You just get more with BruxZir®

Over 10 million restorations delivered through the Authorized BruxZir® Laboratory network

The #1 prescribed brand of solid zirconia is available at dental laboratories nationwide.

Why not put BruxZir to the test today?
November 2010 is a milestone in dental history. That’s the first time that doctors prescribed more BruxZir restorations than PFM restorations. At the time, BruxZir Solid Zirconia was nearly two years old and PFMs were 50 years old. For Glidewell Laboratories, it confirmed a trend that they had been expecting to see for some time: 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 sales grow and PFM sales continue to shrink (see graph to right).

The rapid growth of BruxZir Solid Zirconia took the company somewhat by surprise, as the original intention for the material was as a cast gold or metal occlusal PFM replacement. While almost every dentist I know agrees that cast gold is the finest indirect restorative material we have in dentistry, almost every patient I know won’t agree to letting a clinician place cast gold in his or her mouth.

By 2012, the translucency and esthetics of BruxZir Solid Zirconia had improved substantially, transitioning the material from being solely a posterior solution to being an anterior option as well. The biggest reasons for the rapid growth of BruxZir are high strength and fit. As a monolithic restoration with no porcelain on it, BruxZir Solid Zirconia has the lowest fracture rate of any restoration (aside from cast gold) in our lab. It’s evident 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 Glidewell Laboratories gets from dentists about BruxZir restorations is how well they fit compared to most of the crowns they have used in the past. It took the company a few months to figure out what those dentists really meant. It wasn’t that they previously cemented 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 combination of fit, strength and improved esthetics has made BruxZir Solid Zirconia the most prescribed restoration in the lab, and it shows no signs of slowing down. In 2015, we introduced BruxZir Anterior as the newest member of the BruxZir family. By increasing the amount of yttria in the zirconia oxide, we were able to create a material that competes esthetically with lithium disilicate while still having 50 percent more strength than lithium disilicate. BruxZir Anterior means that solid zirconia can now be your restoration of choice for almost any clinical situation, whether it is in the anterior or the posterior.
Before: This patient recently had an endodontic procedure through this lower molar PFM crown and recurrent decay on the distal of the bicuspid. The patient had never been particularly happy about the gray hue of the PFM, and he didn’t like having a hole in the top of the crown, even though it was patched with composite.

After: According to lab statistics, crowns on first molars fracture more than any other crown, so I chose a BruxZir Shaded crown for its combination of strength and esthetics. Nearly all of the more than 340 Authorized BruxZir Labs now exclusively use the BruxZir Shaded material.

Buccal After: While these BruxZir Shaded crowns won’t be mistaken for enamel when compared to the surrounding natural dentition, it does a very good job of blending in with these teeth. It doesn’t stick out like a PFM restoration. I consider solid zirconia to be the best blend of strength and esthetics for molar restorations.

Visit bruxzir.com for more information.
BruxZir Clinical Studies

BruxZir and e.maxCAD: Superior Clinical Performance at 3+ Years

Gordon’s Clinical Bottom Line: The TRAC research section of CR has been conducting a controlled clinical study of monolithic restorations for 3-1/2 years. These restorations are serving far better than anticipated. This report contains an update on the well-documented positive TRAC research results.

Scanning electron microscope (SEM), clinical, and laboratory examinations are showing equally excellent service for BruxZir and e.maxCAD milled full-contour crowns on molars at 41 months of service in a practice-based controlled clinical study. This service record exceeds that of over 100 other tooth-colored materials studied by TRAC over the past 39 years using the same methods. The superior performance of these two products has commanded our close attention. Literally millions of these two products have now been placed by U.S. dentists over the past five years—tipping dominance away from the time-honored PFM. Yet clinical research has lagged far behind clinical use, leaving important questions unanswered.

This report provides follow-up on the one-year data published in the June 2012 Clinicians Report to update clinicians as answers begin to develop to the following critical clinical questions.

