

# What's new for the clinician?

## Summaries of and excerpts from recently published papers

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### 1. Low-shrinkage composite resins for posterior class II restorations: a randomized clinical trial (RCT)

M Schmidt, I Dige, LL Kirkevang, M Vaeth, P Hørsted-Bindslev<sup>1</sup>

Despite considerable advances in composite resin technology over the last 10 years, shrinkage behaviour and the resultant stresses inherent to directly placed composite restorations continue to challenge clinicians. The most frequently reported reasons for replacement of composite restorations are secondary caries and fractures.<sup>1</sup> To reduce the risk of secondary caries, the development of new materials has mainly focused on the improvement of the marginal adaptation in order to avoid gap formation between the tooth and the restoration. To reduce the problem of polymerization shrinkage and gap formation, a low-shrinkage composite material (Filtek™ Silorane, 3M-ESPE) has been introduced. This material is based on silorane monomers with traditional filler particles. Silorane monomers polymerize by a contraction-neutral ring-opening process which reduces volume shrinkage to 1% compared with 1.7 to 3.5% in methacrylate-based materials.<sup>1</sup> Schmidt and colleagues (2015) reported on a randomized clinical trial that sought to investigate the clinical performance of Filtek™ Silorane by comparing it with a methacrylate-based, composite material (Ceram X™, Dentsply DeTrey).<sup>1</sup>

The null hypothesis was that there would be no statistically significant differences in clinical performance between the two restorative systems after five years.

#### MATERIALS AND METHODS

The study was double-blinded RCT where neither the patients nor the evaluator was aware of the treatment. 72 adult patients from Denmark requiring class II restorations of premolars and/or molars provided 158 restorations at baseline. After 5 years, 107 (52 Filtek™ Silorane, 55 Ceram X™) restorations in 48 patients were evaluated. The average age of the patients was 50.5 years (SD 12.3 years, min. 22.9 years, max. 72.8 years). Only vital teeth without preoperative symptoms were included in the study.

After patients had given their informed consent, their teeth were randomized into two treatment groups (Filtek™ Silorane and Ceram X™) using computer-generated random numbers. The randomization used patients as blocks (based on the number of teeth to be restored) and was balanced within patient, or nearly balanced, if an odd number of teeth was included.

All the restorations were placed by the same dentist using a standardized procedure that include the use of local anesthetic, rubber dam, contoured titanium matrices, wooden wedges and lining with calcium hydroxide paste in the case of deep cavities.

Different adhesive systems designed for each of the materials were used. The adhesive system for Filtek™ Silorane (Silorane System Adhesive, 3M-ESPE) was a two-step self-etch primer and bond, whereas the adhesive system for CeramX (XenolIII, Dentsply DeTrey, Denmark) was a single-step self-etch primer and bond. Adhesive procedures were made according to the recommendations of the manufactures.

The composite material was applied in oblique incremental layers not exceeding 2mm. When necessary, an instrument for approximal contouring was used, and each layer was light-cured for 40 seconds. Restorations were adjusted to occlusion and articulation, finished with diamond burs and final polishing was done using rubber points whilst approximately the restorations were polished with Soflex strips.

The primary outcome was marginal adaptation, and the secondary outcomes were: marginal discoloration, approximal contact, anatomic form, fracture, secondary caries, and hypersensitivity. Marginal adaptation had four different scores: 0 excellent, 1 gap detectable with a 150 µm explorer, 2 gap detectable with a 250µm explorer, and 3 gap detectable with a ball-ended 0.5mm explorer. Approximal contact was assessed according to the size of the approximal space: 0: dental floss could pass, 1: a 50 µm blade could pass, and 2: a 100µm blade could pass. Secondary caries was scored as 0: no caries, 1: inactive caries, 2: active caries without cavity, and 3: active caries

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**Table 1:** Status of sample after 5 years.

