

# The Pursuit of an Ideal Restoration



**by Dr. Arthur “Tony” Tomaro**

For years, the porcelain-fused-to-metal crown (PFM) was a dentist’s restoration of choice. The PFM crown was used in full-coverage single restorations, bridges, implants and full-mouth reconstruction. However, long-term aesthetics and covering the dark-colored metal coping became a major concern, and recession of the gingival tissue because of margin placement was not unusual, resulting in exposure of crown margins.

These issues began the pursuit of an ideal restoration consisting of the following characteristics: beautiful aesthetics, strength, biocompatibility with soft tissue, management of marginal integrity and the ability to be built from an easy-to-use restorative material. This pursuit ushered in the evolution of the all-ceramic restorations with adhesive dentistry. These allowed for increased preservation of tooth structure with minimal invasive care and appeared to be the direction of the future.

Leucite-reinforced and lithium disilicate ceramic with the ability to bond were developed and aesthetic dentistry took a huge leap forward. As with any new product and materials, dentists encountered hurdles for clinical use: The placement of bridges and single restorations in

high-stress flexural areas, such as in the posterior, was a major hurdle for these two materials. It was not unusual for patients, especially those with parafunctional habits, to have breakage of restorations in the molar areas.

The pursuit of an ideal restoration continued until dental zirconia was introduced. Originally used for frameworks and copings, this zirconia was very opaque and strong and, for many of us, P2Z (porcelain fused to zirconia) became a popular discussion. The original zirconia restorations were opaque and unaesthetic while the second generation of zirconia was more translucent. The third-generation is available in multilayered discs<sup>1</sup> and is also used to manufacture artificial diamonds. The basic color gradient is built into the raw material, whereas in the past, color characterizations were added onto the crown's surface with external stains. Today, we have aesthetic anterior zirconium restorations (multilayered).

In a 2015 survey, Makhija and others reported that the most prescribed ceramic material for posterior crowns was monolithic zirconium, with lithium disilicate most often prescribed for anterior crowns.<sup>2</sup> In a recent survey, I spoke to five dental laboratories and they reported that more than 70 percent of their single restorations and bridges are zirconium.

The early and present challenge for clinicians with zirconium restorations is that the restorations come off during service and create frustration for the clinician and patient. Many clinicians seated these restorations using the same protocol as all-ceramic restorations—total-etch or self-adhesive resin cements. Unfortunately, this results in many debonded restorations. There was also confusion surrounding which cement and procedures should be used.

As reported by Marshall D. Fagan,<sup>3</sup> every time the clinician places a final restoration, there are three key considerations to start with:

1. The type of restoration (crown, onlay, veneer, etc.)
2. The material (lithium disilicate, zirconium, metal, etc.)
3. The tooth preparation design.

The following are the current guidelines for zirconium restorations as outlined by Dr. Gordon Christensen:<sup>4</sup>

- Use resin-modified glass ionomer (RMGI) cement for zirconium restorations when the tooth preparation has near-optimum characteristics. Optimum characteristics are at least

4mm in height from the gingival margin to the occlusal table and the lack of parallelism of the preparation walls should be up to, but not more than, 20 degrees from the long axis of the tooth being prepared.

- If the tooth preparation does not have the optimum characteristics, a self-adhesive resin cement (bonding materials incorporated in the cement) or adhesive cement (bonding material placed on the tooth preparation before cementation) is recommended. Avoid contact of phosphoric acid with zirconium restorations. Because of the absence of a glass phase, acid etching is not effective with zirconium materials.<sup>5,6</sup>

Since its introduction in 1972,<sup>7</sup> glass ionomer cements have been viable dental materials. When the two components (glass and acid) were mixed, these materials self-cured. Twenty years later, “resin modified” denotes the addition of resin groups to the glass ionomer material.<sup>8</sup> These light-cured RMGI cements offered many benefits and were followed by the self-cured luting cements, providing a continuous improvement over the years.

