



PFM vs Zirconia Restorations—How are they comparing *clinically*?

Gordon's Clinical Bottom Line: Zirconia-based restorations are making a significant impact. The major question is: Are these restorations as acceptable as porcelain-fused-to-metal (PFM) clinically? This ongoing 900 unit TRAC Research clinical study shows high potential for the zirconia frameworks, but the external ceramics need improvement.



How is metal-ceramic (PFM) comparing to zirconia-ceramic? **AMAZINGLY WELL,**

if the best performing external ceramic for zirconia frameworks is used. Use of zirconia has required a major shift for dentists, laboratory technicians, and industry that involves not only a material change, but a change in fabrication methods and often people performing the work. However, mechanization of dental laboratory procedures is here to stay because it saves time and effort, and is more profitable. So we see CAD-CAM, pressing, and other innovations spreading rapidly before clinical research can verify performance and identify indications and contraindications. **This randomized, controlled clinical trial shows the performance of three-unit posterior prostheses using 3 PFM fabrication methods and 5 major companies' zirconia technologies (listed at right) and evaluates both the framework materials and the external ceramics.**

Frameworks used with External Ceramics in this Clinical Study		
	Frameworks	External Ceramics
M E T A L	Captek by Precious Chemicals	Creation by Jensen Industries
	Ceramco 3 by Dentsply Prosthetics	SoftWear Enamels by Dentsply Prosthetics
	Argen 65 SF by Argen Corporation	Pulse interface by Jensen Industries ❖
Z I R C O N	Cercon by Dentsply Prosthetics	Ceramco PFZ by Dentsply Prosthetics
	Everest by Kavo	CZR Press by Noritake ❖
	Everest by Kavo	Initial ZR by GC International
N I A	IPS e.max ZirCAD by Ivoclar Vivadent	e.max ZirPress by Ivoclar Vivadent ❖
	Lava by 3M ESPE	LavaCeram by 3M ESPE

❖Ceramic was pressed rather than hand layered



CZR Press external ceramic over zirconia



Pulse interface external ceramic over high-gold silver-free alloy

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Integrating Electric Handpieces into Your Practice

Gordon's Clinical Bottom Line: Electric handpieces are preferred by many clinicians for low-speed applications. Most high-speed electric handpieces are still larger and heavier than air driven devices, but they are relatively quiet and concentric. Many clinicians use both air and electric high-speed handpieces to gain the advantages of each.

Electric handpieces have dominated in Europe and other locations for many years; only recently have they experienced an increase of use in the United States. **This report includes survey results; advantages and disadvantages of electric handpieces; clinical and laboratory test results; and clinical tips for selecting and using an electric handpiece.**

2008 Electric Handpiece Survey Results (Based on responses from 144 CR Product Evaluators)

- 44% currently use electric handpieces.
- 92% felt that electric is the same or better than air driven handpieces.
- 82% of users continue to use air turbine handpieces in conjunction with electric.
- 70% of the time is spent using electric for high-speed applications while 40% is spent for low-speed applications.
- 81% stated that the frequency of repair is the same or less than air driven handpieces.
- 87% would purchase another electric handpiece.

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Evaluators Reports and Clinical Tips

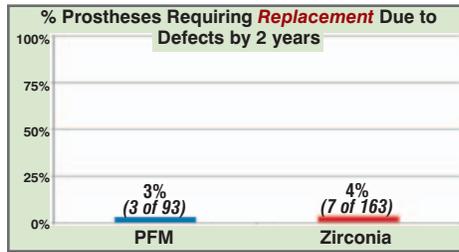
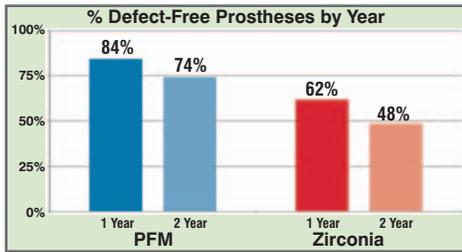
CleanPik: Unique, flexible, plastic toothpick. (Page 4)

Clearfil Ceramic Primer: One-bottle ceramic primer well accepted for wide applications. (Page 4)

Interface: Unique conditioner/primer with long shelf-life. (Page 4)