	Filtek™ Silorane	CeramX™
Number of restorations	52	55
Restorations in females	43	43
Restorations in males	9	12
Premolars	29	30
Molars	23	25
Mean number of surfaces per restoration	2.4	2.7

with cavity. Fracture and discoloration were diagnosed by visual inspection and scored on a binary scale (yes/no). For pulp vitality test, the electrical pulp tester was used. Finally, the examiner assessed treatment need (need for repair or replacement of the restoration).

Restorations were scored after 5 years by one experienced dentist/evaluator (ID).

## RESULTS

Patients were recalled for a 5-year follow-up from September 2012 to February 2013 with an average observation time of 1,780 days (SD 45 days). A total of 32 % of the restorations were lost to 5-year follow-up. Patients examined after 5 years had, on average, 2.2 restorations (min. 1, max. 9) included in the study (see Table 1).

At 5-year follow-up, no statistically significant differences between the two materials were found in marginal adaptation either occlusally ( $p=0.96$ ) or approximally ( $p=0.62$ ). In general, higher scores for marginal gaps were found for occlusal surfaces than for approximal surfaces.

No statistically significant differences were found between the two materials in terms of approximal contact ( $p=0.22$ ), anatomic form ( $p=0.23$ ), fractures ( $p=0.76$ ), or discoloration ( $p=0.89$ ).

Secondary caries was found in two teeth (Filtek™ Silorane). Both of the lesions were active, but only one had a cavity. Inactive caries was found in two teeth (Filtek™ Silorane). A total of 99 teeth (49 Filtek™ Silorane, 50 Ceram X™) were tested for vitality. They were all vital. One tooth showed hypersensitivity (Ceram X™).

At 5-year follow-up, out of 107 restorations, six were repaired (four Filtek™ Silorane, two Ceram X™), and five were replaced (3 Filtek™ Silorane, 2 Ceram X™). All replacements were necessitated by cusp fractures (all in premolars). Five repairs/replacements were placed in molars, six in premolars. Six of the repairs/replacements were placed in the upper jaw, five in the lower jaw. The average size of the restorations in the repair/replacement group was 2.5 surfaces, whereas an average of 2.6 surfaces was found in the whole group. The average age of the patients in the repair/replacement group was 49.3 years, compared with 50.5 years in the whole group.

## CONCLUSIONS

The null hypothesis, that there would be no statistically significant differences in clinical performance for the two materials was accepted. Restorations of both materials were clinically acceptable after 5 years.

## IMPLICATIONS FOR PRACTICE

This study did not find any advantage of the silorane-based composite over the methacrylate-based composite, which indicates that the low shrinkage of Filtek™ Silorane may not be a determinant factor for clinical success in class II cavities after 5 years.

## Reference

- Schmidt M, Dige I, Kirkevang LL, Vaeth M, Hørsted-Bindslev P. Five-year evaluation of a low-shrinkage Silorane resin composite material: A randomized clinical trial. Clin Oral Invest. 2015; 19: 245-251.

# 2. Calcium-enriched mixture cement (CEM) versus root canal therapy (RCT) for the treatment of irreversible pulpitis in permanent molars: A randomized clinical trial.

S Asgary, MJ Eghbal, M Fazlyab, AA Baghban, J Ghoddusi<sup>1</sup>

Experts are of the opinion that for an informed, meticulously selected patient who wishes to avoid root canal therapy (RCT), vital pulp therapy (VPT) should be attempted as the correct/ethical treatment choice especially in contemporary modern endodontics where pulp regeneration in necrotic teeth has become the top goal.<sup>1</sup> Ideally, vital pulp therapy of adult permanent teeth includes direct/indirect pulp capping and partial/coronal pulpotomy using pulp-covering (bio) materials, which subsequently preserve the coronal pulp *in situ*, partially or totally removed to the level of canal orifice(s), and stimulate the formation of dentinal bridge as a natural barrier.<sup>1</sup> VPT can have a high success rate provided that (i) the remaining pulp is either non-inflamed or capable of healing; (ii) hemorrhage is properly controlled;

## ACRONYMS

**CEM:** calcium-enriched mixture  
**RCT:** root canal therapy  
**VPT:** vital pulp therapy

- a biocompatible, bioregenerative capping material is applied; and
- a bacterial-tight seal is present.<sup>1</sup>

Calcium-enriched mixture (CEM) cement has been introduced as a hydrophilic tooth-colored biomaterial with favorable sealing ability.

