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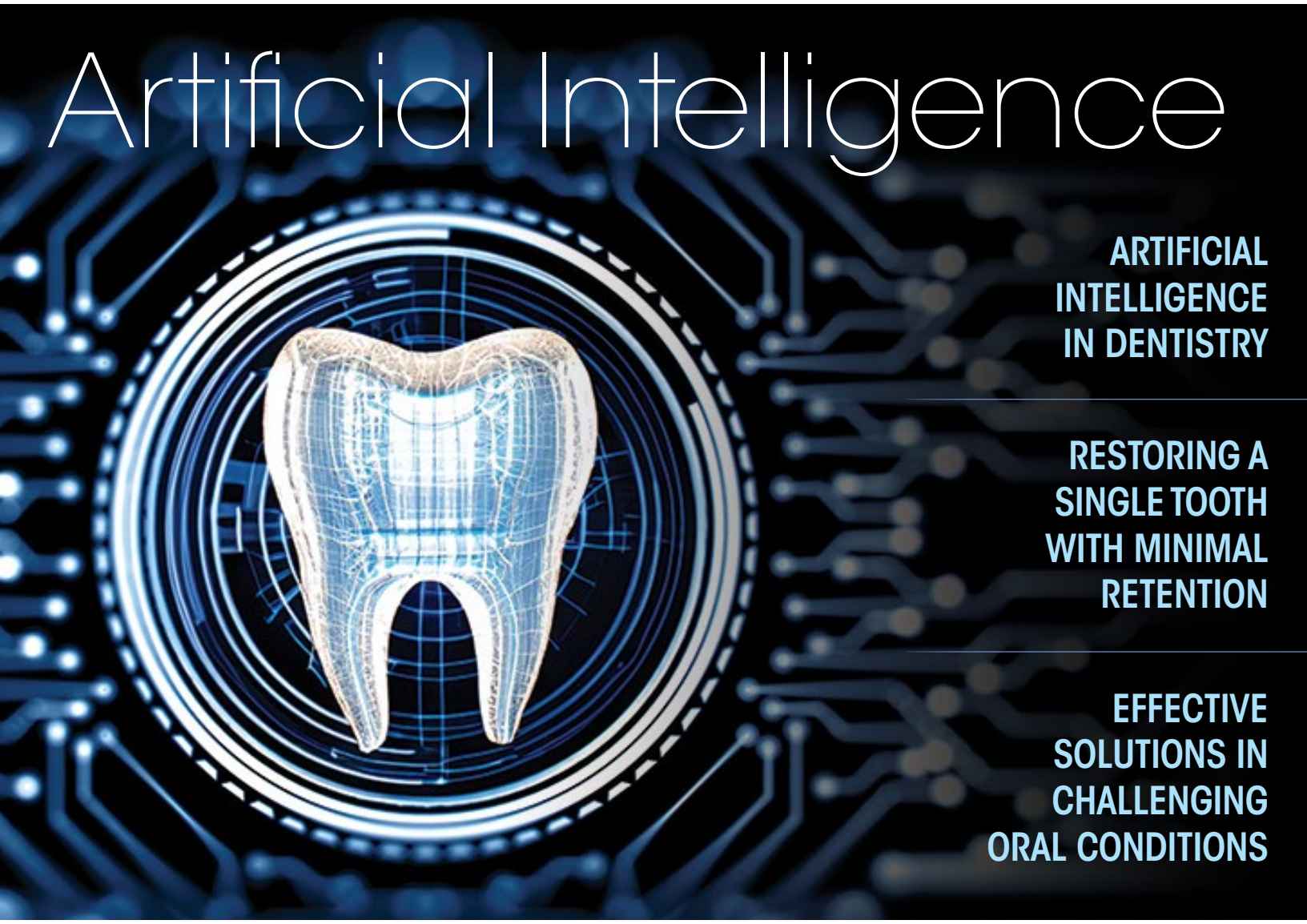
# DENTAL ADVISOR™

Product insights you can trust.

# Artificial Intelligence



## ARTIFICIAL INTELLIGENCE IN DENTISTRY

## RESTORING A SINGLE TOOTH WITH MINIMAL RETENTION

## EFFECTIVE SOLUTIONS IN CHALLENGING ORAL CONDITIONS

DENTAL ADVISOR
Product insights you can trust.

**NOV-DEC, 2023**
VOL. 40 NO. 6

FROM THE DESK OF
*Dr. Sabiha S. Bunek*
*CEO & Editor-in-Chief*



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We have all dealt with Artificial Intelligence somewhere in our lives, whether we realize it or not. From listening to music, watching movies, online shopping, talk to text, asking ***Siri*** or ***Alexa*** for something, it is a part of everyday life. In dentistry, we are also using AI to drive co-diagnosis and using it in treatment with various devices. Dentists are using tools to both diagnose and treat dental conditions, and the business team is even using AI to pre-determine dental claims, submit dental claims, and to schedule and confirm appointments. Patients are using AI to self-diagnose symptoms online. This month we look at the current state of AI in dentistry - where it is being used, potential concerns, and advantages. Feel free to reach out to me personally with questions at drbunek@dentaladvisor.com or to our team at connect@dentaladvisor.com. As always, thanks for reading!

*— Sabiha S. Bunek*

## CLINICAL EVALUATOR PROFILE

### Education and Professional Involvement

**Dr. Jack Nash**

- Associate Degree in Science from Delta College, 1971
- Graduated with honors from Central Michigan University, 1973
- DDS degree from University of Michigan Dental School, 1977
- Mastership with the Academy of General Dentistry
- Senior Consultant for DENTAL ADVISOR
- Served as a Dental Consultant for 3M
- Graduate of 3M Council on Innovative Dentistry
- Distinguished Alumnus Delta College, 2006
- Former adjunct professor Delta College

### Past and Present Community Involvement

- President, Positive Results Downtown Saginaw
- City of Saginaw's Zoning Board of Appeals
- Commissioner of the City Planning Board
- Served on the Board of the YMCA for the past twelve years, and is the current president
- NAACP Life Member
- Graduate of Leadership Saginaw
- Alpha Phi Alpha Fraternity
- Previously active with Saginaw Community Foundation
- Previously active in the Boys and Girls Club
- Previously active in the Boy Scouts of America (Eagle Scout Recognition)
- Previously active in the Saginaw Friendship Games
- Previous Little League sponsor and coach
- Grand Marshall of the Saginaw Christmas Parade, 2015

**Dr. Jack Nash on bass performing with the Robert Lee Revue**

With all of the time that Jack commits to improving the quality of life for the citizens of Saginaw County and the Great Lakes Bay Region, he still dedicates quality time to one of his favorite things, playing music. He is a bass player with Robert Lee Revue and is often seen at charitable and community events.

Jack has received the Freedom Fund Award for leadership in 2010 from the NAACP, the Legacy Civic Fund Award in 2013, the Alpha Phi Alpha Community Service Award from the oldest black fraternity in the United States, the Willie Thompson Community Service Award, the Henry Marsh Award from Leadership Saginaw and the Thurgood Marshall Boy Scout Award.

Dr. Nash and his wife, Janet, have been married for over 40 years and have two children, Phillip, 39, and Gretchen, 37.

**We would like to express our sincere gratitude to Dr. Jack Nash for his commitment and contributions to DENTAL ADVISOR.**

# What is Artificial Intelligence?

**Simply defined, artificial intelligence is the act of training machines to work and behave like humans.** First, AI must discover the problem, make inferences, and use reason to complete a task or form a solution.

## There are levels to AI:

**Machine Learning** focuses on training machines to act like humans via data feed. AI then draws conclusions and makes predictions based on the available datasets. The data are used to learn and experience via algorithms created.

**Deep Learning** mimics the human brain. It uses neural networks to solve complex problems. By making sense of patterns, it can model the mind and segregate patterns into layers of comparable data.

**AI is designed to reason and provide solutions.** There is both strong AI and weak AI. **Weak AI** can only respond to what it is programmed to do; so many "smart" products can only function to the point at which they are trained. Even ***Alexa*** or ***Siri*** can be stumped. **Strong AI** can perform more intellectual tasks; however, some question the validity of the data.

