

# Osseointegration: The Efficacy of the Transitional Denture

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Use of the transitional denture for patients who will receive osseointegration treatment provides several distinct advantages. (1) As a diagnostic tool it is used to establish the correct occlusal vertical dimension, appropriate lip and cheek support, and to assess other esthetic and phonetic factors. (2) It functions as an interim prosthesis. (3) It provides guidelines via surgical guidestents for fixture location and angulation. (4) Also, it can become an integral part of the conversion prosthesis.

The clinical and histologic advances in implant prosthodontics using the concept of osseointegration were originally introduced by Adell et al.<sup>1</sup> Osseointegration has provided prosthodontic and surgical teams with a predictable treatment method for managing the edentulous or partially edentulous patient. This method of prosthodontic reconstruction is referred to as the tissue-integrated prosthesis<sup>2</sup> (Figs. 1 and 2).

The purpose of this article is to discuss the importance and application of a transitional denture for the completely edentulous patient who will receive fixtures for osseointegration.

## The transitional denture

Prior to surgical installation of the titanium fixtures,\* complicated presurgical prosthetic conditions are evaluated by the prosthodontist and oral surgeon to determine specific requirements of the transitional denture prosthesis, as well as its relationship to the final restoration.

A thorough pretreatment patient evaluation is necessary. The preliminary assessment of existing conditions, review of the medical and dental history, and a preliminary diagnosis aid in establishing the prognosis. All of this information assists in determining the

basic criteria for the completed tissue-integrated prosthesis.

The transitional denture is an interim prosthesis that will sustain or improve the quality of life for patients undergoing treatment involving osseointegrated fixtures. Use of the transitional denture establishes the basic criteria for the successful placement of a tissue-integrated fixed prosthesis.

The advantages of using a transitional denture include its value in determining tooth position, occlusal scheme, esthetic requirements, and relative patient comfort. The tran-

\*Biotes, Nobelpharma Inc., Waltham, MA 02254-9051

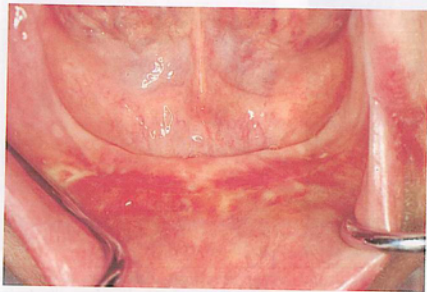


Fig. 1 Edentulous mandible before treatment using osseointegrated fixtures.



Fig. 2 Tissue-integrated prosthesis installed following osseointegration of the titanium fixtures.



*Figs. 3a and 3b Lateral view (left) and occlusal view (right) of tissue-integrated prosthesis with teeth cantilevered anteriorly beyond the crest of the residual ridge.*



sitional denture can also be used in the fabrication of the conversion prosthesis.<sup>3</sup>

There are several disadvantages or limitations to a transitional denture. In spite of a thorough pretreatment examination and transitional denture treatment, patients with extremely severe residual ridge atrophy may continue to have some discomfort that is associated with functional instability. In addition to this, many of these patients require tooth positioning far beyond any remaining residual ridge to achieve the maximum esthetic results. Generally, this accommodation cannot be accomplished with the transitional denture and must be determined during the construction of the final prosthesis. Finally, using a transitional denture adds additional time and cost to the treatment (Figs. 3a to 6).

### The importance of occlusion

Patients who require complex removable prosthodontic treatment usually have little if any residual alveolar ridge that can adequately support a removable prosthesis (Fig. 7). Many of these patients have had multiple unsuccessful denture experiences. Oftentimes inadequate occlusal relationships contribute to the denture failure.

**Occlusal considerations.** Denture occlusion is a major factor in either the preservation or accelerated destruction of the supporting tissues. Patients who complain of "ill-fitting" dentures, frequently have severe occlusal discrepancies. Denture malocclusions may inhibit comfortable physiologic mandibular movements. When occlusal discrepancies are eliminated, mandibular movements can be made without interference.

