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ORIGINAL ARTICLE

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Two-year clinical performance of a nanofiller vs a fine-particle hybrid resin composite

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Abstract The aim of the study was to evaluate the clinical performance of the nanofiller resin composite Filtek Supreme (3M ESPE) vs the conventional fine hybrid resin composite Tetric Ceram (Ivoclar Vivadent) in stress-bearing posterior cavities. In accordance with a split mouth study design, 50 patients (35.7±11.3 years) received at least one pair of Filtek Supreme and Tetric Ceram restorations in each of two comparable class II cavities. To obtain comparability, the adhesive Scotchbond 1 was used for all the restorations. After 2 years, the restorations (total number 112) were scored according to the Ryge criteria. After 2 years (recall rate 100%), the results (%) of the Ryge evaluation for the two groups Filtek Supreme/Tetric Ceram were marginal adaptation: Alfa 96/96, Bravo 2/2, Charlie 2/0, and Delta 0/2; anatomic form: Alfa 98/98, Bravo 0/0, and Charlie 2/2; secondary caries: Alfa 100/100 and Bravo 0/0; marginal discoloration: Alfa 98/100, Bravo 2/0, and Charlie 0/0; surface: Romeo 95/95, Sierra 4/4, Tango 0/0, and Victor 2/2; and color match: Oscar 46/57, Alfa 50/39, Bravo 2/4, and Charlie 2/0. One Tetric Ceram and one Filtek Supreme restoration showed fractures that needed restorative intervention. No severe postoperative sensitivities were reported within the observation period. All restored teeth remained vital; the integrity of all the teeth was scored Alfa. After 2 years, no statistically significant differences (Wilcoxon–Mann–Whitney test) was found between the two restorative materials investigated. Therefore, Filtek Supreme, based on a new nanofiller technology, has proved efficaciousness for clinical use in stress-bearing posterior cavities.

Keywords Nano restorative · Hybrid resin composite · Clinical study · Posterior teeth

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Introduction

During recent years, resin-based direct composite restorations became a routine and well-established procedure in dental practice [6, 9, 10]. Patients and practitioners' demands for an esthetic and minimally invasive restorative concept are compiled [2] in this therapeutic concept. But on the other hand, investigations showed that dental composite restoratives are very technique-sensitive [19] and do not completely prevent microleakage at cervical margins [7] even after easier treatment approaches like the use of metal matrix systems were compiled [29]. Many changes to adhesive systems and restorative materials as well were done in the past. One of these significant changes was the introduction of the first nanocomposite resin restorative (Filtek Supreme) in the year 2000 by the 3M Espe company [4, 5, 28]. Its main focus was to develop a universal restorative, which combines the physical properties [3, 16] and therefore the universal usage of a hybrid resin composite with the gloss retention of the polished surface of a microfiller resin composite [31]. Due to its low filler load and therefore limited physical properties, homogeneous and inhomogeneous microfiller resin composites were not the first choice indications for class IV and class II. Just to increase the filler load generally leads to a problem in wettability due to the enormous surface area of the micro (or nano-) filler particles and to the increased stiffness of the material, which negatively affects handling properties. The new material introduced consists mainly of minor nanoparticles with a particle size ranging from 5 to 20 nm (information obtained from the manufacturer). Due to a particular coating process, those particles do not agglomerate automatically like the filler particles of similar size would do in a conventional "microfiller composite." Due to the ratio of filler surface and resin matrix available, a complete coating of all filler particles by matrix is impossible but a complete resin coating is crucial to ensure mechanical stability. To solve that problem and to avoid the usage of bigger filler particles, those silica nanofiller particles, together with zirconium nanofiller particles, responsible for the radiopacity, are "baked" together as

"clusters" of 0.6–1.4 μm in diameter—comparable in size to a glass filler particle of a hybrid resin composite. The outside of those clusters is then silanized to ensure binding ability to the resin matrix. Wear should now take place by breaking off individual nanoparticles out of the cluster but not by a removal of the cluster as a total [30]. This as a consequence that should lead to a smoother surface compared to a hybrid resin composite [25] and a better abrasion resistance [32] and should result in a long-term polish retention [18]. The focus is particularly on that long-term gloss retention—being aware of the fact that conventional superfine hybrid resin composite with mean filler particle sizes below one micron showed almost the same initial polishabilty [33]. The shading concept comes close to existing restoratives [14]. Because of the fact that the filler (cluster) used in this material for the first time might be prone to disintegration and deterioration over time, i.e., influenced by long-term water uptake, the material was subsequently in the focus of in vitro research on potential influences on material properties [31]. Due to the fact that filler technology might influence the clinical performance of a dental composite significantly [16], the strength of the clusters was a matter of concern. An uncontrolled breaking apart of those clusters might lead to fracture of a restoration in the clinical usage.

