Post-op Sensitivity with Direct Composite Restorations

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Sales of self-etch adhesive systems have grown considerably over the last 10 to 12 years. One of the most important factors contributing to this growth is the perception that self-etch adhesives cause less postoperative sensitivity than etch-and-rinse adhesives. Certainly, there is much anecdotal evidence supporting this perception. But what does the science say? This Critical Appraisal presents evidence from several clinical trials of postoperative sensitivity in posterior composite restorations.

Total-etch versus Self-etch Adhesive: Effect on Postoperative Sensitivity

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Journal of the American Dental Association 2003 (134:1621–9)

ABSTRACT

Objective: The purpose of this clinical study was to determine whether the use of a self-etch adhesive system reduced postoperative sensitivity associated with posterior composite restorations.

Materials and Methods: Two adhesives were used: Clearfil SE Bond (Kuraray America, New York, NY, USA), a two-step self-etch system, and Prime & Bond NT (Dentsply Caulk, Milford, DE, USA). Twenty-five patients ranging in age from 21 to 54 years and requiring Class I or Class II restorations either for replacement of existing restorations or treatment of initial caries lesions were enrolled in the study. All operative procedures were done under rubber dam isolation. The teeth were restored incrementally using Esthet-X (Dentsply Caulk) with Prime & Bond or Clearfil APX (Kuraray) composite with SE Bond. A total of 30 restorations were done using the self-etch adhesive, and 36 were done using the etch-and-rinse adhesive.

Assessments of tooth sensitivity were done before treatment, and at 2 weeks, 8 weeks, and 6 months after restoration placement. Sensitivity was elicited by application of cold (ice stick), compressed air, and masticatory forces. Applications of cold and compressed air were timed, with a maximum application of 15 seconds. Patient perceptions of sensitivity were recorded on a 0 to 10 continuous visual analog scale (VAS).

Results: Sensitivity to cold and compressed air was reported in both severity (mean of the VAS scores) and time to response. For example, the mean severity of sensitivity to cold at 2 weeks was 2.79 for Clearfil SE Bond and 2.06 for Prim & Bond NT. The corresponding mean response times were 7.3 and 8.3 seconds. There were no significant differences between the two adhesives for any of the outcome variables (air sensitivity, air response time, cold sensitivity, and cold response time). No sensitivity to masticatory forces was observed in the study.

Conclusions: The self-etch adhesive system Clearfil SE Bond did not result in less postoperative sensitivity at any recall than that of the etch-and-rinse adhesive Prime & Bond NT.

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COMMENTARY

This was one of the first clinical studies comparing postoperative sensitivity between contemporary etch-and-rinse and self-etch adhesives. All measures of post-op sensitivity were virtually identical for the two adhesives tested. Quoting the authors, "The clinical technique, therefore, may be more relevant for the development of postoperative [sic] sensitivity than is the type of adhesive itself."

Postoperative Sensitivity in Class I Composite Resin Restorations in Vivo

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Journal of Adhesive Dentistry 2006 (8:53–8)

ABSTRACT

Objective: The purpose of this study was to compare the incidence of postoperative sensitivity between a two-step etch-and-rinse adhesive and a two-step self-etch adhesive in Class I composite restorations at baseline, 7 days, and 6 months.

Materials and Methods: A total of 104 occlusal restorations were placed by one operator in 52 patients with ages ranging from 18 to 30 years. Each patient had two molars in antagonistic quadrants with amalgam restorations that required replacement. Other prerequisites included absence of edentulous spaces, the teeth to be restored had proximal and occlusal contacts, and no history of tooth sensitivity. The depth of the preparations was measured in bitewing radiographs. The preparation depth was shallow (superficial third of dentin) in 54 preparations, medium in 38, and deep (inner third) in 12 preparations. Each patient received two restorations, one with Single Bond (3M ESPE, St. Paul, MN, USA), a two-step etch-and-rinse adhesive, the other restoration with Clearfil SE Bond (Kuraray, Osaka, Japan), a two-step self-etch adhesive. All restorations were performed under rubber dam isolation, using Filtek Z250 (3M ESPE) in an oblique incremental technique. The first restoration was finished 1 week after insertion, and the second restoration was placed during this appointment. Patients were instructed to rate the sensitivity using a VAS where 0 corresponded to "no pain" and 10 to "excruciating pain."

