

Clinical Evaluation of a Silorane- and a Methacrylate-Based Resin Composite in Class II Restorations: 24-Month Results

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Clinical Relevance

This clinical study found that both silorane- and methacrylate-based resin composite restorations showed clinically acceptable performance after 24 months in class II slot restorations.

SUMMARY

Objective: To compare the 24-month clinical performance of two different resin composites in class II slot restorations.

Methods and Materials: Thirty-seven patients having at least two approximal carious lesions were enrolled in the study. A total of 116 teeth

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DOI: 10.2341/15-286-C

(58 pairs) were restored with either a silorane-based composite (Filtek Silorane) and its self-etch adhesive (Silorane Adhesive System, 3M ESPE) or a methacrylate-based packable resin composite (X-tra Fil) and its self-etch adhesive (Futurabond NR, VOCO GmbH) according to the toss of a coin. The restorations were evaluated at baseline and at six-, 12-, and 24-month recalls by two calibrated examiners according to the modified US Public Health Service criteria. The comparison of the two restorative materials for each category was performed with the Pearson chi-square test. Within group differences of the materials at different recall times were compared using the Cochran Q and Friedman tests. Bonferroni-adjusted McNemar test was used when significant difference was found ($p < 0.05$).

Results: After 24 months, no statistically significant differences were found between the two restorative materials for the criteria evaluated.

Conclusions: Both silorane- and methacrylate-based resin composites showed clinically acceptable performance in class II slot restorations after 24 months.

INTRODUCTION

Today, resin composites have become one of the most popular esthetic restorative materials, even for posterior regions. However, several drawbacks of these materials, such as difficulty in placement due to their sticky nature and shrinkage during polymerization, are still major concerns for dentists placing direct composite restorations in posterior teeth. Polymerization shrinkage has been shown to cause several clinical problems, such as loss of marginal integrity, microleakage, marginal discoloration, postoperative sensitivity, cuspal deflection, and gap formation.^{1,2}

Several different restoratives with improved mechanical and physical properties have been proposed to overcome these drawbacks. Manufacturers have developed “packable” or “condensable” composites by densely loading fillers into hybrid composites with improved mechanical properties, such as decreased wear, increased packability and depth of cure, and reduced polymerization shrinkage achieved through increased filler loading.³

Another approach to overcome polymerization shrinkage is the introduction of a different type of resin composite with a novel monomer technology, Filtek Silorane, which is a low-shrink posterior restorative that has a matrix derived from a molecule-dominated silorane instead of the conventional methacrylate-based organic matrix. During polymerization of silorane-based composite, ring-opening monomers connect by opening, flattening, and extending toward each other. This polymerization mechanism results in lower volumetric shrinkage than experienced with methacrylate-based ones.⁴ *In vitro* studies have reported promising results for Filtek Silorane, including lower polymerization shrinkage^{5,6} and cuspal deflection,⁷ effective bonding to tooth tissues, and marginal adaptation.⁸⁻¹³ Although the successful results obtained in *in vitro* studies done with Filtek Silorane were not clinically validated, many *in vivo* studies showed a similar but not superior clinical performance of Filtek Silorane compared with methacrylate-based composites,¹⁴⁻¹⁹ while one clinical study showed lower clinical performance of Filtek Silorane in terms of marginal adaptation.²⁰

The aim of the present clinical study was to compare the clinical performance of a silorane-based resin composite, Filtek Silorane, with that of a methacrylate-based resin composite, X-tra Fil, in class II slot restorations over 24 months. The null hypothesis tested was that there would be no

difference in clinical performance between the two different restorative resins tested after 24 months.

METHODS AND MATERIALS

Patient Selection

The protocol and consent form for this randomized controlled clinical study were previously reviewed and approved by the University Human Ethics Committee (HEK 10/35). Before participating in the study, all patients read and signed these written informed consent forms.

A total of 37 patients (27 female and 10 male) who were seeking routine dental care at the restorative dentistry clinics at the University School of Dentistry were selected. Patients having at least two similar-sized approximal carious lesions were included in this study. Their mean age was 29 years, ranging from 18 to 52 years.

Patients with poor oral hygiene, severe medical complications, rampant caries or severe chronic periodontitis, and a history of severe active bruxism and xerostomia were excluded from the study. Permanent premolars and molars with primary caries lesions and without any restorations were included in the study. All teeth included in the study had neighboring teeth and were in occlusion with antagonist teeth.

