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## UTICAJ NEPRAVILNIH APROKSIMALNIH ZUBNIH ISPUNA NA STANJE PARODONCIJUMA

### EFFECT OF IRREGULAR INTERPROXIMAL DENTAL RESTORATIONS ON PERIODONTAL STATUS

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#### Sažetak

**Uvod.** Ispitivanje uticaja nepravilnih zubnih ispuna na potporni aparat zuba i proučavanje nastanka i toka promena u strukturi tkiva je relativno slabo ispitivana tema.

**Cilj** ove studije bio je da se na određenoj grupi pacijenata, različitog uzrasta i pola, klinički i rendgenološki procene promene u parodontijumu nastale usled nepravilnih aproksimalnih zubnih restauracija.

**Materijal i metode.** Nepravilnosti koje su bile obuhvaćene u ovom istraživanju podeljene su u dve grupe: a) zjap (pukotine), koji nastaje između zubnog ispuna i gingivalnog zida kod kaviteta II klase; b) prominiranje zubnih ispuna izvan anatomske sfere zuba, pri čemu nastaje pozitivan stepenik u gingivalnoj trećini kod kaviteta II klase. Ispitivanje je bazirano na tome da li kod određenog oblika nepravilnosti zubnog ispuna ima razlike u stepenu promena na parodontijumu u zavisnosti od materijala od koga je izrađen ispun, a kao materijali su korišćeni kompozitni ispuni i amalgami.

**Rezultati** ovog istraživanja pokazuju da nepravilni zubni ispuni značajno utiču na zapaljensku reakciju u parodontijumu. Nepravilnosti u obliku zjapa prouzrokuju veće promene u parodontijumu. Kompozitni ispuni izazivaju veći stepen zapaljenske reakcije u odnosu na amalgamske ispune.

**Zaključak.** Nepravilni ispuni izazivaju oštećenje parodontalnog tkiva.

**Cljučne reči:** Nepravilni zubni ispuni, zapaljenje parodontijuma

#### Abstract

**Introduction.** Research of effects that irregular interproximal dental restoration have on supporting structures of the teeth and examination of evolution and course of changes in tissue structure is quite a poorly studied topic.

**Aim** of this study is to examine and assess clinical and radiological changes in periodontal tissue caused by irregular interproximal dental restoration in particular group of patients with different age and sex.

**Methods.** Irregularities which were assessed in this study are divided into two groups: a) gap (cracks) occurring between dental restorations and the gingival walls in Class II cavities, b) prominence of dental fillings out of the teeth anatomical sphere, resulting with the positive step in gum third of tooth in Class II cavities. The study was based on whether in the particular forms of irregularities of the dental restorations are differences in the degree of change in the periodontal tissue, depending on the material from which the restoration is made, and the materials used were composite fillings and amalgams.

**Results** of this study show that irregular dental fillings significantly affect the inflammatory response in periodontal tissue. Irregularities in the form of unfilled space cause major changes in periodontal tissue. Composite fillings cause a higher degree of inflammation in relation to amalgam fillings.

**Conclusion.** Improper tooth fillings cause periodontal tissue damages.

**Key words:** irregular dental fillings, inflammation of periodontal tissue.

#### Uvod

Loši zubni ispuni mogu da oštete parodontijum direktnim pritiskom na tkiva i he-

#### Introduction

Poor dental fillings could damage the periodontal tissue by making immediate pressure on

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mijskim dejstvom. Oni utiču na samočišćenje i održavanje higijene usne duplje i favorizuju nagomilavanje dentalnog plaka. Mogu da dovedu zube u traumatski odnos, što uz dejstvo dentalnog plaka prouzrokuje oštećenje parodonticijuma.

Zbog veoma ograničenog prostora za rad i otežanog pristupa instrumenata u interdentalni prostor, često dolazi do nemogućnosti pravilnog oblikovanja aproksimalnog dela zubnog ispuna<sup>1</sup>. Otežano je i samo finiranje i poliranje ispuna. Jedna od nepravilnosti koja može nastati pri postavljanju ispuna je pojava mikropukotine između materijala i zidova kaviteta. Druga nepravilnost koja se često javlja je prominiranje ispuna iznad anatomske sfere zuba, što omogućava brže i obilnije nakupljanje dentalnog plaka<sup>2</sup>. Dentalni plak stvara perzistirajuću inflamaciju gingive, koja vremenom prelazi u parodontopatiju. Inflamacija sa gingive se širi dublje u parodonticijum kroz vaskularni kanal smešten u interdentalnom koštanom septumu. Dalje se inflamacija širi i dospeva u parodonticijum<sup>3-5</sup>.