Asgary and colleagues (2015)<sup>1</sup> from Iran reported on the 5-year treatment outcomes of VPT/CEM or RCT for adult

permanent molars with irreversible pulpitis. In addition, the influence of patient's age/gender on long-term outcomes of VPT as well as effects of the presence of a preoperative periapical lesion on the treatment outcome was assessed.

## MATERIALS AND METHODS

This Iranian study involved patients aged between 9 and 65 years who had a vital molar tooth (detected by clinical sign/symptoms) with a history of pain indicative of irreversible pulpitis i.e. a spontaneous pain or a pain exacerbated with hot and cold stimuli that lasted for a few seconds to several hours. The pain could be interpreted as lingering and could be reproduced using cold/heat testing. Subjects with moderate or severe marginal periodontitis, a tooth non-restorable with amalgam or a tooth with internal/external resorption, and root canal calcification in periapical radiographs and medically compromised patients with systemic complications that would alter the treatment procedure were excluded. All the demographic data, patient codes, and the treated teeth for each subject were recorded before treatment.

Five years after treatment, clinical and radiographic evaluations were done in a standardized manner. In addition, the patient database was also checked for treatment cases with failure, or non attendance in evaluations (i.e. failed cases at 1-year follow-up who did not take part at 2- and 5-year recall). The 5-year results of each treatment group, with/without such failures, were assessed using the chi-square test. The chi-square test was also used for assessing the effect(s) of gender on treatment outcomes in each of the study arms.

The influence of patients' age (three age groups of <20, 20–29, and ≥30 years) as well as the effect of preoperative periapical involvement (i.e. presence/absence of apical lucency) on success/failure were assessed using the multiple binary logistic regression model. The marginal homogeneity test was used to compare the distribution of treatment responses in each of the study arms at 1- and 5-year follow-ups.

## RESULTS

After 5 years, a total number of 271 patients (66.6 %; 137 in VPT/CEM group and 134 in RCT group) were available for assessment of treatment outcomes. Using the independent sample t test, no significant difference in the follow-up duration was shown between the groups ( $P=0.27$ ).

When the data of available patients were assessed, the chi-square test revealed no significant difference in the

treatment outcomes of both groups with the success rates of 78.1 and 75.3 % for the VPT/CEM and RCT groups, respectively ( $P=0.61$ ).

When the missing data related to the previous failures ( $n=13$  in VPT/CEM group and  $n=20$  in RCT group) were evaluated, the difference between the study arms was not significant ( $P=0.29$ ) with success rate being 71.3 % for VPT/CEM group and 65.8 % for RCT group.

In terms of the correlation between patients' age and treatment outcomes in each of the two study arms, the multiple binary logistic regression model revealed that the outcome and patients' age were not significantly related in each of the defined age groups ( $P=0.72$  and  $P=0.61$  for VPT/CEM and RCT arms, respectively;

When assessing the impact of gender on outcomes of treatment in each of the study arms, the statistical analysis did not reveal a significant difference ( $P=0.24$  in VPT/CEM and  $P=0.73$  in RCT).

In addition, the marginal homogeneity test did not reveal a significant difference between the 1- and 5-year results in the group treated by VPT/CEM ( $P=0.09$ ), while the difference for the RCT group was significant ( $P<0.001$ ).

For the interaction of treatment type and preoperative periapical involvement of the teeth on treatment success and failure, the multiple binary logistic regression model revealed no significant differences ( $P=0.71$ ).

## CONCLUSION

The authors concluded that treatment outcomes of VPT/CEM in mature permanent molars with established irreversible pulpitis is comparable with that achieved in RCT.

