthetics

MAK • AFM			Retencijski indeks 0 • Retention index 0	Retencijski indeks 2 • Retention index 2	UKUPNO • Total
MAK/kontrolni zubi • AFM/Control tooth	MAK • AFM	Zbroj • Count	19	21	40
		% od ukupnog • % of Total	47,5%	52,5%	50,0%
	kontrolni zubi • Control tooth	Zbroj • Count	30	10	40
		% od ukupnog • % of Total	75,0%	25,0%	50,0%
UKUPNO • Total		Zbroj • Count	49	31	80
		% od ukupnog • % of Total	61,25%	38,75%	100,0%
MKK • CFM			**Retencijski indeks 0 • Retention index 0**	**Retencijski indeks 2 • Retention index 2**	**UKUPNO • Total**
MKK/kontrolni zubi • CFM/Control tooth	MKK • CFM	Zbroj • Count	20	20	40
		% od ukupnog • % of Total	50,0%	50,0%	50,0%
	kontrolni zubi • Control tooth	Zbroj • Count	36	4	40
		% od ukupnog • % of Total	90,0%	10,0%	50,0%
UKUPNO • Total		Zbroj • Count	56	24	80
		% od ukupnog • % of Total	70,0%	30,0%	100,0%

Fisherov egzaktni test za MAK i kontrolne zube P=0,02 • Fisher's exact test for AFM crowns and control teeth P=0,02
Fisherov egzaktni test za MKK i kontrolne zube P=0,0001 • Fisher's exact test for CFM crowns and control teeth P=0,0001

Tablica 4. Crosstabs-retrakcija marginalne gingive ovisno o vrsti protetskoga rada
Table 4 Crosstabs- marginal gingiva retraction in relation to the type of prosthetics

MAK • AFM			Retencijski indeks 0 • Retention index 0	Retencijski indeks 2 • Retention index 2	UKUPNO • Total
MAK/kontrolni zubi • AFM/Control tooth	MAK • AFM	Zbroj • Count	17	23	40
		% od ukupnog • % of Total	42,5%	57,5%	50,0%
	kontrolni zubi • Control tooth	Zbroj • Count	36	4	40
		% od ukupnog • % of Total	90,0%	10,0%	50,0%
UKUPNO • Total		Zbroj • Count	53	27	80
		% od ukupnog • % of Total	66,55%	33,75%	100,0%
MKK • CFM			**Retencijski indeks 0 • Retention index 0**	**Retencijski indeks 2 • Retention index 2**	**UKUPNO • Total**
MKK/kontrolni zubi • CFM/Control tooth	MKK • CFM	Zbroj • Count	15	25	40
		% od ukupnog • % of Total	37,5%	62,5%	50,0%
	kontrolni zubi • Control tooth	Zbroj • Count	38	2	40
		% od ukupnog • % of Total	95,0%	5,0%	50,0%
UKUPNO • Total		Zbroj • Count	53	27	80
		% od ukupnog • % of Total	66,25%	33,75%	100,0%

Fisherov egzaktni test za MAK i kontrolne zube P=0,00001 • Fisher's exact test for AFM crowns and control teeth P=0,000001
Fisherov egzaktni test za MKK i kontrolne zube P=0,000001 • Fisher's exact test for CFM crowns and control teeth P=0,000001

T-test za ovisne uzorke pokazao je da se prosječne vrijednosti gingivalnog indeksa statistički razlikuju između metal-akrilatnih i metal-keramičkih krunica tj. zuba nosača i kontrolnih zuba (p=0,001 za metal-akrilat-kontrolni zub i p=0,001 za metal-keramički kontrolni zub) (Tablica 2.)

Retencijski indeks

Za testiranje razlike u zastupljenosti retencijskog indeksa, ovisno o vrsti krunica, korišten je Fisherov egzaktni test, zato što su svi ispitanici imali vrijednost retencijskog indeksa 0 ili 2. Nije bilo ni jednoga s vrijednostima 1 ili 3. (Tablica 3.). Pozicija retencijskog indeksa između zuba nosača i kontrolnih zuba razlikuje se u skupini ispitanika s metal-akrilatnim krunicama (Fisherov egzaktni test za metal-akrilatne krune i kontrolne zube p=0,02) i onih s metal-keramičkima (Fisherov egzaktni test za metal-keramičke krune i kontrolne zube p=0,0001). Ali Fisherov egzaktni test pokazao je da nema statistički velike razlike između metal-akrilatnih i metal-keramičkih krunica (p=1,0).

