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Razlozi za postavljanje i zamjenu kompozitnih zubnih ispuna u odrasloj populaciji u Grčkoj

Reasons for Placement and Replacement of Composite Dental Restorations in an Adult Population in Greece

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Sažetak

Svrha: Namjera je bila objasniti razloge za postavljanje i zamjenu defektnih ispuna od smolnog kompozitnog materijala te identificirati odnose između postavljenih i ponovno postavljenih ispuna prema spolu, preparaciji, vrsti zuba i dugotrajnosti. **Materijali i metode:** Studijski se uzorak sastojao od 700 pacijenata – 310 muškaraca i 390 žena u dobi od 18 do 58 godina koji su zatražili zbrinjavanje zubne kazuistike u privatnoj praksi u Grčkoj. Svi su bili klinički pregledani te je nakon toga izračunat broj karijesom zahvaćenih zuba (primarni karijes) i neuspjelih ispuna za svakog ispitanika. Osim toga bio je procijenjen i odnos između postavljenih i ponovljenih kompozitnih restoracija s obzirom na sljedeće parametre: dob te vrstu preparacije i zuba. Statistička analiza obavljena je hi-kvadrat testom. **Rezultati:** Ukupan broj prvi put postavljenih restoracija iznosio je 904 (57,7%), a ponovljenih 380 (32,3%). Primarni karijes bio je najčešći razlog za prvo postavljanje smolnih kompozitnih ispuna (63%), a slijede diskoloracije (15%) i frakture zuba (14%). Među razlozima za ponovljeno postavljanje isticali su se sekundarni karijes (42%), diskoloracija (32%) i gubitak ispuna (20%). Prosječna trajnost ponovno postavljenih kompozitnih restoracija iznosila je oko četiri godine (42%). **Zaključak:** Zubni karijes, primarni i sekundarni, najvažniji je razlog za postavljanje i ponavljanje ispuna od smolnog kompozita, a na drugom je mjestu diskoloracija. Dakle, kod pacijenata s visokim rizikom, kad je riječ o razvijanju karijesa, potrebne su češće stomatološke intervencije kako bi se osigurala prevencija od nastanka novih karijesnih lezija ili recidiva.

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Ključne riječi
zubni karijes; kompozitne smole; dentalna restoracija, trošenje

Uvod

Dobro je poznato da su smolni kompozitni materijali (SK) prvi put bili predstavljeni kao restorativni u izradi ispuna za preparacije Blackova drugog razreda još 1968. godine. No, oni su ubrzo propali zbog pretjeranog trošenja, zubne preosjetljivosti, i/ili odumiranja pulpe, rekurentnog karijesa, otvorenih kontaktnih područja, frakture restorativnog materijala i diskolorirane površine (1).

Danas su to materijali izbora u izradi konzervativnih estetskih ispuna i uglavnom se odabiru za preparaciju karijesnih lezija od I. do V. razreda ili kod traumatskih ozljeda.

Za neuspjele i kratkotrajne ispune dosad se okrivljavalo nekoliko čimbenika, poput kliničke primjene materijala, pacijentove suradnje te odluke stomatologa u vezi s indikacijama za postavljanje i ponavljanje ispuna (2).

Rezultati postignuti u nekoliko radova upućuju na primarni karijes kao glavni razlog (3-13) za postavljanje ispuna, a sekundarni se nametnuo kao najčešći kod ponavljanja kompozitnih ispuna. Na drugom su mjestu diskoloracija zuba i marginalne frakture (6, 8-23).

Introduction

It is well known that the first resin-based composite (RBC) material was introduced as a Class II restorative in 1968. Those restorations soon failed because of excessive wear, tooth sensitivity, and/or pulpal death, recurrent caries, open contact areas or fracture of the restorative material or discoloured surface (1).

Nowadays, RBC materials are the materials of choice for conservative aesthetic restorations, mainly for Class I-V carious lesions or traumatic injuries.

Failure and longevity of restorations have been attributed to several factors such as the clinical usage of material, patient's compliance and clinician's decision regarding the indications for placement and replacement of restorations (2).

Findings from several studies indicated that primary caries was the principal reason (3-13) for placement of restorations, while secondary caries was the most frequent reason for replacement of composite restorations followed by tooth discolouration and marginal fracture (6, 8-23).

Other reasons that have been identified regarding the replacement of composite restorations according to previous

Među razlozima za ponavljanje kompozitnih ispuna u znanstvenim se radovima navode fraktura ispuna, rubni defekt restoracije, fraktura zuba, rubno obojenje uz ispun, nedostatan anatomski oblik i pretjerano porubljivanje ispuna (8,9,12,14,17,19,21,22,24,25).

U ispitivanju koje je proveo Mjör (26), sekundarni karijes i slaba rubna adaptacija najčešći su razlozi za neuspjele SK-ispune.

U studiji Brukiene i suradnika (27) ističe se kako neuspjeli SK-ispuni često ne ovise samo o materijalu, nego i o odgovarajućoj primjeni.

Neuspjeli ispuni postali su velik problem u stomatološkoj praksi jer se gotovo 60 posto svih izvedenih operativnih stomatoloških zahvata odnosi na njihovu zamjenu (26).

Općenito, razlozi za zamjenu razlikuju se ovisno o restorativnom materijalu, denticiji i dobu pacijenta (28, 29).

Svrha je ovog rada procijeniti razloge za postavljanje i zamjenu SK-ispuna te evaluacija odnosa između onih postavljenih i zamijenjenih prema spolu, preparaciji, vrsti zuba i trajnosti zamjenskih ispuna.

Materijali i metode

Ispitanici

Studijski uzorak sastojao se od 700 pacijenata – 310 muškaraca i 390 žena u dobi od 18 do 58 godina (prosječna dob 37,3±4,5 godina) koji su zatražili zbrinjavanje zubne kazuistike u privatnoj praksi u jednom od najvećih grčkih gradova – u Patri.