# Artificial Intelligence as a Diagnostic Tool

**In dentistry, we have seen the advent of predictive software, particularly in caries detection and radiography.** Some examples of this technology are ***Pearl Second Opinion®, Overjet, Logicon*** (Carestream Dental) and ***Videa Health***. These programs work by analyzing radiographs and interpreting the data using a large dataset of images by which the programs were trained. The programs can detect both caries and bone loss levels. Combining this with diagnosis from the Doctor, it can enhance case presentation for clinicians and provide visual data for a patient to better understand their condition.

## A Clinician's Viewpoint:

Dr. Matthew Miller

**Being able to use AI as "another set of eyes" when attempting to properly diagnose current conditions for our patients is a fantastic aid.** A patient's ability to hear or see a confirmation that supports an initial view and takes the bias out of a diagnostic opinion can only be a positive tool. For many, it takes "seeing" rather than "hearing" to believe or understand what is being told to them. Assuming AI is going to diminish human diagnostic skills is far from correct. It actually gives clinicians the chance to see things in a different way and help improve skills as our eyes are opened to different possibilities.

***OraQ™ AI*** (OraQ AI Inc.) is a real-time, treatment planning software. It is designed around AI and machine learning and uses patient assessment tools and risk profiling as well as health history, images, and radiographs to recommend treatments for patients. It was designed by dentists who found time savings in utilizing AI to predict potential treatment needs for both simple and complex cases.

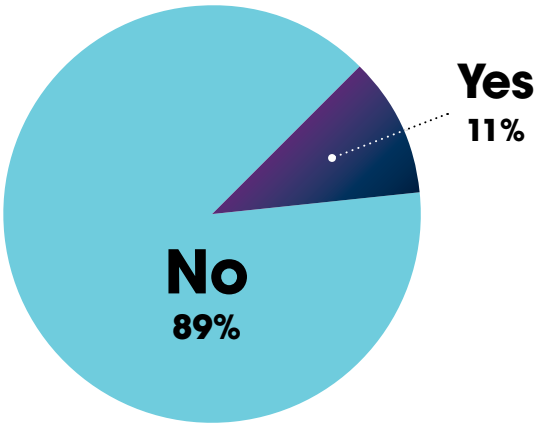
## A Clinician's Viewpoint:

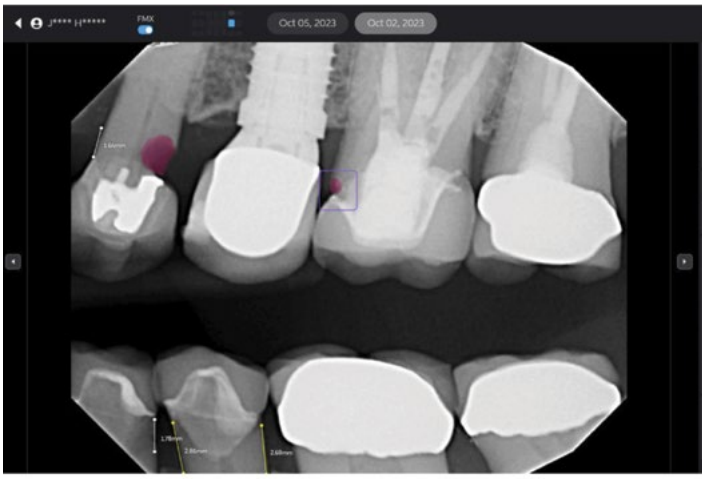
Dr. Ashton Prince

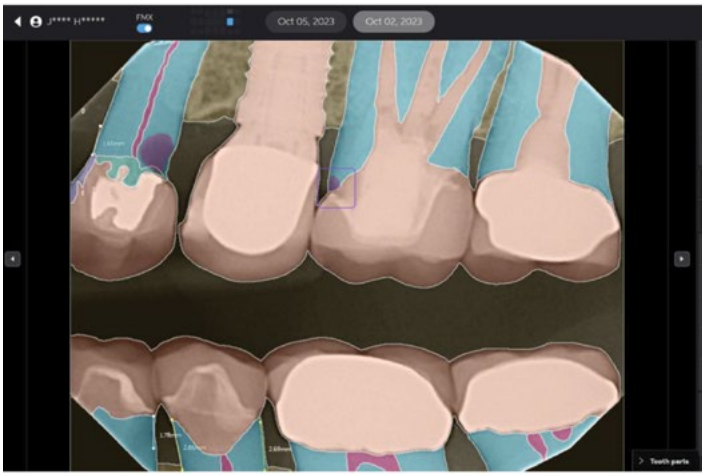
**Despite the advancements in AI, there remains a critical need for continued oversight by clinical professionals.** AI tools should be viewed as aids rather than substitutes for human expertise. Dentists must validate and fine-tune AI-generated recommendations, ensuring they align with the unique needs of each patient. This collaborative approach, combining AI capabilities with the discernment of dental professionals, is crucial for achieving the best outcomes in dental care.

## We Asked our Consultants:

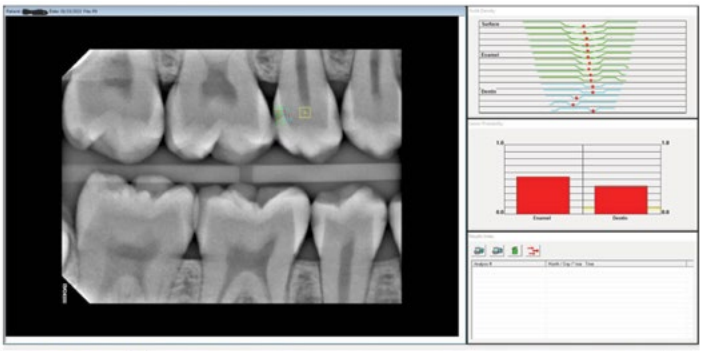
**Do you use Diagnostic AI in your practice?**




**Pearl Second Opinion® software**



**Logicon software** (Carestream)

A dental assistant uses CEREC® PrimeScan (DENTSPLY Sirona) introral scanner on a patient.

# Artificial Intelligence as Treatment

**This is an area where many dentists are unaware that AI is being utilized**. Many intraoral scanners, implant planning software, and 3D printers have embedded AI as a predictor into their software, using algorithms to predict margins for impression taking and design of restorations. ***fastscan.io™*** (Glidewell), ***iTero™*** (Align Technologies), ***CEREC® PrimeScan*** (DENTSPLY Sirona), ***3 Shape TRIOS®*** (3 Shape), ***i700*** (Medit) and ***DEXIS™ IS 3800*** (Dexis) are scanners that provide suggested data for areas that are more difficult to scan or where the scanner cannot see properly. All treatment proposals generated by these devices utilize the data scanned as well as data points that allow for inferences in crown design. They can also assist in smile design for orthodontic cases. In 3D printing (***SprintRay, Ackuretta, Form Labs, fastprint.io*** [Glidewell]) or milling, the design software takes the data and performs interpretation using algorithms and historical data to minimize errors in milling and printing final restorations and appliances. CAD/CAM technology has allowed for virtual reconstruction of the entire dentition, taking into account horizontal, vertical, and coronal dimensions as proposals are created.

The ***CS9600*** (Carestream Dental) uses AI to predict proper positioning, enabling the dental team to take accurate cone beam images. Cone Beam Technology (CBCT) uses AI in several different aspects, both for diagnostics and for treatment and case planning. Software packages such as ***DTX Studio™ Clinic*** (Dexis) ***DSCore™*** (Dentsply Sirona), and others, allow for patient data from radiographs, intraoral images, and intraoral scans to be analyzed together for 2D and 3D renderings, making treatment planning much more comprehensive and collaborative as they can be used simultaneously by general practitioners, specialists and laboratories. Typically, these are cloud-based programs that allow for real-time collaboration and cloud storage of large files.

