

Clinical & Scientific Documentation

BruxZir[®] *Solid Zirconia*

High Strength and Minimally Invasive



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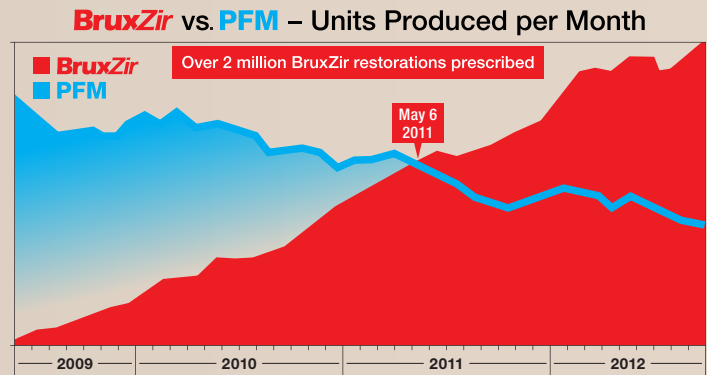
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Castle Ceramics
Dental Laboratory

The BruxZir Phenomenon – A Clinician’s Perspective by Dr. Michael DiTolla

May 6, 2011, is an important day in dental history. That’s the first day that doctors prescribed more BruxZir restorations than PFM restorations. At the time, BruxZir Solid Zirconia was two years old and PFMs were 50 years old. Here at the lab, it confirmed a trend that we had been observing during those two years: the days of the PFM being the dentist’s everyday restoration were coming to a close. The sales of BruxZir never dipped below those of the PFM again; in fact, the gap between the two continues to grow wider as BruxZir grows and PFMs continue to shrink (see graph to right).



The rapid growth of BruxZir Solid Zirconia took us somewhat by surprise, as our original intention for the material was as a cast gold replacement. Almost every dentist I know agrees that cast gold is the finest indirect restorative material we have in dentistry. Unfortunately, almost every patient I know agrees that cast gold is the least esthetic indirect restorative material we have in dentistry. Ten years ago, our R&D department asked me what they should work on, what kind of restorative material would most benefit dentists and patients. My answer was simple: cast gold that is shade A2. They reminded me that they were engineers, not alchemists, but I remained undeterred in my push for a cast gold in shade A2.

Five years later, they presented me with BruxZir, an impressive effort at creating a cast gold in shade A2. Fast-forward five more years to today, and it is clear that they were truly on to something big. As the translucency and esthetics of BruxZir continue to improve, it has transitioned from a posterior material to an anterior material as well that can be used in almost any clinical situation.

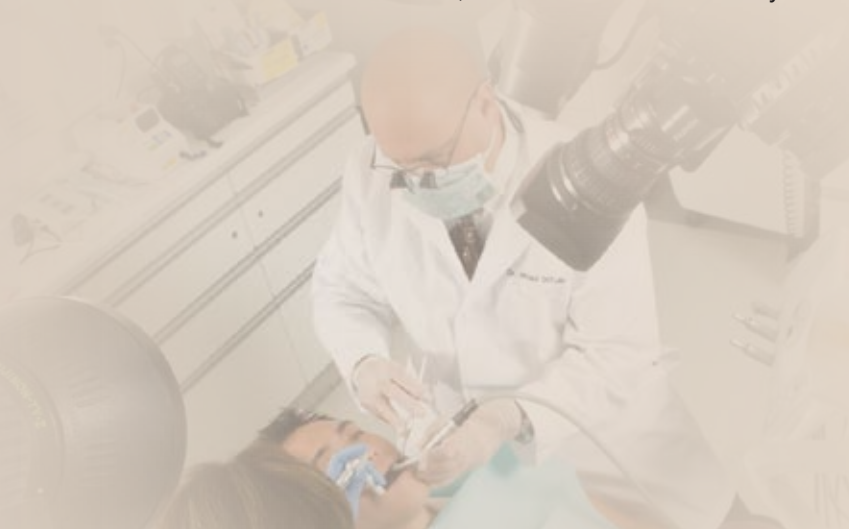
The biggest reasons for the rapid growth of BruxZir are high strength and fit. As a monolithic restoration with no porcelain on it, BruxZir has the lowest fracture rate of any restoration (besides cast gold) in our lab. It’s clear that dentists place strength very close to the top, if not at the top, of their list of desirable characteristics for an everyday crown & bridge material.

By far the most common comment that we get from dentists about BruxZir restorations is how well they fit compared to most of the crowns they have used in the past. It took us a few months to figure out what these dentists really meant. It wasn’t that they used to cement crowns with open margins; it was that the emergence profile of BruxZir crowns blended with the tooth structure and soft tissue better than any material they had previously used (again, with the exception of cast gold.) The microscopic images that follow demonstrate how a high-strength monolithic crown (BruxZir) has a much better emergence profile than a bi-layered crown (PFM) on an identical prep.

This combination of fit, strength and improved esthetics has made BruxZir the most prescribed restoration in the lab, and it shows no signs of slowing down. The final frontier for BruxZir is to be used for veneers, and with the translucency and esthetics improving monthly, that day is not far off.



