

Zirconia Bonding

From Challenge to Predictability

*Understand the science, avoid common bonding pitfalls,
and follow proven protocols for more predictable zirconia restorations.*



Know the Difference, Master the Protocol

Zirconia requires a different approach than conventional ceramics. Understanding the material—and avoiding 4 common bonding pitfalls—can help make restorative outcomes more predictable.

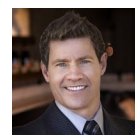
Zirconia has become a go-to restorative material for its strength, esthetics, and versatility. But when a zirconia restoration debonds, the problem often isn't the material—it's the way the material was treated.

One of the most common mistakes is approaching zirconia like a conventional glass ceramic. Zirconia doesn't contain a glass phase, so the hydrofluoric acid etching protocols used for traditional ceramics don't apply. Instead, successful bonding depends on understanding zirconia's unique surface chemistry and following a protocol designed specifically for the material.

That means paying attention to the details that can make or break the bond—from properly conditioning the zirconia surface and using the right chemistry to controlling contamination and following manufacturers' recommended protocols.

Early experiences with zirconia left some clinicians believing that achieving a reliable bond was difficult—or perhaps not possible at all. But as materials and bonding chemistry have evolved, that perception has changed.

"With chemistry and time, manufacturers have found ways to adhere to zirconia," said Dr. Todd Snyder, a cosmetic dentist based in Las Vegas and California. "Now, it's all about following the protocols."



"With chemistry and time, manufacturers have found ways to adhere to zirconia."

Todd Snyder, DDS, FAACD, FIADFE, FASDA, ABAD

The challenge today is less about whether zirconia can be bonded to and more about whether clinicians are consistently following the steps required to bond to it predictably.

"The challenge clinicians have with zirconia is inconsistency and non-familiarity with the product," said Dr. Kapish Goyal, a general dentist and implant specialist in Virginia Beach, VA. "It's critical for dentists to develop a bonding workflow that is consistent and predictable in every clinical situation."

In this eBook, we'll take a closer look at the factors that can determine whether a zirconia bond succeeds or fails. From the initial preparation through cementation, each step matters. By recognizing where bonding can go wrong and understanding the rationale behind the recommended techniques, clinicians can approach zirconia restorations with greater confidence.

THE ZIRCONIA BONDING FORMULA

AIR ABRASION
Create micromechanical retention.



CLEAN SURFACE
Remove contamination after try-in.



MDP CHEMISTRY
Promote chemical adhesion to zirconia.



A MORE PREDICTABLE BOND

Zirconia requires a different approach than glass ceramics. The key is combining proper surface preparation, contamination control, and MDP-based chemistry.

4 Reasons Your Zirconia Bonds Are Failing

These common missteps significantly weaken the bond, leaving patients with restorations that may not stand the test of time.

When bonding to zirconia, little mistakes can have a big impact on the final outcome. Zirconia bonds differently than other dental ceramics because of its material structure, and if this isn't taken into account, there's a good chance you'll be dealing with inconsistent outcomes or even de-bonding down the road.

Zirconia restorations offer versatility, strength, and esthetics, making them an increasingly popular restorative option. But to harness these benefits, dentists must follow the proper steps and avoid common mistakes. Here, we take a look at the most common reasons zirconia bonds fail—and what dentists can do to help ensure successful outcomes.

Reason No. 1: The surface wasn't prepared properly.

Bonding to zirconia "starts with proper surface preparation," BISCO's Clinical Marketing Manager Dr. Rolando Nuñez said. Because zirconia requires mechanical retention, air abrasion is "the most proven way" to prepare the surface for bonding.



You can sandblast in your office, or you can have your lab handle it, Dr. Nuñez said. If the lab creates the mechanical retention, try the restoration in as soon as you receive it. If you sandblast yourself, do so after try-in to create the mechanical retention needed for bonding.

No matter who handles it, sandblast with aluminum oxide that's 20 to 75 microns at 2.8 bars.

Reason No. 2: The restoration was contaminated.

One of the most common mistakes dentists make when bonding zirconia is not properly cleaning the surface after try-in. Even the slightest bit of saliva, blood, or cement residue can negatively impact the bond.

"It's very important to clean the zirconia after try-in," Dr. Snyder said. "The contaminants will reduce the ability of your adhesion to work. You need a specific zirconia cleaner like BISCO's ZrClean."