Clinical Procedures

To detect a difference between the restoration groups according to the retention rate of 30%, with 90% power and 5% type I error rate, it was found that at least 47 teeth should be taken in each group. A total of 116 teeth (58 pairs) were restored with either a silorane-based low-shrinkage resin composite, Filtek Silorane, and its self-etch adhesive, Silorane Adhesive System (3M ESPE, St Paul, MN, USA), or a methacrylate-based packable resin composite, X-tra Fil, and its self-etch adhesive, Futurabond NR (VOCO GmbH, Cuxhaven, Germany), according to the toss of a coin (Table 1). Table 2 shows the distribution of restorations with regard to maxilla/mandible, premolar/molar, and MO/DO.

Bitewing radiographs of the teeth to be restored were taken preoperatively. The lesion depth of the teeth to be restored was the middle or beyond the middle third of the dentin. Cavities were prepared using diamond burs (Diatech, Heerbrugg, Switzerland) under water cooling with no intentional bevels on enamel cavosurface margins and limited to removal of carious tissue. Hand instruments and low-speed steel burs were used to remove the carious

Table 1: Resins Composites and Adhesive Systems Used in This Study			
Product	Type	Composition	Manufacturer
X-tra Fil	Packable hybrid composite resin	Bis-GMA, UDMA, and TEGDMA with 70.1 vol% bariumborosilicate filler	VOCO GmbH (Cuxhaven, Germany)
Filtek Silorane	Low-shrinkage composite resin	3,4-Epoxy-cyclohexylethylcyclopolydimethylsiloxane, bis-3,4-epoxy-cyclohexylethylphenylmethylsilane, yttrium fluoride (15%), camphorquinone, iodine salt, stabilizers, pigments, silanized quartz particles	3M ESPE (St Paul, MN, USA)
Futura Bond NR	One-step self-etch adhesive	Bis-GMA, HEMA, BHT, ethanol, organic acids, fluorides	VOCO
Silorane System Adhesive	Two-step self-etch adhesive	Primer: phosphorylated methacrylates, bis-GMA, HEMA, water, ethanol, silane-treated silica filler, Vitrebond copolymer, initiators, stabilizers; adhesive: hydrophobic DMA, phosphorylated methacrylates, TEGDMA, silane-treated silica filler, initiators, stabilizers	3M ESPE
Abbreviations: Bis-GMA, bis-phenol A diglycidylmethacrylate; UDMA, urethane dimethacrylate; TEGDMA, triethylene glycol dimethacrylate; HEMA, 2-hydroxyethyl methacrylate; BHT, butylated hydroxytoluene.			

tissue. The excavated preparation floor was checked by probing with a sharp explorer and visual inspection. Local anesthesia was applied if necessary. Isolation was accomplished by cotton rolls and a suction device. For all cavities, a metallic matrix was used, and careful wedging was performed with wooden wedges. All materials were used according to the manufacturers' instructions. Filtek Silorane and X-tra Fil resin composites were placed in oblique increments not exceeding 2 mm in thickness. Composite layers were light cured for 40 seconds with a halogen light-curing unit (Hi-Lux Ultra, Benlioglu, Ankara, Turkey) with a minimum light output of 550 mW/cm². Using a radiometer (Curing Radiometer Model 100, Demetron Corp, Orange, CA, USA), the light output of the curing unit was monitored periodically. After polymerization, the occlusion/articulation was checked with articulating papers, and restorations were finished under water cooling with fine diamond burs (Diatech) and polished with rubber polishing kits. Finishing strips (GC, Tokyo, Japan) were used for finishing and polishing of the proximal surfaces. Interproximal contacts were checked with dental floss. All of the restorative procedures were performed by the same operator (EK) with 10 years of clinical experience.

Clinical Evaluation Procedure

This study was double-blinded, as neither the patients nor the evaluators were aware of which resin composite had been used. Two calibrated examiners (GO and RY) independently evaluated the restorations with the aid of a dental explorer and

an intraoral mirror. At the beginning of the study, these examiners were calibrated by rating 20 high-resolution clinical photographs of posterior composite restorations that were representative of each score for each criterion. In the case of disagreement during evaluations, both re-examined the restorations and arrived at a final joint decision in order to obtain only one score for each restoration. The intra- and interexaminer Cohen kappa statistic was high (>0.90). The same evaluators evaluated the restorations during the 24-month period.