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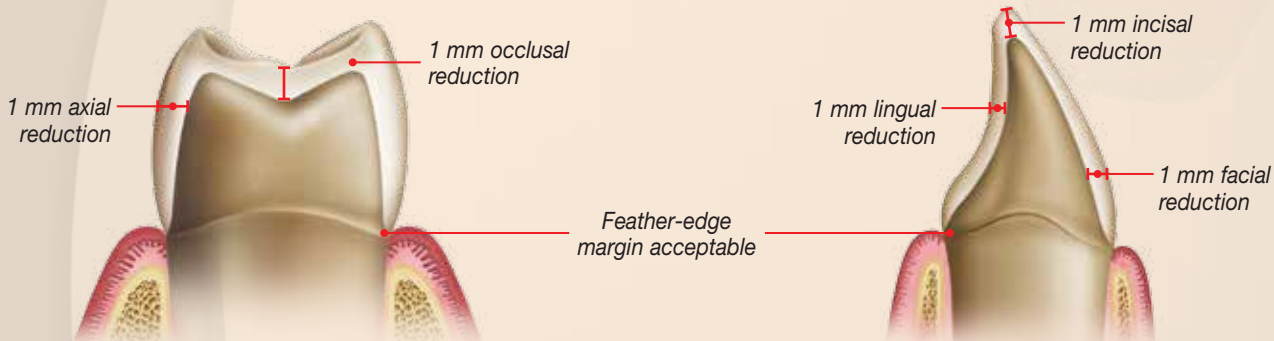


Indications

BruxZir Solid Zirconia is indicated for crowns, bridges, veneers, inlays and onlays. It is an esthetic alternative to PFM metal occlusal/lingual or full-cast restorations and ideal for restorations requiring extra durability such as crowns under partials or screw-retained implant crowns. The chip-proof durability of BruxZir restorations also makes them ideal for bruxers who have broken natural teeth or previous PFM restorations. BruxZir restorations are also ideal for patients lacking the preparation space for a PFM.

Preparation Requirements

- Shoulder preparation not needed, feather edge is OK. It is a conservative preparation similar to full-cast gold, so any preparation with at least 0.5 mm of occlusal space is accepted.
- Minimum occlusal reduction of 0.5 mm; 1 mm is ideal.



These illustrations show an ideal 1 mm reduction for an anterior or posterior BruxZir crown with feather-edge margins. BruxZir does fine at 1.5 or 2.0 mm as well, but this amount of reduction is not always possible. Maintaining 1 mm of BruxZir thickness allows you to safely adjust the crown if necessary when checking the occlusion. While BruxZir can be milled as thin as 0.5 mm, it cannot be adjusted at this thickness without the risk of breakage. With a BruxZir crown at 0.5 mm thickness with high occlusion, consider adjusting the opposing tooth.

Typical Prep with PFM Crown



This image represents the typical PFM prep we receive with a conservative feather-edge margin. When a PFM is fabricated for this prep, there is a bulky 1 mm margin on the PFM that catches on the explorer. Even if the margin is sealed, the emergence profile is unacceptable.

Typical Prep with BruxZir Crown



This image represents the typical PFM prep we receive with a BruxZir crown in place. Because it is a monolithic crown and can be milled to a feather edge, there is no bulk of material, or "speed bump," at the margin. Dentists tell us their explorer cannot detect where the tooth ends and the BruxZir crown begins.

Cementation Recommendations

- Ceramir® Crown & Bridge (Doxa Dental; Newport Beach, Calif.) or a resin-reinforced glass ionomer cement such as RelyX™ Luting Cement (3M ESPE; St. Paul, Minn.) or GC Fuji Plus™ (GC America; Alsip, Ill.) with Z-Prime Plus or Monobond Plus
- For short or over-tapered preparations, use a resin cement such as RelyX™ Unicem (3M ESPE) or Panavia™ F2.0 (Kuraray; New York, N.Y.) with Z-Prime Plus or Monobond Plus

BruxZir Clinical Study 1

BruxZir and Milled IPS e.maxCAD: Very Promising 1-Year Results

Gordon's Clinical Bottom Line: An unprecedented paradigm shift has occurred in the last few months relative to use of tooth-colored crowns! Some major dental laboratories report the percentage of use of full-ceramic crowns is now higher than porcelain-fused-to-metal (PFM). TRAC Research is conducting the following ongoing controlled clinical study on full-zirconia (BruxZir) and milled lithium disilicate (e.maxCAD) restorations in "real-world" dental practices. You will be impressed with the short-term positive results.

BruxZir (Glidewell Laboratories) and milled e.maxCAD (Ivoclar Vivadent) attracted attention of TRAC Research scientists because they are **the first of over 100 posterior tooth-colored restoratives tested here clinically over the past 35 years that showed NO cracks, chips, breaks, wear, or staining after their first year of service.** Practice-based controlled clinical tests of tooth-colored restoratives began in this lab in 1976, when the demise of metal in dentistry began to be discussed seriously. The goal was to identify the most promising alternatives. The same test protocol has been used throughout, allowing comparative analyses as restorations age in service. At one year, BruxZir and milled e.maxCAD show superior performance.

BruxZir and Milled e.maxCAD: Very Promising 1-year Results

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BruxZir		Milled e.maxCAD	

Example clinical and scanning electron microscope (SEM) images of the same restorations at initial placement and one year later show no negative changes in BruxZir and milled e.maxCAD after one year of clinical service.

Three Ways these Restorations are Available to Dentists

1. Conventional impression is mailed to the lab. The lab scans the impression and mills the restoration.
2. Digital impression is mailed to the lab. The lab mills the restoration.
3. The dentist makes the digital impression and mills the restoration in-office. The dentist must have CEREC or 3iD equipment.

Advantages

BruxZir

- Very strong at +1000 MPa
- Strength allows stress of rubber tooth preparation and better edge margins
- Can serve well in heavy occlusion areas where other materials fail
- Reasonably cost (from one lab about \$1999)

Milled e.maxCAD

- Can match surrounding dentures very well
- Strength at +6-350 MPa shows no failure at one year in molar full-crown restorations
- Reasonably cost (from one lab about \$1999)