Results: For each of the two adhesives, there was no significant difference between preoperative sensitivity and postoperative sensitivity at 7 days or at 6 months. For each evaluation period, there was no significant difference in postoperative sensitivity between Single Bond and Clearfil SE Bond. At 7 days, only two restorations in the Single Bond group had a VAS score greater than 3, while only one restoration in the Clearfil SE Bond group had a VAS score greater than 3. At 6 months, no restoration had a VAS score greater than 3.

Conclusions: There is no difference in postoperative sensitivity between a two-step etch-and-rinse adhesive and a two-step self-etch adhesive used under composite resins to restore occlusal preparations in permanent molars. The clinical technique may play a more important role in postoperative sensitivity than the type of adhesive.

COMMENTARY

As in other controlled clinical studies, etch-and-rinse adhesives do not seem to cause a higher incidence of postoperative sensitivity when compared with that caused by a self-etch adhesive. However, the conditions of this study may not extrapolate directly to clinical practice, as all restorations were placed by a single operator and were done under rubber dam isolation.

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Clinical Evaluation of a Two-step Etch&Rinse and a Two-step Self-etch Adhesive System in Class II Restorations: Two-year Results

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Operative Dentistry 2009 (39:656–63)

ABSTRACT

Objective: The purpose of this study was to compare the 2-year clinical performance of a two-step etch-and-rinse and a two-step self-etch adhesive system in Class II composite restorations.

Materials and Methods: A total of 87 Class II restorations were placed in 33 adult patients ranging in age from 20 to 54 years. Each patient had at least one pair of posterior teeth that required a Class II restoration. A single experienced operator placed all of the restorations with rubber dam isolation, sectional matrix system, and incremental placement technique. The same composite, Filtek Z250, was used in all restorations. The two adhesive systems, which were randomly assigned, were Adper Single Bond, a two-step etch-and-rinse system, and Clearfil SE Bond, a self-etch primer system. A moist bonding technique—gentle air-drying without desiccating the dentin—was used for Single Bond. Clearfil was used according to its manufacturer's standard instructions—i.e., the enamel margins were not etched.

The restorations were evaluated by two other investigators at baseline and at 6 months, 1 year, and 2 years after placement. Modified United States Public Health Service criteria were used to rate the restorations with regard to retention, marginal discoloration, marginal adaptation, post-op sensitivity, recurrent caries, color match, and anatomical form. Loss of retention, severe marginal defects, severe discoloration, and recurrent caries were considered to be clinical failures.

Results: Seventy-six percent of the restorations were available for examination at the 2-year recall. Retention rates were 94% for Single Bond and 100% for Clearfil, but the difference was not statistically significant. Three restorations in each group had superficial, localized marginal discoloration. Small marginal defects were seen in one of the Single Bond restorations and four of the Clearfil restorations. No postoperative sensitivity or recurrent caries was observed in either group.

Conclusions: The etch-and-rinse and self-etch adhesive systems evaluated in this study demonstrated similar clinical performance in posterior teeth at 2 years.

COMMENTARY

The two-step etch-and-rinse and self-etch system evaluated in this clinical trial demonstrated excellent performance, with good margins and no post-op sensitivity. The most relevant finding for this Critical Appraisal was the latter—the absence of post-op sensitivity, even immediately after placement. Mild self-etch systems are expected to have little or no post-op sensitivity, and much anecdotal evidence confirms this. In contrast, etch-and-rinse adhesives are reputed to have more frequent and more intense post-op sensitivity. That was not the case in this study. However, it must be noted that all of the restorations were placed by a single operator who was (quoting the authors) "familiar with adhesive dentistry" and obviously used meticulous clinical technique including rubber dam isolation.

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Effect of Glass-ionomer Cement Lining on Postoperative Sensitivity in Occlusal Cavities Restored with Resin Composite—A Randomized Clinical Trial

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ABSTRACT

Objective: The purpose of this study was twofold: (1) to study the ability of a glass ionomer liner to reduce postoperative sensitivity in occlusal composite restorations, (2) to compare the incidence of postoperative sensitivity between a two-step etch-and-rinse adhesive and a two-step self-etch adhesive.

