

Resolving aesthetic complications with osseointegration: using a double-casting prosthesis

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Introduction

Osseointegration uses Biotes† jawbone anchorage units consisting of titanium and gold alloy cylinders. Successful application requires that the fixtures be placed in available alveolar or basal bone. Although prosthetically designed surgical guide stents¹ are helpful in properly aligning fixtures during their surgical installation, anatomical considerations often restrict the fixture position possibilities. In the maxilla, advanced resorption of the residual ridge often requires fixture alignment with severe palatal-labial angulation.

The cementless system of the tissue integrated prosthesis uses a small gold screw to connect the final dental prosthesis to the osseointegrated fixtures. Occasionally fixture position, which is dictated by available bone, produces a mechanical complication which can severely compromise the aesthetic results. Aberrant angulation of fixtures may require placement of the gold fastening screws directly through the labial and buccal surfaces of the prosthetic teeth. This becomes clinically evident when constructing the conversion prosthesis (Fig. 1).² The position of fixtures at angles creating an aesthetically compromised position may also be observed when abutment cylinders are connected (Fig. 2).

Double-casting substructure framework

A special restoration method using a double-casting system has been developed to preclude the aesthetic compromises of the malposed and nonparallel fixtures. The substructure rigid casting, on which the prosthetic dentition will later be positioned, is designed to fit the



Fig. 1 The conversion prosthesis demonstrates aesthetic complications of the screw hole position in the facial surface or incisal edge of the prosthetic teeth.

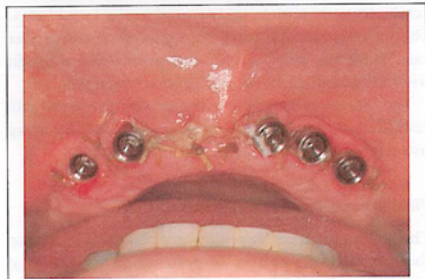


Fig. 2 Severe labial angulation of anchoring unit will produce aesthetic complications in prosthesis construction (one week after abutment connection).

malaligned fixtures. A second casting, secured to the fixture-borne casting with a tube and screw pillars, allows the prosthetic teeth to be fastened directly to an over-casting framework without penetration of the fastening screws through the facial surfaces of these teeth.

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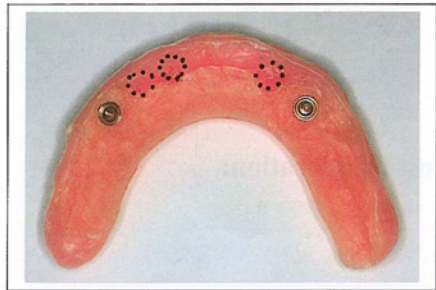


Fig. 3 Two cylinders are used to fasten the acrylic baseplate during aesthetic try-in.

An aesthetic try-in of the denture teeth must be completed prior to initiating the fabrication of the double-casting framework. This wax try-in is supported by a custom acrylic baseplate, held in place by two or three connecting screws (Fig. 3).

The correct position of the denture teeth is established. A silicone bite registration material, such as Ramitec,* a clear acrylic matrix, or a plaster indexing material is used to record tooth position in relation to the master cast. The teeth are then removed from the acrylic try-in baseplate and secured to the facial index. The index media and teeth are replaced on the master cast. Both the substructure and overcasting must fit within the confines of the aesthetic arrangement.

The following is a step-by-step description of the procedure used to design and fabricate the double-casting tissue integrated prosthesis.

Final impression and master cast

The impression transfer copings are securely fastened to the abutment connectors in preparation for the final impression. Dental floss or orthodontic ligature wire is used to connect the transfer copings (Fig. 4). Duralay resin† is applied over the interconnecting dental floss and around each of the transfer copings. This rigid connection establishes a stable relationship between all of the transfer copings.

* ESPE-Premier, Norristown, Pa.

† Reliance Dental Manufacturing Co., Worth, Ill.

‡ Metaux Preciux Sa Matalor, Neuchatel, Switzerland.

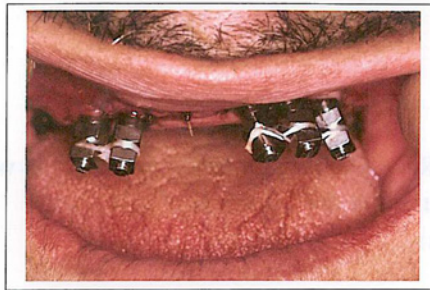


Fig. 4 Impression transfer coping with connecting ligature.

