The Clinical Algorithms of Rehabilitation

by Boyana Byanova, DMD

Abstract

Contemporary aesthetic dentistry has been catalyzed by the adhesion era. The ability to use tooth-colored direct and indirect resins and ceramic-based materials was fully realized as dentin and enamel adhesives were developed and their clinical performance optimized. It may appear that adhesion is a simplistic procedure—a film with which to coat the tooth. In reality, the multifactorial interplay of chemicals with the diverse molecular structures of dentin and enamel and the reconstructive resin materials is a physical interplay of balanced forces.

The attention to detail and the exquisite clinical expertise required for obtaining the ultimate performance from a bonding system and a restoration is a demanding experience.

Educational objectives

After reading this article, the reader should be able to:

• Identify the steps necessary to rehabilitate a severely damaged tooth.
• Recognize when immediate dentin sealing (IDS) is needed.
• Identify the benefits of indirect restoration.
Immediate dentin sealing (IDS) as described by Magne demonstrably improves bond strength, creates fewer gap formations, decreases bacterial leakage, and reduces dentin sensitivity.

Case presentation

The case presented is the rehabilitation of a severely damaged tooth in a 15-year-old with a high caries risk. A conservative direct approach was rejected due to the history of large failing direct restorations and the ancillary degree of missing tooth structure. The indirect approach is a far cry from a micro-invasive approach. However, ultimately, longevity is biologically mandated and compromises the mitigating factor.

Balance in all things is the key to harmony in life and this must also apply to the practice of dentistry. In a perfect world we could combine an ultraconservative restorative approach (which is considered micro-invasive) with a substantial caries remineralization program that may provide therapeutic benefits and significantly reduce both long-term restorative needs and costs, thus complementing the overall concept of minimally invasive dentistry. Unfortunately, the world is far from perfect.

In the case to be shared, the choice was the indirect method of restoration. However, the choice of material was the quandary, as the antagonist was a natural tooth. The material must possess the physical properties of enamel—hardness, modulus of elasticity, abrasion, and compressive and shear strength. The customary first choice is a ceramic—however, its hardness is greater than enamel and as such, in a case with a myriad of large direct restorations, this would prove conflictual. Self-adhesive cements imparted significantly lower bond strength and would not be our material of choice for the cementation of indirect inlays, especially for non-retentive cases. New generations of photopolymers seem to possess the qualities necessary to approximate tooth structure.1, 2

Immediate dentin sealing (IDS) as described by Magne1 demonstrably improves bond strength, creates fewer gap formations, decreases bacterial leakage, and reduces dentin sensitivity (Figs. 1-4; see Figs. 3-4 on p. 108). The procedure mandates immediate application and polymerization of the dentin bonding agent to the freshly cut dentin, prior to impression taking. The use of filled adhesive resins (low elastic modulus liner) facilitates the clinical and technical aspects of IDS. This rational approach to adhesion also has a positive influence on tooth structure preservation, patient comfort, and long-term survival of indirect bonded restorations.

The dentin is etched and then rinsed with Chlorhexidine4, 5 (Fig. 5; see p. 108). Primer is placed, followed by the adhesive. The dentin must not be over-dried. This was achieved by aspirating moisture in the cavity—not air drying—and thus
protecting the collagen fibrils from collapsing (Fig. 6).

The adhesive was light-cured for 40 seconds (Figs. 7 & 8). Highly filled flowable composite was placed in small recesses of the cavity in order to keep maximum surface contact. The layering is done optimally by using thin coatings; each is light-cured for 40 to 60 seconds and again for 40 to 60 seconds. Polymerization is done under glycerin to remove the oxygen-inhibition layer. IDS protects the dentin from contamination during the provisional period.6,7 There are studies that indicate that the bond-dentin interface increases with the IDS approach which would tend to increase the longevity of the restoration.
Freshly cut dentin seems to be best for optimal adhesion; thus, once IDS is performed, cementation of the composite onlay provided by the laboratory provides a number of different connections. These connections include one between enamel and composite (the strongest one), a second that is between composite and composite (also a strong one), and a third one between dentin and composite.

