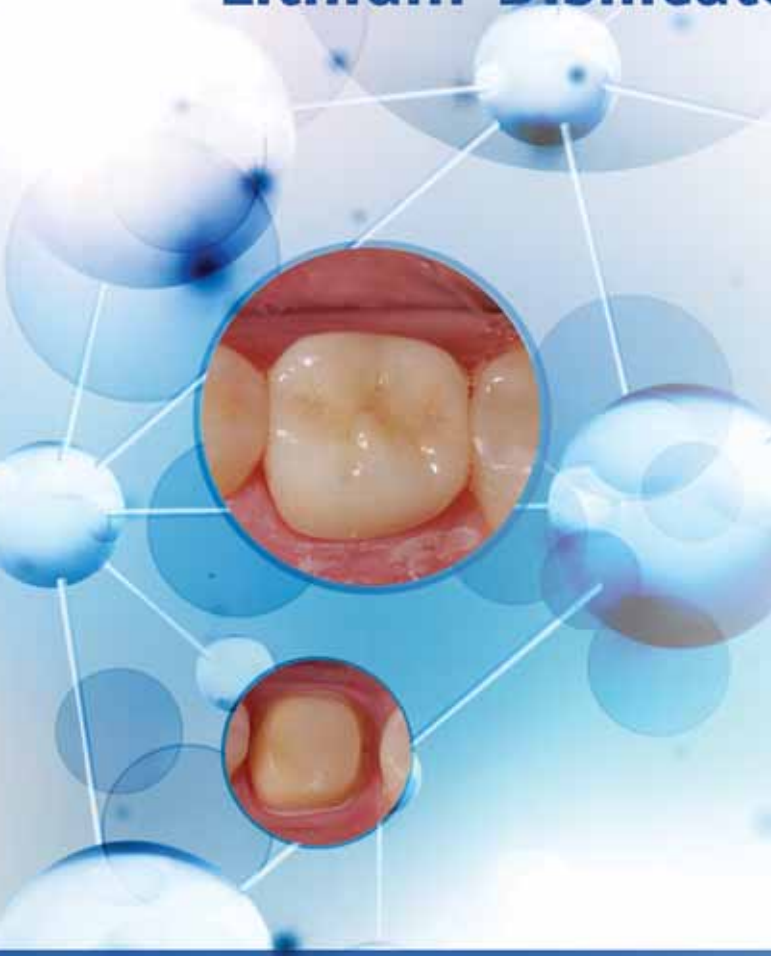
Using Bulk-Fill Composite for a Core Build-up Under a Lithium-Disilicate Crown Restoration



by Amanda Seay, DDS

Learning Objectives

- Discuss the selection of a core build-up material for crown placement therapy.
- Explain the step-by-step procedure for completing a core buildup, crown preparation and a direct composite restoration in the same visit.
- Learn the pros and cons of available core build-up materials.

Abstract

Historically, materials available for a core buildup prior to crown placement have possessed both advantages and disadvantages. In some cases, as with glass ionomer, the number of disadvantages is equivalent to its benefits, and although amalgam has been relied upon for years as a core build-up material, research indicates that its drawbacks are outweighed by its assets.[5-8] As a solution, composite resins are becoming a popular choice as a core build-up material for endodontically treated teeth. This article demonstrates the use of a bulk-fill composite resin and how its many advantages allow the clinician to complete two different types of procedures in one visit.

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Introduction

When patients present with severely compromised teeth due to decay, large damaged or failing restorations, or fracture, extensive treatment might be required particularly if the problem has been further complicated by pulpal necrosis. In such cases it is necessary to rebuild missing tooth structure resulting from decay and root canal therapy. Such treatment can include endodontic therapy followed by a core buildup, and finalized with the placement of an all-ceramic crown. However, clinicians must first evaluate whether there is enough tooth structure remaining to support a crown by core buildup or whether an endodontically retained post and core procedure is required to anchor the core structure to the root.[1] In the past, the cast post and core was standard procedure when endodontic therapy was required. Studies have indicated, however, that excessive removal of sound tooth structure and root fracture caused by the procedure unnecessarily weakens the tooth.[2-4] Today, least invasive treatments are the procedures of choice. Conservative removal of healthy tooth structure results in remaining structural support requiring only a composite resin to rebuild the core.[2] Proper core buildup is essential to provide a foundation to create appropriate retention and resistance form in the crown preparation, as well as to recreate the shape of the original tooth from which to design the final full-coverage crown. When facing a restorative procedure of this type, a combination of different materials and techniques are often required to meet functional and aesthetic requirements.