CPITN

Prosječna vrijednost CPITN-a kod pacijenata s metal-akrilatnim krunicama (Tablica 1. - 1,95±1,01) i metal-keramičkim krunicama (2,00±0,96) statistički se znatno ne razlikuje (p =0, 82). T-test za ovisne uzorke potvrdio je da se prosječne vrijednosti CPITN-a između metal-akrilatnih krunica, tj. zuba nosača i kontrolnih zuba, statistički znatno razlikuju (p=0,001 - Tablica 2.). T-test za ovisne uzorke pokazao je da je prosječna vrijednost CPTIN-a kod zuba s metal-keramičkim krunicama statistički mnogo veća u usporedbi s kontrolnim zubom (p = 0.001; Tablica 2.).

Rezultati Pearsonove korelacije (r=0,55; p=0,001) pokazuju pozitivnu povezanost između dubine periodontalnog sulkusa i duljine nošenja metal-akrilatnih krunica. Može se reći da je prosječna vrijednost dubine periodontalnog sulkusa veća kod pacijenata koji dulje nose takve krunice (Grafikon 2.). Pearsonova korelacija nije pokazala nikakvu vezu između dubine periodontalnog sulkusa i duljine nošenja metal-keramičkih krunica.

T-test for dependent samples showed that average values of the gingival index differ significantly between AFM and CFM crowns i.e. the abutment teeth and the control teeth (p=0.001 for AFM – control teeth and p=0.001 for CFM – control teeth), as presented in Table 2.

Retention Index

To test the difference in presence of retention index according to the type of crowns, Fisher's exact test has been done, because all examinees showed the values of retention index either 0 or 2. There were no examinees with retention index values 1 or 3 (Table 3). Position of the retention index between the abutment and the control tooth differ within the AFM group (Fisher's exact test for AFM crowns and control teeth P=0,02), and within the CFM group (Fisher's exact test for CFM crowns and control teeth P=0,0001).

But, Fisher's exact test showed that there is no statistically significant difference in values of retention index between AFM and CFM crowns (p=1,0).

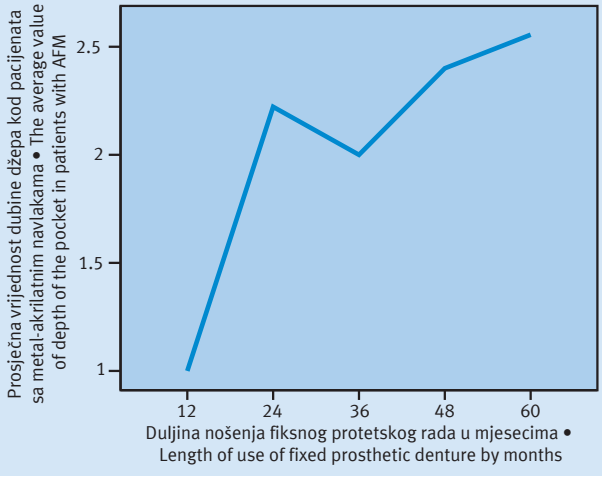
CPITN

The average value of CPITN in patients with AFM crowns (Table1, 1.95±1.01) and CFM crowns (2.00±0.96) presents no statistically significant difference (p = 0.82). T-test for dependent samples found that average values of CPITN between AFM crowns, i.e. the abutment tooth and the control tooth differ significantly (p=0.001, Table 2).

T-test for dependent samples found that the average value of CPITN for teeth with CFM crowns is statistically greater when compared with the control tooth (p=0.001, Table 2).

The results of Pearson's correlation (r=0.55p=0.001) showed a positive association between the depth of periodontal sulcus and the length of use of AFM crowns. So, it can be said that the average value of the periodontal sulcus depth is greater in patients who have had the AFM crowns for longer period of time, as shown in Figure 2.

Pearson's correlation did not show any link between periodontal sulcus depth and length of use for CFM crowns.



Slika 2. Kovarijacija prosječnih vrijednosti dubine džepa kod pacijenata s metal-akrilatnim krunicama i duljine nošenja fiksnog protetskoga rada

Figure 2 Variation of average pocket depth values in patients with AFM and length of use of prosthetic fixtures.

Tablica 4a. Vrsta retrakcije marginalne gingive (kod zuba nosača) i duljina nošenja MAK-a
Table 4a Type of gingival retraction (in observed teeth) and length of use of AFM

		nema gingivalne retrakcije • No gingival retraction	Gingivalna retrakcija • Gingival retraction	UKUPNO • Total
< 2 godine • < 2 years	Frekvencija • Frequency	14	3	17
	% između skupina • % betw. Groups	82.4%	17.7%	100.0%
> 2 godine • > 2 years	Frekvencija • Frequency	6	17	23
	% između skupina • % betw. Groups	26.0%	73.9%	100.0%
UKUPNO • Total	Frekvencija • Frequency	20	20	40
	% između skupina • % betw. Groups	50.0%	50.0%	100.0%

