The Procera Maryland Bridge: A Case Report

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ABSTRACT

Although congenital partial hypodontia is widespread, and a variety of solutions for treating this condition in adolescents have been devised, all have had one or more significant drawbacks. A new treatment option that has recently become available, the Procera Maryland Bridge, appears to deliver excellent esthetics and strength. This article discusses that option and presents a case in which it was used successfully.

CLINICAL SIGNIFICANCE

Congenitally missing lateral incisors always present a treatment dilemma for restorative dentists. Numerous treatment options exist; none of which are totally satisfactory. This article presents a potential alternative for these patients using a novel all-ceramic Maryland Bridge.

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BACKGROUND

As many as 6% of individuals born in the United States have been estimated to have congenital partial hypodontia, with the condition affecting slightly more females than males.[1,2] The optimal method for replacing congenitally missing incisors is not an option for most adolescents, however. Although long-term studies have shown implant-supported crowns to be the most stable, durable, and esthetic restoration available,[3–6] there is consensus that implants should not be placed until growth completion has been definitively documented, such as by consecutive-year cephalometric radiographs that reveal no growth change.[7] Other circumstances also may prohibit the use of implants, including inadequate alveolar architecture in a patient unwilling to undergo bone grafting, emotional immaturity, and financial constraints.

A number of conservative tooth replacement schemes have been developed to fulfill adolescent patients' esthetic needs. One is to eliminate the need for a prosthetic replacement by orthodontically moving the canine(s) into the lateral position(s). European studies have shown a high level of satisfaction among patients treated with this approach.[8,9] When the canines are undersized, it may be possible to whiten and reshape them to closely resemble the missing incisors. However, if the contours of the canine differ too dramatically from the incisor, as is often the case, an unnatural gingival architecture may be unavoidable.[10] Moreover, the presence of the canines in their normal position appears to contribute significantly to appropriate functional occlusion.[11,12]

Two early prosthetic solutions for replacing congenitally missing lateral incisors were the removable partial denture and the three-unit conventional bridge. Although the former can provide adequate esthetics and function, many patients dislike the bulkiness of a removable appliance and the discomfort experienced in wearing it.

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Furthermore, hygiene problems may lead to papillary hyperplasia and generalized gingival inflammation. Three-unit bridges avoid these problems. However, they may require replacement three or four times over the course of a young patient's life, and the need to prepare previously untreated abutment teeth is also a significant drawback. The pulps in adolescent teeth are large, and a heightened risk of endodontic complications from preparation has been documented.[13] Each time the bridge is replaced, the additional loss of tooth structure may lead to loss of one or both abutment teeth.

With the introduction by Livaditis in 1980 of the adhesive-retained fixed partial denture,[14,15] a new era of conservative tooth replacement dawned. The porcelain-fused-to-metal pontic attached to two metal wings came to be known as the Maryland Bridge. Cementing the wings to the lingual side of the abutment teeth dramatically reduced the need for the preparation of those teeth, but a loss of adhesion plagued early versions of the design. Although better adhesive techniques have developed over time, the classic Maryland Bridge also often has an esthetic limitation, as the presence of the dark metal behind the translucent abutment teeth can make them appear gray.

A number of variations upon the basic Maryland Bridge concept have since developed. The all-ceramic veneer bridge consists of an all-ceramic pontic flanked by two veneer retainers that are attached to the abutment teeth, which have been prepared for veneers. Although this treatment can be extremely esthetic, it requires permanent alteration of the facial surface of the anterior teeth. Furthermore, failure along the facial margins of the veneers occurs relatively early. One study has estimated the 5-year success rate at 75%.[16] The Carolina Bridge described by Heymann[17] eliminates the wings from the classic Maryland Bridge as well as the need for any preparation of the adjacent teeth. Instead, an all-ceramic pontic is bonded to the adjacent interproximal surfaces. Although excellent esthetic results can be achieved with this approach, at least 5 mm of incisogingival height is necessary to provide adequate bonding surfaces. Even given that, dislodgement of the pontic can occur.

