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DENTAL ADVISOR™

Product insights you can trust.

THE EVOLUTION OF

Digital Dentistry

THE NEXT FIVE YEARS: EMERGING
TECHNOLOGIES THAT WILL RESHAPE
GENERAL PRACTICE DENTISTRY

AI DIAGNOSTIC PLATFORMS:
FDA-CLEARED WITH INDEPENDENT
PEER-REVIEWED VALIDATION

ON THE HORIZON: BEYOND
THE FIVE-YEAR WINDOW



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*Please send inquiries and address changes to:***DENTAL ADVISOR**

1310 S. Main St., Suite 10, Ann Arbor, MI 48104

Call: 734.364.0944

Fax: 734.665.1648

Email: connect@dentaladvisor.com

Website: dentaladvisor.com

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**Dr. Ashton A. Prince**
Chief Editor

Digital dentistry has fundamentally changed what we are able to offer our patients, but the most significant shift is not the technology itself, it is what the technology makes possible in the room where treatment and care actually happen. When a patient can see an X-ray with specific markers for attention, or watch their tooth appear on a screen seconds after an intraoral scan, something changes in the conversation. The clinical experience becomes transparent and intriguing. The treatment plan has now changed to something they can better see and understand and even participate in, rather than simply accept. That is not a minor improvement in patient communication. It is a different kind of relationship being created between the clinician and the patient, one built on shared vision rather than desired trust.

With digital advantages, we can be more accurate, meaning we can also be more conservative. We can improve our conversations and be more confident in delivering

restorations that return a tooth to what it was rather than simply replacing what was lost.

The focus of this issue is to examine what progress the dental field is making and what is available today. As you determine what enhancements fit best for your office, don't just consider current needs alone, but look to the future for what you want your office to become.

*Ashton A. Prince, DMD***CLINICAL AMBASSADOR PROFILE**

Dr. Marc Lai is a general and cosmetic dentist based in his hometown of San Francisco, CA. He is a graduate of the University of The Pacific Arthur A. Dugoni School of Dentistry and the Kois Center in Seattle, WA, where he received advanced training in the areas of comprehensive, implant, and reconstructive dentistry.

In addition to full time clinical practice, Dr. Lai believes strongly in giving back through volunteer service. In 2019, he was awarded a certificate by the American Dental Association recognizing his community efforts in Jamaica and the greater Caribbean. Dr. Lai still remains heavily involved at his alma mater and serves on the Executive Committee for the Alumni Board at the Dugoni School of Dentistry. He also serves as the founding director of the Kois Study Group of Northern California.

Aside from dentistry, Dr. Lai continues to consult and strategize with small businesses through his management consulting company, MH Management, which was founded in 2009. In his spare time, Dr. Lai enjoys cooking, participating in recreational sports, traveling and spending time with his wife, Irene and their two sons, Nathaniel and Noah.





The Evolution of Digital Dentistry

The Next Five Years: Emerging Technologies That Will Reshape General Practice Dentistry

INTRODUCTION

If you have been in practice for more than a decade, you have already lived through at least one meaningful technology transition, probably the shift from film to digital radiography, or the first time you held an intraoral scanner and realized that your impression workflow was never going to feel the same. What we are navigating now feels different, because it is. The pace has changed. The categories of change have multiplied. And for the first time, some of what is arriving at our doorstep involves not just new tools, but a genuinely different relationship between the clinician, the data, and the diagnosis.

That said, excitement about technology and wisdom about technology are not the same thing. The clinicians I respect most are not the earliest adopters, nor the most resistant, they are the ones who have learned to ask the right questions before they write a check or change a workflow.

Three areas are generating the most credible peer-reviewed evidence in dentistry right now: artificial intelligence in diagnostics, the maturing digital workflow, and salivary diagnostics. Each deserves honest examination, not a catalog of possibilities, but a clear-eyed look at what the research actually supports, where the gaps remain,

and what a general practitioner should reasonably expect to see change over the next three to five years. Where specific platforms are named, they have been selected on the basis of FDA clearance and independent peer-reviewed clinical validation, not market presence or editorial preference.

It is worth acknowledging why that standard matters. A 2024 survey of practicing dentists found that nearly half demonstrated knowledge of AI diagnostic systems below the median score, and that financial constraints, limited training, and uncertainty about clinical evidence were the most commonly cited barriers to technology adoption. Those findings are not surprising, and they are not a critique of those clinicians. They reflect a profession being asked to evaluate a rapidly expanding category of tools without always having the framework to do so confidently.

CONTRIBUTING AUTHOR

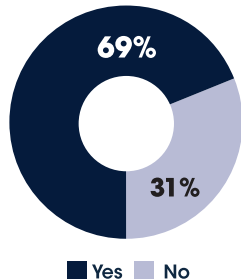


Marc H. Lai, DDS
Clinical
Ambassador

THE EVOLUTION OF Digital Dentistry

We Asked Our DA Clinical Evaluators...

In the past 24 months have you invested in any new technology?



THE DEVELOPING DIGITAL WORKFLOW

The honest conversation about digital impressions is no longer about whether the technology works. It does. The conversation has shifted to why adoption has not followed capability more closely, and what that gap means for practices still making the transition.

An estimated 85% of dental clinics globally still rely on conventional impression techniques, despite intraoral scanning technology being demonstrably accurate, more affordable than it has ever been, and increasingly well-supported by restorative laboratories. The barriers that remain are not primarily technical, they are economic, educational, and habitual. For most practices, it is no longer whether to make the transition. It is when, and how.

A 2025 umbrella review considering more than ten systematic reviews covering over thirty scanner models found that leading platforms demonstrated superior performance over conventional impressions for single-unit and short-span restorations, with meaningful advantages in procedural time and patient comfort. One important nuance: fully edentulous complete-arch cases remain a context where conventional techniques or stereophotogrammetry can hold clinical advantages, meaning this may be a technological limitation worth considering.

For most general practices, the clinical case for intraoral scanning in single-unit and short-span fixed prosthodontics is well-established. There is no longer a meaningful clinical argument for conventional impressions in these applications. The



Clarity Alinger before and after
Photos courtesy of Dr. Mehul Patel

Intraoral Scanners With the Strongest Independent Evidence Base

Scanners consistently ranked in independent peer-reviewed literature

TRIOS® (3Shape)

The most frequently cited scanner in independent peer-reviewed accuracy literature. A 2025 umbrella review of ten systematic reviews identified **TRIOS** as consistently among the highest-ranked platforms for complete-arch trueness and precision. Multiple comparative studies confirm **TRIOS** as the top performer for single-tooth accuracy and overall scan speed. Integrates with open digital workflows, making it compatible with most laboratory and chairside CAD/CAM systems.

