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

Why not put BruxZir to the test today?
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 270 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.

Clinical Dentistry by Michael C. DiTolla, DDS, FAGD
Glidewell Laboratories
www.glidewelldental.com

Description:
A total of 2112 BruxZir Solid Zirconia Crowns and Bridges, a full-contour monolithic zirconia, have been placed and monitored over the past five and a half years. The restorations included single crowns and three-, four-, five- and six-unit bridges (Figure 1). Among the bridges, 63% were three units, 17% were four units, 8% were five units, and 6% were six units. The restorations were cemented with adhesive and self-adhesive resin cements.

Clinical Evaluation Protocol:
Over a six-month period, 1265 BruxZir Solid Zirconia Crowns and Bridges restorations were recalled out of 2112 total restorations placed. Among the recalled restorations, 49% had been in function for up to three years, 28% up to five years and 23% for over five years (Figure 2). The majority (81%) of restorations were fabricated by Glidewell Laboratories, while the remainder (19%) were fabricated by Apex Dental Milling.

Results at 3 years:
BruxZir Solid Zirconia Crowns and Bridges restorations were evaluated in the following categories: aesthetics, resistance to fracture/chipping, resistance to marginal discoloration, wear resistance of the zirconia restoration and opposing dentition, and retention. The restorations were evaluated on a 1-5 rating scale, 1-poor, 2-fair, 3-good, 4-very good, 5-excellent.

Consultants’ Comments
- “Excellent fit and esthetics - exceptional for posterior crowns.”
- “One of the nicest implant crowns I have seen - opaque enough to mask the metal abutment.”
- “BruxZir is a great choice for worry-free crowns and a good value.”
- “BruxZir is my go to restoration for posterior teeth - looks good and guaranteed to last.”
- “I have been using BruxZir for six years and have not been disappointed. Neither have my patients.”

Esthetics
The esthetics of BruxZir Solid Zirconia Crowns and Bridges restorations was rated excellent (Figure 3) based on the consistency of the shade and in comparison to other monolithic zirconia restorations. Zirconia restorations are generally opaque and lack translucency and opalescence. BruxZir Anterior is definitely more translucent and still has high facial strength. The esthetics of zirconia restorations is not comparable to esthetic ceramic restorations resulting from incremental buildup but it is improving. BruxZir Solid Zirconia Crowns and Bridges restorations are perfect for patients desiring more uniform, whiter teeth (81 shade). The new BruxZir 16 recently introduced by Glidewell Laboratories has improved esthetics.
Resistance to Fracture/Chipping
Chipping and fracture of BruxZir Solid Zirconia Crowns and Bridges restorations has been practically non-existent (Figures 3). Only three fractures have been observed. A 2nd molar crown fractured; it was likely the result of insufficient occlusal clearance and reduction. Two implants crowns on lower second molars also fractured and were replaced. Their fracture was probably the result of very low clearance and insufficient space due to implant placement. Having less than 1 mm clearance is not recommended for molars, especially second molars. None of the three- or four-unit bridges fractured. Two five-unit bridges fractured and were replaced with PFM bridges. In both cases, the clearance was minimal and the patients were heavy brusers. Two six-unit anterior bridges were splinted teeth where not more than one or two adjacent teeth were missing.

Resistance to Marginal Discoloration
Only six (0.5%) of the BruxZir Solid Zirconia Crowns and Bridges restorations exhibited slight marginal discoloration at three to five years or more (Figure 3). The opacity of the crowns helps camouflage most staining or microleakage. Staining is more a function of the bonding agent and the cement used rather than the zirconia. If teeth are very discolored, it is advisable to use a more opaque resin for cementation.

Wear Resistance
Almost no wear was observed on BruxZir Solid Zirconia Crowns and Bridges restorations and minimal wear was observed on opposing natural dentition at three to five years (Figure 3). More wear was noted on gold crowns opposing BruxZir Solid Zirconia Crowns and Bridges restorations.

Retention
Sixty-three (3%) out of the 2112 BruxZir Solid Zirconia Crowns and Bridges placed debonded and required re-cementation over the five-year period (Figure 3). This debonding rate is slightly higher when compared to debonding of non-zirconia crowns (2%) that THE DENTAL ADVISOR has documented over time. It is advisable to prime zirconia crowns prior to cementation to improve retention.