Disadvantages

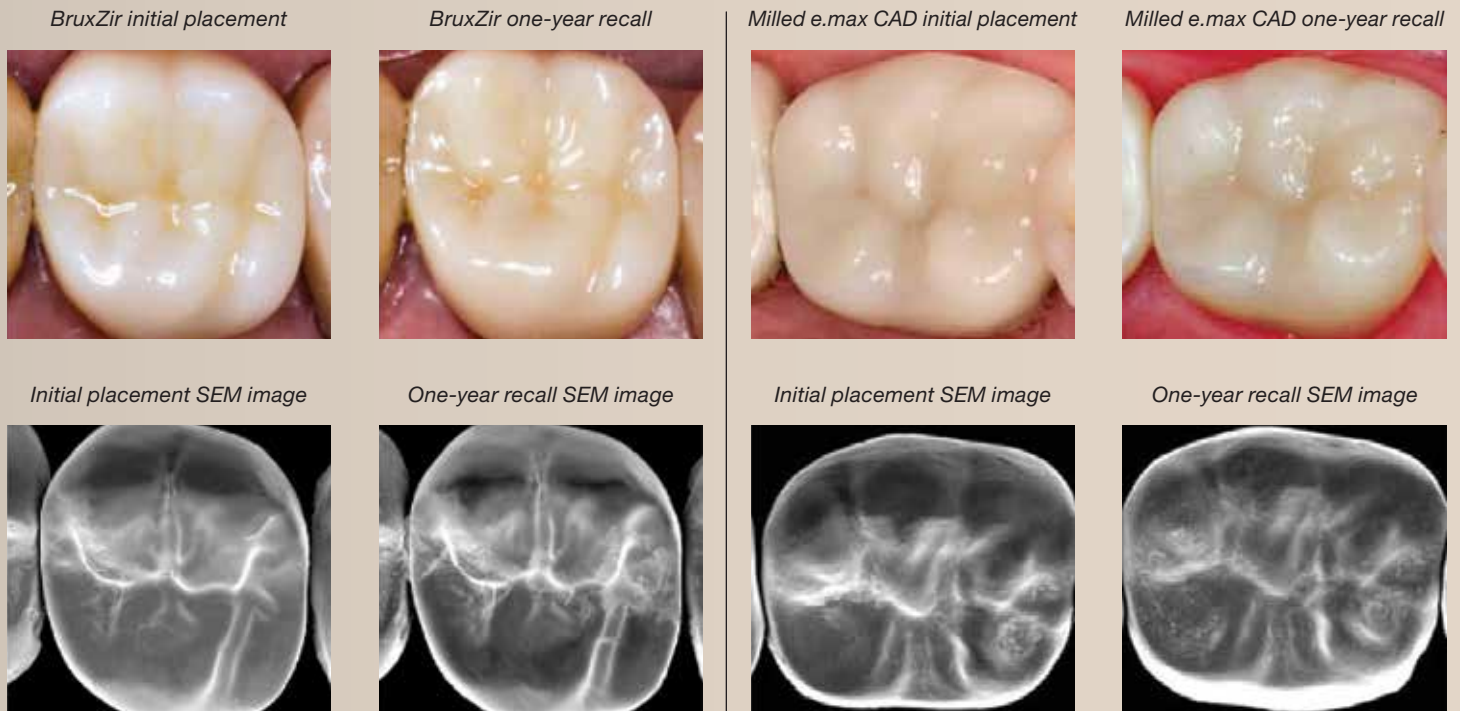
- More long-term clinical data are needed to establish indications, contra-indications, longevity and failure modes. This is the first controlled clinical study comparing performance of e.maxCAD and BruxZir.
- Currently, BruxZir is less esthetic and e.maxCAD has less strength, but both look acceptable in routine and are solving self-retention problems.

Study Protocol Summary

- 20 dentists (agreement with in-office milling and digital impression) in 10 practices
- 80 full-crown restorations
- Clinical and SEM images made on all restorations and supporting dentures at initial placement and one-year recall
- 40 BruxZir restorations placed (20 in-office and 20 in-lab)
- 40 milled e.maxCAD restorations placed (20 in-office and 20 in-lab)
- 2 restorations (1 milled e.maxCAD and 1 BruxZir) were lost to follow-up
- Initial restorations and 12-month follow-up checked using CEREC or 3iD mill for fit and finish. Fit and finish (112) measured, designed by Paul Chou (CSC, Columbia University) with Prof. Carlos Torres (University of California, San Diego)
- Patients kept being billed for BruxZir and e.maxCAD. Malpractice suits for control CAD

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To view the full report, visit www.bruxzir.com.



Example clinical and scanning electron microscope (SEM) images of the same restorations at initial placement and one year later show no negative changes in BruxZir and milled e.maxCAD after one year of clinical service.

SOURCE: An independent, non-profit, dental education and product testing foundation, Clinicians Report®, June, 2012.

ADVANTAGES

BruxZir:

- Very strong at +1000 MPa
- Strength allows more shallow tooth preparation and feather edge margins
- Can serve well in heavy occlusion cases where other materials fail
- Reasonable cost (*from some labs about \$100*)

Milled e.maxCAD:

- Can match surrounding dentition very well
- Strength at +/-350 MPa shows no failures at one year in molar full-crown restorations
- Reasonable cost (*from some labs \$100*)

DISADVANTAGES

- More long-term clinical data are needed to establish indications, contra-indications, longevity and failure modes. This is the first controlled clinical study comparing performance of e.maxCAD and BruxZir.
- Currently, BruxZir is less esthetic and e.maxCAD has less strength, but both look acceptable in molars and are serving well without problems.

Three Ways These Restorations Are Available to Dentists

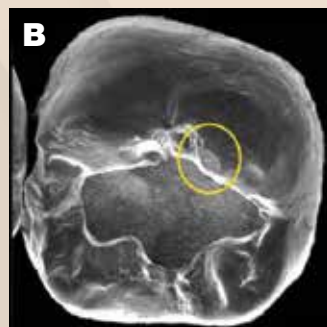
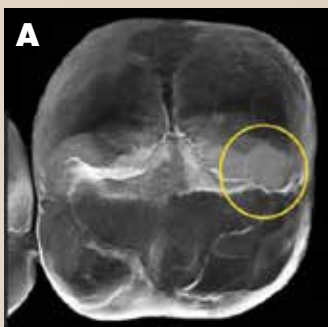
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2. **Digital impression is emailed to the lab.** The lab mills the restoration.
3. **The dentist makes the digital impression and mills the restoration in-office.** The dentist must have CEREC or E4D equipment.