Primescan® (Dentsply Sirona)

Alongside **TRIOS**, **Primescan** is the second platform most consistently identified in independent peer-reviewed literature. A four-scanner comparative study found Primescan displayed the lowest deviation values for both trueness and precision across ceramic surface types. Integrates natively with the Dentsply Sirona **CEREC** ecosystem for same-day chairside restorations, a strong single-system investment for practices pursuing an integrated digital workflow.

iTero Lumina™ (Align Technology)

The **iTero Lumina** intraoral scanner is one of the dominant scanners by market share today. It features a newer generation of scanning technology called, Multi-Direct Capture (MDC), a proprietary image-acquisition approach designed to improve the capture of large dental surfaces while reducing reliance on conventional image stitching. This is accomplished by multiple cameras in the wand that allow for multi angle image acquisition with a 3x larger field of view than previous **iTero** scanners, improving both scanning speed and accuracy. It has been peer-reviewed in many recent studies suggesting that the **iTero Lumina** can provide high levels of full-arch accuracy, trueness, while demonstrating low error rate. Not only is it a dominant scanner in orthodontics as a closed system exclusive scanner for Invisalign, but has been designed to provide both diagnostic tools and restorative solutions for clinicians.

Medit i700 / i900 (Medit)

Appears consistently in independent comparative studies as the strongest mid-tier option, with performance approaching that of **TRIOS** and **Primescan** at a lower price point. A 2025 in-vivo complete-arch study placed **Medit i900** in the top accuracy group with no statistically significant difference from **Primescan**. An open ecosystem approach makes Medit scanners highly compatible with third-party laboratory and software systems, an important consideration for practices not committed to a single manufacturer's workflow.

THE EVOLUTION OF Digital Dentistry

patient experience is better, no tray, no material, no gagging, no temporary restoration in straightforward cases. The efficiency is well documented and worthy of consideration. Over 45% of practices are already operating some form of same-day CAD/CAM workflow, and the gap between those practices and those still waiting is widening in ways patients are beginning to notice.

Chairside 3D printing is the natural next step for practices already inside the digital workflow. Surgical guides, provisionals, night guards, and study models can be printed chairside at a cost and quality point that makes the investment incremental rather than foundational. The same digital file that drives milling can drive printing. For practices that have already adopted intraoral scanning, adding a printer is less a new technology decision than an extension of infrastructure already in place.

SALIVARY DIAGNOSTICS: THE IMMEDIATE FUTURE

Of any technological advances that are currently being pursued, salivary diagnostics is the technology category most intellectually compelling, but also the one that clinicians are most cautious about investing in today.

The research momentum is genuinely extraordinary. In 2024 alone, nearly 300 studies on salivary diagnostics appeared on PubMed, a two- to six-fold increase over the previous



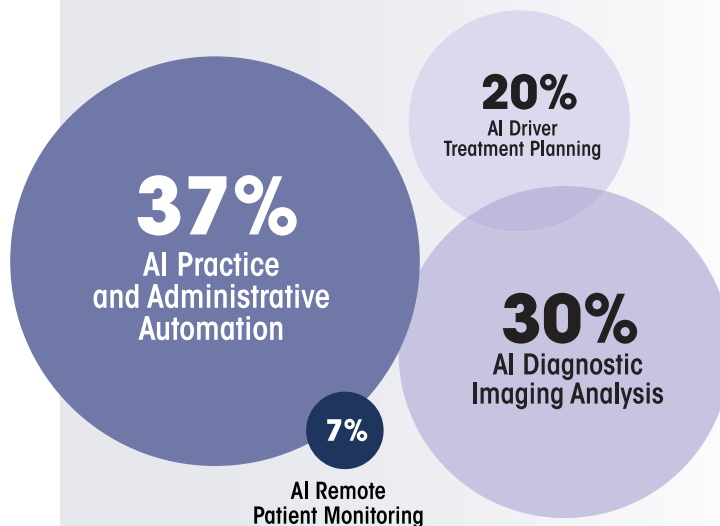
decade. The underlying science is currently reviewing how saliva contains proteins, electrolytes, enzymes, hormones, and microbial DNA, and its composition reflects both local oral health and broader systemic physiological states. Salivary glucose levels correlate with blood glucose. Salivary C-reactive protein tracks cardiovascular risk markers. Saliva has even been studied as a detectable flag for pancreatic and prostate cancers. The implications for dentistry's role in overall health are not incremental. They are substantial.

Consider what a salivary diagnostic workflow could look like in a general practice a decade from now. A patient arrives for their routine examination. They provide a small saliva sample at check-in. By the time they are seated, the clinician has a risk profile covering periodontal disease activity, glycemic control, and cardiovascular inflammation generated from a single, non-invasive collection. The dental appointment becomes something different. Not just oral healthcare. A meaningful access point to systemic health, which would raise value to the dental visit and potentially set many apart from other neighboring clinicians.

What prevents that from being the present is a set of real, persistent challenges. Variability in saliva composition, the absence of standardized collection and processing protocols, and insufficient

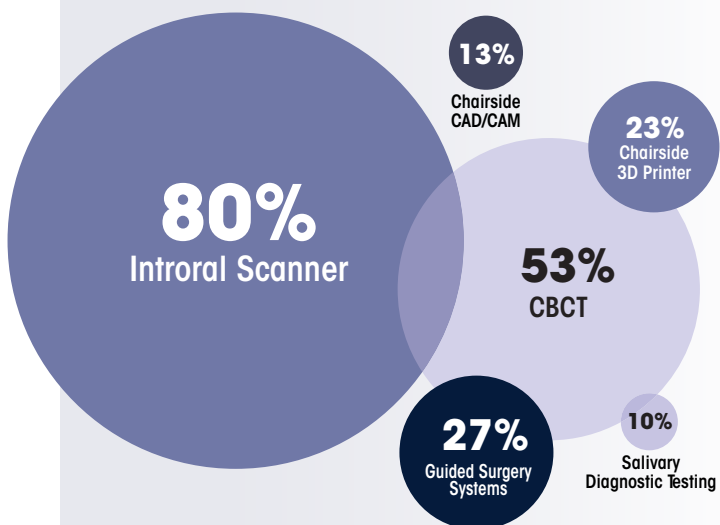
We Asked Our DA Clinical Evaluators...

Which AI-assisted technologies
are currently in your practice?



We Asked Our DA Clinical Evaluators...

Which technology are
you currently using?



AI-Assisted diagnostic software tools like Pearl can save time and also help patients understand their diagnosis better.



Pearl AI | Photo courtesy of Dr. Mehul Patel

biomarker validation across diverse populations all may be limitations. The FDA issued a final rule in 2024 to increase oversight of lab-developed salivary tests, with full implementation expected by 2028, a regulatory development that will ultimately support adoption by establishing clear standards, but one that also signals how much infrastructure still needs to be built.

