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, debonding of the restoration as well as in increased risk of secondary caries and postoperative sensitivity. To reduce the rate of polymerization shrinkage stress during polymerization and offer much greater depth of cure, several posterior composites of this type have been launched on the market. What clinicians need is not always necessary because adhesive composite resin restorations may contribute to the stabilization of the remaining tooth structure. As a result of the shrinkage stress that occurs during the light-curing of composite resin, there are restrictions with regard to the placement technique employed. Studies have shown that the magnitude of the stress generated is dependent on a combination of the material properties and characteristics of the prepared cavity. Contributions to the clinician's bonding substrate.

Recently, several so-called low-shrinkage stress materials have been launched on the market. The majority of them are more concentrated than conventional composites. They feature a modified initiator system which allows them to be cured in increments of up to 4 mm thickness. Bulk-fill composites have been reported to demonstrate significantly less shrinkage stress than conventional posterior composite resin [8].

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.

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.

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 placement procedure excessive.

Fig. 1 and 2. SEM of the filler composition and surface structure of Tetric V Ceram Bulk Fill (magnification: 200x).

Advantages and limitations of direct composite resin restorations

A major advantage of adhesive composite restorations is that the possibility of preserving healthy tooth structure. Unlike indirect procedures, the direct restorative technique with composite 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 should be adjusted to match the restorative material. Elimation of slightly undermined enamel is not always necessary because adhesive composite resin restorations may contribute to the stabilization of the remaining tooth structure.

Figs 3 to 8. The anatomical features of the cusps are successively rebuilt until an ideal occlusal anatomy is achieved.

Methods of lowering the shrinkage stress

Polymerizing low-volume increments may minimize the resulting shrinkage stress and maximize double bond conversion of the monomers to a polymer. Compared with bulk-filling techniques, incremental filling produces lower shrinkage stress (up to a certain thickness of the composite layer). Incremental placement techniques have the advantage of maximizing the polymerization 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.

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-visibility composite may be difficult to place. Recent studies have suggested that fewer increments and even bulk filling can be equally successful. However, the unavailability of suitable bulk-fill composite 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.
achieved by means of the photo-initiator Ivocerin® for example, which is employed by Ivoclad Vivadent. Good mechanical properties such as high flexural strength and impact resistance are 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 into the composite resin less sensitive to ambient light and thus gives the clinician more time to apply and contour the restoration. Another useful quality of this material is its good polishability, which strengthens the achievement of a glossy surface, excellent resistance to wear in the contact area and a high flexural strength of 120 MPa. Moreover, Tetric N-Ceram Bulk Fill is highly radiopaque; therefore, the restoration result is easy to examine on dental radiographs.

A clinical case

The shade of the composite to be used should always be selected at the start of the appointment, i.e. before the rubber dam is placed. This prevents incorrect colour matching due to dehydration. After the carious tissue has been removed (Figs 3 and 4) and the adhesive has been applied (Fig. 5), the entire restorative procedure is then performed with Tetric N-Ceram Bulk Fill. As a consequence, a uniform restoration can be achieved. This increases the longevity of the restoration.

Because of the material’s natural-looking translucency, the shade of the restored site will blend in with the remaining tooth structure. If stained substructure 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 technique has been advocated for the reduction of shrinkage stress, the composite resin described above is an ideal option for the restoration of deep cavities using the bulk-filling technique. The successive build-up technique makes it possible to ensure correct occlusal morphology 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 anatomic entity of the affected area. Each cuspal portion is reconstructed with one increment of composite resin, imparting to each of the cusps its adequate anatomical form.

The size and location of the cavities to be restored determine the number of increments needed. Relatively small Class I cavities can be filled with a single increment of composite resin. Medium-sized and large cavities are restored with several incremental layers of filling is re-built with an increment of maximum 4 mm thickness.

Anatomical features of the occlusal surface should be taken into consideration during the application of the composite resin to mimic the natural tooth structure. Insensitiveness to light is a considerable advantage of Tetric N-Ceram Bulk Fill, which ensures that sufficient time is available to shape and contour the restoration (Figs 6 to 8).

If the composite resin is carefully placed using suitable instruments, only little time is required for the contouring and finishing of the restoration. Hand instruments such as LM Arte-Eccessa (LM Dental) are recommended for the removal of composite excess. Marginal overhangs can be removed with carbide burs (Fig. 10). Composite fillers are then used to refine the anatomical features. Polishing can be accomplished with ease and in one step using Astrobrush® (Fig. 11). The result is an esthetic posterior restoration without postoperative sensitivity (Figs 12 and 13).

Conclusion

The composite resin restorations can be performed in a predictable and efficient way if the appropriate technique and advanced materials are used. As the understanding of the characteristics of new filling materials improves among clinicians, the quality of the direct restorations they fabricate 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 available from the publisher.

Cad Cam Technology: A Review

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CAD CAM technology and materials are currently used in a number of clinical applications, including the fabrication of indirect restorations. CAD-CAM gives both the dentist and the laboratory an opportunity to automate fixed restoration fabrication. Both chairside and laboratory-based technologies are available. The properties of these restorative material – silts and their indications and appropriate use must be understood in order to enable the achievement of predictable and esthetic results for patients.

KEYWORDS:

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Intraoral scanner

Digital impression

Introduction

In the past decade, the demand for all-ceramic restorations has increased in both anterior and posterior teeth and the search for materials with improved properties has expanded. The need for a uniform material quality, reduction in production cost, and standardization of manufacturing process has encouraged researchers to seek to automate the manual process via the use of CAD-CAM technology since 1980.

Computer-aided design (CAD) and computer aided manufacturing (CAM) technology systems use computers to collect information and design, and to manufacture a wide range of products. The introduction of this first digital intraoral scanner for restorative dentistry was in the 1980s by a Swiss dentist, Dr. Werner Mörmann, and an Italian electrical engineer, Marco Brandestini, that developed the concept for what was to be introduced in 1987 as CEREC® by Sirona Dental Systems LLC (Charlottesville, VA), the first commercially CAD-CAM system for dental restorations. Ever since research and development sectors at a lot of companies have improved the technologies and created in-office intraoral scanners.

All the existing intraoral scanners try to face with problems and disadvantages of tradition - al impression fabrication process and are driven by several non-contact optical technologies and principles.

The purpose of this present publication is to provide an extensive review on the CAD-CAM technology and to emphasize on the application of this technology in restorative dentistry.

CAD –CAM techniques

The major goals of the impression – taking process in restorative dentistry are obtaining a copy of one or several prepared teeth, healthy adjacent and antagonistic teeth, establishing a proper interocclusal relation ship and then converting this information into accurate repro- licas of the dentition on which indirect restorations can be performed.

Traditional restorative tech niques for fixed restorations require the use of impression materials to record the contours and dimensions of the preparation. This is followed by the pouring of stone models and dies prior to laboratory fabrication of the definitive fixed restoration. Taking an accurate impression is one of the most difficult procedures in dentistry, requiring careful retraction or removal of soft tissue around preparation margins, hemosta sis, and selection of an appro priate impression material and tray for the technique used.

By using a CAD/CAM restor ative technique, a number of steps can be simplified or eliminated. Digital systems now offer the opportunity to avoid tradi tional, analog impressions, in cluding the usual impression materials, time, and handling limitations associated with them. Intraoral scanners have the potential to offer excellent accuracy with a more comfort able experience for the patient and more efficient workflow for the office. But care must be taken to ensure that the whole preparation is scanned, to avoid introducing errors.

Two techniques can be used for CAD-CAM: The chairside technique or the integrated chairside-laboratory procedure.