

KLINIČKA EVALUACIJA INLEJ-RETINIRANIH ADHEZIVNIH MOSTOVA TOKOM DVOGODIŠNJEG OPSERVACIONOG PERIODA

A CLINICAL EVALUATION OF INLAY-RETAINED FIXED PARTIAL DENTURES AFTER A TWO-YEAR OBSERVATION PERIOD

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APSTRAKT

Uvod. Inlej retinirani adhezivni mostovi predstavljaju konzervativni modalitet tretmana nedostatka pojedinačnog zuba u bočnoj regiji.

Materijal i metod. U kliničku studiju, uključeno je 25 adhezivnih nadoknada. Odabir pacijenata, principi preparacije, kao i tehnika izrade mostova urađeni su prema važećim standardima u ovoj oblasti. Pacijenti su praćeni na svakih 6 meseci tokom dvogodišnjeg perioda. **Rezultati** su statistički obrađeni. Rezultati. Uspešnost nadoknada u prvoj godini iznosi 91.1%, dok kumulativna uspešnost tokom druge godine (24 meseca) iznosi 86.6%. Takođe, ocena boje, teksture i marginalnog prebojavanja daje zadovoljavajuće rezultate tokom perioda praćenja.

Zaključak. Kompozitne nadoknade ojačane vlaknima su minimalno invazivni, estetski i pouzdan način tretmana minimalne krezubosti bočnog segmenta denticije.

Cljučne reči: inlej mostovi, adhezivni mostovi

ABSTRACT

Introduction. Inlay retained adhesive restorations present a conservative approach when a single tooth is missing in the posterior region.

Material and methods. Twenty five restorations were included in the clinical study. Patient selection, preparation technique as well as denture fabrication followed current principles in this area. Patients were examined every 6 months over a 2 year examination period.

Results were statistically analyzed. Results. The success rate for the first year comes to 91.1%, while cumulative success probability during the second year (24 months) was 86.6%. Furthermore, colour, texture and marginal staining were satisfactory during the observation period. **Conclusion.** Fibre-reinforced composite adhesive dentures are a tooth preserving, minimally invasive, aesthetic and reliable treatment option for single tooth replacement in the posterior area.

Key Words: inlay-retained bridges, adhesive bridges

Uvod

Kliničke situacije, u kojima se zapaža nedostatak pojedinačnog zuba postaju sve češće u stomatološkoj praksi. Između različitih varijanti tretmana, nedostajući zub može se nadoknaditi pomoću inlej-retiniranih adhezivnih mostova, u kombinaciji sa adhezivnom tehnikom cementiranja.^{1,2,3} Generalno, metoda

Introduction

Clinical situations with a single tooth edentulous area are becoming more and more frequent in dental practices. Among other treatment modalities, one missing tooth can be restored using inlay-retained fixed partial dentures (iFPDs), in combination with an adhesive luting technique.^{1,2,3} In general, the method provides a conserva-

podržava konzervativni pristup, naročito ukoliko agonisti imaju postojeće ispuni ili kariozne lezije.⁴

Metal-keramika nije mogla da obezbedi dugotrajan uspeh delimičnih nadoknada, stoga su kompozitni sistemi ojačani vlaknima predloženi za navedenu indikaciju.^{5,6} U prvom mahu, javljala su se pucanja i rascementiravanja, dajući kumulativnu stopu uspeha od 73% nakon 5 godina vezano za pucanje i 96% vezano za rascementiravanje.⁶ Dodatno, dugotrajni estetski rezultati nisu bili zadovoljavajući, sa odlamanjem, prebojavanjem i diskoloracijom fasetirajućeg kompozita.

U tom kontekstu, predložene su modifikacije vlaknima ojačane osnove.^{7,8} Nadalje, predstavljena je nova generacija fasetirajućih kompozita, sa modifikovanim sadržajem mikropunioca (SR Adoro, Ivoclar Vivadent; Gradia InDirect, GC; Symphony, 3M itd.). Pomenuti sistemi, kako je navedeno, trebalo bi da omoguće odlično poliranje, sa dugotrajnom rezistencijom na plak i diskoloraciju.