Voice-assist technology exists to both complete patient notes and complete periodontic and hard tissue charting. As with any voice-assist technology, training is necessary for the machine to learn dialect, tone and commands. ***Bola AI*** is the voice assistant for Dentrix and can also be utilized for administrative tasks such as referral completion and letter or report writing. It claims to be "Plug and Play," whereby no voice training is needed. ***Voice Works™*** (Florida Probe) is voice-activated software in which no additional equipment is needed beyond a headset and software. It integrates with most practice management software via a bridge. ***Open Dental*** also offers voice activated periodontic charting through their charting module.

*Continued on pg. 6 »*

## PRODUCT SHOWCASE

### GC Initial LiSi Block (GC America, Inc.)

***GC Initial® LiSi Block*** is a fully crystallized lithium disilicate block that delivers optimal physical properties without firing. It offers reduced processing time – you just need to mill, polish, and place. ***GC Initial LiSi Block*** features GC's proprietary High Density Micronization (HDM) technology for CAD-CAM dentistry, which delivers high wear resistance, smooth margins, and highly esthetic final results. It may be milled with smooth and accurate margins and offers a natural opalescence in any light. Superior gloss may be obtained in a few minutes by polishing, or for a more sophisticated esthetic, remarkable results may be achieved with ***GC Initial® IQ Lustre Pastes ONE***. These make ***GC Initial LiSi Block*** an ideal time-saving solution for single visit chairside treatments.

You can learn more at: GC America Inc., 800-323-7063, www.gc.dental/america

# Artificial Intelligence in Dentistry

## A Clinician's Viewpoint:

Dr. Matthew Miller

**Artificial intelligence (AI) has significantly impacted the field of dentistry by enhancing the integration of dental intra-oral scanners and 3D printers.** This synergy of technologies is transforming the way dental professionals diagnose, plan treatments, and fabricate dental prosthetics. Here is a more detailed look at how AI is used in conjunction with intra-oral scanners and 3D printers.

### Improved Scanning and Data Interpretation:

AI algorithms are used within software to enhance the accuracy and speed of intra-oral scanning. These scanners capture highly detailed 3D images of a patient's oral cavity, which are essential for various dental procedures, including crowns, bridges, and orthodontic treatments. AI can assist in real-time image processing by reducing artifacts and errors during scanning. This helps ensure that the data collected are of the highest quality.

### Automated Margin Detection:

One crucial aspect of dental prosthetic design is margin detection, which involves identifying the boundary between natural teeth and restorative materials such as crowns. AI can automate this process by analyzing scanned images and precisely identifying margins. This automation increases efficiency and reduces the risk of errors in the design phase.

**AI in dentistry, while promising, does have its share of shortcomings and inaccuracies.** One significant challenge is inaccurate margin detection for dental restorations, where AI systems may struggle to precisely identify the boundaries between natural teeth and restorative materials, potentially leading to suboptimal outcomes.

Furthermore, AI-generated restoration designs may not always align with the nuanced preferences and clinical judgment of experienced dentists. These designs may lack the finesse and customization that a human clinician can provide, potentially affecting the esthetics and functionality of dental work.

### Treatment Planning and Virtual Models:

AI, in conjunction with scanned data, can assist in treatment planning. Dentists can use AI algorithms to simulate various treatment options and their potential outcomes. This allows for better communication with patients and more informed decision-making. Additionally, AI can generate virtual models of patients' teeth and oral structures, providing a digital reference for designing prosthetics.

### Custom Prosthetic Design:

3D printers are invaluable for fabricating dental prosthetics like crowns, bridges, dentures, night guards, and clear aligners. AI can optimize the design process, ensuring that prosthetics are tailored precisely to each patient's unique oral anatomy. By analyzing the scanned data, AI can create prosthetic designs that maximize comfort, function, and esthetics.

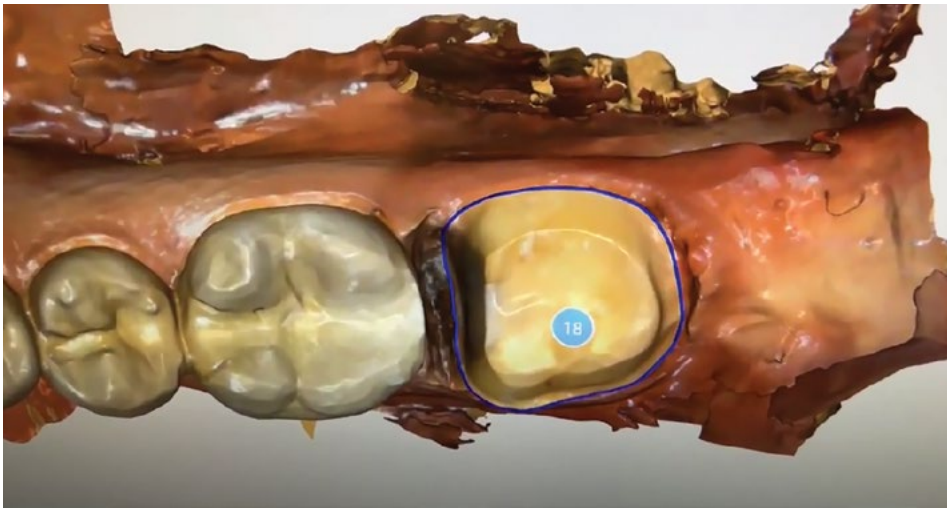
### Quality Control and Manufacturing Optimization:

AI can also play a role in quality control during 3D printing. By monitoring the printing process in real-time, AI algorithms can detect and correct any deviations or defects in the prosthetic's structure. This results in a higher level of consistency and quality in the final product.

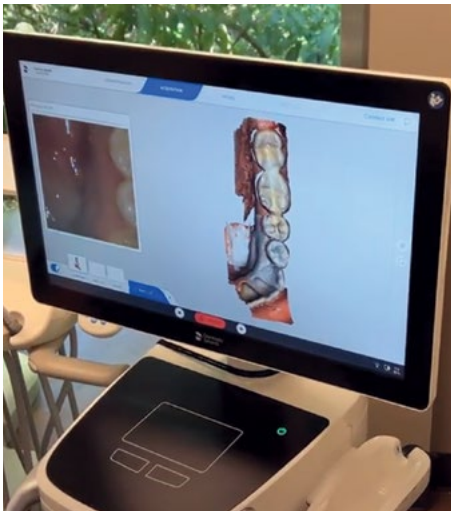
### Cost and Time Efficiency:

**By automating many aspects of the workflow, AI-powered systems reduce the time required for dental prosthetic fabrication.** This not only benefits the dental professional but also improves the overall patient experience by reducing waiting times for restorations. Additionally, the reduction in errors means fewer remakes and, ultimately, lower costs for both providers and patients.

The integration of AI, dental intra-oral scanners, and 3D printers is revolutionizing the field of dentistry. It streamlines the entire process, from data capture to treatment planning and prosthetic fabrication. This synergy not only improves the precision and quality of dental care but also makes it more efficient, accessible and patient-centric. As AI continues to advance, we can expect even more sophisticated applications in the realm of digital dentistry.




**The software helps with automated margin detection identifying missing boundary information between natural teeth and restorative materials reducing the risk of of error during the design phase.**



**The monitor displays missing data that occurred during the scanning process.**

## We Asked Our Consultants why they do or do not use AI in their practice...

"I'm using augmented intelligence with scanning and CBCT. "

"I've been in practice for 35 years. I love technology and am very up to date with products, computers, etc, but I am not interested in using AI at this stage of my career."

"I use the ***TRIOS*** scanner."

"I want to, I just haven't explored the options yet."

"Adds an added benefit to our practice (cutting edge) which is also good for patient perception about our practice."

"Just discovered it at Glidewell's Dentistry on the Rise conference last week!

"I haven't learned enough about it, and I tend to get stuck in my ways!"

"Convenient with office tasks, have not invested in the diagnostic portion yet."

"I don't have enough knowledge on AI and feel it is too new to use at this point."

"I'm concerned about patient acceptance."

"I use it to streamline processes."

"I would like to start to incorporate ***Pearl***."

"I know AI is out there, but just have not embraced it yet."

"Just haven't decided to jump in yet. It is also not available in my office software at present."

"I use AI in ways to automate processes and to bring consistency and accuracy to clinical treatment and business operations."