To bond to zirconia, you must have a clean substrate. After try-in, the surface should be either sandblasted or treated with a specially formulated product like BISCO's ZrClean to remove contaminants, Dr. Nuñez said. Once the surface is clean, prime it with an MDP-containing product like Z-Prime Plus before moving on to cementation.

WHAT NOT TO DO

Remember, zirconia restorations should not be treated the same as glass ceramic. That means don't:

- Use hydrofluoric acid to etch zirconia.
- Rely on silane alone.
- Use phosphoric acid on the zirconia intaglio; phosphate ions can interfere with MDP bonding.
- Assume water, alcohol, or acetone alone will adequately remove salivary phosphate contamination.

Reason No. 3: The surface was etched with hydrofluoric acid.

Hydrofluoric acid works great with restorations that contain silica, and many dentists assume it will work the same with zirconia. It doesn't. Zirconia doesn't contain silica, so hydrofluoric acid etching does nothing.

"Zirconia is a glass-free, polycrystalline oxide ceramic. Unlike lithium disilicate, it cannot be predictably etched with hydrofluoric acid or chemically coupled with silane alone," Dr. Goyal said. "Predictable adhesion requires both micromechanical retention from air abrasion and chemical adhesion from an MDP-containing primer or cement."

Reason No. 4: You used a primer that contains silane.

Remember, zirconia doesn't contain silica, which means there's no silane to react with. To create strong bonds, you need to use a primer like Z-Prime Plus that contains MDP.

Why MDP? Its phosphate end chemically bonds to zirconia's oxide surface, Dr. Goyal explained, while its methacrylate end bonds to the resin cement. This creates a durable chemical link between the zirconia restoration and resin cement.

"BISCO's Z-Prime Plus contains MDP," he continued. "After air abrasion and decontamination with ZirClean, applying Z-Prime Plus improves wetting and chemical adhesion before using a resin cement."

Don't Blame the Cement

Dentists often assume zirconia restorations fail because of the cement they used, Dr. Nuñez said. That usually isn't the reason. How the surface was treated before the cement even touched it determines if the bond lasts or fails. And if a restoration does indeed de-bond, it's usually because there was a failure somewhere in the protocol.

DR. GOYAL'S BISCO BONDING WORKFLOW:

For a high-retention, adhesive approach:

- Ensure the intaglio surface has been lightly air-abraded with aluminum oxide, following the zirconia manufacturer's instructions.
- Try-in the restoration.
- Clean contamination with ZirClean, rinse thoroughly, and air dry.
- Apply Z-Prime Plus to the zirconia intaglio; air dry.
- Treat the tooth with BISCO's All-Bond Universal using the total-etch, selective-etch, or self-etch technique.
- Cement with a dual-cure adhesive resin cement, seat fully and tack-cure briefly for cleanup, then complete curing per instructions.

"This bonding protocol works well," Dr. Goyal said. "It is consistent and avoids de-bonding or breakage of zirconia."



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—Kapish Goyal, DDS, FAGD

Still, cement selection matters. Dr. Goyal recommends considering the preparation design, restoration thickness and translucency, retention, and esthetic needs.

- **Retentive, full-coverage crowns:** Conventional cementation may be acceptable when preparation resistance and retention are excellent.
- **Short, tapered, or minimally retentive preparations, veneers, onlays, and resin-bonded restorations:** Consider using an adhesive dual-cure resin cement with an MDP-containing zirconia primer.

- **Esthetic cases:** Consider cement shade and try-in options, as cement can affect final color. Products like BISCO's Z-Prime Plus bridge the gap between the zirconia surface and a resin cement. And when you pair it with a dual-cured, calcium- and fluoride-releasing, self-adhesive cement like TheraCem that also contains MDP, you achieve both chemical and mechanical retention.

Dr. Snyder turns to TheraCem for thicker zirconia restorations and relies on the light-curable Choice 2 veneer cement for

more translucent restorations. He likes the fact that BISCO offers different cement options for different situations, but to get the best results, you still need to follow the proper protocols.

"At the end of day, you must have the foundation of ZirClean and Z-Prime Plus," Dr. Snyder said. "Without them, it doesn't matter what else you use—you won't get a good, consistent bond."

Finding Success with Zirconia

Zirconia can deliver strong, esthetic, long-lasting restorations, but achieving those results requires a bonding approach that accounts for the material's unique properties. When clinicians understand the rationale behind each step—and have the right materials to support the workflow—they can approach zirconia bonding with greater confidence and predictability.

BISCO's zirconia bonding system is designed to simplify that workflow, with products like ZirClean and Z-Prime Plus addressing key steps in surface preparation, decontamination, and chemical adhesion.

