Using chemical vapor deposition diamond finishing burs for conservative esthetic procedures

Adilson Yoshio Furuse, DDS, MSc, PhD • Leonardo Fernandes da Cunha, DDS, MSc • Patricio Runnacles, DDS, MSc
Rodrigo Pirolo, DDS, MSc • Joao Cesar Zielak, DDS, MSc, PhD

The article demonstrates how chemical vapor deposition (CVD) diamond burs were used in a simple esthetic and cosmetic procedure to treat discolored anterior teeth. A patient who experienced discoloration after bleaching was treated with direct resin composite veneers. Excess restorative material close to the periodontium was removed with a CVD diamond bur attached to an ultrasonic handpiece. The results indicate that CVD diamond burs are appropriate for removing excess material at the gingival margins of resin composite restorations without damaging the periodontium.

Received: November 30, 2011
Revised: March 6, 2012
Accepted: June 13, 2012

Recurrence discoloration is a common occurrence following a walking bleach procedure.1 If an alternative esthetic treatment is necessary after bleaching, direct resin composite veneers may be indicated, as large tooth reductions are not necessary with this method, and veneers are not only an inexpensive, conservative approach, but they also improve esthetics and function.2-4

Veneers are indicated for masking dental discoloration when the cervical margins of the restorations are located at or very near the subgingival area; as a result, excessive amounts of restorative material at the periodontium are common. A restoration inserted close to the gingival margin (as is the case with resin composite veneers) may have a negative effect on marginal periodontal health, due to increased plaque retention and the potential for gingival inflammation and periodontal destruction.5 Additionally, an unpolished restoration is more likely to stain as a result of food and beverage intake, which could lead to discoloration and the need to replace the esthetic resin composite veneer.6 Soares-Geraldo et al suggested a possible relationship between staining from exogenous sources (such as coffee, tea, or red wine) and the degradation of resin-based materials.7

Excess resin composite near the gingival margins normally is removed using diamond burs and surgical scalpels; however, this procedure can be harmful to the periodontal tissues and can result in bleeding. Diamond burs made of polycrystalline chemical vapor deposition (CVD) diamond may be used in ultrasonic handpieces to avoid injury.4 These CVD diamond burs may remove similar amounts of tooth structure compared to conventional high-speed burs; however, the removal process may be slower.9 Slowly removing the restorative material and sound dental structure allows for greater precision, which would be advantageous when finishing and polishing the gingival margins of a restoration.

This article presents a case in which CVD diamond burs were used to remove excess cervical restorative material after placing a direct resin composite veneer.

Case report
A 20-year-old man reported discoloration on an endodontically treated left maxillary central incisor. Clinically, a Class IV restoration was observed (Fig. 1); according to the patient, this restoration was placed due to a fall that happened during his childhood. The patient’s history and radiography suggested intrinsic staining, possibly due to the root canal therapy.

In-office and walking bleach procedures were planned. Approximately 1 mm of root canal restoration material was removed (in the apical direction) from below the cemento-enamel junction (CEJ). A 2 mm resin-modified glass ionomer cement cervical seal (Vitremer, 3M ESPE) was placed, following the anatomy of the CEJ to prevent the bleaching agent from spreading to the periodontal ligament or the periapical area (Fig. 2). The in-office bleaching agent was applied 3 times at the same treatment session prior to utilizing the walking bleach technique (Fig. 3). For the walking bleach procedure, a paste made of sodium perborate and water was inserted into the pulp chamber (Fig. 4). The cavity for coronal access was

Fig. 1. A preoperative view of the patient. Note the compromised esthetics due to discoloration and a Class IV restoration on the left maxillary central incisor.

Fig. 2. A radiograph taken after the application of the glass-ionomer cervical seal.
sealed with Vitremer. After 7 days, the in-office technique was repeated and a fresh paste of sodium perborate and water was applied to the pulp chamber. At 14 days, the in-office technique was repeated once more, and a fresh paste of calcium hydroxide and water was inserted into the pulp chamber, remaining for 2 weeks. A resin composite (Filtek Z350 XT, 3M ESPE) was used to restore coronal access. Figure 5 shows the post-bleaching results. The patient did not return for the next clinical session to replace the Class IV restoration.

After 5 months, the discoloration had recurred and a veneer was indicated. Figure 6 reveals a discrepancy in the form of the two maxillary central incisors. Using a diamond bur, a veneer preparation was made to provide sufficient space for opaque and translucent resin composites; at that point, a self-etching adhesive system (Easy One, 3M ESPE) was applied. A thin layer of Filtek Z350 XT was placed to mask the discoloration of the underlying tooth structure. A dentin shade (A2) was used to simulate the opacity of the dentin and reproduce the dentin lobes. The translucent composite was applied among the lobes to simulate the translucency of the incisal third. To reproduce the appearance of enamel, the enamel shade was applied to the cervical (A2E) and the middle and incisal thirds (A1E). Cosmetic recontouring of the right maxillary central incisor was performed by placing resin composite to correct the morphologic asymmetry, re-establish the midline, and improve harmony, alignment, and color among the anterior teeth (Fig. 7).

The restorations were finished and polished with sequential polishing discs. Cervical margins were finished with a CVD diamond bur (CVDentus) in an ultrasonic handpiece, which produced a vibrating movement rather than a rotational movement (Fig. 10). Even when a CVD bur in an ultrasonic handpiece touches the gingiva, the gingival tissue sustains less damage (due to the unidirectional oscillating movement) than that produced by a high-speed rotational bur. This results in a more precise finish with less noise and less patient discomfort. Other advantages include extended bur durability and preservation of the healthy tooth structure for conservative cavity preparations.8

While CVD burs have the same potential for removing sound dental structure as conventional high-speed burs, the procedure itself may require more time, which could be problematic in cases that require removing large amounts of dental structure or restorative material.9 Although the slower procedure may result in greater precision, it does not mean that ultrasonic instruments do not cause any harm to the dental structure. The clinician should keep in mind that the safety and efficacy of ultrasonic instruments depend on tip angulation, the
level of power the device uses, lateral force, and the amount of time needed for the procedure.

The walking bleach technique was employed as part of an in-office technique. Although the discolored tooth was exposed to a high concentration of hydrogen peroxide, discoloration occurred again. A veneer was discussed with the patient, either placed with direct resin composite or indirect ceramics; a direct resin composite veneer was selected. Advantages to this indirect ceramics; a direct resin composite

Whenever the margins of a restoration are close to the gingival margin (as with veneers), it is important that appropriate finishing and polishing procedures are performed. Excess resin composite at the gingival margin of the veneer makes the restoration more prone to accumulate plaque and pick up staining from the consumption of coffee, tea, or red wine. Increased plaque retention could lead to periodontal problems as well as recurrent caries. Based on the present case report, CVD diamond burs cause less damage to the gingival margins than high-speed rotational burs.

**Summary**

The use of CVD diamond bur during the finishing procedure. Note that the bur is touching the gingiva while being activated by the ultrasonic handpiece.

**Fig. 11. Anterior view of the direct adhesive restorations after finishing and polishing.**

**Fig. 12. The patient after smile harmony was re-established by the resin composite restoration.**

**References**