Since 1968, composite resin in Class II tooth restorations has been promoted by manufacturers. Early composite resin formulations had large-particle-size fillers and other physical property problems, and they degenerated rapidly. Although dentists and patients alike were pleased with tooth-colored posterior restorations, failure of early composite resin formulations for Class II situations gave this material a stigma that is still being overcome. In the mid- to late-1970s, brands of smaller particle-size composite resin started to appear, as well as rudimentary bonding agents. Because of the unacceptable service provided by previous composites and the lack of adequate simple techniques for Class II resins, these restorations were still considered to be less than acceptable. By the mid-1980s, composite resins with small-particle-size fillers (approximately 1 micrometer) accompanied by improved bonding agents were introduced, and the first relatively adequate Class II resin restorations became available. Slowly, dentists began to use composite resin in Class II locations routinely instead of silver amalgam, and clinical research began to show these restorations to be serving relatively well.

Now, approximately 20 percent of intracoronal restorations in the United States are tooth colored, and a growing percentage of dentists are excluding amalgam from their practices for various reasons. This article describes the state-of-the-art in Class II resin restorations, makes observations about current technical and economic challenges with these restorations, and provides suggestions for increasing acceptance of Class II resin restorations.

ALTERNATIVE RESTORATIONS FOR CLASS II LOCATIONS

In the United States, the most commonly used posterior tooth restoration is amalgam. Direct composite resin is second in use. However, there are now 11 different types of tooth-colored restorations. Cast gold restorations, still first in providing long serviceability in the author's opinion, lag significantly in use.

Before initiating any therapy, dentists are advised to provide education to patients about types of restorations available. Patient education is mandatory to satisfy the requirements of informed consent. It is surprising to observe that when patients are provided information about the many types of tooth restorations available, most select tooth-colored restorations, a few select the longest-lasting restoration (gold alloy), and a decreasing—but still a large percentage—select amalgam. Should patients be allowed to select the type of tooth restoration they receive? Why not? When various alternatives, all of which have a reasonable chance for success, are available, patients should receive education about all of the alternatives available. Patients should make an educated decision using the dentist as an expert consultant.

CLASS II RESTORATIVE TECHNIQUES: AMALGAM VS. COMPOSITES

Numerous dental schools in the world do not teach the use of amalgam. When students graduate from these schools, they must learn techniques on their own if they plan to use amalgam. Their complaints about amalgam use are just as strong as those heard from dentists who were taught amalgam first and are changing to composite. Dentists learning to place amalgam for the first time complain of a variety of problems:

- difficulty making tight contact areas, especially if a mushy
mix of spherical amalgam is used;
- waiting period for amalgam to achieve initial set;
- overcarving potential;
- overhanging amalgam material;
- fracture of amalgam on initial closure into occlusion;
- postoperative tooth sensitivity.

Most experienced dentists reading this article have overcome these challenges with amalgam, but please remember how long the period was to overcome these problems. Those who learned composite resin restorations first find amalgam restorations difficult to accomplish.

Dentists competent with amalgam techniques who are changing to composite find the following difficulties with composite resin in Class II locations:
- open contact areas;
- pits and voids in composite resin, especially at tooth preparation margins;
- contact areas resisting floss entry, but improperly contoured;
- difficulty in finishing;
- postoperative tooth sensitivity.

Can these challenges be overcome? Obviously, yes, considering that thousands of dentists have abandoned amalgam. Just as with amalgam, hundreds of repetitions are necessary to overcome the challenges with composite resin techniques. Experienced Class II composite users find returning to amalgam difficult. The clinical challenges with Class II resin can be overcome. Recent introduction of resin-reinforced glass ionomer liners, packable resins, improved matrices and flowable resins greatly reduce difficulties with Class II resin techniques.

Current research is showing composite resin, properly bonded to tooth structure, can serve adequately even in full-crown restorations.

Amalgam has served exceptionally well for restoration of posterior tooth defects, ranging from tiny holes in teeth to amalgam full crowns. High strength and low wear have allowed this success. Composite restorative resin has strength properties lower than amalgam, but similar to tooth structure. Composite resin has been accepted by thousands of clinicians as adequate for restoration of small- and medium-sized intracoronal restorations.

Microfill resin, such as Heliomolar (Vivadent), wears approximately 15 µm per year more than enamel, or about 0.15 mm at 10 years. Are these composite resin quantities negative enough to condemn the material in Class II situations? In my long experience with composite resin, I conclude that such wear is undesirable, but tolerable, assuming that enamel occlusal discrepancies are adjusted occasionally, and restorations are replaced or resurfaced when necessary.

Although there are clinician perceptions that there is more dental caries involvement in Class II resin restorations than in amalgam restorations, currently available improved resins and techniques will probably reduce this challenge.

Composite resin as a Class II restoration has been criticized and maligned by some, but most of the criticism should be directed toward pre-1985 generations of resin. However, physical properties of composite resin could be improved in several ways:
- by reducing wear;
- by reducing polymerization shrinkage;
- by matching expansion-contraction to tooth structure;
- by improving bonding agents.

Current composite resins have problems different from amalgam, but they cannot be
condemned as Class II restorations, and they should not be considered to be experimental.

**ECONOMICS OF CLASS II RESTORATIONS**

One of the significant problems with Class II resins is obtaining adequate payment or acceptance by third-party payment organizations. Atlanta Dental Consultants* reports that average fees for three-surface Class II resin restorations in U.S. communities range from $112 to $231. Assuming clinical time involvement of 20 to 40 minutes for a typical Class II resin restoration, these fee averages are lower than fees for many other similarly difficult procedures in dentistry. These low fees probably are one of the main reasons why there has been slow acceptance of Class II resin restorations for dentists. Categorically, most fees for restorations are significantly lower than fees for nearly all other procedures in dentistry. Fees for restorative procedures need to be analyzed, justified and adjusted accordingly.*

**SUMMARY AND CONCLUSIONS**

Class II resin restorations have been evolving in American dentistry for 30 years, but the concept has had significant difficulty being accepted because of stigma attached to early generations of composites. Currently available composite resins for posterior tooth restorations have physical characteristics justifying their use. Techniques for Class II resin placement have improved significantly, and mastery of them is within the ability of both dentists and dental students. Although composite resin materials and techniques present clinical challenges, so do amalgam materials and techniques. It is time to accept Class II resin restorations, improve dentist and student education about their use, increase acceptance by third-party organizations and various approving groups, and bring this concept into the mainstream of U.S. dentistry.

The views expressed are those of the author and do not necessarily reflect the opinions or official policies of the American Dental Association.

Educational information on topics discussed by Dr. Christensen in this article is available through Practical Clinical Courses and can be obtained by calling 1-800-223-6569.