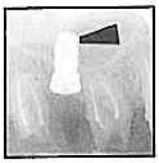
Converting Patients with Periodontally Hopeless Teeth to Osseointegration Prostheses*



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For many years the specialties of periodontics and prosthodontics have worked diligently to save dentitions suffering from advanced stages of periodontal disease. Periodontitis, with advanced levels of bone loss and tooth mobilities, has plagued patients and dentists alike. Even when periodontal surgical therapy has been used to eliminate active acute and chronic disease processes, the mobility of the remaining dentition frequently requires prosthodontic splinting to create stability. Traditionally, a prescription for conventional fixed prosthodontics as a vehicle for both tooth replacement and stabilization of mobile teeth is required for patients with advanced periodontitis. Either single full-arch castings, sectional castings with precision attachments, or complex telescopic fixed partial dentures have been constructed using teeth with advanced mobility patterns as the supporting abutments. Patients undergoing this form of periodontal-prosthodontic reconstruction frequently required extensive endodontic therapy in addition to the prosthodontic and periodontal treatment. In many instances, the long-term prognosis for these complex rehabilitations was guarded, at best, and relied heavily on frequent periodontal maintenance and superb patient cooperation.

With the use of the osseointegration process as developed by Brånemark et al,[1-5] new avenues of therapy are now available for patients suffering the ravages of advanced periodontal disease. Although the Brånemark process of osseointegration using titanium implanted fixtures has been intended for the restoration of the edentulous patient, extrapolating the application of this process has been successfully applied to patients with advanced periodontal disease.[6]

The purpose of this paper is to discuss the philosophy and illustrate through various patient treatments the concept of managing the periodontally compromised dentition through the use of the Brånemark method of osseointegration. The objective of following such a philosophy is to ultimately provide patients with sound prosthodontic and surgical care by (1) following sound biomechanical principals; (2) preserving the maximum amount of healthy supporting

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tissues; (3) permitting the patient to continue normal daily activities and oral function during treatment; and (4) providing the patient with a dentition that is comfortable, functional, stable, and esthetic after the active treatment program.

Treatment classifications

The treatment of the periodontally compromised dentition using the osseointegration process might be categorized into three major therapeutic classifications. These classifications can be briefly described as follows.

Class I: Traditional Brånemark method. The traditional Brånemark method of osseointegration completely replaces all of the hopeless teeth with a tissue-integrated prosthesis. In this classification, the patient may be required to avoid the use of the temporary removable denture for 1 to 2 weeks following the surgical fixture installation.

Class II: Modification of the Brånemark method. This method is used to stabilize periodontally compromised and mobile teeth by splinting these teeth to osseointegrated fixtures. This classification uses a tissue-integrated prosthesis, which also incorporates and stabilizes mobile abutment teeth.

Class III: Modification of the Brånemark method. This method provides complete replacement of the periodontally hopeless dentition with an osseointegrated fixed prosthesis, without rendering the patient totally edentulous prior to the delivery of the tissue-integrated prosthesis. When this method is used, the patient is at no time required to wear a removable prosthesis.

In order to illustrate the philosophy and explain the treatment procedures in greater detail, selected patient histories will be used. Each of the following three patients represents one of the above treatment classifications.

Class I: The traditional Brånemark method

The patient was a 48-year-old man, in good general health, who had received a periodontal prosthesis 15 years earlier (Fig 1a). The existing maxillary and mandibular acrylic resin veneered fixed prostheses exhibited moderate discoloration of the facings. The gold occlusal surfaces had maintained the occlusal vertical dimension, although severe wear facets were present in the canine and premolar areas. Clinical examination of the abutment teeth showed excessive amounts of plaque accumulation. Edematous and inflamed gingival tissues, as well as heavy calculus deposits, were present on both the prosthesis and the natural teeth (Figs 1b and 1c). Clinical evaluation of the dentition indicated that a multitude of infrabony pockets exceeded 12 mm in depth. Widespread suppuration and lack of attached gingiva around potentially key abutment teeth also confirmed the diagnosis of advanced periodontitis. Radiographic examination revealed severe bone loss around the remaining natural dentition (Fig 2).