When validated chairside tools arrive and the research trajectory suggests they will within this decade, the clinician who already understands the science will be in a very different position from the one encountering it for the first time from a vendor.

What This Means For The Clinician Deciding What To Invest In

Technology decisions in a general practice are always decisions based on timing, capital, and the training bandwidth of the team. None of those are unlimited. So the question is never simply whether a technology is good. The question is whether it is good enough and validated enough to justify the specific resources the practice would spend to adopt it.

AI-assisted diagnostics, particularly **Pearl**, **Overjet**, and **VideaHealth**, represent a near-term investment with documented clinical benefit, manageable integration demands, and a cost of entry that has come down considerably. The workflow disruption is low.

Digital workflow expansion, intraoral scanning, chairside CAD/CAM, and integrated 3D printing, represents the investment with the clearest evidence base and the most durable return for practices that have not yet made the full transition. **TRIOS** and **Primescan** are strong leaders in the area, with Medit offering a strong evidence-supported alternative for practices with budget constraints. For practices still relying on conventional impressions for single-unit restorations, the honest assessment is that the patient is demanding more from their experience.

Salivary diagnostics is a space that rewards attention, not

investment, at least for now. However, be aware and prepared. Build the foundational understanding that will let you evaluate these tools critically when they arrive with real validation behind them. The clinicians who will integrate this technology well are the ones preparing now.

What unites all three categories is this: the technology itself is not the hard part. The hard part is developing the clinical discernment to know what the evidence actually supports rather than making decisions based on enthusiasm or apprehension. That discernment is what continuing education, at its best, is supposed to build.

Popular Scanners in the Dental Landscape

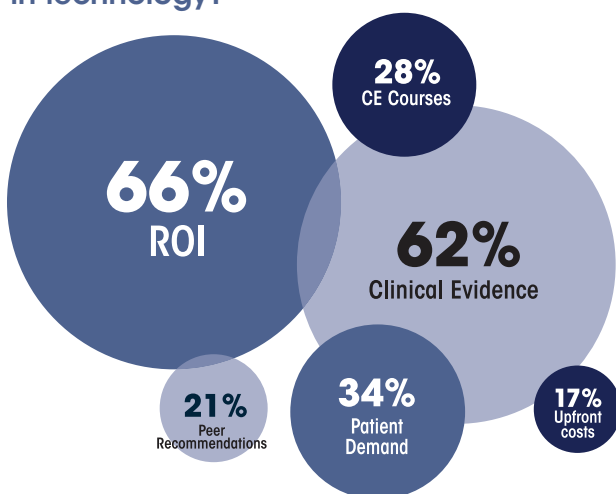
Product	Description
Aoralscan 3 (SHINING 3D Dental) CLINICAL PROBLEM SOLVER	A fast intraoral scanner with significant scan depth capability and is even Mac OS compatible
Medit i900 (Medit) ++++ (86%)	A scanner with efficiency and functionality in mind as it has different tip sizes and intuitive hardware to provide scanning solutions for any restorative workflow
iTero Lumina Pro (Align Technology)	Provides exclusivity to Invisalign orthodontics, while having strong diagnostic tools and restorative workflows
Primescan 2 (Dentsply Sirona)	A cloud native intraoral scanner that scans directly into DS CORE via any wifi-connected device
TRIOS 6 (3Shape)	A wireless scanner option utilizing AI software to provide many disease markers and risk factors such as caries, plaque, recession and tooth wear



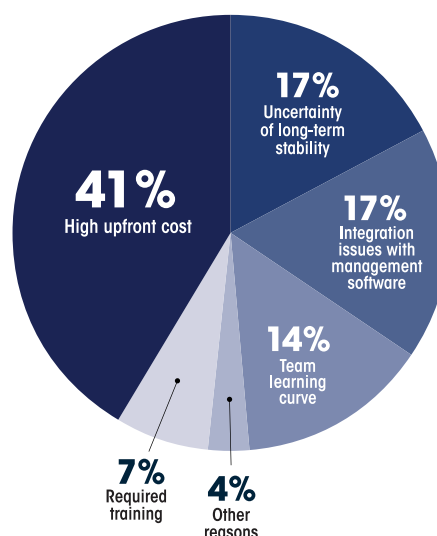
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We Asked Our DA Clinical Evaluators...

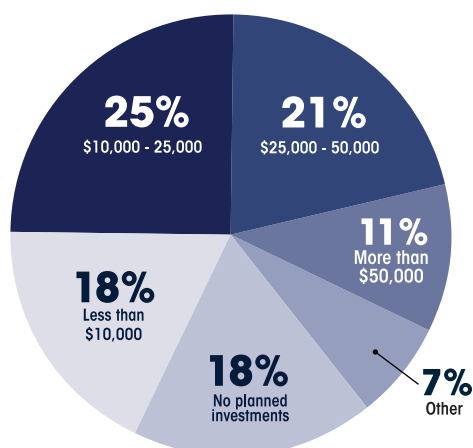
What is the primary influence for investing in technology?



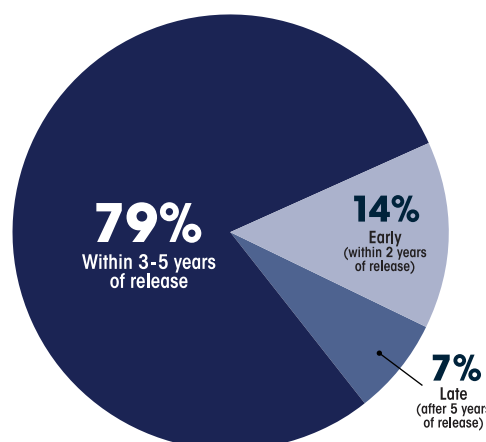
What is the greatest barrier from adopting new technology?



How much does your practice anticipate investing in technology over the next 12-24 months?



How soon after a new technology is released would you feel comfortable adopting it?



ON THE HORIZON: Beyond The Five-Year Window

What does the future of dentistry hold? What areas should clinicians be preparing for and considering for review? Here are a few areas to mention now, and then discuss in detail within the coming years. **Robotic-Assisted Implant Surgery**

The **Yomi** robotic system (Neocis), currently the only FDA-cleared robotic platform for dental implant surgery, has demonstrated placement accuracy superior to static guides, dynamic navigation, and freehand techniques in a large prospective clinical study of 273 implants published in the International Journal of Oral and Maxillofacial Implants, with angulation deviations averaging less than 1.5 degrees and depth deviations less than 0.2 mm. A next-generation platform, **Yomi S**, received FDA clearance in November 2025 and incorporates AI-powered anatomical segmentation from CBCT with single-operator control.



