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In Vitro Comparative Evaluation of Microleakage of Newly Introduced Dyad Flow and Total and Self Etch Adhesives in Class V Resin Composite Restorations

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SUMMARY

Introduction The aim of this study was to evaluate marginal sealing ability of newly introduced Dyad Flow flowable composite and compare to total-etch and self-etch adhesive system at the coronal and apical margins of class V resin composite restorations.

Material and Methods A standard class V cavity (3 mm mesiodistal width, 3 mm occlusogingival height and 1.5 mm axial depth) was prepared on the buccal surface of freshly extracted sound human teeth. Occlusal and gingival margins of the cavities were located in enamel and cementum/dentin, respectively. Teeth were randomly assigned into the three groups (n=10) and restored with different composite materials following the manufacturer's instructions: group I was restored with nanohybrid resin composite using total-etch bonding agent; group II was restored with nanohybrid resin composite using self-etch technique; group III was restored with flowable composite (Dyad Flow), respectively. After finishing and polishing, the teeth were coated with nail varnish and immersed in rhodamine B dye and sectioned longitudinally. Dye penetration was examined under stereomicroscope and scored separately for occlusal and gingival margins on a 0–3 ordinal scale. Data were analyzed with Kruskal–Wallis, Mann–Whitney and Wilcoxon tests ($\alpha=0.05$).

Result Statistical analysis showed that specimens restored with the total-etch and self-etch adhesive systems revealed reduced leakage at the coronal margin. At the apical margin, Dyad Flow showed greater leakage than other groups.

Conclusion Newly introduced flowable composite Dyad Flow showed inferior adhesive bond with enamel and dentin compared to total-etch and self-etch techniques.

Keywords: Dyad Flow; total-etch; self-etch

INTRODUCTION

The search for an ideal dental restorative material, exhibiting appropriate physical and mechanical properties, as well as, excellent aesthetics, has resulted in the introduction of light cured composites. These resins have been widely used as restorative materials for both anterior and posterior teeth. With passage of time various changes are seen in composite bonding system. Due to polymerisation shrinkage of these materials, successful adhesion to enamel and dentin is an indispensable prerequisite for clinical success; otherwise gap formation would endanger clinical success [1, 2].

Enamel bonding has been accepted as clinically strong and durable, because acidic etchants, such as 30–40% phosphoric acid, create enamel microporosities allowing the penetration of monomers consecutively generating micromechanical retention [3, 4]. In contrast, dentin is an unpredictable substrate for adhesion due to tubular structure, high organic content, and intrinsic wetness [5, 6, 7].

To solve the problem, different approaches have been reported in the literature. In two-step total-etch systems, a separate etch and rinse phase is still involved, but a hydrophilic primer and hydrophobic resin are combined into

one application. Although increased technique sensitivity is reported [8, 9] for total-etch adhesives, similar clinical performance is achieved for both conventional and simplified total-etch adhesive versions [10, 11]. Self-etch adhesives represent an alternative approach in enamel-dentin bonding. They do not require a separate acid etch step and are based on the use of nonrinse acidic monomers that simultaneously condition and prime dentin and enamel [8, 12, 13, 14]. This approach eliminates rinsing phase and does not require application of primer in particular conditions of wetness due to the self-etch adhesives' water content; reduced technique-sensitivity and the risk of making errors during application are achieved. For these reasons, their popularity is increasing [15]. Flowable restorative resins with a low viscosity are recommended as the material of choice for restoring Class V cavities. Flowable composites are easier to place and more self-adaptable compared to conventional restorative resin composites [16]. Dyad Flow is new self adhesive flowable composite resin which can be seen as an alternative to the previous time-consuming procedures. It is self adhering composite in which no separate bonding protocol is required. It has fluoride releasing property and its translucent quality provides excellent aesthetics in the vast majority of situations.

The aim of this study was to assess the microleakage of class V cavities restored with a new self-adhesive flowable composite resin and to compare with two-step total-etch and self-etch adhesive system. All used adhesives were also tested for their bonding ability to enamel and dentin.

MATERIAL AND METHODS

A total of 30 intact human teeth were collected and stored in saline at the room temperature for 30 days. A standard class V cavity (3 mm mesiodistal width, 3 mm occluso-gingival height, and 1.5 mm axial depth) was prepared at the cemento-enamel junction (CEJ) on the facial surface of each tooth.

