



A PRACTICAL GUIDE TO MINERAL- ENRICHED COMPOSITES

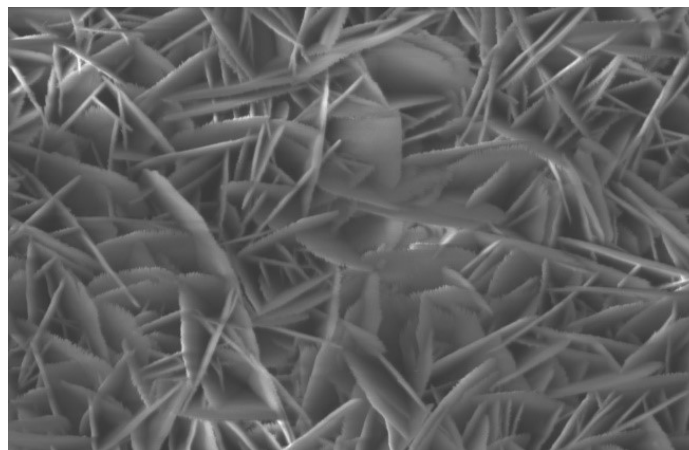
Robert A. Lowe, DDS



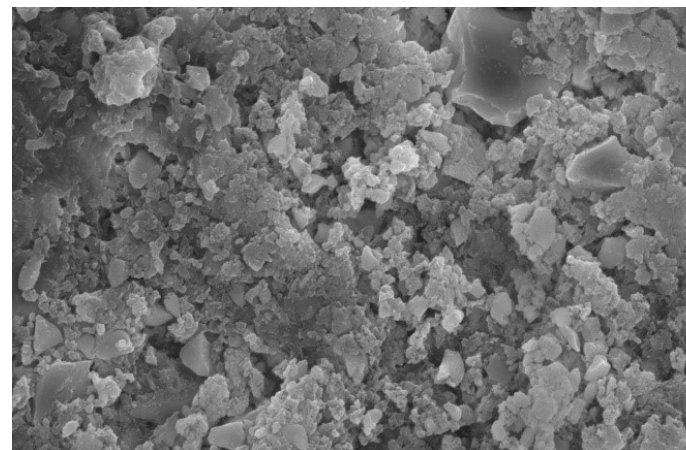
PREVENTION OF EXTENSION WITH MINERAL-ENRICHED COMPOSITES

Dentistry has come a long way since the days of G. V. Black. Rather than “extension for prevention,” there has been a shift towards “prevention of extension,” whereby only infected dentin is removed and affected dentin is left intact. Research shows that affected dentin can be remineralized and turned back into healthy dentin.¹ The potential for remineralization, combined with early diagnosis and minimally invasive treatments, means that more patients can keep their teeth for a lifetime.

A new generation of composite materials contains essential minerals such as calcium, phosphate, and fluoride, which help support the natural remineralization process that is constantly underway in the oral environment. This eBook shows several restorative cases using ACTIVA Presto, a new mineral-enriched light cure composite that mimics the physical and chemical properties of natural teeth.



SEM of ACTIVA Presto stored in phosphate buffered solution (a saliva substitute) for 21 days shows surface precipitation of Calcium Phosphate (CaP). Source: SEMTech Solutions.



SEM of ACTIVA Presto stored in phosphate buffered solution (a saliva substitute) for 21 days shows an eight-fold increase in Calcium and Phosphate ion concentrations. Source: SEMTech Solutions

INFECTED VS AFFECTED DENTIN: WHAT'S THE DIFFERENCE?

Infected Dentin

Highly demineralized dentin with a high bacteria count and the consistency of cottage cheese.

Affected Dentin

Somewhat demineralized dentin that is firmer than infected dentin and has a leathery consistency.

1. Mount GJ, Tyas JM, Duke ES, Hume WR, Lasfargues JJ, Kaleka R. A proposal for a new classification of lesions of exposed tooth surfaces. *Int Dent J*. 2006;56(2):82-91. doi:10.1111/j.1875-595x.2006.tb00078.x
2. Lawson N, Robles A. Clinical Treatment of Deep Caries. *Decisions in Dentistry*. February 2019. <https://decisionsindentistry.com/article/clinical-treatment-of-deep-caries/>. Published February 13, 2019. Accessed October 8, 2019.



Fig. 1-3

54-year-old female patient with a history of periodontal disease had recession due to bone loss, resulting in black triangles between her central and lateral incisors.



Fig. 4

A heavy weight rubber dam was placed and inverted to maximize gingival retraction while maintaining optimal conditions for bonding.



Fig. 5

After cleaning with pumice and prophylaxis paste, a medium fine interproximal strip was used to remove any remaining plaque from the tooth surfaces.

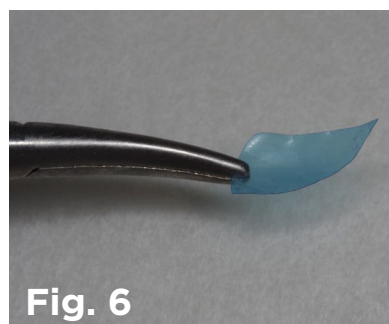


Fig. 6

The Bioclear matrix.