Critical Clinical Questions and Answers Beginning to Develop after 3+ Years of Service

1. Does BruxZir zirconia severely wear opposing dentition?

NO, see chart below. Concern that zirconia would severely wear opposing dentition dictated our locating and measuring all facets on test crowns and all types of opposing dentition. Three-year data below show BruxZir zirconia crowns caused 23% less wear of opposing dentition than the pressed ceramic-over-zirconia Control (PressCeram by Swiss NP over zirconia by Metoxit) and about the same wear as e.maxCAD lithium disilicate processed with an experimental 12.5-minute post-mill procedure. BruxZir received more wear than it caused.

| Table 1: Percent area worn by the Test Crowns and the Opposing Dentition |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Brands of materials studied     | % area worn by Test Crowns on Opposing Dentition | % area worn by Opposing Dentities on Test Crowns |                      |
|                                 | Year 1 | Year 2 | Year 3 | Year 1 | Year 2 | Year 3 |
| BruxZir                         | 5.5    | 10.3   | 12.8   | 8.2    | 14.5   | 29.6   |
| e.maxCAD (27 min post-mill processing) | 6.7    | 10.8   | 17.9   | 4.6    | 7.3    | 11.1   |
| e.maxCAD (12.5 min post-mill processing) | 4.7    | 7.9    | 11.3   | 6.1    | 9.4    | 13.4   |
| Pressed ceramic-over-zirconia (Control) | 10.9   | 14.2   | 16.6   | 8.3    | 11.1   | 16.4   |

* Data apply only to BruxZir zirconia. Other zirconia formulations may perform differently.

2. Does BruxZir zirconia lack of flexibility adversely affect the occlusal system?

Some people predicted tooth mobility, mastication muscle strain, and joint dysfunction. None of the predicted problems have been noted to date in this study. If you have experienced any of these problems with BruxZir, please contact by email rlla@trresearch.org.

3. Do full-zirconia dental restorations undergo phase change in the 100% humidity of the oral cavity?

To date, phase change problems such as surface cratering and microcracks have not been noted by SEM, nor have particles released into soft tissues with resulting inflammatory changes been seen in this study. However, more time is needed to eliminate this question. In 2001, some zirconia hip joint implants showed these changes occurring within months to beyond five years of clinical use. BruxZir was released commercially in summer 2009, so these are critical years regarding this question. Other more recently released dental zirconias will require similar long-term monitoring.

4. If e.max lithium disilicate is performing so well, why consider use of BruxZir full-zirconia?

There are no data to indicate BruxZir and e.maxCAD could not serve equally well in all single-unit situations. Empirically, both dentists and lab technicians have preferred to take advantage of e.max lithium disilicate’s beauty for anterior teeth and BruxZir’s high strength for the following:

- When minimal tooth preparation can be used.
- This study shows BruxZir meeting its claims by serving well with less than 1.0 mm occlusal reduction and near-feather edge margins on molars, even in patients with bruxing/clenching habits. e.maxCAD was not tested with minimal reduction preparations because these claims were not made for this product.
- In areas that force shallow prep due to limited space.
- For labs, anytime the preps are too shallow to allow predictable positive clinical results with other materials.
BruxZir Clinical Studies

BruxZir and e.maxCAD: Superior Clinical Performance at 3+ Years (continued from page 1)

4. If e.max lithium disilicate is performing so well, why consider use of BruxZir full-zirconia? (continued)

Table 2: BruxZir and e.maxCAD are the antithesis of one another in many characteristics.

<table>
<thead>
<tr>
<th>Differences</th>
<th>BruxZir</th>
<th>e.maxCAD</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>• Very high flexural strength (1000+ MPa)</td>
<td>• Lower flexural strength (about 550 MPa)</td>
</tr>
<tr>
<td></td>
<td>• Adequate and improving esthetics</td>
<td>• Excellent esthetics</td>
</tr>
<tr>
<td></td>
<td>• Minimal prep permissible</td>
<td>• Deep prep preferable</td>
</tr>
<tr>
<td></td>
<td>• Moderately worn by opposing dentition</td>
<td>• Moderately weaks opposing dentition</td>
</tr>
<tr>
<td></td>
<td>• Very long post-mill processing (8.5 hours)</td>
<td>• Shorter post-mill processing (12.5 to 27 min.)</td>
</tr>
<tr>
<td></td>
<td>• Mills smoothly at margins</td>
<td>• Milling causes many small chips at margins</td>
</tr>
<tr>
<td></td>
<td>• Cannot acid etch, can sandblast gently</td>
<td>• Acid etches well, must not sandblast</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Similarities</th>
<th>BOTH BruxZir and e.maxCAD</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>• Time consuming to remove, and removal risks prep gouging</td>
</tr>
<tr>
<td></td>
<td>• Glaze degrades at occlusal contacts, but the sugilite material function well in occlusion</td>
</tr>
<tr>
<td></td>
<td>• Currently, more time consuming for labs to polish than to glaze</td>
</tr>
</tbody>
</table>