Nekoliko in-vitro studija podržalo je ideju, da se modifikovana osnova ojačana vlaknima može odupreti mastikatornim silama u bočnoj regiji.^{9,10} Nadalje, potencijalne prednosti kompozitnog sistema vezane su za niži modulus elastičnosti staklenih vlakana u poređenju sa drugim materijalima, što bi modlo da redukuje vrednosti napona na prelazu zub-nadoknada, smanjujući verovatnoću rascementiravanja.¹¹ Dakle, u kombinaciji sa odgovarajućim materijalom za fasetiranje, sistem bi mogao da omogući dobijanje dugotrajnih pozitivnih rezultata kod terapije minimalne krezubosti adhezivnim nadoknadama.

Cilj

Cilj ove studije je da oceni kliničke parametre kompozitnih adhezivnih mostova, koji se koriste za nadoknadu pojedinačnog nedostajućeg zuba u bočnoj regiji denticije, tokom dvogodišnjeg perioda praćenja.

Materijal i metod

a) Odabir pacijenata

U ovoj studiji, urađeno je 25 nadoknada pacijentima, kojima nedostaje drugi premolar ili prvi molar. Starost pacijenata je 19 do 47

godišnjak, posebno ako susjedni zubi imaju ispune ili kariozne lezije.⁴

Metal-keramika nije mogla da obezbedi dugotrajan uspeh delimičnih nadoknada, stoga su kompozitni sistemi ojačani vlaknima predloženi za navedenu indikaciju.^{5,6} Inicialno, sistem je patio od pukotina i odvajanja, što je dovelo do kumulativne stope uspeha od 73% nakon 5 godina bez odvajanja i 96% bez odvajanja.⁶ Osim toga, dugotrajni estetski rezultati su bili loši, sa odvajanjem, obojavanjem i diskoloracijom fasetirajućeg kompozita.

Stoga, modifikacije vlaknima ojačane osnove su predložene.^{7,8} Nadalje, predstavljena je nova generacija fasetirajućih kompozita, sa modifikovanim sadržajem mikropunioca (SR Adoro, Ivoclar Vivadent; Gradia InDirect, GC; Symphony, 3M itd.). Pomenuti sistemi, kako je navedeno, trebalo bi da omoguće odlično poliranje, sa dugotrajnom rezistencijom na plak i diskoloraciju.

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Aim

The purpose of this study was to evaluate clinical parameters of composite iFPDs, used for replacement of a single tooth in the posterior region during a two-year observation period.

Material and methods

a) Patient selection

For this study, 25 restorations were inserted in patients with a missing second premolar or first molar. The age of the patients was between 19 to 47 years. The study was approved by the

godina. Studija je odobrena od strane Etičkog komiteta fakulteta. Specifični kriterijumi izbora su:

- dobra oralna higijena,
- stepen labavljenja zuba je nula,
- oba nosača su vitalni zubi,
- minimalni ili bez znakova mobilnosti agonista ili antagonista,
- okluzo-gingivalna aksijalna dimenzija minimum 3 mm,
- bezubo polje maksimalno 12 mm,
- očnjačko vođenje,
- bez znakova parafunkcionalnih aktivnosti.

b) Preparacija zuba nosača

Preparacija je urađena prema principima, koji se mogu naći u literaturi:^{3,5,6,11,12}

- dubina kaviteta okluzalno minimum 2 mm,
- širina istmusa 1.5 – 2 mm za premolare i 2.5 – 3 mm za molare,
- proksimalno sanduče minimum 1.5 mm,
- divergencija aksijalnih zidova oko 6 stepeni,
- tretman gleđnih prizmi.

Za preparaciju su korišćena standardna inlejšvrdla (Komet Brasseler, Germany), a za tretman gleđnih prizmi korišćen je poseban ultrazvučni set (SonicSYS, KaVo, Biberach, Germany). U slučaju podminiranih zona, korišćena je adhezivna tehnika postavljanja ispuna (Tetric EvoCeram, Ivoclar Vivadent, Schaan, Liechtenstein). Otisci su uzeti A silikonom (Virtual, Ivoclar Vivadent, Schaan, Liechtenstein), uz upotrebu retrakcionog konca broj 0 (Ultrapak, Ultradent, USA).

c) Laboratorijska procedura

Kompozitni sistem ojačan vlaknima korišćen je prema uputstvima proizvođača. Fiber osnova (Vectris, Ivoclar Vivadent, Schaan, Liechtenstein) je napravljenja na osnovu anatomske tehnike^{7,8} i zatim fasetirana estetskim dvojno vezujućim kompozitom (Adoro, Ivoclar Vivadent, Schaan, Liechtenstein). Završno poliranje urađeno je ekstra finim polirerima i dijamantskim pastama.