Fig. 7

A wedge was placed next to the Bioclear matrix.



Fig. 8

The teeth were etched for 20 seconds with Etch-Rite (Pulpdent) before applying a bonding agent.

Images courtesy of Dr. Raymond Kimsey

CLOSING BLACK TRIANGLES

A 54-year-old woman with a history of periodontal disease had experienced bone loss resulting in visible recession, most notably in the form of black triangles. Having received treatment for her periodontal disease, the patient wanted to close all the black triangles in her maxillary anterior teeth (Figure 1 through Figure 3) to improve the esthetics of her smile.

A heavy weight rubber dam was placed and inverted to maximize gingival retraction while maintaining optimal conditions for bonding (Figure 4). Since these teeth were caries-free there was no need for preparation or anesthesia. The teeth were thoroughly cleaned using pumice followed with a medium fine interproximal strip to remove any remaining plaque from the tooth surfaces.

The black triangles were then treated one gap at a time using Bioclear matrices (Bioclear Matrix Systems) (Figure 5 and Figure 6), wedges (Figure 7), and ACTIVA Presto (Pulpdent Corporation), a mineral-enriched composite that releases calcium, phosphate, and fluoride, and contains a shock-absorbing, rubberized resin. The teeth were etched for 20 seconds with Etch-Rite (Pulpdent Corporation) and rinsed before a bonding agent was applied (Figure 8). Since there were contacts at the incisal edge, an instrument was used to mechanically separate the teeth.

Case continued on next page



Fig. 9

Placement of ACTIVA Presto using Bioclear matrix.



Fig. 10-11

Postoperative images of restoration with rubber dam.



Fig. 12

Preoperative image of Class V restoration of tooth No. 4.



Fig. 13

Postoperative image of Class V restoration of tooth No. 4 using ACTIVA Presto shade A6 at the top of the gum line and shade A4 for the remainder of the restoration.



Fig. 14-16

Black triangle restorations at the one-week recall.



Next ACTIVA Presto shade A3.5 was placed (Figure 9), light cured, and contoured with a fine diamond bur, followed with a Montana Jack Scaler (Paradise Dental Technologies) to remove excess bonding agent and any overhangs. Final polishing was done using a Sof-Flex Disc (3M) followed by medium to super fine finishing strips. Figure 10 and Figure 11 show the final postoperative restoration with the rubber dam.

All contacts were polished and flossed to ensure that no composite could be detected with floss. This step was especially important because the area needed to be cleaned well in order to manage the patient's periodontal disease. Any overhangs would be subgingival and could irritate the soft tissue. The combination of the Bioclear matrices with the high viscosity of ACTIVA Presto was ideal in this application.

A Class V restoration was performed. Since tooth No. 4 was caries-free, the preparation was minimal, requiring only a 33.5 inverted cone bur while the tissue was gently retracted by placing Teflon tape in the sulcus. The Teflon tape does not bond to composite, facilitating clean-up. The tooth surface was etched for 20 seconds with Etch-Rite (Pulpdent) before placing a bonding agent. ACTIVA Presto shade A6 was placed at the highest part of the gum line followed by shade A4 for the remainder of the restoration. Due to the flowability of Presto, the two shades were blended at the interface to avoid a distinct delineation of the shades. The restoration was finished using a fine tapered diamond bur followed with Sof-Flex Discs (3M). Figure 13 shows the immediate postoperative restoration of tooth No. 4. Figure 14 through Figure 16 show the black triangle restorations at the one-week recall.

The patient had recession with erosion on tooth No. 4 (Figure 12).



Fig. 17

Caries lesions can be seen on the mesial proximal surface of tooth No. 27.



Fig. 18

Existing caries lesions are visible on the distal proximal surface of tooth No. 26.



Fig. 19

Cavity preparations are shown on the distal surface of tooth No. 26 and the mesial surface of tooth No. 27.



Fig. 20

ACTIVA Presto is injected into the preparation on the mesial surface of tooth No. 27.



Fig. 21

Immediate postoperative image of ACTIVA Presto restorations placed in teeth Nos. 26 and 27.



Fig. 22

Two-year postoperative image. The restorations blend well with the color of the surrounding tooth structure.

CLASS III RESTORATION

An older patient presented with caries lesions on the distal proximal surface of tooth No. 26 (Figure 17) and the mesial proximal surface of tooth No. 27 (Figure 18). After establishing the outline form of the cavity preparation, infected dentin was removed using a polymer bur that is the exact Knoop hardness of healthy dentin (Smart Bur II, SS White). Figure 19 shows the preparation. A super pulsed diode laser (Gemini, Ultradent) was used to remove interproximal gingival tissues, creating a supragingival margin to facilitate matrix placement and application of the restorative material. A unique Mylar matrix (Bioclear) was used to better recreate the anatomic convex profile of the interproximal surface.