"I am looking to incorporate it very soon."

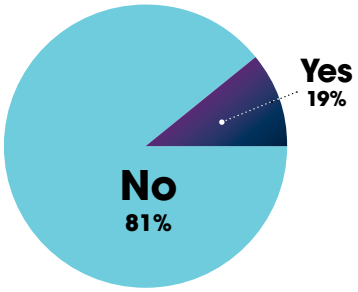
# Artificial Intelligence as Administrative Assistance

**Though it will never replace humans, AI is also being used to complete repetitive tasks in both the business area and clinical areas.** Patient scheduling programs are utilized to minimize checkout time and eliminate the phone tag that comes with patients leaving messages. Programs can be used to analyze a patient's preferred appointment time and make suggestions as to when they can be rescheduled. In addition, missed and overdue appointments can be automated as patients are reminded of their status via email or text message.

Dental claims and predeterminations can now be filed using AI as well. Companies such as *Vyne Dental* are using AI to review claims and necessary attachments, minimizing errors in filing and detecting fraud for multiple claim filing. This can reduce resubmissions and rejections, a big problem for timely payment in dental practices.

Patient programs such as ***Simplifeye*** offer 24/7 response to potential and existing patients and are HIPAA compliant. Typically known as chat bots, the software can be utilized for patient scheduling, payment requests, patient reviews, re-care, and telehealth.

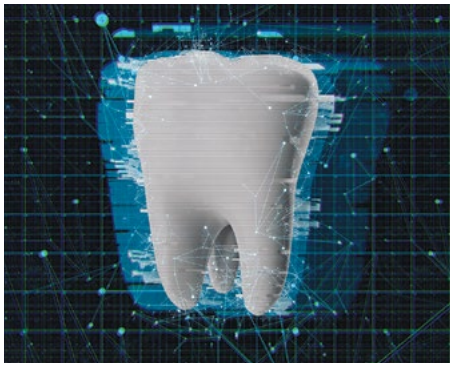
**We Asked our Consultants:**
**Do you use AI for administrative tasks?**




# Future Directions in Dental AI

A patient care Robot now exists, ***Robin the Robot*** (Exxper Technologies) that is designed to keep pediatric and geriatric patients calm and attended to before, during and after dental and medical procedures, by simply acting as a companion. The robot is a care assistant that supports caregiving functions using emotional AI.

Robots have already been deployed for surgical procedures, though dentistry has not seen much of this technology as of yet for routine patient care. Research is being conducted daily on the efficacy and accuracy of robots in dentistry. As with any new technology, adoption is slow, mostly due to cost and training time. The ***daVinci*** (Intuitive) surgical system has been cleared in dentistry for several years for Oral and Maxillofacial surgery, but the expense is great and the confidence in the technology has not yet been achieved as a collective profession. The ***Yomi® Dental Robot*** (Neocis) is the only FDA cleared robotic system specific to dentistry. It has been approved for implant procedures and bone reduction. It is commercially available in the United States.



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***You and your team have an opportunity to influence the future of dentistry.***


***To become an advisor:***
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for more information or scan here »

# SimpliShade™ Bulk Fill Flow

++++½

*Kerr* www.kerrdental.com



DENTAL ADVISOR ++++½

**54** CLINICAL EVALUATORS

**951** TOTAL USES

**91%** CLINICAL RATING

**Key Features:** Single shade • Adaptive Response Technology • Self-Leveling

## Description

***Simplishade™ Bulk Fill Flow*** is a one-shade, flowable bulk-fill composite, requiring a capping layer.

## Indications

- Base/liner under Class I and Class II direct restorations
- Pit and fissure sealants
- Restoration of small cavities
- Class III and V restorations
- Blocking out undercuts
- Small core build-ups
- Repair of resin and acrylic provisional restorations

## Unique Attributes

- ART³ Technology - Adaptive Response Technology which offers easy handling and low shrinkage
- One shade blends with 16 VITA Classical shades
- Self-leveling
- Uses rheological modifiers which reduce the viscosity while you use it; once you are done shaping, the viscosity recovers and anatomy stabilizes before light-curing, reducing the need for additional sculpting.
- Cures up to 5mm

*Photos courtesy of Dr. Frank Berman*

#18 Before

#18 After

*Photos courtesy of Dr. Kristin Fairbanks*

#8 I Before

#8 I After


## Clinical Tips

- Bury the tip in the deepest part of the preparation when extruding the composite.
- Always ensure that the first increment is well placed into the proximal box before bulk filling.
- Wait for the self-leveling feature to take effect, it flows well - avoid over sculpting.

"MATERIAL FULLY ADAPTS TO PREP."

## Evaluators' Comments

*"Great product, strong composite. Beautiful shaping and shade matching."*

*"I don't need to stock multiple colors of composite."*

*"Stays put, yet levels nicely."*

*"Good viscosity and flow."*

*"I didn't have to use a blocker, and the material is a good opacity."*

*"The viscosity of the material is the best I've used so far. Excellent anatomical shaping achieved!"*

*"Nice color and saved me time."*

*"Great flow into hard-to-reach areas and very hard after curing."*

*"I wish it didn't need a capping layer."*

**Consultants who would:**

**78%** Recommend to a colleague

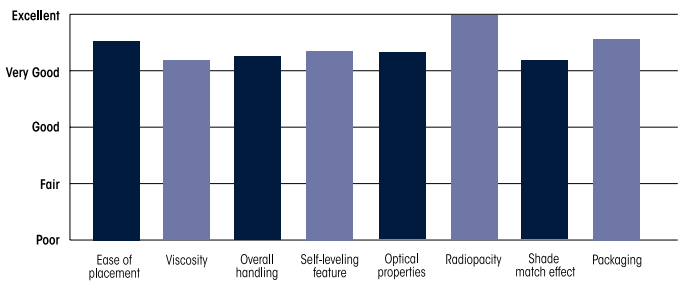
**Consultants who would want to stock in office:**

**11%** Yes, instead of current product

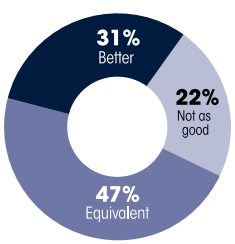
**60%** Yes, in addition to current product

**29%** I might want to order this product for certain cases

**Evaluation Summary:**




**Compared to Competitive Products:**



CLINICAL EVALUATION

# Visalys® Flow

***Kettenbach*** www.kettenbach-dental.com

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DENTAL ADVISOR ++++

**34** CLINICAL EVALUATORS

**733** TOTAL USES

**89%** CLINICAL RATING

**Key features:** Flexible shading system • Self-leveling • Highly-filled flowable composite

## Description

***Visalys® Flow*** is a highly-filled, flowable composite, which offers five base shades as well as opaque and bleach shades.

## Indications

- Anterior and posterior direct restorations
- Class I to VI
- Can be used for sealants
- Lining and coating of cavities
- Luting translucent restorations
- Repairing restorations

## Unique Characteristics

- Flexible Shading System: 5 shades cover the Vita Classical Shade Guide
- Balance between flowability and stability
- Self-leveling with non-drip syringe
- High Filler content: 80%
- Can be used with all light-cured bonding agents

*Photos by Dr. Matthew Miller*

**Prep tooth #18**

**Visalys Flow applied to tooth #18 as cavity liner**


## Clinical Tips

- Opaque shade was very helpful to mask dark stains.
- Works great for anterior esthetic Class V cases.
- Use for securing ortho lingual bars.