d) Adhezivno cementiranje

Kod gotovih nadoknada, provereno je marginalno zaptivanje, okluzija i estetske karakteristike. Nadoknade su, zatim, adhezivno cementirane pomoću visokoestetskog kompoz-

Ethical Committee. Specific criteria for patient selection were:

- good oral hygiene,
- zero degree of loosening,
- both abutments vital,
- minimal or no signs of abutment or antagonist mobility,
- occluso-gingival axial dimension at least 3 mm,
- edentulous area up to 12 mm maximum,
- canine guidance,
- no signs of parafunctional activities.

b) Abutment preparation

Preparation was completed according to the guidelines suggested in the literature:^{3,5,6,11,12}

- occlusal cavity 2 mm deep at least,
- isthmus width 1.5-2 mm for premolars and 2.5-3 mm for molars,
- proximal box 1.5 mm at least,
- taper of the axial walls approx. 6 degrees,
- enamel prism treatment.

Standard inlay burs were used for the preparation (Komet Brasseler, Germany), while a specific ultrasonic set was used for enamel treatment (SonicSYS, KaVo, Biberach, Germany). The adhesive technique with Tetric EvoCeram (Ivoclar Vivadent, Schaan, Liechtenstein) was used for cusp reinforcement, if weakened by caries removal. Impressions were taken with A silicone (Virtual, Ivoclar Vivadent, Schaan, Liechtenstein), with no. 0 retraction cord (Ultrapak, Ultradent, USA).

c) Laboratory procedure

A fibre-reinforced composite system was used according to the manufacturer's instructions. A fibre frame (Vectris, Ivoclar Vivadent, Schaan, Liechtenstein) was fabricated according to the anatomical technique^{7,8} and then covered with esthetic dual-curing composite (Adoro, Ivoclar Vivadent, Schaan, Liechtenstein). Final polishing was done using extra fine polishers and diamond pastes.

d) Adhesive placement

The restorations were tried for fit, occlusion and aesthetic appearance. Subsequently, adhesive cementation was performed using high aesthetic composite cement (Variolink II, Ivoclar Vivadent, Schaan, Liechtenstein).

itnog cementa (Variolink II, Ivoclar Vivadent, Schaan, Liechtenstein). Površine inleja silanizirane su pomoću Monobond S, tokom 60s. Gleđne površine tretirane su 37% fosfornom kiselinom (Total Etch), nakon čega je nanešen Syntac Primer i Adhesive (15s i 10s, respektivno). Tanak sloj bonda (Heliobond) je potom nanešen i prosvetljen 20s. Odnos mešanja baze i katalizatora iznosi 1:1, u željenoj boji, uz upotrebu katalizatora niske viskoznosti. Cement je nanešen na unutrašnje površine nadoknade, nakon čega je nadoknada postavljena in situ, uz upotrebu konstantnog pritiska u trajanju od makar 15 s. Višak je uklonjen pomoću standardnog dentalnog konca, a cement je zatim prosvetljen tokom 40s sa svake strane (Bluephase, Ivoclar Vivadent, Schaan, Liechtenstein). Glicerinski gel je aplikovan pre definitivne polimerizacije, u cilju sprečavanje kiseonične inhibicije.

Po cementiranju, urađene su završne dorade, sa veoma finim dijamantima i silikon-karbidnim diskovima i četkicama (Astrobrush, Ivoclar Vivadent, Schaan, Liechtenstein).

e) Parametri praćenja

Procena uspešnosti izvedena je po cementiranju, a zatim 6, 12, 18 i 24 meseca po tretmanu. Procenu je vršio isti ispitivač, na osnovu kriterijuma koje je predložio Walton.¹³

1. Uspešan – bez potrebe za bilo kakvom intervencijom,
2. U funkciji – pacijent nije dostupan direktnom pregledu, ali je potvrdio uspešnost tretmana preko telefona,
3. Nepoznat – kontakt sa pacijentom nije mogao da bude uspostavljen,
4. Repariran – nadoknada je u funkciji, ali postoji potreba za većom intervencijom,
5. Neuspešan – rascementiranje nadoknade, fraktura osnove ili nosača.

Dalja analiza urađena je na kategorijama uspešan, repariran ili neuspešan, prema modifikovanoj USPHS klasifikaciji.¹⁴ Kriterijumi praćenja bili su:

- za nosače: fraktura, veza, marginalno prebojavanje, sekundarni karijes, postoperativna osetljivost,
- za adhezivne nadoknade: fraktura osnove, fraktra fasete, tekstura, boja.