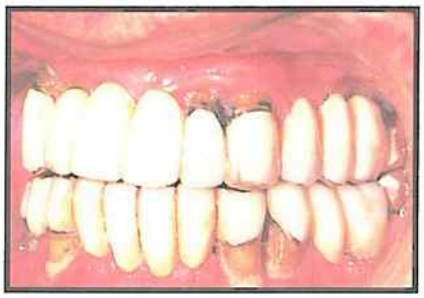


Fig 1a The patient's original acrylic resin veneered splints in centric occlusion.

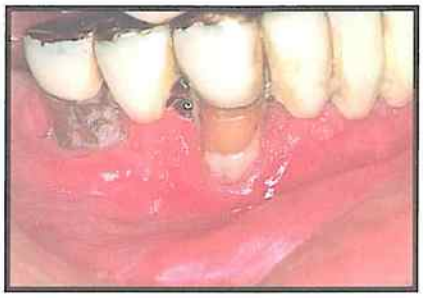


Fig 1b Right buccal view.

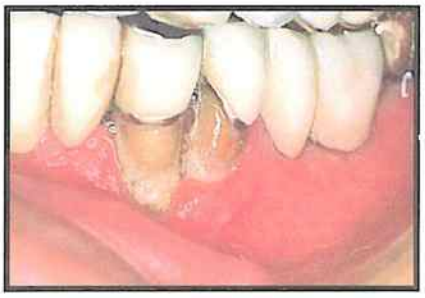


Fig 1c Left buccal view.

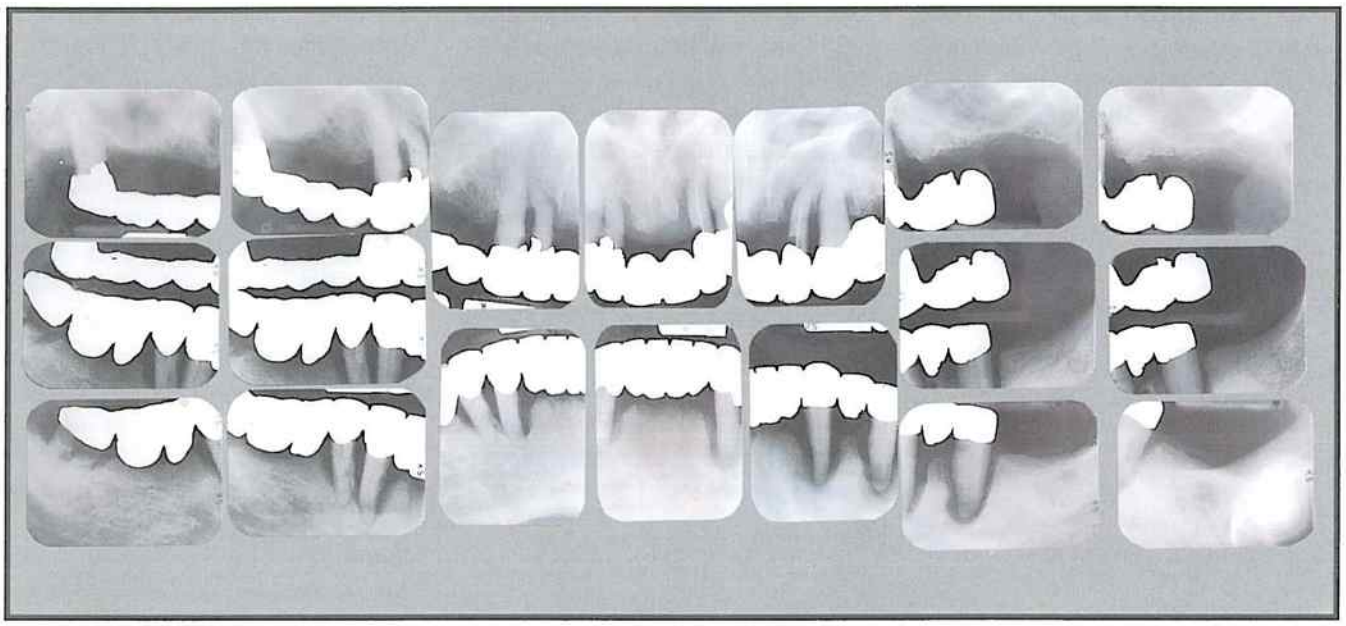


Fig 2 Preoperative complete mouth radiographs showing advanced periodontitis in the maxillary and mandibular arches.

