A High-Density Posterior Composite Used for an Amalgam Replacement

By Timothy C. Adams, DDS

During their more than 30 years of development, composite resins have shown more promise and disappointment than any previous material in dentistry. They were developed in 1962 by Bowen and subsequently introduced to the dental profession.[1] The early claim of a Bis-GMA wear-resistant resin with various ceramic fillers appeared to be the next restorative innovation. It was much more advanced intraorally (better handling, retention, and aesthetics) than its silicate cement and acrylic predecessors. Early resin materials worked relatively well in the anterior, and gained popularity for use as an amalgam replacement in the posterior. Initial clinical evaluation showed promise and created excitement, but it quickly became apparent that there were a few major drawbacks.[2] Leakage due to polymerization shrinkage, wear rates, secondary caries, and postoperative sensitivity stymied the use of direct posterior composites.[3-8]

The good news is that adhesive techniques and materials have gone through a tremendous amount of research and development. This has led to a resurgence of their use as a posterior restorative. Wear rates of posterior composite resins are now comparable to or have exceeded those of amalgam.[5] Postoperative sensitivity has been reduced or eliminated by the proper use of a rubber dam, antimicrobial rinses, and three-sided light curing.[9-11] And secondary caries has been negated by fourth- and fifth-generation bonding, caries detection stain, and three-sided light curing.[11-13] The only significant remaining (but improving) problem is polymerization shrinkage.

A recently introduced direct composite resin (Surefil, Dentsply Caulk) appears to be an ideal amalgam replacement. This high-density composite features interlocking particle technology (IPT), which allows for high aesthetics and amalgamlike handling characteristics. It is a precisely engineered mixture of different-size particles made of a patented fluoride-infused glass. When packed, the larger particles mechanically interlock with the smaller particles, providing a feel and resistance similar to an amalgam during condensation. The interlocking action also eliminates the slumping and rebounding associated with most composites when trying to establish contacts. Using this composite provides great depth-of-cure, a wear similar to enamel, the ability to release fluoride, and amalgamlike handling and finishing characteristics.