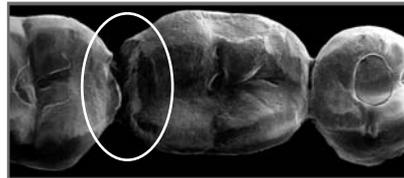
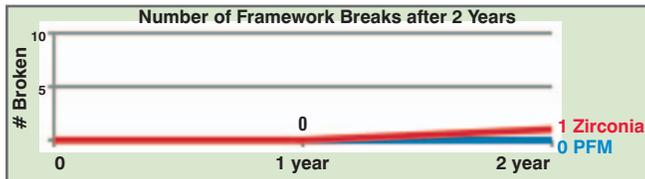
PFM vs Zirconia Restorations—How are they comparing *clinically*? (Continued from page 1)

1. Defect-Free Prostheses after Two Years of Service



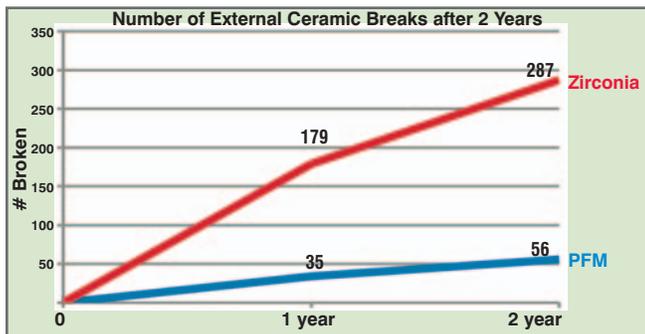
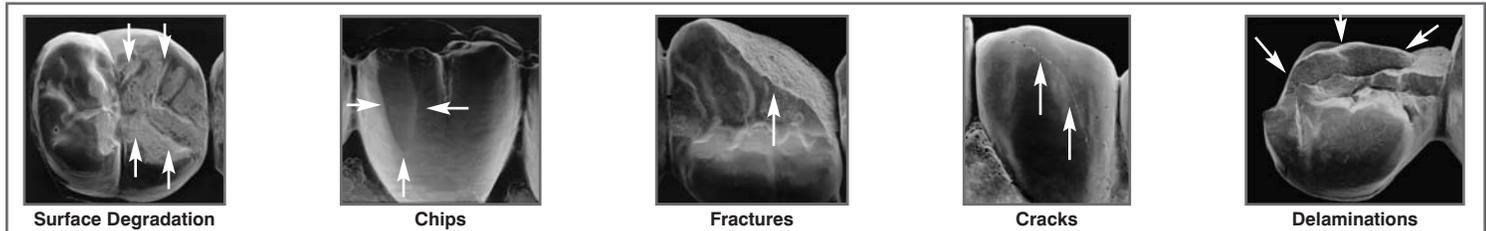
Summary: At 2 years, PFM had almost twice as many defect-free prostheses compared to the zirconia group. Both the PFM and zirconia categories developed more defects with the passage of time. However, most of the defects in both the PFM and zirconia categories were not yet large enough at 2 years to require prosthesis replacement. Percentages for replacement required were almost equal at 3% for PFM and 4% for zirconia.

2. Framework Breaks after Two Years of Service

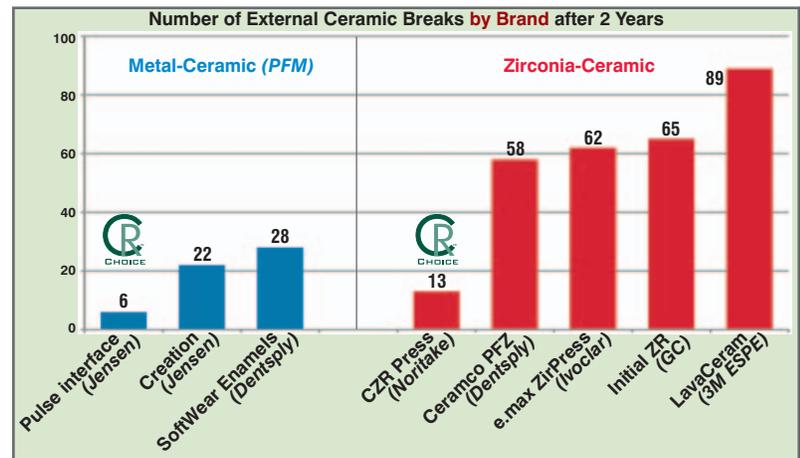


Summary: No metal frameworks broke in 2 years. One zirconia framework broke at 35 months (*image at left*). Span length on broken framework = 14.9 mm. Laboratory error in connector design, endodontic therapy, and occlusal adjustment were all possible causes of this framework break.