Diagnosis: Advanced Periodontitis, maxilla and mandible.
Prognosis: Hopeless (for natural teeth).
Tentative treatment plan: The traditional method of osseointegration to create a tissue-integrated prosthesis using an immediate complete removable denture as the interim prosthesis.

All tentative treatment plans consist of four phases.[7] These are defined in the following manner:

Phase I. Preliminary treatment. This involves elimination of acute pathologic conditions, followed by stabilization of occlusion with provisional restorations.

Phase II. Reevaluation. This phase allows completion of surgical procedures, healing, and confirmation or modification of the treatment plan.

Phase III. The final prosthesis, ie, tissue-integrated prosthesis.

Phase IV. Maintenance and disease control.

In phase I, the presurgical prosthodontic treatment provided for this patient required the removal and temporary replacement of all of the remaining hopeless teeth. This was accomplished through the use of an immediate complete removable denture (Fig 3). The complete elimination of all pathology through the removal of the remaining hopeless teeth and their associated periapical and periodontal abscesses is essential for complete healing to occur. This is necessary before fixture installation. Soft tissue pathology requires a minimum 1-month healing period. In patients exhibiting advanced periodontitis, 6 to 9 months of additional osseous healing is recommended before fixture installation. During this healing period, the patient may continue to wear a transitional denture that is frequently relined with resilient tissue-conditioning materials (Fig 4).

Following fixture installation, a 3- to 4-month healing period is necessary for osseointegration. Following the precepts of the Brånemark method, the second surgical procedure (the abutment connection) was performed. Immediately following the connection of the abutment cylinders, the patient was provided with a conversion prosthesis.

In this example, the provisional, or interim, removable denture was modified in the area of the jaw anchorage units (Fig 5). Prototype stainless steel cylinders with bar-wings used with acrylic resin splinting created a pseudosubstructure framework for the conversion prosthesis (Fig 6). Rubber dam was used to isolate the incision line while the soft acrylic resin joined the winged cylinders (Fig 7). It is important to note that adequate relief of the denture around the prosthetic components is essential to permit the replacement of the provisional denture without interference with the gold cylinders or the titanium abutment connectors. Centric relation was verified prior to connecting the splinted cylinders to the provisional denture.

The ridge-facing view of the conversion prosthesis immediately after the cylinder pickup procedure (Fig 8a) showed voids in the acrylic resin. Brass abutment analogs were installed with long laboratory guidepins in order to protect the abutment face of the prosthetic cylinders (Fig 8b) when additional acrylic resin was added around the occlusal aspects of the guidepins as well as to voids present around the brass analog. Once the acrylic resin had hardened, the guidepins and brass analogs were removed. Flanges on the ridge-facing side were then removed, and the denture was streamlined into the conversion prosthesis (Figs 9a and 9b).

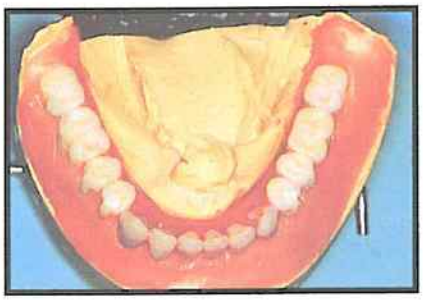


Fig 3 Wax-up for the immediate mandibular denture.

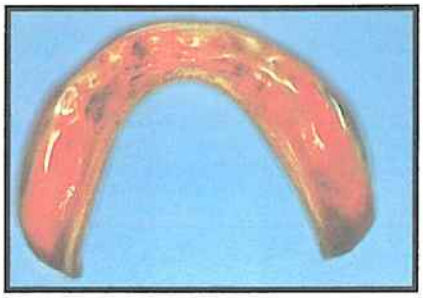


Fig 4 Soft tissue relign after 9 months of postextraction healing.