In vitro investigations are crucial for an early assessment of a dental restorative [11], but in the end, only a clinical study [6, 27] can take all potential variables into account influencing the overall performance of a restorative [8]. While clinical data of 6 or 12 months may primarily show mistakes in the operative procedure, failures might be more related to mechanical problems of the restorative from the first year onward.

Therefore, a prospective two-year clinical study was conducted in a split mouth design (comparable cavity sizes) to obtain information on physical properties after in vivo loading based on the lack of information regarding this consideration so far.

Aim of the study

The aim of this clinical study was to determine the clinical performance of the nanofiller dental composite Filtek Supreme (3M Espe, St. Paul, MN, USA) in stress-bearing posterior cavities over a time period of 2 years in a split mouth study design. A well-established conventional fine-particle hybrid resin composite (Tetric Ceram, Ivoclar Vivadent, Schaan, Liechtenstein) served as control.

Materials and methods

A total of 50 patients (mean age 35.7±11.3 years, 51% women and 49% men) participated in this clinical study. This resulted in a pool of patients balanced for gender and age. The patients were not selected from a certain pool. They were asked whether they want to participate in the study and if they showed at least two comparable cavities to be restored with a dental composite when they reported as patients to the dental clinic. The study design was approved by the ethics committee of the state of Rhineland-Palatinate, Germany. Written informed consent was obtained from every patient in this investigation. They were offered the dental treatment of the selected teeth for free. It was not obligatory for the patients to return for the reevaluation appointments; this was voluntary. When they returned after 2 years for the last follow-up examination, they received a reimbursement for their overall travel expenses for showing up at all three follow-up appointments.

The indications for treatment were primary caries or replacement of existing insufficient restorations. Restored teeth were two to three surface fillings in premolars and two to four surface fillings in molars. There were no exclusion criteria exceeding the general contraindications for directly placed posterior resin composites, for example, lack of possibility to ensure a proper contamination control or an indication for a full cover crown restoration, but endodontically treated teeth were not accepted. Only the inability to show up for a reevaluation after 6, 12, and 24 months was considered. For inclusion in the study, patients had to have at least two comparable cavities to be restored. Comparable cavities were defined as cavities of almost equal dimension in horizontal as well in vertical dimension and affiliation to the same group of teeth (premolars or molars). This relied on the operator's individual assessment of the situation. The focus was to find either two-sided or three-sided cavities to compare. Teeth from the lower jaw were allowed to be compared with teeth in the upper jaw. It was not possible to determine an equivalent volume of the cavities. An existing opponent and a neighbor tooth were required. Periodontal diseases such as gingivitis or periodontitis without severe bone loss at the tooth to be restored were accepted as long as it did not affect the longevity of the tooth. There were no limitations regarding cavity size or location of cervical margins. At least two resin composite restorations were placed in each patient, resulting in a total of 112 restorations. Fifty-nine percent of the Filtek Supreme and 52% of the Tetric Ceram restorations were placed in upper premolars, 13% of the Filtek Supreme and 14% of the Tetric Ceram restorations in lower premolars. Eleven percent of the teeth restored with Filtek Supreme and 18% of the teeth restored with Tetric Ceram were upper molars, while 18% of the lower molars were restored with Filtek Supreme and 16% with Tetric Ceram. Forty-three percent of the Filtek Supreme restorations and 36% of the Tetric Ceram restorations were three-sided (mod cavity design), while 57% of the Filtek Supreme and 64% of the Tetric Ceram restorations were two-sided (om or od, respectively). Within the Tetric Ceram group, the ratio of om-restorations (34%) and od-restorations (30%) was about similar; within the Filtek Supreme group, the percentage of the od-restorations (36%) was higher than the percentage of the om-restorations (20%).

The clinical situation of the tooth to be restored was photodocumented. The clinical procedure of cavity preparation and placement of the restorations were performed

by six experienced dentists (>3a in the department) of the Department for Operative Dentistry of the Dental Clinic of the University of Mainz. They were calibrated in the operative procedure using a phantom model to ensure that all the operators followed the same procedures. All the dentists placed approximately the same number of restorations.

