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DENTAL ADVISOR™

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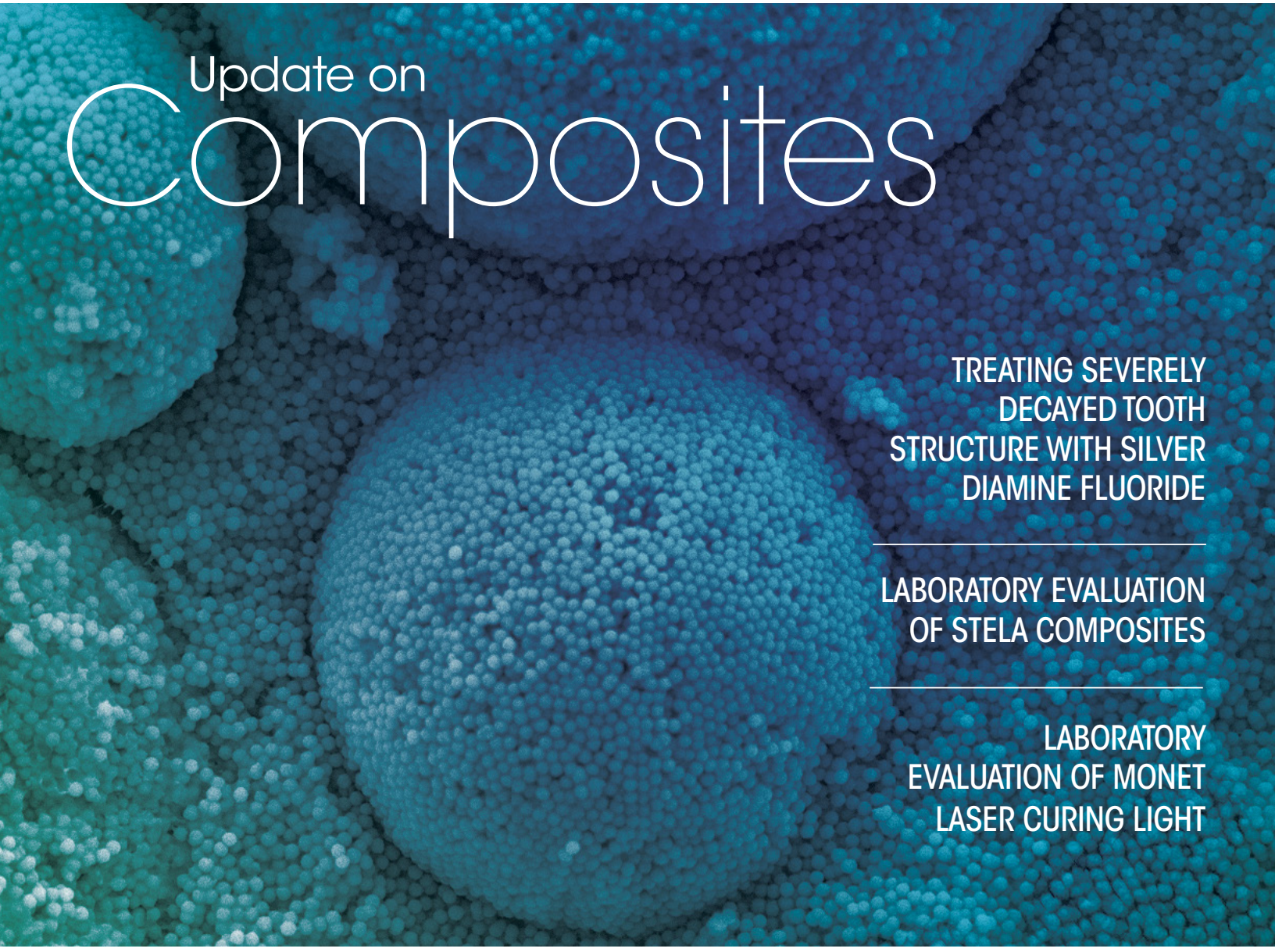

Update on Composites

TREATING SEVERELY DECAYED TOOTH STRUCTURE WITH SILVER DIAMINE FLUORIDE

LABORATORY EVALUATION OF STELA COMPOSITES

LABORATORY EVALUATION OF MONET LASER CURING LIGHT

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FROM THE DESK OF
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As manufacturers make significant progress in resin and filler technology, the utilization of composites is on the rise. Newer composites offer increased strength, esthetics and durability, often replicating natural teeth with minimal shading or layering. With a plethora of new composites flooding the market, this month's issue is dedicated to helping our readers sift through the confusion when selecting a product for specific clinical situations. We trust you will find this information beneficial in choosing the ideal composites for your practice. As always, I welcome your comments and suggestions; you can reach me at drbunek@dentaladvisor.com or reach out to our team at connect@dentaladvisor.com. Thank you for your continued support and reading!

— Sabiha S. Bunek

CLINICAL EVALUATOR PROFILE

Dr. Maggie Augustyn, FAAIP, FICOI is a Dawson trained practicing general dentist, owner of Happy Tooth, author and inspirational speaker. She also holds a faculty position with Productive Dentist Academy. Augustyn reads, researches, writes, and speaks on the things that make us human, that make us hurt, and that make us come alive. Her personal mission is to ignite people towards a journey of a less tainted self-actualization. Though she has no intention of stepping away from holding a handpiece, she is joining a movement of promoting a paradigm shift in dentistry: a much-needed transition uniting what we experience inside the operatory and that which lies outside of it. She eloquently speaks on giving attention to the things that we suppress in the hopes of making us feel less alone and more connected.

She evokes emotion in her audiences, awakening all to the beauty of our chosen paths. She has spoken for intimate study club audiences, been invited to keynote internationally and is no stranger to addressing 300+ audiences. Dr. Augustyn is one of dentistry's most prolific writers and a frequent contributor to AGD's Dental Impact, Dental Entrepreneur Woman and DentistryIQ. She takes most pride in her role as a columnist of "Mindful Moments" at Dentistry Today. Maggie Augustyn has been nominated as Author of The Year at the Dental Festival. She has also been featured on various podcasts and lectures nationally teaching how to create a well-balanced initiative toward leading a fulfilling life as multidimensional humans. **We would like to express our sincere gratitude to Dr. Maggie Augustyn for her commitment and contributions to DENTAL ADVISOR.**

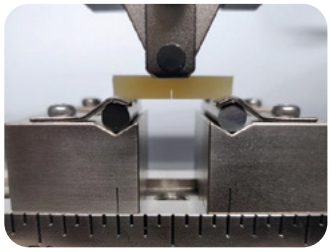
Important Properties of Composites

VISCOSITY:
Clinically, doctors want a composite that flows well without bubbles if flowable, or is pliable enough to pack easily and sculpts and stacks well.

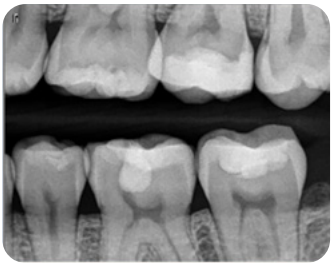
LACK OF STICKINESS:
Composite that sticks to the instrument and does not adapt to cavity walls can cause voids in the final restoration. This can lead to recurrent decay.

BLENDABILITY:
A composite that blends well with surrounding dentition is ideal as it provides a chameleon effect. It is critical that there is no shade shift upon curing.

POLISHABILITY: A material that polishes quickly and easily and achieves a glossy surface ensures that debris and calculus will not build up and cause recurrent decay. A smooth surface minimizes potential for fracture.



HARDNESS: For stress and load bearing areas, having a composite that cures well and is hard without fracturing or chipping is desirable.



RADIOPACITY: A composite that is easily distinguishable on a radiograph is easier to follow clinically over time to assess early microleakage and potential failure. Teeth #14-15, #18-19 are shown. Highly radiopaque composites will show clear boundaries of shrinkage that may occur over time.

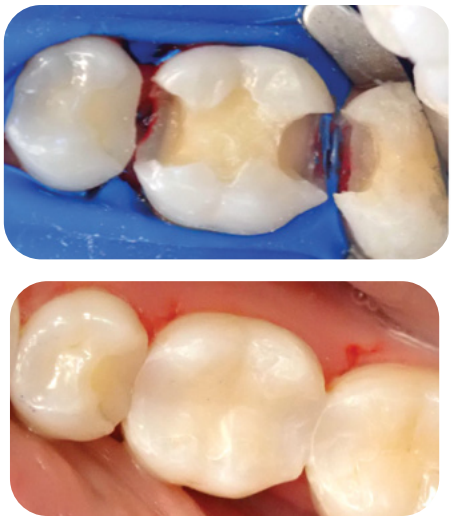
Choosing what to use:

The first question to ask is whether the restoration is more ***cosmetic*** in nature or ***functional*** in nature.

Photos courtesy of Dr. Ashton Prince

Cosmetic cases require highly esthetic composites with high gloss and polishability for a natural luster.

Photos courtesy of Dr. Matthew Miller



Functional cases require less esthetic but stronger composites to withstand occlusal wear, and shrinkage stress.

Particle size of composites

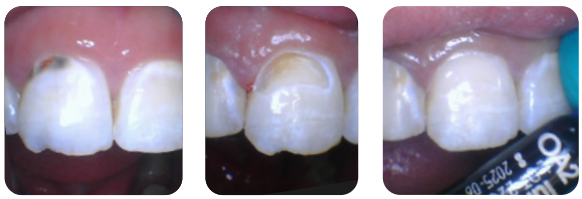
Nanohybrid composites are the most popular type of composite because of their excellent strength, esthetics, wear resistance, handling, and polishability. Nanohybrid composites contain the smallest filler particles and combine the best characteristics of earlier composites such as microfills and microhybrids.