Fisherov egzaktni test za MAK prema duljini nošenja MAK-a i prisutnost retrakcije marginalne gingive P=0,001 •
Fisher's exact test for AFM crowns according to lenght of use of AFM and presence og gingival retraction P=0,001

Tablica 5. Crosstabs – resorpcija kosti ovisno o vrsti protetskoga rada
Table 5 Crosstabs - bone resorption in relation to the type of prosthetics

MAK • AFM			Nema resorpcije • No resorption	Resorpcija • Resorption	Ukupno • Total
MAK/kontrolni zubi • AFM/Control tooth	MAK • AFM	Zbroj • Count	16	24	40
		% od ukupnog • % of Total	20,0%	30,0%	50,0%
	kontrolni zubi • Control tooth	Zbroj • Count	22	18	40
		% od ukupnog • % of Total	27,5%	22,5%	50,0%
UKUPNO • Total		Zbroj • Count	38	42	80
		% od ukupnog • % of Total	47,5%	52,5%	100,0%
MKK • CFM			**Nema resorpcije • No resorption**	**Resorpcija • Resorption**	**Ukupno • Total**
MKK/kontrolni zubi • CFM/Control tooth	MKK • CFM	Zbroj • Count	19	21	40
		% od ukupnog • % of Total	23,8%	26,3%	50,0%
	kontrolni zubi • Control tooth	Zbroj • Count	26	14	40
		% od ukupnog • % of Total	32,5%	17,5%	50,0%
UKUPNO • Total		Zbroj • Count	45	35	80
		% od ukupnog • % of Total	56,3%	43,8%	100,0%

Fisherov egzaktni test za MAK i kontrolne zube P=0,262 • Fisher's exact test for AFM crowns and control teeth P=0,262
Fisherov egzaktni test za MKK i kontrolne zube P=0,175 • Fisher's exact test for CFM crowns and control teeth P=0,175

Retrakcija marginalne gingive

Vrsta retrakcije marginalne gingive kod pacijenata s metal-akrilatnim krunicama (nema retrakcije n=17, retrakcija marginalne gingive n=23) i s metal-keramičkima (nema retrakcije n=15, retrakcija marginalne gingive n=25) statistički se znatno ne razlikuje (Fisherov egzaktni test: p=0,8). Razlika u retrakciji marginalne gingive između zuba nosača i kontrolnih zuba kod pacijenata s metal-akrilatnim krunicama statistički je velika (Tablica 4., Fisherov egzaktni test: p=0,00001). Velika je statistička razlika i između zuba nosača i kontrolnih zuba kod pacijenata s metal-keramičkim krunicama za retrakciju marginalne gingive (Tablica 4., Fisherov egzaktni test: p=0,000001). Koeficijent Spermanove korelacije izračunat je za testiranje povezanosti retrakcije marginalne gingive i duljine nošenja metal-akrilatnih krunica. Ta je korelacija bila pozitivna kod retrakcije marginalne gingive

Marginal Gingiva Retraction

The type of marginal gingiva retraction in patients with AFM crowns (no marginal gingiva retraction n=17, marginal gingiva retraction n=23) and CFM crowns (no marginal gingiva retraction n=15, marginal gingiva retraction n=25) presents no statistically significant difference (Fisher exact test: p=0,8). The difference in marginal gingiva retraction between observed and control teeth in patients with AFM crowns presents statistically significant difference (Table 4.Fisher exact test: p=0,00001). For the difference between observed and control teeth in patients with CFM crowns there is significantly different marginal gingiva retraction (Table 4. Fisher exact test: p=0,000001).

To test association between gingival retraction and length of use of AFM, Spearman's correlation coefficient has been calculated. Spearman's correlation was positive for

zuba nosača metal-akrilatnih krunica i duljine njihova nošenja (r=0,64, p=0,01).

Relacija između duljine nošenja metal-akrilatnih krunica i retrakcije marginalne gingive prikazana je u Tablici 4a. Kako bi uspostavili smjer povezanosti, odlučili smo pacijente podijeliti u dvije skupine, prema duljini nošenja fiksnog protetskog rada, tj. na prvu skupinu (< 2 godine) i drugu skupinu (> godine). Fisherov egzaktni test obavljen je kako bi se ispitale razlike u zastupljenosti retrakcije marginalne gingive i duljine nošenja metal-akrilatnih krunica. Pokazao je da postoji statistički velika razlika u retrakciji marginalne gingive, ovisno o duljini nošenja krunica (p=0,001). Pacijenti koji su imali metal-akrilatne krunice više od dvije godine, imali su statistički mnogo više retrakcije marginalne gingive.

