

# Realizing efficient and predictable posterior quadrant restorations

Combining selective etching, universal adhesive and bulk-fill composite

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Efficiency and long-lasting stability of the result are important requirements that are placed upon direct restorative procedures with composite. In this context, a system of well-coordinated materials is the definite key to success.

It is not uncommon for middle-aged and older patients to present with multiple failing amalgam restorations in a single quadrant. Many such restorations can be replaced conservatively with direct composite. Unfortunately, however, many of the placement and accompanying adhesive protocols required for predictability can be time-consuming and technique sensitive. Therefore, it is important to understand the historical development of adhesive dentistry when considering today's etching and adhesive protocol options.

## In the beginning

Conceptualized more than 50 years ago, Buonocore proposed bonding to enamel and dentin by first treating those surfaces with phosphoric acid before applying resins. Although he considered resin tag formation in the micro-porosities of etched enamel to be principally responsible for adhesion to enamel, bonding to dentin was less predictable due to dentin's composition, water content and smear layer. Not surprisingly, the first dental adhesives were resins that only bonded to enamel; there was little to no dentin bonding. On-going changes in material composition, adhesive mechanism, application method and overall adhesive techniques fuelled the evolution of adhesive dentistry and the introduction of increasingly esthetic restorative materials. They also led to different adhesive etching products and protocols.

## "Total-etch" or "etch-and-rinse" technique

In "total-etch" or "etch-and-rinse" techniques, both enamel and dentin are etched with phosphoric acid to remove the smear layer and condition the preparation prior to bonding, with enamel being etched longer than dentin. The etchant and smear layer are then rinsed off with water and dried. Because dentin should remain moist and slightly glossy in appearance, care must be taken to not over-dry the dentin. This prevents collagen fibrils from collapsing, which would create a less permeable surface for hydrophilic monomers in the adhesive, as well as a weak interface, potentially leading to a poor bond and postoperative sensitivity. Although well-established and clinically proven, total-etch adhesives and



Fig. 1: Preoperative view showing multiple failing side-by-side amalgam restorations in the maxilla

their associated multi-step techniques are often considered to be technique sensitive.

## Selective-etch technique

With selective etching, only the enamel edges of the preparation are etched with phosphoric acid and then rinsed with water. The dentin is conditioned afterwards with either a primer or all-in-one self-etching adhesive; the smear layer is only modified, not removed by rinsing with water after primer application.

Using the selective-etch technique could be problematic if the dentin is inadvertently etched, then "etched" again with a self-etching adhesive.

This over-etching of the dentin could result in reduced bond strength and postoperative sensitivity.

### Self-etch technique

Intended for adhesive bonding without separate etching, the self-etch technique relies on adhesive materials containing acidic monomers that etch and prime enamel and dentin. Demonstrating a milder pH level than total-etch products, self-etch adhesives pose less risk for excessive dentin demineralization, and because the technique sensitive step of precisely drying the dentin is eliminated, collagen-fibre collapse is prevented. Combined, these attributes reduce the likelihood of postoperative issues.

### Realizing predictable efficiency today

Manufacturers have successfully increased the adhesive portfolio by introducing universal adhesives that promote high bond strength to enamel and dentin, and which can be used on both dry and moist dentin. Because they are designed to work with or without phosphoric acid, universal adhesives (e.g. Adhese® Universal) are suitable for selective-etch techniques, without fear of over-etching the dentin.



Fig. 2: View of the completed Tetric EvoCeram Bulk Fill direct composite restoration for tooth 17

### Materials of choice

When replacing multiple failing amalgam restorations in a single quadrant using direct composite, I prefer using the selective-etch technique because it delivers the “best of both worlds”. It provides strong micro-mechanical retention at the enamel margin with less probability of postoperative sensitivity, since the dentinal tubules are not completely opened.

My preferred adhesive for such techniques is Adhese Universal, which is available in traditional bottle and unique VivaPen® delivery. For me, the ergonomic, pen-like VivaPen design and angled brush cannula enhance comfort, control and speed during direct intraoral application while reducing material waste. Containing 2 millilitres of adhesive, the VivaPen can accommodate approximately 190 single-tooth applications, which is almost 3 times the applications per millilitre compared to conventional bottle delivery. As a result, the Adhese Universal VivaPen cost per application is considered to be lower than that of all other leading universal adhesives.

Also contributing to more cost-effective and time efficient direct posterior restorations is the use of a bulk-filled com-

posite (e.g. Tetric EvoCeram® Bulk Fill, Tetric EvoFlow® Bulk Fill). Because they can be placed in a single increment or layer of up to 4 mm, then fully cured, they help eliminate time consuming techniques.

### Case presentation

A 51-year-old male patient presented with multiple failing amalgam restorations (teeth 14 through 17) that exhibited marginal leakage and required replacement (Fig. 1). Rubber dam isolation was established. The existing amalgam restorations and any decay was removed using a carbide bur and the preparations were refined using a diamond bur. Following this, the preparations were cleaned and disinfected with 2 % chlorhexidine gluconate antibacterial scrub.