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Figure 1


Figure 2


Figure 3


Figure 4


Figure 5


Figure 6


Figure 7


Figure 8

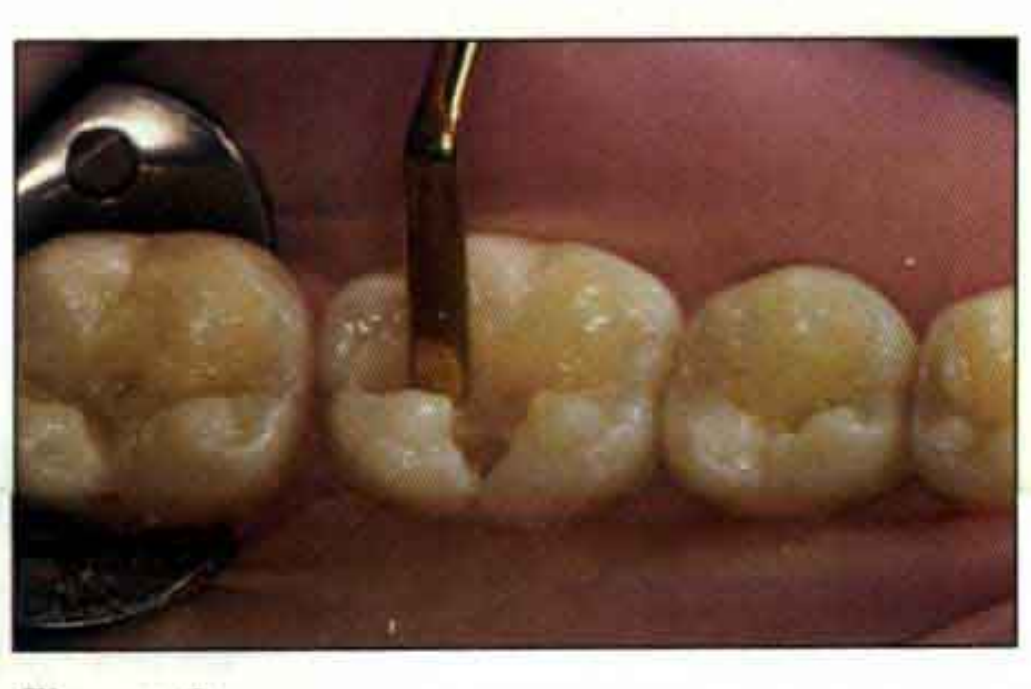
Figure 9


Figure 10

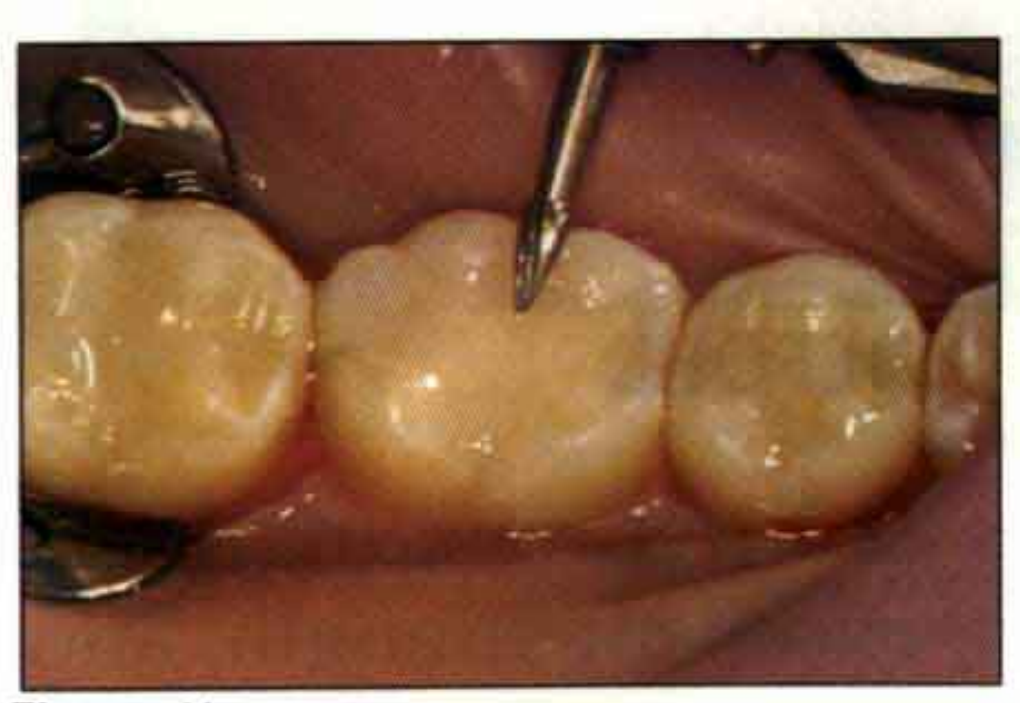
Figure 11

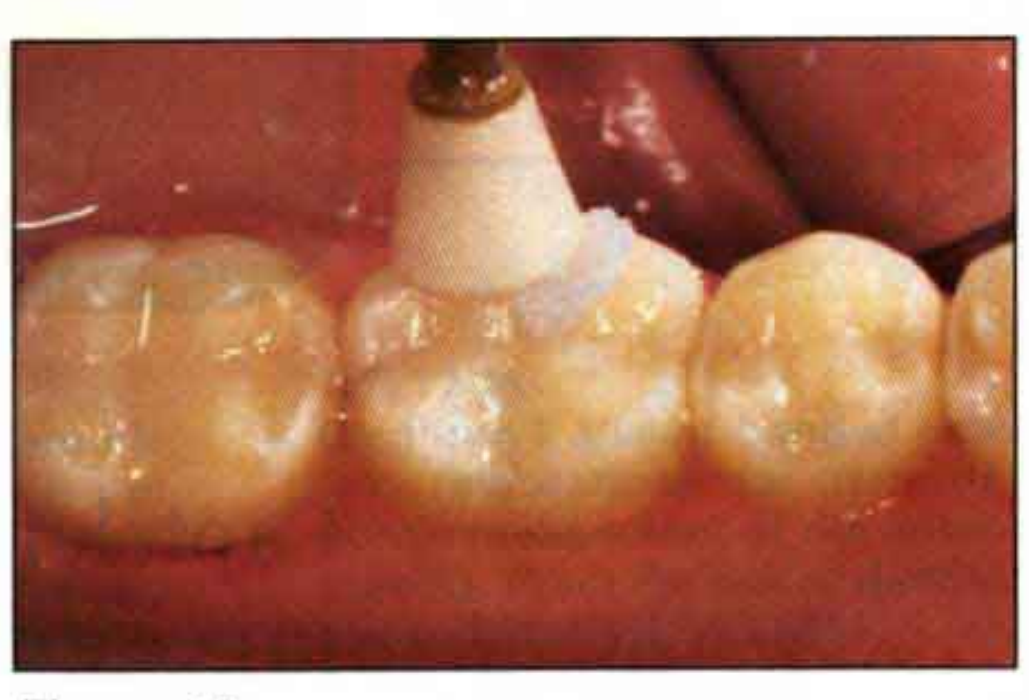
Figure 12


Figure 13


Figure 14


Figure 15

A High-Density Posterior Composite Used for an Amalgam Replacement
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CASE REPORT

A 22-year-old female presented with occlusal amalgam restorations on teeth Nos. 29, 30, and 31. Marginal breakdown and decay was noted on the lingual of teeth Nos. 30 and 31 (Figure 1). The area was anesthetized, and a rubber dam was placed. A No. 330 carbide bur was used to very conservatively remove all of the amalgam restoration (Figure 2). Caries detection stain (Seek, Ultradent) was used to observe and confirm the presence of decay (Figures 3 and 4). A KCP 1000 was then used to clean up the cavity preparations (Figure 5). Note that the conservative outline of preparations was kept very close to original form. Preparations were then scrubbed with Consepsis (Ultradent), rinsed, and lightly air dried with an A-Dec airdryer (Figure 6). A 36% phosphoric acid solution (Ultradent) was then applied to the enamel and dentin surfaces for 15 seconds, rinsed, and lightly air dried (Figure 7). Tublicid Red (Global) was applied as a combination wetting agent and antimicrobial with a multibrush. Excess moisture was blotted dry with a new multibrush to prevent oversaturation of the dentin. The dentin should be moist with a glistening surface. Prime and Bond 2.1 (Dentsply Caulk) was applied liberally with a multibrush for a minimum of 20 seconds (or 5 to 10 coats) as recommended by the manufacturer. The teeth were lightly air dried to remove the acetone carrier, and light cured for 30 seconds. A second coat was then applied and lightly air dried for 5 seconds. A glossy appearance should be apparent on the dentin (Figure 8). An increment of Surefil was then placed with a composite amalgam carrier or a composite instrument and condensed into the preparation (Figure 9). This increment was light cured using the three-sided method[11] of curing. Bulk placement is recommended before curing. Surefil has been shown to cure greater than 5 mm in depth. Recent research suggests that the placement of a condensable composite by bulkfill does not jeopardize the restoration and might very well be a better and easier technique.