The master impression is made using an open-window tray system, providing access for removal of the transfer coping screws.³ A strong elastic impression material such as Impregum® is ideal for making the master impression (Fig. 5). When the transfer coping screws are removed from the abutment cylinders, the impression can be removed from the mouth.

Brass abutment analogues are securely fastened to each of the transfer copings held in the master impression with medium length screws. The impression is boxed, and improved die stone is used to pour the one-piece master cast and base. Once again the impression coping screws are removed to permit removal of the master cast from the final impression.

The stone of the master cast is now generously lubricated using a petroleum lubricant. The gold alloy cylinders are tightly fastened to the brass abutment analogues with either medium or long laboratory screws. The fixture-borne substructure pattern fabrication uses a combination of Duralay (Fig. 6) and prefabricated plastic rods. The rods have 2° tapered sides. The rods are used to connect the gold alloy cylinders crossing longer edentulous areas and the cantilevered section of the prosthesis.

A tube and screw system‡ (Fig. 7) is now incorporated into the fixture-borne pattern. Using surveyor as a paralleling guide, the threaded tubes are attached to the fixture-borne framework (Fig. 8). The occlusal portion of these tubes should be approximately 1 mm below either the occlusal surface of the teeth, through which they will penetrate, or below the acrylic reproduction of gingival tissues.

The substructure fixture-supported pattern is then

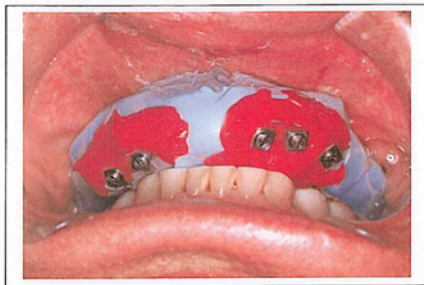


Fig. 5. Master impression.

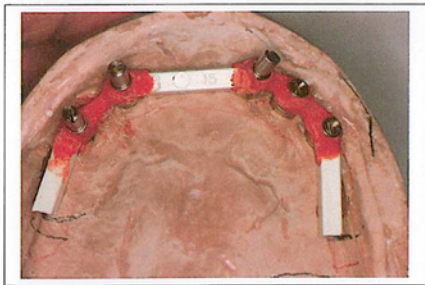


Fig. 6 Plastic bars form the substructure pattern over edentulous areas.

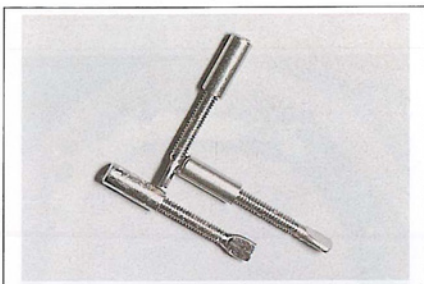


Fig. 7 Tube and screws.



Fig. 8 Tube and screw assemblies are positioned parallel to axial walls of connecting bars.

sprued, invested, and cast using a Type IV gold alloy. After divesting, this framework is finished to a high, rubber wheel finish on the facial, lingual, and occlusal/incisal aspects. The surface approximating soft tissue is highly polished to prevent plaque retention.

The substructure casting should be clinically fitted to confirm accuracy (Figs. 9a and 9b). The substructure framework is then firmly fastened to the brass abutment analogues on the master cast with the small gold Biotes screws. Block-out putty is used to cover the head of each of the gold screws. A thin plastic vacuum and pressure-formed coping is draped over the fixture-borne casting to begin the pattern fabrication for the second-stage overcasting. This overcasting will incorporate the small ferrules (washer-like rings) which fit between the threaded tube and its accompanying screw (Figs. 10a and 10b).

Denture teeth are repositioned, and the wax-up is adjusted to fit without interference with denture tooth position (Fig. 11). Various methods of mechanical retention are then added to the overcasting to provide sufficient methods of acrylic retention (Fig. 12). The second casting (overcasting) is appropriately sprued, invested, and cast, with Type IV gold. After divesting and metal finishing, both castings are secured to the master cast (Figs. 13a and 13b).

The denture teeth are now fastened to the overcasting with pink baseplate wax (Fig. 14).

A final aesthetic try-in should be performed to confirm the position of the teeth on the gold casting (Figs. 15a to 15c). When the patient is satisfied with the aesthetic arrangement, the completion of the laboratory fabrication of the tissue integrated prosthesis is carried out.