Resorpcija kosti

U resorpciji kosti između zuba nosača i kontrolnih zuba kod pacijenata s metal-akrilatnim krunicama nema velike statističke razlike (Tablica 5., Fisherov egzaktni test: p=0,262). Također nema statistički znatne razlike za resorpciju kosti između zuba nosača i kontrolnih zuba kod pacijenata s metal-keramičkim krunicama (Tablica 5., Fisherov egzaktni test: p=0,175). Tip resorpcije kosti kod pacijenata s metal-akrilatnim krunicama (nema resorpcije n = 16, resorpcija n = 24) i metal-keramičkih (nema resorpcije n = 19, resorpcija n = 21) statistički se znatno ne razlikuje (Fisherov egzaktni test: p==.505).

Rasprava

U literaturi se spominju mnogobrojni indeksi za procjenu oralne higijene. U ovom istraživanju je korišten indeks plaka prema Silnessu i Loeu (1964), kako bismo rezultate istraživanja mogli usporediti s rezultatima drugih autora.

Valderhaug i suradnici (22) u svojem istraživanju nisu dobili statistički veliku razliku za indeks plaka između eksperimentalnih i kontrolnih zuba, što je u skladu s ovim istraživanjem za metal-akrilatnu skupinu. Bentley i njegovi kolege (23) mjerili su indeks plaka pomoću indeksa prema Tureskom (od 1 do 5) te ustanovili stupanj 1 i 2 kao najčešći, što odgovara stupnjevima 0 i 1 prema Silnessu i Loeu. Istraživanja tih autora u skladu su s ovim istraživanjem, jer su svi pacijenti imali vrijednost 0 ili 1 za indeks plaka, što pokazuje da je razina oralne higijene kod pacijenata u istraživanju bila zadovoljavajuća. Baučić i suradnici (24) u svojem su istraživanju dobili lošije rezultate za P.I. kod metal-akrilatnih krunica, u usporedbi s punim metalnim, metal-keramičkim krunicama i nebrušenim zubima, doduše bez statističke signifikantnosti. To se ne slaže s ovim istraživanjem. Ipak, može se zaključiti da se akrilat kao gradivni materijal s godinama troši te mu površine postaju grube što pogoduje akumulaciji i retenciji dentalnog plaka. U ovom istraživanju kod pacijenata s metal–keramičkim krunicama nije ustanovljen plak, što pokazuje da je keramika u skupini materijala na koje se plak teže taloži. Ljušković i suradnici (25) ispitivali su promjene na gingivi i razinu oralne higijene 115 zuba zbrinutih fasetiranim krunicama. Kontrolnu skupinu činilo je isto toli-

marginal gingival retraction for abutment teeth with AFM crowns compared to length of use of AFM crowns (r=0,64, p=0,01).

The relation between length of use of AFM and presence of gingival retraction (present or absent) is shown in Table 4a. In order to establish the direction of that link, it was decided to divide the patients with AFM crown into two groups according to the time of use of the fixed prosthetics, i.e. group 1 (< 2 years); group 2 (> 2 years). To test the difference in presence of gingival retraction according to the length of use of AFM crowns, Fisher's exact test has been done. It showed that there is statistically significant difference in gingival retraction depending on length of use of AFM crowns (p=0,001). In patients that use AFM crowns more than two years, there is statistically significant more gingival retraction.

Bone Resorption

The difference in bone resorption between experimental and control teeth in patients with AFM crowns, presents no statistically significant difference (Table 5. Fisher exact test: p=0.262).

For the difference between experimental and control teeth in patients with CFM crowns, there is no significantly different bone resorption (Table 5. Fisher exact test: p=0.175).

The type of bone resorption in patients with AFM crowns (no resorption: n = 16; resorption: n = 24;) and CFM crowns (no resorption: n = 19; resorption: n = 21) presents no statistically significant difference (Fisher exact test: p=0.505).

Discussion

Numerous oral hygiene indices can be found in literature. However, this research used the plaque index (P.I.) according to Sillnes and Loe (1964), in order to make the results comparable to the results obtained by other authors.

In their research, Valderhaug et al. (22) found no statistically significant difference in the plaque index between teeth with crowns and control teeth, which corresponds to this research results for the AFM groups. Bentley et al. (23) measured the plaque index using the Tureski 1 to 5 index and found that values 1 and 2 (corresponding to the Silness and Loe index values of 0 and 1) were the most frequent. This corresponds to findings of this research, as all the patients presented the plaque index values of 0 to 1, thus indicating that the patients in this research maintained a satisfactory level of oral hygiene. In their research, Baučić et al. (24) found poorer results of plaque index in AFM crowns compared to full metal – crowns, metal – ceramic crowns and non – abutment teeth, although without statistical significance. That does not correspond with this research. Nevertheless, this leads to the conclusion that the acrylate wears off and its surface loses its smoothness, allowing accumulation and retention of dental plaque. In this study, no plaque was found in patients with CFM crowns, indicating that ceramic is one of the low plaque-susceptible materials. Ljušković et al. (25) examined the gingival changes and oral hygiene levels in 115 veneer-crowned teeth. The control group consisted of the same number of homologous teeth (positioned in