5. Should BruxZir and e.maxCAD be final polished or glazed?
After only six months, it was evident the glazes would not last long. By three years, 54% of the glaze applied on occlusal surfaces in this study was no longer present (31% removed by dentist for occlusal adjustment and 23% removed by use). Glaze is used because it is faster than polishing, leaves surfaces very smooth, and preserves characterization stains. However, the clinical degradation and resulting gross surface roughness negates all these points. Options are to improve the glazes or develop easy polishing techniques and internal characterization of blocks.

Figure 1: SEM documentation of glaze degradation over time for either BruxZir or e.maxCAD

A. Very smooth surface finish on glaze initially.
B. Glaze loss and roughening after only 6 months of service.
C. Severe glaze roughening and loss exposing underlying material at 3 years.
D. Magnification shows glaze roughness compared to underlying smooth material.

Critical Clinical Questions and Answers Beginning to Develop after 3+ Years of Service (continued)

6. What are the best instruments for occlusal adjustment?
February 2013 Clinicians Report gave detailed analyses of 16 products, naming Laster (Meisinger) and OptaFine (Ivoclar Vivadent) as CR Choices.

7. Is TRAC’s experimental 12.5-min. post-mill processing procedure for e.max the same, better, or worse than the original 27-min. procedure?
The two procedures were statistically the same in 18 variables monitored, but crowns treated using the experimental 12.5 minute method showed numerically less wear of opposing dentition.

8. Does entry access compromise BruxZir and e.maxCAD restorations?
YES, October 2012 Clinicians Report gave detailed information on best instruments and techniques, and concluded with the necessity to use new diamonds, light pressure, and copious water coolant with 1mm or more of occlusal material thickness.

9. What are the best products and techniques for removal of BruxZir and e.maxCAD crowns?
New fine-grit, rounded-taper diamonds used with water coolant, light touch, and frequent examination to avoid gouging underlying dentin works best. Additionally, Polaris Crown Cutting Wheel (Pollard Dental Products) is preferred by some clinicians, but requires attention during use to avoid unintended cutting.

10. What is the best cementation technique for BruxZir and e.maxCAD?
See below and page 4. Steps and best products are different for zirconia vs. lithium disilicate.

11. Can zirconia have the translucency and colors available now with lithium disilicate?
Translucency and colors of zirconia are improving, but currently lithium disilicate is superior in these characteristics. However, BruxZir esthetics can be adequate (see Figure 2, 30 full-crown BruxZir case at right).

12. What is the expected service life and failure mode of BruxZir and e.maxCAD?
No one knows. The first and only chip in this study occurred on BruxZir at one year and has not progressed (see Figure 3 at right). More time is needed to answer this question. Current exceptional service justifies hope for exceptional longevity.

TRAC Conclusions:
BruxZir and e.maxCAD full-contour crowns on molars have demonstrated clinical service superior to all other tooth-colored materials studied clinically by TRAC over 39 years. To date, their service record resembles that of cast metal. Clinical service over three plus years has begun to answer many critical clinical questions, but important questions remain: possibility of phase change of zirconia in 100% humidity of the oral cavity; glaze use, service life, and failure mode. Status reports will be forthcoming as answers to these and other pertinent questions emerge through this study.
BruxZir Clinical Studies

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Purpose
The purpose of this evaluation is to report on the clinical performance of *BruxZir Solid Zirconia Crowns and Bridges* at four years.