## IMPLICATIONS FOR PRACTICE

The trial has provided good evidence that the VPT/CEM procedure which is simple, cost-effective, predictable, and bioregenerative is viable as a realistic alternative for tooth extraction or root canal therapy in general clinical practice worldwide.

## Reference

1. Asgary S, Eghbal MJ, Fazlyab M, Baghban AA, Ghoddusi J. Five-year results of vital pulp therapy in permanent molars with irreversible pulpitis: a non-inferiority multicenter randomized clinical trial. *Clin Oral Invest* 2015; 19: 335-41.

# 3. Rubber interdental bristle versus the standard metal-core interdental brush for interdental cleaning- a randomized clinical trial (RCT).

T Abouassi, JP Woelber, K Holst, S Stampf, CE Doerfer, E Hellwig, P Ratka-Krüger<sup>1</sup>

The importance of plaque removal for the prevention of dental disease is well established. However, habits such as interproximal plaque removal via flossing or alternative methods such as using wooden sticks, rubber-tip applicators, or interdental brushes have yet to become

## ACRONYMS

**EIBI:** Eastman Interdental Bleeding Index  
**IDB:** Standard interdental metal core brush  
**PI:** Plaque Index  
**RIB:** Rubber interdental brush

established as a daily routine for the majority of people who brush their teeth using toothbrushes.

Interdental cleaning plays a crucial role in good oral hygiene because these surfaces are very difficult to reach and are especially prone to periodontal destruction.<sup>1</sup> It has been found that interdental brushes are more effective than dental floss or wooden sticks in removing dental plaque. Interdental brushes have been available since the 1960s and commonly consist of a stainless steel wire which is connected to fine nylon filaments of different diameters. These nylon filaments are normally arranged in either a round or a triangular design, the latter of which was shown to be more effective in cleaning and to require the use of less pressure for insertion.<sup>1</sup> However, when brushes are not carefully used the chance of direct contact between the metal core of the brush and the tooth itself may trigger dentin hypersensitivity and iatrogenic tooth damage.<sup>1</sup> Abouassi and colleagues (2015)<sup>1</sup> reported on a trial that sought to compare a newly developed rubber interdental bristle against the standard metal-core interdental brush for its plaque removal efficacy and reduction of gingivitis in patients. Patients were also questioned afterwards as to their acceptance and satisfaction in using the brushes.

## MATERIALS AND METHODS

51 patients between 18 and 72 years and who had more than 18 interdental sites in their mouths were included in this trial. Those that had been exposed to antibiotic therapy in the previous three months were excluded.

The tested material consisted of a newly developed rubber interdental bristle (Fuchs®, Interbros GmbH, Schöna, Germany; RIB) and a standard metal core interdental brush (TePe®, Malmö, Sweden; IDB).

Gingival condition was assessed using the Eastman Interdental Bleeding Index (EIBI). For this, a triangular wooden interdental device was moved in the facial interdental space depressing the papilla 1–2mm and removed. This procedure was repeated four times. After 15 seconds, the presence or absence of bleeding was assessed.

Plaque levels were assessed using the Plaque Index (PI) with the Turesky modification of the Quigley and Hein Index. Stained plaque was scored from 0 to 5 at each facial and lingual non-restored surface of all the teeth except third molars (0=no plaque, 1=separate flecks of plaque, 2=a thin continuous band of plaque up to 1mm, 3=a band of plaque wider than 1mm but covering less than one third of the crown, 4=plaque covering at least one third of the crown but less than two thirds, and 5=plaque covering two thirds of the crown or more).

The questionnaire to assess patient acceptance consisted of 16 items regarding their subjective evaluation in using the product. The items included a 10-point Likert scale for evaluation of the acute pain intensity when using the product; free text for describing location of pain; 5-point Likert scales [1=very satisfied, 2=satisfied, 3=neutral, 4=unsatisfied, 5=most unsatisfied] for items like subjective cleaning capacity; ease of use; manageability; stability; slip resistance; accessibility of interdental spaces; flavour; and overall assessment with free text for personal comments. Besides the questions generated

by Christou *et al.*<sup>2</sup> the questionnaire was developed by the authors of this study including three researchers in the field of oral hygiene (PRK, CD, and EH). The questionnaire was shown to other patients prior the study to check understanding of the questions.