Unfortunately, a removable denture is sometimes "given" to a patient as an expedient replacement for their missing teeth. Without appropriate service, patients experience sore spots, an inability to eat, speak properly, or feel psychologically comfortable with their new teeth. A major factor contributing to the failure of many new dentures is occlusal interference (Fig. 8). It is important that attention be given to the development of an optimal occlusal scheme before definitive treatment begins.

### Determination of prosthetic occlusion

Interocclusal records and appropriate face-bow transfer are necessary for an accurate mounting of the maxillary and mandibular diagnostic casts on a semiaadjustable articulator (Figs. 9 and 10). The predetermined denture space should adequately accommodate all of the denture teeth that have been selected.

At this stage it is unnecessary to have all patient eccentric mandibular movements replicated on a fully adjustable articulator. The mounting of diagnostic casts is required only to evaluate the vertical and horizontal relationship of the existing residual ridges. This relationship will aid in determining the use of a particular posterior tooth form.<sup>4</sup> It also helps determine an occlusal plane orientation that advantageously directs the forces of mastication toward the supporting tissues.



*Fig. 4 Facial profile without the tissue-integrated prosthesis.*



*Fig. 5 Facial profile illustrating desirable lip support created by the anterior cantilevered tissue-integrated prosthesis.*



*Fig. 6 Facial view with tissue-integrated prosthesis in place illustrates appropriate support of the perioral tissues.*

The anterior denture teeth are arranged in wax. A wax try-in is then completed. Appropriate cosmetic adjustments are made until patient satisfaction is achieved (Figs. 11a and 11b).

The posterior occlusion is then established using the arbitrary articulator mounting. The posterior denture tooth setup need not be returned to the mouth for further evaluation. This procedure provides for a diagnostic evaluation to verify plane orientation and anterior and posterior tooth relationships (Fig. 12).

### Sequential treatment planning for the tissue-integrated prosthesis

Following an evaluation of presurgical prosthodontic considerations, the prosthodontist will consult with the surgical team to discuss the location for titanium fixture placement. The articulator mounting with denture teeth in position should be available during this discussion (Figs. 13 and 14). A decision should be made regarding the use of an acrylic surgical guide to aid the surgeon in the surgical placement of the fixtures. The guide is useful when paralleling multiple fixtures (Figs. 15, 16a and 16b). Radiographic surveys are evaluated to determine the length and location of the fixtures.

### Transitional denture construction

Occlusal parameters established during the diagnostic phase are continued with the fabrication of transitional dentures. New master impressions, face-bow transfers, interocclusal records, and a wax try-in are required. The transitional dentures are completed and placed in the patient's mouth. At the delivery visit, they are remounted on an articulator and equilibrated. The patient may need to return for post-denture delivery adjustments. With the transitional denture completed, the patient is ready for the surgical installation of titanium fixtures.

### Surgical fixture installation

Surgical fixtures are installed according to the precise Brånemark technique.<sup>5</sup>

After fixture installation the transitional denture is relined with an autopolymerizing resilient material. This



Fig. 7 Cephalometric radiograph of a patient with severe maxillary and mandibular atrophy. Typical candidate for tissue-integrated prosthesis.



Fig. 8 Centric occlusion of existing immediate dentures. Malocclusion created by the posterior open bite on the right side.



Fig. 9 Maxillary denture positioned on bite fork prior to face-bow transfer.

procedure is generally accomplished one week to ten days following mandibular fixture installation, and before a final relining of the mandibular denture. If a palatal incision technique is used during maxillary fixture installation surgery, the maxillary transitional denture may be relined immediately following this treatment.

When relining the transitional dentures with a resilient material, every effort must be made to maintain the previously determined occlusal vertical dimension. This can be accomplished by carefully relieving the denture base in the areas directly over the fixture

installation sites. Fixtures are installed in the anterior mandible between the mental foramina. Resilient denture relining material should be placed only in this area, permitting the posterior denture base to seat on the residual ridge as in its presurgical relationship. The maxillary transitional denture should have intimate contact with the hard palate to maintain its position.