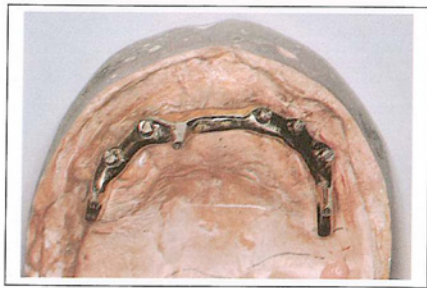


Fig. 9a Substructure complete.

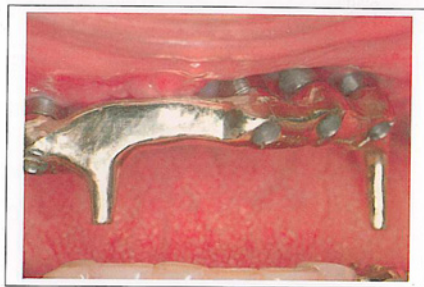


Fig. 9b Substructure casting try-in assures accurate fit before fabrication of the second casting.

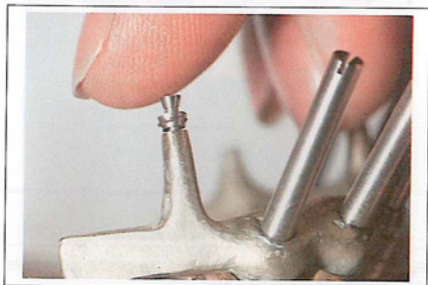


Fig. 10a Screw and ferrule in position prior to waxing the overcasting.

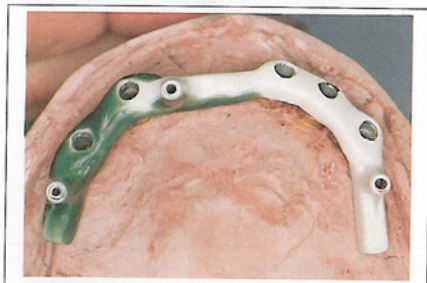


Fig. 10b A plastic base is used as a foundation for the overcasting wax-up.



Fig. 11 A matrix holds teeth in position, permitting wax-up adjustment.



Fig. 12 Loops and beads are used for acrylic retention. The ferrule is attached to the plastic foundation with Duralay resin.

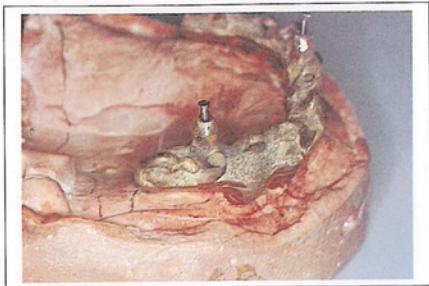


Fig. 13a Lateral view of both castings assembled on the master cast.



Fig. 13b Occlusal view.

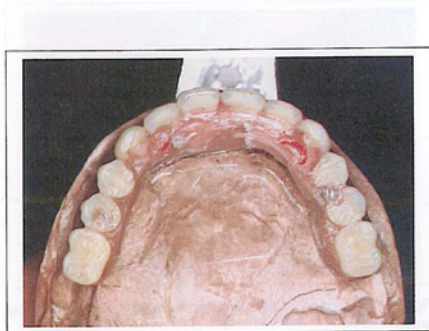


Fig. 14 The denture teeth are positioned over the over-casting.



Fig. 15a Final aesthetic try-in with the teeth set in wax-frontal view.

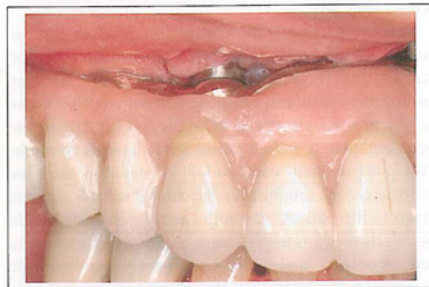


Fig. 15b Right side view directly over the anchorage units.



Fig. 15c Left side view directly over the anchorage units.

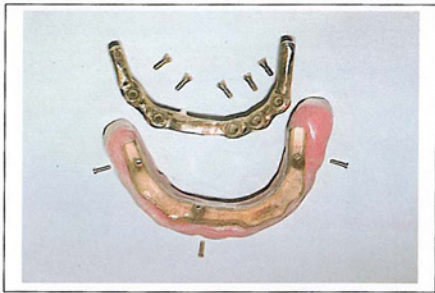


Fig. 15d Disassembled components of the double-casting prosthesis.