First, tooth 17 was restored. A segmented matrix set-up with two 3D-XR rings (Garrison Dental Solutions) and 5.5-mm Slick Band was placed to facilitate predictable and ideal interproximal contacts. The preparation enamel was selectively



Fig. 3: Adhese Universal adhesive was applied to the preparation for tooth 15. Due to hygienic reasons, the manufacturer recommends using the VivaPen Protective Sleeve for intraoral application.

acid-etched with 37 % phosphoric acid for 20 seconds. After a universal adhesive (Adhese Universal) had been applied and light-cured, a layer of Tetric EvoFlow Bulk Fill in shade <sup>IV</sup>W was placed, then light-cured for 10 seconds. The cured Tetric EvoFlow Bulk Fill layer exhibited dentin opacity (Fig. 2). The restoration for tooth 17 was completed with a capping layer using Tetric EvoCeram Bulk Fill, which was smoothed with a modelling instrument designed for composite materials and light-cured for 10 seconds. Next, the restoration was contoured using a fine diamond and polished using discs and points. The cavity of tooth 14 was also conditioned with universal adhesive (Fig. 3). Then a single increment of Tetric EvoCeram Bulk Fill composite in shade <sup>IV</sup>A was placed (Fig. 4) and free-hand contoured utilizing a thin, long-bladed composite instrument (Fig. 5). The composite was then cured for 10 seconds, after which it was contoured using a fine diamond (Komet Brasseler, no. 8368-016) (Fig. 6). Initial post-curing polishing of the restorations was completed using a silicon dioxide disc (3M Soflex), followed by polishing with a Brownie point (Komet Brasseler). Interproximal areas were polished using a finishing strip (Epitex Medium, GC America) (Fig. 7).

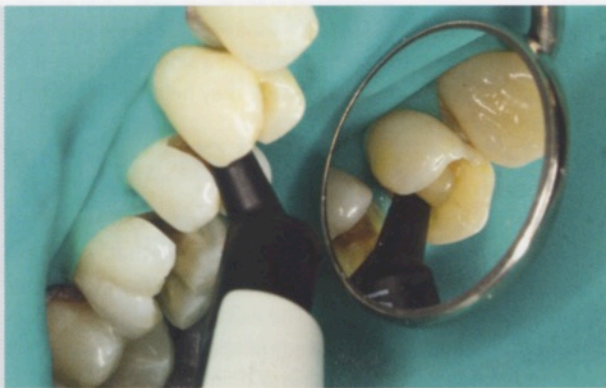


Fig. 4: A single increment of Tetric EvoCeram Bulk Fill composite was placed in the tooth 14 preparation...



Fig. 5: ...and free-hand contoured utilizing a thin, long-bladed instrument.



Fig. 6: Post-cure contouring of the restoration was completed using a fine diamond.



Fig. 7: Interproximal polishing was completed using a finishing strip.



Fig. 8: The preparation enamel in tooth 16 was selectively acid-etched.



Fig. 9: An initial layer of Tetric EvoFlow Bulk Fill was placed into the cavity.



Fig. 10: Finishing of the tooth 15 restoration



Fig. 11: Polishing of all restorations in the quadrant using a silicone brush and diamond paste



Fig. 12:  
The occlusion  
was checked  
after occlusal  
adjustments  
had been made.



Fig. 13:  
Postoperative  
view of the  
completed  
composite  
restorations

Then restoration of tooth 16 began by placing a segmented matrix set-up with two 3D-XR rings and 5.5-mm Slick Band, after which the preparation enamel was selectively acid-etched (Fig. 8). A layer of Tetric EvoFlow Bulk Fill in shade <sup>IV</sup>W was placed up to the proximal box and to the pulpal floor and then light-cured for 10 seconds (Fig. 9). Then Tetric EvoCeram Bulk Fill composite in shade <sup>IV</sup>A was extruded into the preparation as the second layer. The restoration was contoured using a fine diamond and polished using discs and points. Restoration of the quadrant continued by conditioning the tooth 15 preparation. Also for this restoration, Tetric EvoFlow Bulk Fill in shade <sup>IV</sup>W was applied as the initial composite layer and supplemented with Tetric EvoCeram Bulk Fill composite as the capping layer. After light-curing, the restoration was finished and polished using a carbide finishing bur (no. 7408-023, Komet Brasseler) (Fig. 10).

Polishing of all restorations in the quadrant was completed with a silicone brush and diamond paste (Fig. 11). After removing the rubber dam, the occlusion was checked (Accufilm Red/Black, Parkell) (Fig. 12).

### Conclusion

The combination of selective etching using a universal adhesive and placing bulk-fill composite facilitates restoring various teeth in the posterior region. This method allows virtually invisible restorations to be achieved that are indistinguishable from surrounding dentition (Fig. 13). As Tetric EvoFlow Bulk Fill changes its translucency during polymerization and obtains

a dentin-like opacity, the natural translucency of teeth can be more easily mimicked and small stains are even masked. The restorations are also permanently stable and esthetic, yet completed in less chair time, which makes practices more efficient and saves patients time and money. Because the conventional technique-sensitive procedures associated with adhesive direct composite restorations are eliminated, so are the potential complications.



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