One of the challenges that we face in dentistry today is how to build a long-span bridge with maximum esthetics in mind. In the age of implants, we can usually shorten the span by adding in a few implants or eliminate the need for a bridge altogether by using implants to replace those missing teeth.

However, what about those cases where we don’t have the quality or quantity of bone that we need, a medical history that won’t allow implant surgery such as free bleeding, a high-risk host such as a poorly controlled diabetic, smoker, etc.? Often times a patient doesn’t desire to go through the complex surgery of a sinus lift or bone graft to make an acceptable site for implants. Patients should be given the options and risks associated with each approach and allowed to make an informed decision with the dentist’s guidance. For a missing tooth there could be five or more options presented to the patient as ways to restore the space.

A case history

In 1998, a 39-year-old female presented with an abnormally loose tooth #12. Upon radiographic and clinical examination, it was noted there was little to no root left on teeth #10–13. Teeth #8 and #9 appeared normal as did tooth #14. Her gingival health was optimal and her medical history was unremarkable, and she was taking no medications at the time. The patient recalled that when she was 14 years old she was
hit in the face right above these teeth with a golf club during a friend’s backswing, which probably lead to the resorption of the roots of the teeth in question. All options and risks were explained to the patient. The sinus floor was 3 to 4 mm from the crestal bone. Implants with a sinus lift to allow room for placement were discussed.

The patient did not like the idea of surgery and the healing time that would be required for a permanent restoration. A partial was discussed; however, the young patient did not want to have a partial and was worried her esthetic demands would not be met. More options for less permanent treatment were offered, but the patient did not desire them. The patient choose to do a long-span bridge, double abuting on teeth #8 and #9 with pontics to replace teeth #10–13 and using tooth #14 as a distal abutment. This would meet the patient’s demands for esthetics and be a non-removable restoration.

She would have the permanent restoration in less time than it would take to undergo implant therapy. Porcelain-fused-to-metal was used on the original bridge work done in 1998. The highest noble metal content available that could span a four-pontic length was used. The porcelain work was done with a layered porcelain technique to provide a life-like appearance. In January 2012, the patient, who was now 52 years old, presented with a broken tooth. She was eating a peppermint, incised it with the distal of tooth #8 and fractured the porcelain in an incisal gingival direction. About 2 mm of porcelain came off toward the distal contact. The metal substructure of the bridge was showing.

Fig. 3_Lingual of old bridge with metal lingual and occlusal surfaces on the abutments.

Fig. 4_Lingual of new bridge; the BruxZir material allows us to have full contour with the desired esthetics without having to reduce any more than would be required with metal.

Fig. 5_Notify the porcelain repair on the distal of tooth #8 on this old bridge.
The piece of porcelain was intact. She was on her way to a meeting she could not get out of and desired a temporary fix. I tried the piece of porcelain in and found it to be adequate but not an exact match for fit. Some of the porcelain had chipped away and was lost. I roughened the surface of the bridge in her mouth in the area that needed the repair then placed K-etchant Gel by Kuraray to clean the area. I used Alloy Primer from Kuraray on the metal substructure. On the porcelain, I placed Clearfil Ceramic Primer. Clearfil Majesty flowable composite was placed on the metal and on the piece of chipped porcelain. I refit the porcelain and light cured. All of these materials to do the repair are readily available in the Clearfil Repair Multi Purpose kit from Kuraray. It makes life simple to have everything you need in one place.

The patient was able to get on with her day and made it on time to her meeting (Fig. 5). You can see the repair on the distal of #8.

**Material selection**

In the pre-op photo (Figs. 1, 3, 5) you can see there is the telltale sign of a metal allergy to the metal that is in the bridge. The dreaded "black gum" look. In addition, there is a difference in height of the gingiva on teeth #8 and #9. The patient had already made the choice of a bridge, now we had to decide which material to use.

The patient reported that she has metal allergies to jewelry unless it is gold. So odds are high that any metal we use that is not 80 percent gold or more is going to cause a metal allergy and the dark gingiva. However, a metal that high in gold will bend on this long of a span, so we ruled out the use of metal.
By eliminating the metal, the “black gum” look will go away (Figs. 5, 6).

BruxZir was the material of choice for this case. BruxZir is a solid zirconia material that is sold to laboratories in a pre-sintered disk. CAD/CAM technology is then used to design and mill the restoration. BruxZir Zirconia exceeds the flexural strength of typical zirconia (up to 1,465 MPa versus 1,200+ MPa for typical zirconia). BruxZir exhibits three to six times the fracture toughness (also known as the KIC value) of typical zirconia. To better understand this concept, consider that a piece of steel or lead has high fracture toughness, whereas glass or brittle materials have a low KIC value. This property gives it high impact resistance. It also has excellent resistance to thermal shock. This low thermal expansion means the restorations will remain very stable in the mouth. BruxZir is available in all the Vita Classic shades. Due to the esthetic demands of the patient, a monolithic colored restoration would not be acceptable. By performing a “cut back” on the facial of the bridge, we could achieve the desired esthetics and have the necessary strength. The advantage of BruxZir zirconia over other zirconia frameworks with overlay porcelain is that the lingual and occlusal surfaces do not have the opportunity to de-bond or chip. The old bridge had metal lingual on #8 and #9 (Fig. 3) and a metal occlusal surface on tooth #14. This allowed minimal tooth reduction.

Using BruxZir allows us to use the same minimal reduction, as low as 0.5 mm, thus conserving tooth structure. In addition, BruxZir allows us to have the esthetics desired with no additional reduction (Figs. 3, 4). If using a zirconia framework system that required full-contour porcelain, we would need to reduce tooth #14 substantially. This theoretical reduction would give a clinical height on the prep of around 1 mm. This would be an insufficient abutment for a bridge of this length. Minimal preparation of the tooth structure, especially on #14, makes BruxZir an ideal material. Additional considerations were given to try to balance this smile.

