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Esthetic Interim Acrylic Resin Prosthesis Reinforced with Metal Casting

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Abstract

Fabrication of an interim prosthesis is an important procedure in oral rehabilitation because it aids in determining the esthetics, phonetics, and occlusal relationship of the definitive restoration. The typical material (acrylic resin) used in interim prostheses commonly fails due to fractures. During extended oral rehabilitation with fixed partial prostheses, high strength interim prostheses are often required to protect hard and soft tissues, avoid dental mobility, and to allow the clinician and patient a chance to evaluate cosmetics and function before the placement of the definitive prosthesis. Furthermore, a satisfactory interim prosthesis can serve as a template for the construction of the definitive prosthesis. The maintenance of this prosthesis is important during treatment for protection of teeth and occlusal stability. Procedures to reinforce interim prostheses help to improve performance and esthetics in long-term treatment. Due to the low durability of acrylic resin in long-term use, the use of reinforcing materials, such as metal castings or spot-welded stainless steel matrix bands, is indicated in cases of extensive restoration and long-term treatment. This paper describes an easy technique for fabricating a fixed interim prosthesis using acrylic resin and a cast metallic reinforcement.

Long-term prosthodontic treatment requires a cost-effective, durable, and esthetic fixed interim prosthesis that can be easily modified.[1] These interim fixed prostheses are designed to maintain, improve, and/or change oral function and esthetics for varying periods.[2] The interim prosthesis protects the dental pulp and periodontal tissues, prevents tooth movement, aids in occlusal stability, and allows proper mastication.[3,4] In many instances, interim prostheses are also helpful guides for construction of the definitive restoration.[5] Interim prostheses are usually fabricated from autopolymerizing acrylic resin; however, when long-term interim fixed prostheses replace several teeth, the strength and stability of the prosthesis is critical.[3] This material is satisfactory for short-term use, but exposure to saliva and other fluids results in progressive changes of color, form, and loss of surface polish.[6–8] In addition, fluid absorption by the polymer over time decreases strength and stability.[2] Long-term use of interim prostheses requires more durable materials.[1] Many materials have been used to reinforce interim prostheses, and a number of authors have described methods of adding metal reinforcing structures to acrylic resin interim prostheses,[1–3,9–12] including castings, spot-welded stainless steel matrix bands, and precut stainless steel mesh. Carbon fibers[13] and wire have also been used to improve the strength of the restoration.[14]

To achieve practical success, the dentist should understand the importance of the interim prosthesis to the outcome of the definitive restoration. This article describes a laboratory technique for fabricating a reinforced esthetic interim acrylic resin prosthesis with a cast metal framework.

Technique

The technique is described in a patient requiring revision of an old adhesive fixed partial prosthesis restoring the right maxillary canine. The cast metal framework was used because an osseointegrated implant was planned for the canine area, requiring long-term reliance on the interim prosthesis. The prosthesis was made following these steps:

1. An impression was made of the maxillary and mandibular arches using irreversible hydrocolloid (Hydrogum, Zhermack, Rovigo, Italy). The impression was poured using

Figure 1 Wax pattern of a substructure on the upper-right bicuspid and lingual rest on the upper-lateral incisor on the cast.

Figure 2 Occlusal view of the metal substructure adapted on the adjacent teeth.

Figure 3 Wax on the metal substructure and facial indexing of condensation silicone.

Figure 4 Buccal view of provisional restoration of an autopolymerized acrylic resin material before polishing.

Figure 5 Occlusal view after excess removal and polishing of the interim prosthesis.

Figure 6 Interim prosthesis after the placement.

type II dental stone (Gesso-Rio, Rio Claro, Sao Paulo, Brazil). In this clinical situation, the patient had previous tooth preparations recorded in this impression, made after the previous existing adhesive prosthesis was removed. The adhesive prosthesis was then recemented with a provisional luting agent (TempBond, Kerr Corporation, Orange, CA), and the patient was scheduled for the next session.