All restorations were evaluated after one week (baseline), and six, 12, and 24 months using modified US Public Health Service (USPHS) criteria for the following characteristics: retention, anatomical form, marginal adaptation, color matching, marginal discoloration, surface texture, and secondary caries (Table 3).²¹ Bitewing radiographs were taken at all recall times. The restorations were scored as follows: Alpha represented the ideal clinical situation, Bravo was clinically acceptable, and Charlie represented a clin-

Table 2: <i>Distribution of Restorations</i>					
	Filtek Silorane		X-tra Fil		Total
	OM	OD	OM	OD	
Maxilla					
Premolar	11	17	9	19	56
Molar	9	5	10	2	26
Mandibule					
Premolar	1	9	3	10	23
Molar	4	2	2	3	11
Total	25	33	24	34	116

Table 3: Modified US Public Health Service Evaluation Criteria²¹

Characteristic	Evaluation Criteria
Retention	Alpha: The restoration is present.
	Charlie: The restoration is absent.
Marginal discoloration	Alpha: There is no visual evidence of marginal discoloration different from the color of the restorative material and from the color of the adjacent tooth structure.
	Bravo: There is visual evidence of marginal discoloration at the junction of the tooth structure and the restoration that has not penetrated along the restoration in a pulpal direction.
	Charlie: There is visual evidence of marginal discoloration at the junction of the tooth structure and the restoration, but the discoloration has penetrated along the restoration in a pulpal direction.
Marginal adaptation	Alpha: Restoration is closely adapted to the tooth. The explorer does not catch when drawn across the surface of the restoration toward the tooth structure, or, if the explorer does catch, there is no visible crevice along the periphery of the restoration.
	Bravo: The explorer catches and there is visible evidence of a crevice, which the explorer penetrates, indicating that the edge of the restoration does not adapt closely to the tooth structure. The dentin and/or the base are not exposed and the restoration is not mobile.
	Charlie: The explorer penetrates a crevice defect that extends to the dentino-enamel junction.
Color match	Alpha: Restoration matches the shade and translucency of adjacent tooth structure.
	Bravo: Restoration does not match the shade and translucency of adjacent tooth structure, but the mismatch is within the normal range of tooth shades.
	Charlie: Restoration does not match the shade and translucency of adjacent tooth structure, and the mismatch is outside the normal range of tooth shades and translucency.
Surface texture	Alpha: Surface texture is similar to polished enamel as determined by means of a sharp explorer.
	Bravo: Surface texture is gritty or similar to a surface subject to a white stone or rougher than the adjacent tooth structure.
	Charlie: Surface pitting is sufficiently coarse to inhibit the continuous movement of an explorer across the surface.
Anatomic form	Alpha: Restoration is continuous with existing anatomic form.
	Bravo: Restoration is discontinuous with existing anatomic form, but missing material is not sufficient to expose dentin or base.
	Charlie: Sufficient material is lost to expose dentin or base.
Secondary caries	Alpha: No caries are present.
	Charlie: Caries are present.

ically unacceptable situation. In the case of disagreements, the restorations were re-evaluated, and a consensus was reached.

Postoperative sensitivity was assessed by air and/or tactile contact and was recorded as absent, mild, or severe. Sensitivity to air was assessed by blowing a stream of compressed air for five seconds while shielding the neighboring teeth with the fingers. Sensitivity to tactile contact was assessed by moving a probe over the restored tooth surface. Subjects were also questioned regarding sensitivity to cold/hot or other stimuli.

Statistical Evaluation

The comparison of the two restorative materials for each category was performed with the Pearson chi-square test at a significance level of 0.05. Within group differences of the materials at different recall times were compared using the Cochran Q and Friedman

tests. Bonferroni-adjusted McNemar test was used when significant difference was found ($p < 0.05$). All data were analyzed by means of SPSS version 20.0 for Windows (SPSS Inc, Chicago, IL, USA).

RESULTS

All patients were evaluated at the six-month recall (recall rate=100%). At the 12-month recall, three patients did not attend (recall rate=91.8%). After 24 months, 30 patients (92 of 116 restorations) were evaluated (recall rate=81.0%). Seven patients were lost to follow-up due to moving to another town.

Table 4 presents the data of clinical evaluation of the materials used in this study over 24 months.