The teeth were randomly assigned into the three groups (10 teeth in each group): Group A was restored with 3M nanohybrid resin Composite using Total etch technique with 3M Single Bond Adhesive. Group B was restored with 3M nanohybrid resin composite using self-etch

technique with Clear fil self-etch bonding agent. Group C was restored with Dyad Flow composite.

Resin composite shade A2 was used for each group. These were placed in two increments; each increment was cured for 20 s according to manufacturer’s instructions. The restorations were finished with finishing diamond burs and polished with aluminum oxide discs under constant air/water coolant.

The root apices of specimens were sealed with sticky wax; all external surfaces were covered with two layers of nail varnish except for 1.0 mm around the restorations and then immersed in a Rhodamine B dye solution for 24 hours.

The specimens were rinsed in running water, dried and then sectioned faciolingually. The dye penetration depth along the cavity wall (including both occlusal and gingival margins) was measured with a stereomicroscope. The microleakage score was recorded separately for both occlusal and cervical margins on a nonparametric ordinal scale from 0 to 3 (Table 1).

Data were analyzed using Kruskal-Wallis analysis of variance and Mann-Whitney U-test for comparing the restorative materials.

Table 1. Scoring ordinal scale

Tabela 1. Neparametrijska skala rezultata

Microleakage score Ocena mikrocurenja	Result Rezultat
0	No microleakage Nema mikrocurenja
1	Dye penetration less than ½ of axial wall Prodor boje manje od polovine zida
2	Dye penetration more than ½ of axial wall Prodor boje više od polovine zida
3	Dye penetration spreading along the axial wall Prodor boje duž celog zida

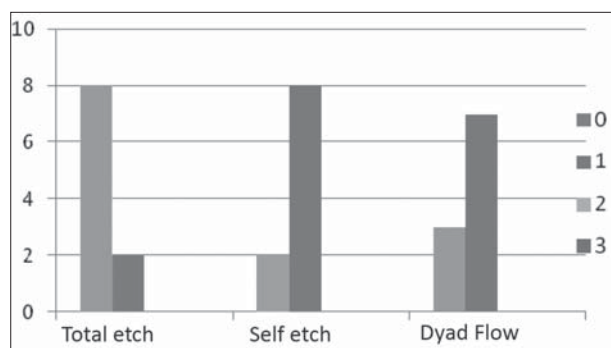
RESULTS

Microleakage was observed in all restorations at occlusal and cervical margins. Kruskal–Wallis analysis of variance showed no significant difference between the total etch and the self-etch group (p=0.001). Dyad Flow showed significant microleakage at occlusal and cervical margins (p>0.05) (Table 2, Graphs 1 and 2).

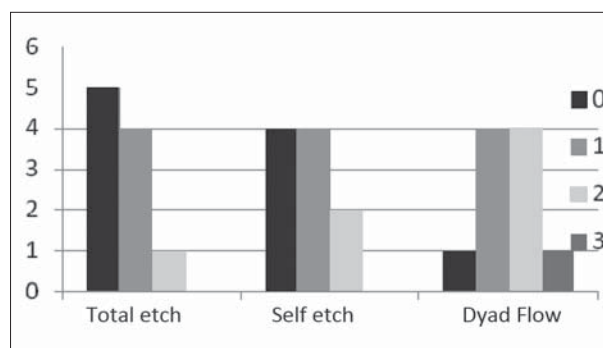
Table 2. Frequency, mean value ± SD of microleakage scores, and p value of the Wilcoxon signed rank test of the three groups used on occlusal and gingival margins (n=10)

Tabela 2. Učestalost, srednja vrednost ± SD za vrednost mikrocurenja, i vrednost p Vilkonsonovog testa rangova kod sve tri grupe na okluzalnim i gingivalnim zidovima kaviteta (n=10)