The protocol was the same for all restorations: After complete removal of existing restorations and caries, an adhesive cavity design was prepared and finished using diamond burs (80 and 30 μm) under constant water cooling (120,000 rpm). The control of the excavated cavity floor was mainly conducted according to probing with a sharp explorer and by means of the color of the underlying dentin. A caries detecting dye (Caries Detector) was not used. The adhesive preparation of teeth where amalgam was replaced did not result in a transformation of the existing undercuts to a nonretentive form. Only a trimming of the margins to cut enamel in the right direction and finish it carefully was conducted in those cases. There were no base-materials used in this clinical study; all restorations were placed according to the total etch/total bond approach.

Table 1 Summary of the individual ratings of the Ryge criteria and additional clinical criteria according to Pelka et al. [20] used in this clinical study on Filtek Supreme and Tetric Ceram

Category	Rating	Characteristic
Marginal adaptation	Alfa	No visible evidence of a crevice along the margin into which an explorer will catch
	Bravo	The explorer catches a crevice along the margin but there is no exposure of dentin or base
	Charlie	Visible evidence of a crevice with exposure of dentin or base
	Delta	The restoration is fractured or missing in part or in toto
Anatomic form	Alfa	The restoration is not undercontoured
	Bravo	The restoration is undercontoured, but there is no dentin or base exposed
	Charlie	Sufficient restorative material is missing so that dentin or base is exposed
Secondary caries	Alfa	No evidence of recurrent caries along the margin of the restoration
	Bravo	Presence of softness, opacity at the margins as evidence of undermining or demineralization, or etching or white spots as evidence of demineralization in areas where explorer catches or resists removal after insertion
Marginal discoloration	Alfa	No existing marginal discoloration at all
	Bravo	Presence of discoloration at the margins between the restoration and the tooth structure; discoloration does not penetrate along the margins of the restoration toward the pulp
	Charlie	The discoloration penetrated along the margins of the restoration in a pulpal direction
Color match	Oscar	The restoration cannot be detected with a mirror
	Alfa	The restoration is visible but there is no mismatch in color, shade, and/or translucency between the restoration and the adjacent tooth structure
	Bravo	There is a mismatch in color, shade or translucency but not outside the normal range of tooth color, shade, and/or translucency
	Charlie	The mismatch is outside the normal range of tooth color, shade, and/or translucency
Surface	Alfa	Surface is smooth and the adjacent tissues showed no irritation
	Bravo	Surface of the restoration is slightly rough or pitted but can be refinished
	Charlie	Surface is deeply pitted or shows irregular grooves, which were not related to the natural anatomy and could not be refinished
	Delta	Surface is fractured or flaking
Interproximal contact	Alfa	Interproximal contact is clinically sufficient; floss passes through against strong resistance
	Bravo	Interproximal contact is clinically acceptable: too loose, but no complaints no food impactions or trauma of the papilla.
	Charlie	Interproximal contact is clinically not acceptable: loose contact with food impactions, and/or trauma of the papilla
Integrity of tooth	Alfa 1	No damage of tooth structure at all
	Alfa 2	Minor splinters of enamel or enamel cracks; repolishable; no need for therapy
	Bravo	Larger enamel cracks where an explorer will catch, not recontourable splinters
	Charlie	Enamel splinters with exposure of dentin
	Delta	Fracture of cusp/tooth
Complaints (postoperative sensitivities)	Alfa 1	No complaints at all
	Alfa 2	Minor complaints after placement of the restoration; no therapy necessary
	Bravo	Persisting minor complaints; still no therapy necessary
	Charlie	Persisting pain; treatment (removal of restoration) necessary and planned
	Delta	Persisting pain; root canal treatment necessary and planned

Occlusal and lateral enamel margins and cervical cementum margins received no bevel preparations, except for cervical enamel margins if enough enamel was left. The use of rubber dam was mandatory for all restorations to avoid contamination of the cavity with saliva, blood, or sulcus fluid in a standardized manner. After placement of a metal matrix system (Tofflemire, Kerr Hawe, Bioggio, Switzerland or Garrisson Dental Solutions sectional matrix system), a total etch (Scotchbond Etchant, 3M Espe, 35% phosphoric acid, lot 4 EC)/total bond procedure was applied to all surfaces of the cavity floor. The adhesive protocol strictly followed the application protocol of the manufacturer: The etching started with enamel etching followed by a visual check if all enamel margins were covered with the etchant gel. Thereafter, the application of the etching gel was extended to all dentinal structures. Fifteen seconds after getting contact with dentin, all the etching gel was removed with suction first followed by 15 s of water-spray. To avoid an overdried dentinal floor, an air-drying of the dentin was omitted. Drying started at the outer surface of the matrix, removing remaining water in those areas. This was followed by removing the water puddles between the inner part of the matrix and the outer cavity walls. After completing this, there was almost no extent of water on the dentin leftover. If this was still the case, a discrete "wiping" of the air syringe removed the remaining water there. This standardized procedure ensured the wet dentinal structure the selected adhesive needed. A rewetting (i.e., by means of a wet cotton pellet) was not necessary in any case. The removal of excess water from the cavity floor by means of a cotton pellet, as suggested by the manufacturer, did not work clinically because it was hard to omit remaining cotton filaments on some margins.