After polymerization, the rubber dam isolation was removed and then an impression was taken for a composite onlay in lab. The dental technician also provided images showing the tooth shades and morphologic characteristics of the teeth.

The future restoration is baked in a special composite oven which heats and pressure-cures the restoration to decrease porosity and air bubbles.

Cementation of the onlay is also done with rubber dam isolation. There are many benefits to working with a rubber dam, and literally no negatives.\(^8\)\(^-\)\(^10\)

Cementation begins by cleaning with microabrasion: 50 microns of aluminium oxide for tooth structures and 30 microns for the onlay. The same composite is used for IDS, cementation and for the onlay. So when we bond the onlay it is, in theory, a monobloc (Figs. 9 & 10).

The tooth structure is etched, rinsed and bonded. No primer is needed as there is no dentin. This was addressed by the IDS approach. For the composite onlay we need only adhesive, once it has been microabraded.

Cleaning of the excess luting material is easier due to the isolation. The use of teflon, matrices and floss further ensure ease of clearance. Light-curing for 40 seconds per side is done first, followed by 20 to 40 more seconds per side under glycerin. We needed a total of 60 seconds to 80 seconds of light-curing per side.

**Conclusion**

Using materials that imitate the natural state obviates future complications such as unusual wear of the antagonist tooth structure, fracturing and periodontal inflammation. The precise protocol of cementation and isolation is the foundational imperative for long-lasting restorations.

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**References**


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**Author Bio**

**Dr. Boyana Byanova** graduated from the Medical University of Sofia and currently practices at Medical Dent in Sofia, Bulgaria. Byanova focuses on aesthetic dental medicine, laser dentistry and aesthetic dental rehabilitation. She is a former official delegate of the Bulgarian Association of Students of Dental Medicine.
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1. “Wet bonding” is a technique used to enhance the bond strength of a total-etch adhesive system to dentin by preventing the exposed collagen fibers from ______ so that adhesive monomers can easily infiltrate the network with the demineralized dentin.
   A) Maturing  
   B) Integrating  
   C) Coalescing  
   D) Collapsing

2. The ideal dentin surface for bonding with a total-etch adhesive system should be a ______ glistening surface with no visible pooling of water.
   A) Smooth  
   B) Hard  
   C) Gummy  
   D) Moist

3. The most common etchant is a 37 percent aqueous solution of phosphoric acid. One of its purposes is to remove the…..
   A) Sclerotic layer  
   B) Dystrophic layer  
   C) Myelinated layer  
   D) Smear layer

4. A primer can effectively hybridize the dentin/enamel (to form a hybrid layer) and….
   A) Penetrate collagen fibrils and dentinal tubules (forming resin tags) resulting in enhanced bond strength
   B) Coagulate collagen fibrils and dentinal tubules (forming resin tags) resulting in enhanced bond strength
   C) Macerate collagen fibrils and dentinal tubules (forming resin tags) resulting in enhanced bond strength
   D) Obliterate collagen fibrils and dentinal tubules (forming resin tags) resulting in enhanced bond strength

5. It is safe to etch superficial and deep dentin, provided that a primer or adhesive is applied to seal the dentin. Is this statement TRUE or FALSE?
   A) True  
   B) False

6. Most resins are cured by….
   A) Air Blasting  
   B) Desiccating  
   C) Abrading  
   D) Light-curing

7. Incremental filling is a technique where multiple small increments of composite are applied and then light-cured. Layering is the technique where a dentin shade of composite is applied to the superficial layers and a shade of enamel is placed on top. This technique can be used for anterior and posterior restorations. Is this statement is TRUE or FALSE?
   A) True  
   B) False

8. LED (Light-emitting diode) lights are replacing halogen curing lights. Is this statement is TRUE or FALSE?
   A) True  
   B) False

9. White lines may result from the dust of the composite that fills the existing microgaps over the edges of the restoration if the composite is not well adapted to the walls of the tooth. Is this statement is TRUE or FALSE?
   A) True  
   B) False

10. There is no evidence that preheating a composite filling material improves its ability to adapt to the cavity margins, with a resultant reduction in microleakage, and an increase in surface hardness. Is this statement is TRUE or FALSE?
    A) True  
    B) False

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