Nakon restauracije aproksimalnih kaviteta, kod kojih se gingivalni stepenik formira subgingivalno, dolazi do oštećenja epitela gingivalnog sulkusa i subepitelnog vezivnog tkiva. Ta oštećenja nastaju, jednim delom, zbog direktnog iritativnog delovanja materijala, a drugim, zbog neadekvatno postavljenog definitivnog ispuna<sup>6,7</sup>.

Amalgamski ispuni, kao najstariji ispuni za definitivno zatvaranje zuba, još uvek zauzimaju značajno mesto u stomatološkoj praksi. Kad ispun prominira iznad anatomske sfere zuba, na aproksimalnoj površini zuba, u subgingivalnom delu dolazi do iritacije gingive i njene inflamacije. Na tom mestu dolazi do povećanog nakupljanja dentalnog plaka i delova hrane, koji u prisustvu mikroorganizama pojačavaju zapaljensku reakciju. Ekspanzija amalgama je proces koji se može smatrati normalnim, ali ukoliko je ona izražena u velikoj meri, dolazi do prominiranja ispuna. Ekspanzija amalgama može biti primarna, koja nastaje nakon kondenzacije amalgama u kavitet i traje do 24 časa i sekundarna, koja se tumači na taj način što cink iz amalgama reaguje sa vodonik-peroksidom, koji se stvara iz pljuvačke, krvi ili vlage, koja može doći u kontakt sa amalgamom još u toku

the tissue and by their chemical effect as well. They influence the self-cleaning and hygiene of the oral cavity and favor accumulation of dental plaque. They can result in traumatic occlusion, which associated with the dental plaque causes periodontal tissue damage. Due to very limited space to work and difficult access to tools to the interdental space, it very often leads to improper design of interproximal dental fillings<sup>1</sup>. Finishing and polishing surface of filling material treatment is also difficult. One of the irregularities that can occur when placing the restoration is the appearance of micro-gap between the material and cavity walls. Another irregularity that often arises is prominence of dental filling over the anatomical sphere of teeth, which enables faster and more abundant accumulation of dental plaque<sup>2</sup>. Dental plaque creates a persistent gingival inflammation, which eventually turns into periodontal disease. Inflammation of the gums spreads deeper into the periodontal tissue through the vascular-tubular channel located in the interdental bone septum. Further inflammation spreads and affects the periodontal tissue<sup>3-5</sup>.

After restoration of proximal cavities, in which the gingival step is being formed subgingivally, the epithelium of the gingival sulcus and subepithelial connective tissue is becoming damaged. These defects arise partly because of direct irritating effect of filling material, and secondly due to inadequate definitive restoration<sup>6,7</sup>.

The amalgam fillings as the oldest fillings for the definitive restoration of the teeth still have an important place in restorative dentistry. When dental filling is prominent above the anatomical sphere of teeth on the proximal surface of the teeth, the gum in the subgingival area is being irritated and inflamed. At this location there is increased accumulation of dental plaque and food components which in the presence of microorganisms enhances inflammatory reaction. The expansion of the amalgam is process that can be considered normal, but if it is expressed widely, the dental filling can become prominent. Process of expanding amalgam filling may be primary, and it occurs after condensation of amalgam in the cavity and lasts up to 24 hours and secondary, which is interpreted in a manner that zinc from amalgam reacts with hydrogen peroxide, which is originated from saliva, blood or moisture which can get in contact with the amalgam during its preparation. One molecule of H<sub>2</sub>O<sub>2</sub> binds to zinc and the

pripreme. Jedan molekul  $H_2O_2$  vezuje se za cink a drugi se oslobađa i na taj način dolazi do bubrenja amalgama<sup>8</sup>. Ova sekundarna ekspanzija može trajati i do osam nedelja. Zbog toga je neophodno izbeći kontaminaciju amalgama vlagom. Biohemijski, srebro i živa mogu igrati ulogu moćnog enzimskog inhibitora. Živa u interakciji sa sulfhidrilnim i disulfhidrilnim grupama, negativno utiče na funkciju enzima. Ispitivanjem dejstva amalgamskih produkata na humane ćelije, utvrđeno je da su koncentracije jona od  $10^{-4}$  do  $10^{-6}$  M, oslobođenih kod korozijske zubnog amalgama, izazivale štetna dejstva na gingivalne fibroblaste, kada se gaje u kulturi tkiva. Rezultati ukazuju da su produkti korozijske amalgama sposobni da izazovu oštećenje ćelija<sup>9,10</sup>.