Study Protocol Summary

- 20 dentists experienced with in-office milling and digital impressions
- 66 patients
- 81 full crowns on molars
- Clinical and SEM images made on all restorations and opposing dentitions at initial placement and each yearly recall
- 11 characteristics graded clinically and 9 in the lab
- 2 test materials, 1 control material (*BruxZir; e.maxCAD with 1/2 made by lab using Ivoclar method and 1/2 milled by dentists using CEREC with a fast mill-fast fire method (12.5 minutes) developed by Paul Child DDS; Control = zirconia substructure with PressCeram veneer ceramic*)
- Cements: RelyX Luting RMGI for BruxZir and Control; Multilink resin for e.maxCAD

Results and Observations

1. **Overall esthetics:** e.maxCAD best with 69% rated excellent for matching color and translucency and 47% excellent for BruxZir.
2. **Wear of opposing dentition by crowns:** All 3 crown materials wore small facets (see image below) in over half the opposing dentitions. Facets by BruxZir were more numerous and larger. More time is needed to see if the facets progress beyond first year “wearing in.”



Images A and B show wear facets on dentition opposing BruxZir and milled e.maxCAD full crowns. All the materials in this study, including the Control, produced similar facets in enamel, gold castings, composite resin and some ceramics.

3. Wear of crowns by opposing dentition: Surprisingly, opposing dentition of all types produced wear facets on all the crown materials. Most aggressive was opposing ceramics, followed by enamel. Cast gold alloy and composite resin also produced wear facets.

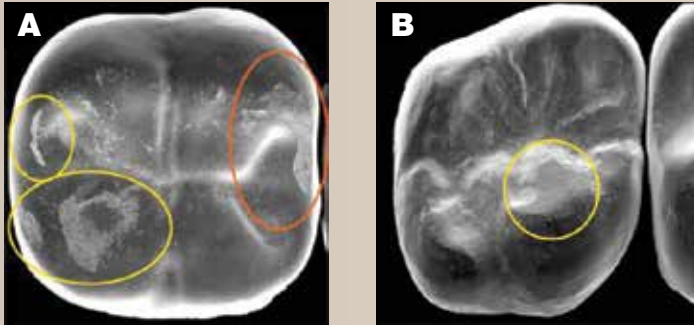


Image A shows a BruxZir crown with wear facets produced by composite resin and enamel (yellow circles) and ceramic (orange circle) opposing dentition. Image B shows a milled e.maxCAD crown with a wear facet made by cast gold opposing dentition. Small wear facets on both the crowns and their opposing dentition is a positive finding indicating near equal wear potential of the materials clinically.

4. Surface smoothness: BruxZir and e.maxCAD ceramics retained smoothness, but surface glazes in some patients roughened and/or wore away at occlusal contacts or were removed by occlusal adjustment. The question arises — is it necessary to glaze these materials?



It is apparent that glazes used on all the crowns in this study will not be long lasting. Image A shows glaze disruption to e.maxCAD by a ceramic onlay; Image B shows glaze worn off a BruxZir cusp tip by opposing cast gold; Image C shows where occlusal adjustment stripped away the glaze and left the zirconia underneath untouched.

5. Cracks, chips, breaks, wear, staining: None of these problems were present on BruxZir and milled e.maxCAD, but the Control (*zirconia substructure plus veneer ceramic*) had cracks, chips and breaks typical of veneering ceramics designed for use on zirconia.

6. Occlusal adjustment: The homogeneously dense BruxZir and milled e.maxCAD both tolerate occlusal adjustment well, but the rotary instruments roughen and remove the surface glazes. Fine diamonds followed by diamond-impregnated rubber cups are indicated for smoothing of occlusal adjustments. Example products: Axis and Komet have special kits (*product numbers LS7579 and LD0707, respectively*).

7. e.maxCAD recommended protocol vs. faster fabrication protocol: A fast mill-fast fine protocol to reduce fabrication time to 12.5 minutes was used by dentists chairside in this research. Although Ivoclar states this protocol is “not recommended by the manufacturer,” so far, no differences have been seen in any of the 20 graded characteristics between the slower and faster processing protocols.

8. No differences: So far, there have been no problems with endo, caries, changes in perio health, unusual plaque retention on the crowns, need for re-cementation, margin fit or interproximal contact. Patient ratings for both crown materials have been very high. Overall ratings of crown “feel” and esthetics are 89% excellent and 11% good.

CR Conclusions: Milled e.maxCAD processed two ways and BruxZir full crowns on molars have served well after one year in this practice-based controlled clinical trial, showing no cracks, chips, breaks, wear or staining. Wear of opposing dentition, glaze degradation, effects of occlusal adjustment and long-term durability of e.maxCAD crowns fabricated with the fast mill-fast fire method remain as questions to be answered as more time passes in this ongoing study. Readers can expect a yearly status report on the progress of the pertinent new materials as they age in service.

BruxZir Seating Instructions

Instructions for Seating BruxZir and Other Zirconia-Based Crowns & Bridges

BruxZir restorations are fabricated from solid zirconia oxide material, much like the zirconia oxide coping found in restorations such as PrismaTik Clinical Zirconia™, Lava™ Zirconia (3M ESPE; St. Paul, Minn.) and NobelProcera™ (Nobel Biocare; Yorba Linda, Calif.). Interestingly, zirconia oxide exhibits a strong affinity for phosphate groups. We can take advantage of this fact with phosphate-containing primers, such as Monobond Plus (Ivoclar Vivadent; Amherst, N.Y.) and Z-Prime™ Plus (Bisco; Schaumburg, Ill.), or cements, such as Ceramir® Crown & Bridge (Doxa Dental), to increase our bond strengths to zirconia oxide. Unfortunately, saliva also contains phosphates in the form of phospholipids, so when a BruxZir crown or bridge is tried in the patient's mouth and comes in contact with saliva, the phosphate groups in the saliva bind to the zirconia oxide and cannot be rinsed out with water. Attempting to use phosphoric acid (which is full of phosphate groups) to "clean out" the saliva only makes the problem worse.