ko homolognih zuba (smještenih u drugoj polovici čeljusti). Krune su bile podijeljene u dvije skupine - one u funkciji do pet godina i od pet do deset. Rezultati su pokazali da je stanje gingive i oralne higijene lošije kod zuba s krunicama negoli kod kontrolnih. To je potvrđeno statistički velikom razlikom srednjih vrijednosti indeksa plaka, gingivalnog indeksa i dubine periodontalnog sulkusa između ispitivane i kontrolne skupine zuba. Duljina nošenja krunica znatno utječe na razinu oralne higijene i retrakciju gingive. To korespondira s rezultatima ovog istraživanja – naime, ustanovljeno je da se prosječna vrijednost indeksa plaka povećava prema tome koliko su dugo u ustima metal-akrilatne krunice.

Za ispitivanje stanja gingive u ovom se istraživanju rabio gingivalni indeks prema Loeu i Silnessu (1963), zbog jednostavnosti izvedbe i česte citiranosti u literaturi, te mogućnosti usporedbe s rezultatima drugih autora. Valderhaug (22) je zabilježio najveći postotak prvog stupnja za G.I., a prema Stipetiću i Ericsson je dobio slične rezultate.(7) Najveći postotak prvog stupnja gingivalnog indeksa pronašli su Stipetić i suradnici, ali je drugi stupanj zabilježen u većem postotku nego u istraživanju Valderhauga i Ericssona.(7,22) I u ovom istraživanju prosječna vrijednost G.I-a za metal-akrilat i metal-keramiku jest vrijednost jedan, ali vrijednost dva je zastupljen kod 17 pacijenata s metal-akrilatnim krunicama i kod 22 pacijenta s metal-keramičkima, što je češće nego u drugim istraživanjima. Razlog može biti različit način preparacije zuba (linijski ili poput stepenice), te neadekvatan odnos ruba krunice prema završnoj preparacijskoj granici. Kent i ostali (27) kritički su govorili o literaturi koja obrađuje djelovanje fiksnih protetskih radova na parodontalna tkiva. U većini studija zaključak je da fiksni protetski radovi mogu pridonijeti upali parodontalnog tkiva, jer povećavaju incidenciju uznapredovale gingivalne inflamacije. Statistički velike razlike vrijednosti G.I-a između restauriranih i kontrolnih zuba, ustanovljene su u gotovo svim studijama. Prema Kentovim podacima (27) srednja vrijednost G.I-a restauriranih zuba veća je od iste vrijednosti za kontrolnu skupinu. Čimbenici restauracija, kao što su rub protetskoga rada, slaba adaptacija ruba, loše konture restauracija i grubost njihovih površina, često su povezane s inflamacijom periodontalnog tkiva (27). To se slaže s rezultatima u ovom istraživanju. Može se reći da neadekvatni fiksni protetski radovi nepovoljno djeluju na zdravlje potpornog aparata zuba i važan su etiološki čimbenik u nastanku parodontalne bolesti.

Vrijednost retencijskog indeksa R.I. dva, bio je rjeđi kod kontrolnih zuba u obje skupine (metal-akrilat i metal-keramika). Statistički je bila velika razlika u vrijednostima retencijskog indeksa između pacijenata s metal-akrilatnim krunicama i kontrolnih zuba te metal-keramičkih krunica i kontrolnih zuba. Rezultate ovog istraživanja nismo mogli usporediti s rezultatima drugih autora zato što u dostupnoj literaturi nismo pronašli radove u kojima je razmatran taj indeks.

Od parodontalnih indeksa u ovom istraživanju korišten je CPITN, zato što ga preporučuje Svjetska zdravstvena organizacija. Kontrola velikoga broja varijabli, kao što su početno zdravlja parodonta, cervikalno-gingivalne pozicije završne linije, konture restauracije i adaptacija ruba restauracije protetskoga rada, od ključne su važnosti za preciznu procje-

the other half of the jaw). The crowns were divided in two groups: those that had been used for up to 5 years and those that had been used for 5 to 10 years. Results indicate that the state of the gingiva and oral hygiene levels were worse in teeth with crowns than in control teeth. This was also confirmed by statistically significant difference in mean values of the plaque index, the gingival index and the depth of periodontal sulcus between investigated and control group of teeth. Length of use of the crowns influenced significantly the level of oral hygiene and gingival retraction. That corresponds to results of this research, which found that the average (P.I.) increases with the time of use of AFM crowns.

