Esthetic rehabilitation of posterior teeth using Bulk-Fill Composite

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In modern restorative dentistry, a strong emphasis is placed on preserving healthy tooth structure and achieving esthetic results. The use of direct composite restoratives can assist in meeting these demands.

Composite resins have become widely accepted in dentistry as direct placement restorative materials for posterior teeth. The advances made in adhesive technology as well as the improvement of the mechanical properties of composite resins (e.g., wear resistance) have contributed to this development. Nevertheless, the polymerization shrinkage and limited curing depth of composite resins continue to be a concern to the clinician. Polymerization shrinkage of composite restoratives has been associated with micro-leakage, de-bonding of the restoration as well as increased risk of secondary caries or postoperative sensitivity. To reduce the rate of polymerization shrinkage, incremental filling techniques have been recommended for many years. The reduced shrinkage per composite layer is believed to minimize the total volumetric shrinkage [1].

Even though incremental layering may be necessary to ensure adequate polymerization of the composite resin, there are also some disadvantages to this technique. For example, air entrapment between the different layers may occur. Moreover, the fact that incremental placement requires considerable time may render the restorative procedure excessively long. The controversy among researchers and practitioners with regard to the appropriate placement technique, namely, incremental layering versus bulk placement, continues to persist.

In recent years, dental manufacturers have gone to considerable lengths to develop bulk-fill composites that demonstrate lower shrinkage stress during polymerization and offer much greater depths of cure. The goal behind these efforts has been to shorten the duration of the restorative procedure [2]. In the meantime, several posterior composites of this type have been launched on the market. What dentists need now is some sort of guideline for their application in concrete clinical situations.

Advantages and limitations of direct composite resin restorations

A major advantage of adhesive composite restorations in posterior teeth is the possibility of preserving healthy tooth structure. Unlike indirect procedures, the direct restorative technique with composite resins requires only minimal removal of sound tooth structure. Preparation to gain access to the lesion is normally limited to the affected area. Nevertheless, the shape of the cavity generated is dependent on a combination of the material properties and characteristics of the prepared cavity. Contributing factors include the confinement conditions imposed on the composite, the volume of the restoration, the restorative technique of each increment because of the reduced attenuation of light through the smaller increments of material and better adaptation of the composite to the cavity walls [4]. Nevertheless, the value of incremental placement in reducing shrinkage stress has been repeatedly questioned [5]. The contradictory conclusions at which studies have arrived might be due to differing testing methods.

Apart from low residual stress and good adaptation, thorough polymerization of the composite resin is an important factor for restorative success. The main concern about the bulk-filling technique is whether the composite cures sufficiently in the deeper portions, as this is a prerequisite for any filling with acceptable physical and biological properties.

Recently, several so-called low-shrinkage stress materials have been launched on the market. The majority of them are more translucent than conventional composites. They feature a modified initiator system which allows incremental filling in increments of up to 4 mm thickness (bulk-filling technique), but still ensures a reliable cure with short irradiation times. Bulk-fill materials have been reported to demonstrate significantly less shrinkage stress than conventional posterior composite resins [6].

Composite restoratives suitable for the bulk-filling technique need to fulfill certain requirements. Among other things, they should demonstrate low polymerization shrinkage and ensure a high depth of cure.

Trouble-free restoration

In the restoration of teeth with composite resin, incremental layering is generally preferred because it reduces gap formation at the adhesive interface and the postoperative sensitivities associated with it. However, multiple layers of high viscosity composite may be difficult to place. Recent studies have suggested that fewer increments and even bulk filling can be equally successful. Moreover, the unavailability of suitable bulk-fill materials has discouraged clinicians from employing such techniques [7]. Today, various dental manufacturers have expanded their offering to include low-shrinkage composites, allowing clinicians to achieve reliable and predictable results with the bulk-filling technique.

Bulk-fill composites should offer high depth of cure. This is
achieved by means of the photoinitiator Ivocerin® for example, which is employed by Ivoclar Vivadent. Good mechanical properties such as high flexural strength are increasingly important, also important in order to make a composite resin suitable for use in occlusion bearing areas [8].

Tetric N-Ceram Bulk Fill from Ivoclar Vivadent combines all of these qualities. This light-curing posterior composite has been specifically developed for the bulk-filling technique. Increments of up to 4 mm thickness can be cured in only 10 seconds at a light intensity of > 1,000mW/cm². Tetric N-Ceram Bulk Fill contains four different types of fillers: a barium aluminium silicate filler, yttrium trifluoride and mixed oxide. Additionally, a prepolymer filler (a shrinkage stress reliever) has been incorporated. This keeps polymerization shrinkage and shrinkage stress to a minimum (Figs 1 and 2). This prevents incorrect colour matching due to dehydration. After the carious tissue has been removed (Figs 5 and 4) and the adhesive has been applied (Fig. 5), the entire restoration procedure can be performed with Tetric N-Ceram Bulk Fill. As a consequence, a uniform restoration with high mechanical and esthetic strength is achieved. Because of the material’s natural-looking translucency, the shade of the restored site will blend in with the remaining tooth structure. If stained sub- stance is visible within the cavity, the clinician may opt to place a layer of Tetric® N-Flow Dentin first. This material has a higher opacity and is thus capable of masking the darker colour of the underlying dentin.

Although the incremental tech- nique has been advocated for the reduction of shrinkage stress, the composite resin described above is an ideal option for the restoration of deeper cavities using the bulk-filling technique. The successive build-up tech- nique makes it possible to en- sure correct occlusal morphol- ogy through the incremental placement of composite. Thin- bladed placement instruments and special brushes are used to sculpt and contour the restored site. The composite is applied in bulk increments to rebuild each anato- mic entity of the affected area. Each cuspal part is recon- structed with one increment of composite resin, imparting to each of the cusps its adequate anatomical form.

The size and location of the cav- ity determines the number of increments needed. Relatively small Class I cavities can be filled with a single bulk incre- ment. Medium-sized and large cavities are restored with several increments of composite resin each with an increment of maximum 4 mm thickness.

Anatomical features of the oc- clusal surface should be taken into consideration during the ap- plication of the composite resin to mimic the natural tooth struc- ture. Insensitivitiy to light is a considerable advantage of Tetric N-Ceram Bulk Fill as a time-saving process that sufficient time is available to shape and contour the resto- ration (Figs 6 to 8). If the composite resin is carefully placed using suitable instru- ments, only little time is required for the contouring and finishing of the restoration. Hand instru- ments such as LM Arte-Eccesia (LM Dental) are recommended for the removal of composite ex- cess. Marginal overhangs can be removed with carbide burs (Fig. 10). Composite finders are then used to refine the anatomical features. Polishing can be accom- plished with ease and in one step using Astrobrush® (Fig. 11). The result is an esthetic posterior restoration without postoperative sensitivity (Figs 12 and 15).

Conclusion
Direct composite resin resto- rations can be performed in a predictable and efficient way if the appropriate technique and advanced materials are used. As the understanding of the charac- teristics of new filling materials improves among clinicians, the quality of the direct restorations fabricated will also increase.

Tetric N-Ceram Bulk Fill with its many innovative features enables clinicians to restore posterior teeth in a much more efficient way. Proper attention to technological advances in the field of restorative therapy allows esthetic treatment to be provided that will satisfy not only the patient but also the dentist performing the restorative procedure.

Full list of references is avail- able from the publisher.