The inlay fitting surfaces were silanized with Monobond S for 60 s. Enamel finish lines were treated with 37% phosphoric acid (Total Etch), after which Syntac Primer and Adhesive were applied (15 s and 10 s, respectively). A thin layer of the bonding agent (Heliobond) was then applied and light cured for 20 s. Base-catalysts were mixed in a 1:1 ratio in the desired colour, low viscosity syringes were used. The cement was applied to the inner iFPD surfaces, after which the restoration was inserted and constant pressure applied for at least 15 s. Excess was removed using regular dental floss, after which the restoration was light cured for 40 s on the each side (Bluephase, Ivoclar Vivadent, Schaan, Liechtenstein). A glycerine gel was applied prior to polymerization in order to prevent oxygen inhibition.

Final adjustments were completed accordingly, with extra fine diamond burs and silicone-carbide discs and brushes (Astrobrush, Ivoclar Vivadent, Schaan, Liechtenstein).

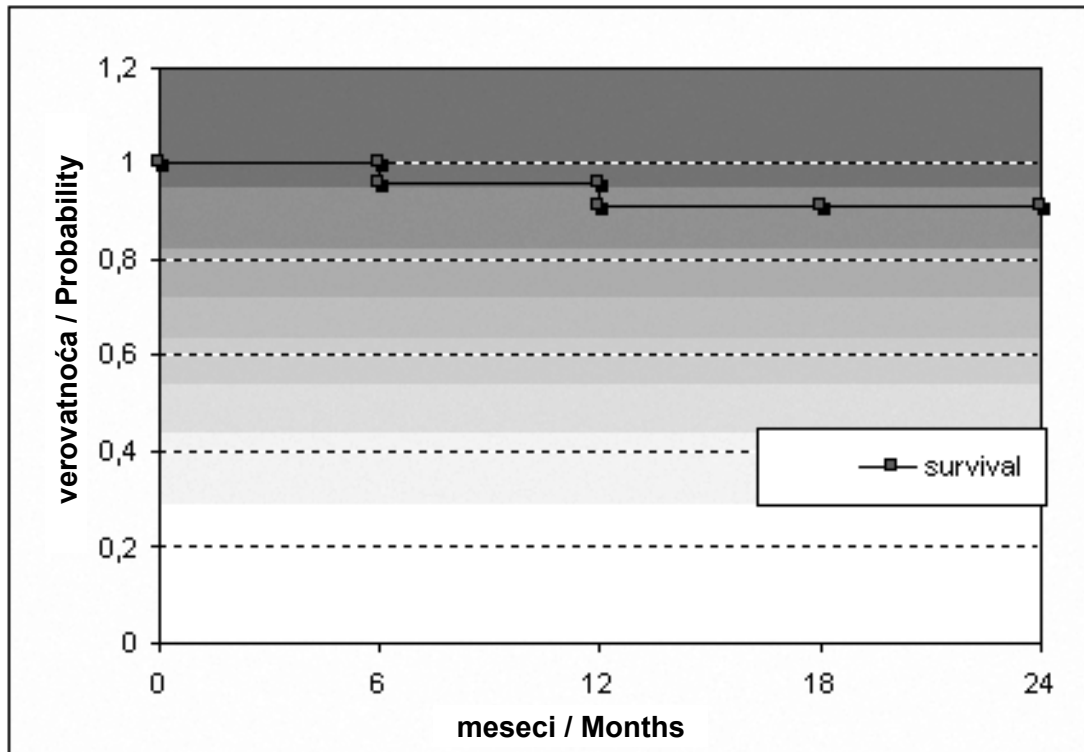
e) Examination

Examination was performed at baseline, 6, 12, 18 and 24 months after treatment. It was performed by one examiner according to the criteria suggested by Walton.¹³

1. Successful – no need for any kind of intervention
2. In function – the patient could not be examined directly, but confirmed no need for re-treatment via phone
3. Unknown. Contact with the patient could not be established.
4. Repaired. The restoration was in function, but there was a need for major correction.
5. Failed. Restoration lost retention, the frame or abutments exhibited fracture.

Further analysis was performed for categories successful, repaired or failed according to the modified USPHS classification.¹⁴ The examination criteria were:

- for abutments: fracture, bonding, marginal discoloration, secondary caries, postoperative sensitivity;
- for iFPD: framework fracture, veneer fracture, texture, colour.