For all cavities, the adhesive system Scotchbond 1 (lot 2 GN 3M Espe) was used in accordance with the manufacturer's recommendations. Two consecutive layers of adhesive were applied to all enamel and dentinal surfaces and gently agitated. Each application took at least 15 s depending on the size of the cavity. A glossy surface served as control to ensure a sufficient adhesive layer on top of all cavity surfaces. The adhesive was light cured for 20 s (Translux CL QTH curing device, Heraeus Kulzer, Hanau, Germany). Wooden wedges (Kerr Hawe, Bioggio, Switzerland) were used to adapt the matrix band to the root surfaces and tightly seal the cavities. The matrix system was placed before the application of the adhesive system in all cases to avoid an influence of this variable [7]. A random distribution of the different restorative materials to the two cavities was carried out. For this clinical study, Filtek Supreme was available in the shades A2 Body (lot EXM #612 TA), A3 Body (lot EXM #612 TB), and A3.5 Body (lot EXM #612 RR); Tetric Ceram in the shades A2 (lot D 55326) and A3 (lot D 63754). The resin composite was applied incrementally, not exceeding 2–3 mm and separately cured for 40 s per increment.

Finishing was done with diamond burs (30 μm); for polishing, flexible discs (80–3 μm, Soflex XT Pop-On, 3 M Dental Products, St. Paul, MN, USA, 3,000–6,000 rpm), Enhance polishing tips (Dentsply/DeTrey, Konstanz, Germany), and polishing brushes (Soflex Brush /3M Espe, Okklu-Brush/Kerr Hawe, Bioggio, Switzerland) were used under constant water cooling. For approximate finishing and polishing, finishing strips (3M Espe) were used. All restorations were scored according to the Ryge criteria considering marginal adaptation, anatomic form, secondary caries, color match, marginal discoloration, and surface [23, 24] by two independent investigators not involved in the placement of the restorations. Additional clinical criteria like "interproximal contact," "integrity of tooth" and "complaints" were taken from Pelka et al. [20]. The examiners were calibrated to a predetermined level of inter- and intraexaminer agreement of at least 95% per single criterion. The training was conducted on approximately 100 posterior resin restorations in other patients from the clinical student courses in Operative Dentistry, not enrolled in the present clinical study. In cases where the two examiners disagreed on a rating, both reexamined the restoration and arrived at a joint final decision. Moreover, each restoration was documented photographically.

A summary of the Ryge-criteria used in this investigation and the additional criteria are shown in Table 1. Alfa and Bravo scores mean "excellent" and "clinically acceptable" results, while Charlie and Delta scores mean "clinically not acceptable," an indication to replace the restoration to prevent future damage or to repair present damage. This evaluation, including a photodocumentation and a test of the tooth vitality (Coolan propane/butane-spray, Voco, Cuxhaven, Germany), was performed after 6 months, 1 and, 2 years for each restoration available in the follow-up phase. For the determination of the tooth's vitality, a foam pad with the Coolan was applied to the buccal surface. Vitality was scored "vital" or "non-vital" according to the response of the patient.

If a restoration was scored Charlie or Delta at a follow-up appointment, the restoration was replaced or repaired at the same appointment. The Charlie or Delta scores were conferred to all further reevaluations in those cases where the restoration had to be replaced, i.e., due to a fracture or secondary caries, even though the complete restoration could not be evaluated afterward and no further evaluations of other criteria such as marginal discoloration were carried out. A descriptive statistical analysis was performed by means of a standard Excel and SPSS software. The Wilcoxon–Mann–Whitney test (5% level of significance) was used to determine the differences in the performance of both restorative materials used.