Razlozi za postavljanje i zamjenu kompozitnih ispuna u razdoblju od dvije godine (od studenoga 2007. do prosinca 2009.) zabilježeni su uz podatke o spolu, vrsti preparacije (prema Blacku), zbrinutom zubu te trajnosti zamijenjenih ispuna, i to uz pomoć samoprocjene pacijenata u anketi kod pitanja o tome kada im je bio postavljen neuspjeli ispun. Dakle, nije moguće objektivno izračunati trajnost svih zamijenjenih ispuna. Kod kliničkog pregleda uzeta je sveobuhvatna anamneza, što je učinio autor rada u vlastitoj privatnoj praksi.

Ispitanici su bili dobrog općeg zdravstvenog stanja, što je ocijenjeno prema odgovorima u zdravstvenoj anketi.

Klinički pregled

Svi su ispitanici bili obaviješteni o procjeni, a zatim su potpisali pristanak za sudjelovanje u ispitivanju.

Autor rada obavio je klinički pregled ispitanika.

Zubi i gingiva osušeni su komprimiranim zrakom, a u stomatološkoj jedinici liječnik se rasvjetom koristio u inspekciji zuba i potrebnih ispuna, odnosno zamjene ispuna. Svi su zubi bili pozorno pregledani sondom i stomatološkim zrcalom.

Glavne kriterije upotrijebljene kao indikacije za postavljenje ispuna odredila je Svjetska zdravstvena organizacija (30), a usmjereni su prema kliničkim znakovima karijesa i karijesnim lezijama (fisuri i glatkim površinama s mekim supstratom, na one koje su se činile sivkastima ili kod vidljivo razvijenog karijesa).

studies are restoration fracture, marginal defect of the restoration, tooth fracture, marginal staining of tooth, deficient anatomical form and over contouring of the restorations (8, 9, 12, 14, 17, 19, 21, 22, 24, 25).

In a study by Mjör (26) secondary caries and poor marginal adaptation were recognised as the most common reasons for failure of composite resin restorations.

Another study by Brukiene et al. (27) showed that in many cases the failure of a composite resin restoration does not only depend on the material itself but also on the proper handling of it.

Failure of restorations is a major problem in dental practice as replacements comprise about 60% of all operative work done (26).

In general, the reasons for the replacement vary depending on the restorative material, the dentition and the age of the patient (28,29).

The aim of the present study was to assess the reasons for placement and replacement of RBC restorations and to evaluate the associations between placed and replaced composite restorations by gender, type of cavity, tooth type and longevity of replaced ones.

Material and Methods

Study population consisted of 700 patients, 310 males and 390 females, 18-58 years of age (mean age 37.3±4.5 years) who sought dental treatment in a private practice in Patra, one of the biggest cities in Greece.

The reasons for placement and replacement of composite restorations of the sample for a period of two years (November 2007-December 2009) were obtained including aspects such as gender of the sample, type of cavity (according to Black's classification), location and type of restored teeth and longevity of replaced restorations, according to self-reported questionnaires regarding the age of their failed composite restorations. It is therefore not possible to calculate objectively the longevity of all replaced restorations. A comprehensive history was taken and all examinations were performed by the author of the present study in its private practice.

The participants were in good general health as estimated by a health questionnaire.

Clinical Examination

All participants were informed about the evaluation to which they would be submitted and gave their informed consent to participate in the study.

The clinical measurements of the participants were performed by the author of the present study as mentioned above.

The teeth and gingival were dried with compressed air while dental unit light was used as the light source for the inspections and restored and non-restored teeth were examined carefully using an intra-oral mirror and an explorer.

The main criteria which indicated the placement of restorations were those that have been determined by the W.H.O (30) and focused on the clinical signs of primary caries and presence of carious lesion (lesions of grooves-vents-crevices

Glavni kriterij za zamjenu ispuna određen je bio u sustavu California Dental Association Quality Evaluation (31) i služio je za procjenu kakvoće zubnih ispuna prema sljedećim parametrima:

a. kakvoći površine i boje,
b. anatomskom obliku,
c. marginalnom integritetu.

Inkluzijski kriteriji

Kriteriji za izbor uključivali su dob iznad 18 godina te u prosjeku 20 preostalih prirodnih zuba, jer velik broj izgubljenih zuba može utjecati na rezultate ispitivanja. Više od 12 izgubljenih zuba može uzrokovati poteškoće u žvakanju, fonaciji i drugim osnovnim potrebama te se one s vremenom pogoršavaju. Ta situacija može prouzročiti i ostale oralne bolesti, uključujući parodontnu bolest (patološku migraciju, pokretljivost zuba), temporomandibularni poremećaj, karijes, itd. (32).

Ekskluzijski kriteriji

Ispitivanjem su bili obuhvaćeni samo zubi anteriornog segmenta maksile i mandibule, a pretkutnjaci i kutnjaci bili su isključeni, bez obzira na to treba li im tek postaviti ispune ili ih zamijeniti.

U postavljanju i zamjeni ispuna kod anteriornih zuba bio je primijenjen ispravan SK-materijal (Z-250, 3M). Idealan je za izradbu restoracija kod prednjih zuba, ali ne bi odgovarao za izradbu ispuna kod stražnjih zuba zbog mehaničkih svojstava (razmjerno je slab te se ne preporučuje kod restauracija u području visokog opterećenja). Zato su bili isključeni posteriorni zubi.

Statistička analiza

Statističke jedinice u ovom ispitivanju bile su pojedinac i zub. Za svakog je pojedinca izračunat broj karioznih zuba (primarni karijes) i oni s nedostatnim ispunima.