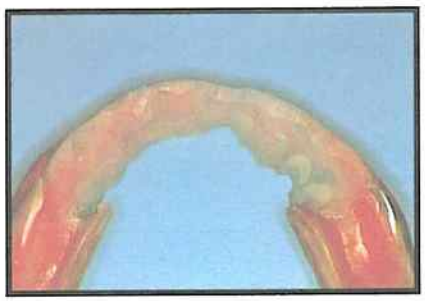


Fig 5 Lingual reduction of the immediate provisional mandibular denture in preparation for the conversion prosthesis.

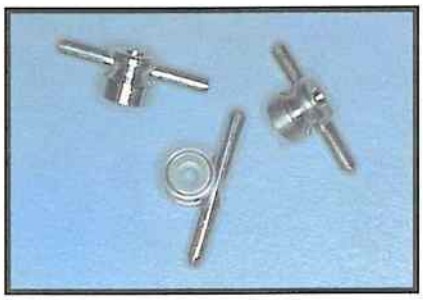


Fig 6 Steel bars connected to the prosthetic gold cylinders will function as acrylic resin splinting bars and as a substructure framework for the conversion prosthesis.

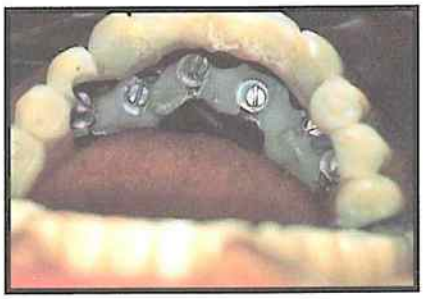


Fig 7 Rubber dam protects the incision line while the bars and copings are joined with acrylic resin.

Fig 8a The ridge-facing view. The conversion prosthesis shows numerous voids requiring additional acrylic resin.

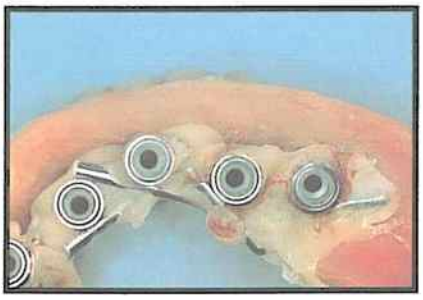
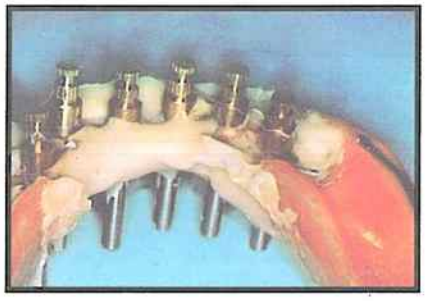
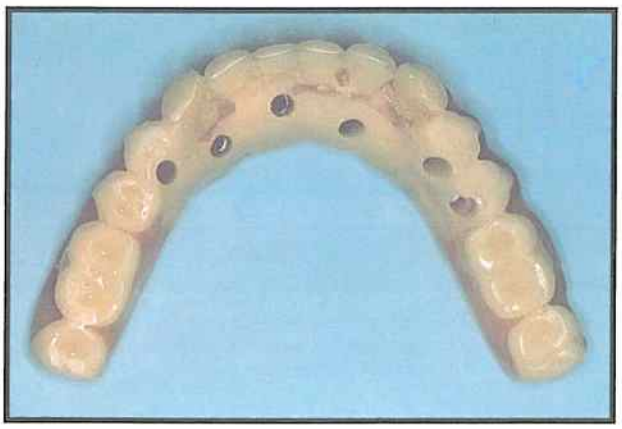