Results

After 2 years, all 112 restorations from baseline (recall rate 100%) could be evaluated and scored according to the Ryge and the extended clinical criteria. The results of the reevaluation after 6 months, one, and 2 years are shown in Table 2. Two fractures of restorations were observed in the reevaluated restorations within the observation period of 2 years: one chipping fracture (cohesive-type fracture) of a distal marginal ridge in a Filtek Supreme restoration placed

in a lower molar and one bulk fracture in the mesial part of a Tetric Ceram restoration placed in a lower premolar. Therefore, the overall clinical success rate for both groups, summing up all the Alfa and Bravo scores, of 98% according to the functional Ryge criteria was found. When also taking the Ryge criteria "color match" into account, which was originally designed to evaluate the aesthetic appearance of anterior teeth solely, the success rate of Filtek Supreme was 95% and was still 98% in the Tetric Ceram group. No statistically significant difference (Wilcoxon–Mann–Whitney test) in the overall survival rate between the two restorative materials was found within the observation period. All restored teeth remained vital, no secondary caries was observed.

Discussion

The clinical study presented here was designed in a split mouth study design to provide a sufficient control within the same subject. This measure should take individual patient variables into account. A total number of 50 patients who received 56 pairs of restorations were considered to be a sufficient number to cover most patients variables. Due to the fact that the mechanical behavior of the new restorative material was the main focus of this investigation, all other variables such as the type of adhesive or isolation were standardized: All restorations were placed under rubber dam isolation *after* application of the matrix system [7]; no base was allowed. The same adhesive was used for both restoratives. The use of Scotchbond 1 for *both* dental restoratives might be discussed controversially. On the one hand, it reduces variables because the restorative material is the only material-related variable left; this gives the chance to evaluate the dental composite itself and not the adhesive system consisting of adhesive *plus* dental composite. But on the other hand, this might contrast with recommendations of the manufacturer of the control material Tetric Ceram, which is generally recommended to be used in combination with an adhesive from the same manufacturer. An influence of the adhesive on the outcome of a clinical study might be seen primarily in marginal discolorations or marginal openings. This was not the case in the entire study: Filtek Supreme and Tetric Ceram both performed similarly in combination with the Scotchbond 1 adhesive. Therefore, as a conclusion, which can be drawn from this study, there is no clinical evidence that a dental composite might perform differently when it is not used together with its recommended adhesive.

One fracture was observed in each group of dental composites: one chipping fracture at a distal marginal ridge in a lower molar within the Filtek Supreme group and one bulk fracture in a lower premolar within the Tetric Ceram group. Both fractures were not in the same subject; therefore, this seems not to be patient-related. It is difficult to speculate about a possible reason for the bulk fracture in the Tetric Ceram group: One failure (2% out of 56 restorations) in a premolar with a total percentage of 34% of Tetric Ceram restorations placed in molars does not seem to show any correlation to loading. This is supported by excellent clinical data available for Tetric Ceram from the literature: Lundin and Rasmusson [15] found one fracture out of 148 mainly class II restorations made out of Tetric Ceram in combination with the adhesive Syntac Sprint. Data from Manhart et al. [17] on the predecessor of Tetric Ceram, Tetric, also showed excellent clinical data after 3 years, especially for premolars. Those reports on the widely accepted clinical use of Tetric Ceram in posterior cavities were the reason to choose this restorative as a control material, which is the most widely used among German general practitioners. Therefore, the one observed bulk fracture from the present study could hardly be seen as material-related; an operator-related effect might be discussed here as well.

It was shown that failures of the adhesive are mostly mixed failures (i.e., adhesive failure and cohesive failure within the adhesive resin) [12, 26]. A study testing effects of composite thickness on shear bond strength to dentin [21] surveyed that dentin bonding systems mainly fail because of dentin fractures or cohesive composite failures, which indicates good adhesion between the dentin and the composite. This may depend on the layer thickness; the mentioned study [21] showed that 5-mm-thick specimens

Table 2 Results of the clinical evaluation of Filtek Supreme (FS) and Tetric Ceram (TC) restorations

