

February 2021

USING ZIRCONIA FOR DURABLE & AESTHETIC RESTORATIONS



ZIRCONIA'S GROWING POPULARITY

Introduction

Back when zirconia crowns were first introduced, they were very functional but too opaque to provide a natural, aesthetic look. Now, thankfully, we are past that.

In fact, there's not just one zirconia anymore. Zirconia products are now made by a number of companies, using different types of restorative zirconia.

Today we are relying less on metal restorations and more on zirconia. In fact, over 70% of full coverage restorations are now zirconia—and there's a reason for that. We want restorations that are natural (no more of the old “blue tooth” problem!) and aesthetic, biofriendly, comfortable, durable and long-lasting. Zirconia gives us all of these things. Plus, zirconia is very predictable, especially when used with a self-adhesive resin cementation technique.



This eBook provides an overview of what you need to know and do in order to successfully give your patients the beautiful zirconia restorations they desire.



Zirconia is very predictable, especially when used with a self-adhesive resin cementation technique.



UNDERSTANDING YOUR OPTIONS

The 3 Basic Types of Restorative Zirconia

There are three basic types of restorative zirconia materials today, and together these have taken over the market, at least in the United States. These are:

Three basic types of restorative zirconia:

1. Anterior
2. Posterior
3. Blended

- 1 Anterior zirconia** – More translucent, less fracture resistant
- 2 Posterior zirconia** – Stronger and more opaque
- 3 Blended zirconia** – Includes both anterior and posterior zirconia in one block

Zirconias Vary in Strength and Opacity

Be aware that there are significant differences in flexural strength between these options. The flexural strength of monolithic anterior zirconia is generally in the 700 to 800 megapascal range, while monolithic posterior zirconia gives you flexural strength of around 1,100 to 1,200 megapascals.

This image helps illustrate the difference in opacity between anterior and posterior zirconia. As you can see, the posterior zirconia on the posterior teeth is more opaque-looking, while the anterior zirconia on the anterior teeth is more translucent. However, this greater translucency means that on the upper left cuspid (#11), where the patient had a metal post, some of that darkness is showing through.



Blended Zirconia Provides Additional Possibilities

With blended zirconia you can have the best of both worlds: greater strength and opacity in the gingival half of the restoration *plus* greater translucency at the incisal edge. To make it look even better, blended zirconia can be either infiltrated with dye or layered with porcelain.

Infiltration

With infiltration, the lab applies stains after the monolithic restoration is milled but before it is fired. With advanced infiltration techniques, a much more natural appearance can be achieved.



Layering

Having the lab layer the blended zirconia restoration with a special type of porcelain adds a little bit more translucency and characterization. However, layering also weakens the restoration. While you should opt for monolithic restorations when it's possible and practical, layered restorations are generally chosen based on the patient's cosmetic needs.



Blended zirconia can be infiltrated with dye or layered with porcelain.



Cost Considerations

In an ideal world, all decisions regarding which type of zirconia to use for a particular case would be made based on which option would provide the greatest aesthetics and strength. However, it is not an ideal world, and cost considerations do come into play.

Blended zirconia is more expensive than posterior and anterior zirconia. Layered restorations are more expensive than monolithic restorations. Infiltration increases cost as well.

You should always use the strongest material that at least meets the patient's minimum cosmetic and functional needs. While you will want to walk your patient through the pros and cons of each option, many patients will simply choose the option that their insurance covers.



5 REASONS TO TRY TheraCem[®]

Dual-Cured, Self-Adhesive Calcium & Fluoride Releasing Cement

Rx Only

1 Contains Fluoride and Calcium

Continuous calcium and fluoride ion release.¹

2 Contains MDP

Strong bond to zirconia, metal and alumina substrates without primer.

3 Easy Clean-up

Gel phase after tack cure facilitates removal of excess cement.