Conclusions
Over the five-year evaluation period, BruxZir Solid Zirconia Crowns and Bridges has proven to be an excellent restoration with respect to esthetics and dependability. It is highly recommended for posterior crowns and three- and four-unit bridges as well as implant-supported crowns and bridges. In select cases, it can be used confidently for anterior restorations. It received a 97% clinical rating.
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 2% less wear of opposing dentition than the pressed ceramic-over-zirconia Control (PressCeram by Swiss NP over zirconia by Metaxit) 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

<table>
<thead>
<tr>
<th>Brands of materials studied</th>
<th>% area worn by Test Crowns or Opposing Dentition</th>
<th>% area worn by Opposing Dentitions on Test Crowns</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year 1</td>
<td>Year 2</td>
</tr>
<tr>
<td>BruxZir</td>
<td>5.5</td>
<td>10.3</td>
</tr>
<tr>
<td>e.maxCAD (27 min post-mill processing)</td>
<td>6.7</td>
<td>10.8</td>
</tr>
<tr>
<td>e.maxCAD (12.5 min post-mill processing)</td>
<td>4.7</td>
<td>7.9</td>
</tr>
<tr>
<td>Pressed ceramic-over-zirconia (Control)</td>
<td>10.9</td>
<td>14.2</td>
</tr>
</tbody>
</table>

   * Data apply only in 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 sella@traresearch.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 a ~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 preps due to limited space.
   - For labs, anytime the preps are too shallow to allow predictable positive clinical results with other materials.
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>
</thead>
<tbody>
<tr>
<td>Very high flexural strength (1000+ MPa)</td>
<td>V • Lower flexural strength (about 550 MPa)</td>
<td></td>
</tr>
<tr>
<td>Adequate and improving esthetics</td>
<td>E • Excellent esthetics</td>
<td></td>
</tr>
<tr>
<td>Minimal prep permissible</td>
<td>R • Deeper prep preferable</td>
<td></td>
</tr>
<tr>
<td>Moderately worn by opposing dentition</td>
<td>S • Moderately weak opposing dentition</td>
<td></td>
</tr>
<tr>
<td>Very long post-mill processing (8.5 hours)</td>
<td>U • Shorter post-mill processing (12.5 to 27 min.)</td>
<td></td>
</tr>
<tr>
<td>Mills smoothly at margins</td>
<td>S • Milling causes many small chips at margins</td>
<td></td>
</tr>
<tr>
<td>Cannot acid etch, can sandblast gently</td>
<td>Acid etches well, must not sandblast</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Similarities</th>
<th>BOTH BruxZir and e.maxCAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time consuming to remove, and removal risks prep gouging</td>
<td>Glaze degrades at occlusal contacts, but the unglazed materials function well in occlusion</td>
</tr>
<tr>
<td>Glaze degrades at occlusal contacts, but the unglazed materials function well in occlusion</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 glaze 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 dentists 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 analysis of 16 products, naming lasser (Meisinger) and OptaFine (Teconic Vident) 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 endo 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 finesse, round-ended 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 Restorations Deliver More Lifelike Results

The BruxZir Full-Strength zirconia powder composition results in restorations with improved optical transmission, homogeneity of color, heightened strength and a more precise fit in multi-unit restorations.

BruxZir Anterior restorations maintain high translucency at nearly double the thickness of BruxZir Full-Strength, providing clinicians with a restorative material with an ideal blend of beauty and function for anterior indications.

Note the differences in these photomicrographs of solid zirconia brands. The high-resolution photomicrographs capture cross-sectioned samples of BruxZir Full-Strength 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 Full-Strength zirconia has a smaller grain size and is nearly free of agglomerates. Unique, patented colloidal zirconia processing gives BruxZir Full-Strength zirconia higher flexural strength and provides more natural-looking restorations.

Scanning Electron Microscope Images

SEM of sintered, colloidaly processed BruxZir Full-Strength zirconia vs. sintered, isostatically pressed zirconia
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 Full-Strength 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.

After 1.2 million wear cycles under a load of 5 kg, BruxZir Full-Strength zirconia compared favorably to Ceramco3, with barely detectable wear. Example of the topography of Ceramco3 after wear test is shown above.

**Comparative Wear Study Results**

The antagonistic (Steatite balls) wear shows BruxZir Full-Strength zirconia only with 72 ± 21 microns, which is significantly lower than Ceramco3, with 110 ± 48 microns. *To view the full study, visit bruxzir.com.*

Ceramco is a registered trademark of Dentsply Sirona Inc.
CASE 1

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.

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.

The crowns on teeth #6, #7 and #8 are BruxZir® Anterior and the crowns on teeth #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.

A patient presented with the chief complaint of wanting to replace the failing composite on one of their maxillary incisors. After noting the minimal wear and absence of para-functional habits, caries were excavated, a preparation was made, and then a BruxZir Anterior crown was delivered.

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.

Captek is a trademark of Argen.
As you can see in this non-retracted “before” photo, the patient had two pre-existing, high-value PFMs over what appeared to be base metal copings on teeth #8 & #9. The condition of the gingiva suggested a possible base metal allergy, which contributed to the dentist’s decision to go with BruxZir Full-Strength Solid Zirconia crowns.

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.
BruxZir® Solid Zirconia is the No. 1 prescribed brand of solid zirconia, with more than 14 million restorations prescribed.