Toksičnost kompozita uslovno se može podeliti na direktnu, prouzrokovanu hemijskim dejstvom monomera i indirektnu, koja nastaje zbog pojave zjapa i prodiranja mikroorganizama u taj zjap, a dalje, pod njihovim uticajem i uticajem njihovih enzima, do oštećenja mekih tkiva<sup>11,12</sup>.

Organska komponenta, bez obzira na svoju hemijsku prirodu, odgovorna je za većinu nedostataka kompozita:

- retrakciju pri polimerizaciji, što ima za posledicu odvajanje zidova kaviteta i stvaranje mikropukotina,
- visok srepen termičke ekspanzije, što takođe doprinosi prethodno opisanoj pojavi,
- poroznost, koja smanjuje mehaničku otpornost kompozita,
- adsorpciju vode, koja uslovljava sekundarnu volumetrijsku ekspanziju.

Primenom najnovijih dentin-adheziva smanjuje se kontrakciona pukotina između kompozita i zubnog tkiva, čime se smanjuje mikroproticanje i mogućnost nastanka sekundarnog karijesa<sup>13,14</sup>.

### **Cilj rada**

Cilj ovog istraživanja bio je da se klinički i rendgenografski verifikuju postojeće nepravilnosti ispuna i da se odredi distribucija oblika nepravilnosti kod amalgamskih i kompozitnih

second one is being released and thus leads to amalgam swelling<sup>8</sup>. This secondary expansion can last up to eight weeks. Therefore, it is necessary to avoid contamination of amalgam with the moisture. Biochemically silver and mercury may play a role of the powerful enzymes inhibitors.

Mercury interaction with sulfhydryl groups and disulfhidrilyl groups negatively affects the function of enzymes. Examining the effects of amalgam products on human cells showed that the ion concentration of  $10^{-4}$  to  $10^{-6}$  M, released during corrosion process of dental amalgam, caused adverse effects on gingival fibroblasts, when grown in tissue culture. The results suggest that amalgam corrosion products are able to cause damage to cells<sup>9,10</sup>.

The toxicity of the composite could conditionally be divided into direct, caused by chemical influence of monomer and indirect, which occurs due to the appearance of unfilled space and penetration of microorganisms in that gap, and further under their influence and impact of their enzymes the soft tissues damage occurs<sup>11, 12</sup>.

Organic component, regardless of its chemical nature is responsible for most of the shortcomings of composites:

- retraction during polymerization, which results in separation of cavity walls and formation of micro-gaps,
- high percent of thermal expansion, which also contributes to the presence of above described occurrence,
- porosity, which reduces the mechanical strength of composites,
- adsorption of water causes secondary volumetric expansion.

By applying the latest dentin-bonding agents, the contraction cracks between composites and tooth structure are reduced which further diminishes the possibility of microleakage and secondary caries<sup>13, 14</sup>.

### **Aim**

The objective of this study was to verify clinical and radiological existing irregularities of the restorations and to determine the distribution of irregularities in amalgam and composite restorations as well as, to determine the degree

ispuna i da se u zavisnosti od tih promena utvrdi stepen promena na parodontalnim tkivima.

### ***Materijal i metode rada***

Ispitivanje je izvršeno na Stomatološkom odseku Medicinskog fakulteta Priština sa sedištem u Kosovskoj Mitrovici.

U ispitivanje su uključene samo zdrave osobe koje su imale potpuno ili delimično očuvane zubne nizove, sa normalnim morfološkim strukturama gingivalnog tkiva i koje su imale jedan ili više nepravilnih amalgamskih ili kompozitnih aproksimalnih ispuna II klase.

Ukupan broj pregledanih zuba sa neadekvatnim ispunom bio je 120, od toga je 58 (48,33%) zuba bilo restaurirano amalgamom, dok su 62 (51,67%) ispuna bila izrađena od kompozita. Broj amalgamskih i kompozitnih ispuna bio je približan što omogućava pravilno sagledavanje uticaja tipa ispuna na proučavane nepravilnosti.

Nepravilnosti aproksimalnih ispuna klasifikovane su u dve grupe:

1. nepravilnost u obliku pukotine ili zjapa na gingivalnom zidu (prostor između gingivalnog zida i ispuna, koji ukazuje na nepravilno rubno zatvaranje) i

2. nepravilnost u obliku stepenika na gingivalnom zidu (kada ispun prominira van anatomske sfere krunice zuba).

### ***Stanje parodonticijuma***

Sondiranje dubine gingivalnog sulkusa (džepa) vršena je Willams graduisanom sondom. Sondirane su mezijalne i distalne površine zuba, na kojima je ustanovljena neadekvatna restauracija intimno uz zub, bez pritiska.