4 Alkaline pH

Generates an alkaline pH in minutes², which promotes pulp vitality.³

5 Radiopaque

Visible on radiograph to easily distinguish from caries.



1. Gleave CM, Chen L, Suh BI. Calcium & fluoride recharge of resin cements. Dent Mater. 2016 (32S):e26.
2. New Self-adhesive Resin Cement With Alkaline pH. Chen L, Gleave C, Suh B, J Dent Res96(A):#286, 2017
3. T. Okabe, M. Sakamoto, H. Takeuchi, K. Matsushima. Effects of pH on Mineralization Ability of Human Dental Pulp Cells. Journal of Endodontics. Volume 32, Number 3, March 2006

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COMMUNICATING WITH THE LAB

Be Sure to Give them All the Information they Need

For best results there are three key pieces of information that you should communicate to the lab:



- 1 **Type of zirconia to use** – For greater control, you should make this decision yourself, based on the considerations discussed above.
- 2 **Prep shade, pre-op shade and patient's final shade** – All of these shades influence how opaque a material should be used. If you will be consulting with the lab regarding which material to use, communicating the preparation shade is especially important. If there are any special considerations, such as a dark necrotic tooth, you must communicate this, too.

3 things to tell the lab:

- Type of zirconia to use
- Prep, pre-op and final shade
- Your goals when using blended zirconia

When identifying the prep and pre-op shades, always hold the shade tab on the same plane as the teeth. Be sure that the teeth are moist and the lips are retracted.

- 3 **Your goals when using blended zirconia** – If you are specifying blended zirconia, be aware that the lab can position the restoration within the zirconia block to either pick up more of the opaque posterior zirconia or to achieve more of an anterior effect. You need to let them know what you're looking for.

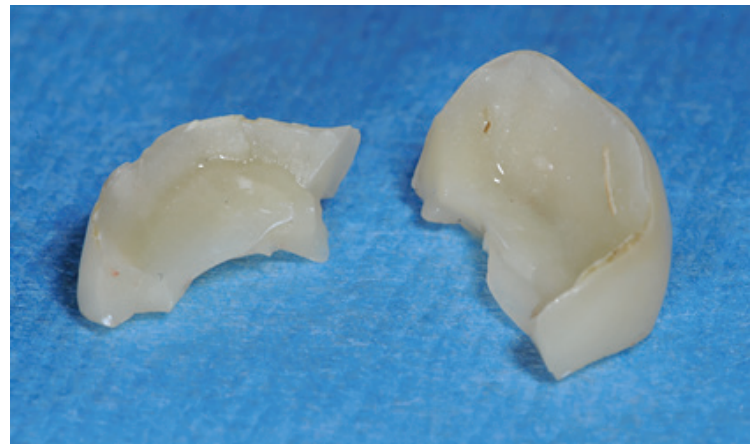
WHY ZIRCONIA CEMENTATION FAILS

Two Factors Make All the Difference

If you look at the research, you see that 12.5% of zirconia crowns that were cemented with conventional cement came out within five years. When a self-adhesive resin cement without primer was used, 6.6% loosened within five years.

Needless to say, we want to get better results than this! What causes these failures?

- 1 Poor prep** – Research has found that if the prep is good, almost any cement works. No improvements in cementation techniques or materials can replace a good prep.
- 2 Wrong cement** – Self-adhesive resin cements have significantly more success than traditional cements.



PROPER PREP IS KEY

What Makes an Ideal Prep?

Since poor prep is one of the main reasons why cementation fails, what makes an ideal prep? For zirconia full coverage crowns, especially in the posterior, you want:

- 1 **Taper** – 4 to 8 degrees
- 2 **Axial wall height** – 4 millimeters or more, if possible
- 3 **Shoulder** – 0.5 to 1 millimeter rounded shoulder or chamfer
- 4 **Occlusal clearance** – 1.5 millimeters if you don't layer it or 2.5 millimeters if you're going to layer it on the occlusal



Before you start drilling, begin with the end in mind. Use your wax up and reduction guide to determine how much tooth structure to remove. For example, here you can see that we're adding length to the teeth, so you would want to plan your reduction accordingly.



