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Temporary Restorations for Resin-Bonded Fixed Partial Dentures

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Abstract

Resin-bonded fixed partial dentures are an alternative to implant prosthesis and conventional fixed partial dentures when abutments are intact or exhibit only minimal carious lesion. However, a conventional provisional restoration is difficult to achieve. Some situations still require using a temporary treatment as when an anterior tooth is missing or for young patient in whom extrusion or migration of the teeth can quickly occur. This article presents and describes several clinical techniques and materials for implementing a provisional restoration for resin-bonded fixed partial denture.

Key words: *acrylic resin, resin-bonded fixed partial dentures, temporary restorations.*

I. INTRODUCTION

Resin-bonded fixed partial dentures (RBFPDs) are minimally invasive fixed prostheses for the replacement of a missing tooth in the anterior or posterior region ensuring the restoration of occlusal stability, aesthetics and function. This treatment option is for patients who may not be candidates for implant therapy or for young patients with incomplete skeletal growth.

RBFPDs have a reasonable survival rate as shown in different studies [1-2].A systematic review in 2017 reported survival rates of 91.4% after 5 years and 82.9% after 10 years [3]. A retrospective examination by Kern et al of 108 zirconia single retainer RBFDPs, of which 69 were maxillary lateral incisors, revealed 98.2% survival after a mean evaluation period of 7.6 years [4].They have to be used in appropriate situations like sufficient interocclusal space and no parafunctional habits. The preparation of the abutment requires a high degree of control and accuracy.

The amount of tooth reduction is based on available interocclusal space and thickness requirements of the retainer that depends on the material. A metal framework requires less volume than ceramic or composite to provide enough strength and prevent fracture.

Provisional restorations play an important role when providing indirect restorations. It helps to enhance aesthetics, stabilization and function for a limited period, after which it is to be replaced by a definitive restoration [5].

The placement of conventional provisional restoration to cover minimally prepared teeth that are to receive an adhesive restoration such as RBFPD is generally difficult.

However, provisionalization of the edentulous area might be recommended not only for esthetic reasons but also to avoid slight tooth movements during treatment, especially following orthodontic treatment [6].Additionally, extrusion of the teeth in the opposing arch occurs for young patients in whom migration of teeth can appear very quickly [7].

II. MATERIAL FOR PROVISIONAL RESTORATION AND CLINICAL TECHNIQUES

2.1. Posterior RBFPDs

Provisional restorations are fabricated utilizing either direct or indirect methods. The indirect technique is performed outside the mouth and requires a cast of the preparation, and the direct technique is performed on the prepared tooth in situ [11]. Fabricating provisional restoration directly on teeth using "the direct method" is suitable for single units [12]. There are different designs for RBFPD in the posterior region. The abutment preparation designs are mostly either minimal preparation within enamel including guide planes, vertical grooves and occlusal rests or a common design as an inlay-like or only-like retainer design. This preparation can generate dentin exposures which require an immediate dentin sealing (IDS) by a local application and polymerization of a dentin bonding agent immediately after tooth preparation to seal the freshly cut dentin surfaces [8].

The provisional restoration for inlay preparation should remain in place during function despite the cavity being non-retentive and should also be easily removed at the fit appointment, leaving a clean and unaltered surface. Acrylic- or composite-based resins may be provisionally cemented after they are polymerized. Although composites provide better marginal adaptation than do acrylic resins, because they exhibit less contraction during polymerization [9], they might not provide a complete seal [10].

Procedures

After lubrication the preparation with glycerin gel, a freshly mixed acrylic light-cure resin asUnifast LC (GC)is packed into the inlay cavity. The patient is asked to bite then the restoration is light-cured for few seconds. The provisional is gently removed and re-seated then photo polymerize for 20 sec. Once at the rubbery stage, remove the provisional before final polymerization extra orally. The restoration is trimmed, adjusted and the occlusion tested in all excursions of mandibule before polishing.

For cementation of the provisional restoration, it is important to avoid eugenol-containing products as it can reduce the bond strength of resin luting cements to cores [13-14].

Another intraoral technique is to make a pre-preparation impression of the tooth to be prepared and adjacent teeth using a silicon putty or alginate with the help of a sectorial impression tray. The impression is re-placed into patient's mouth, checked for accuracy of fit, ease of insertion and set aside. Then, the tooth is prepared and coated with Glycerin gel.

Auto polymerizing acrylic resin or dual-cure bis- acryl resin like Luxacore^{TM} DMG is applied over the surface of the impression material and fitted over the prepared tooth. The impression containing the uncured resin is repositioned in the mouth then removed; while resin remains on the prepared tooth (the resin is not yet completely polymerized). Once at the rubbery stage, the temporary restoration is removed from the preparation,

trimmed and returned on the prepared tooth then polymerized. The provisional restoration is bonded to the tooth without excessive bonding material.(Fig. 1)

For indirect technique, a matrix of the duplicate cast of the wax-up can be used with dual-cure bis-acryl material for the fabrication of the provisional restorations [15].