The Concept of Universal

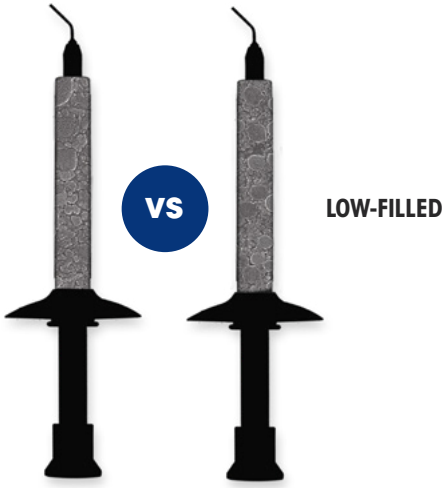
Universal composites can be flowable in nature or packable, and can be used in all classes. The concept of Universal keeps changing in the marketplace; however, in order for a composite to truly be universal, it should be strong enough to use in all cavity classes. Many manufacturers are calling composites universal because they offer a single or minimal number of shades which match all VITA shades.

Product	Rating
3M™ Filtek™ Universal Restorative (3M)	+++++ **(96%)**
LUNA 2 (SDI Limited)	++++½ **(93%)**

Luna 2 photos courtesy of Dr. James Johnson



Types of composites:



Flowable composites

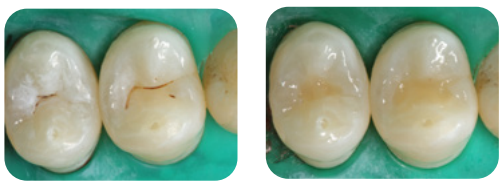
All flowables are not the same. Different amounts of filler content are present and will determine where and how a flowable composite can be utilized clinically. Reduced filler content decreases strength and increases flowability, making these composites easy to place, but less reliable over the long term as they shrink more often.

Highly filled

These can be used in higher load bearing areas, and are closer in properties to traditional composites. They are indicated for all cavity classes.

Product	Rating
CLEARFIL MAJESTY™ ES Flow (Kuraray Noritake Dental Inc.)	+++++ (98%)
3M™ Filtek™ Supreme Flowable Restorative (3M)	+++++ (96%)
G-aenial™ Universal Flo (GC America Inc.)	++++½ (92%)
BEAUTIFIL Flow Plus X (SHOFU)	++++½ (92%)

Photos courtesy of Dr. Michael Koczarski



BEAUTIFIL Flow Plus, Tooth # 12-13

Low filled

These composites are great for repairs but do not have the strength to be used in high stress areas as they will shrink, fracture and chip.

Product	Rating
NovaPro® Flow (Nanova)	++++½ (95%)
ESFlow® (Spident)	++++½ (95%)

Understanding the Differences:

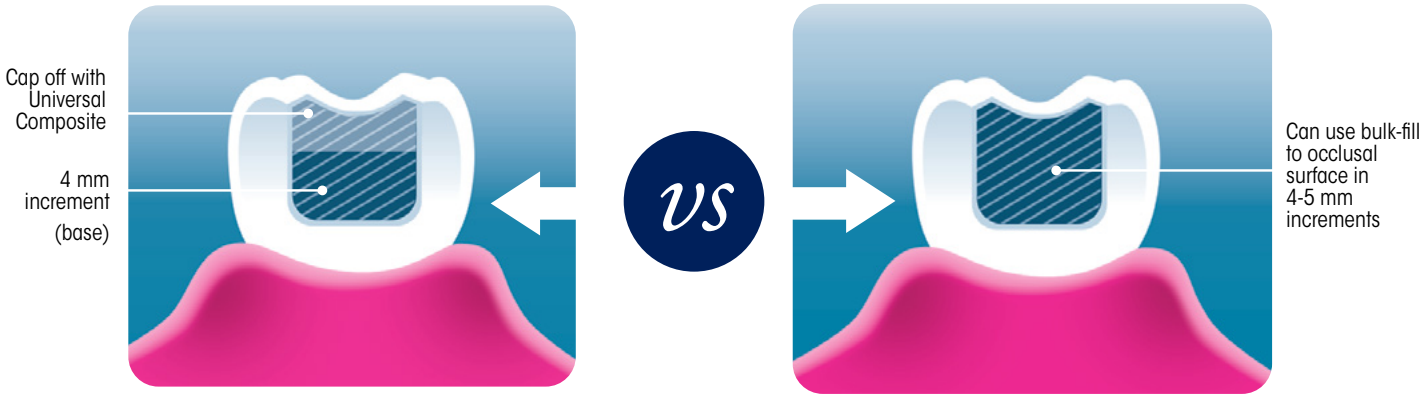
Types of Bulk-fill Composites

Bulk-fill composites are not all the same. It is important to understand how they differ and to use them accordingly. The main difference among bulk-fill composites can be seen in the viscosity of the material and its delivery.

Bulk-fill Composites are available in two viscosities: flowable and packable. They also vary in that some require a capping layer, and some do not. They are not all the same nor can they be utilized in the same way. We refer to the two types of bulk-fill composites as bulk-fill base (require a capping layer), and bulk-fill restorative (do not require a capping layer). Most bulk fill restoratives can be filled to the occlusal surface in one, 4-5 mm increment. Some bulk-fill composites are now also a single shade.

Bulk-fill Flowable
(Base)

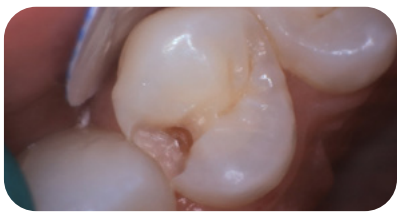
Bulk-fill Restorative
(Can be flowable or packable)

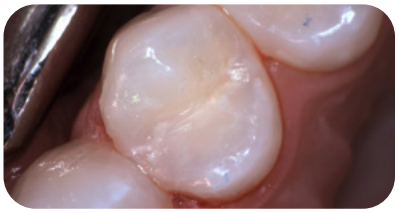


Flowable Bulk Fill Base

Product	Rating
SimpliShade™ Bulk Fill Flow (Kerr)	++++½ **(91%)**

Photos courtesy of Dr. Ashton Prince





Packable Bulk Fill Restoratives

Product	Rating
Admira Fusion x-tra (VOCO)	+++++ **(96%)**
AURA BULK FILL (SDI Limited)	++++½ **(94%)**
3M™ Filtek™ One Bulk Fill Restorative (3M)	++++½ **(92%)**

Flowable Bulk Fill Restorative

Product	Rating
Venus® Bulk Flow ONE (Kulzer)	++++½ **(92%)**

What innovations have made placing composites easier?

Bulk-fill composites have made placing composite ***easier and faster*** as they have moved clinicians away from the 2 mm increment. Many bulk-fills can be placed in a single layer of up to 5 mm in depth, saving time and eliminating steps.

Shading simplification: There has been a trend of adding optical fillers to ***minimize time in the shade selection process*** and to provide a chameleon effect. ***Simplified shading*** systems now exist with ***one single shade up to 3-5 shades***, available as both universal and as bulk-fill composites.

Simplified Shade Composites

Product	Rating
G-aenial™ A'CHORD (GC America Inc.)	++++½ (94%)
SimpliShade™ (Kerr)	++++½ (92%)

Photos courtesy of Dr. Matthew Miller

SimpliShade, tooth # 7

Single Shade Composites

Product	Rating
OMNICHROMA® (Tokuyama Dental)	++++½ (94%)
OMNICHROMA® Flow (Tokuyama Dental)	++++½ (91%)

Single Shade Bulk-Fill Composites

Product	Rating
Admira Fusion x-tra (VOCO)	+++++ (96%)
AURA BULK FILL (SDI Limited)	++++½ (94%)
Venus® Bulk Flow ONE (Kulzer)	++++½ (92%)

Polishing: Composites are being made that often require little to no polish, but if polished, ***time is minimized and surface roughness is reduced*** which can lead to plaque accumulation and recurrent decay.

Single-Step Polisher

Product	Rating
OneGloss (SHOFU)	++++½ (91%)

Multi-Step Polishers

Product	Rating
Super-Snap X-TREME™ (SHOFU)	+++++ (98%)
A.S.A.P.® (Clinician's Choice)	++++½ (93%)
3M™ Sof-Lex™ Diamond Polishing System (3M)	++++½ (92%)

Product Highlights

OMNICHROMA Family
(Tokuyama Dental America, Inc.)

The ***OMNICHROMA*** composite family offers clinicians a complete direct restorative system with three viscosities and only one shade to choose from, streamlining the restorative process. They save doctors time and money by eliminating the need for shade selection and keeping excess products for incidental shades on hand.

Now in packable, flowable and bulk-fill, ***OMNICHROMA*** composites provide exceptional physical, mechanical, and esthetic properties: low shrinkage, low wear and abrasion, high compressive and flexural strength, high polishability and stain resistance, and unprecedented shade-matching before and after bleaching.

Online: www.tokuyama-us.com

SimpliShade™ Bulk Fill
(Kerr)

SimpliShade Bulk Fill is a one-shade, SingleFill™ bulk-fill composite that cures up to 5 mm and does not require a capping layer.

- One shade to match all 16 VITA® classical shades
- Cures up to 5 mm, no capping layer required
- Lower wear rate and comparable shrinkage stress when compared to other bulk fill brands
- Higher flexural strength and initial gloss than competitors
- Next generation ART technology (ART³) provides:
  - Ease of sculpting with Adaptive Rheological Response Technology
  - Virtually indistinguishable blending with Adaptive Color-Blending Response Technology
  - Enhanced marginal adaptation with Adaptive Shrinkage Stress Response Technology

Online: www.kerrdental.com

3M™ Filtek™ Easy Match Universal Restorative
(3M)

Experience shade matching made easy with ***3M Filtek Easy Match Universal Restorative***. Coming soon - ***3M Filtek Easy Match Universal Restorative*** is a streamlined system built on clinically proven nanotechnology, a hallmark of the globally trusted family of ***3M Filtek Easy Match Universal Restoratives***. A new way to achieve natural-looking smiles, simply and intuitively. Just three shades deliver an excellent match to almost any patients smile. Anterior or posterior. Without a blocker – and without sacrificing opacity.