The Loe and Stillness gingival index (G.I.) was used to assess the state of the gingiva, as it is easily applied and frequently cited, and easily comparable with results reported by other authors (19). Valderhaug (22) found the highest percentage of level 1, and Ericsson had similar results according to Stipetić. (7) The highest percentage of (G.I.) level 1 was found by Stipetić et al., but level 2 was also found to be greater than in researches of Valdehaug and Ericsson (7,22). This study also found that the average (G.I.) value for AFM and CFM was 1, but a value of 2 was found in 17 patients with AFM crowns and 22 patients with CFM crowns, which is more frequent than in other research findings. The reason may be in the different preparation procedures (linear or graded) and inadequate ratio between the edge of the crown and the final border of the preparation. Kent et al. (27) presented a critical overview of sources on effects of crowns and other fixed prosthetic appliances on periodontal tissue. Most of the studies found that crowns and fixed prosthetics may contribute to periodontal inflammations, i.e. they increase the incidence of advanced gingival inflammation. Statistically significant difference in (G.I.) values between teeth restored with crowns and control group of teeth were found in almost all the studies. As reported by Kent (27) the mean (G.I.) value in prosthetic restored teeth is greater than the value in the control group. Factors related to the prosthetic restorations such as the marginal edge of the crown, poor adaptation of the marginal edge, poor contours of the restoration and rough margins are often connected with inflammations of periodontal tissue (27). These findings correspond to our study results. It could be stated that inadequately produced fixed prosthetic appliances have negative influence on the tooth support system, and that they are important factor in the etiology of periodontal disease.

Retention index (R.I.) value of 2 was very rare in control teeth of both investigated groups (AFM and CFM). There was statistically significant difference in values of retention index between patients with AFM crowns and control teeth and CFM crowns and control teeth. This study was unable to compare its results with results of other authors, because none of the sources available considered this index.

This study used CPITN as the periodontal index, as it is recommended by the World Health Organization.

Careful control of various variables, such as initial periodontal health, cervical - gingival position of the marginal edge, restoration contours and adaptation of the crown margin are of main importance for the precise measurement

nu dubine periodontalnog sulkusa (27). Stipetić i suradnici (7) u svojem su istraživanju ustanovili da je prosječna dubina periodontalnog sulkusa na nosačima mosta bila 2,9 mm, a na homolognim zubima 2,1 mm. Postojala je statistički znatna razlika između nosača mosta i homolognih zuba koji su imali manju dubinu periodontalnog sulkusa ($p<0,01$). To korespondira s rezultatima ovog istraživanja. U ovoj studiji 13 pacijenata s metal-akrilatnim krunicama i 10 pacijenata s metal-keramičkima imali su dublje periodontalne sulkuse od 4 mm. Razlog može biti neadekvatna higijena i činjenica da fiksno-protetski radovi utječu na zube nosače, osobito ako su prije toga bile registrirane promjene na parodontu.

Retrakcija marginalne gingive prati subgingivalno postavljen rub krunice. Kod ispitivanih metal-akrilatnih krunica 57 posto zuba nosača imalo je retrakciju marginalne gingive, dok je retrakcija bila na samo 10 posto kontrolnih zuba unutar iste skupine. U skupini pacijenata s metal-keramičkim krunicama 62 posto zuba nosača i 5 posto kontrolnih imali su retrakciju marginalne gingive. Iako nije bilo znatne razlike između metal-akrilata i metal-keramike, statistički je bila velika razlika u retrakciji marginalne gingive unutar tih dviju skupina. Retrakcija marginalne gingive kod kontrolnih zuba većinom je ustanovljena na bukalnim površinama postranih zuba. Uzrok je vjerojatno nepravilna tehnika četkanja zuba. Kad je riječ o utjecaju duljine nošenja fiksnoga protetskog rada na retrakciju marginalne gingive, ustanovljena je pozitivna povezanost između duljine nošenja metal-akrilatnih kruna i retrakcije marginalne gingive tj. vrste retrakcije. Kod pacijenata koji su fiksni protetski rad nosili manje od četiri godine, nije bila pronađena cirkularna retrakcija gingive. Mogućnost za tu vrstu retrakcije povećava se ako pacijenti dulje nose metal-akrilatne krunice. Napankangas i suradnici (10) u svojem su istraživanju ustanovili retrakciju marginalne gingive nakon deset godina kod metal-keramike na 13 posto zuba nosača, što je znatno manje nego u ovom istraživanju nakon pet godina. Kod njih je većina fiksno-protetskih radova bila sa supragingivalnom lokacijom margina, pa nas ne čudi taj nizak nalaz retrakcije marginalne gingive. Stipetić i suradnici (7) ustanovili su retrakciju marginalne gingive na 23,8 posto nosača mosta nakon dvije godine. Baučić i suradnici (24) u svojem su istraživanju pronašli gingivalnu recesiju različitih stupnjeva u 50 posto slučajeva, s nižim postotkom kod metal-keramičkih radova, što se ne slaže s ovim istraživanjima. Razlog može biti neodgovarajuća debljina ruba fiksnoga protetskog rada.