Yomi Dental Robot (Neocis)

Regenerative Dentistry and Bioactive Materials

Stem cell and tissue engineering approaches to dental regeneration are active research areas, with current clinical focus on enamel remineralization and dentin regeneration rather than whole-tooth regrowth, which remains experimental. Bioactive restorative materials (including those releasing fluoride, calcium, and phosphate) are already entering the clinical market and represent the near-term leading edge of this category.

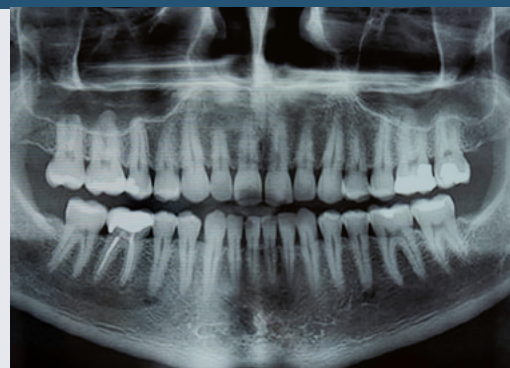


Augmented Reality in Treatment Planning and Patient Communication

AR applications in dentistry are emerging in two contexts: intraoperative surgical guidance overlaying planned anatomy onto the operative field, and patient-facing visualization tools for treatment planning communication. Peer-reviewed literature on dental AR surgery is early-stage and predominantly in vitro. Patient communication applications are already commercially available but lack independent clinical validation of their effect on treatment acceptance.

AI-Integrated Treatment Planning and Predictive Modeling

The current generation of AI tools focuses on detection, identifying pathology on radiographs. The next generation integrates AI across the full treatment planning workflow: proposing restorative designs from trained datasets, predicting periodontal treatment outcomes, modeling long-term prognosis for teeth under consideration for extraction versus restoration, and automating documentation. This evolution will affect how AI platforms are selected and priced within the five-to-ten-year window.



Salivary Point-of-Care Diagnostics for Systemic Disease

The pipeline for salivary biomarker diagnostics is expanding rapidly. Microfluidic biosensor platforms, capable of detecting multiple biomarkers from a single small saliva sample, represent the most likely pathway to a practical chairside diagnostic device. The FDA's 2024 rulemaking on lab-developed tests, fully effective by 2028, will create clearer regulatory pathways. This is the category with the highest potential consequence for the dentist's role in systemic health screening, and the one most worth following.



20 CLINICAL EVALUATORS

332 TOTAL USES

97% CLINICAL RATING



Category: Oral Surgery

Description

The **Luxator®** instrument line - the original **Luxators** on the market have set the standard for atraumatic extractions, helping clinicians remove teeth and roots while preserving surrounding bone and soft tissue.

The line includes **Luxator Stainless Steel Periotomes**, **Luxator Titanium Periotomes**, **Luxator Forte Elevators**, and **Luxator Stainless Steel Short Periotomes**, offering a variety of tip shapes, widths, and angulations for different clinical needs.

Featuring ergonomic, color-coded handles for enhanced grip and control, **Luxator** instruments are available individually or in kits, giving clinicians the flexibility to choose the right instrument for every extraction.

Indications

- Atraumatic extractions for General and Complex situations
- Fractured and decayed root retrieval
- Implant site preparation involving tooth removal for immediate anterior and posterior implant sites
- Sectioning and removal of multi-rooted teeth



Unique Attributes

- Wide range of tip shapes and angulations for nearly any extraction scenario
- Large, ergonomic handles that reduce the force needed for luxation
- Thin, sharp tips that help minimize bone and soft-tissue trauma
- Color-coded handles for quick identification on a busy tray
- Stainless Steel **Luxator** tips can be sharpened to maintain blade sharpness and extend instrument life
- **Luxator Titanium** features a titanium-coated blade that never needs sharpening

Clinical Tips

- Let the shape of the luxator follow the tooth or root surface until it engages, then apply gentle, sustained apical pressure rather than force.
- For multi-rooted teeth, section the tooth first and use the luxators/ periotomes as periotomes to remove each root individually.
- Review the manufacturer's IFU and instructional materials before first use; the sequencing and purpose of each tip becomes intuitive quickly once reviewed.
- Use the periotome first, followed by the Forte elevator, as an efficient standard sequence for routine extractions.
- Because the tips are very sharp, use controlled, deliberate pressure during initial cases until you are familiar with the instrument's feel.
- Any of the tips can be aligned along the long axis of the tooth to improve luxation and initiate mobility.

"EXCELLENT OVERALL!
I GIVE IT A 10/10."

Evaluators' Comments

"The ergonomics of the instrument were fantastic, and the instructions on proper use were very helpful."

"All of the [**Luxator Periotomes**] were fabulous. I was so incredibly impressed with the handling and sharpness of the instruments. Very ergonomic, and I was able to extract very difficult ankylosed roots."

"Bone was preserved with minimal tissue trauma post-extraction in every single patient."

"They were super sharp, helped preserve bone, and increased speed and efficiency with atraumatic extractions."

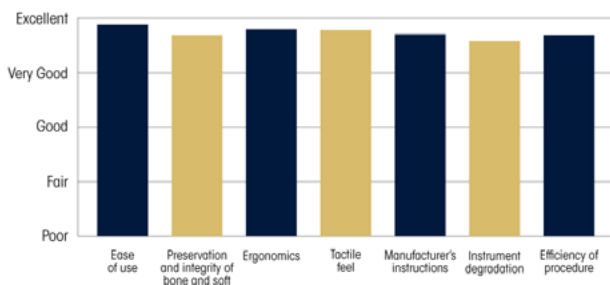
"Very difficult to go back to the old [periotomes] for extraction. Definitely a part of our extraction setup going forward."

Consultants who would
want to stock in office:

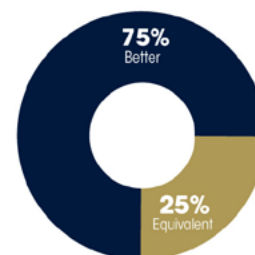
55% Yes, in addition to
current product

30% Yes, instead of
current product

Evaluation Summary:



Compared to Competitive Products:





26 CLINICAL EVALUATORS

976 TOTAL USES

96% CLINICAL RATING

Category: Disposables | Occlusion Articulating Paper

Description

TrollFoil is a super-thin, double-sided articulating foil designed to provide precise and consistent occlusal markings on wet, dry, and highly polished surfaces. The 8-micron foil is pre-mounted in a semi-rigid frame that keeps it flat and taut, allowing convenient one-handed placement without forceps while preventing ink from transferring to the clinician's fingers. A removable protective strip supports clean handling, and the thin design is suitable for challenging clinical situations, including limited opening, smooth implant surfaces, gag-sensitive patients, wand metal or nonmetal restorations.