The only way we have found to successfully remove these phosphate groups from the interior of a BruxZir restoration is with the use of Ivoclean (Ivoclar Vivadent). This zirconia oxide solution is placed inside the restoration for 20 seconds and then rinsed out. Due to the large concentration of free zirconia oxide in the Ivoclean, it acts as a sponge and binds to the phosphate groups that were previously bonded to the BruxZir restoration. Once the Ivoclean is rinsed out, you will have a fresh bonding surface for the Monobond Plus, Z-Prime Plus or Ceramir to bond to.

The clinical steps would look like this:



1. This patient has a PFM crown on tooth #9 that he would like to replace. Tooth #8 has a failing composite with some fairly significant recurrent decay underneath it that will also require a full-coverage crown. Every month or two I do an anterior BruxZir case like this to give the R&D department some feedback on the translucency of the material, which they continue to improve. Tooth #8 & #9 will be prepped for BruxZir crowns.



2. The BruxZir crowns fit well, and the patient has approved them, so it is time to start the cementation procedure. Since zirconia crowns are susceptible to salivary contamination from phospholipids when they are tried in the mouth, if you simply rinse them out with water, as I am doing here, you remove the visible saliva, but the phosphate groups remain bonded to the zirconia surface. The good news is that once we remove these salivary phosphate groups, we are going to take advantage of this fact when we cement or bond these crowns.



3. Fortunately, Ivoclean (Ivoclar Vivadent) was released earlier this year, specifically for the purpose of cleaning out restorations prior to bonding or cementation. I place a couple drops in both of the crowns that will stay in place for 20 seconds. Ivoclean is a concentrated zirconia oxide solution. When placed in crowns, it sets up a concentration gradient so that the salivary phosphate groups bonded to the inside of the crowns are drawn across the gradient to the zirconia particles in the Ivoclean, which can then be rinsed away.



4. I use a microbrush to ensure that the Ivoclean is evenly distributed and has come in contact with all of the internal surfaces of the crowns, although it is not necessary to agitate it against the surface of the zirconia crowns. We just want to ensure that the purple Ivoclean material is coating the entire internal surface of the crown; then, after 20 seconds, it can be rinsed out. Make sure you brush it all the way on to the margins with the microbrush, don't be afraid to get it on the outside surface of the crown.

BruxZir Seating Instructions



5. After 20 seconds, the Ivoclean is rinsed from the crown with an air/water syringe. Ironically, perhaps the worst thing you can do to clean out zirconia-based crowns after try-in is to use phosphoric acid to clean them. As you might imagine, phosphoric acid is full of phosphate groups, so they will occupy every receptor site on the zirconia. It is only by flooding the crowns with Ivoclean that we can decontaminate the internal surfaces in preparation for cementation or bonding. Since Ceramir cement contains phosphates, it will bond directly to the BruxZir crowns without the use of a zirconia primer.



6. Fill the BruxZir crowns with the Ceramir and seat them simultaneously on the preps. Because Ceramir cement is so moisture tolerant, I no longer have to vigorously air-dry the preps prior to cementation, I simply use cotton balls to remove pooling moisture. Not having to blast the preps with air anymore, I find that I have to anesthetize far fewer patients for crown seats than before. We use pinewood sticks to ensure that the crowns stay in place while the cement sets, in case there is any soft tissue rebound. Ceramir is the one cement I use where the excess always peels off in one piece, simplifying cleanup.

Instructions for Adjusting and Polishing BruxZir Crowns & Bridges

Adjust BruxZir Solid Zirconia restorations using a fine-grit diamond with light pressure to avoid potential microfractures. The specially designed BruxZir Adjustment & Polishing Kit may be purchased through Glidewell Direct at www.glidewelldirect.com.



A football-shaped bur is most effective for adjusting occlusion on the occlusal surfaces of posterior teeth and lingual surfaces of anterior teeth.



A tapered bur is most effective for adjusting cusps or proximal contacts.



A round bur is used to adjust a cusp or fossa and for creating endodontic access.



Using light pressure and no water, begin pre-polishing with the brown cup to remove abrasions left by the diamonds.



Continue pre-polishing with the green cup until a more glossy look starts to appear on the adjustment areas.



Finally, use the white cup with light to medium pressure to achieve a "wet" high shine.

BruxZir Before & After Cases

CASE 1



This patient had pre-existing, high-value PFMs over base metal copings on tooth #8 & #9. The condition of the gingiva suggested a base metal allergy, which led to the decision to go with BruxZir all-ceramic (solid zirconia) crowns. The crowns' midline is also off, as are the axial inclinations. The unhealthy gingival tissue was removed with a diode laser and BioTemps were placed. The smooth glazed surface of BioTemps helps gingiva heal faster in these types of cases.



In these "after" lateral smile views, you will notice the flat facial profiles of the BruxZir crowns. Flat facial profiles are much more difficult to achieve with bi-layered restorations such as porcelain-fused-to-metal or porcelain-fused-to-zirconia. Since a BruxZir zirconia restoration is monolithic (one layer), it is much easier to achieve desirable contours.

CASE 2



This female patient presented with a predominately cast metal bridge, which her dentist prescribed after she fractured the porcelain on each of the abutment teeth on the previous restoration. The patient always disliked how it looked and desired a more esthetic, long-term option. Because her PFM restorations had fractured previously, a high-strength BruxZir bridge was prescribed, providing the patient with the best combination of strength and esthetics.

BruxZir Before & After Cases

CASE 3



When this patient required an onlay to replace a broken cusp, cast gold was suggested, but the patient declined. A BruxZir onlay was used instead due to its impressive strength.

CASE 4



The patient had always disliked the metal occlusal on this PFM. When it became necessary to replace it, a tooth-colored BruxZir crown was chosen.

