

## Resin-bonded fixed partial denture using In-Ceram and Targis-Vectris system: A clinical report

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The conventional approach for replacing missing maxillary lateral incisors dictates the placement of either a conventional porcelain-fused-to-metal(PFM)bridge, resin-bonded fixed partial denture, or single implant prosthesis. However, several appearance-related disadvantages have been reported in the use of a prosthesis which incorporates a metal substructure. To address these limitations, metal -free restorative alternatives have been recently developed to expand the clinical options when fabrication of these prostheses is indicated. This clinical report describes the treatment of patients with a missing maxillary lateral incisor where the dentition was non-invasively restored with resin-bonded fixed partial denture(RBFPD) using In-Ceram and Targis-Vectris system.(J Korean Acad Prosthodont 2000;38:375-381)

**A** resin-bonded fixed partial denture(RBFPD) is an alternative treatment for the replacement of missing teeth. Rochette<sup>1</sup> first described a method to splint periodontically mobile teeth using a cast metal framework. Several techniques to treat the bonding surface of the metal framework have also been described<sup>2,4</sup>. However, it has been reported that the metal frameworks frequently debond from the composite luting cement, despite improvement in metal bonding agents<sup>5</sup>. In addition, the dark color of cast metal frame of the RBF-PD might cause esthetic problems in the anterior teeth region.

Since 1988, the In-Ceram system (Vita Zahnfabrik, Germany), which is based on a high-strength alumina ceramic, has been available. The high

strength also allows the fabrication of small anterior fixed partial dentures. In 1991, Kern et al<sup>6</sup> manufactured adhesive fixed partial dentures with ceramic wings, a design similar to that of metal-supported adhesive prostheses. Durr et al<sup>7</sup> reported high failure rates among these prostheses, especially in the region of the interdental connector. Finite-element analysis and in vitro studies<sup>8</sup> indicated that a modified design that provided good mechanical retention form was the best solution for all-porcelain resin-bonded fixed partial dentures.

The use of fiber reinforced composite framework can potentially overcome the problem of debonding of composite luting cement to the framework of the resin-bonded fixed partial denture and

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the esthetic liability of cast metal frameworks.

This clinical report describes the treatment of patients with a missing maxillary lateral incisor where the dentition was noninvasively restored with resin-bonded fixed partial denture using In-Ceram and Targis-Vectris system.

### CASE 1

A 17-year-old woman was referred by her orthodontist to the Department of Prosthodontics of Seoul National University Hospital for treatment. The patient's maxillary left lateral incisor was congenitally missed, and her chief complaint was the poor esthetics as a result of the missing tooth. The dentition was intact.

Intraoral examination revealed a healthy dentition and healthy periodontal tissues(Fig. 1). The interabutment distance was 4mm and insufficient space. The patient was not willing to have implants placed because of the increased expense. The patient opted for treatment with a noninvasive all-ceramic(In-Ceram, Vita Zahnfabrik) RBFDP. The shade was selected, preparation of the abutments was accomplished(Fig. 2), polyvinylsiloxane rubber impression(Examix, GC, Japan) was made for abutments, and irreversible hydrocolloid impression was made for the opposing dentition.



Fig. 1. Facial view of the patient's condition.