Indications

- Checking occlusion on wet or dry teeth
- Use in patients with limited mouth opening
- Marking occlusion on implants with smooth surfaces
- Use with gag-sensitive patients
- Checking contacts on metal and nonmetal restorations

Unique Attributes

- Built-in tab allows placement without articulating forceps.
- Foil material coated with carbon-based color, offering more accurate results.
- Ultra-thin foil provides precise, clearly defined contact markings.
- Produces visible marks on Zirconia, Porcelain, Metal, Composite and other restorative materials.
- Performs on both wet and dry surfaces, with red and blue options for distinguishing occlusal movements.



Photo courtesy of Dr. Sabiha Bunek



Clinical Tips

- Dry the tooth surfaces before use to improve the clarity of the markings.
- Use blue foil for centric occlusion and red foil for excursive movements to help identify interferences.
- Have the patient bite firmly, then gently pull the foil through the contact to enhance the markings.
- Make sure the patient's teeth are biting only on the marking paper and not on the frame holding it together.

"THIS IS A
10 OF 10.
THE BEST
WE'VE TRIED."

Evaluators' Comments

"Very thin, so it marks only where the contact points are. It does not tear easily."

"It is a necessary product in all offices."

"The plastic form makes handling it much easier than loose strips."

"The markings are very distinct and easy to read. Point contacts are the clearest I've ever seen with any brand of articulating medium."

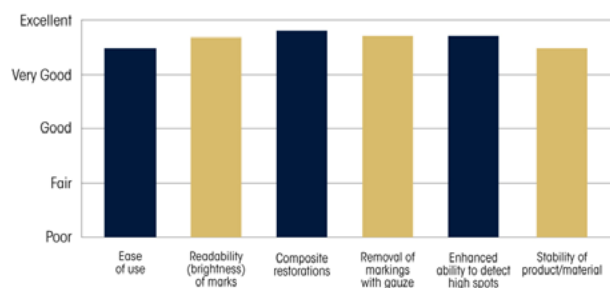
"For occlusal equilibrations and adjustments of dental orthotics, I liked it a lot and will continue to use it."

Consultants who would
want to stock in office:

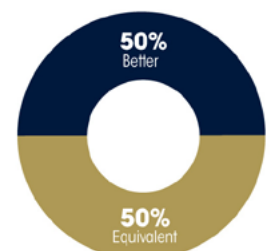
58% Yes, in addition to
current product

35% Yes, instead of
current product

Evaluation Summary:



Compared to Competitive Products:





16 CLINICAL EVALUATORS

288 TOTAL USES

96% CLINICAL RATING

Category: Cement | Dual Cure Resin

Description

TopCEM Dual Cure Resin Cement™ is a versatile resin cement designed for the permanent cementation of crowns, bridges, inlays, onlays, veneers, root canal posts, and other restorations, as well as core build-ups. Its dual-cure formulation provides the flexibility to use either light-curing or dual-curing techniques, depending on the clinical situation. **TopCEM** offers more than 100 MPa of flexural strength, low film thickness, three opacity levels, seven shades, and ultra-low solubility and water absorption.

Indications

- Permanent cementation of crowns, bridges, inlays, onlays, veneers, and other indirect restorations
- Cementation of metal, metal-alloy, metal-ceramic, all-ceramic, porcelain, and composite restorations
- Cementation of restorations made from combinations of these materials
- Permanent cementation of all types of root canal posts
- Core build-ups

Unique Attributes

- Wide range of shades for improved esthetic matching and masking dark stump shades
- Predictable gel phase that allows easy removal of excess cement after tack curing
- Versatile bonding performance with ceramic, zirconia, implant, post, and low-retention restorations



Clinical Tips from Evaluators

- Tack cure for approximately 1 second, then remove excess cement while it is in the gel phase.
- Select a shade slightly lighter than expected for anterior restorations.
- Maintain proper isolation to support predictable bonding performance.
- Carefully check for residual cement, especially around crown margins and implant restorations.

"GREAT PRODUCT! CLEANUP IS A CINCH!"

Evaluators' Comments

"A great addition to my cementation protocol."

"Great esthetics, easy cleanup, and compatibility with many materials."

"The flow of the material was great, and the option for different shades was ideal."

"The mixing tips are effective and do not waste too much material."

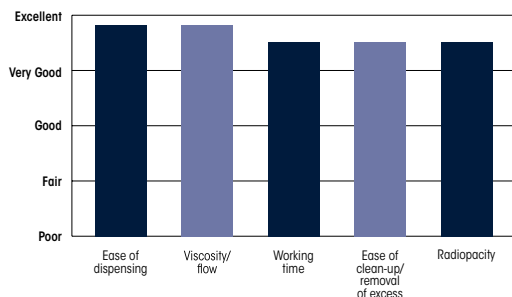
"A good, sound product with a lot more shades than most resin cements available today."

Consultants who would want to stock in office:

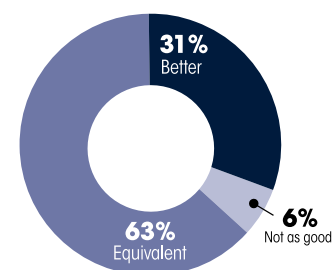
56% Yes, in addition to current product

19% Yes, instead of current product

Evaluation Summary:



Compared to Competitive Products:



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MSDH, RDH
Clinical Ambassador



Charlie
Ward, DDS
Clinical Ambassador



Michelle
Lee, DDS
Clinical Ambassador

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DENTAL SOCIETY

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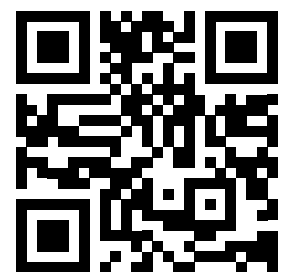
PROGRAM SERIES SUMMARY

This continuing education series provides an evidence-based review of contemporary restorative and preventive dentistry with an emphasis on clinical decision-making, material selection, and clinical protocols. Through expert-led lectures, participants will review direct restorative techniques, ceramic material selection and cementation, post-endodontic restoration principles, preventive maintenance philosophies and the scientific foundations influencing material performance. The program is designed to support improved clinical predictability, long-term restorative outcomes, and the delivery of high-quality patient care. Choose a program location near you and take advantage of this opportunity to strengthen your clinical expertise.

INTENDED AUDIENCE

This continuing education series is designed for general dentists, dental hygienists, and dental team members involved in restorative, minimally invasive, and preventive dental care who are looking to expand their knowledge of current materials, techniques, and evidence-based clinical protocols. Each program in the series offers focused clinical insights tailored to everyday practice. Explore the programs in detail and choose a convenient location near you to attend.