		Marginal adaptation				Anatomic form			Marginal discoloration			Color match				Surface				Interproximal contact			Integrity of tooth					Complaints				
		A	B	C	D	A	B	C	A	B	C	O	A	B	C	A	B	C	D	A	B	C	A1	A2	B	C	D	A1	A2	B	C	D
Baseline	FS	100	0	0	0	100	0	0	98	2	0	86	14	0	0	100	0	0	0	95	5	0	100	0	0	0	0	100	0	0	0	0
	TC	100	0	0	0	100	0	0	100	0	0	86	14	0	0	100	0	0	0	96	4	0	98	2	0	0	0	100	0	0	0	0
6 months	FS	98	2	0	0	100	0	0	95	5	0	40	55	2	4	95	5	0	0	89	11	0	100	0	0	0	0	93	0	7	0	0
	TC	98	2	0	0	98	2	0	98	2	0	60	36	4	0	96	4	0	0	89	11	0	98	2	0	0	0	91	2	7	0	0
12months	FS	96	4	0	0	100	0	0	96	4	0	49	47	2	2	96	4	0	0	89	11	0	100	0	0	0	0	96	0	4	0	0
	TC	98	2	0	0	96	2	2	100	0	0	62	38	0	0	93	4	4	0	89	11	0	98	2	0	0	0	95	0	5	0	0
24months	FS	96	2	2	0	98	0	2	98	2	0	46	50	2	2	95	4	0	2	89	11	0	100	0	0	0	0	98	0	2	0	0
	TC	96	2	0	2	98	0	2	100	0	0	57	39	4	0	95	4	0	2	89	11	0	98	2	0	0	0	91	2	4	4	0

The Ryge and California Dental Association scores are shown as documented at baseline after 6, 12, and 24 months
A Alfa, *B* Bravo, *C* Charlie, *D* Delta, and *O* Oscar

exhibited only adhesive failures and significantly lower bond strengths than 2-mm-thick specimens. Results showing that the dental composite was not adequately polymerized at the bottom revealed that there is a marked decrease in hardness and degree of conversion when the composite thickness is more than 3 mm [13, 21, 22]. In the present study, the restorative material cured and at the same time did not exceed a layer thickness of 2–3 mm; therefore, appropriate physical properties of the material could be expected.

Taking the acceptance level of the American Dental Association (ADA) for unrestricted use for restoring posterior teeth including cuspal replacement into account, due to the one bulk fracture observed Tetric Ceram would have missed passing those criteria, while Filtek Supreme would. But the study design of the presented investigation was not exactly performed according to the ADA criteria [1]: ADA requires an 18-month report for the final assessment; in the present study, it was 24 months. In contrast to ADA, which only allows first and second molars (50 at baseline) in a clinical trial, in the present study only 35 molars (=31%) but 77 premolars were included. This was mainly due to the split mouth study design because two comparable cavities to restore were easier to find in premolars (mainly replacement of amalgams) than in molars where cavity size differed more widely compared to premolars. In contrast to ADA, in the present study only class II cavities were restored, while 25% of class I restorations would have been allowed.

In the present study, the wear of the restorations was not considered. This is an additional important parameter for dental composites indicated for posterior teeth and is in fact required by the ADA [1]. But the main focus of this investigation was the strength of the material with regard to potential fractures, which might be seen to be related to the nanofiller clusters being inserted into a dental composite for the first time. Therefore, the wear was not considered in the present study.

As an interesting side effect of this clinical study, the criterion color match should be mentioned: Even if it did not reach the level of significance, a tendency toward a higher percentage of "Oscar" scores was seen in the Tetric Ceram group. This was mainly due to stains and discolorations in the fissures of some Filtek Supreme restorations. This was most severe in one subject who received two pairs of restorations: one in upper and one in lower molars. The Filtek Supreme restorations were placed in the lower jaw in the first molar, while it was in the second molar in the upper jaw. Both Filtek Supreme restorations showed a heavy staining of the fissures, while both Tetric Ceram restorations showed none. The stains could only be removed in part by polishing. But it has to be mentioned that both Filtek Supreme restorations incidentally showed a more pronounced occlusal anatomy with slightly deeper fissures and the adjacent enamel fissures showed discolorations as well, which has to be taken into account in this matter as well. Interviewing the patient only resulted in the information that she was a heavy coffee-drinker but did not show any unusual predilections for food and beverages; no medication (such as chlorhexidine) was reported as well. This information has to be seen more or less as a single observation of a clinical side effect than as a conclusion of this study. But the more pronounced staining in deeper, maybe not sufficiently polished, grooves in the Filtek Supreme restoration should be given attention in further or ongoing clinical studies on that material.

Conclusions

Both restorative materials investigated showed acceptable clinical performance in posterior teeth over a time period of 2 years. At 2 years, no significant differences were observed in this study between both types of dental composites. Therefore, within the limitations of this clinical study, the new nanofiller restorative Filtek Supreme can be saved for use in posterior restorations. However, further long-term recalls are needed for a final evaluation of this new type of dental composite.

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