Hi-kvadrat test pokazao se prikladnim u provjeri hipoteze o nepostojanju razlike između muškaraca i žena u studiji s obzirom na broj postavljenih i zamijenjenih ispuna (razredi preparacije od I. do III.), razloga za postavljanje i zamjenu ispuna, vrste zuba i trajnosti zamjenskih ispuna. Analiza podataka obavljena je statističkim paketom verzije 16,0 programa SPSS (SPSS Inc, Chicago, IL, SAD).

Vrijednost p manja od 5 posto ($p<0,05$) smatrala se statistički značajnom.

Rezultati

U sklopu ovoga rada bilo je postavljeno ukupno 904 SK-ispuna, i to 44 posto kod muškaraca i 56 posto kod žena. Prvi put su bila postavljena 524 (57,7%) ispuna, a 38 (42,3%) je bilo zamjenskih.

Većina prvi put postavljenih ispuna izrađena je kod muškaraca (58%) te kod 42 posto žena, a 24,7 posto zamjenskih ispuna bilo je postavljeno muškarcima te 75,3 posto ženama.

and smooth surfaces, which had soft substrates, those that appeared as grey areas and those that developed visible cavity)

The main criteria which indicated the replacement of restorations as those that have been determined by the California Dental Association Quality Evaluation System (31) and are used for the assessment of the quality of dental restorations are the following:

a. surface quality and colour
b. anatomical form
c. margin integrity

Inclusion criteria

The selection criteria comprised age above 18 years and a mean number of 20 natural teeth, since large numbers of missing teeth might interfere with the results of the present study. More than 12 missing teeth can cause problems with eating, speech, and other basic activities that may worsen with time. Eventually, the remaining teeth in the jaw shift in an attempt to fill in the gap left by a missing tooth. That situation can cause other oral diseases, including periodontal disease (pathologic migration, mobility) temporo-, mandibular joint (TMJ) disorder, dental caries, etc. (32).

Exclusion criteria

Only anterior teeth of the mandible and maxilla were included in the present study. Restored and non-restored molars and premolars and amalgam-restored anterior teeth were excluded from the study.

A proper RBC material (Z-250, 3M) was used for the placement and replacement of restorations of the anterior teeth. That material is ideal for restorations of anterior teeth and unsuitable for restorations of posterior teeth because of its mechanical properties (relatively weak and can not be used in load bearing areas). That was the reason why posterior teeth were excluded from the study.

Statistical analysis

Statistical units of the present study were the individual and the tooth. For each patient the number of decayed teeth (primary caries) and failed-restored teeth was calculated.

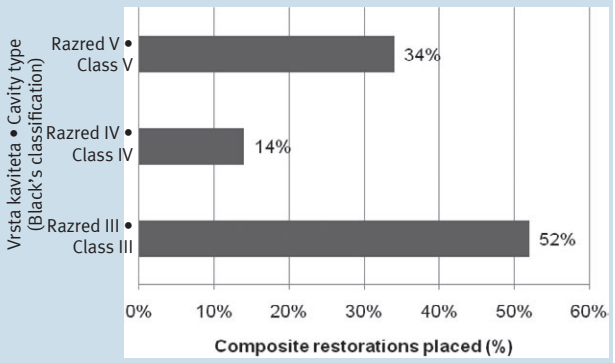
As appropriate chi-square test was employed to test the hypothesis of no differences between males and females regarding the number of placed and replaced restorations (Class I-III), the reasons for placement and replacement of the restorations, the type of tooth in which placed and replaced restorations and the longevity of replaced restorations. The data analysis was performed using the statistical package of SPSS ver.16.0 program package (SPSS Inc.,Chicago, IL).

A p value less than 5% ($p<0.05$) was considered to be statistically significant.

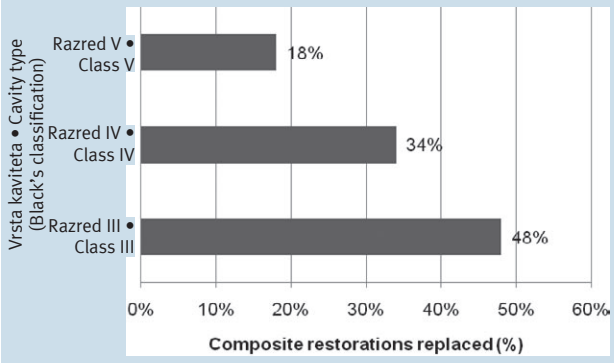
Results

A total of 904 composite resin restorations were placed during the present study, 44% in males and 56% in females. Five hundred and twenty four (57.7%) of those were placed for first time while three hundred and eighty (42.3%) were replaced.

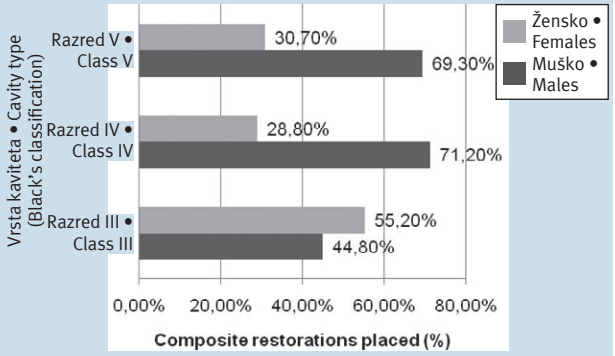
Most placed composite restorations were made for males (58%) and 42% for females, while 24.7% of the replaced composite restorations were made for males and 75.3% for females.