CASE 5



This endodontically treated molar had a large amalgam and several fractures, necessitating a full-coverage BruxZir crown.

CASE 6



This PFM crown had undergone chipping on multiple cusps and the mesial marginal ridge, resulting in an open contact. To prevent this from happening again, a high-strength BruxZir crown was prescribed as a replacement restoration.

CASE 7



Delivery of the BruxZir screw-retained implant crown involved removing the custom healing abutment and then seating the one-piece crown. The abutment screw was tightened to 35 Ncm, and a periapical radiograph was taken to verify final seating.



Once the interproximal and occlusal contacts had been checked, the occlusal screw access opening was sealed with a piece of Teflon tape and composite, bringing the BruxZir implant case to a successful conclusion.

BruxZir Before & After Cases

CASE 8



As you can see in the “after” photo, the BruxZir bridge has acceptable esthetics, although it won’t be mistaken for IPS Empress® anytime soon. Because BruxZir restorations are virtually unbreakable and the patient had already broken two PFM bridges in the past, this was the most appealing solution.

IPS Empress is a registered trademark of Ivoclar Vivadent.

CASE 9



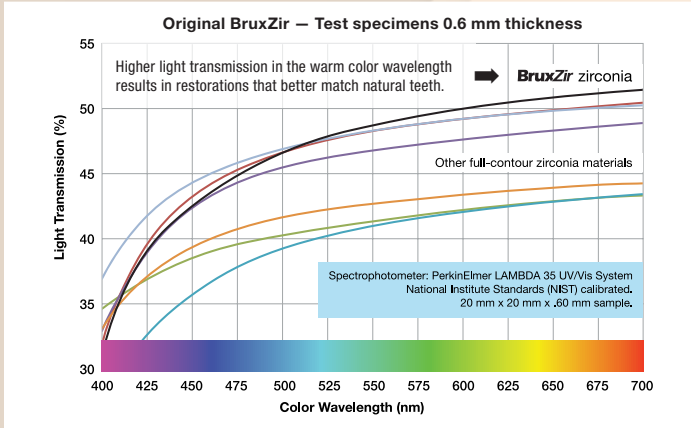
This patient fractured a porcelain all-ceramic crown on the second molar and chipped the first molar. Both crowns were replaced with BruxZir crowns.

CASE 10

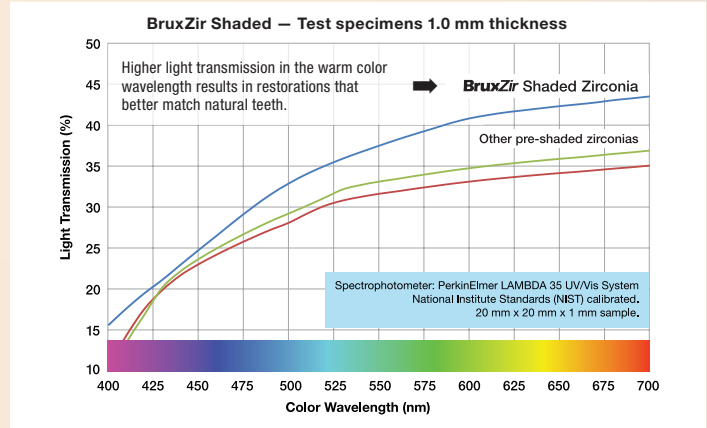


When a patient generates enough occlusal force to break a PFM, a BruxZir crown is a great choice as a replacement.

BruxZir's translucency is unsurpassed in the warm color spectrum for more natural esthetics.



BruxZir zirconia exhibits higher translucency in the warm color spectral wavelength (>550 nanometers), allowing for more natural-looking restorations.



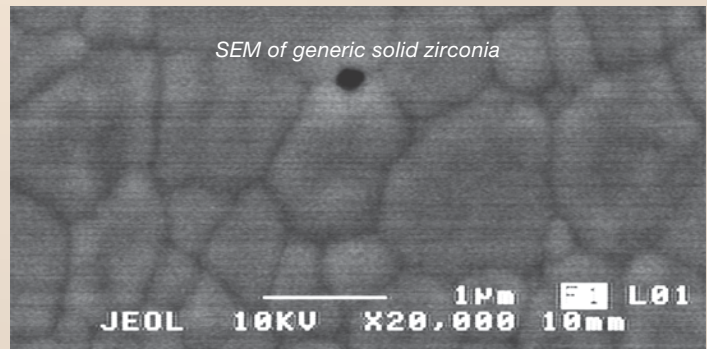
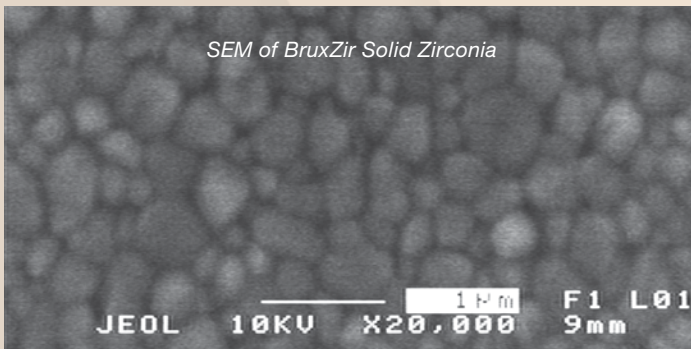
BruxZir Shaded zirconia, which allows for improved shade consistency, also exhibits a higher translucency when compared to other pre-shaded zirconias.

BruxZir Restorations Deliver More Lifelike Results



Note the differences in these photomicrographs of solid zirconia brands. The high-resolution photomicrographs capture cross-sectioned samples of BruxZir Solid Zirconia and two generic competitors. The visible white spots in the competitor samples reveal agglomerates that remain after the sintering process, which decrease translucency and flexural strength. BruxZir Solid Zirconia has a smaller grain size and is nearly free of agglomerates. Unique, patented colloidal zirconia processing gives BruxZir Solid Zirconia higher flexural strength and provides more natural-looking restorations.