Core Build-up Materials

Material choices for core buildups have included glass ionomer, amalgam and composite materials.[1] For core preparation following endodontic treatment, glass ionomer materials have demonstrated advantages such as low post-operative sensitivity, bonding ability and fluoride release, contributing to their wide use. However, when compared to modern composite materials, their advantages are minimized due to inferior physical properties, prolonged chemical curing reaction and poor manipulation.[5]

Over the years, amalgam has been a strong and heavily relied upon restorative material. However, it too comes with drawbacks. Concerns have been raised regarding its high modulus of elasticity. Amalgam has proven three-times more rigid than composites[6] and therefore might be a contraindication as build-up material under all-ceramic crowns.[2,3] When used with metal or metal-based crowns, invasive preparations such as grooves, slots or undercuts are necessary to ensure a successful restoration. Sometimes pins are needed to anchor the amalgam, which can cause cracks and iatrogenic infiltration into pulpal areas.[7] Also, when used under translucent ceramic materials, the silver color of amalgam might show through, negatively affecting the overall aesthetics of the permanent crown restoration.[1] Finally, depending on its composition, amalgam can take up to 24 hours to set, eliminating it as a viable material choice for same-day restorations.[1]

The treatment becomes twice as challenging when it involves a core buildup and the placement of a crown beside a tooth requiring a direct composite restoration. In such cases, the clinician is faced with several different viscosities, shades and materials from which to choose to achieve a natural looking and durable restoration. As a resolution to such challenges, composite resins have become popular as a core build-up material for endodontically treated teeth.

Composite Core Materials

Composite resin provides many advantages over glass ionomer and amalgam as a core material.[1] Eliminating the need for cuts, grooves or pins, composite resin allows for less invasive and more conservative tooth preparation when utilized with a self-etch or total-etch adhesive due to its ability to bond to enamel and dentin with greater strength than glass ionomer.[1,8] Due to its color properties and wide range of available shades, composite can be used under translucent ceramics with no adverse affects on aesthetics, contrary to amalgam.[1] While amalgam fills the space in the tooth, that is essentially all it does. Composite, on the other hand, restores the tooth structure, providing a stronger foundation for crowns.

Advantages of Composite as a Core Material

- Eliminates the need for cuts, grooves or pins
- Less invasive, more conservative tooth preparation
- Bonds to enamel and dentin with greater strength
- Available in a wide range of shades
- Provides no adverse affects on aesthetics
- Restores the tooth structure
- Provides a stronger foundation for crowns

1. *Blank, JT. Restoring severely compromised teeth with a core build-up. The advantages of using a direct, light-cured only composite core material. Inside Dentistry. November/December 2010; 6(10):108-112.*
2. *Margeas, RC. Using an auto-dispensed composite core build-up material. Inside Dentistry. November/December 2005; 1(2).*
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4. *Raygot CG, Chai J, Jameson DL. Fracture resistance and primary failure mode of endodontically treated teeth restored with a carbon fiber-reinforced resin post system in vitro. Int J Prosthodont. 2001;14(2):141-5.*
5. *Cohen BI, Pagnillo MK, Deutsch AS, et al. Fracture strengths of three core restorative materials supported with or without a prefabricated split-shank post. J Prosthet Dent. 1997; 78(6): 560-565.*
6. *Bryant RW, Mahler DB. Modulus of elasticity in bending of composites and amalgams.J Prosthet Dent. 1986 Aug;56(2):243-8.*
7. *Imbery TA, Swigert R, Richman B, et al. Resistance of composite and amalgam core foundations retained with and without pins and bonding agents. Gen Dent. 2010; 58(2):130-137.*
8. *Bishara SE, Gordan VV, VonWald L, et al. Shear bond strength of composite, glass ionomer, and acidic primer adhesive systems. Am J Orthod Dentofacial Orthop. 1999;115(1):24-28.*

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Formulated for light curing in up to 2mm increments, conventional composites are not applicable for larger restorations for which a bulk placement would be ideal, for instance, the type of preparation resulting from root canal therapy. The material also contains a patented "polymerization booster." This newly developed photo initiator is added to the material in conjunction with today's traditional photo initiators. The "booster" is much more reactive to curing light than the standard initiators. This allows the composite to achieve a 4mm depth of cure without compromising aesthetics or working time, like some bulk fill composites. The following case requires a material for a core buildup following endodontic therapy, as well as a material for a direct posterior restoration. The ideal material for both indications is a bulk-fill that demonstrates efficient dispensing and curing, durability, sculptability and excellent aesthetics. In this particular case, Ivoclar Vivadent's Tetric EvoCeram Bulk Fill composite in shade IVA was selected to complete both the crown buildup and the direct composite restoration. Specifically designed for efficient and effective direct posterior restorations, Tetric EvoCeram Bulk Fill can be placed and cured in bulk increments of up to 4mm without compromising marginal adaptation.[9] Its unique consistency allows the material to intimately adapt to preparation walls and remains sculptable and moldable until cured. Its availability in three universal shades ensures natural blending with surrounding dentition and is ideal for use as a core build-up material under ceramic crowns. Chosen for its strength, aesthetics and ease of use, this bulk-fill composite demonstrates a high compressive strength and fracture resistance, along with low polymerization shrinkage stress.[9] Due to its unique initiator system and ability to cure in up to 4mm increments in only 10 seconds,[9] the technique sensitivity associated with conventional composites is eliminated along with the need for multiple materials. Therefore, the time required to complete a restoration is significantly reduced making it more efficient for the patient and the clinician.