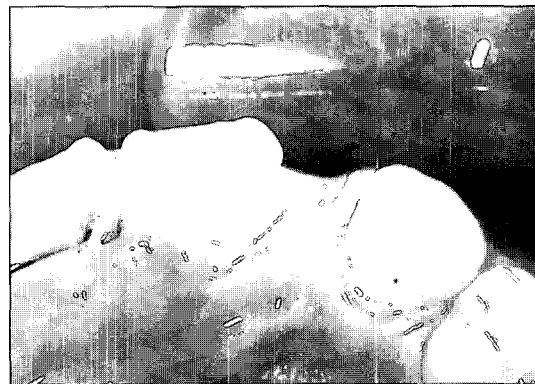


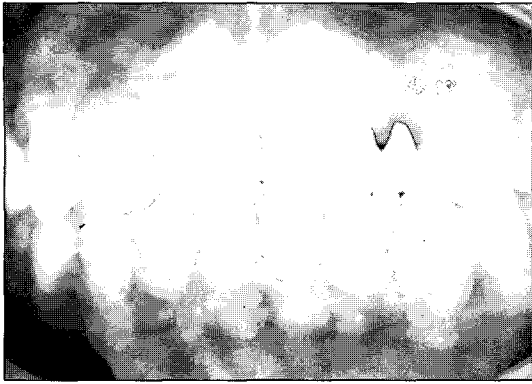
Fig. 2. Occlusal view of the final bridge preparations.



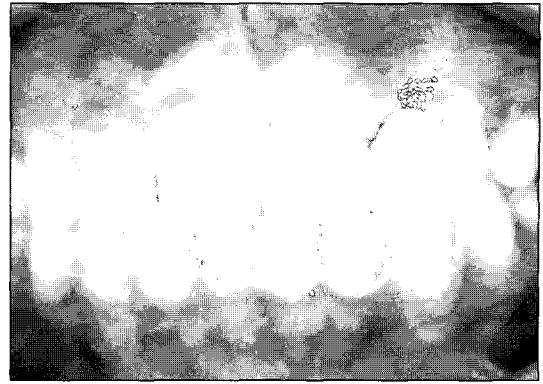
Fig. 3. The special-plaster cast with a slipped adhesive prosthesis.



Fig. 4. In-Ceram copings are shown after glass-infiltration.



(A)



(B)

**Fig. 5.** (A) The framework is tried in. (B) All-ceramic resin-bonded fixed partial denture after insertion and polishing.

### LABORATORY PROCEDURE

The first step used an extremely fine-grained aluminum oxide powder suspension in a slip-casting procedure to create a core material. The powder slip suspension was applied to the plaster die. During sintering, the die was shrunk and removed in one piece from the substructure(Fig. 3).

The second step was the infiltration firing step. The outer surfaces of the porous, sintered substructure were coated with a slurry of glass powder and fired at 1100°C(Fig. 4).

After the coping has been completed, the marginal integrity was clinically verified(Fig. 5A) and then the porcelain application was initiated. Vita porcelain(Vita Zahnfabrik,Germany) was used to recreate the desired esthetics necessary for the final restoration of her upper left lateral incisor. The pontic was designed so that it overlapped the mesial portion of the facial aspects of the canine to create an illusion of an esthetically acceptable restoration(Fig. 5B).

### CLINICAL PROCEDURE

The bonding surfaces of the abutments were cleaned with pumice and acid-etched with phosphoric acid gel. The bonding surface of RBFPD was

cleaned and sandblasted. The resin-bonded fixed partial denture was then luted with a resin cement(Panavia 21, Kuraray Co.Ltd, Japan).

### CASE 2

A 22-year-old man was referred to Department of Prosthodontics of Seoul National University Hospital for treatment after extraction of maxillary left lateral incisor because of vertical fracture by trauma(Fig. 6). His chief complaint was the poor esthetics as a result of the missing tooth and immediate treatment.

Intraoral examination revealed a healthy dentition with minimal plaque and slight gingivitis. There was no evidence of bruxism or wear facets on the occlusal surfaces of teeth. There was anterior crowding and irregular gingival line. The patient opted for treatment with a noninvasive fiber reinforced composite (Targis-Vectris system) resin-bonded fixed partial denture. The shade was selected, Preparation of the abutments was accomplished, and impressions were made(Fig. 7).

### LABORATORY PROCEDURE

A framework was made on a dental cast that



Fig. 6. Facial view of the patient's condition after extraction.

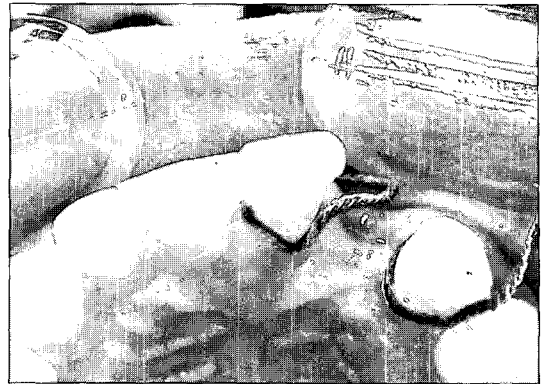


Fig. 7. Occlusal view of the preparation of abutments.