**"NICE TO HAVE A FLOWABLE THAT BLENDS."**

## Evaluators' Comments

*"I liked the viscosity, there was no slumping."*

*"Viscosity is thick - it stays where it is put."*

*"Chameleon effect is effective without lowering value, which is common in many composites that are single shade."*

*"An even whiter shade would be desirable."*

*"Shade system could be more intuitive, and a shade guide should be included."*

**Consultants who would:**

**85%** Recommend to a colleague

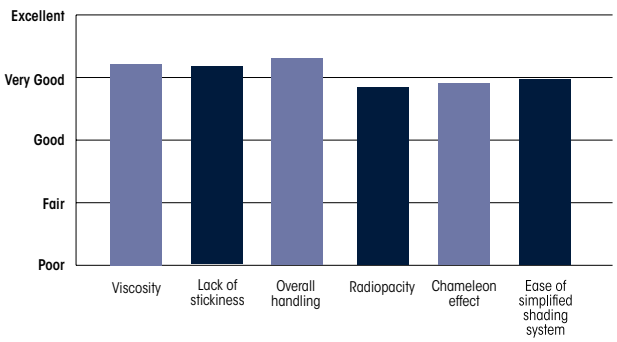
**Consultants who would want to stock in office:**

**12%** Yes, instead of current product

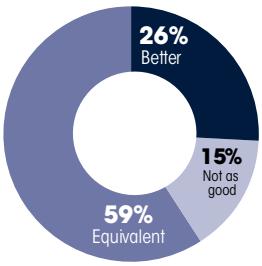
**53%** Yes, in addition to current product

**26%** I might want to order this product for certain cases

**Evaluation Summary:**




**Compared to Competitive Products:**



# Visalys® Fill

***Kettenbach*** www.kettenbach-dental.com

++++



DENTAL ADVISOR ++++

**27** CLINICAL EVALUATORS

**688** TOTAL USES

**88%** CLINICAL RATING

**Key features:** Flexible Shading system • Chameleon effect
• Universal, nano-hybrid composite

## Description

***Visalys® Fill*** is a universal, nano-hybrid composite, which offers five base shades as well as opaque and bleach shades.

## Indications

- Direct Anterior and Posterior Restorations
- Class I to VI
- Core build-ups
- Esthetic shape correction
- Composite Inlays

## Unique Characteristics

- Flexible shading system: 5 shades cover the Vita Classical Shade Guide
- Can be used with all light-cured bonding agents

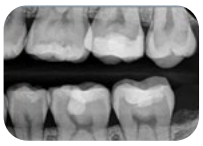
*Photos by Dr. Ashton Prince*

Etch applied to tooth #8

Visalys Fill applied to tooth #8

Visalys Fill #8 Final

*Photos by Dr. Gina Meylan*



Post-op Radiograph: Visalys Fill #14, #18 and #19

Visalys Fill #14 Final

Visalys Fill #18 & #19 Final


## Clinical Tips

- When in the anterior, use smaller increment layers for better chameleon blending.
- Keep away from ambient light.

"EASY TO PLACE."

## Evaluators' Comments

*"Chameleon effect works well with less value drops/graying compared to single-shade composites."*

*"Handling was great and the materials were smooth and had a great blending ability."*

*"This composite stays where it is placed."*

*"I liked the final appearance and the gloss of the restoration."*

*"Shading could be more simplified with an included shade guide."*

**Consultants who would:**

**81%** Recommend to a colleague

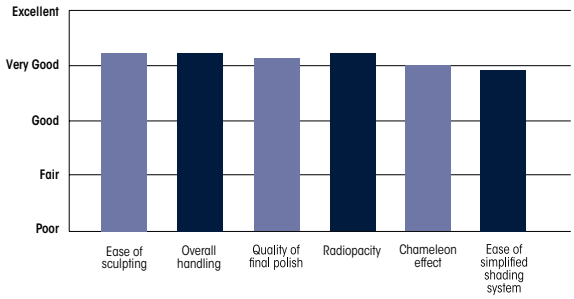
**Consultants who would want to stock in office:**

**4%** Yes, instead of current product

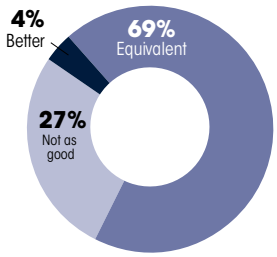
**54%** Yes, in addition to current product

**27%** I might want to order this product for certain cases

**Evaluation Summary:**




**Compared to Competitive Products:**



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# Clinical Case Report

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Number 54 – November, 2023

# Effective Solutions in Challenging Oral Conditions

*(GC America)*

## Introduction

Glass Ionomers and Resin Modified Glass Ionomers are often the material of choice when treating cervical root caries or decay in a patient with a high caries risk. They are also a good choice for patients where isolation may be difficult or compromised. Traditionally, these materials require either trituration or hand mixing. With decline of amalgam use, many dental offices do not keep capsule mixers, therefore having to triturate a material can be a big deterrent. Also, hand mixing incorporates air bubbles which may negatively impact the physical properties.

***GC Fuji Automix LC*** (GC America) is a radiopaque resin-reinforced glass ionomer available in an automix delivery that does not require trituration. It comes with an ergonomic dispenser that allows for controlled and precise placement into the preparation. The bioactive material allows for a high fluoride release that is also rechargeable. In conjunction with the ***GC Cavity Conditioner***, the ***Fuji Automix LC*** forms a chemical bond to tooth structure, even in the presence of saliva. This material makes an excellent choice in situations where isolation can be a challenge and when a bioactive restoration is desired.


**GC Fuji Automix LC**

## Clinical Case Report

In the past, there have been a variety of GI and RMGI materials available on the market, ranging from those that required hand-mixing, trituration, or came in an automix delivery but had awkward ergonomics and poor handling characteristics. In contrast, ***GC Fuji Automix LC*** offers an easy and precise delivery system coupled with the material's excellent handling characteristics.

A 25-year-old female was referred by her orthodontist for restorative treatment. The patient presented with multiple asymptomatic carious lesions noted clinically and radiographically throughout her dentition. As noted on the pre-operative bitewing radiograph (Figure 1), the patient had decay on teeth 15, 18, and 19. Tooth 14 was previously extracted, and socket preservation grafting was performed by another provider. Prior to presenting for restorative therapy, tooth 18 was previously deemed non-restorable, was extracted and socket preservation grafting was performed by that same clinician, following this radiograph. Additionally, tooth 13 had a history of prior endodontic therapy without a definitive indirect restoration.

Caries control and prevention, as well as her restorative options, were reviewed with the patient. The agreed upon treatment plan was to perform caries control with direct resin restorations, along with a regimen of adjunctive topical fluoride therapy while the patient completed her conventional orthodontic therapy. Once the orthodontic therapy is completed, she will undergo definitive restorative therapy with a combination of indirect, tooth and implant supported restorations. The patient's current desire is to eventually restore teeth #13 and #15 and replace tooth #14 with a 3-unit FPD and replace tooth #18 with an implant.

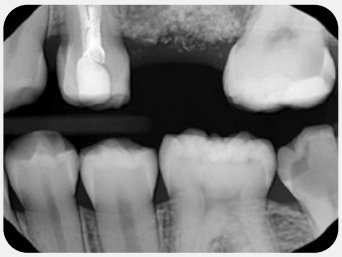


**Figure 1.** Pre operative radiograph showing decay on teeth 15, 18, and 19.

**Figure 2.** Pre operative intraoral photo of tooth 15 showing an existing resin restoration with reccurrent decay on the distal, occlusal, and lingual surfaces.

**Figure 3.** Prepared tooth 15 with Medicom SafeMatrix Contoured matrix band. (Note: the discoloration in the occlusal groove was determined to be staining)

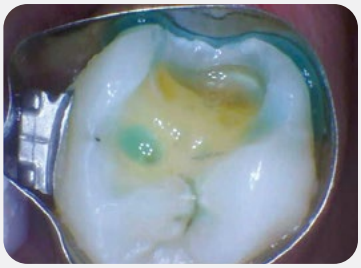


**Figure 4.** GC Cavity Conditioner applied for 10 seconds, light cured for 20 seconds and subsequently rinsed.

A pre-operative intraoral photo of tooth 15 is noted in Figure 2. Given the severity and location of decay, high caries risk, and difficult isolation of tooth 15, a "sandwich technique" using a bioactive RMGI and a resin capping layer was chosen to restore the tooth.