Retention

A 100% retention rate was recorded for Silorane and X-tra Fil restorations at the six- and 12-month recalls. At the end of 24 months, one restoration

Table 4: Clinical Evaluation of the Materials Used in This Study Over 24 Months

	Filtek Silorane				X-tra Fil				Between-Group <i>p</i>
	n	A (%)	B (%)	C (%)	n	A (%)	B (%)	C (%)	
Retention									
Baseline	58	58 (100)	—	0 (0.0)	58	58 (100)	—	0 (0.0)	—
Six-month	58	58 (100)	—	0 (0.0)	58	58 (100)	—	0 (0.0)	—
12-month	51	51 (100)	—	0 (0.0)	52	52 (100)	—	0 (0.0)	—
24-month	46	45 (97.8)	—	1 (2.1)	46	45 (97.8)	—	1 (2.1)	1.000
Within-group <i>p</i>	0.392				0.392				
Marginal discoloration									
Baseline	58	58 (100)	0 (0.0)	0 (0.0)	58	58 (100)	0 (0.0)	0 (0.0)	—
Six -month	58	56 (96.5)	1 (1.7)	1 (1.7)	58	58 (100)	0 (0.0)	0 (0.0)	0.246
12-month	51	50 (98)	1 (1.9)	0 (0.0)	52	52 (100)	0 (0.0)	0 (0.0)	0.495
24-month	46	44 (95.6)	0 (0.0)	2 (4.3)	46	46 (100)	0 (0.0)	0 (0.0)	0.133
Within-group <i>p</i>	0.029				1.000				
Marginal adaptation									
Baseline	58	58 (100)	0 (0.0)	0 (0.0)	58	58 (100)	0 (0.0)	0 (0.0)	—
Six-month	58	58 (100)	0 (0.0)	0 (0.0)	58	55 (94.8)	3 (5.1)	0 (0.0)	0.243
12-month	51	48 (94.1)	3 (5.8)	0 (0.0)	52	42 (80.7)	9 (17.3)	1 (1.9)	0.086
24-month	46	39 (84.7)	6 (13)	1 (2.1)	46	35 (76)	10 (21.7)	1 (2.1)	0.544
Within-group <i>p</i>	0.002				0.001				
Color match									
Baseline	58	57 (98.2)	1 (1.7)	0 (0.0)	58	55 (94.8)	3 (5.1)	0 (0.0)	—
Six-month	58	57 (98.2)	1 (1.7)	0 (0.0)	58	55 (94.8)	3 (5.1)	0 (0.0)	—
12-month	51	49 (96.0)	2 (3.9)	0 (0.0)	52	48 (92.3)	4 (7.6)	0 (0.0)	—
24-month	46	44 (95.6)	2 (4.3)	0 (0.0)	46	44 (95.6)	2 (4.3)	0 (0.0)	—
Within-group <i>p</i>	0.392				0.261				
Surface texture									
Baseline	58	58 (100)	0 (0.0)	0 (0.0)	58	58 (100)	0 (0.0)	0 (0.0)	—
Six-month	58	57 (98.2)	1 (1.7)	0 (0.0)	58	57 (98.2)	1 (1.7)	0 (0.0)	1.000
12-month	51	50 (98.0)	1 (1.9)	0 (0.0)	52	51 (98.0)	1 (1.9)	0 (0.0)	1.000
24-month	46	45 (97.8)	1 (2.1)	0 (0.0)	46	45 (97.8)	1 (2.1)	0 (0.0)	0.422
Within-group <i>p</i>	0.368				1.000				
Anatomic form									
Baseline	58	58 (100)	0 (0.0)	0 (0.0)	58	58 (100)	0 (0.0)	0 (0.0)	—
Six-month	58	58 (100)	0 (0.0)	0 (0.0)	58	58 (100)	0 (0.0)	0 (0.0)	—
12-month	51	51 (100)	0 (0.0)	0 (0.0)	52	52 (100)	0 (0.0)	0 (0.0)	—
24-month	46	46 (100)	0 (0.0)	0 (0.0)	46	46 (100)	0 (0.0)	0 (0.0)	—
Within-group <i>p</i>	—				—				
Secondary caries									
Baseline	58	58 (100)	—	0 (0.0)	58	58 (100)	—	0 (0.0)	—
Six-month	58	58 (100)	—	0 (0.0)	58	58 (100)	—	0 (0.0)	—
12-month	51	51 (100)	—	0 (0.0)	52	52 (100)	—	0 (0.0)	—
24-month	46	46 (100)	—	0 (0.0)	46	46 (100)	—	0 (0.0)	—
Within-group <i>p</i>	—				—				
Abbreviations: A, Alpha; B, Bravo; C, Charlie.									

