Osseointegration for the Periodontally Compromised Patient

A patient history is presented in which two osseointegrated titanium fixtures were used to restore a partially edentulous mandible and stabilize periodontally compromised teeth. A metal ceramic restoration was fabricated using coping prostheses over the periodontally involved natural terminal abutments and gold cylinders attaching to the intermediate implant abutments. The need for careful treatment planning, fabrication, delivery, and aftercare were stressed. *Int J Prosthodont* 1988; 1:51–58.

Osseointegrated titanium implants as developed by Bränemark have proven effective in the treatment of complete edentulism.¹ Titanium fixtures with a specific screw-shaped configuration and special surface finish, according to the “osseointegration procedure” prescribed by Bränemark et al, can produce a strong, intimate, and long-lasting connection between the implanted fixture and living bone.²

In 1975 Haraldson¹ demonstrated that patients restored with bone-anchored fixed partial dentures approach or equal the function of dentate individuals with the same quality and distribution of teeth. More recently, osseointegrated titanium fixtures have been used for the restoration of the partially edentulous dentition.⁴ Sullivan et al⁵ have also described the use of the Bränemark tissue-integrated prosthesis to restore a hemidentate arch.

This article will present the concept of the tissue-integrated prosthesis used in conjunction with the periodontally compromised dentition. Specifically, it will address the restoration of an edentulous area bordered by teeth with poor periodontal support and significant mobility. The following patient history outlines the treatment sequence for a patient with a periodontally compromised dentition containing an edentulous area.

**Patient History**

For 10 years the patient was restored with an acrylic resin veneered stress-broken four-tooth fixed partial denture extending from the mandibular left third molar to the mandibular left first premolar (Fig 1). The third molar had drifted and tilted mesially. Clinically, this prosthesis exhibited overcontoured abutment retainers, hyperplastic and inflamed gingival tissues, and a +3 mobility in a buccolingual direction (determined on a scale of 0 to 3 with 3 being the most mobile). Radiographic examination confirmed these clinical findings and demonstrated 30% to 50% bone loss around the abutment teeth. The diagnosis was categorized as moderate to advanced periodontitis with secondary occlusal trauma.

The preliminary phase of treatment called for the removal of the existing restoration and replacement with a high-impact, heat-processed acrylic resin provisional fixed partial denture contoured to permit...
proper oral hygiene by the patient. In addition, initial periodontal therapy via root planing and curettage as well as subsequent periodontal surgery was performed in an effort to produce a healthy periodontal environment.

The patient continued wearing the acrylic resin provisional restoration for 3 years following the periodontal surgery. Periodic reevaluations indicated no improvement in the stability of the abutment teeth. With the poor prognosis of the molar and second premolar abutment, the patient was allowed to continue wearing the provisional prosthesis rather than commit to a more final form of fixed prosthesis. Without the use of osseointegrated implants, the alternative prosthodontic treatment would have called for a distal extension removable partial denture.

The maxillary dentition was also severely compromised by moderate to advanced periodontitis. After 5 years of active periodontal and prosthodontic treatment, an anterior porcelain-fused-to-gold fixed prosthesis was used to restore the maxillary anterior dentition. The posterior dentition was replaced with a precision attachment retained removable partial denture.

**Psychosocial Considerations**

The patient was distraught over the loss of her natural teeth. When discussing the potential loss of the mandibular posterior teeth, it was quite evident that this patient would not only have physical difficulty managing another removable prosthesis, but would also suffer psychologic depression if additional natural teeth were removed.

**Treatment Plan**

The final treatment plan for the mandibular left posterior quadrant called for the use of two Brånemark titanium screw-type fixtures to be placed in the edentulous area of tooth 19. Cast gold telescopic copings were planned for the mobile molar and premolar. A porcelain-fused-to-gold overcasting would then join the abutment teeth to the fixtures.