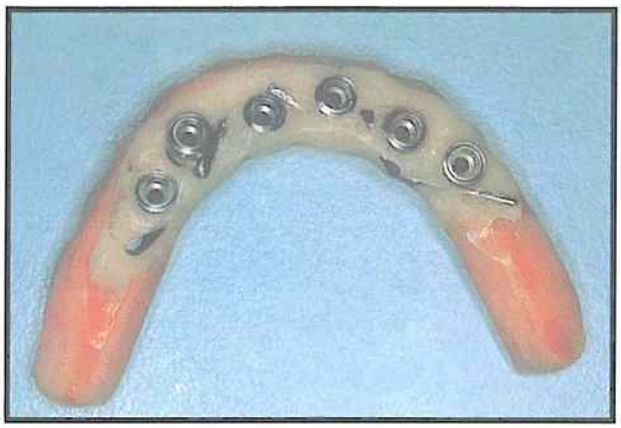
Fig 8b Brass abutment analogs are installed prior to the addition of acrylic resin.



Clinical installation of the conversion prosthesis should include re-verification of the occlusal vertical dimension as well as centric occlusion and lateral movements. In addition, this prosthesis should be designed to provide adequate space for appropriate plaque control.[7]

After the occlusal vertical dimension and the interarch occlusal relationship were confirmed, the conversion prosthesis was fastened to the master cast to record the occlusal vertical dimension during the articulation process (Fig 10). Clinically, this typical tissue-integrated prosthesis uses the "highwater design" to ensure adequate room for oral hygiene maintenance not only between the gold substructure and the mucosal tissues, but also interproximally between the titanium abutment cylinders (Fig 11).





Figs 9a and 9b Complete reduction of the buccal and lingual flanges. All excess acrylic resin is removed and the conversion prosthesis is polished.

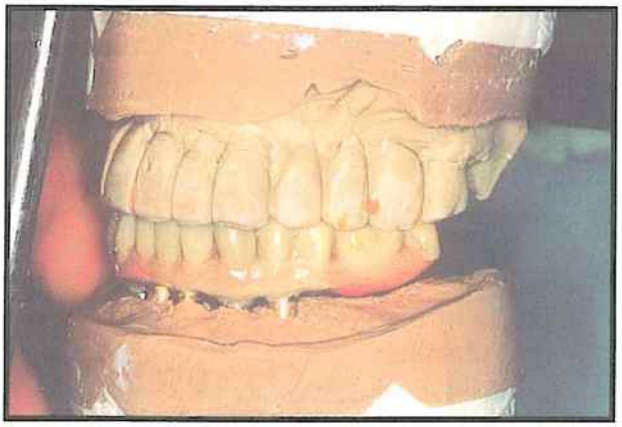


Fig 10 Conversion prosthesis used to record occlusal vertical dimension during the articulation process.

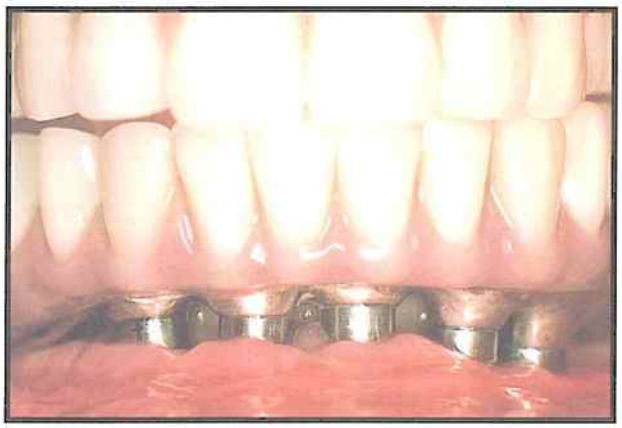


Fig 11 The traditional Brånemark tissue-integrated prosthesis showing highwater design for easy oral hygiene maintenance.