Za stanje gingive u predelu zuba sa nepravilnim ispunom korišćen je gingivalni indeks po Lou-Silnesu<sup>15-17</sup>.

Udaljenost od apeksa do glednocementne granice i udaljenost od apeksa zuba do vrha interdentalnog septuma analizirana je na urađenim retroalveolarnim snimcima. Merenje je vršeno ortodontskim šestarom a vrednosti izražene u mm (slika 1). Izračunavanjem razlike ove dve vrednosti dobijen je stepen koštane resorpcije. Merenje je vršeno sa mezijalne i distalne strane zuba, na strani sa nepravilnim

of changes in the periodontal tissues depending on these changes.

### ***Material and methods***

The research was conducted at the Dental Department of Faculty of Medicine Priština, temporarily seated in Kosovska Mitrovica.

The study included only healthy subjects (persons) who had complete or partial preserved dental arches with normal morphological structures of gingival tissue and who had one or more irregular amalgam or composite fillings of restorated class II of cavities.

The total number of teeth with inadequate restorations was 120 of which 58 (48.33%) teeth were bio-restored with amalgam, and 62 (51.67%) restorations were made of composites. The number of amalgam and composite restorations was approximate allowing proper consideration of influence of the type of tooth filling on studied irregularities.

Irregularities in interproximal restorations were classified into two groups:

1. irregularity in the form of gaps/cracks on the gingival wall (the space between the gingival wall and filling referring to improper marginal closing),

2. irregularity in the shape of the step on the gingival wall (prominence of dental filling out of the anatomical sphere of tooth crown).

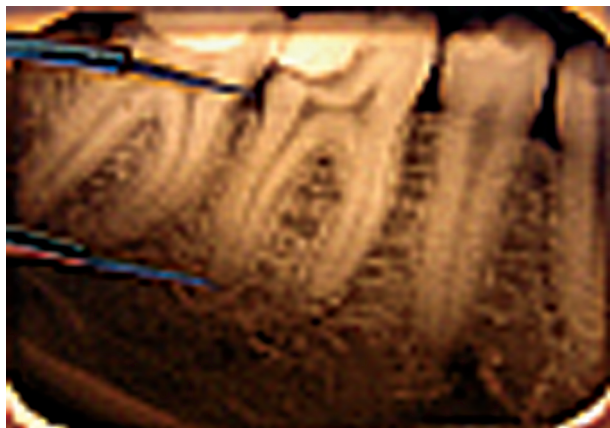
### ***Periodontal condition***

Probing depth of gingival sulcus (pocket) was performed with Willams graduated probe. Probing was performed intimately with the tooth without pressure on the mesial and distal surfaces of teeth, and inadequate restoration was found.

The gingival index according to Lou-Silnesu was used to establish the state of the gingiva in the area with irregular tooth filling<sup>15-17</sup>.

Distance from the apex to cemento-enamel junction border and distance from the apex of the tooth to the top of the interdental septum were analyzed on retro alveolar X-Rays. The measurement was done with orthodontic gauge and values were expressed in mm (Figure 1). By calculating the difference of the two values the degree of bone resorption was obtained. The measurement was performed on mesial and





Slika 1. Način merenja vrednosti potrebnih za ispitivanje.  
Figure 1. The way of measuring values required for testing

ispunom i na intaktnoj aproksimalnoj strani i ove dve vrednosti su međusobno upoređivane.

## Rezultati

Ispitivanje je izvršeno na 80 pacijenata oba pola, prosečne starosti  $34,57 \pm 8,21$  godina, u rasponu od 21 do 49 godina. Koeficijent varijacije od 23,76 ukazuje na homogenost uzorka u pogledu starosti.

U ispitivanom uzorku bila je 61 (50,83%) nepravilnost ispuna u obliku pozitivnog stepenika, kao i 59 (49,17%) nepravilnosti u obliku zjapa (pukotine) na gingivalnom zidu.

Dubina gingivalnog sulkusa-džepa određivana je na strani ispuna i aproksimalnoj strani zuba sa neispravnim ispunom. Na strani nepravilnog aproksimalnog ispuna srednja vrednost je iznosila  $3,51 \pm 0,68$  (u opsegu od 2 do 7mm, sa koeficijentom varijacije od 19,49), a na intaktnoj aproksimalnoj strani  $2,03 \pm 0,58$  (u opsegu od 1,6 do 6mm, sa koeficijentom varijacije 27,12), (Tabela 1.)