**SCAN HERE
TO REGISTER!**





58

CLINICAL EVALUATORS

551

TOTAL USES

91%

CLINICAL RATING

Category: Preventive | Desensitizer

Description

Cavex ExSense BrushPen is a desensitizing treatment designed to help prevent and reduce tooth sensitivity caused by erosion or exposed dentin. The formula contains 2% hydroxyapatite, which seals dentinal tubules and microcracks in the enamel, along with 0.1% potassium nitrate to help restore micro-hardness. Its brushpen delivery system allows clinicians or patients to apply the gel directly to localized sensitive areas with precision and control. **Cavex ExSense** also supports and accelerates the remineralization process for instant and long-lasting sensitivity relief.

Unique Attributes

- Precise brush-tip applicator for localized sensitivity treatment
- Controlled delivery for application to specific cervical or exposed dentin areas
- Portable desensitizing option for patients with ongoing sensitivity concerns

Clinical Tips

- Review the directions before use to ensure the pen is opened and activated correctly.
- Twist/click the pen slowly to avoid over-dispensing
- Apply directly to localized sensitive areas, especially cervical areas or exposed dentin.
- Use on clean, dry teeth when possible to help the gel stay in place.



"EASE OF APPLICATION AND THE RESULTS WERE FANTASTIC"

Evaluators' Comments

"Immediate relief in sensitivity and ease of use"

"It was very effective from day one."

"Application was easy and the effectiveness was more than anticipated"

"I wish the brush tips were replaceable"

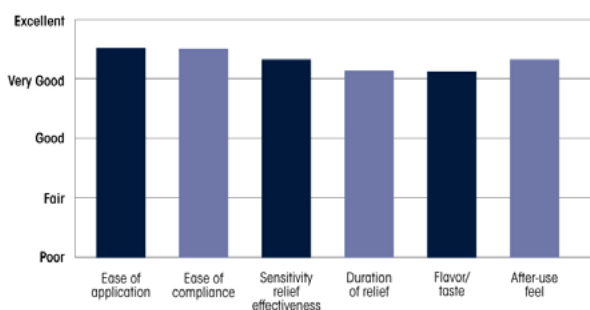
"I wish the effectiveness lasted longer as it wears off too quickly"

Consultants who would want to stock in office:

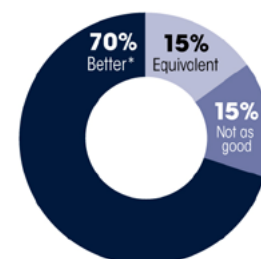
74%

Likelihood to purchase Cavex ExSense BrushPen

Evaluation Summary:



Compared to Competitive Products:



*Among those who compared it with another desensitizer

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ZenSeal™ Pro Root Canal Sealer Evaluation

Margaret Gilmartin, B.S., John M. Powers, Ph.D.

Abstract

This study evaluated the physical properties of **ZenSeal™ Pro**, a calcium silicate-based root canal sealer, compared with **EndoSequence® BC Sealer™ HiFlow** and **EdgeBioCeramic™ Sealer**. Film thickness, setting time, solubility, flow, and radiopacity were evaluated according to ISO 6876, and mixing tip waste was compared between **ZenSeal Pro** and **EndoSequence BC Sealer HiFlow**. **ZenSeal Pro** demonstrated film thickness and flow comparable to the other sealers and met ISO 6876 requirements for film thickness, flow, and radiopacity. **ZenSeal Pro** exhibited the shortest setting time, significantly lower solubility than **EndoSequence BC Sealer HiFlow**, and significantly less mixing tip waste. Although **ZenSeal Pro** demonstrated the lowest solubility, all three materials exceeded the ISO 6876 maximum solubility requirement. Overall, **ZenSeal Pro** demonstrated favorable physical properties and improved material utilization compared with the tested commercial sealers.



Introduction

Root canal sealers fill the interface between gutta-percha and canal walls and should provide appropriate flow, film thickness, radiopacity, solubility, and setting characteristics. Premixed calcium silicate-based sealers are widely used because of their favorable handling and physical properties. This study evaluated **ZenSeal Pro**, a premixed calcium silicate-based root canal sealer, compared with commercially available bioceramic sealers according to ISO 6876. Film thickness, setting time, solubility, flow, radiopacity, and mixing tip waste were evaluated.

Materials

ZenSeal Pro (Kerr Corporation), **EndoSequence BC Sealer HiFlow** (Brasseler USA), and **EdgeBioCeramic Sealer** (EdgeEndo)

Methods

Film Thickness: Film thickness was evaluated according to ISO 6876 using five specimens per material. Sealer was placed between two optically flat glass plates, and a 150 N load was applied 180 seconds after dispensing. After 10 minutes, film thickness was calculated from the difference between the initial and final plate measurements.

Setting Time: Setting time was evaluated according to ISO 6876 using three specimens per material. Sealer was placed in 10 mm × 2 mm molds and maintained at 37°C and ≥95% relative humidity. A 100 g Gilmore-type indenter with a 2 mm tip was applied at predetermined intervals until no visible indentation was produced.

Solubility: Solubility was evaluated according to ISO 6876 using six 20 mm × 1.5 mm disc specimens per material. After setting, two specimens were immersed in 50 mL of deionized water at 37°C for 24 hours. The solution was filtered into a preweighed dish and evaporated at 110°C to constant mass. Solubility was calculated as the percentage of dissolved residue relative to the original specimen mass.

Flow: Flow was evaluated according to ISO 6876 using three specimens per material. Approximately 0.05 ± 0.005 mL of sealer was placed between glass plates under a total load of 120 ± 2 g. After 10 minutes, the maximum and minimum diameters were measured and averaged to determine flow.

Mixing Tip Waste Reduction: Mixing tip waste was evaluated using six dispensing measurements for **ZenSeal Pro** and **EndoSequence BC Sealer HiFlow**. Residual material retained within each delivery tip was determined by mass difference and expressed as a percentage of the total material dispensed.

Radiopacity: Radiopacity was evaluated according to ISO 6876 using three 10 mm × 1 mm discs per material. Specimens were radiographed adjacent to an aluminum step wedge using a Dexis Titanium dental X-ray sensor. Radiopacity was determined by comparison with the aluminum step wedge and reported as millimeters of aluminum equivalent (mm Al).

Results

FILM THICKNESS

Film thickness testing demonstrated similar performance among the three bioceramic sealers. **Edge BioCeramic Sealer** exhibited the highest mean film thickness, followed by **ZenSeal Pro** and **EndoSequence BC Sealer HiFlow**. One-way ANOVA indicated no statistically significant differences in film thickness among the materials ($F(2,6) = 0.60, p = 0.58$).