[14,15] The restoration was carved with a composite instrument and a cone burnisher (Figure 10). A layer of DeOx (Ultradent) was placed to prevent an oxygen inhibition layer from forming. The final cure was performed and the restoration was finished with a finishing bur (Figure 11).

Note that the majority of the finishing was accomplished before the final cure due to the excellent handling characteristics of the posterior composite. The rubber dam was removed and the occlusion was checked. The restoration was finished with a series of enhanced finishing cups and points (Dentsply Caulk) and polishing paste (VH Technologies) (Figures 12 and 13). A final layer of unfilled resin (Ultradent) was placed following acid etching of the tooth restoration interface for 15 seconds (Figure 14). The final check revealed a very natural looking restoration with exceptional contour, marginal integrity, anatomy, color, and strength (Figure 15).

CONCLUSION

More research and long-term clinical studies will have the final say, but Surefil direct composite resin seems to have a legitimate and clinical advantage with its IPT technology. Its amalgamlike handling, fluoride release, aesthetics, radiopacity, and indication in classes I and II load-bearing conservative posterior restorations allows the material to be a logical choice for aesthetic-restorative clinicians. Many clinicians are still leery of using this material in class I and conservative class II cavity preparations. The industry estimation is that only 10% to 20% of general dentists prefer posterior composite resins to amalgam. This percentage will remain unless dentists increase their standards and clinical ability with proper hands-on postgraduate training or the handling properties of direct composite resins improve and exceed amalgam.✦

References

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