Abbreviations: A, Alpha; B, Bravo; C, Charlie.

from the Silorane group and one from the X-tra Fil group were missing. No statistically significant differences were found between the two materials' retention rates ($p > 0.05$).

Marginal Discoloration

At the six-month recall, one restoration received a Bravo score and one a Charlie score from the Silorane group in terms of marginal discoloration.

At the 12-month recall, one Silorane restoration had a Bravo score, while two Silorane restorations received Charlie scores at the 24-month recall. The marginal discoloration results were statistically significant within the Silorane group ($p=0.029$). None of the X-tra Fil restorations showed marginal discoloration during the 24-month period. There was no statistically significant difference between Silorane and X-tra Fil restorations ($p>0.05$).

Marginal Adaptation

At 12 and 24 months, three and six restorations, respectively, received Bravo scores, and one restoration received a Charlie score for marginal adaptation in the Silorane group. The numbers of Bravo scores for the X-tra Fil restorations were three, nine, and 10 at the six-, 12-, and 24-month recalls, respectively. At 12 and 24 months, one restoration received a Charlie score.

The results for intragroup comparisons were statistically significant for both groups ($p=0.002$ for Silorane and $p=0.001$ for X-tra Fil), while no statistically significant differences were found between restorative materials at the end of 24 months ($p>0.05$).

Color Match

In terms of color match, one Silorane restoration and three X-tra Fil restorations received Bravo scores at baseline and at the six-month recall. At the 12-month recall, two of the 51 Silorane restorations and four of the 52 X-tra Fil restorations were rated Bravo. At the end of the study, two restorations were rated as Bravo in each group. There was no statistically significant difference between the groups during the 24 months ($p>0.05$).

Surface Texture

At the six-, 12-, and 24-month recalls, only one restoration's surface texture from each group was gritty and rated as Bravo ($p>0.05$).

During the 24-month period, all evaluated restorations were continuous with existing anatomic form, and no secondary carries were detected. None of the patients reported postoperative sensitivity.

DISCUSSION

In the present study, silorane- and methacrylate-based restorative materials' clinical performance was compared and resulted in similar clinical outcomes after 24 months, so the null hypothesis was accepted.

Since the introduction of Filtek Silorane, several *in vitro* studies with contradictory findings have been conducted to evaluate its performance.^{8,22} In a recent *in vitro* study, marginal adaptation and bonding effectiveness of a silorane- (Filtek Silorane) and a methacrylate-based packable composite (Filtek P60) were found to be similar.⁸ On the other hand, another *in vitro* study reported better marginal adaptation with a silorane- than with a methacrylate-based composite.²² In a further *in vitro* study, Sampaio and others²³ evaluated the resin/dentin interface created by a silorane- and three different methacrylate-based composites and found similar microtensile bond strength values at 24 hours and six months. In an *in vivo* study, Schmidt and others²⁰ evaluated the marginal adaptation of Filtek Silorane and CeramX (methacrylate-based composite) for one year and reported that the methacrylate-based one exhibited better performance.

Polymerization shrinkage and the adhesive systems used are known to be important factors that influence the marginal adaptation of composite resins.²⁴ Releasing stresses onto the adhesive interface as a result of polymerization shrinkage impairs the marginal integrity of restorations and shortens the clinical longevity of direct resin restorations.²⁵ Although *in vitro* studies confirm that a silorane-based composite has a lower volumetric shrinkage (less than 1.0%) than methacrylate-based ones⁵ and causes less cuspal deflection^{7,26} and microleakage,^{10,11} the results of this study showed that reduced polymerization shrinkage yielded no detectable clinical performance improvement. The changes in composite viscoelastic behavior that occur during polymerization, from predominantly viscous to mostly elastic, make polymerization stress development a quite complex event. In accordance with our findings, in a five-year clinical study Schmidt and others¹⁴ and in a three-year clinical study Mahmoud and others¹⁶ also found similar marginal adaptation in class II restorations restored with silorane- and methacrylate-based composites. Yazici and others¹⁷ evaluated the clinical performance of Filtek Silorane, Filtek P60 (packable resin composite), and Filtek Supreme (nanofilled resin composite) in class I restorations and found similar clinical performance over three years. However, contrary to our findings, they found statistically significant differences between Filtek Silorane and a packable resin composite, Filtek P60, in terms of marginal adaptation.