3. External Ceramic Breaks after Two Years of Service (See summaries below for frequency of defects shown in SEM pictures)



Summary: External ceramic breaks were 5 times more prevalent with ceramic formulations used on zirconia vs. those used on metal. Formulations of these ceramics differ to match the coefficient of thermal expansion (CTE) of the zirconia vs. metals. The same types of breaks were seen in 4 different zirconia-ceramic brands from 8 different laboratories. This indicates a basic problem needing investigation by the ceramic manufacturers. Individual types and percents of problems observed at 2 years with zirconia were: chips 48%, surface degradation 45%, fractures 7%, cracks <1%, delaminations <1%. Once initiated, external ceramic breaks generally increased in number and severity over time.



Summary: PULSE INTERFACE pressed to metal and CZR PRESS pressed to zirconia had significantly fewer breaks at 2 years. The superior performance of these 2 ceramics calls attention to their formulations as well as the pressing process. However, e.max ZirPress used the same pressing process as CZR Press but had 5 times more breaks, directing attention to ceramic formulation as a key factor.

Important Clinical Tips—Dentist and laboratory technician teams should meet and review the following points:

- Although PFM restorations were most trouble free, if CZR Press was pressed over zirconia, these restorations were equal to the best PFM.
- Dentists must remove more tooth structure for zirconia (2 mm occlusally, 1.5 mm axially, 1.2 mm chamfer margins) and cut clearly visible margins for CAD-CAM.
- Labs must alter framework design offered by software to achieve durable connector size and shape and for proper ceramic support at cusp tips, marginal ridges, etc.
- Labs should keep occlusal anatomy simple with rounded surfaces at edges of the occlusal table to minimize chips and shearing.
- Dentists must limit grinding of ceramic for occlusal adjustment to include only high spots—grinding on fired ceramic initiates degradation.
- Labs and dentists be aware that ceramic breaks are not seen well clinically, but can be felt by patient's tongue. Generally, defects progress in size and number over time.

TRAC Conclusions: After two years of clinical service, metal and zirconia frameworks are not the issue; they are performing equally well. The issue is breaks in the external ceramics. Pulse interface by Jensen pressed over high-gold, silver-free alloy, and CZR Press by Noritake pressed over zirconia performed best and equally well.

Integrating Electric Handpieces into Your Practice *(Continued from page 1)*

Advantages Compared to Air Turbine

- **Higher Torque:** Torque increases to maintain speed with minimal stalling.
- **Concentric Cutting:** Allows for better margin definition and smoother cutting.
- **Reduced Noise:** The volume is perceived to be less because the frequency is lower.
- **Durability:** If properly maintained, survey results indicate repair requirements may be less. However, repairs to electric handpieces are more expensive.
- **Single Motor:** High- and low-speed applications including endodontics can be accomplished with one motor using different attachments.
- **Control Box:** Speed, torque, pre-programmed settings, lighting, etc., can be adjusted on a digital display.

Disadvantages of Electric

- **Cost:** Significantly more expensive than conventional air turbine.
- **Weight and Ergonomics:** Heavier and larger handpiece may cause poor balance, fatigue, and discomfort. Intraoral access may be limited due to size of handpiece head and angle.
- **Learning Curve:** Cutting style may need to be adjusted due to different feel and feedback of electric handpieces.
- **Infection Control:** Similar to air turbines, cross contamination is possible due to inability to sterilize irrigant, cords, and some motors.
- **Heat:** *Friction of internal gears can heat up handpiece head and possibly burn patient. Heat can be minimized by following manufacturers' instructions for lubrication and maintenance, and assuring adequate air and water flow during use.*