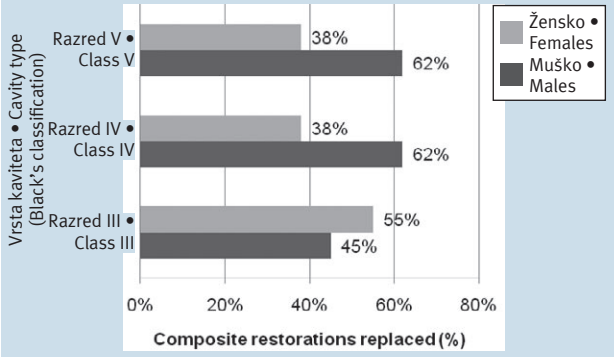
Slika 1. Distribucija prvi put postavljenih ispuna prema Blackovoj klasifikaciji
Figure 1 Distribution of placed composite restorations according to Black's classification



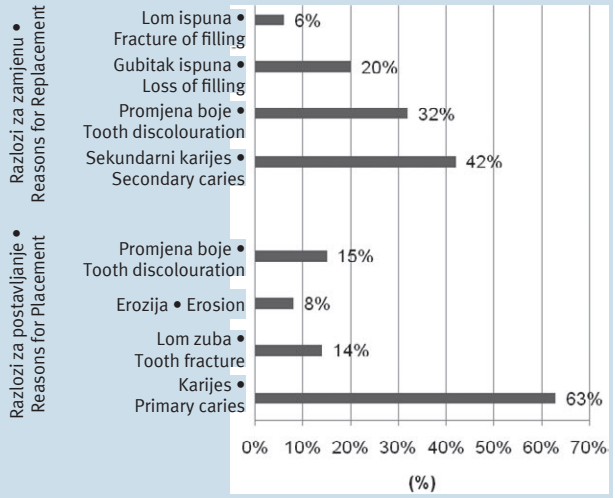
Slika 2. Distribucija zamijenjenih kompozitnih ispuna prema Blackovoj klasifikaciji
Figure 2 Distribution of replaced composite restorations according to Black's classification



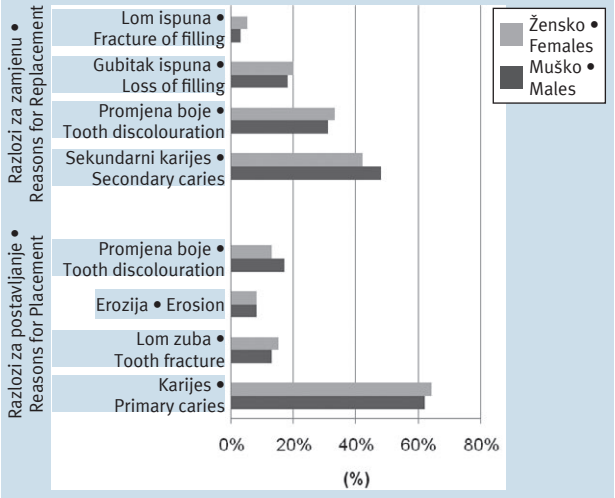
Slika 3. Distribucija prvi put postavljenih kompozitnih ispuna prema Blackovoj klasifikaciji s obzirom na spol
Figure 3 Distribution of placed composite restorations according to Black's classification by gender



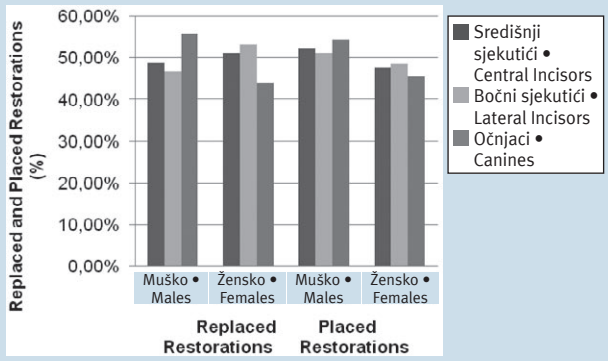
Slika 4. Distribucija zamijenjenih kompozitnih ispuna prema Blackovoj klasifikaciji s obzirom na spol
Figure 4 Distribution of replaced composite restorations according to Black's classification by gender



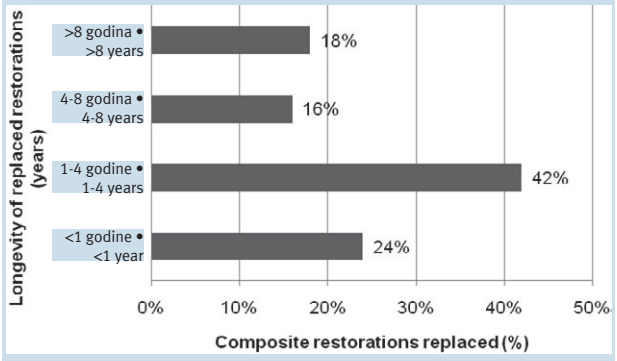
Slika 5. Razlozi za postavljanje inicijalnih i zamjenskih ispuna
Figure 5 The reasons for placement and replacement of composite restorations



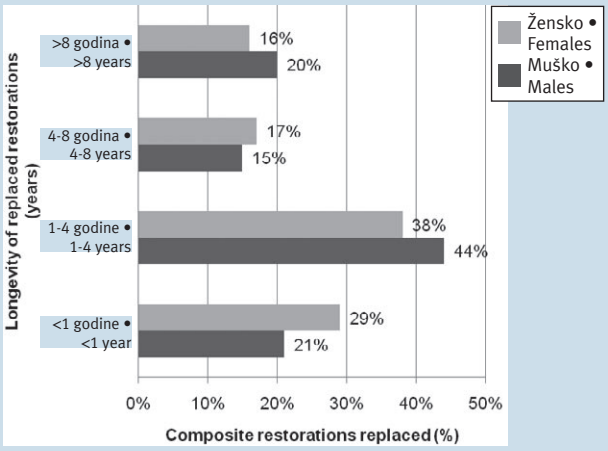
Slika 6. Razlika u razlozima za postavljanje inicijalnih i zamjenskih ispuna prema spolu
Figure 6 The reasons for placement and replacement of composite restorations by gender



Slika 7. Distribucija zamjenskih i inicijalnih ispuna prema vrsti zuba i prema spolu
Figure 7 The distribution of replacement and placement restorations according to tooth type by gender



Slika 8. Prosječan vijek trajanja zamjenskih kompozitnih ispuna
Figure 8 The median longevity of replaced composite restorations



Slika 9. Prosječno preživljavanje zamjenskih kompozitnih ispuna prema spolu
Figure 9 The median longevity of replaced composite restorations by gender

Razlika između muških i ženskih ispitanika, s obzirom na prvi put postavljene ispune i zamjenske ispune, pokazala se statistički značajnom (p<0,0001).