Grafikon 1. Kaplan-Mier kriva verovatnoće delimične i potpune uspešnosti adhezivnih mostova u toku 24 meseca praćenja
Graph. 1. Kaplan – Mier partial and full survival probability during 24 months examination period

Korišćen je a – d sistem ocenjivanja, gde je:

- a – odličan,
- b – prihvatljiv,
- c – popravljiv,
- d – nepopravljiv.

f) Statistička analiza

Statistička analiza urađena je u SPSS programskom paketu verzija 12.0 (SPSS, Chicago, IL, USA). Izračunati su srednja vrednost, standardna devijacija i koeficijent varijacije, nakon čega je primenjena univarijantna Kaplan – Meier-ova analiza.

Rezultati

Primer uspešne nadoknade prikazan je na slici 1. Ukupna uspešnost adhezivnih nadoknada prikaza je u tabeli 1. Jedna restauracija nalazi se u kategoriji 'neuspešan' u trećem mesecu, usled frakture osnove. Detaljna analiza pokazuje da su dimenzije osnove bile neadekvatne, što bi se moglo smatrati glavnim uzrokom neuspeha. Druga nadoknada u ovoj kategoriji našla se u devetom mesecu po cementiranju, a u pitanju je rascementiranje na oba konektora. Kako

The ranking system used was a-d, where;

- a – excellent,
- b – acceptable,
- c – repairable,
- d – irreparable.

f) Statistical analysis

Statistical analysis was carried out using the SPSS software package ver. 12.0. (SPSS, Chicago, IL, USA). The mean value, standard deviation and variation coefficient were calculated. In addition, an univariate Kaplan – Meier estimation was performed.

Results

A successful restoration is shown in picture 1. Overall success of the iFPDs is shown in the fig.1. One restoration failed due to framework failure in the third month. The patient was a male, 43 years old, with a metal-ceramic FPD as antagonist. Detailed analysis has shown that framework dimensions were insufficient, which can be claimed to be the main factor responsible. The second failure occurred 9 months after insertion and this was due to debonding, both on

šestomesečni izveštaj o ovom pacijentu nije dostupan ('nepoznat' u tabeli 1), ne može se sa sigurnošću tvrditi, da li je delimično rasce-mentiravanje prethodilo potpunom ispadu iz funkcije. Prema komentaru pacijenta, prevremeni kontakt se može smatrati uzrokom odvajanja mosta od zuba nosača.

Detaljna klasifikacija data je u tabeli 2. Kod jedne nadoknade, može se naći reparabilna fraktura fasete, bez većih ispada iz funkcije. Ni jedan nosač nije pretrpeo frakturu tokom funkcije, takođe, nema znakova problema sa vitalitetom tokom perioda praćenja. Postoperativna senzitivnost javila se u dva slučaja, trajala je oko 4 meseca i može biti povezana sa najvećom površinom zuba tretiranom kiselinom. U oba slučaja, u pitanju su mlađi pacijenti (23 i 25 godina). Jedan slučaj bio je sumnjiv na sekundarni karijes, međutim, radiografsko ispitivanje nije potvrdilo prisustvo destrukcije. Kod jedne nadoknade, javila se inflamacija gingive u predelu distalnog dela MOD konektora, razlog se, međutim, može naći u lomu plombe susednog zuba, koji je izazvao iritaciju papile.

Vrednosti Kaplan – Meier-ove verovatnoće dati su na grafikonu 1. Uspešnost nadoknada u prvoj godini iznosi 91.1% (isključene kategorije 'nepoznat'), dok kumulativna uspešnost tokom druge godine (24 meseca) iznosi 86.6%.

Marginalno prebojavanje prikazano je u tabeli 2, kao i tekstura i boja. Vezano za prebojavanje, nakon 24 meseca 78,1% nadoknada ocenjeno je sa A, 18,8% sa B dok se 3,1% nadoknada nalazi u kategoriji C. Prebojavanje se moglo ukloniti sa polirerima, u nekim slučajevima. Boja je pokazala dobre rezultate kako inicijalno, tako i nakon 2 godine funkcije.

Pacijenti su, generalno, zadovoljni preduzetim tretmanom. Čak i oni, kod kojih se javio problem i neuspešan rad, bili su spremni na ponavljanje tretmana pre nego na opciju punih čaurastih retinera.