All three materials exhibited film thickness values well below the ISO 6876 maximum requirement of 50 μm , indicating that each sealer should be capable of forming a thin interface between gutta-percha and canal walls while maintaining adequate adaptation within the root canal system.

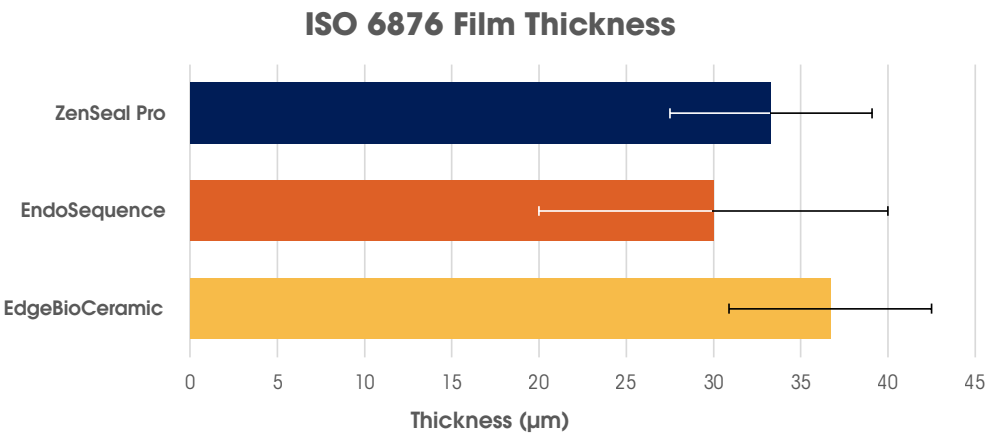


Figure 1. Mean film thickness (μm) measured according to ISO 6876.

Sealer	ZenSeal Pro	EndoSequence	Edge Bioceramic
Film Thickness (μm)	33 (6)	30 (10)	37 (6)

Table 1. Comparison film thickness

SETTING TIME

A one-way ANOVA revealed a significant difference in setting time among the root canal sealers ($F(2,6) = 581.71, p < 0.0001$). **ZenSeal Pro** had the shortest mean setting time; EndoSequence had a significantly longer setting time, while **Edge BioCeramic Sealer** had the longest setting time.

ZenSeal Pro demonstrated the shortest setting time among the materials evaluated. A shorter setting time may reduce the period during which the sealer remains susceptible to disruption or washout and allow the material to achieve its final properties more rapidly.

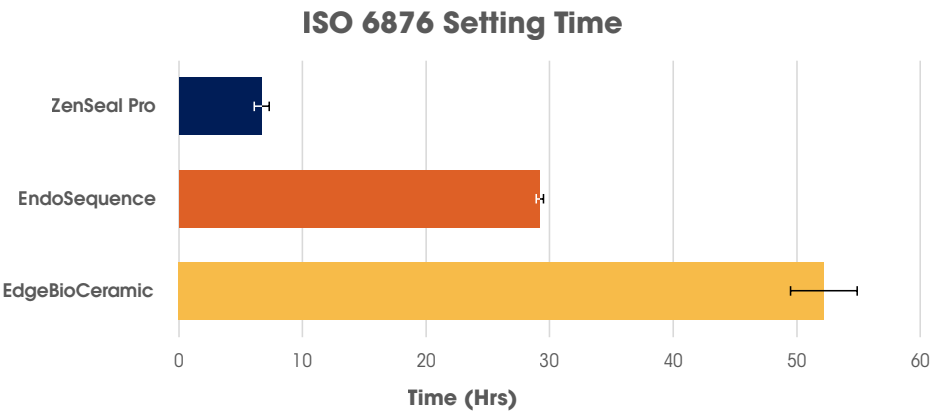


Figure 2. Mean setting time (hr:min:sec) measured according to ISO 6876.

Sealer	ZenSeal Pro	EndoSequence	Edge Bioceramic
Film Thickness (μm)	6:43:1 (0:37:2.1)	29:11:11 (0:16:56.4)	52:14:41 (2:44:56.5)

Table 2. Comparison of setting time

SOLUBILITY

A one-way ANOVA revealed a significant difference in solubility among the three root canal sealers, $F(2, 3) = 19.37$, $p = 0.019$. ZenSeal Pro demonstrated the lowest mean solubility, followed by **Edge BioCeramic Sealer** and **EndoSequence**, respectively. Tukey post hoc analysis showed that **ZenSeal Pro** had significantly lower solubility than **EndoSequence BC Sealer HiFlow** ($p = 0.0177$). No significant differences were observed between **ZenSeal Pro** and **Edge BioCeramic** ($p = 0.0562$) or between **EndoSequence BC Sealer HiFlow** and **Edge BioCeramic** ($p = 0.2292$).

ISO 6876 Solubility

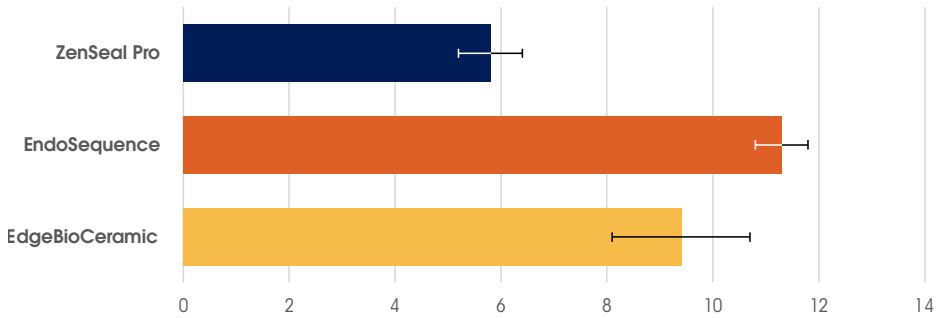


Figure 3. Mean solubility (%) measured according to ISO 6876.

Sealer	ZenSeal Pro	EndoSequence	Edge Bioceramic
Solubility (%)	5.8 (0.6)	11.3 (0.5)	9.4 (1.3)

Table 3. Comparison of solubility

Lower solubility may contribute to greater resistance to material dissolution and help maintain the integrity of the sealer within the root canal over time. Although **ZenSeal Pro** exhibited the lowest mean solubility among the materials evaluated and was significantly less soluble than **EndoSequence BC Sealer HiFlow**, all three sealers exceeded the ISO 6876 maximum solubility requirement of 3.0%. Therefore, the observed differences should be interpreted as relative comparisons among the tested materials rather than evidence of ISO compliance.

FLOW

Flow testing demonstrated similar performance among the three bioceramic sealers. One-way ANOVA indicated no statistically significant differences in flow among the materials ($F(2.6) = 3.94$, $p = 0.081$). All three sealers exceeded the ISO 6876 minimum flow requirement of 17 mm, indicating adequate flow for effective canal adaptation. Lower flow may also reduce the potential for excessive apical extrusion while maintaining adequate canal wall coverage.