(t-test=16,938,  $p < 0,001$ )

Studentovim t-testom utvrđeno je da je prosečna dubina gingivalnog sulkusa na strani nepravilnog ispuna statistički značajno veća u odnosu na dubinu gingivalnog sulkusa na intaktnoj aproksimalnoj strani zuba ( $p < 0,001$ ).

Prosečna vrednost dubine gingivalnog sulkusa na strani ispuna bila je statistički značajno veća kod kompozitnih u odnosu na amalgamske ispune ( $p < 0,01$ ), dok su na intaktnoj aproksimalnoj strani prosečne vrednosti bile približno iste (Tabela 2.).

Prosečna vrednost dubine gingivalnog sulkusa na strani nepravilnog aproksimalnog

distal sides of teeth on the side of the improper filling and the intact proximal side and the two values were compared with each other.

## Results

The research was performed on 80 patients, with an average age of  $34.57 \pm 8.21$  years, ranging from 21 to 49 years. Coefficient variation of 23.76 points shows homogeneity of the sample in terms of age.

In the research sample, the total number of 61 (50.83%) irregular fillings in the form of positive steps was noticed, and 59 (49.17%) irregularities in the form of unfilled space (gap) on the gingival wall.

The depth of the gingival sulcus-pocket was determined on the side where the filling was and on the proximal side of the teeth with irregular restorations. On the side of an irregular proximal restorations the mean value was  $3.51 \pm 0.68$  (ranging from 2 to 7mm, with a coefficient of variation of 19.49), and the intact proximal side of  $2.03 \pm 0.58$  (range from 1.6 to 6 mm, with a coefficient of variation 27.12 (Table 1).

(t-test=16,938;  $p < 0,001$ )

Student t-test showed that the average depth of the gingival sulcus on the side of an irregular filling was significantly statistically higher compared to the depth of the gingival sulcus in intact proximal side of the tooth ( $p < 0,001$ ).

The average value of the depth of the gingival sulcus on the side where restoration was placed was significantly higher on the side with composite fillings compared with side with amalgam fillings ( $p < 0.01$ ). On intact interproximal side there was no significant difference. (Table 2).

The average value of the depth of the gingival sulcus on the side with irregular filling was significantly higher compared to unfilled space at the gingival wall to irregularities in the form of positive steps ( $p < 0.01$ ). On the interproximal side there was no stastically significant difference (Table 3).

The most common grade of gingival sulcus index (60%) was the change of color and gingival bleeding on pressure. One quarter of the teeth (25%) with irregular interproximal

*Tabela 1. Dubina gingivalnog sulkusa zuba sa nepravilnim ispunom (mm)*  
*Table 1. The depth of the gingival sulcus of teeth with irregular filling (mm)*

Dubina gingivalnog sulkusa zuba sa nepravilnim ispunom The depth of the gingival sulcus of teeth with irregular filling (mm)	n	X	SD	Cv
na strani ispuna On the side where the tooth filling is placed	120	3,51	0,68	19,49
Na intaktnoj aproksimalnoj strani On the intact interproximal side	120	2,03	0,58	27,12

*Tabela 2. Dubina gingivalnog sulkusa (mm) kod zuba sa nepravilnim ispunima u odnosu na vrstu ispuna*  
*Table 2. The depth of the gingival sulcus (mm) of the teeth with irregular fillings in relation to the type of restoration*

Dubina gingivalnog sulkusa zuba sa nepravilnim ispunima The depth of gingival sulcus of the teeth with irregular tooth fillings	Tip ispuna Type of tooth filling								T-test	p
	Amalgamski Amalgam filling				Kompozitni Composite filling					
	n	X	SD	Cv	n	X	SD	Cv		
na aproksimalnoj strani sa ispunom On the interproximal side where the tooth filling is placed	58	3,34	0,76	22,62	62	3,67	0,57	15,57	2,705	0,0078
na intaktnoj aproksimalnoj strani On the intact interproximal side	58	2,16	0,74	34,16	62	2,1	0,38	17,86	0,538	0,5915

ispuna bila je statistički značajno veća kod zjapa na gingivalnom zidu nego kod nepravilnosti u obliku pozitivnog stepenika ( $p < 0,01$ ). Na aproksimalnoj strani nema statistički značajnih razlika. (Tabela 3.).

Najzastupljenija ocena gingivanog indeksa (preko 60%) bila je promena boje i krvarenje gingive na pritisak. Jedna četvrtina zuba (25%) sa nepravilnim aproksimalnim ispunom je pokazala samo promenu boje na okolnoj gingivi, dok je spontano krvarenje gingive zabeleženo kod 12,5% zuba sa nepravilnim ispunom (Tabela 4.).

