SHORT COMMUNICATION

Intraoral framework pick-up technique to improve fit of a metal-resin implant prosthesis

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ABSTRACT

The achievement of passive fit is an important prerequisite for the prevention of complications in full-arch screw-retained implant prosthesis. With cemented prosthesis, the cementation compensates for the discrepancies in the cast framework, but the lack of retrievability seems undesirable. The aim of this paper is to propose a modified screw-retained prosthesis design for complete arch implant fixed rehabilitation. A technique for the fabrication of a full-arch metal-resin implant-supported screw-retained prosthesis is described. Cementation of the framework to the abutments intraorally improves the passivity of fit of the prosthesis on the implants. Maintenance of screw-access channels in the final prosthesis ensures retrievability. The metal-resin design allows for easy repair and maintenance. The prosthesis is cost-effective compared to conventional options and can be employed as a viable treatment alternative when considering metal-acrylic resin complete arch fixed prosthesis.

Key words: Complete edentulism, fixed retrievable denture, implant prosthesis, passive fit

For restoration of completely edentulous arches, screw-retained implant fixed prostheses have been traditionally advocated due to the ease of retrievability, benefit of splinting and low-profile retention. The hybrid screw-retained prostheses additionally compensate for the lost tissues in moderate to severely resorbed alveolar ridges. However, lack of passive fit of the cast framework remains a problem area.[1,2] Passive seating is generally regarded as a requirement for maintaining successful long-term osseointegration.[1-4] Fit discrepancies may lead to biological and particularly mechanical complications.[3-5] Cement-retained fixed implant prostheses as an alternative have the advantages of passively fitting frameworks and better esthetics,[6,7] but lack of retrievability for repair or maintenance remains a consideration.[8] A combination of screw- and cement-retention would have the advantages of both the approaches.

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There have been earlier attempts by authors to achieve passive fit with both metal–ceramic[9,10] and metal–acrylic resin[11-15] complete arch implant prostheses through various techniques. Some of these techniques involved removable prosthesis[11] and others, though fixed, were mostly applied with mandibular arch prostheses supported by six dental implants.[12-14] The earlier techniques were also done using conventional implants[11-14] whereas the present technique involved zygoma implants. One author[15] had described using zygoma implants but the cementation was carried out at the final prosthesis stage in that paper.

Another factor to consider is the cost of the prosthesis. Earlier authors have either used precious dental alloy[12,14] or titanium[13] for the fabrication of the framework. In this article, cast cobalt-chrome alloy was used for framework fabrication that minimized the cost of the prosthesis. This paper describes an alternative technique for the fabrication of an implant retained, maxillary complete arch, metal-reinforced acrylic resin prosthesis supported by four implants to enhance passive fit.

CLINICAL REPORT

A 28-year-old male was treated for maxillary complete edentulism by placement of two zygomatic implants (Branemark Zygoma TiUnite-52.5mm, Nobel Biocare AB, Goteborg, Sweden) in conjunction with two regular dental implants (Replace Select Tapered TiU; Nobel Biocare AB) in the anterior maxillary region, under general anesthesia. An

insertion torque of more than 35 Ncm was achieved for both the zygomatic and regular dental implants. Angled multiunit abutments (17° zygoma multiunit abutments: Nobel Biocare AB) were fitted to the zygomatic implants at 25 Ncm torque immediately postsurgery. Ten days postimplant surgery, the implants were immediately loaded using a screw-retained provisional acrylic fixed complete denture at 10 Ncm torque.

The fabrication of the definitive prosthesis was initiated after providing adequate time (8 months) for osseointegration of the implants, tissue healing, and finalization of vertical dimension, occlusion, and aesthetics with the interim prosthesis [Figure 1]. Maxillary open-tray impression was recorded with polyether impression material (Impregum; 3M ESPE AG, St.Paul, MN, USA) using a custom tray with the provisional screw-retained acrylic prosthesis in place. The provisional prosthesis was picked up with the impression and an initial working cast (Type IV dental stone, Ultrarock; Kalabhai Karson Ltd, Mumbai, India) was poured with the implant replicas (NobRpl, Nobel Biocare AB) attached to it. Once the cast was ready, a silicone index (Silicone putty Aquasil; Dentsply DeTrey, Konstanz, Germany) was fabricated to record the facial positions of the artificial teeth and the soft tissue replicating the tooth positions of the maxillary provisional denture. The provisional prosthesis was then removed and delivered back to the patient.

Screw-retained titanium cylinders (Nobel Biocare AB; Goteborg, Sweden) were attached to the implant analogs on the initial working cast and milled to a 2° degree taper on a milling machine (F200 2H 23; Bredent BF 1, Bredent GmbH, Senden, Germany). The silicone record index was used to evaluate the available space for an acrylic resin pattern for the metal substructure. The pattern was fabricated for the substructure with autopolymerizing acrylic resin (GC pastern resin; GC Corp, Tokyo, Japan) on the milled abutments with spacer thickness of 100 μm. The height of the milled titanium cylinders was adjusted as indicated. The pattern was cast with cobalt-chrome alloy (d.SIGN 30; Ivoclar Vivadent AG, Schaan, Leichtenstein). The framework fit was checked on the abutments. Once checked, an acrylic index was prepared on the milled abutments to aid in intraoral transfer of abutments without disturbing the interabutment positions and abutment/implant position [Figure 2]. After the transfer of the abutments, the frameworks were cemented intraorally to the milled abutments with dual-cure composite adhesive cement (DTK adhesive; Bredent GmbH) [Figure 3]. DTK adhesive is a self-cure and light-cure composite cement that is used to bond metal to metal. Once the cement had set, the abutment screws were untorqued and framework removed. Excess cement was cleared from the assembled framework. New open-tray polyether impressions were made of the maxillary arch with the framework fitted back. The framework was picked up with the impression. A final working (master) cast was poured using type-IV dental stone (Ultrarock; Karson Kalabhai).