Electric High-Speed Handpiece Comparison

Product Image						
Brand Company	Ti-Max NL400 Brasseler/NSK www.brasselerusa.com	ELECTROtorque TLC Kavo www.kavousa.com	NuTorque DentalEZ (Star) www.dentalez.com	Optima MX Bien-Air www.bienair.com	SIROTorque L+ Sirona www.sirona.com	eStylus Dentsply (Midwest) www.dentsply.com
Features						
Cost (Motor, controller, and 1:5 attachment)	\$3,190	\$4,307	\$4,515	\$3,370	\$3,855	\$3,722
Available Attachments	1:5, 1:1, 4:1, 10:1, 16:1 contra-angles; 1:1 straight; & specialty	1:5, 1:1, 2:1, 2.7:1, 27:1 contra-angles; 1:1 straight; & specialty	1:5, 1:1, 16:1 contra-angles; & 1:1 straight	1:5, 1:1, 10:1 contra-angles; & 1:1 straight	1:5, 1:1, 2.4:1, 6:1, 9.5:1, 24:1 contra-angles; 1:1 straight; surgical; & specialty	1:5, 1:1, 10:1 contra-angles; & 1:1 straight
Motor Type	Brushless	Brushless	Brushless	Brushless	Brushless	Brush
Motor Sterilization	Motor only	Motor only	Motor only	Motor only	No, wipe disinfect only	No, motor sheath only
Handpiece Weight	168 g	226 g	208 g	238 g	175 g	225 g
Contra-Angle	18 degrees	27 degrees	17 degrees	22 degrees	19 degrees	21 degrees
Head Height with Bur	22.4 mm	22.2 mm	23.1 mm	23.1 mm	22.5 mm	23.1 mm
H₂O Adjustment on Handpiece	No	Yes	No	No	Yes	No
Display	Numeric with buttons	LCD with buttons	Touch screen	Touch screen (color)	LCD with buttons	LCD with buttons
Main Controller Functions	<ul style="list-style-type: none"> • Speed control • Reverse direction • 2 programmable presets • Gear ratio selection • Air pressure calibration 	<ul style="list-style-type: none"> • Speed control • Reverse direction • Endo mode with torque limit • 12 programmable presets • Gear ratio selection • Air pressure calibration 	<ul style="list-style-type: none"> • Speed control • Reverse direction • Endo mode with torque limit • 8 programmable presets • Gear ratio selection • Displays bur speed • Air pressure calibration 	<ul style="list-style-type: none"> • Speed control • Reverse direction • Endo mode with torque limit • 5 programmable presets • Gear ratio selection • Displays bur speed 	<ul style="list-style-type: none"> • Speed control • Reverse direction • 4 programmable presets • Gear ratio selection • Displays bur speed 	<ul style="list-style-type: none"> • Speed control • Reverse direction • Endo mode with torque limit • 12 programmable presets • Gear ratio selection • Displays bur speed • Air pressure calibration
Average Clinical Ratings						
Ergonomics	Excellent-Good	Excellent-Good	Good	Fair	Excellent-Good	Good
Cutting Efficiency	Excellent	Excellent-Good	Excellent-Good	Excellent-Good	Excellent-Good	Good
Control/Refining Margin	Excellent	Excellent-Good	Excellent	Excellent-Good	Excellent-Good	Good
Speed Control with Rheostat	Excellent-Good	Excellent	Good	Excellent-Good	Good	Good
Lighting	Excellent-Good	Excellent	Good	Excellent	Excellent-Good	Excellent-Good
Ease of Controller Use	Good	Good	Excellent-Good	Excellent	Excellent-Good	Excellent-Good
Overall Grade*	Excellent 	Excellent-Good	Excellent-Good	Excellent-Good	Excellent-Good	Good

* Overall grade based on cost, features, and clinical performance, and weighted according to survey and clinicians' responses.

Summary of Clinical and Laboratory Evaluations

- **Cutting efficiency** is superior to air turbine, varies by brand, yet some require more pressure to cut similarly.
- **Ergonomics** are improving in design, weight, and balance, but are still inferior to air turbine.
- **Control/refining margin** is perceived as smoother and more precise with overall better preps.
- **Control units** varied from simple numeric displays with limited options to multi-function touch screens with extended options.

- **Speed control with rheostat** is most effective with ELECTROtorque TLC, Ti-Max NL400, and Optima MX. Speed can also be adjusted at the controller.
- **Intraoral access** continues to be limited by larger head size and greater contra-angle.
- **Other features** improve versatility and convenience, including water adjustment at handpiece, light intensity control, specialty attachments, etc.