Diskusija

Adhezivne delimične nadoknade, kakvi su inlej-retinirani mostovi, veoma su interesantan modalitet tretmana, koji podržava prezervaciju tvrdih zubnih tkiva. Pored minimalne invazivnosti, oni takođe predstavljaju brz, efikasan i jeftin način tretmana.^{1,2,3,4,5,6,8,12}

Vezano za druge mogućnosti, puni čaurasti retineri imaju uspešnost od 92% nakond 10

mesial and distal retainers. Since details from a 6 month recall were unavailable (unknown in fig. 1), it cannot be ascertained whether partial debonding appeared prior to total failure. According to the patient statement, premature contact can be considered to be the reason for debonding.

A detailed classification is shown in fig. 2. One restoration exhibited a repairable veneer fracture with no major consequences. No abutment showed fracture during function and there were no signs of vitality problems during the examination period. Postoperative hypersensitivity appeared in two cases, it lasted for 4 months and can be linked with the area having the greatest degree of etching. Both cases appeared in younger patients (23 and 25 years of age). One case was susceptible to secondary caries, however radiographic investigation showed no signs of caries destruction. One restoration showed gingival inflammation next to the distal part of the MOD connector. However, the reason for the inflammation was due to a filling failure in a neighbouring tooth, which was the cause of subsequent irritation, rather than any problems with the restoration under study.

The Kaplan- Meier probability is shown in graph. 1. The success rate for the first year comes to 91.1% (unknown statement excluded), while the cumulative success probability during the second year (24 months) was 86.6%.

Marginal discoloration is shown in table 2, as well as colour match and texture. Regarding staining, after 24 months 78,1% were ranked A, 18,8% were B whilst 3,1% were rated C. Discoloration could be removed with polishers in some cases. Colour match has shown good results both initially and after a 2 year period of function.

Patients are generally satisfied with the treatment. Even those exhibiting fatal failure showed interest in re-treatment rather than a full crown FPDs restoration.

Discussion

Adhesive partial restorations, such as iFPDs, are a very interesting way towards hard dental tissue preservation. Besides minimal invasiveness, they also provide a quick, efficient and cost effective restorative option.^{1,2,3,4,5,6,8,12}

Among other treatment modalities, full crown FPDs express survival rates of 92% over



Slika 1. Primer restauracije iz kategorije 'uspešan' (0,6,12,18,24 meseca)
 Picture 1. Example restoration from the 'successful' category (0,6,12,18,24 months)

Tabela 1. Klasifikacija uspešnosti radova prema Walton-u
 Table 1. Survival rates according to Walton

| | nulti pregled Basic examination | 6 meseci 6 months | 1 godina 1 year | 1.5 godina 1.5 years | 2 godine 2 years |
|------------------------|------------------------------------|----------------------|--------------------|-------------------------|---------------------|
| | n=25 | n=25 | n=24 | n=23 | n=23 |
| Uspešan/Successful | 25 | 23 | 20 | 20 | 16 |
| U funkciji/In function | 0 | 0 | 2 | 1 | 4 |
| Nepoznat/Unknown | 0 | 1 | 1 | 1 | 3 |
| Repariran/Repaired | 0 | 0 | 0 | 1 | 0 |
| Neuspešan/Unsuccessful | 0 | 1 | 1 | 0 | 0 |

Tabela 2. Rezultati prema modifikovanim USPHS kriterijumima (a-odličan, b-prihvatljiv, c-popravljiv, d-nepopravljiv)
 Table 2. Results according to the modified USPHS criteria (a - excellent, b - acceptable, c - repairable, d - irreparable)

| | nulti pregled Basic examination | 6 meseci 6 months | 1 godina 1 year | 1.5 godina 1.5 years | 2 godine 2 years |
|--|------------------------------------|----------------------|--------------------|-------------------------|---------------------|
| Nosači (n=50)/Retainers | n=50 | n=46/48 | n=40/42 | n=42 | n=32 |
| Fraktura (zub)/Fracture | 50A | 46A | 40A | 42A | 32A |
| Veza/Connection | 50A | 46A | 40A,2D | 42A | 32A |
| Marginalno prebojavanje Marginal discoloration | 50A | 44A, 2B | 35A, 5B | 36A,5B,1C | 25A,6B,1C |
| Sekundarni karijes Secondary caries | 50A | 46A | 40A | 42A | 32A |
| Postop. osetljivost Postoperative sensitivity | 48A,2B | 46A | 40A | 42A | 32A |
| Mostovi (n=25)/Bridges | n=25 | n=23/24 | n=20/21 | n=21 | n=16 |
| Fraktura (osnova) Fracture (base) | 25A | 23A,1D | 20A | 21A | 16A |
| Fraktura (delaminacija) Fracture (delamination) | 25A | 23A | 20A | 20A,1C | 16A |
| Tekstura/Texture | 22A,3B | 20A,3B | 16A,4B | 17A,4B | 15A,1B |
| Boja/Color | 21A,4B | 19A,4B | 16A,4B | 17A,4B | 15A,1B |