(A)



(B)

Fig. 8. (A) Unidirectional fiber reinforcement (Vectris Pontic), (B) Woven fiber reinforcement (Vectris Frame).

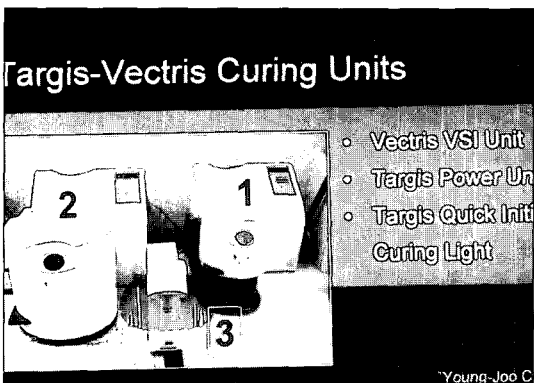


Fig. 9. Targis-Vectris curing unit.

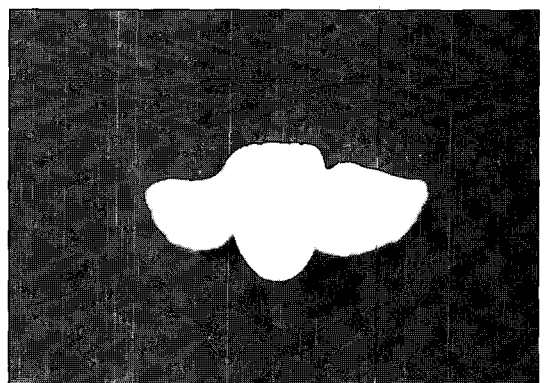
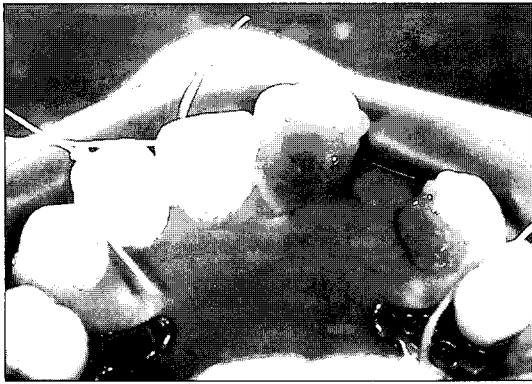
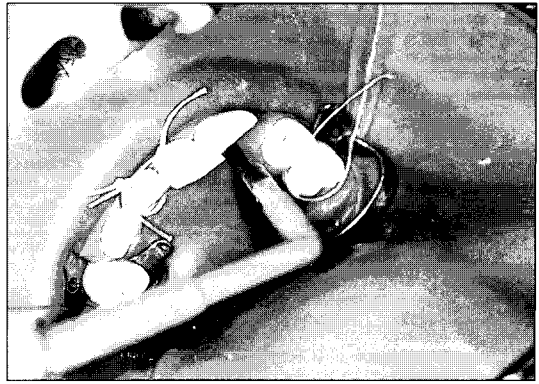


Fig. 10. Facial view of Targis-Vectris RBFDP.



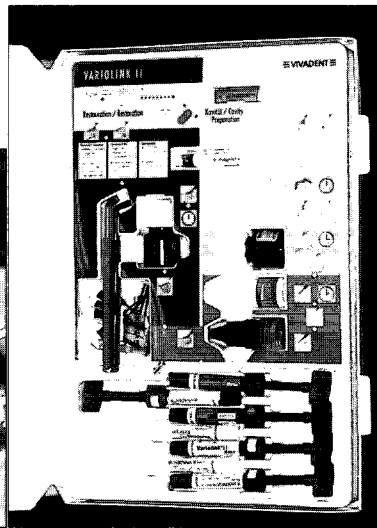
(A)



(B)



(C)



**Fig. 11.** (A) The abutment teeth were etched with 37% phosphoric acid. (B) Dentin primer and adhesive, were applied. (C) The RBFDP was luted with a dual cured resin luting cement(Variolink II,Ivoclar,Liechtenstein).