The wax-up was done on the framework using the previous silicone index guide, on the master cast. Esthetics, phonetics, and occlusion of the set-up were verified intraorally. The verified set-up (trial denture) with the framework was transferred back on to the master cast. The final prosthetic teeth (Ivoclar Vivadent AG) and denture base acrylic resin were processed to the assembled framework on the master cast through a conventional compression molding technique. The finished metal-resin prosthesis [Figure 4] was then fitted intraorally and screws torqued to the recommended levels. Aesthetics, phonetics, and occlusion were verified [Figure 5]. The screw-access channels were filled with gutta percha and the openings sealed with light-cure composite. A panoramic radiograph was taken to check the fit of the prosthesis [Figure 6].

DISCUSSION

The prosthesis described in this paper provides an esthetic and relatively inexpensive alternative to conventional PFM implant-supported bridges. Although, implant metal-ceramic restorations have superior aesthetics and strength in comparison to implant metal-resin fixed prostheses in most cases, the cost of full-arch metal-ceramic restorations are a limitation for many patients.[14,15] The use of a base metal alloy along with milled prefabricated abutments in place of cast gold cylinders ensure the feasibility.[15] Ceramic failures also remain a common problem with full-arch metal-ceramic restorations and intraoral porcelain repair may not be satisfactory.[9,10] Removal and firing of screw-retained metal-ceramic prosthesis is a potentially hazardous procedure. With metal-resin fixed complete dentures, repair procedures are economic and are easy to perform in a dental laboratory with a good prognosis.[14-16]

This technique minimized the potential misfit produced by the fabrication errors of the long-span cast framework, by intraoral luting of the framework to the abutments.[9,11] Minor-dimensional discrepancies may be compensated by cement and cement space. The screw retention enables removal of the prosthesis and the abutments without use of a crown remover for repair or for other reasons. Various modifications of this design had been employed by earlier authors, albeit, with differences in materials and the intended purpose. McCracken *et al.*[12] used a screw-retained framework with cemented denture to eliminate visible screw-access holes for aesthetic reasons and to ensure the simultaneous ease of retrievability of the prosthesis for repair and maintenance. Other authors have luted immediately loaded provisional full-arch restorations intraorally either through a single[15] or multiple step[14] technique to achieve passive fit of the screw-retained prostheses. Few of them have used this concept with

Figure 1: Occlusal view of the maxillary provisional screw-retained acrylic prosthesis

Figure 3: Maxillary screw-retained framework cemented intra-orally to the milled abutments

Figure 5: Anterior view post-treatment

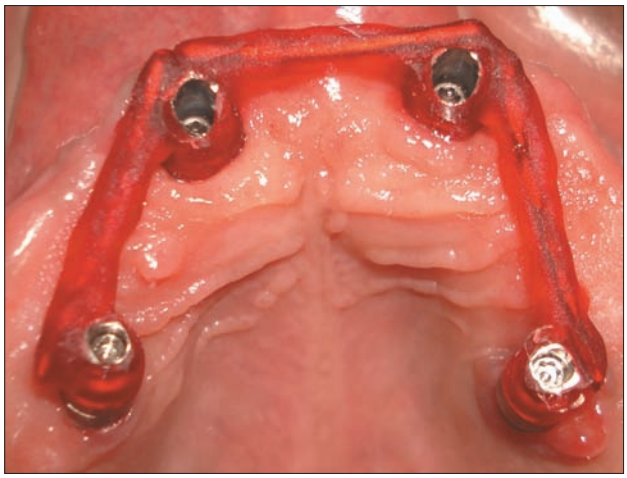

Figure 2: Maxillary milled abutments positioned intraorally with the pattern resin index

Figure 4: Fitting surface of the finished prosthesis prior to issue

Figure 6: Post-treatment panoramic view

definitive prostheses and the intraoral cementation was accomplished with the final finished prosthesis in such cases.[16] Laser welding of titanium abutment-framework junctions was an added feature postcementation in one study.[13] Most of these combined techniques aimed at optimization of fit of the complete arch prosthesis to minimize potential complications.

Grossly misangulated implants may present a limitation to this technique. It can be countered with angled or cast abutments, to an extent. The technique also demands accurate transfer of abutments from the laboratory casts to the implants, intraorally.[13-15] The impressions had to be repeated twice with the present technique.

CONCLUSION

The proposed technique uses a custom cast frame in combination with prefabricated milled abutments to create a retrievable metal-resin fixed complete denture. The technique may be useful in situations where screw-retention is intended and a cost-effective option is desired. Long-term clinical studies evaluating the success rates of

this treatment modality in comparison with conventional options are required, before recommending it for routine use in clinical practice.

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