Scanning Electron Microscope Images

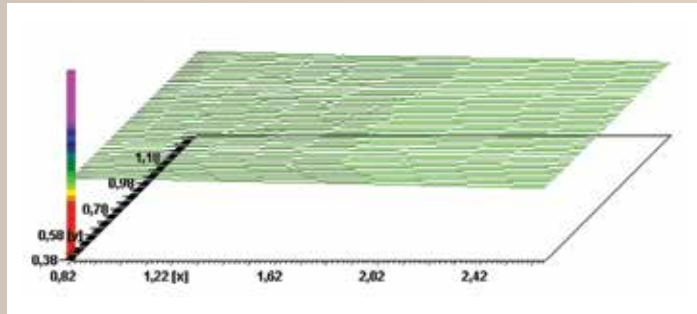


SEM of sintered, colloiddally processed BruxZir Solid Zirconia vs. sintered, isostatically pressed zirconia

BruxZir vs. Ceramco®3 – Comparative Wear Study

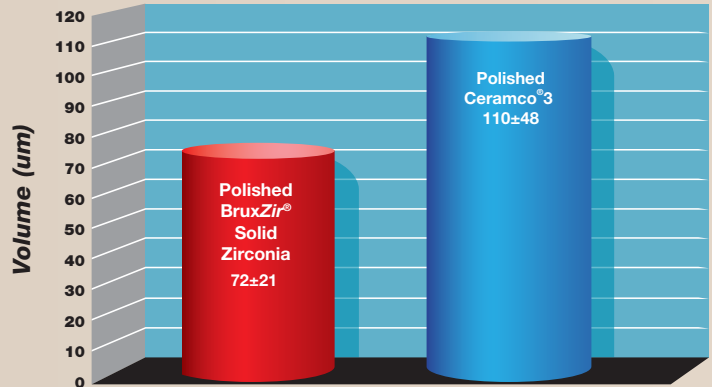


BruxZir® Solid Zirconia and Ceramco®3 were tested in a comparative wear study led by Dr. Jürgen Geis-Gerstorfer, a professor at the University Hospital Tübingen in Germany.

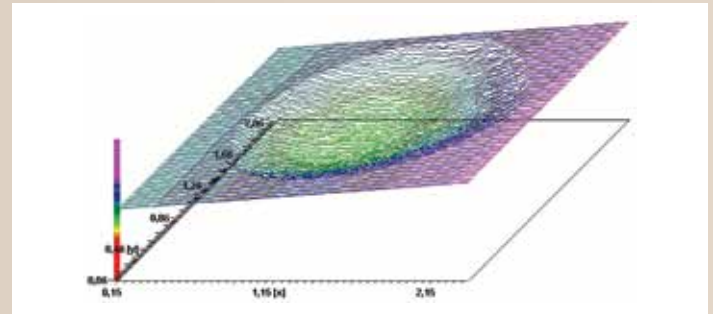


Each material was tested using an eight-chamber Willytech Chewing Simulator, which simulated the clinical performance of the material over a period of five years. Example of the topography of BruxZir after wear test is shown above.

Antagonist Wear Study



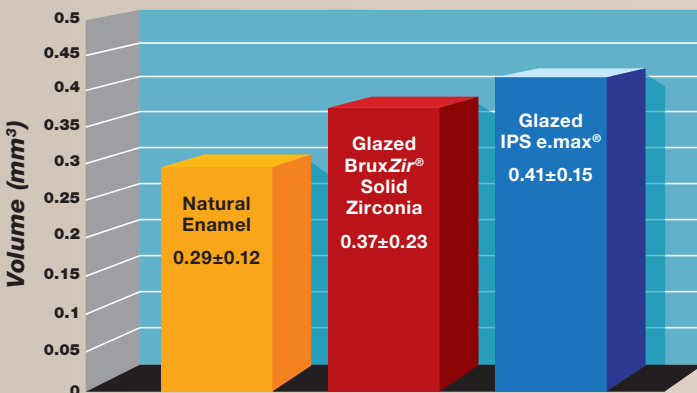
The antagonistic (Steatite balls) wear shows BruxZir zirconia only with 72±21 micron, which is significantly lower than Ceramco3, with 110±48 micron.



After 1.2 million wear cycles under a load of 5 kg, BruxZir compared favorably to Ceramco3, with barely detectable wear. Example of the topography of Ceramco3 after wear test is shown above. *To view the full report, visit www.bruxzir.com.*

Ceramco is a registered trademark of DENTSPLY Ceramco.

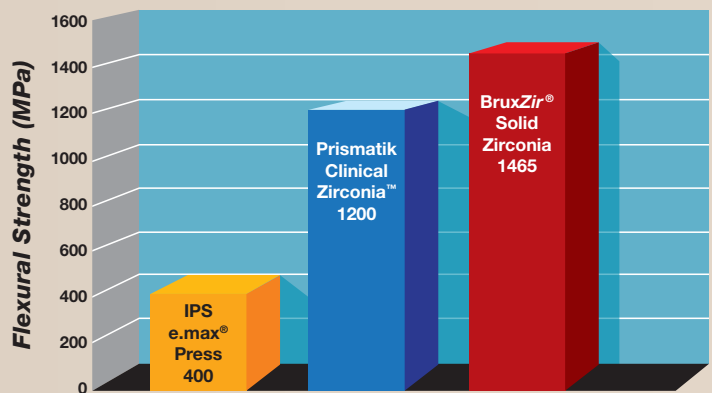
BruxZir vs. IPS e.max® Enamel Wear Test



In a recent study to measure the volumetric loss of enamel, glazed BruxZir zirconia was found to wear compatible with enamel and virtually identical to glazed IPS e.max. *To view the full study, visit www.bruxzir.com.*

IPS e.max is a registered trademark of Ivoclar Vivadent.