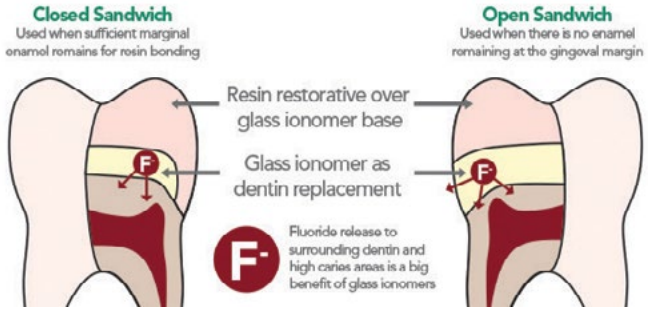
Two sandwich techniques exist: open and closed. A closed sandwich technique is when a bioactive material is placed in a way that it is completely enclosed by a separate resin material, such as a pulp cap. An open sandwich technique leaves the bioactive material exposed to the oral cavity and has a restorative capping layer over it. This is typically used for Class II restorations, and is intended to reduce the incidence of microleakage and recurrent decay.

The tooth was isolated and prepared - excavating the existing restorative material, decay, and cracked and fractured tooth structure. The decay was deep; however, exposure of the pulp did not occur. A ***SafeMatrix*** (Medicom) contoured matrix band was placed around the tooth (Figure 3), and the area was isolated using a combination of dry angles, cotton rolls, and suction. ***GC Cavity Conditioner*** was applied to the tooth surface for 10 seconds, light cured for 20 seconds and then rinsed to remove contaminates, the smear layer, and improve the bond strength of the restorative material (Figure 4).

***GC Fuji Automix LC*** was placed in the distal proximal box and in the deepest areas of the restoration (Figure 5). The material was easy to place, adapt, and sculpt, and it was not sticky. Moreover, as the material begins to set, it can be condensed into the preparation to ensure no voids were present. Once cured by both a high-powered curing light (***3M Elipar Deep Cure,*** 3M) and allowing time to self-cure, a selective-etch technique was used to bond the capping layer of the restoration.

**Figure 5.** GC Fuji Automix LC after curing.

**Figure 6.** Final restoration following occlusal adjustment, contouring, and polishing.




A 37.5% phosphoric acid gel was applied to the enamel cavosurface margin for 15 seconds and then rinsed. Multiple coats of ***Optibond Universal*** (Kerr) bonding agent were applied to the entire cavity preparation for 20 seconds, air thinned, and light-cured for 10 seconds. ***Simplishade Universal Bulk Fill*** (Kerr) packable composite was used as the final capping layer and light-cured from the occlusal, buccal, and lingual surfaces at 10 second intervals respectively. The final occlusal adjustments and contouring were performed with ***NTI*** (Kerr) finishing carbides, and polishing was performed using ***ProGloss*** (Kerr) and ***Occlubrush*** (Kerr) composite polishers (Figure 6). The occlusion was then verified to be within normal limits.

## Class V Clinical Case:

An excellent indication for use of ***GC Fuji Automix LC*** is in Class V restorations. Often they extend onto or are completely on the root surface and can be difficult to isolate. Because this material has a rechargeable, high-level fluoride release and bonds to tooth structure in the presence of saliva, it is a great choice for Class V restorations.

In this clinical scenario, the patient presented with cervical erosion and sensitivity on tooth #26 (Figure 7). The patient has a moderate to high caries risk, and due to the properties of the ***GC Fuji Automix LC***, it was selected as the material of choice in treating this case. The ***GC Cavity Conditioner*** was applied for 10 seconds and then rinsed, leaving the tooth surface moist. The ***GC Fuji Automix LC*** was placed onto the tooth, sculpted, and light cured for 20 seconds (Figure 8). The material was allowed to completely polymerize before finishing and polishing was performed.

**Figure 7.** Before

**Figure 8.** After

The material comes in Vita shades: A1, A2, and A3. While a slightly brighter shade was selected for this restoration for better visibility and distinguishability from the tooth, the patient was happy with the results. The material adapts well and polishes nicely such that it blends well with the tooth when corresponding shade is selected.

## Conclusion:

In a situation where the decay was deep and the caries risk high, using ***GC Fuji Automix LC*** allowed for easy and confident utilization of a sandwich technique to restore the patient's tooth. Having a precise mixing and delivery system that is effortless to use helped to expedite the restorative steps and did not disrupt the procedure. The dispensing gun and cartridge are intuitive and ergonomic, and the extrusion of the material is smooth and consistent. The rechargeable, high fluoride-releasing property of this material is ideal for patients with severe decay and/or root caries, as it prevents the recurrence of decay formation and reduces the incidence of postoperative sensitivity. Being able to use ***GC Fuji Automix LC*** without compromise in situations where isolation is unachievable or less than ideal is a huge benefit to the patient and clinician. No longer is amalgam needed in those situations, and a more compatible bioactive restoration can be placed instead.

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Clinical Case Report

Ashton A. Prince, D.M.D.
St. George, Utah

Number 56 – November, 2023

# Restoring a Single Tooth with Minimal Retention

*(GC America Inc.)*

## Introduction

When treating our patients, it is important to have confidence in the restorative materials being used. As any dentist can attest, we expect our materials to perform with an extremely high rate of long-term success while also overcoming situations where our clinical skills are limited or treatment presentations are not ideal. The universal resin cement, ***G-CEM ONE***, when used in conjunction with ***G-Premio BOND***, provides the versatility, durability and ease of use needed to perform reliable restorations with confidence — even in cases where mechanical retention is reduced.

G-CEM ONE™

G-Premio BOND™

## Procedure

In this case, there was a presentation of a 46-year-old female with a severely discolored mesioincisal-facial composite restoration on tooth #7 that had aged over 13 years. At that time, the initial treatment was performed to close off a large mesial gap between the maxillary right lateral and right central incisors. The desires of the patient were simple: minimal reduction of the natural tooth but matching material and shading of the already present porcelain restorations on the central incisors. The decision was made to create a lithium disilicate restoration, and to do so on a minimally prepared tooth. To assist in overcoming the lack of mechanical retention encountered by the minimal preparation, the enhanced bonding properties of ***G-CEM ONE*** with ***G-Premio BOND*** was utilized.

**Figure 1.** Preoperative image with the existing composite restoration.

**Figure 2.** Patient desired minimal reduction with limited mechanical retention, thus creating the need to rely on chemical retention in the form of ***G-Premio BOND*** and ***G-CEM ONE*** cement.

**Figure 3.** 37% phosphoric acid etch, performed in a "selective-etch" fashion only on enamel surface.

Despite the ability of ***G-CEM ONE*** cement to function in a self-adhesive fashion, the more secure technique, albeit more technique sensitive process, of bonding with the universal adhesive ***G-Premio BOND*** in the presence of surrounding enamel was performed.

Treatment began by performing "selective-etch" of the existing enamel surfaces with a 37% phosphoric acid etch for 15 seconds. This assists in cleaning the surface of the teeth by removing the smear layer and opening the enamel tubules of the tooth. After rinsing of the acid etch and gentle drying of the tooth, application of the ***G-Premio BOND*** was done with a microbrush in a scrubbing technique for 10 seconds and then the material was allowed to interact uninterrupted with the tooth surface for an additional 10 seconds. A full blasting of oil-free air to thin the material and an LED curing light with a strength over 1,000 mW/cm2 for 10 seconds was completed to cure the ***G-Premio BOND*** material in preparation for receiving the ***G-CEM ONE*** cement.

**Figure 4.** The prepared tooth with ***G-Premio BOND*** already applied but not yet air-thinned.

**Figure 5.** Initial placement of the porcelain restoration with the "seeping out" of the ***G-CEM One*** material.

**Figure 6.** Initial plucking off of the self-setting material with a dental explorer instrument.

After applying the ***G-CEM ONE*** cement into the prepared porcelain restoration, initial placement of the restoration onto the prepared tooth was completed. A desired and expected "seeping out" of the excess cement was seen with a constant application of pressure to the facial surface of the restoration. This pressure was applied for 30 seconds while initial self-setting of the cement occurred. There is also an ability to tack-cure the ***G-CEM ONE*** material for a faster set and clean-up if so desired. The remaining cement can be "plucked off" by use of an explorer or a #12 blade and then flossing interproximally to remove any excess. In this case, the material was allowed to self-cure for 30 seconds to allow for ideal adhesion and setup, then a light-cure was performed for added confidence.