Na Slici 1. predstavljena je distribucija prvi put postavljenih ispuna prema razredima Blackovih preparacija, a na Slici 2. je distribucija zamjenskih ispuna prema istim preparacijama. Najviše prvi put postavljenih (52%) i zamjenskih ispuna (48%), preparacije su III. razreda prema Blackovoj klasifikaciji, te je zabilježena i statistički značajna razlika (p<0,0001).

Među muškarcima zabilježen je veći postotak prvi put postavljenih SK-ispuna kod preparacija IV. i V. razreda negoli kod žena, te se razlika između žena i muškaraca s obzirom na vrstu preparacije također pokazala statistički značajnom (p<0,0001) (Slika 3.).

Slične razlike zabilježene su između muškaraca i žena sa zamjenskim ispunima (p<0,0001) (Slika 4.).

Primarni karijes je bio glavni razlog za postavljanje SK-ispuna kod obaju spolova (62% kod muškaraca i 64% kod žena), a zatim slijede diskoloracija, fraktura i erozija. Tu nije uočena statistički značajna razlika između muškaraca i žena (p>0,1) (Slika 5.).

Kod obaju spolova najčešći razlozi za zamjenu kompozitnih ispuna su sekundarni karijes (48% kod muškaraca i 42% kod žena), diskoloracija, gubitak ispuna i njegova fraktura

The difference between males and females regarding the composite restorations placed and replaced was statistically significant (p<0.0001).

In Figure 1 it is shown the distribution of placement composite restorations according to Black's classification and in Figure 2 the distribution of replacement ones, respectively. Most placed restorations (52%), and most replaced ones were Class III (48%). Between placed and replaced composite restorations and the type of cavity according to Black's classification a statistically significant difference was recorded (p<0.0001).

Males showed a higher percentage of composite restorations placed than females regarding Class IV and V and the difference between males and females regarding the type of cavity of placed restorations was statistically significant (p<0.0001) (Figure 3).

The same observations were recorded for the replacement composite restorations between males and females (p<0.0001) (Figure 4).

Primary caries was the principal reason for placing of composite restorations for both genders (62% in males and 64% in females) followed by tooth discolouration, tooth fracture and erosion, however the difference between males and females was no statistically significant (p>0.1) (Figure 5).

(Slika 5.). Ipak, u toj usporedbi nema statistički značajne razlike između muškaraca i žena (p>0,1) (Slika 6.).

Distribucija prvi put postavljenih i zamjenskih ispuna prema vrsti zuba za oba spola prikazana je na Slici 7. Nema statistički značajne razlike između muškaraca i žena s obzirom na postotke zamjenskih ispuna zabilježenih prema vrsti zuba (p>0,1). Slični su rezultati i za prvi put postavljene ispune (p>0,1). Vijek trajanja zamjenskih ispuna zabilježen je kod 380 neuspjelih restoracija. Prosječna trajnost kompozitnog ispuna bila je otprilike četiri godine (42%), 18 posto kompozitnih ispuna zamijenjeno je u razdoblju duljem od osam godina, 16 posto zamijenjeno je u razdoblju od četiri do osam godina, a 24 posto u razdoblju kraćem od jedne godine (Slika 8.).

Razlika između muškaraca i žena, s obzirom na trajnost zamjenskih kompozitnih ispuna, nije statistički značajna (p>0,1) (Slika 9.).

Rasprava

Prema rezultatima dobivenima u ovom ispitivanju karijes je glavni razlog za postavljanje kompozitnih ispuna. Taj se zaključak slaže s podacima iz ostalih studija. U istraživanju koje su proveli Deligeorgi i njegovi suradnici (3), primarni je karijes glavni razlog za prvo postavljanje ispuna. Slično su zaključili i autori ostalih radova (4-10, 12).

U studiji Brage i njegovih kolega (11) glavni su razlozi za prvo postavljanje ispuna primarni karijes i nekariozni gubitak tvrdoga zubnog tkiva, a i Frost (13) ističe slične nalaze.

U ovome su radu glavni razlozi za zamjenu ispuna sekundarni karijes i diskoloracija, što je u skladu s nalazima iz ostalih radova (6, 8-10, 14-19).

Prema rezultatima iz sličnih ispitivanja, sekundarni je karijes glavni razlog za zamjenu ispuna (6, 10, 11, 13, 23).

Visoku incidenciju sekundarnog karijesa vezanu za SK-ispune možemo objasniti na temelju mikrobioloških nalaza (33). Znatno više bakterija Streptococcus mutans uočeno je na rubovima preparacija SK-restoracija negoli kod amalgamskih ili stakleno-ionomernih materijala (5). U jednoj je studiji (34) potvrđeno da se više dentalnog plaka nalazi na sučelju kompozita i zuba, negoli u uporabi amalgama i zubnog tkiva. U dodatnim nalazima dosadašnjih istraživanja (33, 34, 35) autori upozoravaju na veću akumulaciju dentalnog plaka u materijalima proizvedenima na temelju smole, te da taj plak ima veći kariogeni potencijal nego što je zabilježeno kod amalgama, silikatnog cementa i stakleno-ionomernih materijala. Mikropropuštanje je također vezano za razvoj sekundarnog karijesa (35, 36). U jednoj studiji (37) dokazano je da utori manji od 35 do 50 µm kod sučelja zubnog tkiva i ispuna, ne predisponiraju pacijenta na razvoj sekundarnog karijesa, kao što je slučaj s većim utorima.