2. The acrylic resin pattern for the metal framework was sculpted (Duralay, Reliance Dental Mfg. Co., Worth, IL) and waxed with sculpture wax on the cast (Sculpture Wax PK, Kota Ind e Com Ltd., São Paulo, Brazil). This

framework must resist the stresses of mastication after incorporation of acrylic resin (Fig 1).
3. The acrylic resin pattern was invested and cast using an Ni–Cr alloy (Remanium CS, Dentaurum Group, Ispringen, Germany). Other alloys may be used if preferred.
4. The sprues were removed, and the casting was seated on the gypsum model, finished, and polished (Fig 2).
5. A wax pattern was sculpted of the interim prostheses with the framework in place (Sculpture Wax PK), and a facial index was made using an elastomeric impression material (Zetalabor, Zhermack), including the teeth.
6. The facial index was removed from the gypsum model (Fig 3).
7. The wax pattern was removed with dental instruments and/or boiling water, leaving only the original Ni–Cr structure placed over the gypsum model.
8. Autopolymerizing acrylic resin of the correct color selection was incrementally added to the index, and the index was seated on the cast. In this patient, the resin used was Dencor (Clássico Dentistry Products, Sao Paulo, Brazil). Color resin 67 was used for the occlusal third and color resin 69 for the remaining portions.
9. The index was held in position on the cast with rubber bands, and the assembly was placed in a pressure pot for 5 minutes at 30°C and vacuum. After polymerization, the index was removed for finishing (Fig 4).
10. The excess resin that extruded out on the lingual and vestibular surfaces and visible voids was removed for adaptation. The resin was trimmed, shaped, polished, and adjusted, and the polish on the metal was touched up (Fig 5).
11. The interim prosthesis was rebased with acrylic resin 67 (Dencrilay, Clássico Dentistry Products) and received a final trim, shape, and polish. Final occlusal and/or esthetic adjustments were made. The teeth receiving the restoration were prepared for cementation, and the restoration was cemented in place using a temporary luting agent (TempBond) (Fig 6).

Discussion

This technique uses autopolymerized acrylic resin reinforced with a cast metal framework to prevent the multiple fractures and lack of retention that could occur if the occlusal load was borne by the resin alone, mainly in the reposition of the upper canines. The reinforcement eliminates fractures and provides a significant improvement in rigidity and longevity of the interim prosthesis.[15]

Fabrication of a reinforced metal framework guided by a diagnostic wax-up generated the desired contours for the finished interim prosthesis.[3] According to Binkley and Irvin, metal-reinforced fixed interim prostheses display advantages such as favorable periodontal contours, stable occlusion,[16] more strength, greater esthetic satisfaction, less time spent repairing provisional restorations,[2] and greater patient acceptance. Reduction of flexion in the restoration minimizes the progressive loss of cement and diminishes the chance of recurrent decay, reduces the amount of acrylic resin necessary for strength in the interproximal spaces, facilitates oral hygiene, provides occlusal stability and maintenance of vertical dimension, and offers greater wear resistance.[10] The occlusion, tooth contours, and pontic design developed in the interim prosthesis can be duplicated in the definitive restoration.[12]

Patients presenting with traumatized or lost anterior teeth require immediate attention for restoration of esthetics and function.[17] Esthetic issues play an important role in the anterior area, and in the patient illustrated, the fabrication of the fixed interim prosthesis required an immediate procedure that was performed in two sessions. Different clinical techniques such as indirect provisional fabrication may be required to accommodate certain situations.[1]

The choice of heat-processed acrylic resin could provide a interim prosthesis of greater strength and stability that is more resistant to polymer breakdown and can function satisfactorily for longer periods than autopolymerized resin;[13] however, because the prosthetic space in this case was short, autopolymerizing resin was used in a pressure pot. Longer span acrylic resin interim prostheses are subject to flexion and fracture under occlusal forces,[14] and if the restoration requires a long span, the heat-processed resin could be used to improve the final strength.[18]

One of the indications for reinforced fixed interim prostheses is for the subsequent placement of dental implants. The technique may also be used in long-span or implant-supported interim prostheses, cantilevers, and immediately loaded implants. The maintenance of long-term provisional treatment in association with procedures such as alveoloplasty, tissue augmentation, dental implant placement, endodontic therapy, and orthodontics is frequently useful.[15] One advantage is that this prosthesis is able to function from the presurgical through the surgical stages until the insertion of the definitive fixed and implant-supported restorations.

Conclusions

Interim fixed prostheses provide a template for defining tooth contour, esthetics, proximal contacts, and occlusion and for evaluating performance to optimize the definitive prosthesis. In long-term treatments, the reinforcement of interim prostheses is indicated to maintain periodontal health, comfort, and function, and to avoid fractures during the rehabilitation period.

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