

## Critical Appraisal

## TO BEVEL OR NOT IN ANTERIOR COMPOSITES

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Composites are widely used for the functional and esthetic restoration of anterior teeth. The placement of a cavosurface margin bevel on the enamel margins of anterior composite preparations traditionally has been recommended to enhance retention and for esthetic reasons, as bevels result in a gradual transition between the restoration and the tooth. However, advances in adhesive and composite technology, as well as careful composite selection and application techniques, have made it possible to place adequate anterior composites without a bevel. Elimination of bevels results in more conservative cavity preparations, a simpler technique, a reduced restored surface area, and the preservation of tooth structure when the restoration is replaced. This Critical Appraisal summarizes clinical reviews and laboratory research publications related to the influence of cavity preparation and, more specifically, cavosurface bevels on the performance of anterior composite restorations.

## DIRECT ADHESIVE RESTORATION OF ANTERIOR TEETH: PART 1. FUNDAMENTALS OF EXCELLENCE

E.M. de Araújo Jr, L.N. Baratieri, S. Monteiro Jr, L.C.C. Vieira, M.A.C. Andrada *Practical Procedures and Aesthetic Dentistry* 2003 (15:233–240)

## ABSTRACT

**Objective:** This clinical report presents an innovative approach for direct restorations with composite resin in anterior teeth. Emphasis is placed on minimally invasive preparation and esthetics.

**Summary:** The article provides general recommendations on how to achieve excellence with direct anterior composite restorations. A clinical protocol is described, highlighting indications of anterior composites, selection of composite material, and conservative cavity preparation. Some of the innovative techniques proposed by the authors include making a color map of the tooth to be restored that serves as a guide for the restoration. Also, the authors emphasize the importance of generating a mock-up restoration after the tooth preparation is completed to confirm shade selection. In regard to tooth preparation, the authors claim that cavosurface bevels are not necessary for retention and/or esthetics. The authors also challenge the widely accepted concept that only gifted clinicians can execute imperceptible anterior composites. The proposed protocol is illustrated with clinical case reports.

\*Professor and head, Operative Dentistry Division, Federal University of Santa Catarina, School of Dentistry, Florianópolis, SC, Brazil †Assistant professor, Department of Operative Dentistry, University of North Carolina, School of Dentistry, Chapel Hill, NC, USA **Conclusion:** Composite resins have evolved to become the material of choice for the conservative and esthetic restoration of anterior teeth. Following a protocol geared toward conservation of sound tooth structure and proper selection and placement of the material, the clinician can place anterior composites with predictability in butt-joint margin preparations.

## COMMENTARY

Tooth preparation concepts and techniques should evolve along with the advancement of composite and adhesive restorative systems. Adhesive materials enable clinicians to generate more conservative preparations than with nonadhesive materials because resistance and retention forms are not as critical. Using effective adhesive systems and suitable composites, the authors contend that a cavosurface margin bevel is not needed for retention or esthetics. According to the authors,

tooth preparation for anterior composites should be limited to the removal of the unsatisfactory restoration and/or carious tissue, preserving all remaining sound tooth structure. This approach is especially relevant for young patients. Because direct composites still have inherent disadvantages, such as polymerization shrinkage and susceptibility to staining, composite restorations occasionally must be replaced. Therefore, the younger the patient, the more likely replacements will be necessary during his or her life. The initial composite restoration should be as conservative as possible to minimize the costs and complexity of the eventual replacement restorations.

Much more than hand skill is required to obtain success with direct composites. Good diagnosis and treatment planning also are important for a good prognosis, as is following a restorative protocol that should be adapted to every case in particular. In addition, it is important to use efficient adhesive systems and composites with suitable optical properties. Hands-on continuing-education programs offer clinicians the opportunity to practice in extracted teeth the concepts of tooth preparation and composite placement discussed in the article. Finally, clinicians should develop an artistic sense and cultivate the habit of observing details of natural teeth in order to reproduce them in composite restorations.

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## EFFECT OF LIGHT SOURCE POSITION AND BEVEL PLACEMENT ON FACIAL MARGIN ADAPTATION OF RESIN-BASED COMPOSITE RESTORATIONS

D.C. Hoelscher, W.A. Gregory, J.B. Linger, F.E. Pink American Journal of Dentistry 2000 (13:171–175)

### ABSTRACT

**Objective:** This in vitro study evaluated the influence of cavosurface bevel placement and light source orientation on the microleakage of Class III resin-based composite restorations. Materials and Methods: Forty Class III cavities were prepared on the mesial and distal surfaces of 20 extracted human incisors. A 45°, 0.5 mm wide bevel was placed in the facial cavosurface margin of half the specimens. Lingual and gingival margins were beveled in all specimens. Cavities were restored with Prisma TPH composite (Dentsply Caulk, Milford, DE, USA). The light-curing technique varied, as only half the beveled specimens and half the nonbeveled CRITICAL APPRAISAL

specimens received a facial light exposure. The remaining specimens were cured only from the lingual aspect. All specimens were thermocycled and immersed in a silver nitrate solution for microleakage evaluation. Dye penetration along the interface was measured, and the results were analyzed for statistical differences among groups.