**Fig. 12.** Fiber-reinforced composite resin-bonded fixed partial denture after insertion and polishing.

incorporated unidirectional fiber reinforcement (Vectris Pontic), along with woven fiber reinforcement (Vectris Frame) (Fig. 8A, B). A framework was cured by pressure, heat, and light with Vectris VSI unit (Ivoclar, Liechtenstein) (Fig. 9). The fiber framework was the ground to the final shape with a handpiece micromotor that used a medium grit diamond bur.

The fiber framework was veneered with ceromer (Targis), then cured with Targis power unit and finished by grinding the surface with a medium grit diamond bur, grinding the surface of the veneers with pumice, and finally polishing (Fig. 10). The bonding surface of the RBFPD was smoothly sandblasted with aluminum oxide and silanized.

### CLINICAL PROCEDURE

Rubber dam isolation of the abutment teeth was placed, the bonding surfaces of the abutments were cleaned with pumice and acid-etched with phosphoric acid gel (Fig. 11A). Dentin primer and adhesive were applied on the bonding surfaces of the abutments (Fig. 11B). The RBFPD was then luted with a dual cured resin luting cement (Variolink II, Ivoclar, Liechtenstein) (Fig. 11C). Excess luting cement was removed, and the occlusion was carefully adjusted. Final finishing in the traditional manner was completed (Fig. 12).

### DISCUSSION

The introduction of an all-ceramic resin-bonded FPD with the use of In-Ceram ceramic (Vita Zahnfabrik, Germany) provides a more esthetic prosthesis. The advantages of an all-ceramic FPD include improved esthetics and biocompatibility, resistance to degradation in the oral cavity, a coefficient of thermal expansion that is similar to tooth structure, resistance to electrolytic corrosion, successful bonding of porcelain

veneer to the ceramic coping, and low thermal conductivity. The major disadvantages is potential fracture of the restoration, because dental ceramics are fragile in tension. In 1998, Kern et al reported the success rate was 94.1% after 1 and 5 years of clinical service in all-ceramic RBFPD<sup>9</sup>.

The use of fiber reinforced composite framework can potentially overcome the problem of debonding of composite luting cement to the frame of the RBFPD and the esthetic liability of cast metal frameworks. The minimal thickness of the retainer wings should be 0.5mm; to achieve this goal, sufficient space must be present, either because of overjet that is present or because of tooth preparations. Deep bite situation and bruxism are contraindications to use of these techniques. Altieri et al<sup>10</sup> monitored a group of 12 patients who have received 14 single tooth replacement experimental restorations made with prefabricated continuous fiber-reinforced composite (FRC) frameworks. The survival probability at 12 months was approximately 50%. No debonding was reported between the polymeric composite luting cement and etched enamel.

The ovate pontic has a rounded base and is inserted into the extraction site at the time of tooth removal or into a surgically prepared site for healed edentulous ridge. A 1mm concavity should be developed and a temporary acrylic resin pontic placed. This allows the tissue to heal around the ovate form. If needle probing demonstrates a soft tissue depth of only 2mm, a surgical osteoplasty is necessary to develop a suitable recipient site for the pontic<sup>11</sup>.

### SUMMARY

Resin-bonded fixed partial denture using In-Ceram or Targis-Vectris system allows conservative replacement of missing maxillary lateral incisor, but sufficient clinical crown length and adequate occlusal clearance are necessary for restora-

tion. Resin-bonded fixed partial dentures using In-Ceram or Targis-Vectris system require only minor tooth preparation and allow access to maintain esthetics and periodontal health. Longitudinal studies are needed to verify the efficacy of all-ceramic or fiber-reinforced composite RBFDPs.

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