Case Presentation

A 38-year-old male presented with a carious lesion requiring endodontic therapy, core buildup and placement of a crown on

9. *Tetric EvoCeram Bulk Fill: Efficient restoration of posterior teeth. Schaan, Liechtenstein: Ivoclar Vivadent; 21 March 2011.*

Fig. 1: Pre-operative view of patient's teeth showing tooth #19 IRM placed following root canal therapy and tooth #18 occlusal amalgam with mesial decay.

Fig. 2: A non-latex rubber dam was placed and teeth #17-20 were isolated.

Fig. 5: A bonding agent was applied, air thinned, and LED light cured for 10 seconds.

Fig. 6: Tooth #18 was filled using Tetric EvoCeram Bulk Fill shade IVA and shaped to proper anatomical contour.

tooth #19 (Fig. 1). In addition, the patient requested the replacement of an existing amalgam restoration on tooth #18. The patient agreed to treatment in two phases. During the first phase, root canal therapy was performed on tooth #19 by an endodontist. The patient returned for phase two, which consisted of restorative treatment for tooth #18 and #19.

The patient was anesthetized with a 2% lidocaine block and a non-latex rubber dam was placed, leaving teeth #17–#20 exposed (Fig. 2). The existing amalgam and temporary material placed by the endodontist after root canal therapy was removed using a #330 bur (SS White Burs, Inc., Lakewood, New Jersey). A round #4 bur (SS White Burs, Inc.) was then used to remove any sharp angles around the cavosurface margin (Fig. 3).

A tofflemire band was placed on tooth #18 prior to the application of a 35% phosphoric acid etch (Total Etch, Ivoclar Vivadent, Amherst, New York), which was agitated for 15 seconds, thoroughly rinsed, then blot dried (Fig. 4). Using a fourth-generation, two-step bonding system, the primer was agitated into the dentin for 10 seconds, then dried to evaporate the remaining alcohol solvent. The adhesive was then applied onto the enamel and dentin, air thinned, then cured for 10 seconds using an LED curing light (bluephase, Ivoclar Vivadent) (Fig. 5).

Before dispensing the composite into the tooth preparation, the depth of the preparation was assessed to determine the appropriate amount of composite material required. This can be done using a perio-probe or with the length of the bur during tooth preparation. In this case, the preparation on tooth #18 measured approximately 2mm in depth on the occlusal surface and 4mm in depth on the interproximal box using perio-probe. Since the bulk-fill composite (Tetric EvoCeram Bulk Fill) chosen for this case will cure in up to 4mm increments, only a single layer was required. Bulk-fill composite in shade IVA was injected directly into the tooth preparation and condensed to ensure intimate adaptation. Once the material was placed, a gold posterior occlusal sculpting instrument (Cosmedent, Chicago, Illinois) was used to perform anatomical detailing and to smooth the composite into the margins to eliminate the possibility of voids. After light curing for 10 seconds, the tofflemire band was removed and the restoration was

Fig. 3: The amalgams were initially removed and the decay excavated using a #330 bur.

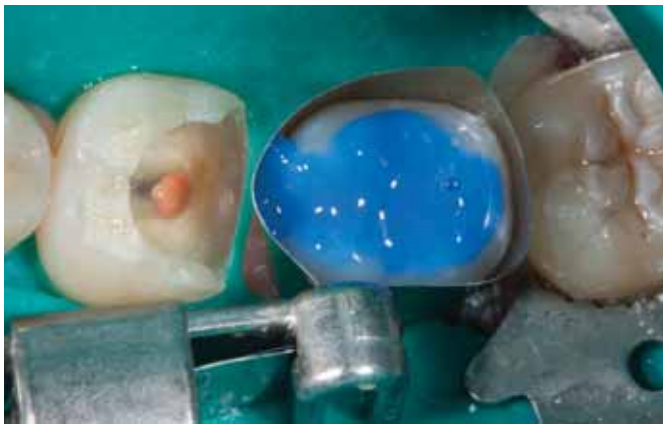

Fig. 4: A tofflemire band was placed on #18 and etched with 35% phosphoric acid for 15 seconds.