Clinical Evaluation Protocol
A total of 1,392 *BruxZir Solid Zirconia Crowns and Bridges* restorations have been placed over the past 56 months. Nine hundred and thirteen (913) restorations were recalled over four months including: single crowns (84%), 7% of which were implant crowns, and 16% that were 3- and 4-unit bridges (Figure 1). Of the 913 recalled restorations, 5% were anterior crowns and 95% posterior crowns.

Clinical Evaluation Protocol
*BruxZir Solid Zirconia Crowns and Bridges* restorations were evaluated in the following categories: esthetics, resistance to fracture/chipping, resistance to marginal discoloration, and wear of zirconia and opposing dentition.

**Fig. 1:** Distributions of Restorations at 4-year Recall

- Implant crowns: 16%
- 3- and 4-unit bridges: 7%
- Single crowns: 77%

1,392 restorations have been placed over the past 56 months. 913 restorations were recalled over four months including: single crowns (84%), 7% of which are implant crowns, and 16% that were 3- and 4-unit bridges.

**Fig. 2:** Age of Restorations at 4-year Recall

- Over 4 years old: 18%
- Between 3 and 4 years old: 47%
- Less than 3 years old: 35%

All restorations were cemented with adhesive and self-adhesive resin cements. The majority (85%) of the restorations were fabricated by Glidewell Laboratories, while 15% were fabricated by Apex Dental Milling. Of the 913 recalled restorations, 18% were over 4 years old, 35% were between 3 and 4 years old and the remaining 47% were less than 3 years old.

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

**Esthetics**
The esthetics of *BruxZir Solid Zirconia Crowns and Bridges* was rated excellent (Figure 3), based on the consistency of the shades and a comparison of the esthetics to other monolithic zirconia restorations. *BruxZir* tends to be less opaque than other zirconia restorations. Only 19 (2%) of the *BruxZir* restorations received a rating of 4. *BruxZir* restorations were not compared with layered ceramic restorations. *BruxZir* restorations are perfect for patients looking for more monochromatic and whiter teeth like a B1 shade. The new *BruxZir* 16 pre-shaded zirconia and Anterior *BruxZir* further improve esthetics. Note: THE DENTAL ADVISOR is now beginning a one-year recall of Anterior *BruxZir* restorations.

**Resistance to Fracture/Chipping**
Chipping and fracture of *BruxZir Solid Zirconia Crowns and Bridges* single crowns have been practically non-existent (Figure 3); three failures (0.3%) were observed. A second molar crown fractured, but fracture was likely due to a lack of occlusal clearance and insufficient reduction. Having less than 1 mm of clearance is not recommended for molars. Two implant crowns on lower second molars fractured and one had to be replaced. The failure was again due to very low clearance and insufficient space due to implant placement. In one case, the abutment also failed. None of the three- or four-unit bridges fractured. THE DENTAL ADVISOR has been documenting the failure of ceramics for over 30 years and *BruxZir* has by far the lowest failure rate at four years.

**Resistance to Marginal Discoloration**
Only five of the *BruxZir Solid Zirconia Crowns and Bridges* restorations (0.5%) exhibited slight marginal discoloration at four years (Figure 3). The opacity of the crowns helps camouflage most staining or microleakage. Also staining is a function of the bonding agent or cement rather than the zirconia.

**Wear Resistance**
Almost no wear was observed on *BruxZir Solid Zirconia Crowns and Bridges* restorations and very minimal wear was observed on opposing natural dentition at four years (Figure 3). More wear was visible on gold crowns opposing *BruxZir* restorations.

**Retention**
Thirty-nine crowns (2.8%) out of the 1392 *BruxZir Solid Zirconia Crowns and Bridges* crowns debonded and required reattachment (Figure 3). This debonding rate is slightly higher (2.8% vs 2.0%) when compared to non-zirconia crowns that THE DENTAL ADVISOR has documented over time. Regular use of zirconia primers could result in a reduction of the debonding rate.

**Conclusions**
Over the four-year evaluation period, *BruxZir Solid Zirconia Crowns and Bridges* have proven to be excellent restorations with respect to esthetics and durability. *BruxZir Solid Zirconia Crowns and Bridges* received a 98% clinical performance rating.

