Beyond the Maryland Bridge

Gary M. Radz, D.D.S.

Introduction

For many years, the Maryland Bridge has been utilized as a conservative treatment modality to replace a missing tooth. Clinicians who have inserted a Maryland Bridge during the last ten years have seen several clinical problems associated with this restoration. The traditional Maryland Bridge has two weaknesses: (1) the difficulty of bonding to metal; (2) less than optimum esthetics.

The traditional Maryland Bridge has two weaknesses: (1) the difficulty of bonding to metal; (2) less than optimum esthetics.

Although recent improvements in adhesive technology have reduced the number of debondings associated with the metal/tooth interface, this is still the weak link in this restoration.

The esthetics associated with the traditional Maryland Bridge are compromised by the use of the metal framework. Many patients are unsatisfied with the metal present on the lingual aspect of these restorations. Since many of these restorations are placed in the maxillary anterior area, this objection is understandable. A compromise in the esthetics is also noticed in the pontic area. Since metal provides the framework, an opaque must be used under the porcelain. Dentists who have placed an all-ceramic restoration will recognize the superior esthetic vitality and natural translucency, which can be achieved when the use of metal is eliminated from any restoration.

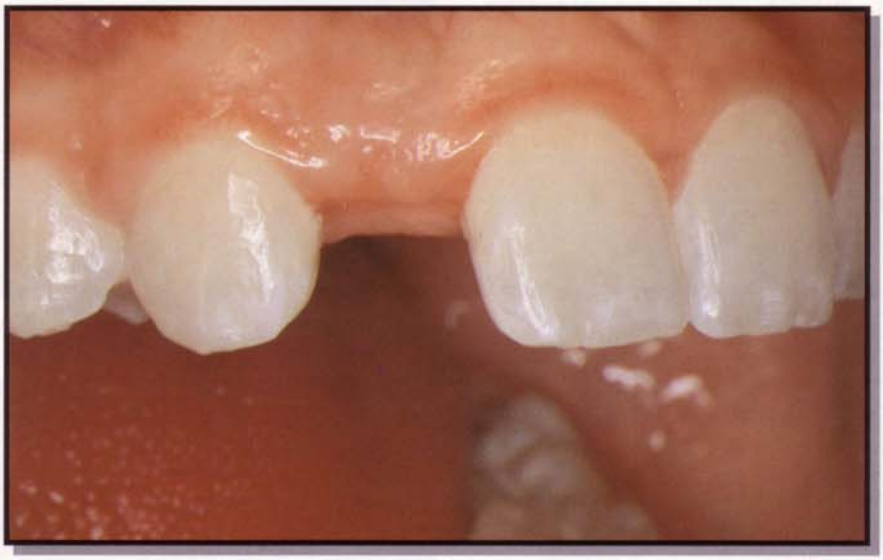

Figure 1: Congenitally missing #7

Figure 2: Preparation for bridge abutments

With recent advancements in adhesive technology, new and stronger composite resin materials, and the development of a bondable polyethylene fiber, it is possible to create a conservative highly-esthetic prosthesis to be used in clinical situations when a Maryland Bridge would have been considered[1].

The technology which makes this restoration possible is the development of a high strength, high molecular weight, biocompatable polyethylene fiber (Ribbond, Ribbond, Inc.). This fiber is used in the construction of boats, submarines, and bulletproof vests. It provides extremely high strength with little weight or bulk. The polyethylene

fiber is treated with cold gas plasma which, by changing the contact angle of the resin-fiber interface, allows for excellent bonding with composite resins[2].

It is the incorporation of the polyethylene fiber into a composite resin matrix which enables the fabrication of a prosthetic framework of adequate strength to be used in a three-unit, fixed partial denture. The result is a restoration with superior esthetics, excellent bonding potentials, and compression and flexural strength comparable or superior to metal.

Although recent improvements in adhesive technology have reduced the number of debondings associated with the metal/tooth interface, this is still the weak link in this restoration.

Case Study

This 15 year-old girl had recently completed orthodontic treatment and was referred to the practice for cosmetic consultation and evaluation. A symmetrical space had been created for placement of a pontic to replace a congenitally missing #7 (Figure 1). At the time of our initial evaluation, the patient had a denture tooth in her orthodontic retainer used as both a cosmetic replacement and a space maintainer.

Upon clinical evaluation, it was noted that the patient had a Class 1 occlusion with centric contacts on #6 and #8 at the incisal 1/3. She had no anterior restorations and areas of slight hypocalcification at the insical 1/3 of teeth #'s 8, 9, and 10.

Figure 3: Laboratory model showing the final preparation

Figure 4: Lingual aspect of the bridge framework

Treatment options for replacement of a congenitally missing lateral incisor would include: (1) a conventional 3-unit porcelain-fused-to-metal bridge, (2) a 3-unit all-ceramic bridge, (3) a single tooth implant; (4) a traditional Maryland Bridge; (5) an all-ceramic Maryland-type Bridge; or (6) a reinforced composite Maryland-type Bridge.

After discussing the treatment options with the patient and her mother, it was decided to fabricate a reinforced composite resin Maryland-type Bridge with a porcelain veneer bonded to the pontic. The advantages of this restoration are many; (1) it is minimally invasive; (2) has high strength; (3) bonds well to enamel; and, (4) is highly esthetic.