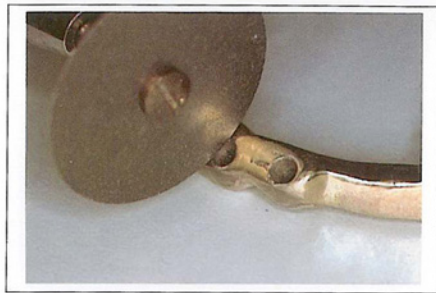


Fig. 16 The small indexing lock cut into the gold alloy cylinder.

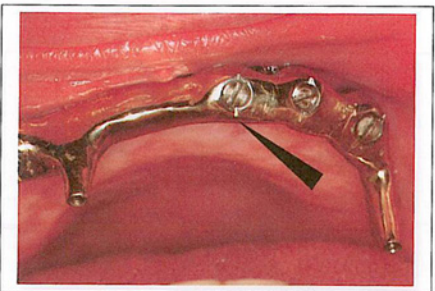


Fig. 17 Gold screws fix the substructure casting securely to the titanium anchorage units. Arrow indicates indexing lock.

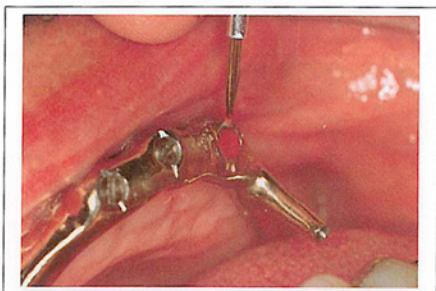


Fig. 18 The head of the gold screw is coated with Duralay resin.

Insertion of the double-casting tissue integrated prosthesis

Before the double-casting tissue integrated prosthesis components are assembled for delivery to the patient (Fig. 15d), special consideration should be given to sealing the gold screws that secure the fixture-borne substructure casting. A small indexing or locking cut is made in the substructure casting prior to its insertion over the abutment connectors (Fig. 16). When this casting is securely in position with all gold screws tightly fastened (Fig. 17), a small amount of acrylic resin is painted into the head of the screw and allowed to flow into the small indexing lock made on the occlusal surface of the Biotes gold cylinder. This acrylic lock will

prevent vibrations from loosening the gold fastening screws (Fig. 18).

The overcasting is then placed in position and securely fastened to the substructure with the tube and screw system (Figs. 19a to 19c). The tube and screw overcasting screwhead can also be sealed with tooth-colored acrylic or similar material when the final prosthesis has been completed and all adjustments have been made. Two posttreatment casts should be made of the final prosthesis, one retained for the clinical records and one given to the patient. On both casts, indications should be clearly made as to the precise location of the tube and screw system so that if future maintenance and removal is required, the location of the screwheads can be easily identified.

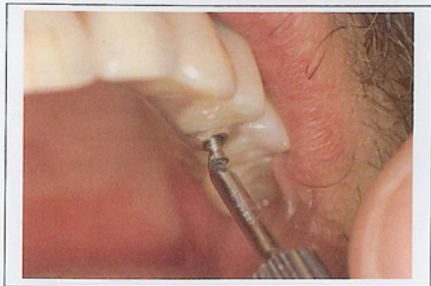


Fig. 19a Tube-screw is inserted.

Before final dismissal the patient is again instructed in proper oral hygiene and plaque control techniques.⁴

Summary

A method for prosthetically managing aesthetic complications produced by the malalignment of osseointegrated titanium fixtures has been described. The disadvantages of this technique include the need for additional laboratory procedures and a second accurately fitting casting, as well as the extra costs incurred in fabrication of the double-casting tissue integrated prosthesis. The technique does, however, maintain the aesthetic integrity of the facial surfaces of the prosthetic teeth and permits easy access for future maintenance.

References

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2. Balshi, T. J. The Biotes conversion prosthesis: a provisional fixed prosthesis supported by osseointegrated titanium fixtures for restoration of the edentulous jaw. *Quintessence Int.* 16(10):667-677, 1985.

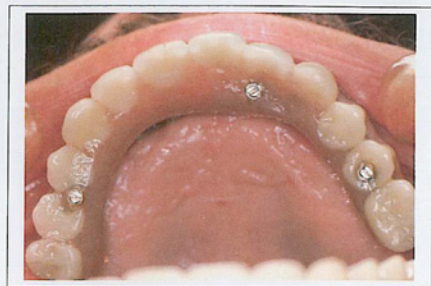


Fig. 19b The final tissue integrated prosthesis is held in position.



Fig. 19c Custom incisal edge characterization.

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