Groups Grupe	Occlusal margin Okluzalni zid					Cervical margin Gingivalni zid					P
	Microleakage score Ocena mikrocurenja				Mean±SD X̄±SD	Microleakage score Ocena mikrocurenja				Mean±SD X̄±SD	
	0	1	2	3		0	1	2	3		
Total-etch	8	2	0	0	0.020±0.422	5	4	1	0	0.60±0.699	0.206
Self-etch Samonagrizajući	2	8	0	0	0.80±0.426	4	4	2	0	1.10±0.738	0.180
Dyad Flow	3	7	0	0	0.60±0.516	1	4	4	1	1.50±0.850	0.024*



Graph 1. Microleakage graph score at occlusal margin
Grafikon 1. Ocena mikrocurenja na okluzalnom zidu



Graph 2. Microleakage graph score at cervical margin
Grafikon 2. Ocena mikrocurenja na gingivalnom zidu

DISCUSSION

Microleakage has been defined by Sidhu and Henderson as “The clinically undetectable passage of bacterial fluids, molecules or ions between a cavity wall and the restorative material applied to it” [17]. The primary objective of a dental restoration is to create a ‘perfect’ seal, and prevent leakage of contaminants contained in the oral environment. However, long-term microleakage occurs in all restorations [18].

Microleakage is more critical in class V cavities located both in dentin and/or cementum, which may lead to a weaker marginal seal than that on the enamel surface; adhesion between composite resins and dentin is not as strong as with enamel [19, 20]. Filling material can be dislodged occlusally during polymerization contraction, causing poor adaptation of the restoration at the cervical margin [21]. Higher organic component, tubular structure, fluid pressure and lower surface energy make bonding to dentin more difficult than enamel [22].

In the present study, microleakage was assessed in newly introduced Dyad Flow and compared to total etch and self-etch adhesive system at the coronal and apical margins of class V resin composite restorations. The use of organic dye as tracer is one of the most common methods of detecting micro leakage *in vitro* and it was used in our study.

The latest development in dentin adhesion is based on simplification and reduced application time. This led to the introduction of Dyad flow in which no separate bonding protocols are required. Selfetching adhesives do not require a separate acid-etch-step as they condition and prime enamel and dentin simultaneously by infiltrating and partially dissolving the smear layer and hydroxyapatite to generate hybrid zone, which plays a major role in adhesion. In total etch method, phosphoric acid etches the enamel and removes the smear layer, helps deeper penetration of resin monomers and formation of longer tags providing durable marginal seal [23]. Self-etch systems contain ester monomers with grafted carboxylic or phosphate acid groups dissolved in water. With these systems,

the smear layer is dissolved and incorporated into the hybrid layer. The bonding mechanism for strong self-etch adhesives is very similar to that of etch-and-rinse systems. Their bond strength, particularly for all-in-one systems, is relatively low, probably because of their high initial acidity and high water content.[23]. Clearfil SE Bond is a mild two-step self-etch adhesive with a pH very close to 2 [24].

In this study, the results showed greater microleakage scores at the cervical margins compared to the occlusal margins. In 3M ESPE Adper, occlusally 80% samples showed no microleakage and 20% samples showed dye penetration less than ½ of axial wall while cervically 50% samples showed no microleakage; 40% samples showed dye penetration less than ½ of axial wall and 10% showed dye penetration more than ½ of axial wall i.e score 2 (Figure 1).

Similarly with Clearfil SE; occlusally 20% samples no microleakage and 80% samples showed dye penetration less than ½ of axial wall compared to cervical margin where 40% samples showed no microleakage; 40% samples showed dye penetration less than ½ of axial wall and 20% samples showed dye penetration more than ½ of axial wall (Figure 2). However this difference was not statistically significant.

Flowable composites contain dimethacrylate resin and inorganic fillers with a particle size of 0.4 to 3.0 µm and



Figure 1. Microleakage in total-etch method
Slika 1. Mikrocurenje kod primene *total-etch* tehnike