It has been reported that during the polymerization of the predominantly elastic-viscous material,

the viscoelastic properties of silorane change and the low initial flow of base resin restricts the flow of silorane, and this results in increased stresses.⁶ Weinmann and others⁴ also reported high initial flexural modulus shown by Silorane, which may explain its high polymerization stress value in spite of the low volumetric shrinkage (both postgel and total). Similar marginal adaptation results of silorane resin composite, despite its low polymerization shrinkage, might be explained in this way.

Another factor that may influence the marginal adaptation of composite restorations is the adhesive system. In the current study, both composite resins were used with their respective adhesive systems from the same manufacturer. Silorane System Adhesive is a two-step self-etch system with a pH of about 2.7, while Futura Bond NR has a pH of about 1.4. The acidity of the adhesives has been reported to interfere with demineralization and adhesion to tooth structures;²⁷ however, this was not confirmed in our study because there was no statistically significant difference in terms of marginal adaptation. In accordance with our findings, Barraco and others¹⁵ found similar clinical performance of Filtek Silorane applied with its respective adhesive system and Filtek Z250 applied with a two-step etch-and-rinse adhesive (Adper Scotchbond 1 XT, 3M ESPE) and a two-step self-etch adhesive (Adper Scotchbond SE) at the end of two years.

The cavity configuration is also a factor affecting the transmission of polymerization shrinkage stress²⁸, but in our study the C factor had no influence since all of the cavities evaluated were class II slot cavities with a similar C factor.

In the present study, the incidence and extent of marginal discoloration of Silorane restorations increased over 24 months, while none of the X-tra Fil restorations showed marginal discoloration. However, there were no differences between the different recall times in terms of marginal discoloration in Silorane and X-tra Fil restorations. It is known that marginal discoloration is one of the first signs of a composite resin's clinical failure and is related to microleakage. Several *in vitro* studies¹¹⁻¹³ have proven that silorane-based composites improve marginal adaptation due to their reduced shrinkage, thereby decreasing the residual stress at the adhesive-tooth interface, and show less microleakage than methacrylate-based ones. Contradicting the idea that less shrinkage contributes to lower polymerization stress, no advantages of silorane-based composite over methacrylate-based composite have been observed in clinical studies.^{14,17,18} Shrinkage values of 1% and 1.7% have

been reported for Filtek Silorane⁴ and X-tra Fil, respectively (http://www.voco.com/us/product/x_tra_fil/index.html). Although this difference is distinct in the laboratory, it was difficult to show the effect in the clinic, where so many factors, such as chemical and physical properties, influence the final restoration. Thus, it might be concluded that the low shrinkage of materials may not be a determinant factor for clinical success.

In the current study, none of the restorations had Charlie scores in terms of color match, which was similar to the results of other studies.^{16,17}

Secondary caries have been attributed to poor oral hygiene and plaque accumulation.²⁹ No secondary caries were detected over the 24-month period of this study. This finding may be a result of our selection of patients with good oral hygiene. On the other hand, this short period of time may not be sufficient for observing the formation of secondary caries. The smooth surface texture of the restorations may be another reason. Only one restoration from each group was scored as Bravo during the clinical trial. Charlie scores were not recorded, denoting that all the restorations were acceptable in terms of surface texture. Comparable results were reported in other clinical studies with clinically acceptable surface textures of silorane restorations.^{16,19}

This study has several limitations. First, it was impossible to blind the operating dentist (EK) because she had to follow the different treatment protocols for the two materials during placement. Second, the 24-month recall rate of 81% might be modest. The reason was that the patients had moved and did not want to spend their time and money just for re-examination. However, in future studies, patients might be instructed to return for a refund. Third, long-term clinical evaluations are required to fully assess the performance of this material and warranted to confirm our results, as this was a short-term follow-up of a 24-month study with a small number of evaluable restorations.

CONCLUSIONS

Within the limitations of this clinical study, it can be concluded that the clinical performance of a silorane-based composite was acceptable at the end of the 24-month evaluation period, with no obvious advantage compared to methacrylate-based packable composite. Both silorane- and methacrylate-based resin composite restorations showed no significant clinical difference in class II slot preparations after 24 months of evaluation.

Regulatory Statement

This study was conducted in accordance with all the provisions of the local human subjects oversight committee guidelines and policies of Hacettepe University. The approval code for this study is HEK 10/35.

Conflict of Interest

The authors of this article certify that they have no proprietary, financial, or other personal interest of any nature or kind in any product, service, and/or company that is presented in this article.

(Accepted 7 January 2017)

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