ACTIVA Presto was injected to fill the preparation to the cavosurface margins (Figure 20). Once the matrix was adapted closely to the tooth and secured, the material was light cured per the manufacturer's instructions. Finishing was done using a fine carbide composite finishing bur (FG-7901, SS White) before final polishing with rubber composite polishing abrasives (A.S.A.P. All Access All Surface Polishers, Clinician's Choice). Figure 21 shows the final restoration immediately after placement. Two years later, the restorations appear to have "matured" and blend well with the surrounding tooth structure (Figure 22). The case demonstrates the composite material's ability to stack and hold its shape, and to integrate with the tooth structure to provide long-term esthetics and strength.

SEVERE CARIES RESTORATION

A 35-year-old female patient with a penchant for sugary drinks showed severe caries in teeth Nos. 6, 7, and 8. All three teeth were intact during the initial consultation, but when she returned several weeks later for treatment, tooth No. 7 had broken at the gum line (Figure 23) and had to be endodontically treated. Once the root canal was complete, medium grit diamond burs (50-60 microns) were used to access the caries, followed by a selective caries removal process. The infected dentin was removed from the axial walls of the cavity with sharp spoon excavators followed by carbide burs. The affected dentin was left intact and the floor of the preparation was covered with ACTIVA BioACTIVE-BASE/LINER. Tooth No. 7 was restored first, using a resin-reinforced fiber glass pin, Sycamore Wedge, Palodent Matrix (Dentsply Sirona), and ACTIVA Presto shade A2 (Pulpdent Corporation). After application of Clearfil SE Bond (Kuraray Noritake), the ACTIVA Presto was placed in four increments, starting with the proximal area before building up the vestibular and palatal aspects. Next ACTIVA Presto was used to restore teeth Nos. 6 and 8. The three teeth were contoured using low grit diamond burs (15-40 microns) and abrasive strips for the interproximal area and then polished with Twist Dia (Kuraray Noritake) and Unigloss Paste (Intensiv).

The patient returned one month later. Plaque disclosing Mira-2-Ton liquid (Hager & Werken) was applied to teeth Nos. 6, 7, and 8 (Figure 24) and then rinsed, revealing very little plaque in the areas around the restorations (Figure 25). Figure 26 shows the final restorations at the one-month recall appointment.



Fig. 23

Severe caries in teeth Nos. 6, 7, and 8, with tooth No. 7 broken at the gum line.



Fig. 24

Plaque disclosing Mira-2-Ton liquid (Hager & Werken) was applied to the restored teeth at the one-month recall appointment.



Fig. 25

Mira-2-Ton was rinsed, revealing very little plaque in the areas around the restorations.



Fig. 26

Final restorations at one-month recall appointment.

Images courtesy of Dr. Stefano Daniele

THE SANDWICH TECHNIQUE WITH ACTIVA BIOACTIVE AND ACTIVA PRESTO

A patient who could not afford a crown received a direct restoration using the sandwich technique and mineral-enriched restorative materials. There was marginal failure in the area of an existing restoration of tooth No. 3 near the mesial marginal ridge (Figure 27). A portion of the mesial margin had been compromised due to fracture, and recurrent decay was diagnosed using Quantitative Laser Fluorescence (QLF) and verified clinically. Caries detection (SoproCare: Acteon) showed active caries

lesion around a defective restorative margin on tooth No. 3 (Figure 28). Decay was visible upon removal of the defective restoration (Figure 29) and a Smart bur 2 (SS White Dental) was used to remove infected dentin only. The preparation was etched with 38% phosphoric acid (Etch Rite, Pulpdent Corporation) for 15 seconds and rinsed well. Excess moisture was removed using high-volume suction to avoid desiccating the dentin. An adhesive resin was applied to the dentin surface, air thinned, and light cured.

Next, ACTIVA BIOACTIVE-RESTORATIVE was placed in the cavity and light cured, leaving approximately 1.0-1.5 millimeters for the final layer of restorative material (Figure 30). ACTIVA Presto was chosen for the enamel replacement, since it is a mineral-enriched universal composite material with a stackable viscosity that holds its shape. Figure 31 is an occlusal view of the completed restoration on the surface of tooth No. 3.



Fig. 27

Preoperative occlusal view of tooth No. 3 shows compromised mesial margin.



Fig. 28

Caries detection (SoproCare: Acteon) shows active caries lesion around a defective restorative margin on tooth No. 3.



Fig. 29

Decay is visible upon removal of the defective restoration. Affected dentin is not removed.



Fig. 30

Occlusal view of tooth No. 3 after placing ACTIVA BIOACTIVE-RESTORATIVE as a dentin replacement.



Fig. 31

Occlusal view of the completed restoration after placing ACTIVA Presto as the enamel layer. Note the anatomical form and high luster of ACTIVA Presto.

ABOUT THE AUTHOR

ROBERT A. LOWE, DDS, received his Doctor of Dental Surgery degree from Loyola University School of Dentistry. After completing his residency, Dr. Lowe went into private practice and began to pursue another passion: clinical teaching. While running his own practice, Dr. Lowe served as a Clinical Professor in Restorative Dentistry at Loyola University School of Dentistry until its closure in 1993. In 2000, he relocated to Charlotte, NC.

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