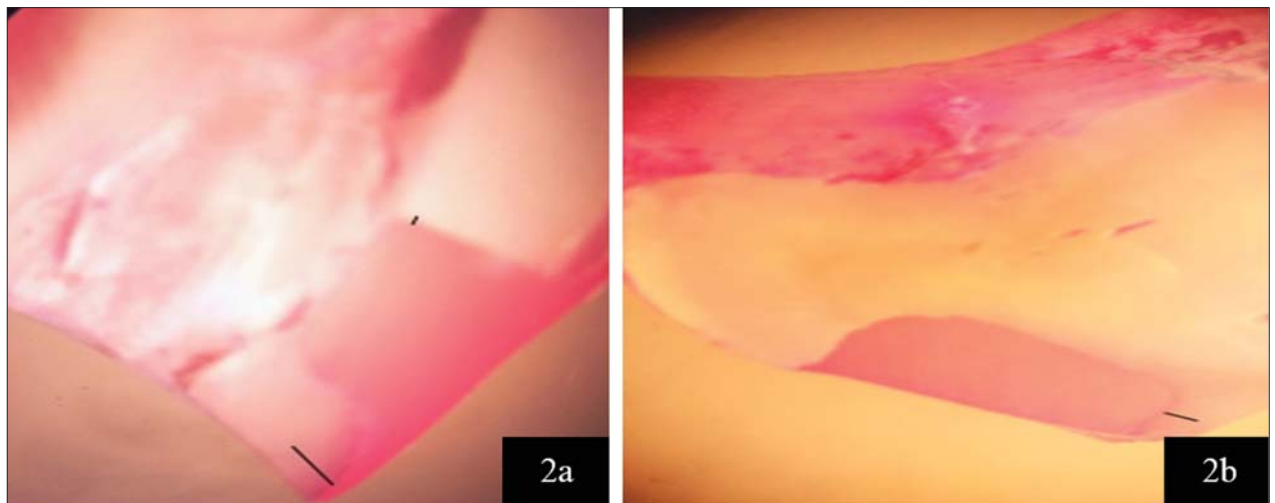


Figure 2. Microleakage in self-etch method: a) occlusal – 1, cervical – 3; b) occlusal – 0, cervical – 2
Slika 2. Mikrocurenje kod primene samonagrizajuće tehnike: a) okluzalno – 1, gingivalno – 3; b) okluzalno – 0, gingivalno – 2

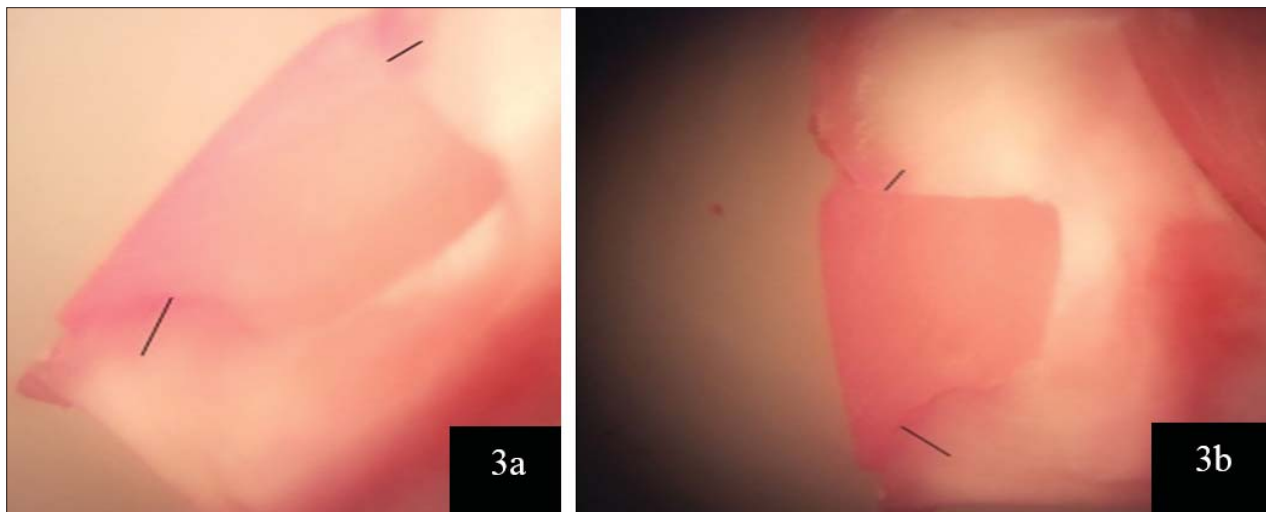


Figure 3. Microleakage in Dyad Flow: a) occlusal – 2, cervical – 3; b) occlusal – 2, cervical – 3

Slika 3. Mikroocurenje kod primene Dyad Flow: a) okluzalno – 2, gingivalno – 3; b) okluzalno – 2, gingivalno – 3

filler loading of 42% to 53% by volume. Recently, self-adhesive flowable composites have become available. Flowable composites have a low modulus of elasticity, which may make them useful in cervical abfraction areas. Because of their lower filler content, they exhibit higher polymerization shrinkage and lower wear resistance than universal composites. The viscosity of these composites allows them to be dispensed by a syringe with a needle tip for easy handling [23].