Online: www.3m.com

Online: https://engage.3m.com/easy-match-first2know

CLEARFIL™ MAJESTY ES Flow
(Kuraray)

CLEARFIL MAJESTY ES Flow is a light-cure, universal flowable composite that is more than a liner/base. With its excellent durability and esthetics, ***CLEARFIL MAJESTY ES Flow*** can be used in Class I, II, and occlusal surface restorations, as well as Class V restorations. ***CLEARFIL MAJESTY ES Flow*** is easy to polish by wiping the cured resin with an ethanol-soaked gauze or cotton roll, making it simple to incorporate into the clinical workflow ***CLEARFIL MAJESTY ES Flow*** contains special submicron fillers that are treated with a proprietary silane coupling agent, giving the product excellent mechanical properties. Available in shades A1, A2, A3, A3.5, A4, KA6, B1, B2, XW, and W. These shades correspond with Kuraray's ***CLEARFIL MAJESTY ES-2*** shade guide.

Online: www.kuraraydental.com

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Clinical Case Report

Matthew R. Miller, D.D.S.
Reimels, Miller, Paterra Family & Cosmetic Dentistry, Huntersville, NC

Number 58 – February, 2024

Treating Severely Decayed Tooth Structure with Silver Diamine Fluoride (SDF)

(Centrix, Inc.)

Introduction

Dental caries is a common chronic disease affecting individuals of all ages, with a significant impact on the overall health and quality of life. It is caused by the demineralization of tooth structure by acids produced by bacteria in dental plaque. If left untreated, caries can progress and lead to tooth loss, pain, and infection. The traditional approach to managing caries has been to remove the decayed tooth structure and restore the tooth with various dental materials. However, incorporating alternative approaches such as remineralization therapy with ***SilverSense SDF***™ (Centrix, Inc.) along with modern dental materials and techniques have reshaped how clinicians approach caries management, not just in young patients but adults as well. ***SilverSense SDF*** (Centrix, Inc.) is a 38% silver diamine fluoride that contains, approximately, 25% silver (weight/volume), that acts as a antimicrobial, and ~5.0% fluoride to help prevent further demineralization and begin the remineralization process. It has been approved by the FDA for use as a desensitizing agent. It works by forming a layer of silver phosphate on the surface of the tooth, inhibiting bacterial growth and remineralizing the demineralized tooth structure.

Silver Diamine Fluoride (SDF) has emerged as a promising agent in the field of dentistry, particularly in aiding the remineralization of tooth structure. This case report presents four successful cases where SDF was employed to arrest decay and remineralize tooth structure, avoiding invasive treatments and preserving the vitality of the teeth.

SilverSense SDF™
(Centrix, Inc.)

Case 1: Deep Carious Lesion on Tooth #3

A 47-year old female patient presented with a deep carious lesion on tooth #3 with a deep carious lesion noted radiographically and clinically. Prior to administration of local anesthetic, the tooth was diagnosed as vital with normal pulpal health. Upon excavation of decay, close proximity to the pulp tissue was confirmed clinically. Selective caries removal was performed, stopping short of the pulp, followed by the application of ***SilverSense SDF*** (Centrix, Inc.) and was subsequently air dried. A light-curable resin-modified calcium silicate bioactive liner was placed at the deepest part of the preparation, covering the region closest to the pulp. A light-curable resin composite was placed incrementally as the final capping layer: an opaque layer of composite was initially applied followed by a universal light shade of composite to color blend with the tooth. Note that using a curing light will activate the silver ions that have been scrubbed into the dentinal tubules; therefore, the preparation needed to be refined at the cavo-surface margin and DEJ to avoid noticeable discoloration and cosmetic failures. The patient experienced no post-operative sensitivity or complications.

Figure 1. Pre-operative: Clinical decay on tooth #3.

Figure 2. Conservative selective caries removal performed prior to the application of ***SilverSense SDF*** (Centrix, Inc.).

Figure 3. Decay removal was stopped short of the pulp.

Figure 4-5. To avoid the discoloration, bevel the cavosurface margin after light curing or use a self-curing material. ***SilverSense SDF*** (Centrix, Inc.) was applied followed by an indirect pulp cap with a light curable bioactive liner ***Lime-Lite™ Enhanced*** (Pulpdent) and restored with an opaque universal composite resin ***SimpliShade™ Universal*** Opaque and Medium (Kerr).

Case 2: Root Surface Carious Lesion on Tooth #31

A root surface carious lesion was identified on the cervical of the mesio-buccal root surface of tooth #31. After removing the decay, ***SilverSense SDF*** (Centrix, Inc.) was applied, dried, and wiped with gauze. A dual-curing RMGI composite was then applied and allowed to self-cure to prevent potential discoloration from light curing over the ***SilverSense SDF*** (Centrix, Inc.)-treated surface. Once the material was cured, it was trimmed and polished. The patient reported no post-operative sensitivity or issues.

Figure 6. Tooth was initially treated at a hygiene visit with ***SilverSense SDF*** (Centrix, Inc.) to arrest the progression of the decay.

Figure 7. Decay was removed, and it extended approximately 2mm subgingivally. ***SilverSense SDF*** (Centrix, Inc.) was applied followed by a dual cure RMGI, ***GC Fuji® Automix LC*** (GC America) shade A2, that bonds in the presence of saliva.

Figure 8. Final restoration: RMGI was allowed to self cure to avoid discoloration.

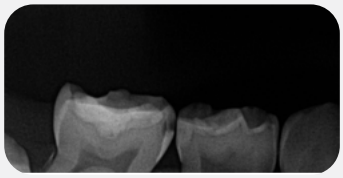
Historical Reference Cases Using SDF

Case 3: Malformed tooth structure resulting in a severe decay on a 3-year-old female

In 2018, a 3-year-old female patient presented with underdeveloped primary second molars exhibiting poor enamel formation, resulting in moderate carious lesions on the occlusal surfaces. The patient was unable to tolerate treatment until she was older. Conservative therapy was performed. The initial recommendation from another clinician involved pulpotomies and stainless steel crowns. However, an alternative approach was proposed, involving the application of SDF and fluoride varnish every three months with continued monitoring. As the patient grew older and demonstrated improved compliance, a final application of SDF was administered, followed by the placement of a durable RMGI filling material. This technique successfully prevented recurrent decay, and the teeth continue to remain healthy and symptom-free 5½ years later.

Figure 9. 2018: Pre-operative panoramic view

Figure 10. 2020 introral images (2-years post-op of SDF and fluoride varnish applications) showing arrested decay on teeth T and K. Defects were present in the tooth structure, making it difficult to keep debris out of the area and combat subsequent recurrent decay formation.



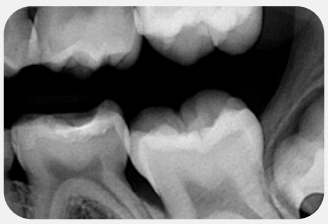


Figure 13. 2023: The teeth are stable and free of recurrent decay. The discoloration is of no concern since conservative therapy was performed, and pulpotomy and stainless steel crowns were avoided.

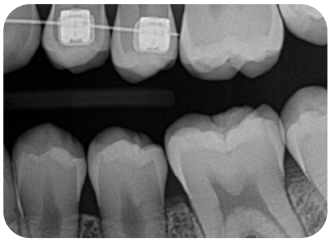
Figure 11. 2021: 3-year follow up, bite wing of tooth T showing new interproximal decay on mesial. This is after repeated SDF and fluoride varnish applications and RMGI occlusal fillings on K and T. RMGI filling is intact, but new decay now present on mesial which was subsequently treated.

Figure 12. 2022: 4 years after repeated SDF and fluoride varnish applications and RMGI occlusal fillings K and T. Bitewing shows treated interproximal decay on mesial. Additional sites have also been treated. Occlusal surfaces of K and T that were initially treated with SDF and RMGI are intact and stable with no evidence of recurrent decay.

Figure 14. 2023: 5½ years after repeated SDF and fluoride varnish applications and RMGI occlusal fillings K&T

Case 4: Occlusal Decay in an 18-Year-Old Male

An 18-year-old male patient presented with severe decay on the occlusal surfaces of his second molars following orthodontic therapy. Despite the teeth exhibiting vital pulpal health, endodontic therapy was considered likely due to the proximity of the decay to the pulp tissue. Additionally, the impacted third molars further complicated the situation, as they lacked sufficient space to erupt and their positioning against the distal surfaces of the 2nd molars could potentially compromise the success of indirect restorations subsequently needed after endodontic therapy. To mitigate the progression of decay, SDF was applied until the patient could receive restorative treatment. Selective caries removal was performed, followed by the application of SDF, a light-curable resin-modified calcium silicate bioactive liner, a dual-curing RMGI base, and a final layer of light-curable resin composite. This approach preserved the vitality and health of the teeth, maintaining their asymptomatic state going on 2 years since treatment.



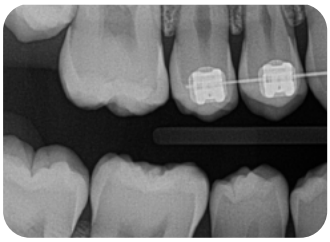


Figure 15 -16. 2019: Left side bitewing (photo left). Right side bitewing (photo right) No evidence of decay, but hygiene discussed as related to demineralization and gingival coverage over the patient's molars.

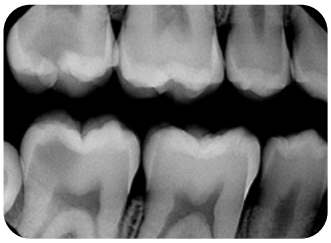


Figure 17. 2021: Patient is now 16 years old, severe decay noted on second molars. Teeth tested vital and asymptomatic.

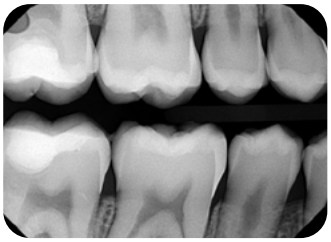


Figure 18. 2021 Immediate post-op radiograph: Conservative selective caries removal performed with SDF. Decay removal was stopped short of the pulp. SDF was applied followed by an indirect pulp cap with a light curable bioactive calcium silicate ***TheraCal LC***, (Bisco) and restored with a bioactive RMGI filling material and composite resin capping layer. Teeth remained vital and asymptomatic post operatively.

