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A direct bonded fixed partial dental prosthesis: A clinical report

ABSTRACT

A direct bonded fixed partial dental prosthesis with a composite resin denture tooth as a pontic, a tri-*n*-butylborane initiated adhesive resin, and screw posts for reinforcement was still functioning after an observation period of 20 years. The prosthesis was found to be reliable for long-term clinical use when chemically and mechanically reinforced.

INTRODUCTION

In the extraction of a single tooth, especially an anterior tooth, where adjacent teeth are present the direct bonded fixed partial dental prosthesis (DBFPDP) incorporating a composite resin denture tooth as a pontic may be selected for esthetic reasons until a definitive prosthesis can be fabricated.[1] Generally, the DBFPDP technique is used for only a limited time. The mechanical properties of the artificial tooth and the adhesive agents and the bond strength between the tooth substance and artificial teeth are considered insufficient for long-term use, although the reliability of the properties of each material has been reported.[2-10] However, the DBFPDP technique is based on the concept of minimal intervention since it can conserve the enamel of the abutment teeth. The DBFPDP is a useful prosthetic method when it is reinforced with additional materials.[1,11,12]

An implant-supported fixed dental prosthesis is effective for single tooth replacement but is not suitable for all patients, primarily because of local or general contraindications or economic circumstances. A conventional fixed partial dental prosthesis is also not always

suitable. The RBFPP method is a minimally invasive, one visit treatment at minimal cost and provides fixed prosthodontic treatment with minimum intervention.

This clinical report describes the treatment of a DBFPDP reinforced with 2 dental screw posts that connected the pontic to the abutment teeth of a patient with a missing premolar.

CLINICAL REPORT

A 47-year-old woman presented at the Division of Fixed Prosthodontics at Nagasaki University Hospital of Dentistry with the chief complaint of difficulty in eating and food impaction as a result of a missing mandibular right first premolar (Fig. 1). She was using a clasp-retained removable partial dental prosthesis to replace the missing mandibular right molars. The removable partial prosthesis had a suprabulge clasp with a rest seat on the distal of the second premolar (Fig. 2). Both the canine and the second premolar were unrestored.

At first, a fixed partial dental prosthesis was proposed, but the patient declined because she wanted to conserve the intact tooth structure of the existing abutment teeth. Implant placement and the fabrication of implant-supported prostheses were indicated, but the patient also declined because she was afraid of implant surgery. Therefore, a direct bonding fixed partial dental prosthesis (DBFPDP) with an artificial denture tooth as a pontic was provided as an interim prosthesis until a definitive prosthetic method could be decided.

A composite resin denture tooth (Endura M30; Shofu Inc.) was shaped as a pontic and adjusted to the missing tooth space. Two grooves for screw posts to increase retention (Dentatus Classic Post System (gold plated); Dentatus AB) were placed in the mesial and distal ridges of the artificial tooth. In addition, shallow grooves for the screw posts were placed in the enamel of the marginal ridges of the abutment teeth on the side adjacent to the missing tooth. The bonding

surfaces of the composite resin tooth were airborne-particle abraded with 50 to 70 μm alumina (Hi-Aluminas; Shofu Inc.) with an airborne-particle abrader (Micro Blaster MB102; Comco Inc), lightly air dried with an air syringe, and primed with a 3-liquid ceramic primer (Clearfil Porcelain Bond System; Kuraray Noritake Dental Inc). The bonding surfaces of the abutment teeth were polished with fluoride-free pumice, etched with 40% phosphoric acid (K-Etchant; Kuraray Noritake Dental Inc.) for 30 seconds, rinsed with water, and air dried. The screw posts were airborne-particle abraded with the same method as for the bonding surfaces of the composite resin tooth and treated with noble metal alloy primer (V-Primer; Sun Medical Co, Ltd). The composite resin tooth was bonded to the missing tooth space, and 2 screw posts were put on the grooves to sit astride the abutment tooth and the artificial tooth. The artificial tooth was fixed to the abutment teeth with a tri-*n*-butylborane (TBB) initiated adhesive resin (Super-Bond C&B; Sun Medical Co, Ltd) with a brush-dip technique.[13]

The resin was carefully applied to the mesial and occlusal surfaces of the second premolar abutment tooth, to avoid interference with the clasp of the existing removable partial dental prosthesis. After polymerization, complete insertion of the prosthesis was confirmed, and the occlusion adjusted (Figs. 3, 4). The patient was satisfied with the treatment, both esthetically and functionally. All treatment was completed in one visit.