**Results:** The nonbeveled restorations leaked more than did the beveled restorations. In the beveled specimens, facial light curing resulted in less microleakage than occurred with the lingual cure.

**Conclusion:** Facial bevels with facial light curing can reduce microleakage in Class III composite resin restorations.

### COMMENTARY

The results of this study lead the reader to conclude that bevels must be systematically performed in Class III composite restorations as the beveled preparations resulted in less leakage than occurred with the nonbeveled ones. However, caution should be exercised when extrapolating the results of this study to clinical practice.

As this was an in vitro study, the restorative procedures were not as complex as in a clinical situation. Clinically, it is somewhat difficult to prepare conservative Class III restorations owing to the position of the adjacent tooth, when present. Class III access preferably should be performed directly and strictly at a proximal or lingual surface. Therefore, if facial access can be avoided, the placement of a facial bevel becomes a moot point. One should not extend the preparation facially simply to have a facial bevel as that would unnecessarily expose the restoration facially.

Another factor that makes it difficult to translate the results of this study directly into clinical practice is that, clinically, the marginal sealing process can be affected by a number of variables, such as cavity configuration, insertion and curing techniques, hygroscopic expansion of the composite, occlusal stress, and the adhesive capacity of the composite resin. These factors were all standardized in an in vitro study, but would not be clinically.

Another limitation acknowledged by the authors is that the materials used, although possibly the state of the art at the time the study was conducted, are nowadays challenged by newer and better materials. Newer adhesive systems would likely enable better sealing of the cavities owing to the better quality of the etching and substrate-adhesive hybridization. Although a bevel is recommended to improve retention, studies have shown that the bevel is not essential for sealing if etching is effectively performed.

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## MICRO-TENSILE BOND STRENGTH OF SELF-ETCHING ADHESIVES TO GROUND AND UNGROUND ENAMEL

G. Ibarra, M.A. Vargas, S.R. Armstrong, D.S. Cobb Journal of Adhesive Dentistry 2002 (4:115–124)

#### ABSTRACT

**Objective:** The purpose of this study was to compare the bond strength of self-etching adhesive systems with that of a total-etch adhesive system when applied to ground and unground enamel.

Materials and Methods: Seventytwo bovine incisors were selected and randomly divided into three groups (n = 24), according to the adhesive system used: two selfetching adhesive systems (Prompt L-Pop, 3M ESPE, St. Paul, MN,

USA, and Clearfil SE Bond, Kuraray, Tokyo, Japan) and one total-etch adhesive (Scotchbond Multi-Purpose, 3M ESPE). The facial enamel surface of half the specimens in each group was ground with a 600-grit silicon carbide paper to simulate enamel preparation (ground enamel); the other half of the specimens were left intact (unground enamel). The adhesive systems were applied and composite resin (Herculite XR, Kerr, Orange, CA, USA) was placed in 2 mm increments to the bonded specimen surface. Each increment was cured for 40 seconds. The specimens were then processed for microtensile bond strength testing, and the fracture site was analyzed microscopically to determine the type of fracture.

**Results:** No statistically significant differences in mean bond strengths were noted between the samples bonded to ground and unground enamel surfaces, or between the adhesive systems used. Failures occurred principally at the bonded interface.

**Conclusion:** The nature of the enamel substrate (ground vs unground) had no effect on the bond strengths of self-etching and total-etch adhesives.

#### COMMENTARY

Many types of adhesive systems are used in restorative dentistry today, but they can generally be classified as total-etch systems and self-etching systems. The former have been studied extensively and bond predictably to enamel; the latter are relatively new, and their bond to unprepared enamel has been matter of debate as some contend that they are not acidic enough to etch the enamel. According to the results of this study, selfetching systems can be considered a viable alternative as the systems tested bonded equally well to ground and unground enamel. However, the reader must not conclude that such systems should be substitutes for the total-etch systems. Further research is needed to confirm the effectiveness of selfetching systems because, among other variables, these systems are available in a variety of commercial brands and compositions.

Ground and unground enamel are surfaces usually found during clinical procedures with adhesive restorations. According to some authors, etching unground enamel produces a less homogeneous etching pattern, which compromises retention and marginal seal. However, the results obtained in this study confirm those of other studies that also show that current adhesive systems offer comparable bond strengths to ground and unground enamel. Therefore, additional grinding of tooth structure cannot be justified from a bonding standpoint since it is possible to obtain retention independently from surface grinding.

