

Efficiency and esthetics in the posterior region with bulk-fill composites: Current trends and future options

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Since bulk-fill composites have been on the market for a number of years, the time has come to take a look back at the introduction, development, current trends and future options of these materials.

When bulk-fill composites first hit the market, they were considered a true innovation. We had been layering posterior composites for more than 40 years, yet many of us were not quite sure for what reasons the layering technique was mandatory. Understanding the reasons why a certain technique is applied is crucial for the correct assessment of the pros and cons of any technique.

Basically, there were four reasons:

1. Esthetics: It is obvious that a layering technique involving dentin, enamel and effect shades leads to a better final outcome than a technique that uses only a single layer in a standard translucency. As regards the bulk-fill technique, this reason can easily be rejected because, objectively, most posterior restorations are almost always placed using one shade only and most patients are satisfied with the result.

2. Reduction of volumetric shrinkage: The less composite we place, the smaller the volumetric shrinkage.

3. Reduction of shrinkage stress: This reason makes sense and is based on the configuration factor. It is said that the shrinkage stress is reduced if the unbonded surface area of a layer is larger than the bonded surface area. Although there is enough in-vitro evidence on the relevance of the C-factor, a clinical correlation has not yet been shown. This point can be easily illustrated by the fact that Class-I restorations have an unfavourable C-factor but a high survival rate while Class-V restorations have a favourable C-factor but a low survival rate. This example shows that the C-factor is only one of many factors that determine the success of a direct restoration - and frequently not the most important one.

4. Depth of cure: This is probably the most important factor because increments of only 2 mm could be applied before the advent of bulk-fill composites. Some studies suggest that the depth of cure of certain composites is even lower than 2 mm. This was the reason why all layers were restricted to a maximum thickness of 2 mm. If not, the composite material placed in the deeper areas of the cavity would never receive enough light to cure adequately. Having discussed all these factors, we may realize that we are not so far from the bulkfill technique. If a composite is capable of reducing the stress when applied in thick layers and, at the same time, offers an increased level of translucency and a more effective light-curing process, the bulk-fill technique is feasible. In most cases, shrinkage stress relievers are responsible for the reduction of shrinkage stress. Shrinkage stress relievers are fillers with a lower modulus of elasticity.

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Figure 1: Pre-op situation.



Figure 2: Enamel etching with Total Etch.



Figure 3: Application of Adhese Universal with the VivaPen.

Their function is to release the stress as the composite polymerizes. The second aspect, i.e. the depth of cure, was achieved by making the composites more translucent with the effect of enhancing the passage of light through the material. As a result, the depth of cure was increased. This point has also been proven to be true. In addition, some manufacturers improved the polymerization process in deeper areas by adding newly developed initiators (e.g. Ivocerin® Ivoclar Vivadent, Liechtenstein) to the formulation.

Nowadays, all major dental manufacturers offer bulk-fill composites. Bulk-fill composites can basically be categorized into two main groups: first, flowable bulk-fill composites requiring a final capping layer and, second, sculptable bulk-fill composites. Generally, these materials increase the efficiency of the restorative workflow as they allow the fillings to be placed with either a single-increment technique (sculptable composite) or a two-increment technique (dentin replacement with flowable composite and capping layer with sculptable composite). These methods are obviously faster and easier to perform than conventional layering procedures. However, this advantage is undermined by the fact that bulk-fill materials are generally too translucent and allow discolourations to shine through the restorations,

especially if they are used to replace an amalgam filling. Nevertheless, clinical evidence has shown that the results achieved with the new bulk-fill methods are comparable to the results achieved with conventional multi-layer techniques.

Fortunately, new developments often pave the way for new technologies. By this I mean the Aessencio technology developed by Ivoclar Vivadent, Liechtenstein. The Aessencio technology allows a composite to be highly translucent prior to being light-cured and causes a drop in translucency as it polymerizes. Once polymerized, the material exhibits a dentin-like translucency and is capable of effectively masking most discolourations. Practitioners can follow a very efficient procedure to accomplish fillings due to the Aessencio technology of Tetric EvoFlow® Bulk Fill and the combination with Tetric EvoCeram® Bulk Fill as the final capping layer. Two steps will be enough in most clinical situations. At the same time, patients will receive a sufficiently esthetic restoration. In addition, the entire adhesive restorative protocol has become more predictable with the recent introduction of universal adhesives, as they have eliminated the need for dentin etching. Dentin etching was one of the reasons for the variability and sensitivity of the adhesive technique in the past years. A recently published meta-analysis showed the importance of predictable clinical protocols as the correlation between in-vitro tests and clinical performance is poor. Furthermore, there is growing evidence in clinical trials and elsewhere that self-etch protocols show a favourable performance. The clinical case below demonstrates how these materials are used.

