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CASE REPORT

Replacement of missing lateral incisors with lithium disilicate glass-ceramic veneer-fixed dental prostheses: a clinical report

Sami M. Bissasu & Nabil A. Al-houri

Faculty of Dentistry, Department of Fixed Prosthodontics, Damascus University, Damascus, Syria

Correspondence
S. M. Bissasu, Faculty of Dentistry, Department of Fixed Prosthodontics, Damascus University, Al-mazeh street, 00963-932248746, Syria.
Tel: 00963-113325015;
E-mail: samimbg@hotmail.com

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Key Clinical Message

This report describes the use of lithium disilicate glass-ceramic veneer-fixed dental prostheses in replacing congenitally missing maxillary lateral incisors. This kind of prosthesis has an advantage over a lingual-retainer resin-bonded fixed dental prosthesis in its capability of changing the color and shape of the abutment teeth. The prostheses provided an acceptable esthetics and comfort for the patient.

Keywords

All-ceramic resin-bonded fixed partial denture, esthetics, IPS e.max, lithium disilicate glass-ceramic veneer, missing incisor, veneer-fixed dental prosthesis.

Introduction

Replacing a missing incisor is an important issue in the dental practice. There are several options that exist for replacing it. These include an implant-supported prosthesis, a conventional fixed dental prosthesis (FDP), and a resin-bonded fixed dental prosthesis (RBFPD). The treatment of choice should be the least invasive option that satisfies the expected esthetic and functional objectives [1]. An implant-supported prosthesis has become a common method of replacing a missing tooth [2]. However, there are still certain instances in which implants cannot be used. In these situations, a tooth-supported prosthesis must be considered. Unfortunately, the conventional FDP is the least conservative option [3]. An RBFDP is more conservative than a conventional FDP, removing ~3–30% of the coronal tooth structure by weight [3]. The success rate of this type of prosthesis has varied widely. Hansson [4] reported 54% failure rate after 11 months of follow-up, whereas Priest [5] reported a 10% failure rate over 11 years. Specific criteria must be addressed to ensure optimal esthetics and a long-term success. These include position, mobility, thickness, and translucency of the abutment teeth as well as the overall occlusion [6]. Success of RBFDPs depends largely on bonding of resin cement to the bonding surfaces of both the abutments and the prosthesis. Many factors affect the strength of resin cement bonding. They include framework material, surface treatment, film thickness, and type of resin cement [7].

An all-ceramic RBFDPs were introduced as a conservative treatment option more than 25 years ago [8]. Feldspathic porcelain, zirconia, glass-infiltrated alumina, and hot-pressed ceramics have all been used to fabricate an anterior all-ceramic RBFDP with lingual retainers [9–26]. Single retainer all-ceramic RBFDPs made from a glass-infiltrated alumina ceramic showed a 10-year survival rate of 94% [11]. In 1993, Denissen et al. replaced missing anterior teeth in selected cases by 12 feldspathic veneer FDPs. The success rate was 75% after 5 years [27]. Cohen et al. also presented two clinical cases in which an anterior missing tooth was replaced by all-porcelain veneer FDP [28]. Similarly, Schaffer presented a clinical case in which an upper central incisor was replaced with a feldspathic veneer FDP [29].

Both glass-ceramic and high-strength oxide ceramic can be used to produce optical properties similar to those observed in natural teeth [30]. It has been shown that the highest flexure strength, exceeding 1000 MPa, was found with Zirconia [31], whereas the lowest flexure strength was found with IPS Empress and feldspathic porcelain [32]. Intermediate values were found with In-Ceram and IPS Empress 2 (more recently developed IPS e.max, IvoclarVivadent, Schaan, Liechtenstein) [31]. Oxide ceramics, such as In-Ceram and Zirconia are opaque ceramics, whereas glass ceramics are more translucent and therefore more esthetic [33]. IPS e.max is a lithium disilicate glass ceramic, which can be used for veneers and partial crowns. Its flexure strength is about 400 MPa, so it is indicated for anterior FDPs [33]. Contrary to oxide ceramics, IPS e.max, which is a silica-based lithium disilicate ceramic, is an etchable ceramic. Therefore, a strong and durable resin–ceramic bond can be obtained by hydrofluoric acid etching and silane application [34]. This clinical report describes the use of veneer FDPs made from a lithium disilicate glass ceramic for the replacement of two congenitally missing maxillary lateral incisors.

Clinical Report

A 19-year-old patient, who had congenitally missing maxillary lateral incisors (Fig. 1), was referred to Fixed Prosthodontics Department at Faculty of Dentistry-Damascus University (Damascus, Syria). The patient's chief complaint was her unesthetic appearance. Clinical and radiographic examinations were made. The maxillary central incisors and canines were intact with a little malalignment. The overjet and overbite of the anterior teeth were within the normal limits with a Class I Angle classification of the overall dental occlusion. The different treatment options were discussed with the patient. Two IPS e.max press veneer FDPs were selected as the treatment of choice.

Figure 1. Preoperative view of the patient with congenitally missing maxillary lateral incisors.