Continued on page 4

Integrating Electric Handpieces into Your Practice (Continued from page 3)

Clinical Tips

- Use of electric low speed is superior to conventional air turbine for most indications such as trimming appliances, dentures, provisionals, or other hard substances
- Some clinicians combine air turbine for gross reduction and electric for refinement
- Use electric for removal of crowns or cutting through zirconia
- Compare features and benefits of each handpiece (see chart on page 3)
- Arrange to try the handpieces in your office
- Find the best ergonomic fit

- Determine what type of attachments you will use (*most used are low-speed (1:1), high-speed (1:5), and straight (1:1) attachments*)
- Use handpiece maintenance systems such as Quattrocare (KaVo), Assistina (A-dec), or Lubrina (J. Morita)
- Train auxiliaries in the proper care and maintenance of handpieces
- For surgical use, it is recommended to use a different electric handpiece motor and cord which can be sterilized; has separate foot controls for speed and sterile water; and is designed for surgery

CR Conclusions: The main advantages of electric handpieces are higher torque, reduced noise, constant speed, and greater cutting efficiency. Disadvantages continue to be high cost, weight, and ergonomics. **Overall, all brands performed well.** Ti-Max NL400 (Brasseler) had the best combination of cost, features, and clinical performance. **Clinician's preference may be the single most important factor in choosing an electric handpiece.**

Unique Flexible Plastic Toothpick

For those who enjoy using toothpicks, this thin plastic pick with a subtle textured surface provides effective cleaning while massaging the gums. Finger grip end provides user excellent control. Plastic improves access by eliminating splintering and providing ability to "thin down" the pick unlike standard flat or round toothpicks.

Advantages:

- Design allows excellent access into interproximal areas, good grip, and effective cleaning
- Good combination of flexibility and rigidity
- Effective thin size
- Can be reused
- Convenient portable carry case
- Excellent texture

Disadvantage:

- Tapered edge may be too sharp if inserted with sharp edge toward papilla

CleanPik



Dr. Collins Dental

26229 Enterprise Court
Lake Forest, CA 92630
888-583-6048 • Fax 949-916-0951
www.drcollinsdental.com

\$1.85 / Box of 32 piks (6¢/pik)

CR Conclusions: 75% of 28 Evaluators stated they would incorporate the CleanPik into their practice. 86% rated it excellent or good and worthy of trial by colleagues.

One-Bottle Ceramic Primer Well Accepted

Bonding ceramic restorations to resin cement is now a commonly accomplished procedure. Additionally, all dentists must repair, at least for an interim time, ceramic restorations that have chipped or broken.

Clearfil Ceramic Primer



Kuraray America

600 Lexington Ave, 26th Floor
New York, NY 10022
800-879-1676 • Fax: 212-867-3543
www.kuraraydental.com

\$89 / 4 ml bottle

Clearfil Ceramic Primer is a silane coupling agent supplied in one bottle. The ceramic surface should be sandblasted, cleaned with phosphoric acid, and primed with the product before application of adhesive and attaching the resin to the ceramic. Hydrofluoric acid is not required.

96% of 25 CR Evaluators rated Clearfil Ceramic Primer excellent or good, and 88% said they found the product worthy of trial by colleagues.

CR Conclusions: Clearfil Ceramic Primer is easy to use and effective. The shelf life of ceramic primer is two years. Long-term clinical research and data are being established.

Unique Multi-Purpose Ceramic Primer

Challenges with most ceramic primers are short shelf-life and need to use hydrofluoric acid to etch the ceramic surface. Interface has resolved these challenges.

Interface



Apex Dental Materials

330 Telser Rd
Lake Zurich, IL 60047
877-273-9123 • Fax 847-719-1122
www.apexdentalmaterials.com

\$95 / Kit (two 3 ml bottles)

Interface is supplied in two bottles. It allows simultaneous conditioning of ceramic, enamel, and dentin prior to use of Simplicity or Surpass adhesives. It is activated just before use; has specific and varied instructions for several uses; and does not require hydrofluoric acid etching before application.

100% of 23 evaluators rated Interface excellent or good, and 100% said they found the product to be worthy of trial by colleagues.

CR Conclusions: Interface is an effective ceramic, enamel, and dentin primer/conditioner that requires activation just before use ensuring its chemical activity and freshness. Long-term clinical research and data are being established.

"Clinical Success is the Final Test"

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