This study was performed in a crossover design. Each participant was asked to attend three times for the respective test interdental brush. The subjects were randomly assigned to a treatment sequence for the two tested products using a computer-generated randomization schedule. The subjects were randomly assigned to either treatment pair group “AB” or “BA”. Patients were randomized to receive either RIB (Rubber interdental brush) or IDB (standard interdental metal core brush).

During the first appointment, plaque evaluation was followed by professional dental cleaning and by oral hygiene instructions.

Tested rubber interdental bristles were designed for single use, so the patients were informed to use a new RIB every time. The IDB were multiple use products. Each time, the IDB had to be rinsed with tap water and stored dry at room temperature. Patients were asked to discard the IDB when the filaments were no longer straight or when the metal core became damaged.

At the start of the trial, subjects were given the same type of toothpaste and toothbrushes. EIBI scores were taken from the interdental papillae adjacent to interproximal test sites after 1 week. The second measurement of plaque was taken after 4 weeks. After this session, participants were asked to fill out a questionnaire regarding their opinion about the interdental brush. After 4 weeks wash out time, participants started the second course using the other product in the same manner.

## RESULTS

Of the total of 39 patients who completed the study (there were 12 dropouts), 23 were female and 16 male with an average age of 44 years, ranging from 21 to 72 years.

Regarding EIBI, a total of 7,151 interdental sites were analyzed with a mean of 22.92 interdental sites per patient and measurement.

EIBI as a parameter for gingival inflammation/bleeding was significantly reduced after 4 weeks in both the RIB and IDH groups. No statistically significant difference with regard to bleeding index was registered between RIB and IDB. Both products showed a similar effect on bleeding index.

Regarding the plaque index, a total of 16,133 sites were analyzed with a mean of 51.71 analyzed sites per patient and measurement. IDB showed no significant changes in PI after 4 weeks.

RIB showed a low but significant increase of PI after 4 weeks. No statistically significant differences concerning the plaque index were observed between the two tested interdental brushes. RIB and IDB each showed a statistically significant decrease of PI after a single use, respectively with IDB being more effective in plaque reduction in comparison to RIB after a single use ( $p=0.0075$ ).

Within low values of pain, IDB provoked significantly more pain during brushing compared with RIB as assessed with



a 10-point Likert scale. RIB was found to be significantly softer than IDB and more comfortable in use. Regarding the overall assessment, RIB was rated significantly superior in comparison to IDB on a 5-point Likert scale.

### CONCLUSION

The authors concluded that both interdental cleaning products tested were suitable for daily interdental cleaning. Rubber bristles showed more plaque accumulation compared to the interdental brushes, but with no statistical significance between the two devices. Both products showed a reduction in gingival inflammation after 4 weeks. Patients described rubber brushes as being more comfortable in application and handling.

### IMPLICATIONS FOR PRACTICE

Rubber interdental brushes displayed the same cleaning efficacy as the standard metal core interdental brushes. These brushes were found to be more comfortable for patient use but can only be used once before discarding as opposed to the standard metal core brushes which can be used multiple times.

### References

1. Abouassi T, Woelber JP, Holst K, Stampf S, Doerfer CE, Hellwig E, Ratka-Krüger P. Clinical efficacy and patients' acceptance of a rubber interdental bristle. A randomized controlled trial. Clin Oral Invest 2015; 18: 1873-80.
2. Christou V, Timmerman MF, VanderVelden U, VanderWeijden FA. Comparison of different approaches of interdental oral hygiene: interdental brushes versus dental floss. J Periodontol 1998; 69:759-64.



## CONGRESS HIGHLIGHTS