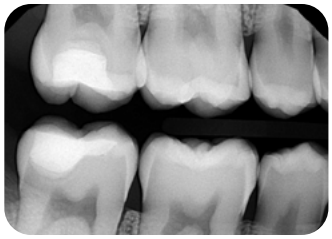


Figure 19. 2022: 11-month follow-up radiograph. Teeth remained vital and asymptomatic post operatively at subsequent follow-up appointments. Third molars were removed. The SDF discolored only the carious tooth structure, but after using a LED curing light to cure the bioactive calcium silicate indirect pulp cap, the remaining tooth surfaces became discolored.

Figure 20. 2023: 2-year follow up, tooth #31. The SDF discolored only the carious tooth structure, but after using a LED curing light to cure the bioactive calcium silicate indirect pulp cap, the remaining tooth surfaces became discolored. To avoid the discoloration shown, bevel the cavosurface margin after light curing or use a self-curing material.

Figure 21. 2023: 2-year follow up, tooth #2. The SDF discolored only the carious tooth structure, but after using a LED curing light to cure the bioactive calcium silicate indirect pulp cap, the remaining tooth surfaces became discolored. To avoid the discoloration shown, bevel the cavosurface margin after light curing or use a self-curing material.

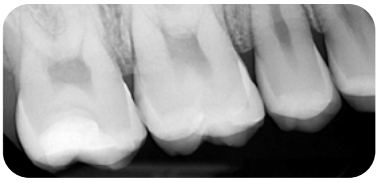


Figure 22. 2023: Radiograph of tooth #2. Two-year followup. Teeth remained vital and asymptomatic post operatively at subsequent follow up appointments. No evidence of the progression or recurrence of decay noted.

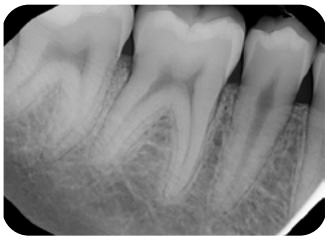


Figure 23. 2023: Radiograph of tooth #31. Two year follow-up. Teeth remained vital and asymptomatic post operatively at subsequent follow up appointments. No evidence of the progression or recurrence of decay noted.

Discussion

The cases presented in this report demonstrate the effectiveness of SDF in aiding the remineralization of tooth structure and preventing further decay in patients of varying ages. Its application extends beyond pediatric dentistry, proving beneficial in both pediatric and adult patients. ***SilverSense SDF*** (Centrix, Inc.) offers a conservative approach to caries management, with the potential to avert invasive treatments such as pulpotomies, root canal therapy, and full coverage restorations.

Conclusion

The use of SDF has shown promising results in clinical practice, aiding in remineralization and preventing decay. Further studies and research are warranted to comprehensively understand the long-term effects and benefits of SDF. Nevertheless, its current applications have demonstrated significant advantages for both patients and clinicians, offering a valuable tool in the conservative management of caries and the preservation of tooth health.

DENTAL ADVISOR
Product insights you can trust.

Translating the Science

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Number 38
dentaladvisor.com

Laboratory Evaluation of STELA Composites

M. Cowen, J.M. Powers

INTRODUCTION:

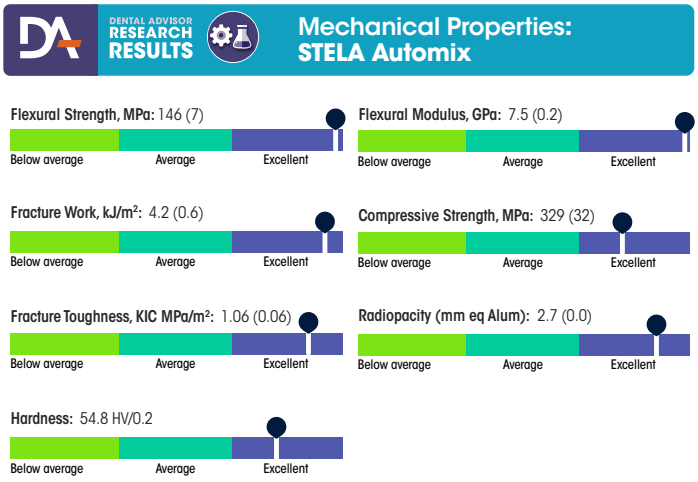
STELA from SDI is a new self-cured composite system which has indications for class I, II, III and V restorations. It has a unique offering of 2 formulations in an automix syringe or capsule. The advantage of the capsule is that it is much more highly filled and allows more shaping before curing, while the automix formulation is ideal for any case which calls for an injectable or flowable composite. ***STELA*** also includes fluoride, calcium and strontium which can help create a positive pH while being BPA and HEMA free.

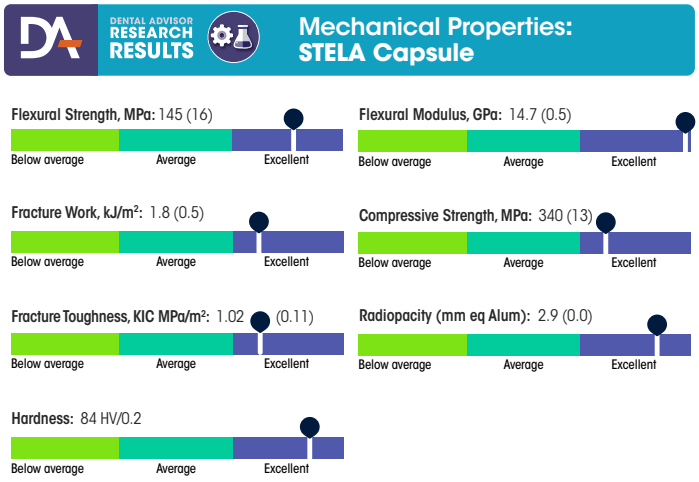
So why use a self-curing composite? The primary advantage of self-curing composite is that they can have an unlimited depth of cure ensuring that all parts of the restoration are cured evenly. Light curing can be both technique sensitive and by the nature of initiating the polymerization process at the outside of the composite, there is potential that in large filling, a gap can be created at the bottom of a restoration. Self-curing will evenly distribute the polymerization stresses across any bonding interfaces with a primer that catalyzes the ***STELA*** composite at the bonding interface, so the interface cures first. Contact-curing primers have a great potential to reduce sensitivity and help ensure gap free margins.

RESULTS SUMMARY:

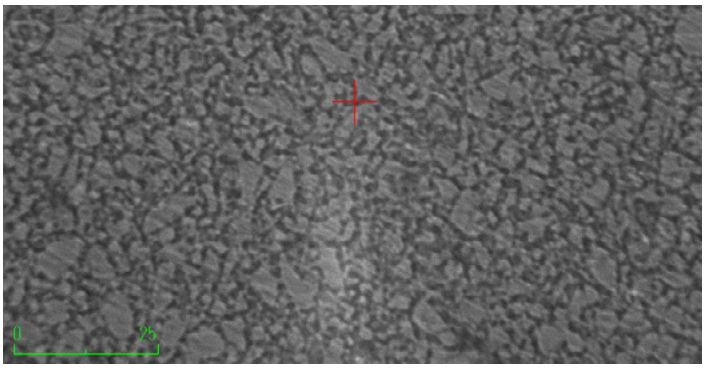
In this study, we tested the mechanical properties of the two formulations, radiopacity, bond strength and a SEM evaluation of the dentin margins to test the gap-free claims. Overall, we found that ***STELA*** has mechanical strength properties which are excellent compared to other composites with an ideal radiopacity. The combination of a self-curing polymerization with a contact curing primer can help ensure good marginal integrity, especially in the bottom of large restorations. ***STELA Automix*** with ***STELA Primer*** showed excellent bond strength, marginal adaptation and no marginal gaps at the bottom of large restorations.

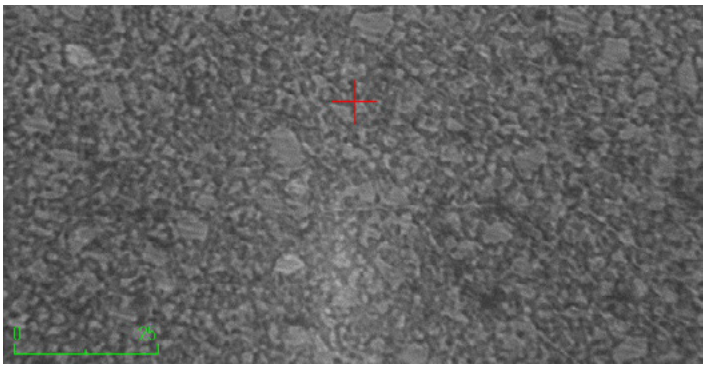
Mechanical Properties





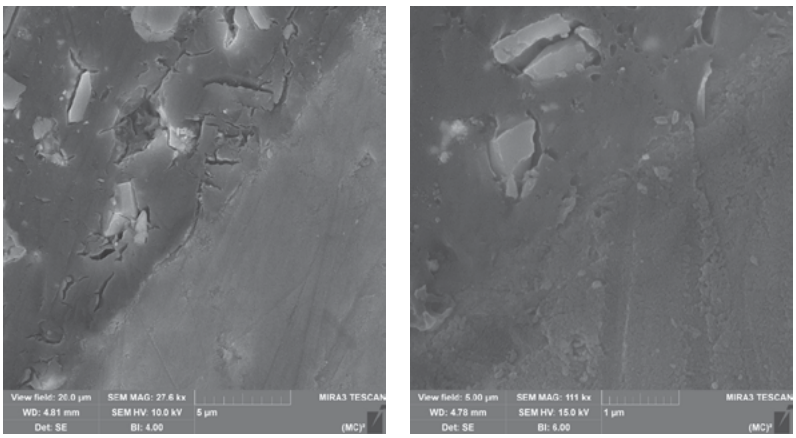
Both formulations exhibit very similar ultimate flexural strength, fracture toughness, compressive strength and radiopacity and closely match the values from SDI's internal testing. The flexural strength is above average for composites, and especially other competitive flowable and capsule-based restoratives we have tested. The main difference between the two formulations mechanically is that the capsule has a larger percentage of fillers which also includes larger filler particle sizes, and this results in a stiffer composite. The capsule version has a modulus that is higher than nearly all composites on the market (typical range 5-12 GPa) which makes it closer to the ideal of enamel modulus. This helps resist occlusal forces better as the composite will bend less during chewing. The advantage of lower modulus of the automix formulation composite is that it can spread stress placed upon them on a larger area which allows them to absorb more total energy represented in the fracture work energy value.