The ending restorative result left the patient very pleased with the cosmetic similarities to the maxillary central incisors and the dentist was able to feel confident in the long lasting abilities of retention despite the mechanical limitations that were experienced.

**Figure 7.** Cleaned and polished restoration after cementation.

## Conclusion

***G-CEM ONE***, when used in conjunction with ***G-Premio BOND***, is a proven solution to achieving successful treatment outcomes in a wide range of cases and circumstances, even in the uncomfortable presence of retentive limitations. Due to the enhanced versatility of the material compared to similar bonding agents, whether the clinical case calls for a more or less technique sensitive process, it can be used successfully with metal, porcelain, zirconia or other restorative materials. As the universal ***G-Premio BOND*** can also be used for traditional composite treatments, there is a minimizing of inventory needed to achieve successful bonded restoration outcomes for patients.


**Figure 8.** Before and After for the restoration.

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Translating the Science

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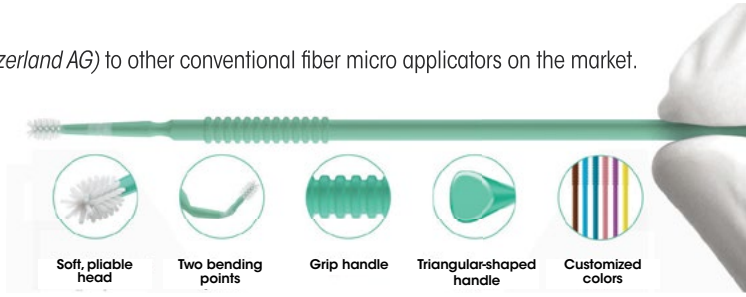
# In Vitro Evaluation of ZerofloX™ an Innovative Applicator Brush

M. Cowen, J.M. Powers

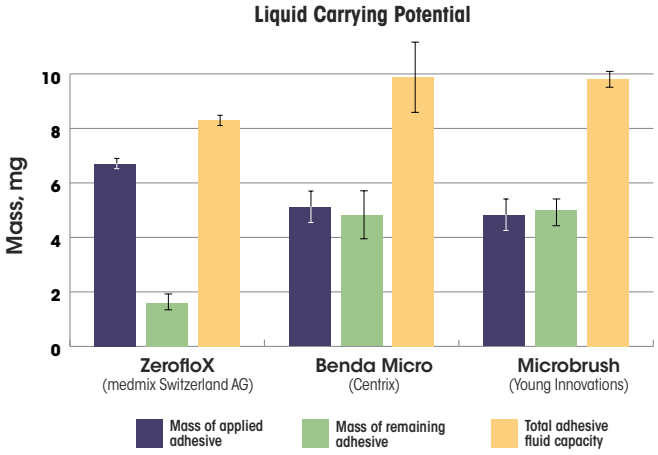
## INTRODUCTION:

In this study we compared a new disposable applicator brush, ***ZerofloX™*** *(medmix Switzerland AG)* to other conventional fiber micro applicators on the market. ***ZerofloX*** differs from other applicators on the market by using fiber-free elastomer bristles rather than the common fiber flocking with most applicator brushes. This change may allow less loss of adhesively-fixed fiber flocks, which could remain in the final restoration as debris. The ***ZerofloX*** may also provide more consistent performance by having the same uniform shape for every brush compared to other applicators which may vary in the exact number of fibers and shape of the brush. To test these claims, we examined the liquid carrying potential of the brushes, how much the comparable fiber applicators shed bristles, and then tested the bonding performance of the brush to ensure it has no problems during use.




### Liquid Carrying Potential

To measure the extent that the applicator brushes adsorb liquid adhesive onto the surface, the brushes were weighed before and after being dipped into an excess of ***iBond Universal*** *(Kulzer)*, and then spread onto a large flat tooth preparation and reweighed. The tooth preparation was cleaned and reused for all test replications for consistency. This allowed us to measure how much liquid it picked up, placed, and remained on the brush. Interestingly, the ***ZerofloX*** adsorbed less overall liquid but then applied nearly all of that liquid onto the surface, compared to the fiber brushes which still retained approximately half of the liquid rather than applying it. The ***ZerofloX*** also had more consistent measurements for every replication due to the variable nature of exactly how many fibers are on the microbrushes compared to the consistent shape of the ***ZerofloX***. The end result is that the ***ZerofloX*** is more efficient by wasting less adhesive that is left on the brush after application, and a more predicable vehicle for moving adhesive from a mixing well and applying it to a surface. This would allow less adhesive required to be dispensed into a mixing well for small tooth preparations, or more precise application to multiple preparation sites.




### Fiber Applicator Shedding

One of the primary reasons that ***ZerofloX*** was invented was to eliminate the loss of adhesively-fixed fiber flocks on the tooth preparation/surface. We measured the extent that fiber microbrushes tend to shed fibers during application by wetting them in a solvent common to adhesives and rubbing them on a glass slide for 20 seconds to simulate an adhesive application in a bonding procedure. We found that on average, the ***Microbrush*** *(Young Innovations)* shed an average of 3.5 bristles per application and the ***Benda Micro*** *(Centrix)* brush shed 4.2 bristles with a maximum of 6 bristles lost with either brush. The potential concern with bristles being shed onto prepared surfaces is that it can create a weak spot in the adhesive interface which may serve as the initiation site for debonding; or it can be carried by the solvent toward the margins increasing the chance for microleakage or unesthetic fibers showing on the surface which may appear as a defect at the margin. Overall, this may not be a major contributing factor for restorative failure, but this is difficult to study and hasn't been assessed to our knowledge.

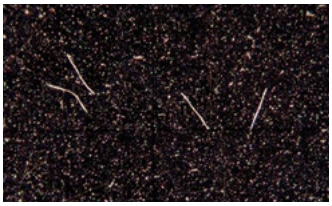
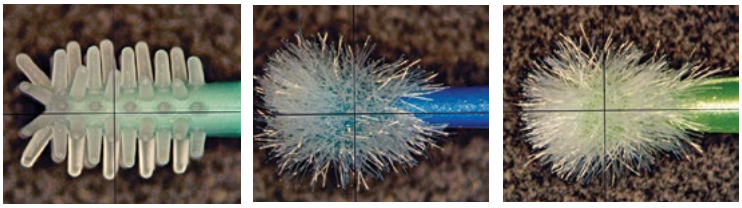


**Fig 1.** Example of bristles on microscope slide

**DRY**



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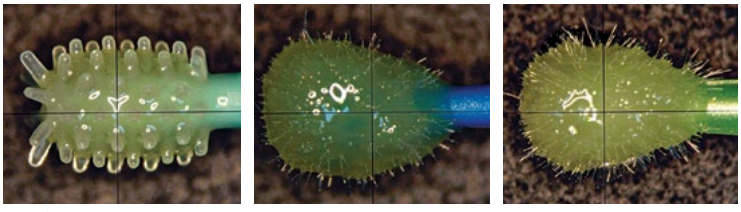
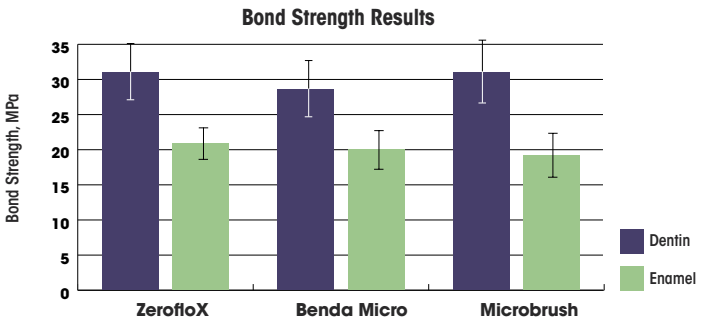


ZerofloX | Benda Micro | Microbrush

**Fig 2.** Brushes shown before and after immersion in ***iBond Universal***

## Bond Strength Performance

Given this is a new kind of brush with different adsorption characteristics to other common brushes, we thought it would be a good idea to test the bonding performance compared to the other fiber brushes tested. We used the common Ultradent shear bond strength method (ISO 29022) to both measure the bond strength and look at the bonding interface for appearance of voids or abnormalities on dentin and enamel surfaces. Overall, there was no significant difference in the bonding performance in terms of bond strength or failure mode between the different groups. We did find a few fibers in the bonding interface of the test specimens for the fiber applicator groups, and those specimens had a lower bond strength than the average for those groups. However, fibers were only found in the bonding interface of 4/40 total specimens due to the large area being applied (~78.5 $mm^2$) compared to the relatively small specimen sizes (4.5 $mm^2$); examination of the unbonded adhesive on the surface confirmed fibers were shed during application. While the presence of the fibers didn't particularly affect the overall average bond strength values due to the small sample size, it serves as proof of concept that the fiber at the interface may create a weak point in the bonding interface.