ISO 6876 Flow

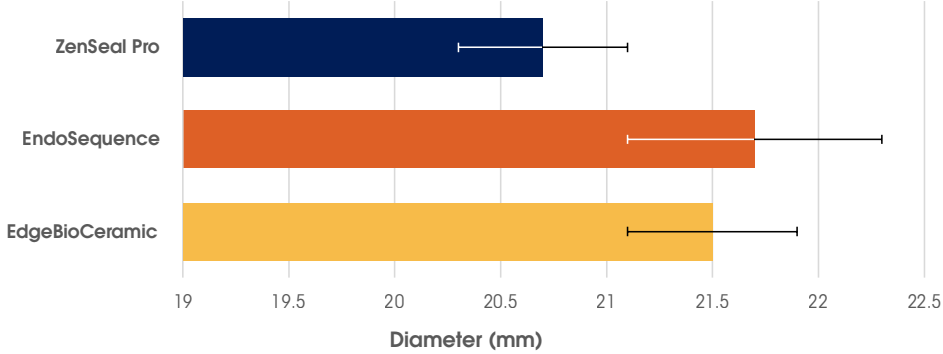


Figure 4. Mean flow diameter (mm) measured following ISO 6876.

Sealer	ZenSeal Pro	EndoSequence	Edge Bioceramic
Flow Diameter (mm)	20.7 (0.4)	21.7 (0.6)	21.5 (0.4)

Table 4. Comparison of flow diameter

MIXING TIP

ZenSeal Pro produced less tip waste relative to **EndoSequence BC Sealer HiFlow**.

An unpaired t-test with Welch's correction demonstrated a significant difference in mixing tip waste between the two materials, $t(7.45) = 3.29$, $p = 0.012$.

ZenSeal Pro exhibited significantly lower mean tip waste compared with **EndoSequence BC Sealer HiFlow**.

Reduced material retention within the delivery tip may improve material utilization, decrease product waste, and allow more usable sealer to be delivered from each syringe.

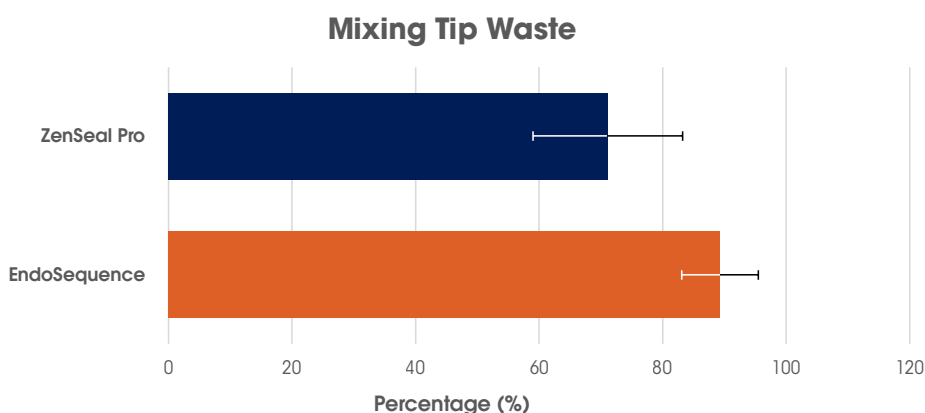


Figure 5. Mean mixing tip waste (%) of **ZenSeal Pro** and **EndoSequence BC Sealer HiFlow**.

Sealer	ZenSeal Pro	EndoSequence
Tip Waste (%)	71 (12)	89 (6)

Table 5. Comparison of mixing tip waste percentage

RADIOCAPACITY

All three root canal sealers exceeded the ISO 6876 minimum radiopacity requirement of 3 mm Al.

EndoSequence BC Sealer HiFlow exhibited the highest mean radiopacity, while **ZenSeal Pro** and **Edge BioCeramic Sealer** demonstrated equivalent radiopacity. All three materials satisfied the ISO requirement and should be readily distinguishable from surrounding tooth structure on clinical radiographs. Adequate radiopacity allows the sealer to be distinguished from surrounding tooth structure on radiographs, facilitating evaluation of sealer placement and the completed root canal obturation.

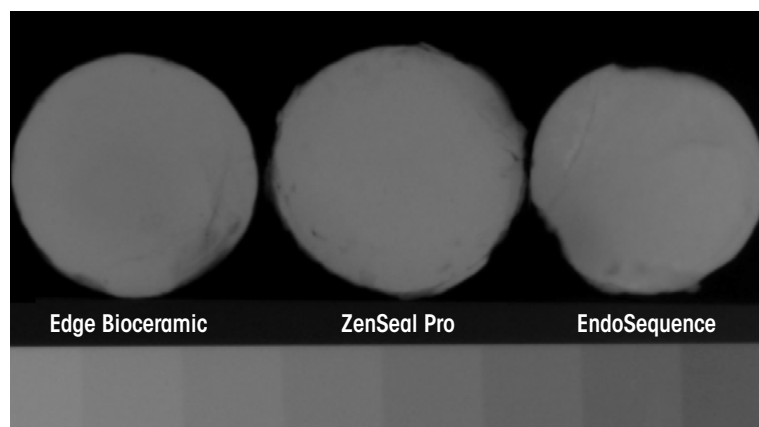


Figure 6. Representative radiographs of the tested root canal sealers positioned adjacent to an aluminum step wedge.

Sealer	ZenSeal Pro	EndoSequence	Edge BioCeramic
Radiopacity (mm Alum)	4.5 (0.0)	5.0 (0.0)	4.5 (0.0)

Table 6. Mean radiopacity (mm Al) determined according to ISO 6876.

Conclusion

ZenSeal Pro demonstrated physical properties comparable to commercially available calcium silicate-based root canal sealers while exhibiting several favorable performance characteristics. Film thickness and flow were comparable to **EndoSequence BC Sealer HiFlow** and **Edge BioCeramic Sealer**, with all three materials meeting the ISO 6876 requirements for film thickness and flow. **ZenSeal Pro** exhibited the shortest setting time and significantly lower solubility than **EndoSequence BC Sealer HiFlow**. In addition, the **ZenSeal Pro** automix delivery system produced significantly less mixing tip waste, indicating improved material utilization during dispensing. All three sealers also exceeded the ISO 6876 minimum radiopacity requirement of 3 mm Al, allowing them to be readily distinguished from surrounding tooth structure on clinical radiographs.

Overall, the results indicate that **ZenSeal Pro** provides physical properties consistent with those expected of a calcium silicate-based root canal sealer while offering advantages in setting time, delivery efficiency, and radiopacity suitable for clinical use.

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