Jedan od najvažnijih znakova parodontalne bolesti kod odraslih jest gubitak alveolarne kosti, što se vrlo lako može procijeniti rendgenskom snimkom. Valderhaug i suradnici (22) u svojoj studiji rađenoj 15 godina, kod subgingivalno postavljenih fiksnih protetskih radova u opservacijskom razdoblju nisu pronašli statistički velike razlike u gubitku kosti između zuba s krunicama i onih kontrolnih. U ovom istraživanju rezultati analize retroalveolarnih snimki i statističke analize za resorpciju kosti potvrđuju navedene rezultate. Baučić i suradnici (24) ispitivali su fiksne protetske radove koji su bili u usnoj šupljini pet i više godina. Oni su također pronašli resorpciju i kod zuba nosača i kod kontrolnih zuba. Mnogo je čimbenika koji utječu na resorpciju kosti i oni bi trebali biti analizirani u budućim longitudinalnim studijama.

of periodontal sulcus depth. (27) In their study, Stipetić et al. (7) found that the average depth of periodontal sulcus in bridge abutments was 2.9 mm, and 2.1.mm on homologous teeth. This difference was statistically significant between the bridge abutment and the homologous teeth, which had smaller periodontal sulcus depth ($p<0.01$). This corresponds to findings in our study. In our study 13 patients with AFM crowns and 10 patients with CFM crowns had periodontal sulcus deeper than 4 mm. The reason for that can be inadequate hygiene and the fact that fixed prosthetic appliances had great influence on abutment teeth especially if their periodontal health was previously compromised.

Retraction of marginal gingiva accompanies the subgingivally placed margin of the crown. In the group of investigated AFM crowns 57% of abutment teeth had retraction of the gingiva while there was retraction in just 10% of control teeth within same group. In the group of investigated CFM crowns 62% of the abutment teeth and 5% of control teeth had the retraction present. Although there were no considerable differences betweenAFM and CFM groups, there was statistically significant difference in marginal gingiva retraction within these two groups. In the group of control teeth, marginal gingiva retraction was found on buccal surfaces of lateral teeth. This was probably caused by inadequate brushing technique.

Considering the effect of the duration of use of fixed prosthetic appliance on the marginal gingiva retraction, a positive link was found between the length of use of AFM crowns and the type of retraction. In patients who have used fixed prosthetics for less than four years, circular retraction of the gingiva was not found. The possibility of this type of retraction increases with the time of use of AFM crowns. In their study, Napankangas et al. (10) found retraction of the marginal gingiva after 10 years of use of CFM crowns in 13% of the abutment teeth, which is considerably less than in our study after five years of use. But most of the crowns included in Napankangas et al. study had supra-gingival margins; therefore reported low values of marginal gingiva retraction are not surprising. Stipetić et al. (7) found marginal gingiva retraction in 23.8% of all bridge abutments after two years of use. Baučić et al. (24) found gingival recession of different levels in 50% of all cases, with lower percentage in CFM prosthetics, which does not correspond to this study. The reason for that finding might be in inadequate thickness of the marginal edge of the crowns investigated in this study.

An important sign of periodontal disease in adult patients is the loss of alveolar bone, which is easily assessed by radiographic examination. Valderhaug et al. (22) observed abutment teeth with sub-gingivaly placed crown cervical margins during a period of 15 years, and found no statistically significant differences in bone loss between abutment teeth and control teeth, across the study period. In this study, results of the analyses of retroalveolar radiographic images and statistical analyses of bone resorption confirmed the findings mentioned above. Baučić et al. (24) studied fixed prosthetic appliances used for five or more years. They found alveolar bone resorption in both abutment and non-abutment teeth. There are numerous factors influencing bone resorption and they should be analyzed in future longitudinal studies.