Maxillary and mandibular diagnostic casts were made from alginate impressions. Wax-up was made in the anterior region of the maxillary cast. A silicone index of the wax-up was made to ensure appropriate depth of the preparation. The central incisors and canines were prepared according to the general guidelines of a porcelain veneer preparation, considering the path of insertion of each FDP (Fig. 2). The tooth reduction was made by using a tapered round-end diamond bur (#868 314 016, Komet Dental, Gebr. Brasseler, Lemgo, Germany) in order to create a 0.5-mm chamfer finish line. Labial surfaces were prepared to provide 0.5–1 mm thickness of the retainers at the middle and incisal thirds. Incisal reductions were a feather-edge preparation for the canines, and 1–1.5 mm beveled preparation for central incisors. The proximal reduction was extended just into the proximal contact point at the mesial surfaces of the central incisors and the distal surfaces of the canines, whereas the preparation was extended to the proximo-lingual line angles adjacent to the edentulous area to provide an adequate bucco-lingual dimension of the connectors. All internal line angles were rounded, and all surfaces were finished with fine diamond burs (#8868 314 016, #8379 314 023, Komet Dental). A putty wash impression technique was used to make a complete arch impression with a vinyl polysiloxane impression material (Virtual, IvoclarVivadent, Schaan, Liechtenstein). A provisional FDP was fabricated from autopolymerizing resin material (Structure 2 SC, Voco, Cuxhaven, Germany) according to the wax-up and were cemented with a flowable autopolymerizing composite (Tetric N-Flow, IvoclarVivadent) only. The definitive casts were mounted in a semi-adjustable articulator (Stratos 200, IvoclarVivadent). All-ceramic veneer FDPs were fabricated with a lithium disilicate glass ceramic (IPS e.max press, IvoclarVivadent). Full contour FDPs were heat-pressed with a low-translucency ceramic ingot (Low Translucency A1 ingot, IPS e.max press, IvoclarVivadent). Then, the final shade was obtained by

Figure 2. Buccal view of abutment tooth preparations.

application of stains (IPS e.max Ceramic Shades, Essence, IvoclarVivadent). The dimensions of the connectors were at least 5 × 2.5 mm [35]. The pontics' design was modified ridge lap, because it combined esthetics with ease of cleaning. A first try-in was performed to assess complete seating of the prostheses, marginal adaptation of each retainer, tissue contact, form, occlusion, and shade matching. After all modifications were made, a final approval from the patient was obtained.

The prostheses were cemented with transparent light polymerizing resin cement (Variolink N, Base, IvoclarVivadent) in accordance with the manufacturer's instructions. The prostheses were cleaned with alcohol 96%. The intaglio surfaces of the prostheses were acid etched with hydrofluoric acid 5% (IPS Ceramic etching gel, IvoclarVivadent) for 20 sec. Then, all surfaces were thoroughly rinsed with water spray and dried with oil-free air. The etched surfaces were treated with a silane coupling agent (Monobond S, IvoclarVivadent) for 60 sec, and the agent were dispersed with a strong stream of air. The enamel and exposed dentin were etched with 37% phosphoric acid (N-Etch, IvoclarVivadent) for 30 and 15 sec, respectively. A bonding agent (Excite F, IvoclarVivadent) was applied to all bonding surfaces of the prostheses and the abutments, and carefully air thinned. The light polymerizing resin cement was applied directly to the intaglio surfaces of the prostheses, and then the two prostheses were bonded to the abutment teeth simultaneously. The excess resin cement was removed with a microbrush, and each surface was light polymerized for 60 sec. The occlusion was evaluated, and necessary occlusal adjustments were made using fine diamond burs and porcelain polishing kit (Optrafine, IvoclarVivadent). Recall visits were performed three times over 18 months period (Fig. 3). No debonding was observed, and function and esthetics were satisfactory.

Figure 3. Postoperative frontal views of all-ceramic veneer FDPs.

Discussion

Several treatment options were discussed with the patient. Implant-supported prostheses following orthodontic treatment were rejected because of surgery and long treatment time. Lingual RBFDPs were contraindicated because shape and alignment of the abutment teeth needed modifications. Also, nonconservative conventional FDPs were not the treatment of choice, especially with the sound abutment teeth.

An all-ceramic prosthesis has an advantage over a metal-ceramic one in esthetics and biocompatibility [35]. Several in vivo and in vitro studies evaluated the performance of RBFDPs made from lithium disilicate glass-ceramic with encouraging results [16, 36]. IPS e.max is a lithium disilicate glass-ceramic with different degrees of translucency, which expands their indications to porcelain veneers. Moreover, the full-anatomic design gives the prosthesis an additional strength rather than building layering porcelain over a framework [37]. IPS e.max glass-ceramic has high bond strength to resin cement compared to oxide ceramics [34, 38]. All these factors encourage the use of this kind of ceramic in fabricating all-ceramic veneer FDPs.

With all-ceramic veneer FDPs, changing the color, shape, and alignment of the abutment teeth was possible. This gave an advantage over a lingual-retainer all-ceramic RBFDP. Also, there was a little chance of changing the envelope of function when veneer FDPs were used in maxillary teeth. Moreover, maxillary veneer FDPs would expose to less loading than a lingual-retainer FDP.

Disadvantages of veneer FDPs are several. The final esthetic outcome in veneer FDPs is less than that of conventional FDPs or a lingual-retainer RBFDPs, because the embrasures cannot be widened as in conventional FDPs. Also, their indications are limited to a short span edentulous area in the anterior region, with relatively intact and bulky abutment teeth, without parafunctional occlusal habits, and with normal occlusal relationships. Moreover, a general recommendation for the use of IPS e.max veneer FDPs cannot be given until positive long-term results and encouraging in vitro studies are available.

Summary

IPS e.max glass-ceramic veneer FDPs have been used to replace two congenitally missing maxillary lateral incisors.

The prostheses were followed up for 18 months without any functional or esthetic problems. However, an adequate evidence of the long-term success is required before this new design can be recommended as an alternative option for replacement of a missing incisor.

Conflict of Interest

None declared.

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