COMMENTARY

MULTIPLE CUSPAL-COVERAGE DIRECT COMPOSITE RESTORATIONS: FUNCTIONAL AND ESTHETIC GUIDELINES

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Ever since resin-based composites were first used on posterior teeth in the early 1970s,¹⁻⁴ there has been great controversy regarding their use. Today, almost 40 years later, it is interesting to observe the passion with which both academicians and clinicians argue in favor of or against posterior composites. In general, those who favor posterior composites cite esthetics and adhesive properties as their key advantages over other direct restorative alternatives—mainly dental amalgam. On the other hand, those who oppose posterior composites cite postoperative sensitivity, polymerization shrinkage, and a sensitive and time-consuming clinical technique as drawbacks of the technique.

The reality is that all of these are legitimate arguments. There is an extensive body of evidence showing that posterior composites work very well when properly used—namely in conservative restorations, using incremental placement, in teeth that can be properly isolated, and in patients with no severe parafunctional habits.^{5–15} A recurrent conclusion of studies evaluating the long-term clinical performance of posterior composites is that an increase in the number of restored surfaces is a negative predictor of longevity, i.e., the more conservative the restoration, the longer it will last.

These introductory paragraphs are required as context for a commentary on the article "Multiple cuspal-coverage direct composite restorations: functional and esthetic guidelines" by Drs. Deliperi and Bardwell. The article suggested guidelines for the use of direct composites in large, cusp-replacing posterior restorations. The authors rationalized their treatment philosophy loosely based on selected published research and on their own observations and assumptions. According to the authors, success can be achieved when placing large, cusp-replacing composites by using a "fastidious technique and stepwise protocols, cavity preparation, tooth structure preservation through bonding, layering and curing techniques, and occlusal equilibration and analysis of antagonist teeth."¹⁶ This conclusion statement is arguably proper, but the article that preceded it did not support it entirely.

The rationale presented by the authors to justify the use of large, cusp-replacing direct composite restorations was based on the following statements and references:

- 1. "There has been a paradigm shift from the routine use of amalgam to adhesive composite resin when restoring posterior teeth." I agree with this statement to some extent, but amalgam is still the main posterior restorative material in many countries. The amalgam technique is less complex than the posterior composite technique. Not-withstanding the financial and technical aspects of the posterior composite technique, composites are a logical choice for small- and moderately sized posterior teeth defects, but not necessarily large, cusp-replacing restorations. Because of the increased regulation of amalgam use in many countries, however, it is possible that direct composites might become an alternative for complex restorations in cases where indirect restorations cannot be used because of financial restrictions.
- 2. "Clinical studies have reported no significant difference in clinical success of direct and indirect composite restorations in short- and long-term evaluations."¹⁰ The article cited to back up this statement is a superb review presented by Dr. Reinhard Hickel at the 2004 Buonocore Memorial Lecture. However, Dr. Hickel's review also taught us that indirect restorations in general exhibited a significantly lower mean annual failure rate than direct restorations (p = 0.0031), and that single-surface restorations show greater longevity than multisurface restorations.¹⁰ These findings spell caution when using multisurface, direct composites for cusp-replacement situations. It is also important to note that some clinical studies comparing the performance of direct and indirect composite restorations show a higher failure rate for direct composites;^{17,18} so the evidence on this issue is not as definitive as the

authors stated. The apparent discrepancy between the results presented by Hickel's review and those found in other studies could be due to the different methodologies used in the different studies. For example, it might not be proper to compare longitudinal performance data from one study investigating indirect restorations to data of another study investigating direct restorations. Differences in sample size, case selection (including but not limited to the size of the restorations), follow-up period, etc., could lead to a biased conclusion.

- 3. "Single-visit direct cuspal-coverage resin-bonded restorations may be considered a viable alternative to conventional indirect restorations for cusp-coverage restorations when performed in patients with either ideal or less favorable occlusion." This bold statement is backed up by two references.^{19,20} The studies cited did not have proper control groups, and the evaluation times were not adequate (2 weeks in one of them). To suggest that direct composites can be used for cusp replacements in patients with less favorable occlusion requires a more solid backing, and readers should take this statement at face value. I am a strong proponent of using posterior composites, but I do not think that, at the present time, there is enough scientific or clinical evidence to back up this statement.
- 4. "Tooth fracture is the leading cause of failure among cuspal-coverage amalgam restorations."²¹ The implication is that restoring teeth with direct composite will yield a better outcome, i.e., less tooth fracture. The article cited did not compare amalgam and composite restorations. It simply looked cross-sectionally at a large number of complex amalgam restorations that failed and reported on the types of fracture. What the article actually shows (and this is stated in its conclusion) is that "replacement or coverage of fracture-prone cusps is likely to improve the life expectancy of complex amalgam restorations." It might as well be that tooth fracture is an important cause of failure among cuspal-coverage composite restorations.
- 5. "Wear pattern is less favorable for extensive posterior composites when compared with amalgam." Indeed, as the authors pointed out, wear still is a concern for large posterior composites.^{13,22} The "protective wear theory" introduced by Jorgensen²³ and Jorgensen and colleagues²⁴ and also supported by Bayne and colleagues²⁵ does not hold for multiple cusp-replacing composites, as the restoration does not benefit from the "sheltering effect" of the preparation walls.
- 6. "Alternative occlusal schemes reduce stress on residual cavity walls and/or cusps as well as provide an even distribution of forces." While the "alternative occlusal scheme" proposed by the authors is intriguing, there is no evidence that it actually works. This statement is based on theorization and assumption, and there is no indication in the article that this concept was tested. Therefore, it might be premature to assume that the use of the proposed occlusal scheme will result in better outcomes. Again, readers should take this statement at face value.
- 7. "Resin-based composites do reinforce weakened teeth utilizing modern enamel–dentin adhesive systems." This statement is highly arguable. The relevant question is not whether composites reinforce weakened teeth, but to which extent composites reinforce weakened teeth. Is the reinforcement enough to fully restore the fracture resistance of the weakened tooth, and is this strengthening effect long lasting? In vitro studies showed that adhesive restorations only partially strengthen teeth weakened by tooth preparation,^{26–29} and many do not show this positive effect at all.^{30–32} Unfortunately, there is no clinical evidence that composites reinforce weakened teeth. In fact, one clinical study showed no difference in the prevalence of cusp fracture in teeth restored with amalgam and with composite.³³

Drs. Deliperi and Bardwell should be complimented by sharing a conservative approach to restoring a severely compromised posterior tooth with composite, and for the opportunity to discuss several important aspects of the posterior composite technique. However, there is no evidence of midterm or long-term success of the technique they proposed. The single case presented has no follow-up after 2 weeks. The restoration the authors replaced had been placed 2 years previously. What evidence do the authors present that their new restoration will last any longer than the one they replaced? And if it does, can a similar outcome be expected of similar restorations in other patients?

Success or failure of restorations of any kind cannot be established with small sample size studies and/or short observation periods. Clinical observations may yield insight into performances and outcomes, but such observations cannot be generalized as evidence of success of a clinical technique. Like the authors, I am hopeful that improvements in the material and a better understanding of the clinical technique will lead to long-term success when direct composites are used on teeth with one or more missing cusps. In keeping with that goal, the authors will hopefully follow-up on this publication with a longitudinal study with proper control groups, a more substantial sample size, and a longer observational period.

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