When a labial incision is used during fixture installation for either the maxillary or mandibular arch, the labial flange of both dentures should be extensively relieved. Because of morphological changes caused by surgery,



Fig. 10 Patient stabilizes maxillary denture during face-bow transfer.

the original tissue base relationship cannot be retained in the area directly over the fixture installation sites. However, careful repositioning of the transitional dentures using the established occlusal scheme as a guide will provide a clinically acceptable result.

Final curing of the relined material should occur in a heated pressure pot. The excess relined material is then trimmed. The occlusion is corrected so that the same occlusal scheme developed in the transitional dentures prior to the surgical procedure is provided

for function. Patients are instructed to use the dentures with extreme caution during the initial healing period. A soft diet is recommended for the first three to four weeks following surgery.

A postoperative appointment is scheduled for 48 to 72 hours following the surgical fixture installation. Healing progress is assessed with special attention to the area directly over the titanium fixtures. Patients are informed that any lesions or irritation precipitated by the dentures must be immediately reported to the prosthodontist.

If the transitional dentures are functioning adequately at the first postoperative visit, patients are scheduled to return on a monthly basis until the healing period is completed.

The healing period varies from 3 to 4 months in the mandibular arch and up to 6 months in the maxillary arch. During long-term healing periods, complete soft tissue relining of the transitional denture may need to be repeated. Occasionally, a hard relined material may be preferable.

#### Postsurgical use and management of the transitional prosthesis

Certain conditions may contraindicate the use of transitional dentures immediately following surgery, particularly in the mandibular arch. Primary wound closure must be maintained for successful osseointegration. Postsurgical edema may prevent comfortable and atraumatic seating of the transitional denture. Irritation of the already edematous tissue can occur if the patient insists on placing the dentures in function immediately following fixture installation surgery. General instability of the denture during early function may lead to reopening of the incision wound. Unless esthetic and/or speech requirements mandate, the use of the mandibular denture, particularly, should be avoided whenever possible for two weeks following installation of the fixture.

Esthetic or psychosocial considerations may require immediate use of the maxillary transitional denture follow-



Figs. 11a and 11b Patient evaluates the anterior arrangement of mandibular denture teeth for the transitional denture (left). Mandibular anterior arrangement is essential to the total esthetic result (right).



Fig. 12 The horizontal interpupillary line is verified after anterior teeth are set.

ing fixture installation surgery. If immediate use is required it should be noted during treatment planning for coordination of the surgical-prosthetic team effort. The use of a palatal incision for placement of maxillary fixtures permits successful immediate replacement of the maxillary transitional denture. This approach may also reduce the amount of postsurgical edema since the transitional denture can function as a pressure pack over the surgical site. Exceptionally tight closure of the incision wound is necessary if the patient is expected to wear the transitional dentures immediately. Tissue-base relationships can be better retained by relining only in the area where the fixtures have been placed.

Prior to dismissal, patients are instructed in proper oral and denture hy-

giene. Saline mouthwashes and gentle water lavage of the surgical sites are used during the first 72 hours postsurgery. In addition to cleansing the oral cavity, the tissue side of the denture should be cleaned with cool running water and a very soft toothbrush. After the first 72 hours the transitional denture should be cleaned more thoroughly with a mild soap and a denture brush. Cleaning agents such as a washcloth or an extra-soft toothbrush can be used to cleanse the residual ridge and oral tissues except for the incision and area immediately over the fixture placement site.

Seven to ten days following surgery, the sutures are removed. The tissues may then be cleansed more vigorously. Impeccable oral hygiene is necessary for proper healing and a good prognosis.

When all postsurgical edema has subsided, the transitional dentures are again relined. The occlusion must also be verified and adjusted if necessary.

#### Second surgical visit: the abutment connection and prosthodontic management

When osseointegration has occurred, the patient is scheduled for exposure of the titanium fixtures. The surgeon and prosthodontist will provide concurrent treatment during this treatment phase. Previously, the surgeon has accurately recorded distances between the fixtures to simplify the location of the osseointegrated fixtures during the surgical uncovering.

Following surgical exposure, a titanium abutment is securely fastened to each fixture. The jawbone anchorage unit now consists of the osseointegrated titanium fixture and the abutment connector. This unit is then tested by percussion and visual observation to ascertain osseointegration. Fixtures not osseointegrated are removed at this time. The resultant socket is thoroughly debrided and allowed to heal.