Also Dyad Flow without acid etching and bonding agent showed the highest microleakage scores than other groups (Figure 3). Our study showed that in Dyad Flow group occlusally 30% samples showed no microleakage and 70% samples showed dye penetration in less than ½ of axial wall; cervically 10% samples showed no microleakage, 40% samples showed dye penetration less than ½ of axial wall and 40% samples showed dye penetration more than ½ of axial wall and 10% samples showed dye penetration spreading along the axial wall. In this group statistically significant difference was observed between microleakage at cervical and occlusal margins. This is in accordance with previous studies that reported poorer bonding to dentin compared to enamel due to higher organic component, tubular structure and lower surface energy of dentin [15]. Also, previous studies reported that no flowable material can completely eliminate microleakage due to higher polymerization shrinkage and coefficient of thermal expansion [25, 26]. As manufacturers launch new self adhesive flowable composites before the conclusion of independent ongoing studies, efforts toward future research should be directed to assess the quality and reliability of these materials through both laboratory and clinical evaluations.

CONCLUSION

In class V restorations restored with composite resin, the choice of material affects the microleakage and retention of the restoration. Within the limitations of this *in vitro* study, it may be concluded that in class V cavities the

application of acid etching provided better occlusal and cervical marginal sealing. All tested adhesives showed a certain amount of microleakage in enamel and dentin. At both enamel and dentin margins, total etch adhesive performed better than other groups. At the apical margin, Dyad Flow showed greater leakage than the other groups.

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Evaluacija mikrocurenja novih tečnih kompozita (*Dyad Flow*) i adheziva baziranih na *total-etch* i samonagrizajućoj tehnici kod V klase kompozitnih ispuna

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KRATAK SADRŽAJ

Uvod Cilj ovog istraživanja je bio da se proceni sposobnost marginalnog zaptivanja novih Dyad Flow tečnih kompozita i dva adhezivna sistema, *total-etch* i samonagrizajućeg sistema, na koronarnom i gingivalnom zidu V klase kompozitnih ispuna.

Materijal i metode rada Standardna V klasa (3 mm meziodistalne širine, 3 mm okluzo-gingivalne visine i 1,5 mm dubine) ispreparisana je na vestibularnoj strani sveže ekstrahovanih intaktnih ljudskih zuba. Okluzalni i gingivalni zid preparacije su se nalazili u gleđi, odnosno cementu/dentinu. Zubi su metodom slučajnog izbora raspoređeni u tri grupe od po 10 zuba, a ispreparisani kaviteti su zatvoreni različitim kompozitnim materijalima prema instrukcijama proizvođača: grupu A su činili ispuni od nanohibridnih kompozita primenjeni *total-etch* tehnikom, u grupi B kaviteti su bili ispunjeni nanohibridnim kompozitom primenom samonagrizajuće tehnike, a u grupi C kaviteti su ispunjeni samonagrizajućim tečnim kompozitom Dyad Flow. Nakon obrade i poliranja ispuna, zubi su premazani lakom za nokte i uronjeni u boju rodamin B, a nakon toga uzdužno presečeni. Dubina prodiranja boje je procenjena pomoću stereomikroskopa, i to posebno za okluzalni i gingivalni zid ispuna. Rezultati su predstavljeni na skali od 0 do 3. Podaci su analizirani Kruskal–Volisovim, Man–Vitnjevim i Vilkoksonovim testovima ($\alpha=0,05$).

Rezultati Svi uzorci su pokazali manje mikrocurenje na okluzalnom zidu kaviteta u odnosu na gingivalni zid. Na gingivalnom zidu kaviteta Dyad Flow je pokazao veće mikrocurenje u odnosu na druge adhezivne sisteme.