Fig. 7: A tofflemire was placed on #19 and the tooth was etched with a 35% phosphoric acid for 15 seconds.

Fig. 8: Tooth #19 was filled with Tetric EvoCeram Bulk Fill and LED light cured for 10 seconds.

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light cured again to ensure a complete cure in the interproximal region (Fig. 6). (In general, it is not required as material will be cured fully in 10 seconds.)

Tooth #19 was restored using the same technique and the initial crown preparation was completed with the rubber dam in place for ease of lip and tongue retraction (Figs. 7-9). Due to the adaptability of cured composite, predictable, smooth and even crown preparations are easily achieved. Next, the rubber dam was removed and the patient's occlusion was checked and adjusted (Fig. 10). The crown preparation was then refined, a final impression taken, and the provisional placed. The patient returned several weeks later for the final placement of an IPS e.max lithium-disilicate crown restoration, chosen for its strength and aesthetics, onto tooth #19 (Fig. 11).

Fig. 9: Image of tooth #18 and #19 filled and cured to completion.
Fig. 10: The crown preparation for tooth #19 is finalized without a rubber dam and ready for the final impression.
Fig. 11: Post-operative image of tooth #18 composite and tooth #19 IPS e.max crown.

Conclusion

In dentistry today, the ability to complete two different types of procedures during one appointment is a viable option in many cases. In this case the advantages were significant. The utilization of a bulk-fill composite for a core buildup and a direct posterior restoration ensured durability and predictability. The elimination of the need for cuts, grooves or posts allowed for a more conservative preparation. The convenience of placing and curing a bulk-fill in one increment eliminated the technique-sensitive and time-consuming layering process, which saved time. By following this technique, it is possible to provide your patients with a long-lasting, durable and aesthetic restoration in a single visit. ■

Author's Bio

Amanda Seay, DDS, is the owner and solo practitioner of Park West Dentistry, a private practice in Mount Pleasant, South Carolina. Her expertise ranges from complex restorative treatment planning to comprehensive preventive and restorative dentistry, as well as from dental implant and reconstructive dentistry to dental photography. A mentor at the Kois Center, Dr. Seay also has published articles covering the art and techniques of aesthetic dentistry, practice management, dental materials and oral health. In addition, she serves on the editorial boards of several peer-reviewed journals. A graduate of New York University College of Dentistry, she commits herself to hundreds of hours of continuing education each year and is currently in the accreditation process with the American Academy of Cosmetic Dentistry (AACD). She can be contacted at: frontdesk@amandaseay.net.

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1. When determining the proper procedure for a crown placement for a large restoration, what important factor must a clinician consider?
   a. Where in the mouth the restoration is placed
   b. The age of the patient
   c. The amount of tooth structure remaining
   d. If the patient has allergies

2. When preparing a severely damaged or decayed posterior tooth for a crown, a necessary first step is to:
   a. Extract the tooth
   b. Fabricate a bridge
   c. Rebuild the tooth structure
   d. Etch the tooth

3. Based on the goal for conservative endodontic preparation therapy, which would be the appropriate choice as a core build-up material?
   a. Amalgam
   b. Glass ionomer
   c. Composite resin bulk-fill
   d. Conventional composite resin

4. To ensure an aesthetically pleasing crown restoration, which core build-up material should be avoided?
   a. Glass ionomer
   b. Composite resin
   c. Zirconia
   d. Amalgam

5. When used as a core build-up material, what might be required to anchor amalgam?
   a. Adhesive
   b. Grooves
   c. Slots
   d. Pins

6. The following material might take up to 24 hours to set, depending upon its composition:
   a. Composite resin
   b. Glass ionomer
   c. Zirconia
   d. Amalgam

7. Historically, standard procedure for crown preparation was:
   a. A bridge
   b. Composite resin
   c. Cast post and core
   d. Composite layering

8. Conventional composites are designed for light curing in:
   a. 1 to 2mm increments
   b. 2 to 3mm increments
   c. 3mm increments only
   d. 4mm increments only

9. The use of a bulk-fill composite as a core build-up material eliminates the need for:
   a. Layering
   b. Grooves, posts or cuts
   c. Both a and b
   d. None of the above

10. Proper crown buildup is essential to:
    a. Create appropriate retention and resistance form
    b. Recreate the shape of the original tooth
    c. Provide a foundation for the final crown
    d. All of the above

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