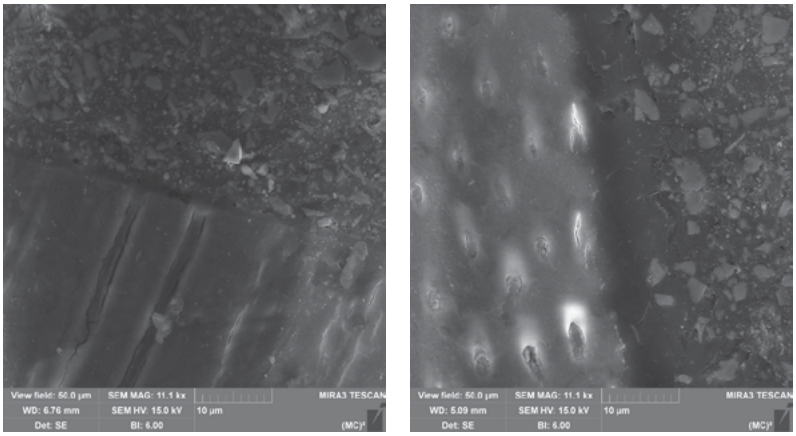


400 X images showing differences in filler distribution. The capsule formulation (left) has larger filler particles which adds to the stiffness of the composite. Any mixed flowable composite needs a larger resin component in order to be able to be extruded, however *STELA* has a particularly strong resin matrix which allows it to have a high flexural and compressive strength.

SEM Evaluation: An evaluation of the margins in tooth restorations placed with very large restorations which would be challenging for light-cured, bulk-filled composites was performed using the Automix Formulation. Tooth restorations were sectioned producing 1 mm cross-sections to evaluate the interfaces.



Enamel margins show good adaptation. Overall, the bonding interfaces to enamel are similar to other composites, with an advantage in dentin margins compared to light-cured composites.

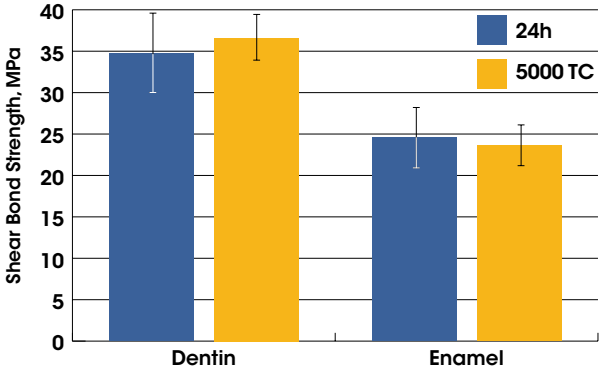


Dentin margins have continuous margins in all reviewed specimens, with evidence of good penetration into dentinal tubules. There could not be a better result in dentin bonding from this evaluation.

Photo courtesy of Dr. Adam Hodges

Radiopacity: Dentin on average has about the same radiopacity as aluminum which is why this is used as the comparison in studies, while sound enamel has about 2X the radiopacity of aluminum. ***STELA*** which has a radiopacity of 2.7-2.9X aluminum should be distinct from tooth structure in restorations.

ISO 29022 Bond Strength Results



There is good bond strength to dentin and enamel in combination with ***STELA Automix*** and ***STELA Primer*** with no significant loss of bond strength after accelerated aging. Mixed failure modes were predominately seen in both enamel and dentin specimens, before and after thermocycling indicating a strong bond as the failure was not at the bonding interface.

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Product insights you can trust.

Biomaterials Research Report
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Number 167 – January 2024

Laboratory Evaluation of Monet Laser Curing Light

M. Cowen, J.M. Powers

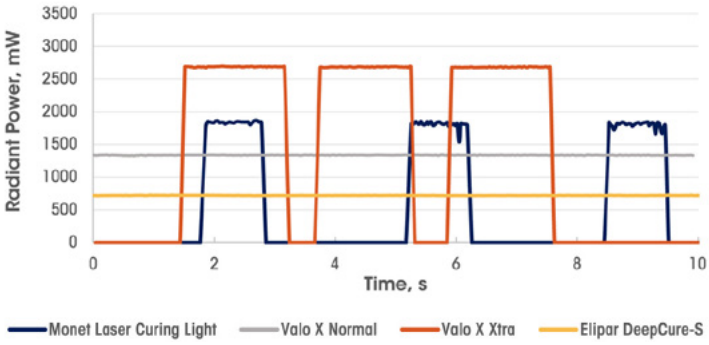
Introduction:

The ***Monet Laser Curing Light*** (AMD Lasers) is the first composite curing light using laser diode technology which solves the challenge of beam collimation in curing light technology. Even the best curing lights on the market typically lose over half of their effective light energy received by the composite when separated by as little as 8-10 mm from the surface of the composite while the ***Monet Laser Curing Light*** would have no significant drop in energy from any clinically significant distance. In clinical situations in which it is difficult to have ideal placement of the curing light, the loss of that much energy means that the composite must be cured for twice the typical time or longer to reach the required energy suggested by the composite manufacturer.

In this study, we compared the ability of the ***Monet Laser Curing Light*** to polymerize 3 different bulk-filled composites compared to popular curing lights on the market, the ***3M™ Elipar™ Deep Cure-S*** (3M) and ***VALO™ X*** (Ultradent). Each of these lights have different power outputs, and wavelengths of light that is emitted. It is important to consider each of these factors when choosing how long to cure any given composite as each composite may have different requirements for achieving the desired depth of cure. We tested the claims that the ***Monet Laser Curing Light*** could cure bulk-filled composites in three 1-second exposures similar to how other curing lights cure in 10 or 20 seconds. We also tested the performance of the curing lights at 2 mm and 10 mm distances from the surface to compare the effect that the superior beam collimation has on composite curing.

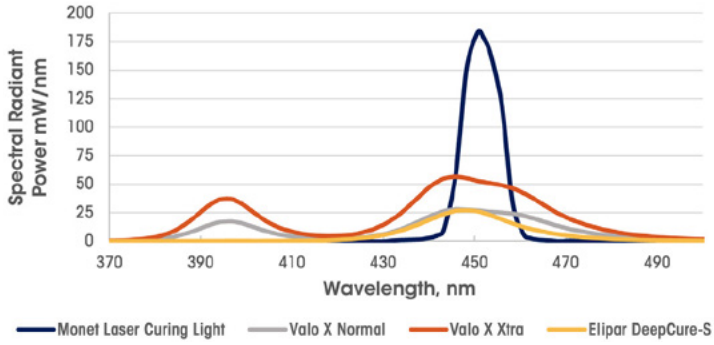
Comparison of Radiant Power:

Radiant Power Over 10 Seconds



This graph shows the total radiant power output of the curing lights. The ***VALO X*** has a pulse mode (Xtra) that is designed to deliver the same total power over 3 pulses as it does with the normal mode over 10 seconds. The ***Monet Laser Curing Light*** activates for 1 second per button press to ensure safe use with such a concentrated light source. As you can see from the Spectral Radiant Power graph, some of the power output from the ***VALO X*** in the UV range is not useful in curing the composites used in this study.

Spectral Radiant Power



This is the spectral radiant power of the curing lights. Camphorquinone (CQ) is the most common photoinitiator in composites and reacts to light in the 430 – 510 nm range with an absorption peak around 468 nm. The peak of the ***Monet Laser Curing Light*** is closer to the peak of CQ which means more of the light output is applied to activating CQ. The ***VALO X*** has an LED in the UV range which means that some of the power output won't significantly affect the curing of a composite which only contains a CQ photoinitiator.

The Composites:

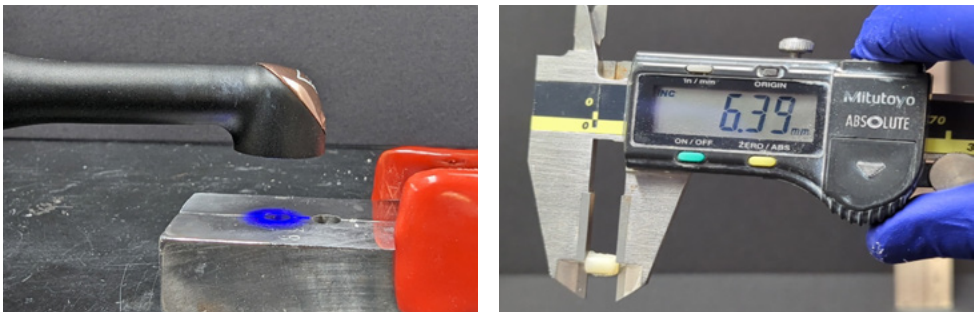
Composite	Instructions
3M™ Filtek™ One Bulk Fill (3M)	For 4 mm increment depth in one curing direction, cure for 20 seconds with LED light over 1000 mW/cm²
OMNICHROMA® Flow Bulk (Tokuyama Dental)	For 3.6 mm increment depth in one curing direction, cure for 20 seconds with LED light over 1000 mW/cm²
SonicFill 3 (Kerr)	Cure for 10 seconds with LED light over 1000 mW/cm² from a single occlusal cure

3M Filtek One Bulk Fill and ***SonicFill 3*** also suggest curing for three 10 second exposures (buccal, lingual, occlusal) for class 2 restorations or posterior restorations. In this study, to directly compare the curing performance of the curing lights, we only cured from one direction.