Poor prep is one of the main reasons why cementation fails.



The Zirconia Must be Clean

Whether you are using TheraCem® or another brand of self-adhesive resin cement, when it comes to MDP and its bond to zirconia, contaminants are a serious problem. If there are phosphates or even proteins on the zirconia, the bond will not work.

After you get the restoration back from the lab, you'll want to try them in. Doing so will leave contaminants on the zirconia. When this happens, you cannot just grab your air-water syringe and rinse the restoration out. This will not get rid of the contaminants, and the residue of those contaminants will ruin the bond to the zirconia.

There are two options for properly removing the contaminants from the zirconia to create a bondable surface. You can:

- 1 Air abrade it with 50-micron aluminum oxide; or
- 2 Use a restoration cleaner on the inside of the crowns for 20 seconds and then rinse



If there are contaminants on the zirconia, the cementation will fail.



The Tooth Must be Clean

In addition to cleaning the zirconia restoration, you must also clean the tooth. Do this after you try in the restoration and take it back off.

Never use a mouth rinse to clean the tooth or the restoration. Mouth rinses have flavoring agents, oils and other ingredients that might inhibit the bond to the tooth. Instead, you should:

To ensure the tooth is completely clean, use:

- Cavity Cleanser
- Microbrush
- Unfilled gauze to “shoeshine” the tooth

- 1 Use a 2% chlorhexidine cavity cleanser
- 2 Use a microbrush and an unfilled gauze to “shoeshine” the tooth

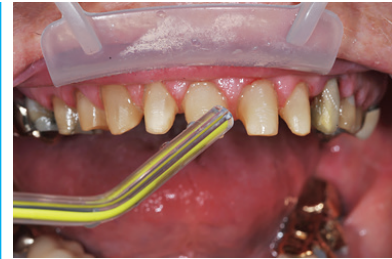


CEMENTATION FOR DURABILITY AND REGENERATION

Use Calcium-Releasing, MDP-Based Cements

As you have seen, one key to avoiding cementation failure is proper prep. The other lies in your choice of cement. Zirconia adhesion today is based on the MDP (10-methacryloxydecyl dihydrogen phosphate) monomer. MDP has very high bond strengths to zirconia.

However, you should not use just any MDP-based cement. For best results, choose a calcium-releasing cement. Calcium-releasing cements are all about ionic exchange. The cement gives off ions that positively influence both the tooth and the saliva in the oral environment, in order to stimulate repair. The result is longer-lasting restorations and margins, less leakage and less sensitivity.



For best results, choose a calcium-releasing cement.



TheraCem® is an Excellent Choice

BISCO's TheraCem® is a dual-cured, self-adhesive resin cement that provides a continuous release of fluoride and calcium¹, which are both important to the tooth. TheraCem® provides excellent bonding to both dentin and zirconia. Plus, you'll love its ease of use. No etch, primer or bonding needed, and it is extremely easy to clean up.

TheraCem® is the type of calcium-releasing cement that provides the best long-term results. All else being equal, if we can use restorative materials like TheraCem® that can have a positive influence on the oral environment, shouldn't we?

TheraCem®:

- Dual-cured, self-adhesive resin cement
- Excellent fluoride and calcium release
- Simple to use – no etch, primer or bonding needed
- Very easy clean up
- Strong bond to almost everything



Conclusion

Crowns are the most expensive restoration procedure that most doctors do routinely. By understanding which type of zirconia to use for a given case, giving the lab the information they need, completing a proper prep and using an excellent self-adhesive resin cement you can give your patients the durable, long-lasting and aesthetic restorations they deserve.

1. Gleave CM, Chen L, Suh BI. Calcium & fluoride recharge of resin cements. Dent Mater. 2016 (32S):e26.

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