Zaključak Novi tečni kompozit Dyad Flow je pokazao lošiju adhezivnu vezu sa dentinom i gleđi u poređenju sa drugim ispitanim adhezivnim sistemima.

Ključne reči: Dyad Flow; *total-etch*; samonagrizajući adhezivni sistem

UVOD

Potruga za idealnim stomatološkim restaurativnim materijalom, koji ima odgovarajuće fizičke, mehaničke i estetske osobine, dovela je do uvođenja svetlosnopolimerizujućih kompozita. Ove smole se široko koriste kao restaurativni materijali za ispune na prednjim i bočnim zubima. U kompozitnim ispunima vremenom se javljaju promene u adhezivnom sloju. Zbog polimerizacijske kontrakcije ovih materijala, dobra veza sa gleđi i dentinom je neophodan preduslov za klinički uspeh; u protivnom, dolazi do stvaranja pukotine između ispuna i zuba i samim tim do nekvalitetnog ispuna [1, 2].

Veza između kompozita i gleđi je klinički jaka i izdržljiva veza, zato što kiseline, kao što je fosforna kiselina u koncentraciji od 30–40%, nagrizaju gleđ i dovode do stvaranja mikroporoznosti. Posle nagrizanja u nastale mikropukotine prodire monomer i stvara mikromehaničku vezu između smole i zuba [3, 4]. Nasuprot gleđi, dentin ostvaruje slabiju vezu s kompozitom zbog tubularne strukture, visokog organskog sadržaja i unutrašnje vlažnosti [5, 6, 7].

Da bi se rešio ovaj problem, uvedeni su različiti adhezivni sistemi. *Total-etch* u dva koraka uključuje nagrizanje i ispiranje zuba u prvom koraku, ali hidrofилни prajmer i hidrofобни bond su kombinovani u jednom preparatu koji se aplikuje u drugom koraku [8, 9]. *Total-etch* tehnika može dovesti do osetljivosti zuba, ali sličan klinički uspeh se postiže konvencionalnom ili pojednostavljenom *total-etch* tehnikom [10, 11]. Samonagrizajući adhezivni sistemi su alternativni način ostvarivanja veze gleđi i dentina s kompozitima. Oni ne zahtevaju poseban korak nagrizanja (*etch*) i zasnivaju se na kiselim monomerima koji istovremeno nagrizaju, ali i služe kao prajmer za gleđ i dentin [8, 12, 13, 14]. Ovaj sistem eliminiše fazu ispiranja i ne zahteva primenu bonda u određenim uslovima vlažnosti zbog sopstvenog

sadržaja vode. Na ovaj način pojednostavljenim postupkom se smanjuje mogućnost greške, pa se ova tehnika sve češće primenjuje [15]. Tečni kompoziti imaju malu viskoznost i materijal su izbora za restauraciju kaviteta V klase. Tečni kompoziti su lakši za upotrebu i samoadaptabilni u poređenju s konvencionalnim restaurativnim kompozitima [16]. Dyad Flow je novi samonagrizajući tečni kompozit koji se jednostavno upotrebljava. On se vezuje samonagrizajućom tehnikom. Ima sposobnost otpuštanja fluorida i dobra estetska svojstva.

Cilj ovog istraživanja je bio da se proceni sposobnost marginalnog zaptivanja novih Dyad Flow tečnih kompozita i dva adhezivna sistema, *total-etch* i samonagrizajućeg sistema. Svi adhezivni sistemi su procenjeni na koronarnom i gingivalnom zidu V klase kompozitnih ispuna.

MATERIJAL I METODE RADA

U studiju je uključeno ukupno 30 ekstrahovanih intaktnih ljudskih zuba koji su čuvani u fiziološkom rastvoru na sobnoj temperaturi 30 dana. Standardni kaviteti V klase (3 mm meziodistalne širine, 3 mm okluzo-gingivalne visine i 1,5 mm dubine) ispreparisani su na cementno-gleđnom spoju na vestibularnoj površini svakog zuba.