godina i 74% nakon 15 godina.¹⁵ Uobičajeni problemi, vezano za nosače, su karijes (18%) i potreba za endodontskim tretmanom (11%). Očigledno je, da se uzroci neuspeha punih i delimičnih retinera veoma razlikuju, što pokazuje ova studija. Pucanje i rascementiranje mogu se povezati sa redukovanom geometrijom adhezivnih mostova, čime se minimizira kako bonding zona, tako i dimenzije osnove. Zahvaljujući adhezivnom cementiranju i vidljivim marginama, pojava sekundarnog karijesa nije tako uobičajena. U ovoj studiji, nisu se javili endodontski problemi, što podržava ideju da je šteta nanešena pulpnom tkivu manja kod delimičnih u poređenju sa punim čaurastim retinerima.¹⁶

Neke studije pokušale su da poboljšaju otpornost fiber osnove. Članak Song i sar.¹⁷ poredi dva načina preparacije zuba nosača, koji se razlikuju u dimenzijama, odnosno ekstenzivnosti proksimalnog sandučeta. Iako drugi način obezbeđuje veću prezervaciju zubnih tkiva, pokazao se značajno slabijim u poređenju sa klasičnim sandučastim dizajnom. Ova studija, takođe, ukazuje na značaj vertikalne dimenzije konektora, pre nego na njegovu širinu, čineći visinu najznačajnijim faktorom vezano za odluku o postavljanju adhezivne delimične nadoknade.

Poboljšanje osnove dovodi do razlika u tipu neuspeha, u poređenju sa prvom generacijom kompozitnih adhezivnih mostova. Kako je prikazano u literaturi,⁶ uspešnost od 71% nakon 5 godina uglavnom se može vezati za delaminaciju fasete. Sa jednim izuzetkom, ovakvo predviđanje ne može se izvesti, na osnovu rezultata ove studije. Navedeni primer može se, međutim, oceniti kao 'reparabilan', a klinička procedura reparacije čini se da je jednostavna i efikasna.

Rascementiranje je, prema literaturi, češće primećeno u mandibuli u poređenju sa gornjom vilicom.¹⁸ Uzroci se mogu povezati sa specifičnom ulogom donje vilice u mastikatornim pokretima. Takođe se češće može očekivati na premolaru, usled manje površine veze. Rascementiranje se, i u ovoj studiji, dogodilo u donjoj vilici, mada se ono može vezati za prevremeni kontakt, koji nije uklonjen usled nedostupnosti pacijenta. U poređenju sa metal-keramičkim delimičnim nadoknadama, kompozitne restauracije pokazuju manju tendenciju ka rascementiranju.¹⁶ Razlozi se mogu povezati sa većom jačinom veze između gleđi

10 years and 74% over 15 years.¹⁵ The most common problems with abutment teeth of conventional FPDs are caries (18%) and the need for endodontic treatment (11%). It is obvious, compared to the results of this study, that failure rates greatly differ between full and partly retained FPDs. Both debonding and fractures can be related to the reduced geometry of iFPDs, which minimizes the bonding area as well as framework dimensions. Due to the adhesive cementation and visible margins, secondary caries is less likely to occur. This study also did not indicate any endodontic problems, supporting a thesis that damage to the pulp tissues is much lower with iFPD restorations compared to full retainers.¹⁶

Some studies tried to improve fracture resistance of the fibre framework. An article by Song et al¹⁷ compared two abutment preparation designs, which differ in proximal box dimensions and extension. Though a tube-shaped design provided maximal tissue preservation, it appeared to be significantly weaker compared to the box-shaped design. This study showed the importance of the connector dimensions in the vertical plane, rather than in the width, making the height the most decisive factor when deciding pro et contra iFPDs.