The transitional prosthesis may now be converted to either a fixed prosthesis<sup>6</sup> or a removable provisional overdenture. This prosthodontic treatment is the first step in making the change from a transitional prosthesis to a tissue-integrated prosthesis.

Modification of the transitional denture prosthesis requires the use of specially designed gold cylinders.\* If the conversion prosthesis technique is used, these cylinders will be securely

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Fig. 13 Mounted diagnostic casts.

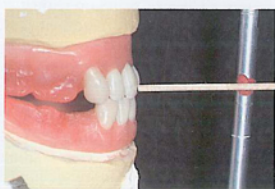


Fig. 14 Anterior teeth positioned in wax.

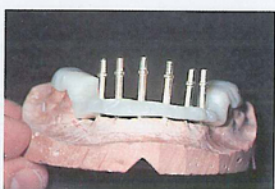


Fig. 15 Guidestent with brass indicator rods. The transitional denture serves as a guide to fixture placement.

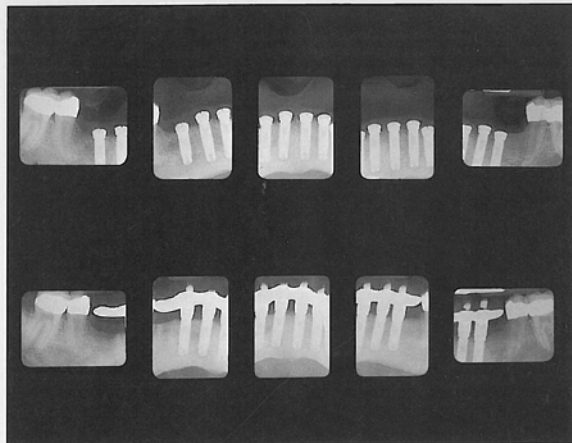


Fig. 16a Radiograph shows fixture well aligned as a result of using the above guidestent.

fastened to the transitional denture. Simply relining the transitional prosthesis with a resilient material over the gold cylinders may provide adequate retention of the prosthesis.<sup>7</sup>

Tight tissue closure and firm pressure against the abutment connectors is helpful in establishing an effective soft tissue seal. The placement of a chairside lining material enables the patient to continue to function with a removable transitional denture while the final tissue-integrated prosthesis is being fabricated. Furthermore the desired esthetic, functional, phonetic, and psychosocial benefits can be maintained during final healing.

If a continuous crestal incision is used to expose the fixtures during abutment connection, a periodontal pack may be used to assist in maintaining mucosal adaptation to the abutments. The pack can be held in position with plastic healing caps securely fastened to selected abutment connectors as described in the original osseointegration treatment protocol, or it may also be retained by a conversion prosthesis described by Balshi.<sup>3</sup>

When plastic healing caps are used, transitional dentures generally cannot be worn successfully over them. Patients wearing the plastic healing caps usually discard the transitional denture during the two weeks following surgical uncovering of the fixtures. When the tissues have adequately healed, the plastic healing caps are removed and the transitional denture is then modified and relined as previously described in this article.

An additional advantage of using the transitional denture as a conversion prosthesis, is the opportunity to transfer the occlusal vertical dimension and tooth positional relationships directly to the master cast during the mounting process. This can be accomplished at the time of the master impression. The occlusion of the conversion prosthesis is verified intraorally. The prosthesis is then removed from the mouth and securely fastened to the master cast for appropriate articulation. Labial indexing of the conversion prosthesis will aid in the recording of tooth position for the transfer to the definitive restoration.

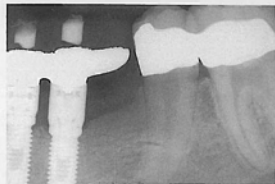


Fig. 16b Close-up view of right side shows fixtures in parallel alignment.

## Summary

The use of a transitional prosthesis in the management of a patient undergoing definitive treatment involving the tissue-integrated prosthesis has been described. It is useful as a diagnostic aid, in the preparation of surgical guidestents, as an interim restoration, and assists in wound healing. □

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