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ORIGINAL ARTICLE

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One-year clinical evaluation of a flowable resin liner associated with a microhybrid resin in noncarious cervical lesions

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Abstract The aim of this study was to compare the clinical performance over 1 year of a microhybrid composite resin for class V restorations both lined and not lined with a flowable composite resin. Nineteen patients having at least two pairs of cervical noncarious lesions under occlusion were enrolled in this study. A total of 38 restorations were placed, half for each group (Single-Bond + Filtek-Flow + Filtek Z250, and Single-Bond + Filtek Z250). Two calibrated operators placed all restorations according to the manufacturers' instructions. Two other independent examiners evaluated the restorations at baseline and after a 12-month period according to the USPHS criteria and modified criteria for color match. The classic alpha score was divided into A1 for "not detectable" and A2 for "slightly discernible" filling. Statistical analysis was conducted using Fisher's exact test and McNemar's test (P=0.05). One restoration was lost after 12 months for each group (retention rate 95% for each group). After 12 months, 18 restorations showed a trend towards dark yellowing (color match A2). The use of Filtek Flow as a liner under Filtek Z250 restorations did not improve the clinical performance of class V restorations after 6 and 12 months of evaluation.

Keywords Adhesive systems · Clinical trials · Composite · Dental materials · Flowable composites

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Introduction

A clinical study with earlier generation adhesive systems showed that retention of restorations in noncarious cervical lesions was influenced by the elastic modulus of the composite resin [5]. The rationale behind this is that high modulus materials are unable to flex when the tooth structure is deformed under load and therefore they are displaced from the cavity. In contrast, low modulus materials can flex with the tooth and therefore can remain in situ.

Flowable composites present inferior mechanical properties due to their lower filler content [3, 6]. In face of that, some researchers proposed using materials with low elastic modulus, such as flowable composites, between the cavity walls and performing the final restoration usually with high elastic modulus materials, with the aim to absorb the stresses generated during polymerization shrinkage of composites. Unterbrink, Liebenberg [15] recommended the use of a thin, first layer of radiopaque flowable composite resin on top of the adhesive to achieve better sealing of the cavity margins. To date, no clinical study has attempted to evaluate the performance of hybrid composites used for restoring noncarious cervical lesions lined or not lined with a flowable resin composite. That was the aim of the present investigation.

Materials and methods

The materials employed in this study were the Filtek-Flow Single-Bond flowable composite resin adhesive system, and the Filtek Z-250 microhybrid composite resin (both from 3M ESPE, St. Paul, Minn., USA). The protocol and consent form for this study were reviewed and approved by the University of São Paulo Committee on Investigations Involving Human Subjects. The criteria for patient selection were similar to those described by Loguercio et al. [9]. Lesions not classified as class 2 or 3 of dentin sclerosis and exhibiting hypersensitivity were excluded from the study [13].

All patients were informed of the nature and objectives of this study; however they were unaware of the location of each material. Nineteen patients with a mean age of 40 years were selected. Thirty-eight restorations were placed, 19 for each group. The distribution of restorations was approximately equally divided be-

tween maxillary (21) and mandibular (17) arches, and about 69% of the restorations were placed in premolars (26) and 31% in anterior teeth (eight in incisors and four in canines).

Under supervision of one experienced clinician (ADL), two previously calibrated operators' undergraduate students (CZ and KL) restored all lesions with rubber dams. No bevel was performed. Then the materials were inserted according to the manufacturer's instructions. In group 1 (restorations lined with Filtek-flow), Single-Bond was applied. Then, one increment (±1.5 mm) of Filtek-Flow was placed and light-cured for 40 s. The lesions were incrementally filled with Filtek Z250 (± three increments). Each increment was light-cured for 30 s using a VIP light unit set at 600 mW/cm^2 (Bisco, Schaumburg, Ill., USA). In group 2 restorations, the lesions were restored similarly to the first group, except that Filtek-Flow was not employed as a liner. All restorations were finished with fine-grained diamond burs (no. 1190F, KG Sorensen). After 1 week, the restorations received a final polishing with Sof-Lex Pop-On (3M ESPE).

Clinical evaluation was done at baseline and 12 months according the USPHS criteria adapted by Barnes et al. [2]. Modified color match criteria were used [11]. Two other independent examiners (AR and NRR) performed the evaluation using a mirror and a double probe [3, 5] (KG Sorensen) after tooth prophylaxis. They were unaware of which material had been used in the restorations. The differences in the ratings of the two materials after 12 months were tested with Fisher's exact test (P=0.05), and the performance of the materials at baseline and after 12 months was evaluated by McNemar's test (P=0.05) based on one restoration per patient for each group of materials.

Results and discussion

According to the USPHS criteria, only retention and color match deserve attention. In regard to the former, two restorations were lost after 12 months, one for each material. With respect to color match criteria, the classic alpha score was divided into A1 and A2 [11] and 18 restorations were given scores of A2 due to the trend towards dark yellowing after 12 months. This difference was statistically different from baseline (P<0.05).