Materials and Methods: A total of 106 occlusal restorations were placed by one operator in 72 patients with ages ranging from 18 to 37 years. Teeth were first or second molars with moderate to deep occlusal caries lesions. The exclusion criteria included the presence of a previous restoration, preparation depth less than 2 mm, and pulp exposure or near exposure. Carious dentin was stained with a caries detector dye (and removed with slow-speed round bur and spoon excavator). The average depth of the preparations was 3.0 mm (ranging from 2.0 to 4.5 mm). Restorative procedures were carried out under gauze/cotton roll isolation combined with high volume suction. Rubber dam was only used when moisture control was difficult to achieve.

The preparations were restored with one of four restorative procedures: (1) Single Bond 2,[1] a two-step etch-and-rinse adhesive, with no liner; (2) Fuji Lining LC (GC Corporation, Tokyo, Japan), a resin-modified glass ionomer (RMGI) liner, applied to the entire dentin surface, followed by Single Bond 2; (3) Clearfil SE Bond, a two-step self-etch adhesive, with no liner; (4) Fuji Lining LC RMGI liner applied to the entire dentin surface, followed by Clearfil SE Bond.

All restorations were placed incrementally with Filtek Supreme XT[2] (3M ESPE). Not all patients received one restoration of each group. When a patient received multiple restorations, the restorations were placed in different quadrants at different appointments. Sensitivity was evaluated at baseline, 1 week, and 1 month, using a modified VAS from 0 to 100 mm. The tooth was isolated with gauze, and an ice stick was applied to the buccal surface for 20 seconds or until the patient felt the stimulus. Additionally, postoperative sensitivity during daily function was reported.

Results: Two patients (three restorations) did not return for the recalls, but reported no sensitivity during telephone interviews. Only 4 out of 103 restorations had postoperative sensitivity in daily function—one in the Single Bond 2 group without liner, and the other two in the Clearfil SE Bond group without liner. At 1 month, no cases reported of postoperative sensitivity in daily function were reported. No significant differences were found among the four treatment groups at baseline or at either recall. However, there was a tendency for lower sensitivity in response to cold stimulation when the self-etch adhesive was used independent of the presence of a liner. Within each experimental group, no statistically significant differences were found between baseline and either recall. However, when data were pooled for all four groups, a statistically significant difference was measured among the three evaluation periods—tooth sensitivity to cold stimulation was lower at 1 week and at 1 month than at baseline, without any significant difference between 1-week and 1-month evaluations.

[1] *Identical to Adper Single Bond Plus in the United States.*

[2] *Identical to Filtek Supreme Plus in the United States.*

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Conclusions: No significant difference in postoperative sensitivity was reported among the four restorative techniques, using a combination of an etch-and-rinse or self-etch adhesive with or without RMGI liner.

COMMENTARY

Although the use of a caries detector dye has been shown to increase the volume of the final cavity preparation by over 50% (Banerjee et al., Am J Dent 2003; 16:228-30), the results of this clinical study showed a low incidence of sensitivity to cold. According to the authors, preparations followed a "minimal intervention technique." The use of an RMGI liner might have been more effective in reducing postoperative sensitivity in more extensive preparations, by reducing the volume of the composite resin and, consequently, the polymerization stress associated with its shrinkage.

SUGGESTED READING

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THE BOTTOM LINE

- Much anecdotal evidence indicates that postoperative sensitivity is reduced when self-etch adhesives are used to place posterior composite restorations than when etch-and-rinse adhesives are used.
- The results of controlled clinical trials do not support this anecdotal evidence. Postoperative sensitivity in clinical trials is similar for etch-and-rinse and self-etch adhesives.
- In some clinical studies, all restorations were placed by a single operator. In most, rubber dam isolation was used. Thus, "real world" results might be different from those obtained under relatively ideal conditions in clinical trials.
- The clinical trials show that operator technique is a more important factor than choice of the adhesive system in postoperative sensitivity.

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