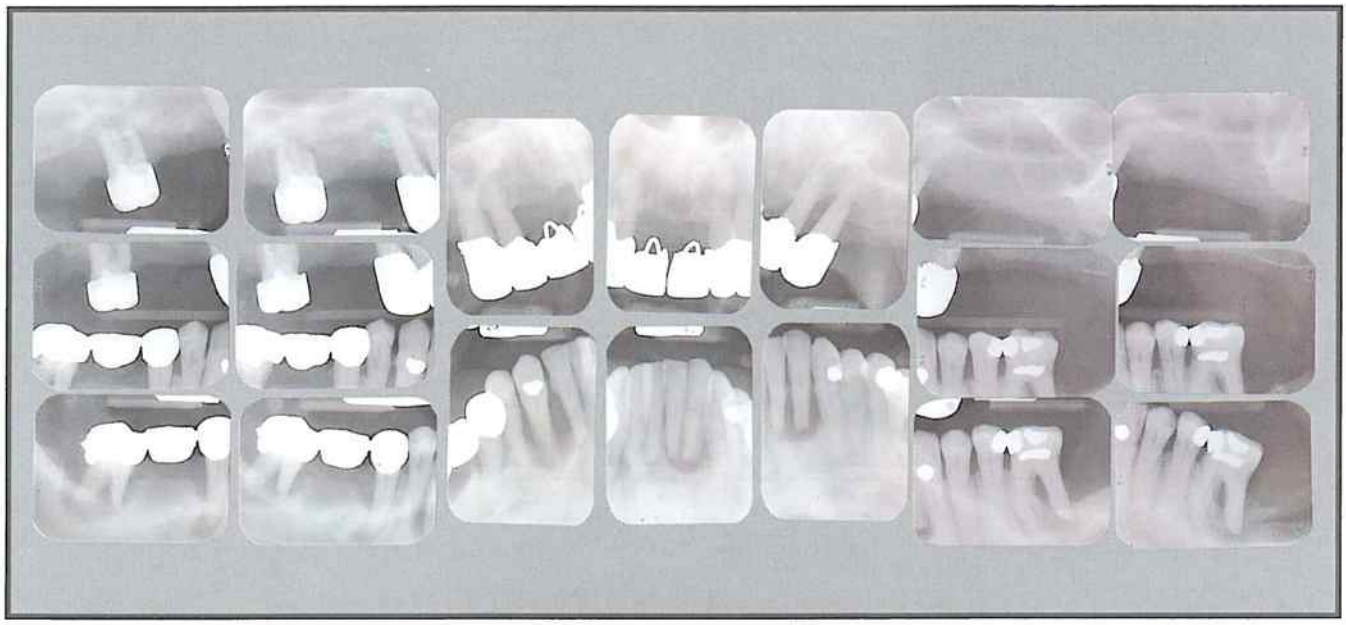


Fig 12 Preoperative radiographs show moderate to advanced periodontitis. Note the fractured maxillary anterior splint.

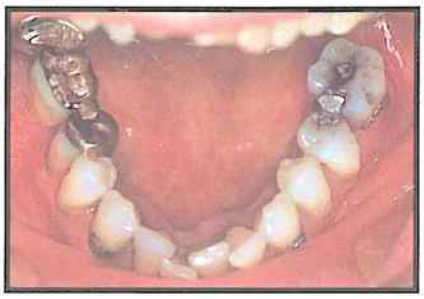


Fig 13 View of the mandibular arch with an acrylic resin veneered fixed prosthesis in the right posterior quadrant.

Class II: Modification of the Brånemark method

The second classification of treatment for the periodontally compromised dentition is based on stabilizing periodontally mobile teeth using osseointegrated titanium fixtures. The patient used to illustrate this procedure was a 51-year-old woman in excellent general health. She presented with an existing maxillary fixed prosthesis fractured at the midline. The pretreatment periapical radiographs showed severe bone loss surrounding all of the maxillary teeth (Fig 12). Radiographic examination indicated that the maxillary right molar had lost all bone support. The maxillary teeth all exhibited advanced mobility. The mandibular arch had been restored with an acrylic and gold fixed partial denture in the right posterior quadrant (Fig 13). Radiographically, this arch exhibited a significant loss of alveolar supporting bone associated with the anterior teeth. Posterior radiographs evidenced molar bone loss.

Diagnosis: Maxillary arch – multiple missing teeth, advanced periodontitis, a fractured anterior prosthesis with significant tooth mobility.