Zubi su metodom slučajnog izbora svrstani u tri grupe sa po 10 zuba u svakoj grupi. Kaviteti u grupi A su ispunjeni 3M nanohibridnim kompozitom primenom *total-etch* tehnike uz korišćenje 3M Single Bond adheziva. U grupi B kaviteti su ispunjeni 3M nanohibridnim kompozitima primenom samonagrizajućeg adheziva Clearfil. Za kavitete u grupi C korišćen je samonagrizajući Dyad Flow tečni kompozit.

Svi kompoziti su bili A2 boje. Postavljeni su slojevito, i to u dva sloja, gde je svaki sloj polimerizovan 20 sekundi prema

uputstvima proizvođača. Za završnu obradu korišćeni su dijamantski boreri i aluminijumoksidni diskovi sa stalnim hlađenjem vazduhom i vodom.

Apeksni otvori korenova su zatvoreni lepljivim voskom; sve spoljne površine zuba su premazane sa dva sloja laka za nokte osim 1 mm oko ispuna i uronjeni u Rodamin B rastvor boje tokom 24 sata. Uzorci su nakon jednog dana isprani tekućom vodom, osušeni, a potom presečeni u vestibulolingvalnom pravcu. Dubina prodora boje duž zidova kaviteta (kako okluzalnog, tako i gingivalnog zida) izmerena je pomoću stereomikroskopa. Rezultati su predstavljeni neparametrijski brojevima od 0 do 3 (Tabela 1).

Za statističku obradu podataka korišćeni su Kruskal–Volisova analiza varijanse i Man–Vitnijev U-test.

REZULTATI

Mikrocurenje je zabeleženo kod svih ispuna i na okluzalnom i na gingivalnom zidu. Kruskal–Volisova analiza varijanse nije pokazala statistički značajnu razliku između *total-etch* i samonagrizajuće tehnike ($p=0,001$). Dyad Flow je pokazao značajano veće mikrocurenje na okluzalnom i gingivalnom zidu u odnosu na druge sisteme ($p>0,05$) (Tabela 2, Grafikoni 1 i 2).

DISKUSIJA

Mikrocurenje su Sidu (*Sidhu*) i Henderson (*Henderson*) [17] definisali kao „klinički neprimetan prolaz bakterija, molekula ili jona između zidova kaviteta i ispuna“. Osnovni cilj ispuna je da stvori „savršen“ kontakt i spreči kontaminaciju iz usne duplje. Međutim, mikrocurenje se javlja kod svih ispuna [18].

Mikrocurenje je veoma značajno kada se zid kaviteta V klase nalazi u dentinu i/ili cementu, zato što može dovesti do slabijeg rubnog zatvaranja nego da je zid u gleđi, jer je veza između adheziva i dentina mnogo slabija nego između adheziva i gleđi [19, 20]. Tokom polimerizacije ispuna može doći do povlačenja ispuna u okluzalnom pravcu, što dovodi do mikrocurenja na gingivalnom zidu [21]. Veća količina organskog sadržaja, tubularna struktura, pritisak tečnosti i manja površinska energija utiču na slabiju vezu adheziva sa dentinom [22].

U našoj studiji mikrocurenje je izmereno za novi materijal Dyad Flow i upoređeno sa *total-etch* i samonagrizajućom tehnikom na okluzalnom i gingivalnom zidu kaviteta V klase. Za merenje mikrocurenja korišćen je rastvor organske boje, što je najčešće korišćena metoda upošte.

Najnoviji razvoj u dentin-bondingu odnosi se na pojednostavljenje tehnike i skraćivanje vremena rada. To je dovelo do uvođenja tečnog kompozita Dyad Flow, koji ne zahteva posebne bonding protokole. Samonagrizajući adhezivni sistemi ne zahtevaju poseban korak nagrizanja i upotrebu prajmera, zato što oni istovremeno infiltriraju i delimično rastvaraju razmazni sloj i hidroksiapatit i stvaraju hibridni sloj, koji igra glavnu ulogu u adheziji. U *total-etch* tehnici fosforna kiselina nagriza gleđ i uklanja razmazni sloj, pomaže dublje prodiranje smole monomera i formiranje čvršće veze [23]. Samonagrizajući sistemi sadrže estarske monomere sa grupama karboksilne ili fosfatne kiseline koje su rastvorene u vodi. U ovim sistemima razmazni sloj se rastvori i potom postane deo hibridnog sloja. Mehanizam

vezivanja kod jakih samonagrizajućih adheziva je sličan onom kod sistema koji koriste nagrizanje i ispiranje. Njihova snaga vezivanja, posebno za sveobuhvatne sisteme, relativno je niska, verovatno zbog visoke početne kiselosti i visokog sadržaja vode [23]. Clearfil SE Bond je samonagrizajući adheziv koji se koristi u dva koraka i ima kiseli pH blizu 2 [24].