Preparation and Design

Using no anesthetic, #6 and #8 ar e prepared using two diamond burs, a #837KR and #881-016 (Brasseler, Savanna , GA). The preparation is kept in enamel and at a depth between 3/4 and 1 mm (Figure 2). The advantage of not using anesthetic is that it allows you to gauge when you are approaching the dentin. On both #6 and #8 the preparation is taken facially to just lingual to the mesial facial line angle and the distal facial line angle respectively.

Lingually the preparation is rounded, will include 1/2 to 1/3 the mesial-distal width, 1/2 of the incisal-gingival length, and is kept gingival to the centric contacts when possible. The laboratory model shows the final preparation from the lingual aspect (Figure 3). An appropriate depth must be created to allow for space for fabrication of the Bridge framework matrix. Clinically, the entire preparation remained in enamel and the patient experienced no discomfort.

A full arch impression was taken with a light and heavy body polyvinylsiloxane (Extrude, Kerr). A lower, full-arch alginate impression is taken for an opposing model. A bite registration (Stat Bite, Kerr) will record the patients centric occlusion. The above materials are sent to the laboratory with a slide photograph (Figure 1) of the patient's anterior teeth. This will allow the ceramist to visualize the areas of slight hypocalcification at the incisal 1/3 which we would like reproduced in the restoration.

Delivery and Insertion

The prothesis returns from the lab in two pieces. One is the Bridge framework. It is fabricated from a laboratory composite resin (Herculite XRV Lab, Kerr) which has been successfully used in indirect composite inlays and onlays for years.[3] Incorporated within the composite is a length of reinforced polyethylene fiber. In Figures 4 and 5, the incorporated fiber can be seen. The internal aspects of the wing abutments have been etched and silanated in the laboratory. The second piece of the protheses is a porcelain veneer (Optec, Jeneric-Pentron) similar to a veneer you would place on a natural tooth. These two pieces will be inserted individually.

The esthetics associated with the traditional Maryland Bridge are compromised by the use of the metal framework.

The framework is tried in to check the marginal integrity (Figure 6). The veneer is then placed on the framework matrix using glycerin. Esthetics are then evaluated. With the approval of the patient and parent of the esthetics, the Bridge is then bonded to place.

The prepared area of the teeth are first cleaned with a slurry of pumice. Numbers 6 and 8 are then etched with 35% solution of phosphoric acid (Ultra-etch, Ultradent). A primer and bonding agent are then applied to the preparation (Optibond, Kerr). A dual cure composite resin cement (Enforce, Dentsply) is placed on the preparation area. The Bridge matrix is seated to place. Excess cement is removed using dental floss and a stiff brush lubricated with bonding agent. Special care must be taken to keep bonding agent or cement from the facial aspect of the pontic. A curing light is then placed on the lingual of #6 and #8 for two minutes per tooth to initiate the set of the cement.

The porcelain veneer is then tried in again to insure that it will fully seat. The facial aspect of the pontic on the framework is lightly brushed with an air abrasive unit (Microetcher, Danville Engineering). The internal aspect of the veneer is silanated. Bonding agent is applied to both the framework and the veneer. The veneer is cemented to place using an untinted light cure composite cement (Porcelite, Kerr). While being held firmly in place, the excess cement is then cleaned with a stiff brush lubricated with bonding agent. The insical aspect of the veneer is light cured for 15 seconds. This will act to "tack down" the veneer and allow for cleaning of the gingival and interproximal areas more easily using dental floss. When cleaning is completed, the

Figure 5: The bridge consists of a reinforced composite matrix and a porcelain veneer

The technology which makes this restoration possible is the development of a high strength, high molecular weight, biocompatable polyethylene fiber.

Figure 6: The bridge framework try in

Figure 7: The final bridge at delivery

facial aspect of the veneer is then light cured for two minutes.

Excess cement is then removed using a #12 scalpel blade interproximally, and carbide finishing burs (ET Finishing System, Brasseler). Polishing is completed on the lingual using a composite finishing system (D*Fine, Clinicians Choice). The porcelain veneer is polished using a porcelain polishing disc (Dialite, Brasseler).

Conclusion

The final result is a conservative restoration which will provide the patient with excellent esthetics for many years to come. This ability to maintain quality tooth structure, particularly with a young adult, offers an excellent treatment option for the restorative, cosmetic dentist. As our material and techniques continue to advance, we will be able to produce stronger, more conservative and esthetic alternatives to conventional porcelain-fused-to-metal restorations.

Acknowledgements

The author would like to acknowledge the work of Americus Dental Laboratory for the fabrication of this restoration.

REFERENCES

1. Dickerson,W.G.. "A conservative alternative to single tooth replacement: A three year follow-up." *Prac. Perio. and Aesth. Dent.* Aug '93; 43-48.

2. Jackson, R., Ferguson,R. "An esthetic bonded inlay/onlay technique for posterior teeth." *Quint. Int.* 1990; 21:7-12.

3. Miller,T.E., Rudo,D.N. "Emergency direct fabrication of a resin fixed partial denture by using a ceramometal crown with reinforcing woven polyethylene ribbon as a pontic." *Gen. Dent.* Nov-Dec '95. 560-563.

Dr. Gary Radz is in private practice in Charlotte, North Carolina. His general dentistry practice focuses heavily on esthetic/cosmetic procedures. He has published numerous articles related to cosmetic dental procedures. Working with Dr. Ross Nash, he is involved with clinical evaluations of dental materials and equipment for dental manufacturers.