Mandibular arch – moderate to advanced periodontitis with severe bone loss and tooth mobility.

Prognosis: Maxillary arch – poor to hopeless.

Mandibular arch – multiple hopeless teeth, some moderately mobile teeth capable of treatment.

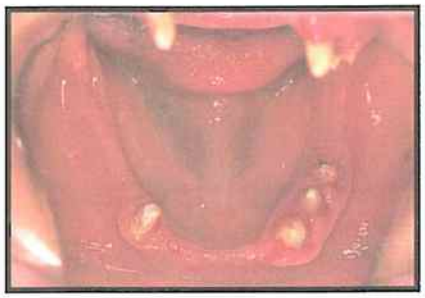


Fig 14 The four remaining abutment teeth after extraction sites have completely healed.

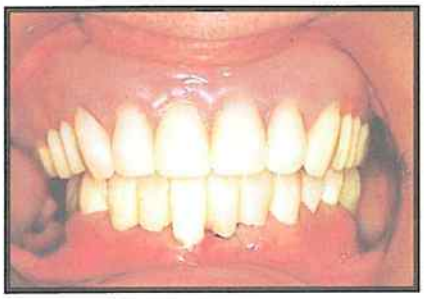


Fig 15 The maxillary complete overdenture and mandibular provisional fixed restoration.

Fig 16a Mandibular radiographs showing endodontic treatment of the remaining mandibular abutment teeth for a fixed provisional restoration and the extraction sites immediately following removal of the hopeless teeth.

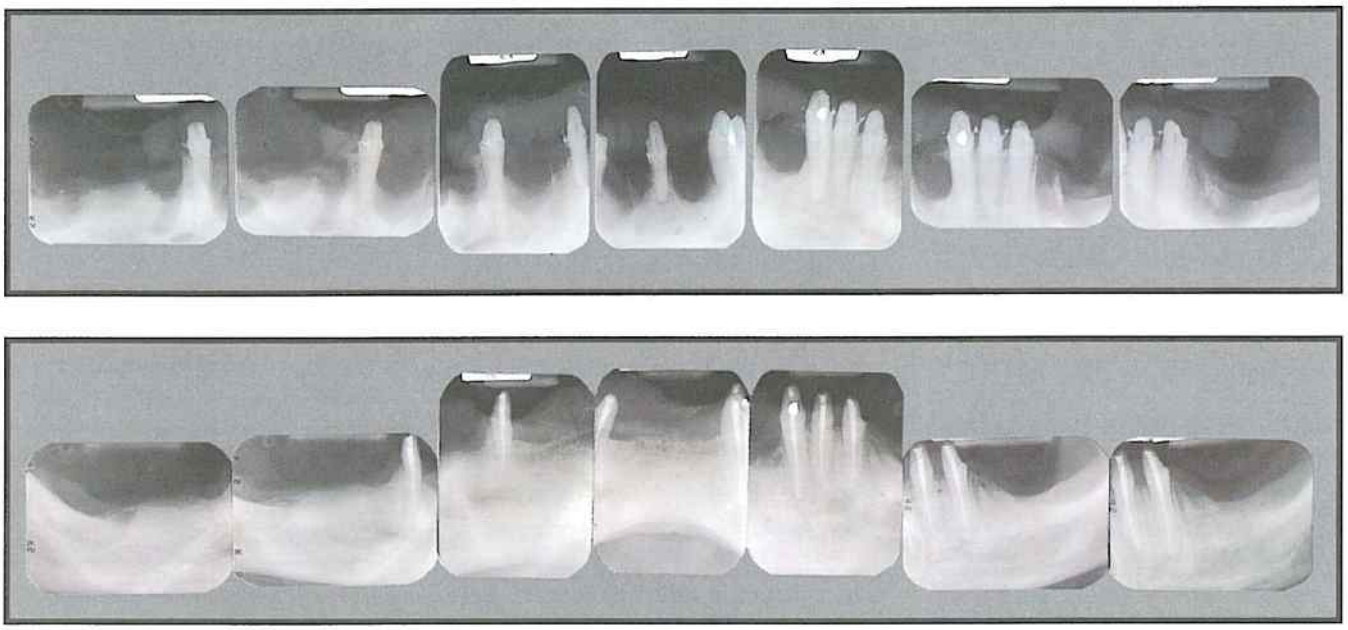


Fig 16b Radiographs show complete healing of the alveolar ridge in the extraction sites prior to fixture installation.