“I have been using *BruxZir* crowns for almost five years and I have not been disappointed - neither have my patients. It is a great value.”
BruxZir Restorations Deliver More Lifelike Results

BruxZir translucency is unsurpassed in the warm color spectrum for more natural esthetics. BruxZir Solid Zirconia exhibits higher translucency in the warm color spectral wavelength (>550 nanometers), allowing for more natural-looking restorations. BruxZir Shaded zirconias allow for improved shade consistency, exhibiting a higher translucency when compared to other pre-shaded zirconias.

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, colloidaly processed BruxZir Solid Zirconia vs. sintered, isostatically pressed zirconia
**BruxZir** Scientific Validation

**Flexural Strength Comparison**

- **BruxZir® Anterior**
  - Average: 650 MPa
  - Maximum: 720 MPa

- **BruxZir® Shaded 16**
  - Average: 1000-1100 MPa
  - Maximum: 1330 MPa

- **BruxZir® Shaded**
  - Average: 1100-1200 MPa
  - Maximum: 1435 MPa

- **BruxZir® Original Unshaded**
  - Average: 1150-1250 MPa
  - Maximum: 1465 MPa

BruxZir Solid Zirconia crown & bridge restorations easily exceed the ISO 6872 flexural strength specification of 800 MPa for posterior ceramic bridges.

**BruxZir vs. Ceramco®3 — Comparative Wear Study**

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

**Comparative Wear Study Results**

- Polished **BruxZir® Solid Zirconia**: 72±21 μm
- Polished **Ceramco3**: 110±48 μm

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

  *To view the full study, visit www.bruxzir.com.*

**BruxZir vs. IPS e.max® Enamel Wear Test**

- Polished **BruxZir® Solid Zirconia**: 72±21 μm
- Glazed **BruxZir® Solid Zirconia**: 0.37±0.23 mm³
- Glazed **IPS e.max®**: 0.41±0.15 mm³

- In a recent study to measure the volumetric loss of enamel, glazed BruxZir Solid 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.*

Ceramco is a registered trademark of DENTSPLY Ceramco.

IPS e.max is a registered trademark of Ivoclar Vivadent.
The crowns on tooth #6, #7 and #8 are BruxZir Anterior and the crowns on tooth #9, #10 and #11 are IPS e.max. Due to the increased translucency of BruxZir Anterior you can see that these solid zirconia crowns come much closer to matching the proven esthetics of IPS e.max.

These IPS e.max crowns were fabricated with IPS e.max MT (Medium Translucency) ingots. Because these crowns are less translucent than the IPS e.max HT (High Translucency) ingots, the tetracycline-stained preparations do not show through at all.

Both sets of restorations look more vital than the patient’s existing PFM crowns. These Captek™ crowns had been in place for 15 years, and while they served her well, she was not pleased with the visible margins and was happy to hear that there are now several more esthetic options available.

A single-unit BruxZir Anterior crown was seated on tooth #9. Matching a shade in the esthetic zone has been a difficult task for dentists, and BruxZir Anterior has moved the bar ahead in terms of making that achievable with monolithic zirconia. We might be closer than most think to the day where monolithic zirconia crowns are the treatment of choice for restorations in the esthetic zone.
As you can see in this non-retracted “before” photo, the patient had two pre-existing, high-value PFM s over what appeared to be base metal copings on tooth #8 & #9. The condition of the gingiva suggested a possible base metal allergy, which contributed to my decision to go with BruxZir all-ceramic (solid zirconia) crowns.

CASE 3

Delivery of this 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 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.

CASE 4

As you can see in this non-retracted “before” photo, the patient had two pre-existing, high-value PFM s over what appeared to be base metal copings on tooth #8 & #9. The condition of the gingiva suggested a possible base metal allergy, which contributed to my decision to go with BruxZir all-ceramic (solid zirconia) crowns.
BruxZir® Solid Zirconia is the #1 prescribed brand of solid zirconia, with more than 10 million restorations prescribed.

Patient’s left central was restored with BruxZir Solid Zirconia.