Depth of Cure Testing Methods:

ISO 4049 Depth of Cure Method:

The most common method for measuring depth of cure is based on the ISO 4049 standard for polymer-based restorative materials. This method takes a cylinder of composite cured in a metal mold, gently removes the soft uncured composite with a plastic spatula and measures the height of the remaining cylinder before dividing the height by half. This is because there is a gradient of composite that is cured, with the most polymerization at the top, until just barely enough polymerization at the bottom to keep its form. This test method was developed more than 4 decades ago to test the first composites on the market, and for the most part, does a good job of estimating the depth of cure in a quick test. However, there are now many factors that affect polymerization in modern composites as bulk-filled composites were developed to increase the depth of cure with secondary initiators or polymerization accelerators, which have been able to increase the depth of cure but is not captured by this simple "scrap-back" estimation method.



ISO 4049 "Scrap-back" Test Method: Half of cured composite = depth of cure

Hardness Depth of Cure Method:

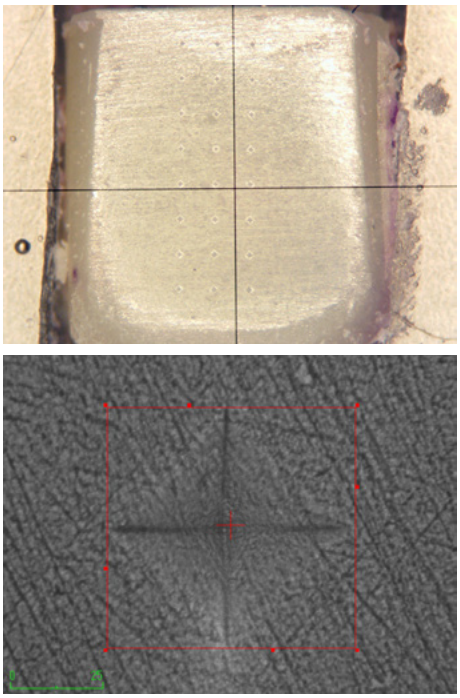
In an attempt to directly measure the depth of cure of composites, a common quantitative method is used by measuring the hardness of the composite at different depths as the hardness of the composite is correlated to the polymerization of the resin. For hardness testing, a diamond indenter is pressed into the surface with a defined force and the resulting size of the dent made in the composite is measured. A larger indent means that the composite resisted the force less, resulting in a lower hardness measurement. A ratio of 80% of the maximum hardness of a given composite is a common standard used for clinically acceptable hardness.

DENTAL ADVISOR Method:

In this study, we combined these two tests by curing composite in a mold according to ISO 4049, and then let the cylinder cure for 24 hours in 35°C water as composite can continue curing over that time. Then the cylinder was mounted, and the hardness measured every 0.5 mm from the top of the cylinder. The values are compared to a reference hardness of the composite cured under ideal circumstances, and the depth of cure was determined to be the point in which the composite at a given depth is at 80% of the maximum hardness of the composite.

In this study, we also measured the depth of cure at a 2 mm distance and 10 mm distance from the surface to measure the effect the beam collimation had on curing the composites.

This is the ***Mini Gig*** (MSC15-W, Ultradent Products, Inc.) spectroradiometer with integrating sphere which accurately measures radiant power and spectral emission (wavelengths of light).



Hardness Method: Larger indents = lower hardness

Depth of Cure Results:

3M Filtek One Bulk Fill:

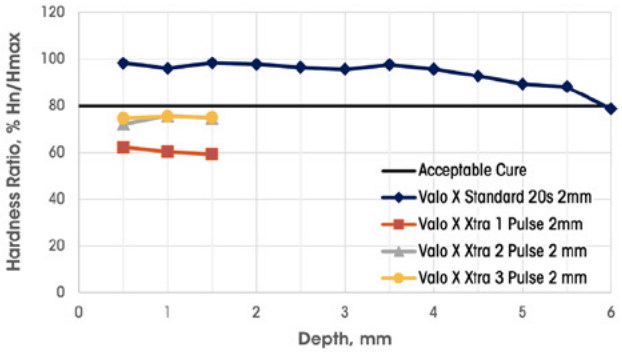
For ***3M Filtek One Bulk Fill***, the hardness depth of cure method showed a greater depth of cure compared to the ISO method for this composite. The ***Monet Laser Curing Light***'s three 1-second curing exposures were roughly equivalent to 20 seconds of curing with the ***3M Elipar DeepCure-S*** and ***VALO X*** with this composite. This testing suggests ***3M Filtek One Bulk Fill*** is effective at curing with short exposure times.

In all of the test results, there was no significant difference in curing depth from 2 or 10 mm with the ***Monet Laser Curing Light*** as expected. For hardness ratio testing, any differences lower than about 0.3 mm is within the range of error of the test as the measurements are made every 0.5 mm of depth, and the depth of cure is simulated by a mathematical regression line in between these indents.

OMNICHROMA Flow Bulk:

For ***OMNICHROMA Flow Bulk***, this composite appears to require longer exposure times in order to fully polymerize or reach an acceptable hardness, but once the composite reaches a threshold of enough light energy, it will continue curing to a greater depth. This may be due to the initiator technology as some composites include inhibitors to slow polymerization to lower shrinkage stresses. In any case, after three 1-second cures, the ***Monet Laser Curing Light*** was able to effectively cure to over a 3.5 mm depth described in the manufacturer IFU. We would suggest 4 or 5 seconds of total curing exposure for this composite as a safety margin if curing this composite in bulk to account for any inefficiencies in curing light placement during the light curing procedure. This is an important example that although a composite may appear to be hard and in one piece, it may not be fully polymerized, even on the surface.

OMNICHROMA Depth of Cure by Hardness Ratio



SonicFill 3:

For ***SonicFill 3***, the hardness depth of cure and ISO depth of cure is in closer alignment, similar to traditional composites. ***SonicFill 3*** in particular requires multiple exposures from different directions in order to cure in bulk-filled cases though the instructions state that 10 seconds of curing is sufficient for occlusal curing. For this composite, the ***Monet Laser Curing Light*** after two 1-second esposures cured to a greater depth than 10-second exposures for the ***VALO X*** and ***3M Elipar DeepCure-S***.

3M Filtek One Bulk Fill

	Distance	ISO DoC	Hardness DoC
3M Elipar DCS 20 seconds	2 mm	3.6	5.7
	10 mm	3.2	5.5
Monet Laser Curing Light 1 exposure	2 mm	2.6	3.1
	10 mm	2.6	3.1
Monet Laser Curing Light 2 exposures	2 mm	3.0	4.6
	10 mm	3.0	4.3
Monet Laser Curing Light 3 exposures	2 mm	3.3	5.5
	10 mm	3.3	5.3
VALO X 20 seconds	2 mm	3.4	5.1
	10 mm	3.0	4.7
VALO X Xtra 1 exposure	2 mm	2.4	2.7
	10 mm	2.0	2.2
VALO X Xtra 2 exposures	2 mm	2.7	3.7
	10 mm	2.4	3
VALO X Xtra 3 exposures	2 mm	3.0	4.1
	10 mm	2.6	3.3

OMNICHROMA Flow Bulk

	Distance	ISO DoC	Hardness DoC
3M Elipar DCS 20 seconds	2 mm	4.0	6.5
	10 mm	3.6	5.5
Monet Laser Curing Light 1 exposure	2 mm	0	0
	10 mm	0	0
Monet Laser Curing Light 2 exposures	2 mm	2.6	0
	10 mm	2.6	0
Monet Laser Curing Light 3 exposures	2 mm	3.0	3.9
	10 mm	3.0	3.6
VALO X 20 seconds	2 mm	3.7	6.0
	10 mm	3.3	5.1
VALO X Xtra 1 exposure	2 mm	2.0	0
	10 mm	2.0	0
VALO X Xtra 2 exposures	2 mm	2.7	0
	10 mm	2.4	0
VALO X Xtra 3 exposures	2 mm	2.8	0
	10 mm	2.4	0

SonicFill 3

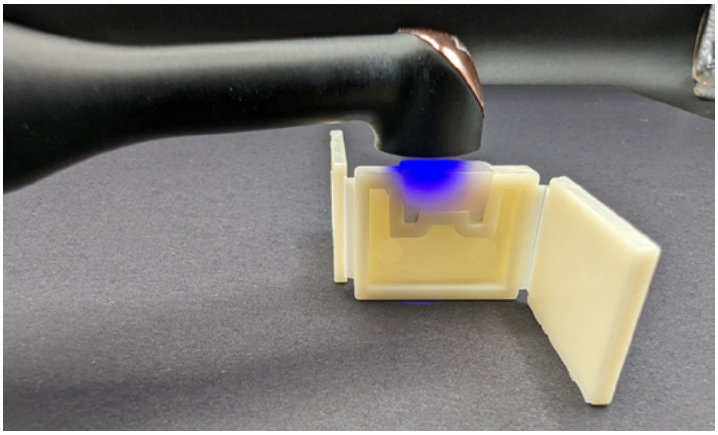
	Distance	ISO DoC	Hardness DoC
3M Elipar DCS 20 seconds	2 mm	2.7	2.7
	10 mm	2.3	2.5
Monet Laser Curing Light 1 exposure	2 mm	2.1	1.5
	10 mm	2.1	1.3
Monet Laser Curing Light 2 exposures	2 mm	2.4	2.8
	10 mm	2.4	2.5
Monet Laser Curing Light 3 exposures	2 mm	2.6	2.9
	10 mm	2.6	3
VALO X 20 seconds	2 mm	2.6	2.6
	10 mm	2.3	1.8
VALO X Xtra 1 exposure	2 mm	2	0
	10 mm	1.6	0
VALO X Xtra 2 exposures	2 mm	2.2	2.2
	10 mm	1.9	1.8
VALO X Xtra 3 exposures	2 mm	2.4	2.4
	10 mm	2.1	1.6

MOD Filling Simulation:

Another useful curing test is with a mold from Ultradent, that simulates an MOD filling which is 11 mm across the top surface, up to 7 mm deep at the proximal box and 5 mm deep at the center. We cured composite in these molds from the top surface only to visualize differences in beam width and depth of cure, and then soaked the composite in acetone for 18 hours which turns uncured composite into a chalky white color to reveal areas of under-cured composite. Of course, if this restoration were to be performed clinically, then the proximal boxes should be cured from different directions rather than just occlusally.