The use of bovine teeth could be considered a study limitation. However, their size and availability make them ideal for bonding tests. Although bovine enamel is more porous than human enamel, bovine teeth can be considered good alternatives for bonding studies owing to their overall similar morphology to human teeth.

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# IN VITRO EVALUATION OF MARGINS OF REPLACED RESIN-BASED COMPOSITE RESTORATIONS V.V. Gordan

Journal of Esthetic Dentistry 2000 (12:209-215)

### ABSTRACT

**Objective:** The purpose of this in vitro study was to evaluate the increase in size of Class V restorations caused by bevel placement and following restoration replacement. The null hypothesis tested was that a bevel would not cause additional loss of tooth structure following the restoration replacement. The study also compared the area and perimeter of Class V cavities with and without bevel prior to restorations.

Materials and Methods: Class V cavities with a cavosurface margin of 90° were performed in extracted anterior teeth. Half the specimens received a 1.5 mm wide, 45° occlusal cavosurface margin bevel, and the other half were maintained with a butt-joint margin. Impressions were made of all preparations, before and after the bevel, if used. All preparations were restored with composite resin. The preparation perimeter and surface area, as well as the restoration surface area, were recorded for all specimens. A different investigator then removed the restorations, and the perimeter of the new preparation was recorded. Data obtained from the perimeter and area measurements in all samples were analyzed for significant differences.

**Results:** Beveling increased both perimeter and surface area of the initial preparations and restorations. Once the initial restorations

were removed, restorations placed with butt-joint margins resulted in increased area and perimeter. However, beveled restorations did not lead to larger preparations after the restoration had been removed. Restoration perimeter and surface area were not affected by beveling the cavosurface margin. Placing a bevel did not affect the preparation after the restoration was removed.

**Conclusion:** The placement of a cavosurface bevel might result in overextension of the preparation and unnecessary removal of healthy tooth structure.

## COMMENTARY

Studies have shown a significant increase in cavity size when restorations are replaced, leading to a more onerous and complex treatment. To our knowledge, this is the first published study that evaluates the influence of the cavosurface margin preparation on cavity size following restoration replacement.

The initial conclusion could be that restorations with bevels are better because, when replaced, there is a smaller increase in cavity size when compared with nonbeveled restorations. However, the authors assume that practitioners tend to be more conservative in restorations with bevels on the cavosurface margin. In reality, the clinician rarely knows if a restoration that he or she is replacing had beveled margins. It is important to highlight the apparent bias caused by the orientation of the practitioner to remove the restoration with a minimal increase in cavity size, which makes the situation different from the reality. Furthermore, the fact that the restorations were done on extracted teeth facilitates the view of the restoration's limits and the preparation as such.

This article reinforces the concept that prior to restoration, bevels cause the removal of sound tooth structure, as seen in the results obtained when comparing the cavities with and without bevel. Bevels have been recommended to increase bond strengths and to hide the compositetooth restorative interface. With contemporary adhesive systems, retention should not be an issue as the entire surface of the preparation is bonded. Regarding esthetics, with the proper use of the variety of available shades of composite resins, it is possible to perform satisfactory restorations, eliminating the need for the removal of additional tooth structure. In other words, it is possible to execute with clinical success suitable restorations with nonbeveled preparations, maintaining the quality of the remaining tooth structure.

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## THE BOTTOM LINE: TO BEVEL OR NOT IN ANTERIOR COMPOSITES

Considerable amounts of time and resources are invested in developing materials and techniques that allow clinicians to use anterior composites effectively and predictably. However, the influence of the cavosurface margin configuration (ie, bevel vs butt-joint) on the clinical performance of anterior composites is still debatable. Traditionally, a cavosurface bevel has been indicated for more effective retention and to improve esthetics, permitting a gradual composite-tooth transition. With the total-etch technique and today's adhesive systems, it is possible to overcome problems related to retention and microleakage, with esthetics remaining perhaps the only advantage of performing a bevel. However, it must be pointed out that the noted esthetic benefit occurs at the expense of sound tooth structure with proven enlargement of the marginal configuration. For this reason, the use of a bevel should not be mandatory.

Dental materials continuously improve through research and development in both privately and federally funded ventures. However, even with the many innovations constantly introduced in the marketplace, some tooth preparation concepts remain unchanged and are used in a controversial way. Although bevels are still widely recommended, growing evidence indicates that anterior composites can be performed with an even more conservative approach. Functional and esthetic composite restorations without a bevel can be executed, provided there is sufficient knowledge of restorative procedures and efficient adhesive systems are used. Composites should have suitable optical properties to reproduce the dental polychromatic nature more faithfully. Furthermore, training and determination is essential. An effective esthetic outcome is more a result of professional expertise than of the tooth preparation as such.

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