Fig1: (a) Intraoral view of prepared teeth(b)Temporary bridge obtain by placing a putty matrix filled with temporary material (Unifast^{TM}*Trad GC) on the prepared teeth*

Another alternative is to use new temporary materials available for the temporization of inlay preparations. RevotekLC (*GC)* is a methacrylate-based (UDMA 25-50%, trimethacrylate 10-20%) a single-component, malleable and sculptable composite resin temporary inlay material which is placed chairside, light-cured and easily removed using a rigid instrument. Telio CS Inlay/Onlay (Ivoclar-Vivadent) is another methacrylate-based temporary inlay material that, once placed in the inlay cavity and contoured appropriately, are light cured and produce a good cavity seal, so do not need to be removed for cementing with a luting cement.(Fig. 2)

Fig 2: (a) View of prepared teeth (b) Temporary material (Temp it^{TM}*bluSpident) (c) Light-cure of the temporary material (d) Final provisional material in place*

Care must be taken when using these materials in a cavity which contains composite or adhesive resin, as these may bond and create difficulties when removing the temporary inlay. In this case, coating the resin composite or adhesive with *Glycerin gel* before placing and curing the material is recommended [16].

2.2. Anterior RBFPDs

The interim restoration have to fill the space created by the minimally invasive of the palatal or lingual surfaces of the abutment teeth and to replace the missing tooth. There may be different preparation designs but lingual veneers, small proximal boxes on the pontic side, and cingulum grooves are common in most of the articles [17, 18]. Cingulum grooves that are placed in the center of the lingual fossa facilitate the exact three-dimensional seating of the framework [15] and provide mechanical retention of the provisional prosthesis when the resin material penetrate the groove [19].

Direct technique for the temporary palatal veneer

To prevent migration of the abutment teeth, a provisional restoration can be madeintraorally by a direct process by adding resin to fill the space created.

After coating the prepared tooth with Glycerin, a light-cure acrylic resin (Unifast LC GC) is prepared by mixing powder and liquid acrylic. One deposit a uniform film of material on the prepared tooth surface then ask patient to bite and pre-polymerize for 5 seconds.

Gently remove the provisional restoration slightly before complete polymerization. Re-seated the restoration and photo polymerize for 20 sec. Once at the rubbery stage, remove the provisional before final polymerization extra orally.

The restoration is trimmed, adjusted and the occlusion tested in all excursions of mandibule before polishing. After polishing of the provisional restoration, it is bonded to the palatal surfaces of the abutment teeth with a spot-etch and bonding technique [20]. Once cemented, restoration should be re-checked for fit and occlusion.

When the patient return for the definitive cementation, the provisional restoration can be easily dislodged with a spoon excavator. The prepared tooth surface is polished with pumice and water on removing the provisional cement [21].

Technique for interim treatment of the missing anterior tooth

Two methods involve laboratory steps:

*Orthodontic retainer with tooth denture or a simple removable prosthesis helps to provide a good esthetic result.

*Thermoplastic matrix with a denture tooth placed into the space representing the missing tooth on the matrix can be used but this matrix have to be removed while eating.

Those interim treatments may affect speech or have negative effect on the soft tissues [7].

A fixed alternative to those removable methods is to bond a replacement tooth (crown of the patient's natural tooth, acrylic or composite resin denture tooth) with bulk resin composite to form the customized pontic tooth that fitted the edentulous ridge and proximal sides of the abutment [22].

After tooth preparation, a small area on the proximal surfaces (slightly facial to the prepared surfaces) is conditioned with 35% phosphoric acid, rinsed, and dried thoroughly; a single-bottle, multipurpose, light-curing universal adhesive resin is applied to etched surfaces then the denture tooth is maintained in a correct spatial relationship with adjacent teeth and alight-cure flow able composite is add to bond it to the adjacent teeth.

Another alternative is to create a pontic by adding gradually composite, using a wire or fiber as scaffolding, bonded to the proximal surfaces of the abutment.

Another method uses composite tooth, which is fixed on the buccal surfaces of the abutment teeth with an orthodontic wire and dental composite, so the prepared dental surfaces are not used and kept untouched as they are reproduced in the dental impression [6].

The "bonded tooth technique" represents a cheap, simple and comfortable choice for the patient. However, it does not allow trying the RBFPD in the mouth until the bonded provisional tooth is removed [7].

More recently, Computer-Aided Design and Manufacturing (CAD/CAM) technologies (laboratory or chairside) can be used for the fabrication of PMMA dental prostheses.

Although the chemistry of CAD/CAM PMMA is similar to that of conventional heat-cured PMMA, CAD/CAM PMMA shows superiority in terms of many properties, including its hardness, flexural strength, flexural modulus, and impact strength [23].

Prior to preparing the abutment, an intraoral digital scan, including the lower reference arch and bite registration, is submitted to the laboratory. The pontic shade is selected using a shade guide. A second scan is done after finishing the preparation of the abutments.

The CAD/CAM PMMA provisional resin-bonded fixed partial denture is milled in PMMA with a similar design to the ceramic or metal RBFPD with two wings for adhesion and two hooks for stabilization.

After provisional cementing of the provisional RBFPD, the pontic is checked with articulating paper to eliminate all occlusal interferences.

III. CONCLUSION

Despite the minimally invasive preparation, interim restoration is required for RBFPD for esthetic reasons and to avoid supraeruption or other tooth movements especially for young patient and following orthodontic treatment.

There are many different products and techniques to make provisional restoration for RBFPD. It involves material selection and clinical management. However, there might be no need for a provisional restoration, if the RBFPD is construct chairside by CAD/CAM at the same appointment.

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