The physical properties of RMGI cements make them ideal for cementing zirconium restorations. They provide a continuous fluoride release, hydrophilicity that allows for use in hard-to-reach places with limited to no isolation, and can bond directly to dentin, minimizing postoperative sensitivity. RMGI cements also create a chemical seal that minimizes microleakage, have an excellent film thickness and allow for quick and easy placement and easy cleanup.

With continuous clinical studies and research, the following are the guidelines the CR Foundation recommends for cementing zirconia restorations:

**Retentive prep:** Sandblast the interior of the zirconia restoration. Clean the tooth preparation with flour of pumice and water on a rubber cup, place a desensitizer/disinfectant on the tooth preparation for two 1-minute applications (such as Gluma from Heraeus Kulzer or MicroPrime from Danville Materials) and suction it off (do not wash it off) and seat with RMGI cement such as Meron Plus AC by Voco or RelyX Luting Plus from 3M.

**Minimally retentive prep:** Sandblast the interior of the zirconia restoration. Place an MDP primer on the interior of the restoration (e.g., Z-Prime Plus from Bisco or Monobond Plus from Ivoclar Vivadent). Roughen the tooth preparation with a coarse diamond and clean the tooth preparation with flour of pumice and water on a rubber cup. Place a tooth desensitizer/disinfectant on the tooth preparation and suction it off (do not wash it off). Place a bonding agent—I use Futurabond U from Voco—on the interior of the restoration and the exterior of the tooth preparation, then seat with a self-adhesive or adhesive cement.<sup>4</sup>

Examples of self-adhesives include Bifix SE by Voco and RelyX Unicem 2 by 3M. Some adhesive cements to use include Bifix QM by Voco and Panavia by Kuraray Dental.

## Case Study

A 51-year-old patient presented for a hygiene recare and periodic exam. Upon radiographic examination, the noted cervical decay on tooth #2 (Fig. 1) had advanced from her initial new patient comprehensive exam. Fig. 1 also shows a 12-year-plus implant with a PFM crown, placed by the patient's previous dentist.

Initially, the treatment plan was to replace the restoration. I explained to the patient that we wanted to remove the previous restoration and decay as conservatively as possible. However, because of the size of the restoration, location of the decay and the tooth (posterior second molar), and her clenching/grinding, the tooth may have needed full coverage for occlusal support (Fig. 2). Upon removal of the restoration and decay, the clinical decision to fabricate a full zirconium crown was based on lack of tooth support. The final preparation demonstrated the optimum characteristics mentioned on p. 81.

Upon delivery of the crown, I used Meron Plus AC, a resin-modified glass ionomer cement by Voco that's indicated for the cementation of crowns, bridge inlays, and onlays made from ceramic, zirconium and metal.

At the seat appointment, after the temporary was removed, the new zirconium crown was tried in and proper fit and occlusion were verified. The interior of the restoration was sandblasted (Fig. 3), and the tooth preparation was cleaned with flour of pumice and desensitized/disinfected (Gluma). A Meron Plus AC application capsule was activated, mixed and dispensed into the interior of the restoration (Fig. 4). The cement has a working time of about two minutes at room temperature and sets in the mouth in three to five minutes. After approximately four minutes the material reaches a gel-like consistency, making it easy to remove any excess material with the aid of a probe, curette or dental explorer. Fig. 5 demonstrates this gel-like consistency and, with a curette, removal of excess material is fast and easy.

Fig. 6 shows the completed restoration. Most notable is the acceptable aesthetics, contour and shade match to the adjacent teeth, which is only accomplished with a very skilled dental technician. The patient was very happy with the results.



## Conclusion

As a clinician, it is amazing to witness the changes in the materials we use, such as with the evolution of restorative materials and glass ionomers over the years. We must always use the best material for the treatment we are rendering as our patients deserve the best. Staying informed in changes and keeping up-to-date is our responsibility as professionals. RMGI cements are proven materials for the cementing zirconium restorations. As in all procedures, proper protocol must be followed to achieve the maximum success. However, the research continues, as it should, to evolve and improve.

Have we achieved the ideal restoration? As of this writing, I am glad to say dentistry as a profession will always continuously seek better materials, restorations and products. The pursuit goes on.

## References

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## Author Bio



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