THE PROCERA MARYLAND BRIDGE

The Procera Maryland Bridge represents a further evolution of Livaditis's initial concept. The one-piece zirconia framework incorporates an all-ceramic incisor pontic connecting two wings that are bonded (or cemented) to the lingual of the adjacent teeth. Preparation is restricted to the lingual surfaces and the lingual aspect of the interproximal and is minimal, limited to 0.5 mm or less of the enamel layer. The framework is precision milled from a solid piece of zirconia.

It can be secured by cementing the zirconia wings directly to the prepared abutment teeth. Zirconia cannot be acid-etched. To further increase the bond strength capability of the wings, the Drake Precision Laboratory has developed a proprietary process for coating them with porcelain, etching the porcelain, and bonding the porcelain surface to the teeth with composite, veneer cement, or a composite-based luting system.

Zirconia has been demonstrated to be very durable.[18,19] Although long-term studies of this restoration have not yet been carried out, the most common failure mechanism of other winged bridges has been the debonding of one or both retainers. Nonetheless, published reports have shown life expectancies of 7 to 15 years for adhesively bonded winged bridges.[19–22]

The Procera Maryland Bridge *could* be considered:

1. for the central and lateral incisor replacement in either arch

2. for the replacement of congenitally missing maxillary lateral incisors
3. as a temporary prosthetic solution for patients who desire implants but have not reached physical maturity

Contradictions include cases involving deep Class II occlusion, tight anterior occlusion, bruxism, inadequate posterior support, and periodontally compromised abutment teeth.

The following case report illustrates the use of the Procera Maryland Bridge.

CASE REPORT

The patient was an 18-year-old female in excellent general health who presented with an undersized right lateral incisor and a congenitally missing left lateral incisor (Figures 1 and 2). She had been under orthodontic care for approximately 10 years and had worn an artificial tooth attached to the orthodontic wires. With the completion of her orthodontic treatment, she was eager to replace the missing tooth with a stable esthetic solution. However, consecutive cephalometric radiographs indicated that she had not reached full physical maturity and thus, was not yet a candidate for single implant placement. After a review of her options, she elected to receive a Procera Maryland Bridge as an interim solution.

Study models were made, an articulator was mounted, and a diagnostic wax-up was done. A temporary "flipper" partial and a rigid space maintainer were fabricated. It was determined that the occlusal clearance was minimal, so a 0.5-mm lingual preparation was planned. (With an open-bite situation, little or no lingual reduction may be necessary). To provide mechanical resistance form for the lingual wings, a box preparation was outlined in ink on the lingual and interproximally just into the contact area (Figures 3 and 4). The outlined area was then reduced by 0.5 mm with butt-joint cavosurface walls (Figures 5 and 6). At the same time, the undersized right lateral incisor was prepared for a Procera zirconium crown (Figure 7).

An impression was taken in polyether impression material (Figures 8 and 9) and sent to the laboratory, along with the bite records and the mounted study models on an articulator. Detailed shade mapping was done, and numerous digital photographs were taken with reference shade tabs.

Figure 1. Pretreatment, frontal, full smile.

Figure 2. Pretreatment, retracted, lateral view.

Figure 3. Provisional partial denture on study cast.

Figure 4. Proposed restoration outline.

Figure 5. Occlusal view close-up of preparation with ovate pontic preparation.

Figure 6. Lateral view of ovate pontic and canine preparation.

Figure 7. Lateral close-up of lateral incisor crown preparation.

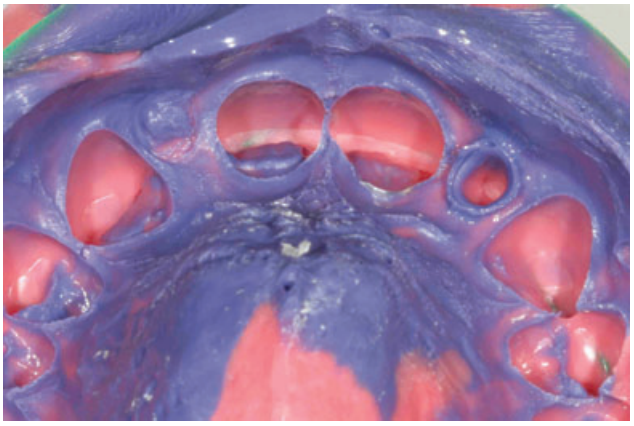

Figure 8. Final impression.