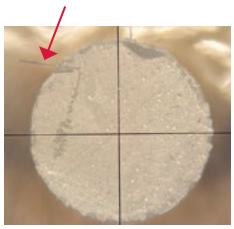



**Fig 3.** Example of a fiber found at the bonding interface

## Pit and Fissure Application

We also examined the ability of the ***ZerofloX*** to be used for their indications of applying flowable composites such as in pit and fissure restorations, either as a means of pushing flowable into crevices or removing excess. We then sectioned the specimens and examined the margins using a Scanning Electron Microscope to see if any defects were detected.

In one test group, we treated teeth for sealant placement with ***Fit SA*** (Shofu USA), a self-adhesive light-cured composite, by cleaning and etching the surfaces with 37% phosphoric acid followed by placement and modification by the brushes.

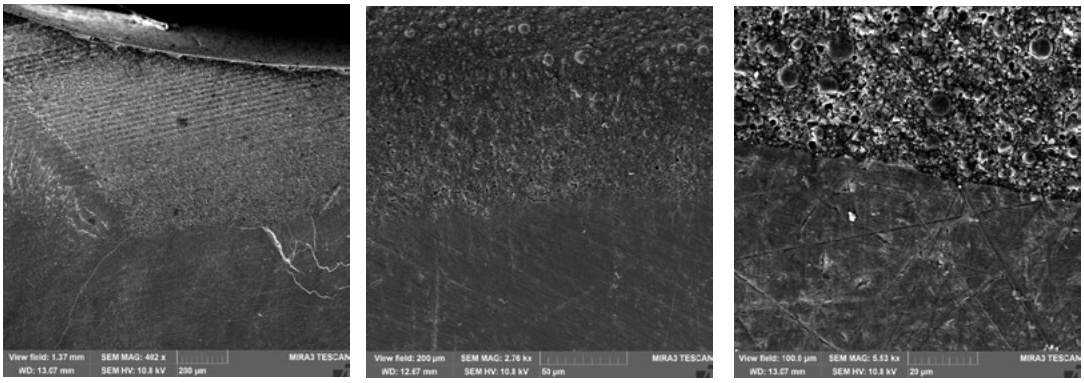


**Fig 4.** Representative examples of the margins of ***Fit SA*** applied with ***ZerofloX***

### Results

There was no significant differences found between the ***ZerofloX*** groups and the ***Microbrush*** group in the number of voids, or thickness of the bonding layer. Excellent marginal adaptation was achieved with use of the ***ZerofloX*** applicator with these flowable composites and adhesives.

In another case, we treated teeth with surface caries by minimally preparing the teeth with a diamond bur and treated the teeth with ***3M Scotchbond Universal Plus*** and ***3M Filtek Supreme Flowable Restorative***.

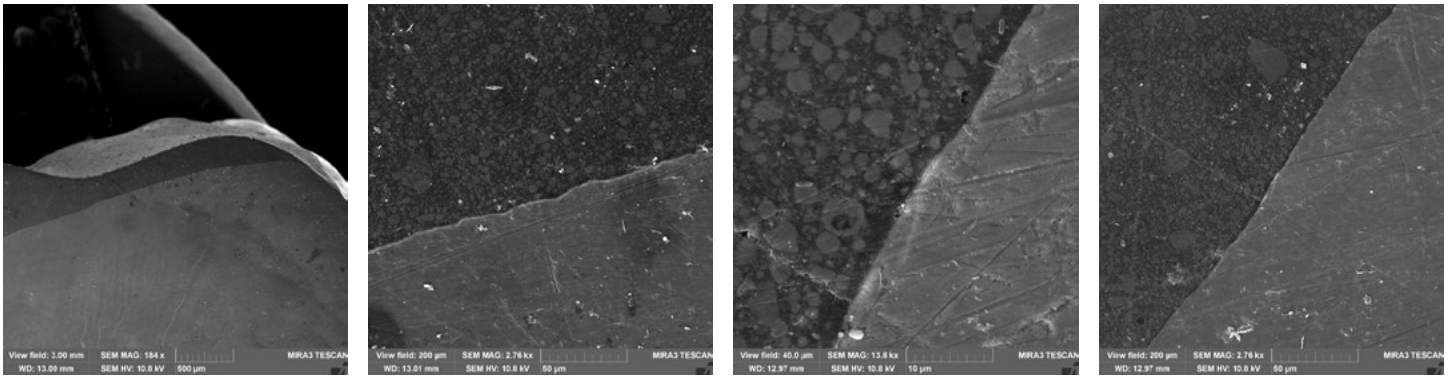


**Fig 5.** Representative examples of the margins of ***3M Scotchbond Universal Plus*** and ***3M Filtek Supreme Flowable Restorative*** an applied with ***ZerofloX***


## Pierrel

**Preferred Product: Goccles**

*Deborah Laird and Fabio Veloti*


## SHOFU

**Preferred Products: OneGloss and Super-Snap X-Treme**

*Mike Gainsburg, Michelle Jacobellis and Garrett Pizzaloto*


## VOCO

**Top Awards: Profluorid Varnish, Admira Fusion x-tra, Ionolux, Provicol QM Plus**

*Zoran Pantelin*


## Cavex Holland BV

**Top Award: Cavex Cream Alginate**

*Sander Hagermans and Hans Maarten Den Boer*


## Tokuyama

**Top Awards: OMNICHROMA & OMNICHROMA Flow**

*Azmeraye Tesfaye, Daniel Mula, Gurvinder Chahal, Lily Nguyen and Abir Bou Khouzam*


## Denmat

**Top Award: Firefly Cordless Headlight System**

*Sam Danak*


## Zest Dental Solutions

**Preferred Award: Bulk EZ Plus**

*Zach Burkett, Nick Aralis and Troy Anderson*


## Ivoclar

**Top Awards: Bluephase PowerCure, Monobond Plus, Ivoclean, Variolink Esthetic and VivaStyle Whitening Strips**

*Karen Gutmann, Matt Danwinand John L. Mayer*


## Clinician's Choice

**Top Award: ASAP Indirect +**

*Peter Alport*


## HuFriedyGroup

**Top Award: Crosstex Surgical Face Masks**

*Danny Forcucci*


## Premier Dental

**Top Awards: Traxodent & Enamel Pro**

*Michael D'Errico, Jeff Spiker and Laura Dawson*


## Kuraray Dental

**Top Awards: CLEARFIL MAJESTY ES Flow, CLEARFIL SE Protect, PANAVIA SA Universal and CLEARFIL Universal Bond Quick**

*Amanda McLeod and Dinesh Weerasinghe*

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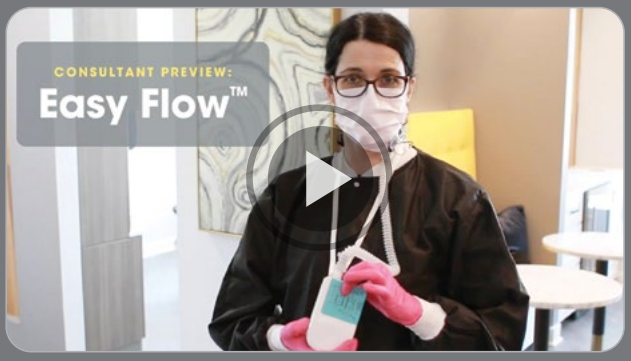


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