Nepravilni aproksimalni kompozitni ispuni statistički značajno češće rezultiraju gingivalnim indeksom čija su obeležja sve promene na gingivi i spontano krvarenje, dok je za amalgamske ispune karakteristična samo promena boje gingive zuba sa ispunom. Stoga se na osnovu tabele kontigencije 3x2 i vrednosti

restoration showed just a change of the color of the surrounding gingiva, while spontaneously gingival bleeding occurred in 12.5% of teeth with irregular tooth fillings. (Table 4).

Statistically, irregular composite proximal fillings more often result in gingival index, hallmarked with all changes in the gingiva and spontaneous bleeding, while the amalgam fillings are hallmarked with the change of color of gingive surrounding the tooth with restoration. Therefore, based on contingency tables 3x2, and  $\chi^2$  value of the test performed (7.53) the statistically significant difference between the gingival index of teeth with irregular composite and amalgam fillings ( $p < 0,05$ ) can be shown.

Composite fillings often as subjective symptoms have a feeling of burning and itching than is the case with amalgam, which often have as a subjective symptoms the feeling of foreign

*Tabela 3. Dubina gingivalnog sulkusa (mm) kod zuba sa nepravilnim ispunima u odnosu na oblik nepravilnosti*  
*Table 3. The depth of the gingival sulcus (mm) in the teeth with irregular fillings in relation to the form of irregularities*

Dubina gingivalnog sulkusa zuba sa nepravilnim ispunama The depth of the gingival sulcus of teeth with irregular tooth fillings	Oblik nepravilnosti ispuna Shape of irregularity								T-test	p
	Pozitivni stepenik Positive step				Zjap na gingivalnom zidu Gaps on the gingival wall					
	n	X	SD	Cv	n	X	SD	Cv		
na strani ispuna on the side of the filling	59	3,33	0,60	17,89	61	3,69	0,72	19,61	2,942	0,0039
na intaktnoj aproksimalnoj strani the intact proximal side	59	2,13	0,62	29,26	61	2,12	0,53	25,11	0,056	0,9555

$\chi^2$  testa (7,53) pokazuje statistički značajna razlika gingivalnih indeksa između zuba sa nepravilnim kompozitnim i amalgamskim ispunima ( $p < 0,05$ ).

Kompozitni ispuni češće kao subjektivne tegobe daju osećaj žarenja i peckanja nego što je to slučaj kod amalgama, koji češće kao subjektivnu tegobu daju osećaj stranog tela između zuba, međutim, statistički značajne razlike u zastupljenosti subjektivnih tegoba između ovih vrsta ispuna nisu utvrđene (Tabela 5.).

Stepen koštane resorpcije iznosio je od 1 do 5mm, sa prosečnom vrednošću 2,58 (sa koeficijentom varijacije od 27,76) što govori o homogenosti uzorka zuba sa nepravilnim zubnim ispunama po pitanju razlike stepena koštane resorpcije.

Stepen koštane resorpcije bio je značajno veći kod pacijenata sa kompozitnim ispunima ( $p < 0,001$ ) u odnosu na pacijente koji su imali amalgamske ispune. Pri ovome su koeficijenti varijacije ispod 30 što govori o homogenosti poduzoraka formiranih na bazi tipa ispuna (Tabela 6.).

## Diskusija

Rezultati istraživanja nedvosmisleno ukazuju na negativni uticaj nepravilnih ispuna na stanje parodontijuma. Ovako izazvane promene vremenom prelaze u još teže oblike zapaljenja, koja na kraju prouzrokuju i gubitak zuba. Oboljenja parodontijuma predstavljaju veliki problem u kliničkoj praksi zbog učestalosti, kompleksnosti etiopatogeneze i

body presence between the teeth, however, statistically significant differences in subjective symptoms between these types of restorations were not established. (Table 5).

The degree of bone resorption ranged from 1 to 5 mm, with an average 2.58 (the coefficient of variation of 27.76) which indicates the homogeneity of the sample teeth with irregular dental fillings in terms of degree of difference of bone resorption.

Irregular composite fillings showed statistically significantly higher average values in the degree of bone resorption ( $p < 0,001$ ) compared to amalgam. The coefficients of variation were below 30, which indicated the homogeneity of subsamples formed on the basis of the type of fillings. (Table 6).