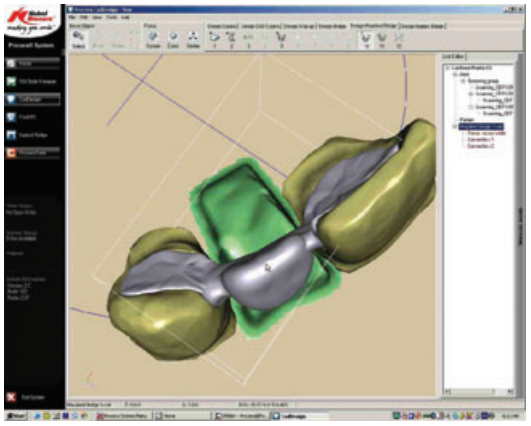

Figure 9. Nobel Biocare Software scan (Nobel Biocare AB, Göteborg, Sweden).

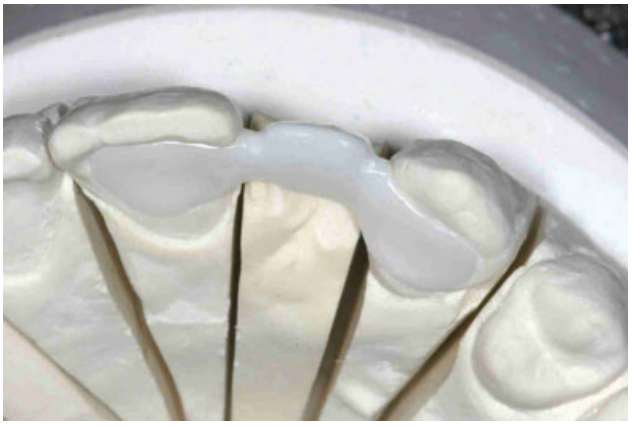

Figure 10. Zirconium framework on die model without porcelain on pontic.

Figure 11. Completed restorations on die model.

Figure 12. Final treatment, frontal, full smile.

In the laboratory, a die model was poured (Figure 10) and scanned with a Procera Forte laser scanner, and the digital data obtained from the scan were imported into a computer. Using the Procera software, a Maryland Bridge was designed on the computer, and the completed design was sent electronically to the Procera facility in Sweden where computer numerically controlled milling machines were used to mill the bridge out of a solid blank of zirconium (Figure 11).

The bridge was returned from Sweden to the laboratory, where porcelain was added to the lingual surface of the wings in a proprietary process. After the creation of the pontic, the porcelain surface was acid-etched, and the bridge was returned to the restorative dentist.

The bridge was tried in (Figure 12), and the esthetics of the color and contours were evaluated. The porcelain surfaces of the bridge wings

Figure 13. Final treatment, occlusal view.

Figure 14. Final treatment, head and shoulder view.

were bonded to the lingual surface of the abutment teeth using conventional acid-etch/bonding techniques. The bridge was seated using a thin coating of unfilled resin and flowable composite over all surfaces and a layer of a highly filled composite used as luting agent. This "sandwich" of composite was fully seated. Prior to curing, the excess composite was removed and sculpted to conceal interproximal connector areas. Some concerns exist about the complete curing using this approach. Zirconia is very opaque; however, with the applied porcelain on the wings, it has been this clinician's experience that complete curing occurs. Occlusion was adjusted after the final seating. All surfaces were thoroughly polished with various rubber points and wheels. After delivery, impressions were taken to fabricate an acrylic nightguard.

The patient was advised of the importance of returning for follow-up every 6 months until she is ready to replace the bridge with an implant. Figures 13 and 14 show the final restoration.

CONCLUSION

Although implant-supported prostheses are ultimately the best solution for patients with congenitally missing incisors, until such patients have reached full physical maturity, a transitional restoration is often necessary. The Procera Maryland Bridge is such a restoration. It requires minimal preparation of the abutment teeth and provides excellent esthetics.

DISCLOSURE

The authors do not have any financial interest in the companies whose materials are included in this article. Mr. Drake owns the laboratory in which the featured restorations were fabricated.

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