High Flexural Strength



Lithium disilicate ceramics have 400 MPa and typical zirconia materials have a flexural strength of more than 1200 MPa. BruxZir Solid Zirconia restorations are able to exceed that strength threshold, with flexural strengths up to 1465 MPa.

The Dental Advisor: BruxZir Solid Zirconia and Bridges 18-month Clinical Performance Report

Purpose

The purpose of this clinical study was to determine the clinical performance of **BruxZir Solid Zirconia Crowns and Bridges** (Glidewell Dental Laboratories) over an 18-month period.

Clinical Evaluation Protocol

At recall time, over 390 full-contour, monolithic **BruxZir** restorations (crowns and bridges) were placed. All restorations were fabricated at *Glidewell Dental Laboratories*. Most of the restorations were cemented with self-adhesive resin cement or adhesive resin cement.

Placement

The following parameters were evaluated at placement: esthetics, marginal accuracy, fit, interproximal contacts, and occlusion. Restorations were evaluated on a 1–5 rating scale: 1 = poor, 2 = fair, 3 = good, 4 = very good, 5 = excellent.

Esthetics, marginal accuracy, fit, and interproximal contacts of more than 96% of the restorations were rated excellent at placement. Very few restorations (less than 2%) had to be remade because of improper fit. A few restorations had light interproximal contacts and had to be remade. For the category of occlusion, 84% of the restorations received an excellent rating. In many cases, the occlusion was light and in some cases the restoration was out of occlusion. Based on customer feedback, *Glidewell Dental Laboratories* designs most of their crowns light in occlusion.

Results at 18 Months

In December 2012, 367 **BruxZir** restorations were recalled and evaluated.

Of the 367 **BruxZir** restorations observed at recall (Figure 1), there were:

- 287 posterior single crowns
- 36 units - 12 three-unit bridges
- 24 units - six four-unit bridges
- 10 units - two five-unit bridges
- One 3-unit inlay bridge
- 7 implant crowns

Of the 367 restorations, 121 (33%) had been in function for 18 months while 246 (67%) had been in function for one year (Figure 2).

The recalled **BruxZir** restorations were evaluated in the following categories:

- Resistance to fracture or chipping
- Esthetics
- Resistance to marginal discoloration
- Wear on zirconia and opposing dentition
- Retention

Restorations were evaluated on a 1–5 rating scale: 1 = poor, 2 = fair, 3 = good, 4 = very good, 5 = excellent.



To view the full report, visit www.bruxzir.com.

FIGURE 1

Types of restorations placed.

- Single Crowns
- Implant Crowns
- Bridges

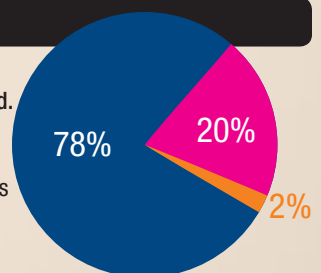
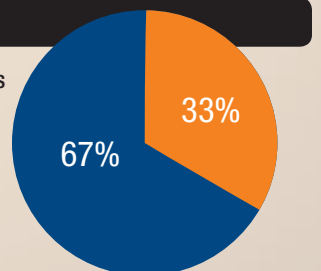


FIGURE 2

Age of restorations at recall.

- 18 Months
- 1 Year



The Dental Advisor Results *continued*

Esthetics

BruxZir restorations were rated excellent for esthetics when compared to other monolithic zirconia crowns (Figure 3).

Resistance to Fracture/Chipping

Nearly all **BruxZir** restorations exhibited no fracture or chipping (Figure 3). One five-unit bridge with very little clearance fractured one week after cementation. The bridge was redone, and is in function without any issues.

Resistance to Marginal Discoloration

No restorations exhibited marginal staining (Figure 3).

Wear Resistance

Minimal wear was observed on **BruxZir** restorations or on opposing tooth structure (Figure 3).

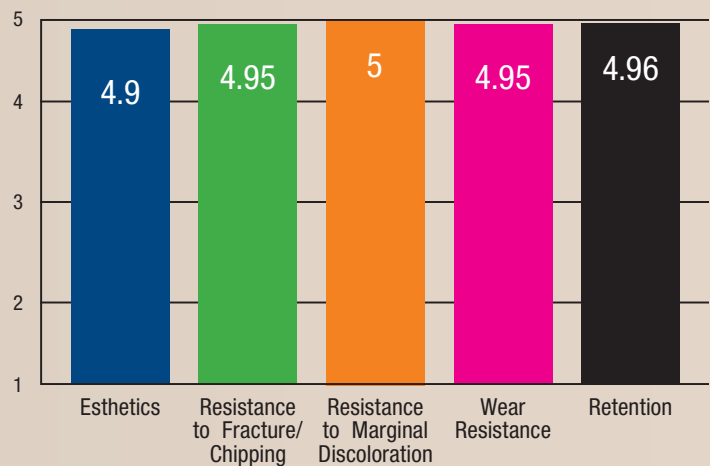
Retention

Three posterior crowns debonded (Figure 3). One was cemented with self-adhesive resin cement and two were cemented with an adhesive resin cement. Two of the teeth had short clinical crowns.

Conclusion

Ninety-eight percent of **BruxZir Solid Zirconia Crowns and Bridges** restorations manufactured by *Glidewell Dental Laboratories* received a 5 or excellent rating at 18-month recall. All of the single crowns and all of the three- and four-unit bridges had no evidence of fracture or chipping. One of two five-unit bridges failed shortly after cementation and was replaced. Over the 18-month period, **BruxZir** has proven to be an excellent restoration with respect to esthetics, resistance to fracture/chipping, resistance to marginal discoloration, wear resistance, and retention. **BruxZir** received a clinical rating of 98%.

FIGURE 3 Ratings of **BruxZir** restorations at recall.



Four-unit bridge for teeth 18-21 at 15 months.

BruxZir®

Solid Zirconia

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