## Discussion

The research results clearly indicate the negative impact of irregular tooth fillings on the condition of periodontal tissue. Such induced changes over time turn into more serious forms of arthritis, which ultimately cause the loss of teeth. Periodontal diseases are a major problem in clinical practice because of the frequency, complexity etiopathogenesis and their consequences<sup>18-20, 22-25</sup>. In the research sample, the total number of 61 (50.83%) irregular fillings in the form of positive steps were noticed, and 59 (49.17%) irregularities in the form of unfilled space (gap) on the gingival wall. This speaks of an almost identical

Tabela 4. Gingivalni indeks kod zuba sa nepravilnim ispunima u odnosu na vrstu ispuna  
 Table 4. Gingival index of teeth with irregular fillings in relation to the type of restoration

Gingivalni indeks zuba Gingival index of teeth	Amalgamski ispuni Amalgam tooth filling		Kompozitni ispuni Composite tooth filling		Ukupno Total No.	
	n	%	n	%	n	%
Promena boje gingive Change of the color of gingiva	19	32,76%	11	17,74%	30	25,00%
Promena boje, krvarenje na pritisak Change of color and gingival bleeding on pressure	36	62,07%	39	62,90%	75	62,50%
Sve promene izražene, spontano krvarenje All changes expressed; spontaneous bleeding	3	5,17%	12	19,35%	15	12,50%

posledica koje ona ostavljaju<sup>18-20, 22-25</sup>. U ispitivanom uzorku ustanovljeno je na 61. zuba (50,83%) nepravilnost ispuna u obliku pozitivnog stepenika, kao i 59 zuba (49,17%) sa nepravilnostima u obliku zjapa (pukotine) na gingivalnom zidu. Ovo govori o gotovo identičnoj učestalosti ovih oblika nepravilnosti u ispitivanom uzorku. Dubina gingivalnog sulkusa na strani ispuna (srednja vrednost) iznosila je  $3,51 \pm 0,68$  (u opsegu od 2 do 7mm, sa koeficijentom varijacije od 19,49), a na aproksimalnoj strani (gde je krunica intaktna)  $2,03 \pm 0,58$  (u opsegu od 1,6 do 6mm, sa koeficijentom varijacije 27,12). Ovo ukazuje da je na strani ispuna postojao gingivalni džep. Slični rezultati se navode i u radovima drugih autora<sup>8-10</sup>. Prosečna dubina gingivalnog sulkusa na strani ispuna statistički je značajno veća u odnosu na dubinu gingivalnog sulkusa na aproksimalnoj strani zuba ( $p < 0,001$ ). Na strani ispuna je prosečna vrednost dubine gingivalnog sulkusa statistički značajno veća kod kompozitnih u odnosu na amalgamske

frequency of these types of irregularities in the sample. The depth of the gingival sulcus on the side of an irregular proximal restorations mean value was  $3.51 \pm 0.68$  (ranging from 2 to 7mm, with a coefficient of variation of 19.49), and on the the intact proximal side of  $2.03 \pm 0.58$  (range from 1.6 to 6 mm, with a coefficient of variation 27.12).

This indicates that on the side where restoration was applied, a gingival pocket existed. Similar results are given in the works of other authors<sup>8-10</sup>. The average depth of the gingival sulcus on the side where the filling is placed was statistically significantly higher than the depth of gingival sulcus on the interproximal side of the tooth ( $p < 0,001$ ). On the side of filling the average value of the depth of the gingival sulcus is statistically significantly higher in the composite tooth fillings compared to amalgam tooth fillings ( $p < 0,01$ ), while on the interproximal side the average values are almost identical.

The research has shown that the average value of depth of gingival sulcus on the side

Tabela 5. Subjektivne tegobe usled nepravilnih ispuna kod zuba u odnosu na vrstu ispuna

Table 5. Subjective symptoms due to improper tooth fillings in relation to the type of restoration

Subjektivne tegobe Subjective symptoms	Amalgamska ispuna Amalgam tooth filling		Kompozitna ispuna Composite tooth filling		Ukupno Total No.	
	n	%	n	%	n	%
Osećaj stranog tela Feeling of foreign body presence	44	75,86%	39	62,90%	83	69,17%
Osećaj žarenja i peckanja Burning and itching sensation	14	24,14%	23	37,10%	37	30,83%



*Tabela 6. Stepen koštane resorpcije kod zuba sa nepravilnim aproksimalnim ispunima u odnosu na vrstu ispuna*

*Table 6 The degree of bone resorption in teeth with irregular interproximal fillings in relation to the type of restoration*

Tip ispuna Type of restoration	n	X	SD	Cv
Amalgamski Amalgam tooth filling	58	2,35	0,57	24,21
Kompozitni Composite tooth filling	62	2,79	0,78	27,83
Ukupno Total No.	120	2,58	0,70	27,30

ispune ( $p < 0,01$ ), dok su na aproksimalnoj strani prosečne vrednosti takoreći identične.