**Fixture Installation**

A surgical guide stent, prepared to fit precisely over the adjacent abutment teeth (Fig 2), was used during surgical installation of the titanium fixtures to provide precise proximal as well as long-axis alignment (Fig 3). Two 7-mm titanium Brånemark fixtures (Nobelpharma, Inc, Waltham, Mass) were used to avoid impingement on the inferior alveolar canal. Radiographic examination of the fixture locations showed the coronal distance between the fixture head and the adjacent premolar to be approximately 3 mm. The distance between the apex of the fixture and adjacent premolar was only 1.5 mm (Fig 4).
The second-stage surgery was completed 3½ months following fixture installation. Radiographic examination verified the proper adaptation of the titanium abutment collar to the osseointegrated fixtures (Fig 5).

Special impression transfer copings were secured to the two abutment cylinders and then joined with an autopolymerizing acrylic resin to ensure the interfixture relationship. Conventional retraction methods were used to prepare the gingival tissues surrounding the abutment teeth for the master impression. Next, an elastomeric impression material was injected into the sulcus around each abutment tooth immediately following the removal of the retraction cord. Impression material also was injected under the acrylic resin transfer coping connection and around the abutment cylinders. An open-window impression tray was completely filled with the impression material and appropriately positioned. Finger pressure was used to displace the impression material immediately over the screw heads holding the implant transfer copings (Fig 6a). When the impression was completely set, the screws were readily visible (Fig 6b) and easily removed.

The existing provisional acrylic resin restoration could again be used to restore and stabilize the area until the final tissue-integrated prosthesis was completed (Fig 7a). The addition of acrylic resin on the cervical aspect of the pontics established an intimate contact with the hexagonal abutment screw and the periphery of the abutment cylinder (Fig 7b). Excess resin was trimmed and the provisional restoration cemented to the abutment teeth with a non-eugenol temporary cement. Note that it is not necessary to apply cement to the face of the titanium abutments (Fig 7c).

### Laboratory Procedures

In the laboratory, the steps below are followed to prepare the final prosthesis. The master cast is poured with an improved die stone after the brass...
abutment analogues have been securely fastened to the transfer copings (Fig 8). Vacuum-pressure plastic copings are made for the individual dies (Fig 9). The telescopic copings are waxed and refined using a surveying instrument (Figs 10 and 11), and the molar and second premolar copings are cast with a Type III gold alloy. (The first premolar coping was designed for an independent porcelain-fused-to-gold crown and cast with a high-gold-content ce-

The telescopic copings are then refined (Fig 12) and prepared for waxing of the tissue-integrated prosthesis portion of the restoration.

The premanufactured precious metal cylinders are fastened to the brass abutment analogues with the laboratory guide pins. An acrylic resin matrix is then used to create a rigid framework for the completion
of the wax-up (Fig 13). Technicians should avoid placing resin or wax on the cervical millimeter of the precious metal coping anchored to the abutment connector (Fig 14a). Buccal and lingual contours are designed for complete porcelain veneering; the overcasting wax-up is then appropriately sprued (Figs 14b and 14c) and ready for investing.

The high-gold-content porcelain alloy casting is divested with care not to mar or abrade the manufacturer's finish on the precious metal cylinders (Figs 15a and 15b). The casting is then finished and refitted to the master cast. Laboratory guide pins should permit the articulated casts to be closed without impinging on the screw heads (Figs 16a and 16b).

Porcelain application to the telescopic tissue-integrated prosthesis begins with a thin wash of opaque porcelain as a method of metal conditioning (Fig 17a). A second thin application of opaque porcelain masks the substructure framework; extreme care must be taken to prevent any porcelain from entering the screw holes (Fig 17b). Laboratory guide
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Figs 18a to 18c  Opaqued casting screwed to the master cast (left). Buccal view of the porcelain buildup (center). Lingual-occlusal view of the porcelain buildup (right).

pins are again inserted and the tissue-integrated prosthesis framework is securely fastened to the master cast for body porcelain application (Fig 18a). Conventional porcelain buildup techniques may be used for most areas of the restoration; however, extreme caution must again be taken to prevent any porcelain from falling into the screw holes (Figs 18b and 18c).