Framework improvements lead to a difference in the failure type, compared to the first generation of composite iFPDs. As reported in the literature,⁶ survival rate of 71% after five years has been mainly related to veneer delamination. This is not an expectation arising from the results of this study, given the observation of only one such occurrence. The mentioned case, however, can be classified as repairable and clinical procedure seems to be simple, efficient and long-lasting.

Debonding is reported to be more likely in mandibular restorations rather than those in the upper jaw.¹⁸ The reasons could be related to specific lower jaw movements during mastication. It is also rather expected on premolars, due to a reduction in the bonding surface. Debonding in this study appeared to occur in the lower jaw but can be related to a premature contact, which was not treated because of the patient's unavailability. Compared to the cast metal ceramic iFPDs, composite restorations are less likely to debond.¹⁶ The main reason for this is the enhanced bonding strength between enamel and the composite iFPD, compared to

sa jedne, i kompozitne nadoknade, sa druge strane, u poređenju sa gleđ-metal vezom. Drugi razlog može se tražiti u razlici elastičnih modula, gde se kompozitni približava dentinskom. Za povećanje jačine veze predložene su modifikacije dizajna.¹⁹ Ipak, ove modifikacije, usled svoje komplikovanosti, verovatno se pre mogu izvesti ukoliko se, kao gradivni materijal, koriste keramički materijali.

Boja, tekstura i diskoloracije značajno su uticale na rezultate prve generacije fasetirajućeg kompozita.^{5,6,12} Promene u sadržaju punioca, kao i poboljšana, dvojna svetlosno – toplotna polimerizacije vode značajno boljem ishodu, kakav se zapaža u ovoj studiji. Kod pomenu-tih članaka, mogu se naći izveštaji o akumulaciji plaka, koji sledstveno vode gingivalnim problemima. Slični nalazi ne mogu se naći u ovom istraživanju. Način slaganja slojeva u principu se ne razlikuje od onog, primenjenog kod keramičkih materijala, osim jednostavnosti izrade, koja potiče od nepostojanja potrebe za predimenzioniranjem nadoknade. Prema rezultatima ove studije, boja može biti adekvatna čak i u najzahtevnijim zonama, kakve su prelazi zub – nadoknada.

Ova studija bazirana je na nedostatku zuba u bočnoj regiji, a u literaturi se mogu naći i primeri anteriornih ili čak višečlanih nadoknada.²⁰ Iako inicijalni rezultati deluju ohrabrujuće, generalno se višečlane nadoknade ne mogu uspešno uraditi adhezivnom tehnikom. To je i razlog fokusiranosti ove studije na mostove manjeg raspona. Eventualna dalja poboljšanja mogla bi dovesti do proboja adhezivnih nadoknada i u ovom indikacionom polju.

Zaključak

Kompozitne nadoknade ojačane vlaknima su minimalno invazivni, estetski i pouzdan način tretmana minimalne krezubosti bočnog segmenta denticije. U kliničkoj praksi, za postizanje dugotrajnih rezultata pažnju treba obratiti na izbor pacijenata, okluzo – gingivalnu dimenziju nosača, modelovanje osnove i adhezivnu tehniku cementiranja.

the enamel-metal bond. A second factor could be due to a difference in the elasticity modulus. The modulus of composite closely matches that of dentin. For bonding improvement a modified design has been suggested.¹⁹ However, it has to be noted that the latter is more likely to be achieved with high-strength ceramic frameworks, due to its complexity.

Colour match, texture and discoloration greatly influenced a positive outcome of the first generation of veneering composite.^{5,6,12} Changes in the filler content, as well as improved dual light-heat polymerization led to a significantly better outcome in this study. The above articles reported plaque accumulation, which lead to subsequent gingival problems. However, those findings can not be confirmed by the present investigation. The composite layering technique basically does not differ from those used for ceramic restorations but it is more convenient since there is no shrinkage of the material. From the results seen in this study, colour can be achieved and matched even in the most demanding areas, such as tooth-restoration transition.

While this study is based on posterior single-tooth replacements, others were focused on anterior or even long-span composite iFPDs.²⁰ Though initial results were encouraging, in general multiple tooth restorations can not be supported by the adhesive technique. For this reason this study focused on short-span iFPDs. However, eventually, further improvements could provide a breakthrough in multiple composite restorations.

Conclusions

Fibre-reinforced composite iFPDs are a tooth preserving, minimally invasive, aesthetic and reliable treatment option for single tooth replacement in the posterior area. In clinical practice, attention should be paid to patient selection, abutment height, framework modelling and adhesive cementation in order to achieve long-lasting results.

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