Broj dostupnih dokaza upućuje na nepostojanje odnosa između razvoja sekundarnog karijesa i veličine utora na sučelju zubnog tkiva i ispuna, osim kod makropropuštanja ako je utor širi od 250 (37) ili čak 400 µm (38).

The reasons for replacement of composite restorations were for both genders, secondary caries (48% in males and 42% in females), tooth discolouration, loss of filling and filling fracture (Figure 5), however no statistically significant difference between males and females was observed (p>0.1), (Figure 6).

The distribution of replacement and placement restorations according to tooth type for both genders is shown in Figure 7. No statistically significant difference between males and females regarding the percentages of replacement restorations according to tooth type recorded (p>0.1). The same finding recorded for the placement restorations (p>0.1). The longevity of replaced composite restorations was recorded for three hundred and eighty failed restorations. The median longevity of a composite restoration was approximately 4 years (42%), 18% of composite restorations were replaced in a period more than 8 years, 16% of those were replaced between 4-8 years and 24% were replaced in a period less than 1 year (Figure 8).

The difference between males and females regarding the longevity of replaced composite restorations was no statistically significant (p>0.1) (Figure 9).

Discussion

According to the present study primary caries was the principal reason for placing of composite restorations. That finding is in agreement with the findings that were recorded in other studies. In a study by Deligeorgi et al. (3) showed that primary caries was the main reason for the placement of initial restorations. Similarly results were observed in previous studies (4-10, 12).

A study by Braga et al. (11) showed that the main reasons for the placement of initial restorations were primary caries and non-carious tooth substance loss, while Frost (13) recorded similar observations.

In the present study secondary caries and discolouration of the restorations were the main reasons for replacement, findings that are in agreement with the findings of previous studies (6, 8-10 14-19).

Secondary caries was the principle reason for replacement of restorations according to similar studies (6, 10, 11, 13, 23).

The high incidence of secondary caries associated with the resin composite restorations could be explained on the basis of microbiological findings (33). A significant higher proportion of *Streptococcus mutans* was found at the cavity margins of the resin composite restorations than for amalgam and glass-ionomer material (5). Another study (34) showed that more dental plaque was found at the composite/tooth interfaces than at the amalgam/tooth interfaces. In addition findings from previous studies (33, 34, 35) indicated that resin-based materials accumulate more dental plaque and this plaque is more cariogenic than that seen on amalgam, silicate cement and glass-ionomer materials. Microleakage also has been associated with the development of secondary caries (35,36). Another study (37) indicated that crevices at the tooth-restoration interface of less than 35 to 50 µm do not predispose a patient to the development of secondary caries while larger crevices do.

Dakle, sekundarni se karijes ne razvija zbog mikropropuštanja duž sučelja zubnog tkiva i ispuna, nego je to površinska lezija slična primarnom karijesu na glatkoj površini (39).

Treba istaknuti da su kompozitne restoracije osobito osjetljive na tehniku. Osim toga, klinički ishod ovisi i o oralno-higijenskim navikama pacijenta. Kompozitni materijali ubrzavaju rast i širenje bakterije Streptococcus mutans, što u kombinaciji s lošom oralnom higijenom pogoduje razvoju sekundarnog karijesa (27).

Polimerizacijsko skvrčavanje još je jedan čimbenik koji potiče sekundarni karijes i zbog toga treba slijediti naputke proizvođača kako bi se smanjio učinak pretjerane polimerizacije (40).

Diskoloracija je jedan od razloga za postavljanje kompozitnih restoracija i još je velik problem i za stomatologa i za pacijenta. U istraživanju Mjora i Toffenettija (17) istaknuto je kako rubna diskoloracija može nastati zbog nedovoljnog kiselinskog jetkanja cakline prije nanošenja veznog sredstva, uz nepropisan postupak s materijalom (nanošenje, koncentracija, adaptacija) i poteškoće vezane za polimerizacijsko skvrčavanje. Povećanje jetkane površine rezultira jačom vezom između cakline i smole, što pojačava retenciju restoracije i smanjuje rubno skvrčavanje i rubnu diskoloraciju (41, 42).

U jednoj studiji ističe se da su glavni razlozi za zamjenu kompozitnih ispuna marginalna diskoloracija, marginalna fraktura i raspad (18). To se u mnogome podudara s istraživanjima provedenima u Velikoj Britaniji (7, 8, 43).

Radovi koje su objavili Burke i suradnici (8), Deligeorgi i njegovi kolege (12), Mjor i njegova ekipa (14), Mjor i Toffenetti (17), Asghar i suradnici (19), Van Nieuwenhuysen i kolege (21) te Forss i Widstrom (22) upućuju na frakturu zuba kao na dodatan razlog za zamjenu ispuna. Vehkalajti i Palotie u svojem su radu (44) objavili da je sekundarni karijes, osim frakture, prevjesa i rubne diskrepancije, najčešći razlog za zamjenu ispuna.

Među ostalim razlozima za zamjenu ispuna su frakture restoracija, marginalna infiltracija, nedostatan anatomski oblik i pretjerano povećanje opsega restoriranoga zuba (24, 25).

U svom radu je Al-Negrish (9) nazvao endodontsku terapiju trećim najvažnijim razlogom za zamjenu ispuna.

Razlozi za zamjenu ispuna razlikuju se prema odabranom restorativnom materijalu (često je razlog za neuspjeli ispun i pogrešan postupak s materijalom, a ne isključivo materijal (Brukiene i suradnici [27]) ili prema denticiji i dobi pacijenta (28, 29).