Clinical Delivery

The laboratory technician prepares the prosthesis for cementation by completing the porcelain firing.

Figs 20a to 20c  Occlusal view of completed porcelain applied to the single premolar crown and four-unit tissue-integrated prosthesis. Laboratory guide pins secure the prosthesis to the master cast (left). Buccal view of finished porcelain on the master cast (center). Lingual view of completed porcelain (right).

Fig 21  Clinical evaluation of completed porcelain prior to final polishing of the gold framework and implant cylinders. Adequate space has been maintained for hygiene.

Fig 22  The precision fit of the final prosthesis is verified radiographically to ensure intimate contact of the gold cylinder with the titanium abutments.
establishing either a bisque bake or the final glaze (Fig 19). Even if the prosthesis is glazed, the restoration should remain unpolished (Figs 20a to 20c, Fig 21) until after a final clinical try-in and adjustments are made.

After seating the prosthesis, the occlusion is adjusted. Clinical inspection must be verified by radiographic examination to ensure accurate adaptation of the telescopic copings on the abutment teeth as well as precise seating of the tissue-integrated prosthesis on the osseointegrated titanium fixtures and abutments (Fig 22). The prosthesis is then removed from the mouth for the final porcelain glazing and polishing of the gold substructure (Figs 23a to 23c).

The telescopic gold copings and individual porcelain-fused-to-gold crowns are cemented with zinc oxyphosphate cement. The tissue-integrated prosthesis is then delivered and secured with small gold screws to the abutment connectors. No cement is used between the tissue-integrated prosthesis and the telescopic gold copings (Fig 24).

Retrievability of the tissue-integrated prosthesis is maintained by sealing the screw access openings first with a layer of gutta percha and then a matching tooth-colored composite resin (Fig 25). Temporarily sealing the screw hole access openings should be considered for the first 3 months following placement of the prosthesis.

**Oral Hygiene Maintenance**

Patients treated using this procedure need to be instructed on precise methods of oral hygiene. Special instruments should be provided to assist them in maintaining the titanium abutment cylinders in a plaque-free state. The author recommends that during the first year following the delivery of a tissue-integrated prosthesis, either complete or partial, the patient should be recalled on 3-month intervals. This program may be diminished to 4-month recall appointments during the second year and every 6 months thereafter, provided the patient continues to exhibit superior oral hygiene.

**Patient Response**

In the author’s experience, all patients who have received a sectional tissue-integrated prosthesis to restore partial edentulism have responded favorably to treatment and identify comfort and function as
Summary

The use of the tissue-integrated prosthesis supported by Brånemark fixtures for the restoration of the partially edentulous periodontally compromised dentition has been demonstrated with a patient study. Clinical and laboratory aspects of treatment include the diagnosis and treatment planning required for the use of the tissue-integrated prosthesis to stabilize adjacent mobile teeth.

Laboratory points important to note include: casting design and fabrication, porcelain application, and especially the avoidance of porcelain particles in the access screw holes. Clinical points important to note include: the master impression technique, modification of the provisional restoration, verification of fit, delivery of the final tissue-integrated prosthesis, and oral hygiene maintenance.

Acknowledgment

The author offers special thanks for laboratory support to the technicians of Fort Washington Dental Lab Inc, Fort Washington, Pennsylvania; to Ken Orth, CDT, for photographing the laboratory procedures; and to Mickey Herpen for preparation of the manuscript.

References


Amalgam Toxicity: A Review of the Literature

The paper evaluated methods used for detecting mercury content in the body and examined the claim that mercury from silver amalgam fillings causes disease. The methods evaluated for detecting mercury toxicity used by anti-amalgam practitioners were symptom questionnaires, electrical readings from fillings, urine mercury analyses, skin patch tests, blood serum profiles, blood counts, hair analysis, and oral mercury vapor measurement. The literature review found no scientific data to support the usefulness of these screening tests for detection of mercury in the body or the contention that amalgam fillings are dangerous to the patient.