The patient wanted to change the anatomy of #7 and add a little more length. A veneer was added to this case on tooth #7. IPS e.max lithium disilicate by Ivoclar Vivadent was chosen for the veneer material. IPS e.max lithium disilicate is an all-ceramic material that is available in a millable block or pressable ingot using the lost wax technique. IPS e.max CAD blocks have a flexural strength of 360 MPa versus 400 MPa for the IPS e.max press ingot. Blocks and ingots are available in various shades and levels of opacity to achieve a final shade match.

A stump shade is recommended for IPS e.max due to the level of translucency. IPS e.max press was used for the veneer and is indicated for anterior crowns and bridges with one pontic as well as posterior single units. A gingival re-contouring procedure to match gingival heights was performed on teeth #8 and #9 using radiosurge electrocautery.

**Lab portion**

This case was sent to Oral Arts Dental Laboratories, a full-service lab located in Huntsville, Ala. I took a stick bite to establish the horizontal place along with full upper and lower impressions and bite. Once the model work was completed, the models and dies required digital scanning. BruxZir is a CAD/CAM-fabricated material and thus must be digitally designed by a technician using a digital scanner and design software.

Once the final contours and design are complete, the file is “nested” or positioned in the zirconia disk (Figs. 10, 11) and milled to a full contour approximately 30 percent larger than the final restoration. Once the restoration is milled and removed from the disk, it is dipped in the appropriate coloring solution and sintered in an oven for 6.5 hours at 1,530 degrees Celsius where it shrinks to its final size. I requested that Oral Arts e-mail me the initial design for my approval before milling (Fig. 7).

The case met my expectations on design and we proceeded with fabrication. On large complex cases, I enjoy the option of approving digital case design via e-mail before case completion.
After the bridge framework was sintered and checked for accuracy of fit and margins (Fig. 8), IPS e.max Ceram was stacked and baked onto the facial surfaces for enhanced esthetics.

IPS e.max Ceram is a stackable ceramic powder within the IPS e.max system. The veneering ceramic is the key to highly esthetic results, both on lithium disilicate and on zirconium oxide (Fig. 9). The veneer was then waxed to a cut-back shape with mamelons, invested, burned out using the lost wax technique and pressed using IPS e.max Press lithium disilicate.

Once the veneer was divested, it was layered using IPS e.max Ceram to further improve esthetics.

**Final delivery and cementation**

One of the challenges of cementing a case like this is the fact there are two dental materials side by side. Tooth #7 has an IPS e.max veneer and teeth #8 and #9 will be BruxZir with porcelain facials. IPS e.max is more translucent than the BruxZir, thus allowing more visibility of the cement and tooth that is prepped. The cement chosen for the bridge was Panavia SA Cement, a self-adhesive resin.

I choose a selfadhesive resin cement for the bridge because it has ease of use in that it can be light cured, but if the light doesn’t penetrate the zirconia completely it will auto cure. This gives strength but also keeps the cementing process simple; it also would work on a full crown made of IPS e.max.

The cement for the veneer was Clearfil Esthetic Cement EX, a resin cement. Veneer preps do not have a retentive and resistant form.

The veneer needs to have the maximum strength that resin bonding can give. I can get light though the veneer to fully cure the cement so an auto-cure option is unnecessary. Clearfil Esthetic Cement EX is one of the strongest bonds available and will work excellently on this veneer or a full crown made from IPS e.max.

Both restorations, the veneer and bridge, were tried in and contacts and occlusion checked. The colors were very close to exact between the two restorations. Clearfil Esthetic Cement EX comes with try-in paste, so we used the try-in paste and found that Universal colored try-in paste on both the bridge and veneer made a perfect match. K-etchant gel was used to clean both restorations; the abutments were cleaned using a prophy cup and simple flour pumice with no fluoride. Panavia SA Cement was placed in the bridge abutments and the bridge was placed on the teeth. There is no need for a silinating agent on BruxZir because Panavia SA Cement will bond to the zirconia. Then it was light cured in place and the excess cement cleaned off.

An advantage to this type of cement is that it gives the benefits of resin bonding, and if you can’t get the curing light to the cement through the material it will auto cure in five minutes on its own, thus giving the benefit of a resin cement but the ease of use of a glass ionomer.
The veneer was treated with ceramic primer before resin bonding using Clearfil Esthetic cement in the Universal shade and light cured, then the excess cement was cleaned up.

_The bottom line_

In 2011, many labs reported the number of metal-free restorations surpassed the number of porcelain-fused-to-metal restorations for the first time. Most of these metal-free restorations are full-contour zirconia and lithium disilicate. Porcelain-fused-to-metal restorations have reigned as the predominant tooth-colored, indirect restorations for 50 years, so they have a long, successful history. On the other hand, BruxZir has a much shorter history and most labs have only had it available for less than four years.

The demand on the dentist to place esthetic restorations that are strong and will last has lead to BruxZir’s large market share. Learning new ways to employ this material is a must, and new innovative techniques can evolve to meet our patients’ demands.

_The author_

Mark McOmie, DMD, attended the University of Utah. While attending the university he worked as a lab technician for several years. He then furthered his education at the University of Louisville School of Dentistry, graduating and entering private practice in 1998. McOmie has presented research at the Kentucky Dental Association, International Association of Dental Research and American Association of Dental Research. He is a member of the Tennessee Valley Dental Study Group, Chattanooga Area Dental Society, Tennessee Dental Association, and the American Dental Association. McOmie also has hospital privileges at Memorial Hospital, where he routinely presents lectures on dentistry.

You may contact him at markmcomie@gmail.com.