Navedene razlike mogli bismo pripisati heterogenim uzorcima ispitane populacije, progresiji karijesa i restorativnim materijalima kojima su se stomatolozi koristili posljednjih nekoliko desetljeća, različitim metodama i kriterijima u procjeni, frekvenciji postavljenih i zamijenjenih ispuna (primjerice, u nekim su radovima autori procjenjivali prvi put postavljene ispune te one zamjenske kod prednjih ili stražnjih zuba, a u drugima su bili uključeni i amalgamski ispuni te se uzimala u obzir i različita važnost koju populacija posvećuje održavanju zuba i redovitim kontrolama). Ovim su radom bili obuhvaćeni ispitanici koji su sami zatražili sto-

However the bulk of available evidence indicates that there is no relationship between thedevelopment of secondary caries and the size of the crevice at the tooth-restoration interface except in cases of macroleakage in which the crevice exceeded 250 μm (37) or 400 μm (38).

Thus, secondary caries do not develop as a result of microleakage along the tooth-restoration interface but it is a surface lesion similar to primary carious lesion on smooth surface (39).

It is important to emphasize that composite resin restorations are extremely technique sensitive. Additionally the ultimate clinical outcome is highly influenced by the oral hygiene of the patients. Composite accelerate the growth of *Streptococcus mutans*, which in combination with poor oral hygiene may cause secondary caries (27).

Another factor which leads to secondary caries is that all composites shrink during curing period, consequently it is important to minimize the effect of composite shrinkage following the usage instructions of the materials (40).

Discolouration as a reason for replacement of composite restorations still remains a significant problem both for the clinician and the patient. A study by Mjor and Toffenetti (17) reported that margin discolouration suggests inadequate acid-etching of the enamel prior to placing the bond agent, inadequate handling of the material (placing, concentration, adaptation) and the problems associated with polymerization shrinkage. The increase in etched surface area results in a stronger enamel to resin bond, which increases the retention of the restoration and reduces marginal microleakage and marginal discolouration (41, 42). Another study showed that the main reasons for replacement of composite restorations were marginal discolouration, marginal fracture and degradation (18). Those findings agree broadly with studies carried out from the United Kingdom (7, 8, 43).

Previous studies by Burke et al. (8), Deligeorgi et al. (12) Mjor et al. (14), Mjor and Toffenetti (17), Asghar et al. (19), Van Nieuwenhuysen JP et al. (21), Forss and Widstrom (22) showed that tooth fracture was an additional reason for replacement of restorations. In a study by Vehkalahti and Palotie (44) secondary caries, along with fractures, overhangs and marginal discrepancy was the most common reason for replacement of restorations.

Other reasons that have been identified are restoration fractures, marginal infiltration, deficient anatomical form and over contouring of the restorations (24,25).

In a study by Al-Negrish (9) root canal treatment was recorded as the third important reason for replacement of restorations.

The reasons for the replacements vary depending on the restorative material (in many cases the failure of a restoration does not only depend on the material itself, but also on proper handling of the material, Brukiene et al. [27]), the dentition and the age of the patient (28,29).

The above differences could be attributed to the heterogeneous population samples which were examined, the progression of dental caries and the restorative materials during the last decades, the different methods and criteria which were used in order to assess the frequency of placed and re-

matološko liječenje u privatnoj praksi, dakle, uzorak se ne bi mogao smatrati nasumičnim.

Kao što je već spomenuto, inicijalni su ispuni najčešće bili postavljeni muškarcima, a ženama je postavljeno najviše zamjenskih ispuna. Razlike među spolovima, s obzirom na postavljanje inicijalnih i zamjenskih ispuna, mogli bismo pripisati činjenici da žene češće posjećuju stomatologa od muškaraca, a razlike zbog zamjene ispuna mogli bismo pripisati čimbenicima vezanima za restorativni materijal, denticiju i dob pacijenta. U istraživanjima provedenima u Norveškoj i Islandu nije bila izolirana veza između zamjene ispuna i spola pacijenata (6, 14), ali su Asghar i suradnici (19) zabilježili izrazitu povezanost između spola i razloga za zamjenu ispuna. Na odluku o zamjeni ispuna najviše utječu subjektivni čimbenici, poput stomatologove interpretacije zatečenog stanja ispuna i zdravlja zuba te kriterija upotrijebljenih u definiciji neuspjelih ispuna i pacijentova zahtjeva. Ta je odluka podložna velikoj varijaciji (45, 46). U cijelom području nedostaju standardizacija i općenito dogovoreni kriteriji koji bi trebali pomoći stomatolozima u donošenju odluke o zamjeni ispuna (47).

Prosječna trajnost neuspjelih ispuna u ovom je radu iznosila oko četiri godine, što je u skladu s rezultatima u ostalim radovima. Mjör i Toffenetti (17) u svojem su istraživanju zabilježili prosječnu trajnost od 3,3 godine, u jednom drugom radu (19) iznosila je tri godine, a u trećem (20) je prosječna trajnost bila šest godina. U sličnim su radovima zabilježene trajnosti od 7,1 godine (18) te šest (22) osam (48) i devet godina (49). Trajnost ispuna od 2,4 godine zabilježili su Vehkalahti i Palotie (44), a Moorhead i suradnici (48) dobili su prosječnu trajnost ispuna od osam godina.

Jokstad i suradnici (4) pokazali su utjecaj vrste, veličine i materijala na trajnost ispuna, uz mogući utjecaj smještaja restoracija u usnoj šupljini.

Oblik preparacije i pažljiv postupak s materijalima, preduvjeti su za dugotrajnost ispuna (48).

Teško je otkriti specifične razloge za nizak prosjek trajnosti zamjenskih ispuna, no mogu biti presudni operativna tehnika, kakvoća materijala i pažljiv postupak prema naputcima proizvođača (50).