Clinical case

A 33-year-old patient presented with a failing amalgam restoration on the upper right 4 with no interproximal contact (Fig. 1). After the amalgam filling had been removed and a rubber dam placed (OptraDam®), a matrix, wedge and ring were inserted (V4 Triodent). The enamel was etched with



Figure 4: Tetric EvoFlow Bulk Fill was applied.



Figure 5: Tetric EvoFlow Bulk Fill before light-curing. The high translucency facilitates the penetration of light.

phosphoric acid (Total Etch) and then rinsed with water (Fig. 2). Subsequently, the adhesive (Adhese® Universal) was applied with the help of the new VivaPen delivery form and carefully scrubbed into the tooth structure of the entire cavity for 20 s (Fig. 3). Next, the solvent was evaporated until a shiny immobile film resulted. Then, the material was lightcured using a Bluephase® Style third-generation curing light.

Tetric EvoFlow Bulk Fill was applied to the proximal box and cavity floor (Fig. 4). Initially, the material was as translucent as most other flowable bulk-fill materials. This translucency makes it difficult to mask discolourations (Fig. 5).

Figure 6 shows how the translucency altered in the course of the curing process and the material started to mask the discolourations underneath it. Then, a final composite layer of Tetric EvoCeram Bulk Fill was applied. Excess composite was carefully removed and the filling contoured to an

adequate anatomical shape prior to undergoing final polymerization (Fig. 7). This was all accomplished in a single step, as most of the cavity had already been filled before with Tetric EvoFlow Bulk Fill. After final curing, the restoration was polished with OpraPol. Then, Fluor Protector S was applied. The completed restoration rather closely resembles the natural tooth structure. It is virtually impossible to detect the margins from the occlusal and frontal view (Fig. 8). The X-rays show the excellent radiopaque properties of both materials, i.e. the flowable and sculptable variant (Figs 9a and b).

Conclusion

To sum up, the “bulk-fill technique” using Tetric EvoFlow Bulk Fill and Tetric EvoCeram Bulk Fill allows us to be more efficient with almost no compromises compared to the



Figure 6: Once cured, Tetric EvoFlow Bulk Fill exhibits a dentin-like translucency, masking discolourations.



Figure 7: Tetric EvoCeram Bulk Fill was applied as a final layer. All excess was removed before curing.



Figure 8: Completed restoration after 1 week. Occlusal view.

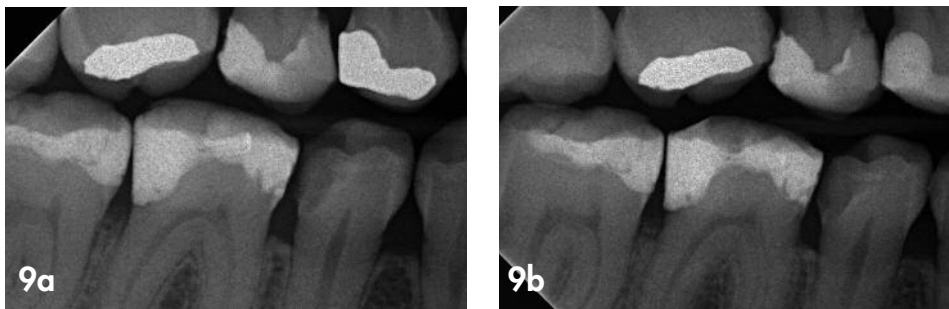


Figure 9a and b: X-ray images before and after the restoration. Both the flowable and sculptable variants offer adequate radiopaque properties.

conventional layering technique. The C-factor is no longer an issue due to the shrinkage stress relievers. As expected, marginal gaps do not occur more frequently and are not larger compared to the conventional layering technique. Application is clearly quicker and the esthetic effect is in most cases similar to that of conventional composites. The

differences in the translucency of materials for conventional posterior composite restorations are no longer of relevance due to the Aessencio technology. This sets a new standard in this group of composite.

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