Zaključci

1. Fiksni protetski radovi utječu na parodontalno zdravlje.
2. Statistički je znatna razlika između eksperimentalnih i kontrolnih zuba u skupini pacijenata s metal-akrilatnim krunicama za gingivalni i retencijski indeks, CPITN te retrakciju marginalne gingive, a nema statistički velike razlike za indeks plaka i resorpciju kosti.
3. Statistički je znatna razlika između eksperimentalnih i kontrolnih zuba u skupini pacijenata s metal-keramičkim krunicama za indeks plaka, gingivalni i retencijski indeks, CPITN te retrakciju marginalne gingive, a nema statistički velike razlike za resorpciju kosti.
4. Statistički je znatna razlika između metal-akrilatnih i metal-keramičkih krunica za indeks plaka, a nema statistički velike razlike za gingivalni i retencijski indeks, CPITN, resorpciju kosti i retrakciju marginalne gingive.
5. Duljina nošenja fiksnog protetskog rada (do pet godina) u skupini pacijenata s metal-akrilatnim krunicama utječe na indeks plaka, dubinu gingivalnog sulkusa i retrakciju marginalne gingive. Prosječna vrijednost indeksa plaka i dubina gingivalnog sulkusa povećavaju se s duljinom nošenja metal-akrilatnih krunica. Klinički pojava cirkularne retrakcije marginalne gingive veća je kod pacijenata koji dulje nose metal-akrilatne krunice.
6. Duljina nošenja fiksnog protetskog rada (do pet godina) u skupini pacijenata s metal-keramičkim krunama ne utječe na praćene indekse.

Oba materijala za oblaganje, i akrilat i keramika, stabilni su za fiksne restauracije. Na keramiku se plak slabije taloži negoli na akrilate i tvrda zubna tkiva. Prijeko su potrebni doktrinarni, interdisciplinarni pristup, parodontalni protokol i tretman prije svake protetske terapije. Zdrav parodont osnova je za uspjeh protetske terapije. Svakih šest mjeseci nužni su kontrolni pregledi fiksnih protetskih radova, jer utječu na zdravlje parodonta i trajanje fiksnih protetskih radova.

Conclusions

1. Fixed prosthetics impact periodontal health.
2. In the group of patients with AFM crowns, there are statistically significant differences between observed teeth and control teeth in terms of gingival index, retention index, CPITN and marginal gingiva retention, whereas there are no statistically significant differences in terms of plaque index and bone resorption.
3. In the group of patients with CFM crowns, there are statistically significant differences between observed teeth and control teeth in terms of plaque index, gingival index, CPITN, retention index and marginal gingiva retraction, whereas there are no statistically significant differences in terms of bone resorption.
4. There is a statistically significant difference in the plaque index between AFM and CFM crowns, whereas there is no statistically significant difference in the gingival index, the retention index CPITN, bone resorption and marginal gingiva retraction.
5. The length of use of fixed prosthetics (under five years) in the group of patients with AFM crowns does influence the plaque index, the gingival sulcus depth and the marginal gingiva retraction. The average plaque index and the gingival sulcus depth increase their values with time of use of AFM crowns. Clinical appearance of circular retraction of the marginal gingiva is increased in patients who have AFM crowns for longer period of time.
6. The length of use of fixed prosthetics (under five years) in the group of patients with CFM crowns displayed no impact on the indices observed.

Both the acrylate and the ceramics are stable materials suitable for fixed restoration work. Ceramic is less susceptible to plaque accumulation than acrylate and even hard tooth tissue. Prosthodontic treatment should be preceded by an interdisciplinary, doctrinal approach, a periodontal protocol and treatment. A healthy periodontium is the precondition for successful prosthodontic treatment. Fixed prosthetic work should be checked every six months. Check-ups contribute to a healthy periodontium and longer life span of fixed prosthetics.

Abstract

Purpose: The purpose of this study was to examine if there is any difference between observed teeth (abutment teeth) and control teeth (homologous) in patients with acrylate fused-to-metal (AFM) crowns and those with ceramic fused-to-metal (CFM) crowns, and if there is any difference between AFM and CFM crowns in terms of plaque index, gingival index, retention index, CPITN, marginal gingiva retraction and bone resorption. The next objective was to examine if the length of use of AFM and CFM crowns bears any impact on these indices. **Material and methods:** The study included 80 patients of both sexes aged 20 to 65 with fixed prosthetics (single crowns). All the research parameters were obtained from clinical examinations and radiographic analyses. **Results** showed that in the group of patients with AFM crowns there was a statistically significant difference between observed and control teeth in terms of gingival index, CPITN, retention index and marginal gingiva retraction, whereas there was no statistically significant difference for other indices observed. Results also showed that in patients with CFM crowns there was a statistically significant difference between observed and control teeth in terms of plaque index, gingival index, CPITN, retention index and marginal gingiva retraction, whereas there was no statistically significant difference for bone resorption. A statistically significant difference was found between AFM and CFM only in terms of plaque index. **Conclusion:** The length of use of the prosthetic appliance (under five years) in the group with AFM crowns did influence the plaque index, the depth of periodontal sulcus and the marginal gingiva retraction. The length of use of fixed prosthetic appliances (under five years) in the group with CFM crowns did not influence the indices observed.

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Key words
Metal Ceramic Alloys; Composite Resins; Dental Plaque Index, Alveolar Bone

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