U ovoj studiji rezultati su pokazali veće mikrocurenje na gingivalnom zidu nego na okluzalnom. U 3M Espe Adper, 80% uzoraka nije pokazalo mikrocurenje, a 20% uzoraka je pokazalo prodor boje duž manje od polovine okluzalnog zida, dok kod gingivalnog zida 50% uzoraka nije pokazalo mikrocurenje; 40% uzoraka je pokazalo prodor boje manje od polovine gingivalnog zida, a 10% je pokazalo prodor boje duž više od polovine aksijalnog zida, tj. na ordinarnoj skali to je odgovaralo broju 2 (Slika 1).

Slično je i sa Clearfil SE: na okluzalnom zidu 20% uzoraka nije pokazalo mikrocurenje, a 80% uzoraka je pokazalo prodiranje boje duž manje od polovine okluzalnog zida u odnosu na gingivalni zid, gde 40% uzoraka nije pokazalo nikakvo mikrocurenje, 40% uzoraka pokazalo je prodor boje duž manje od polovine gingivalnog zida, a 20% uzoraka je pokazalo prodor boje više od polovine gingivalnog zida (Slika 2). Međutim, ova razlika nije bila statistički značajna.

Tečni kompoziti sadrže dimetakrilatnu smolu i neorganska punila sa česticama veličine 0,4–3,0 μm i 42–53% zapremine. Nedavno su se na tržištu pojavili samonagrizajući tečni kompoziti. Tečni kompoziti imaju niski moduo elastičnosti, što ih čini pogodnim za postavljanje ispuna u cervikalnom delu zuba. Zbog nižeg sadržaja punila, oni pokazuju veću polimerizacionu kontrakciju i nižu otpornost na habanje u poređenju s konvencionalnim kompozitima. Viskoznost ovih kompozita omogućava njihovu aplikaciju pomoću šprica i igle [23].

U našoj studiji Dyad Flow samonagrizajući kompozit je pokazao najveće mikrocurenje u odnosu na druge grupe (Slika 3). U 30% uzoraka nije bilo mikrocurenja, a 70% uzoraka je pokazalo prodor boje duž manje od polovine okluzalnog zida. U 10% uzoraka nije otkriveno mikrocurenje na gingivalnom zidu, u 40% uzoraka boja je otkrivena do manje od polovine gingivalnog zida. Takođe, u 40% uzoraka prodor boje zabeležen je preko polovine dužine gingivalnog zida, dok je u 10% uzoraka prodor boje bio zabeležen duž celog zida. Prodor boje na okluzalnom zidu je statistički značajno bio manji nego na gingivalnom. Ovi rezultati su u skladu s ranijim istraživanjima koji nalaze slabiju vezu kompozita sa dentinom u odnosu na gleđ zbog veće količine organskih komponenata, tubularne strukture i manje površinske energije dentina [15]. Takođe, ranije studije su pokazale da je kod tečnih kompozita nemoguće eliminisati mikrocurenje zbog veće polimerizacione kontrakcije i koeficijenta termičkog širenja [25, 26]. U ispitivanjima novih materijala treba sprovesti što više laboratorijskih i kliničkih studija, da bi se dobro procenio kvalitet tih materijala.

ZAKLJUČAK

Kod ispuna V klase vrlo je važan odabir kompozita zbog posledičnog mikrocurenja i retencije ispuna. Svi ispitaniji materijali u našoj studiji su pokazali mikrocurenje. Najbolja veza je ostvarena sa zubom posle nagrizanja zidova ispuna i na okluzalnom i na gingivalnom zidu kaviteta. Na gingivalnom zidu Dyad Flow je pokazao najveće mikrocurenje u odnosu na druge grupe.