Istraživanje je pokazalo da je na strani ispuna prosečna vrednost dubine gingivalnog sulkusa statistički značajno veća kod zjapa na gingivalnom zidu nego kod nepravilnosti u obliku pozitivnog stepenika ( $p < 0,01$ ). Na aproksimalnoj strani nema statistički značajnih razlika. Prosečna dubina gingivalnog sulkusa-džepa na strani ispuna za stepenik bila je 3,33 mm a za zjap 3,69 mm, dok je prosečna dubina sulkusa na intaktnoj strani bila 2,12 mm. Ovi rezultati direktno ukazuju na negativno dejstvo nepravilnog ispuna na meka tkiva. U odnosu na gingivalni indeks, kod naših istraživanja, kompozitni ispuni statistički češće izazivaju sve promene na gingivi i spontano krvarenje, slične rezultate su pokazali i drugi autori<sup>11-13</sup>, dok je za amalgamske ispune karakteristična samo promena boja gingive u blizini zuba sa ispunom. Stoga se na osnovu tabele kontigencije 3x2 i vrednosti  $\chi^2$  testa pokazuje statistički značajna razlika gingivalnih indeksa između zuba sa nepravilnim kompozitnim u odnosu na amalgamske ispune ( $p < 0,05$ ). Neki autori su u svojim ispitivanjima naveli da karijes na aproksimalnim stranama deluje slično kao nepravilni ispun, s time da nepravilni ispun daje veći stepen promena na gingivu<sup>14</sup>.

Nepravilni kompozitni ispuni su pokazali statistički značajno veće prosečne vrednosti stepena koštane resorpcije ( $p < 0,001$ ) u odnosu na amalgamske, što predstavlja značajnu razliku u odnosu na rezultate nekih autora koji nisu konstatovali pojavu koštane resorpcije<sup>8</sup>. Generalno svaki neadekvatni stomatološki rad može izazvati zapaljenje parodontijuma<sup>26</sup>.

where the dental filling is placed was statistically higher in the unfilled space at the gingival wall compared to irregularities in the form of positive step ( $p < 0,01$ ). On interproximal side there was no statistically significant difference. The average depth of the gingival sulcus-pocket on the side of the filling for the step was 3.33 mm and 3.69 mm for the gap, while the average depth of the sulcus on the intact side was 2.12 mm. These results indicate a direct negative effect of improper filling of soft tissue. In relation to the gingival index in our study the composite fillings were statistically more likely to cause any changes in the gingiva and spontaneous bleeding. Similar results have been shown by other authors as well<sup>11-13</sup>, while the amalgam filling causes just a change of color of the gingival surrounding tooth with restoration. In some studies authors state that caries of interproximal surfaces operates similarly to improper restoration, but irregular tooth filling gives a higher degree of changes on the gingival tissue<sup>14</sup>.

Therefore, based on contingency tables 3x2 and  $\chi^2$  value of the test performed (7.53) the statistically significantly difference between the gingival index of teeth with irregular composite and amalgam fillings ( $p < 0,05$ ) can be shown.

Irregular fillings showed statistically significant higher average values of bone resorption ( $p < 0,001$ ) compared to amalgam tooth fillings, which is a significant difference compared to the results of some authors who did not ascertain the occurrence of bone resorption<sup>8</sup>. Generally, any irregular dental work can cause inflammation of the periodontium<sup>26</sup>.

## ***Zaključak***

Prosečna dubina gingivalnog džepa, kao i stepen koštane resorpcije, ukazuje da kompozitni ispuni, sa nepravilnošću u obliku zjapa prouzrokuju najveći stepen koštane resorpcije, vertikalnog tipa, mada je koštana resorpcija u manjoj meri izražena kod svih nepavilnih ispuna. Merenjem svih vrednosti na zubima sa nepravilnim ispunom i njihovim upoređivanjem sa vrednostima dobijenim na suprotnoj aproksimalnoj strani zuba, koja je intaktna, sa sigurnošću možemo konstatovati da nepravilni ispuni izazivaju oštećenje parodontalnog tkiva.

## ***Conclusion***

The average depth of the gingival pocket and the degree of bone resorption suggest that composite restorations, with irregularity in the form of unfilled space cause the highest degree of bone resorption, vertical type, although bone resorption to a lesser extent is expressed in all irregular restorations. By measuring the value of all the teeth with irregular tooth fillings and their comparison with the values obtained on the opposite side of the tooth which is intact, we can say that the damage caused by improper tooth fillings causes periodontal tissue damages.

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