Uspio ili neuspio ispun, prvi put postavljeni i zamjenski, ovise o sljedećim povezanim glavnim čimbenicima: vještini stomatologa, pacijentovoj suradnji i restorativnom materijalu. Treba dodati i pacijentovu oralnu higijenu jer može utjecati na razvoj sekundarnog karijesa i diskoloraciju.

placed restorations (e.g. in some studies the investigators assessed placed and replaced composite restorations in anterior teeth or posterior teeth while in other studies amalgam restorations have been included), the different importance that have been adopted by the population samples regarding the value of teeth maintenance and the need for a regular dental follow-up. The present study concerned subjects who sought dental treatment in a private practice therefore, the sample could not be considered as a random one.

As mentioned above the most placed composite restorations were made for males while the most replaced composite restorations were made for females. Gender differences regarding the placement of new restorations could be attributed to the fact that females visit their dentists more frequently than males, while the differences regarding the replacement of composite restorations could be attributed to factors concerned the restorative material, the dentition and the age of the patient. In studies conducted in Norway and Iceland no association was found in the reasons for replacement of restorations and patient gender (6,14) while significant associations between gender and the reasons for replacement of restorations were recorded in a study by Asghar et al. (19). The decision to replace a restoration is influenced by more subjective factors such as dentists' interpretation of the restoration's condition and the health of the tooth, the criteria used to define failure and patient demand. These decisions are subject to a great deal of variation (45,46). There is a lack of standardization and no generally agreed criteria are used to decide when a restoration requires replacement (47).

The median longevity of the failed restorations of the present study was approximately 4 years, while several studies have shown different results. A study by Mjör and Toffenetti (17) showed that the median longevity was 3.3 years, while other study (19) reported that the median longevity of composite restorations was 3 years and another one (20) showed that the median longevity was 6 years. Similar studies reported survival periods, 7.1 years (18), 7.8 years (21), 6 years (22), 8 years (48), 9 years (49). A study by Vehkalahti & Palotie (44) showed that the mean age of failed restorations was 2.4 years, while another study by Moorhead et al. (48) showed that the median age of resin-based composite restorations was 8 years.

A study by Jokstad et al. (4) showed that the longevity period was influenced by the type and size of the restoration, the material and possibly the intra-oral location of the restorations.

Cavity form, preparation and careful handling of the material are prerequisites forlongevity of restoration (48).

It is difficult to discover specific reasons for the low median longevity of the restorations replaced, however operative technique, material quality and careful handling according to producer instructions may play important roles (50).

As mentioned above, the success or failure of restoration, placed and replaced, depends on the following main factors: the dentist's skills, the patient compliance and the restorative material, factors that are closely related. In addition the oral hygiene of the patient also may play an important role in the development of secondary caries and discolouration.

Zaključci

Primarni karijes glavni je razlog za postavljanje kompozitnih ispuna kod obaju spolova, a slijede zubna diskoloracija, fraktura i erozija; Sekundarni karijes glavni je razlog za zamjenu kompozitnih ispuna, a slijede diskoloracija, gubitak ispuna i fraktura ispuna kod obaju spolova; Najviše je, prema stajalištu Blacka, postavljeno inicijalnih i zamjenskih ispuna III. Razreda; Kod muškaraca je najviše inicijalnih ispuna postavljeno na očnjacima obiju čeljusti, a kod žena su najčešći na bočnim sjekutićima. Isto je zabilježeno i kod zamjenskih ispuna; Prvi put postavljeni ispuni češći su kod muškaraca, a ženama je postavljeno više zamjenskih ispuna; Prosječan vijek trajanja kompozitnog ispuna iznosi četiri godine (42%), 18 posto kompozitnih ispuna zamijenjeno je u razdoblju duljem od osam godina, 16 posto nakon četiri do osam godina, a 24 posto u razdoblju kraćem od jedne godine.

Conclusion

1. The principal reason for the placement of composite restorations was primary caries followed by tooth discolouration, tooth fracture and erosion for both genders.
2. The principal reason for the replacement of composite restorations was secondary caries followed by tooth discolouration, loss filling and filling fracture for both genders.
3. Most placed restorations and most replaced ones were Class III.
4. In males the most placed restorations concerned canines of both jaws, while in females concerned the lateral incisors. The same observations were recorded for replaced restorations.
5. Most placed composite restorations were made for males while, most replaced composite restorations were made for females.
6. The median longevity of a composite restoration was approximately 4 years (42%),18% of composite restorations were replaced in a period more than 8 years, 16% of those were replaced between 4-8 years while 24% were replaced in a period less than 1 year.

Abstract

Aim: The aim of the present study was to investigate the reasons for placement and replacement of defective resin-based composite (RBC) restorations and the associations between placed and replaced composite restorations by gender, type of cavity, tooth type and longevity of replaced ones. **Materials and Methods:** Study population consisted of 700 patients, 310 males and 390 females, aged 18 to 58 years old who sought dental treatment in a private practice in Greece. All subjects were clinically examined and the number of decayed teeth (primary caries) and failed-restored teeth was calculated for each patient. In addition the association between placed and replaced composite restorations and the following aspects was assessed: gender, cavity type and tooth type. Statistical analysis was accomplished by using chi-square test. **Results:** The total number of restorations placed were 904, 524 (57.7%) were placed for first time while 380 (32.3%) were replaced. Primary caries was the most frequent reason for the placement of new composite resin restorations (63%) followed by tooth discolouration (15%) and tooth fracture (14%) while the main reasons for replaced resin composite restorations were secondary caries (42%), discolouration (32%) and loss of filling (20%). The median longevity of the replaced resin composite restorations was approximately 4 years (42%). **Conclusions:** Dental caries, primary and secondary, was the principle reason for placed and replaced resin composite restorations followed by tooth discolouration. Therefore, patients at a high risk of developing caries may require more frequent dental care to ensure that new and recurrent carious lesions are prevented.

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