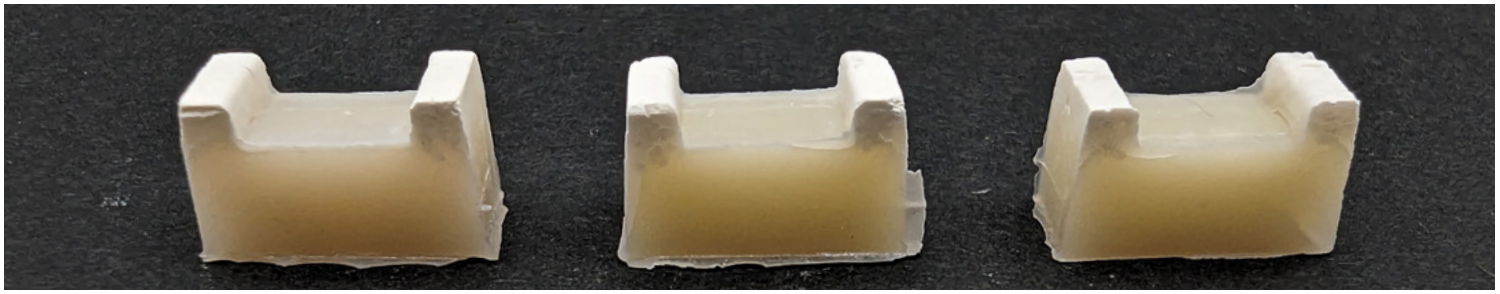
The ***Monet Laser Curing Light*** suggests that for composite restorations wider than 8 mm multiple exposures should be performed, so one set of three 1-second exposures were performed over each proximal box compared to 20 second exposures from the ***VALO X*** and ***3M Elipar DeepCure-S*** for each composite.

The ***Monet Laser Curing Light*** shows over 5 mm depth of cure for ***3M Filtek One Bulk Fill***, about 5 mm depth of cure for ***OMNICHROMA Flow Bulk*** and approximately 4 mm depth of cure for ***SonicFill 3*** in this test.



This is the Ultradent MOD mold with the sides exposed revealing the cured composite. The ***Monet Laser Curing Light*** has a low powered aiming light for help with aiming the ***Monet Laser Curing Light*** before exposure. As this is a laser, wearing proper safety eyewear is important as should be done with all curing lights.

3M Filtek One Bulk Fill:

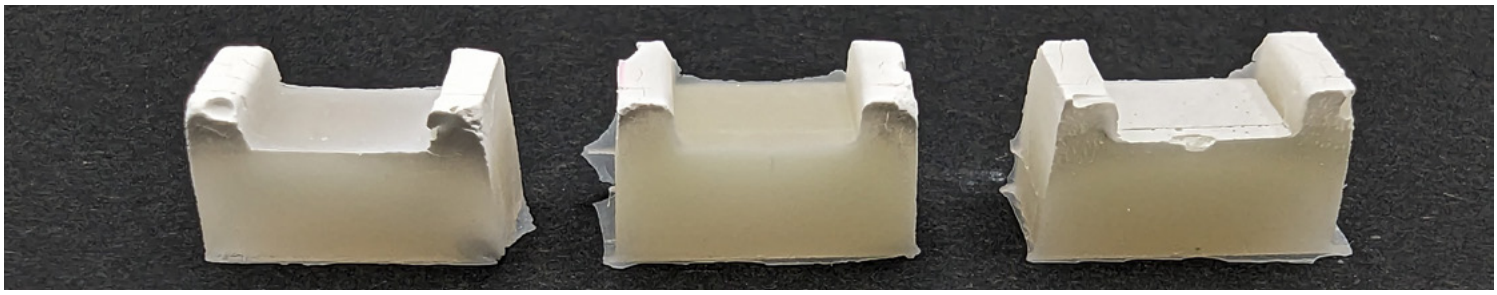


Monet Laser Curing Light
2 x 3 1-second exposures

3M Elipar DeepCure-S
20 seconds

VALO X
20 seconds

OMNICHROMA Flow Bulk:



Monet Laser Curing Light
2 x 3 1-second exposures

3M Elipar DeepCure-S
20 seconds

VALO X
20 seconds

SonicFill 3:

Monet Laser Curing Light
2 x 3 1-second exposures

3M Elipar DeepCure-S
20 seconds

VALO X
20 seconds

ZenSeal™

Kerr www.kerrdental.com

+++++

27 CLINICAL EVALUATORS

204 TOTAL USES

96% CLINICAL RATING

Key features: Bioceramic • Premixed • Hydrophilic

Description

ZenSeal™ is a root canal sealer that:

- Is calcium-silicate based
- Requires no mixing
- Offers high flowability

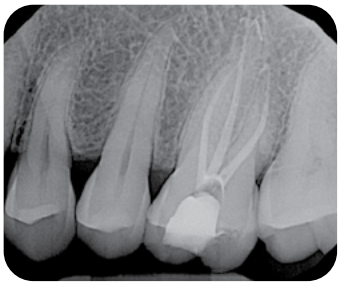
Indications

- Permanent obturation of the root canal following vital pulp-extirpation, removal of infected or necrotic pulp and placement of intracanal dressings.
- ***ZenSeal™*** is suitable for the single-cone technique.

Unique Attributes

- Syringe with small tip allows for direct placement into the canal
- Premixed
- Active components mimic MTA
- Low film thickness

Courtesy of Dr. Wasim Hanna



#14 cracked tooth syndrome with severe tenderness to percussion, *GuttaCore* used with *ZenSeal*

Clinical Tips

- Mark the disposable tips to measure depth and avoid overfilling.
- Place the material quickly as it does set up faster than we would normally expect.
- It is not necessary to pump the gutta percha as the cement will flow into the cleaned areas.
- After thoroughly instrumenting, cleaning and drying the canal, place the cement into the canal and gently place your gutta percha.
- Extrude material very slowly, with little pressure, through the needle tip into the canal withdrawing slowly as the material extrudes.
- Push gently on the syringe, a little goes a long way.

"GREAT SEAL AND EASY TO USE."

Evaluators' Comments

"Excellent flow characteristics and radiopacity. I tried it with both the stock syringe tips included with the sealer and the minimal waste tips and it flowed beautifully."

"The small application tip was great to work with."

"Unable to utilize for warm vertical condensation."

"Using a syringe to inject into the canal can result in overfilling of the canal."

Consultants who would:

96% Recommend to a colleague

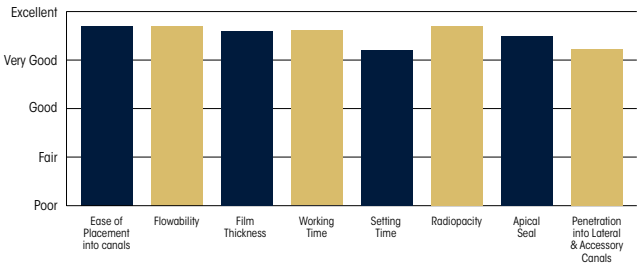
Consultants who would want to stock in office:

44% Yes, instead of current product

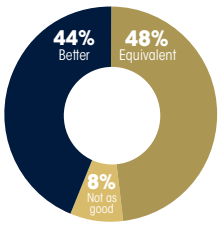
48% Yes, in addition to current product

4% I might want to order this product for certain cases

Evaluation Summary:



Compared to Competitive Products:



CLINICAL EVALUATION

3M™ Filtek™ Easy Match Universal Restorative

3M 3M.com/dental

++++

RATING SYSTEM: Excellent +++++ Very Good ++++ Good +++

DENTAL ADVISOR ++++

33 CLINICAL EVALUATORS

659 TOTAL USES

88% CLINICAL RATING

Key features: Three-shade composite • Intuitive shade selection • Blending effect

Description

3M™ Filtek™ Easy Match Universal Restorative is a simplified shade composite system with bright, natural, and warm shades to enable a faster shade selection process.

Indication

- All anterior and posterior composite restorations, all classes

Unique Attributes

- Intuitive shade selection
- Naturally adaptive opacity
- Takes on a dentin-like-opacity at thicknesses >2 mm
- Takes on an enamel-like-translucency at thicknesses between 0.5 and 0.75 mm

Pre-op: #9-11

Prep: #9-11

Post-op: #9-11

Clinical photos courtesy of Dr. Adam Hodges

Clinical Tips

- In the anterior, make sure your bevel is at least 2-3 mm in length as a short bevel is difficult to blend.
- Write the shades it matches on the bottle, so you don't have to remember bright, warm, natural.
- Use a warmer for easier handling.*
- Familiarize yourself with the 3 shades first by curing buttons on the tooth.

**Warm capsules up to 70°C/158°F for up to 1 hour per 3M guidelines.*

"COLOR MATCHING FOR ALMOST EVERY INDICATION."

Evaluators' Comments

"Deep posterior Class II restorations were done with exceptional ease of handling and polishing."

"I thought in Class V situations the esthetics were especially good."

"I did several chairside veneers with beautiful and easy results."

"Less inventory management with only 3 shades and excellent handling and physical properties."

" Make it one shade only."