The patient was followed up at 3-month intervals for oral hygiene and evaluation of the DBFPDP and removable prosthesis. One year after the treatment, other treatments, including a conventional fixed partial dental prosthesis and implant-supported prostheses, were recommended to the patient, but she again refused because she was satisfied with the DBFPDP. Ten years after treatment, the removable partial dental prosthesis was refabricated because the resin base had fractured. In accordance with the treatment plan of the previous dentist, a

suprabulge clasp with mesial rest was used for the second premolar. The DBFPDP had been functioning for more than 20 years without debonding (Figs. 5-7). Although marginal leakage was found, the patient chose to continue with the DBFPDP.

DISCUSSION

The DBFPDP is a technique requiring a single visit because impression and cast making are unnecessary. Nevertheless, the mechanical properties of the DBFPDP as a definitive prosthesis are insufficient when compared to a conventional fixed partial dental prosthesis. To reduce the chance of debonding or fracture, the prosthesis should be designed so that occlusal forces avoid the adhesive interface between the resin and artificial tooth. A satisfactory outcome can be achieved by the appropriate selection of materials and bonding systems. Minesaki et al[1] reported that both TBB-initiated adhesive resin and metal posts with screws were suitable for bonding a DBFPDP. The metal post with screw for mechanical retention is one of the materials that can reinforce bonding between the artificial tooth and tooth structure, although there are other materials for reinforcement, such as fiber materials.[11,12] Since the metal post used was gold-plated brass, a thione primer (V-Primer) was helpful in the bonding of the noble metal ingredient to the luting material, which contains a carboxylic functional monomer. The metal-treated post was adequately bonded with cement and the metal post reinforced the strength of the cement itself.

The pretreatments for bonding between the artificial composite resin tooth and cement and between the enamel and cement were also related to the strength of the DBFPDP. Many researchers have reported the adequate performance of adhesive resin for bonding to tooth structure.[2-5] For this patient, pretreatment with phosphoric acid was effective since the bonding

area was limited to the enamel. Airborne-particle abrasion and silanization were also appropriate[1] since the artificial tooth used for the patient was a microfilled composite resin that included 47% organic filler.[7,8] As a result, the properties of the materials and bonding systems were suitable. In addition, the patient's opposing removable partial dental prosthesis with the same composite resin artificial teeth may have increased the longevity of the DBFPDP. However, the stained interface between the enamel and resin cement was an esthetic problem (Figs. 5, 6). The position of the rest of the refabricated denture might make the color change of the cement or the stains caused by microleakage of the cement less noticeable (Fig. 7). Piemjai et al[5] reported that the TBB-initiated adhesive resin used exhibited less microleakage than other acid-base cements at the cementum margins. Yet, the microleakage could not be avoided, regardless of the performance of the resin, since this DBFPDP had unexpectedly been in place for 20 years. In addition, the resin itself had changed color. Even if the bond strength between the artificial tooth and abutment teeth is clinically satisfactory, the DBFPDP should be removed at the patient's request in the future.

SUMMARY

This clinical report describes a DBFPDP technique with a composite resin tooth as a pontic, a tri-*n*-butylborane initiated adhesive resin, and 2 screw posts. The DBFPDP incorporating a composite resin denture tooth as a pontic is reliable for long-term clinical use when chemically and mechanically reinforced.

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LEGENDS

Fig. 1. Preoperative buccal view of missing mandibular right first premolar.

Fig. 2. Preoperative occlusal view with clasp-retained removable partial dental prosthesis.

Fig. 3. Buccal view after DBFPDP treatment.

Fig. 4. Lingual view after DBFPDP treatment with clasp-retained removable partial dental prosthesis.

Fig. 5. Buccal view of DBFPDP 20 years after treatment.

Fig. 6. Occlusal view of DBFPDP 20 years after treatment.

Fig. 7. Occlusal view of DBFPDP 20 years after treatment with refabricated clasp-retained removable partial dental prosthesis.