"BISCO has done a great job of creating chemistries that work," Dr. Snyder said, "and simplified protocols to make sure clinicians get consistent, high-quality bonds and longevity in their restorations."



YOUR ZIRCONIA DECISION GUIDE

Dr. Nuñez outlines 2 clear workflows for bonding zirconia restorations

When placing zirconia restorations, following a clear bonding workflow is essential. Skipping a step can compromise the bond and lead to restoration failure.

Here, Dr. Nuñez shares simple, effective protocols for achieving predictable results with zirconia restorations.

The Protocols

The confusion around zirconia bonding often starts with sandblasting. Sandblasting is the most common way to create mechanical retention on zirconia, making it a critical step in the bonding process, Dr. Nuñez said.

The question is: Who should do the sandblasting—the clinician or the lab? In the early days of zirconia, Dr. Nuñez said, the lab typically handled it because few clinicians owned sandblasters. Today, more clinicians are taking on the step themselves.

It doesn't matter who does the sandblasting, Dr. Nuñez said. The key is to have a clear protocol and follow it consistently. Here's how the 2 approaches work.

Protocol 1: The Lab Handles Sandblasting

- **Start with a trusted lab.** Make it clear that you expect the technician to handle sandblasting, and ask about their procedure.
- **Try in the restoration.** Once you receive the sandblasted restoration, try it in.
- **Decontaminate after try-in.** Saliva will contaminate the restoration during try-in, which can compromise the bond. Clean it with a product specifically formulated for zirconia, such as ZirClean.

"Saliva cannot be removed in the ultrasonic cleaner," Dr. Nuñez said. "It cannot be removed using acetone or alcohol. Once you clean it with ZirClean, now your surface is pristine. It's ready to receive the primer."

- **Apply an MDP-containing primer.** Not every primer will work. Silane does not bond to zirconia because zirconia does not contain silica. An MDP-containing primer provides the chemical component of the bond.

- **Cement according to the manufacturer's instructions.**

"There is no way you're going to fail if you do this," Dr. Nuñez said. "Sandblast it by the lab. Try it in. Clean it with a zirconia cleaner. Prime it with an MDP-containing primer. You're good to go."

Protocol 2: You Handle Sandblasting

- **Tell the lab you'll handle sandblasting.** Dr. Nuñez cautioned against having the restoration sandblasted twice, as this could impact the structure of the zirconia.
- **Try-in before sandblasting.** When you receive the restoration, complete the try-in before sandblasting.
- **Sandblast after try-in.** Rather than using a chemical cleaner to remove contamination, sandblasting physically removes it.

"By sandblasting, you're removing all the contaminants," Dr. Nuñez explained. "When you use a cleaner, you remove the contamination chemically, but with the sandblaster you remove it physically. You're done. Easy."

- **Rinse thoroughly after sandblasting to ensure the surface is clean.**
- **Apply an MDP-containing primer.**
- **Cement according to the manufacturer's instructions.**

ADDITIONAL RESOURCES

WATCH A WEBINAR

Check out a variety of courses on zirconia bonding:

Unlocking Adhesive Excellence in Zirconia Bonding

Course Info



Categories: Restorative Dentistry

Author(s): Dr. Alex Vasserman

CE Supporter: BISCO

Target Audience: Dental Assistants, Dental Hygienist, Dentists from novice to advanced

AGD Credits: 1.00

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Pro Tip

Apply a thin layer of <1mm thickness on moist dentin and light-cure for 20 seconds to prevent TheraCal LC from flaking off.

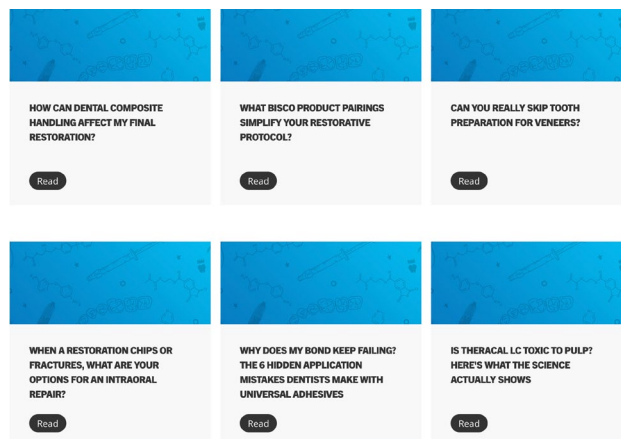
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