One of the methods used to maximize the retention rates of class V restorations is the placement of low elastic modulus materials. The reason behind this is that these materials are supposed to flex with the tooth rather than debond during cervical flexure. As mentioned in the introduction, flowable composite resins present a low elastic modulus and thus may be employed for cavities exposed to tooth flexure [8]. Besides that, flowability is regarded as a desirable handling property which allows the material to be injected through small-gauge dispensers, thus simplifying the placement procedure and increasing the range of applications. This property allows for good wetting along the cavity walls, which improves the adaptation of the restorative material to them. Low elastic modulus also contributes to stress relief from polymerization shrinkage of composites, preserving the marginal integrity of restorations [4].

Some studies have proposed the use of flowable composites as the sole material for noncarious cervical lesions restorations [1, 12, 14]. However, this approach presents some disadvantages:

1. Flowable composites have mechanical properties inferior to those of microfilled and microhybrid composites [3, 6].
2. Fewer shade options are available, which hinders good initial color match [7], while microfilled and microhybrid composites are offered in a variety of shades and translucencies and provide excellent esthetic appearance.
3. Sculpturing restorations made with low viscosity materials is more difficult to perform [7, 14].
4. The high organic content of flowable composite allow higher water sorption and discoloration over time, as already demonstrated for microfilled composites, whose organic content is higher than the microhybrid ones [11].

Therefore, the combination of flowable and microfilled or microhybrid composites combines the advantages of both materials. We supposed that flowable composites used as liner would improve the retention rates of restorations; however, this was not observed. This hypothesis was based on earlier studies showing that stresses generated by the polymerization shrinkage of Filtek Z250 were significantly reduced when this composite was combined with Filtek-Flow [4]. A 1-year period is perhaps too short to detect differences in the retention rates of the restorative approaches.

In regard to color match of Filtek Z250, a dark yellowing was observed after 1 year (score A2) for 18 restorations. This finding is difficult to explain, because only one composite resin was employed in the current study and because discoloration is usually found for composites with high organic content, such as microfilled resin and not microhybrids like Filtek Z250 [11]. However, this finding is supported by Narhi et al. [10] who detected that only 60% of the Z250 restorations were scored as alpha after 1 year. This indicates that the use of this composite resin in anterior teeth might cause esthetic problems in the short term. Further studies should be conducted to evaluate these hypotheses.

Conclusion

Filtek Flow as a liner under Filtek Z250 restorations did not improve the clinical performance of class V restorations after 12 months of evaluation. Filtek Z250 showed a trend towards dark yellowing after 12 months.

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References

1. Baratieri LN, Canabarro S, Lopes GC, Ritter AV (2003) Effect of resin viscosity and enamel beveling on the clinical performance of class V composite restorations: three-year results. Oper Dent 28:482–487

2. Barnes DM, Blank LW, Gingell JC, Gilner PP (1995). A clinical evaluation of a resin-modified glass ionomer restorative material. J Am Dent Assoc 126:1245–1253
3. Bayne SC, Thompson JY, Swift EJ Jr, Ttamatiedes P, Wilkerson M (1998) A characterization of first-generation flowable composites. J Am Dent Assoc 129:567–577
4. Braga RR, Hilton TJ, Ferracane JL (2003) Contraction stress of flowable composite materials and their efficacy as stress-relieving layers. J Am Dent Assoc 134:721–728
5. Heymann HO, Sturdevant JR, Bayne S, Wilder AD, Sluder TB, Brunson WD (1991) Examining tooth flexure effects on cervical restorations: a two-year clinical study. J Am Dent Assoc 122:41–47
6. Labella R, Lambrechts P, Van Meerbeek B, Vanherle G (1999) Polymerization shrinkage and elasticity of flowable composites and filled adhesives. Dent Mater 15:128–137
7. Latta MA, Di Lorenzo SC, Cavel WT, Murdock CM, Naighton WN (2004) Clinical evaluation of a flowable composite resin. J Dent Res 83
8. Levitch LC, Bader JD, Shugars DA, Heymann HO (1994) Non-carious cervical lesions. J Dent 22:195–207
9. Loguercio AD, Reis A, Barbosa AN, Roulet JF (2003) Five-year double-blind randomized clinical evaluation of a resin-modified glass ionomer and a polyacid-modified resin in non-carious cervical lesions. J Adhes Dent 5:323–332
10. Narhi TO, Tanner J, Ostela I, Narva K, Nohrstrom T, Tirri T, Vallittu PK (2003) Anterior Z250 resin composite restorations: one-year evaluation of clinical performance. Clin Oral Invest 7:241–243
11. Reusens B, D'hoore W, Vreven J (1999) In vivo comparison of a microfilled and hybrid minifilled composite resin in class III restorations: 2-year follow-up. Clin Oral Invest 3:62–69
12. Schwartz RS, Haveman CW, Conn LJ, Summitt JB, Robbins JW (1998) Clinical evaluation of a one bottle adhesive: 18-month results. J Dent Res 77:297
13. Swift EJ Jr, Perdigão J, Heymann HO, Wilder AD Jr, Bayne SC, May KN Jr, Sturdevant JR, Roberson TM (2001) Eighteen-month clinical evaluation of a filled and unfilled dentin adhesive. J Dent 29:1–6
14. Tyas MJ, Burrow MF (2002) Three-year clinical evaluation of One-Step in non-carious cervical lesions. Am J Dent 15:309–311
15. Unterbrink GL, Liebenberg WH (1999) Flowable resin composites as "filled adhesives": literature review and clinical recommendations. Quintessence Int 30:249–257