Consultants who would:

85% Recommend to a colleague

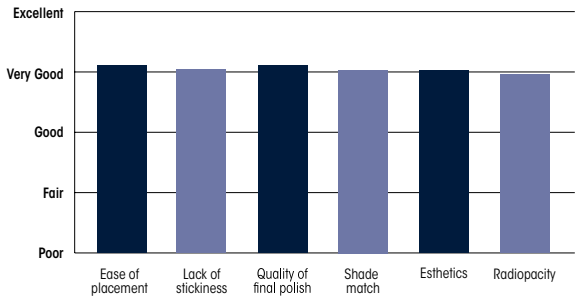
Consultants who would want to stock in office:

21% Yes, instead of current product

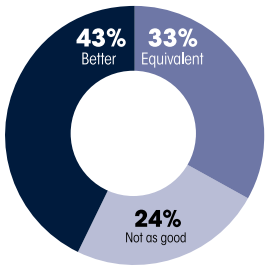
40% Yes, in addition to current product

24% I might want to order this product for certain cases

Evaluation Summary:



Compared to Competitive Products:



Strata-G™

Garrison Dental Solutions www.stratagmatrix.com

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DENTAL ADVISOR ++++

17 CLINICAL EVALUATORS

514 TOTAL USES

88% CLINICAL RATING

Key features: Forms a 270° Seal™ • Strong Tooth Separation • StrataBond™ Silicone Tips

Description

Strata-G™ is a sectional matrix system which includes rings, bands and wedges as well as an instrument for ring placement.

Indication

- Creation of tight contacts on Class II composite restorations.

Unique Attributes

- Drawn-wire nickel titanium rings plus PEEK reinforcement in the tips produces consistent separating pressure longer, retaining shape over time.
- Marginal ridge enhancements built into the matrix bands and rings help provide finishing flair.
- New pedodontic size.
- Newly designed wedges that sit deeper in the preparation and have more flexible sidewalls.

Photos courtesy of Dr. Mark Lai

#3 Comp placed

#3 Comp prepped

#3 Comp prepped with band placed.

#3 Post-op

- The ***Strata-G™*** rings, bands and wedges combine for a 270° Seal™ for ultimate flash control. The rings won't spring off the tooth, and the Wide Preparation ring makes tough wide preparations no problem.

Clinical Tips

- The contour on the matrix can sometimes make it difficult to seat fully if there is crowding; switching to a smaller size will help.
- In conservative preparations, place the wedge first to separate the contacts so it is easier to insert the metal matrix band and not damage it. Once the metal matrix band is inserted, you can readjust the position of the wedge so that it presses against the band and adapts it to the tooth.
- Do not burnish above the height of contour for the contacts. This will overextend the marginal ridge. Burnishing lower and letting the band contours come off the proximal ridge leads to much less need for adjustment and better contours.

"GREAT FOR TREATING ADJACENT TEETH IN SUCCESSION."

Evaluators' Comments

"I like the tight, reliable contacts the matrix system helped me achieve."

"Excellent adaptation of the ring to the tooth and the preparation, and the grip of the forceps on to the ring."

"It is nice to have rings that are specifically designed for wider or deeper preps."

"Many ring sizes to choose from."

"Make the bands less rigid."

"Redesign the wedges."

Consultants who would:

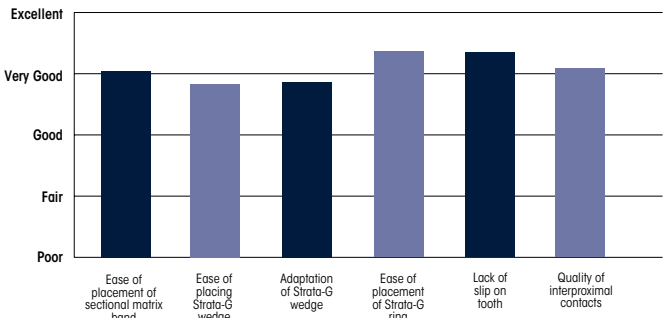
93% Recommend to a colleague

Consultants who would want to stock in office:

44% Yes, instead of current product

45% Yes, in addition to current product

Evaluation Summary:



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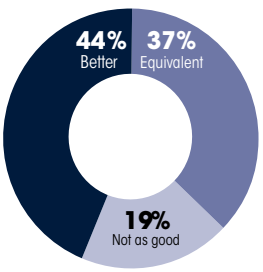

MI Paste® ONE Perio

GC America, Inc. www.gc.dental/america

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DENTAL ADVISOR ++++

41 CLINICAL EVALUATORS

958 TOTAL USES

89% CLINICAL RATING

Key features: 2-in-1 application • Anti-gingivitis • Sensitivity reduction

Description

MI Paste® ONE Perio is a one-step, stannous fluoride toothpaste which contains RECALDENT®.

Indications

- For use as an everyday toothpaste
- Great for patients at high risk for caries or sensitivity, ortho patients and those with active gingivitis
- 2-in-1 application: Contains anti-gingivitis toothpaste and MI Paste Plus®

Unique Attributes

- Contains stannous fluoride which effectively creates a long-lasting, anti-biofilm to help prevent and treat gingivitis
- Penetrates biofilms and enamel.
- Binds to tooth surfaces to localize bio-available minerals of calcium, phosphate and fluoride
- Works as emulsifier and chelating agent for effective stain removal.

Clinical Tips

- Provide printed instructions for the patient so that changes in routine will be remembered.
- Demonstrate the amount of paste to be used so that it is not over a pea size, as most people tend to use a ribbon.
- Recommend to your referring orthodontist to use on all mutual orthodontic patients.

"I'M A BIG FAN OF MI PASTE, SO THIS IS A GREAT ADDITION."

Evaluators' Comments

"It had the consistency and flavor of any other regular toothpaste."

"Made my teeth feel clean and smooth after using even though it did not feel abrasive at all."

"Post op sensitivity was reduced drastically while using MI Paste ONE Perio."

"I like this concept for ortho patients."

"Make a larger tube with a flip-top cap."

Consultants who would:

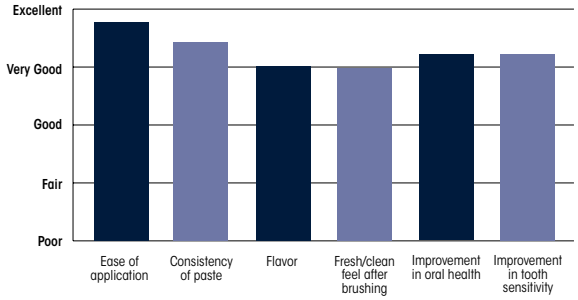
90% Recommend to a colleague

Consultants who would want to stock in office:

83% Yes, would purchase again

17% No, would not purchase again

Evaluation Summary:



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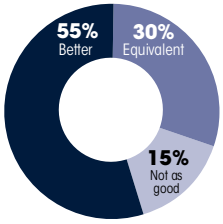

SimpliShade™ Bulk Fill

Kerr www.kerrdental.com

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DENTAL ADVISOR ++++

56 CLINICAL EVALUATORS

1034 TOTAL USES

89% CLINICAL RATING

Key features: No capping layer • 5 mm depth of cure • Single shade

Description

SimpliShade Bulk Fill is a bulk fill composite that:

- Requires no capping layer
- Is one shade that covers all 16 VITA classical shades
- Utilizes special nanofiller architecture which mimics natural enamel structure and interacts with light for indistinguishable blending

Indications

- Direct placement in anterior and posterior teeth
- Core build-ups
- Repair of defects in restorations

Unique Attributes

- ART³ Technology - Adaptive Response Technology which offers easy handling and low shrinkage
- One shade blends with 16 VITA Classical shades
- Cures up to 5 mm
- Special nanofiller architecture mimics the natural enamel structure and interacts with light for virtually indistinguishable blending

Images courtesy of Dr. Ashton Prince

#3 MO, #4 MOD, #5 DO Before

#3 MO, #4 MOD, #5 DO After

Clinical Tips

- Compress material well against the preparation walls.
- If a tooth is between shades, this is a great product to choose.
- Always cure from the buccal, lingual, and occlusal surfaces.
- Pack well and cure material completely.
- Useful for cervical lesions.

"SCULPTS INTO SHAPE AND IT STAYS WITHOUT SLUMPING."

Evaluators' Comments

"I was able to work much quicker with Class II restorations and on children with this product."

"Didn't stick to instruments while manipulating."

"No capping layer required – a great feature!"

"No fluoride release"

"Excellent seal but visible pending the shade of the tooth"

"Offer different shades with translucency."

Consultants who would:

95% Recommend to a colleague

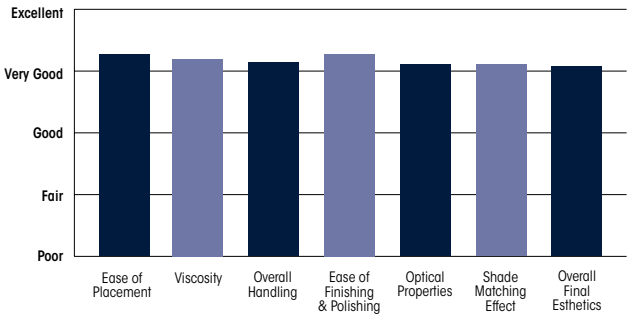
Consultants who would want to stock in office:

21% Yes, instead of current product

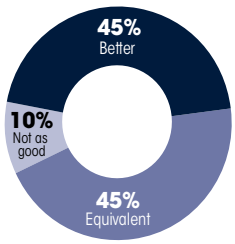
57% Yes, in addition to current product

22% I might want to order this product for certain cases

Evaluation Summary:



Compared to Competitive Products:



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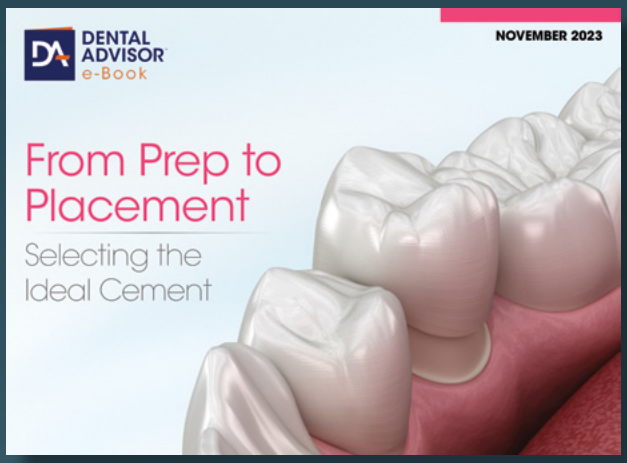

eBook

Motion Graphic Video

Motion Graphic Video

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Clinical Video

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