Tentative treatment plan: Maxillary arch – immediate overdenture followed by a custom complete removable overdenture.

Mandibular arch – tissue-integrated prosthesis incorporating mobile abutment teeth.

Phase I: The preliminary treatment

The maxillary arch presurgical prosthodontic treatment called for the removal of the remaining molar, reduction of the endodontically treated anterior teeth, and placement of an immediate provisional complete overdenture. At the time of delivery of this prosthesis, the mandibular arch was simultaneously treated by the removal of all the periodontally hopeless teeth and the placement of a fixed provisional restoration (Figs 14 and 15).

The remaining maxillary teeth received endodontic treatment to permit a favorable reduction of the crown:root ratio and to help determine the feasibility of maintaining these teeth as abutments for a final overdenture. In the mandibular arch, after initial provisionalization and healing occurred, the remaining incisor abutment was reevaluated and deemed hopeless. This tooth was subsequently removed because of its advanced mobility (Figs 16a and 16b). The remaining mandibular teeth received endodontic treatment prior to final tooth preparation.

Before osseointegration was initiated, comprehensive periodontal therapy was performed to establish a healthy environment for the existing natural dentition.

Phase II

Adequate soft tissue healing, as well as residual alveolar ridge healing, is an essential part of the presurgical reevaluation for osseointegration procedures (Fig 16b). The mandibular provisional restoration exhibited a +2 mobility even after maximum soft tissue and hard tissue healing had occurred.

After the healing of the extraction sites, the Brånemark-type titanium fixtures were installed in the edentulous areas between and posterior to the remaining abutment teeth (Figs 17 and 18). The provisional tooth-supported fixed prosthesis was then modified, relieving the pontic areas over the fixture installation sites (Fig 17). This restoration was then recemented for the remaining healing or osseointegration period.

After 3 to 4 months of healing and osseointegration, the provisional restoration was removed and the titanium abutment cylinders were connected. It was unnecessary to incorporate the prosthetic gold cylinders into the provisional prosthesis since adequate retention could be provided by temporary cementation to the abutment teeth.

Initially, clearance must be provided to permit reseating of the provisional restoration without impingement on the abutment connectors (Fig 19). The provisional prosthesis received additional stability when the prosthetic gold cylinders were put in contact via a reline of the pontic areas (Figs 20 and 21). It is imperative to radiographically verify the adaptation of the abutment cylinders to the titanium fixtures following the abutment connection procedure (Fig 22).

Axial alignment of the bone anchorage units is extremely important in producing a functional prosthesis. Esthetic, as well as functional, complications arise when fixture angulations are malposed (Figs 23 to 27). This example demonstrates a strong argument for the use of specific surgical guidestints.[8]

When splinting mobile teeth to osseointegrated fixtures, telescopic gold copings should be used over the abutment teeth (Fig 28). The overcasting for the tissue-integrated prosthesis is cast in a type IV gold or similar semiprecious alloy. A casting try-in is essential for verifying the fit between the telescopic copings and the overcastings as well as the accuracy to the bone-anchored titanium units (Fig 25). When casting accuracy is verified, the denture teeth are set for function and esthetics (Fig 26). A wax try-in of the tooth arrangement will verify its esthetic acceptability and patient approval.

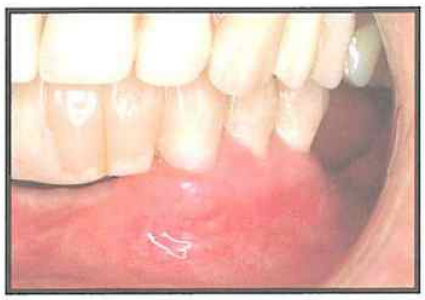
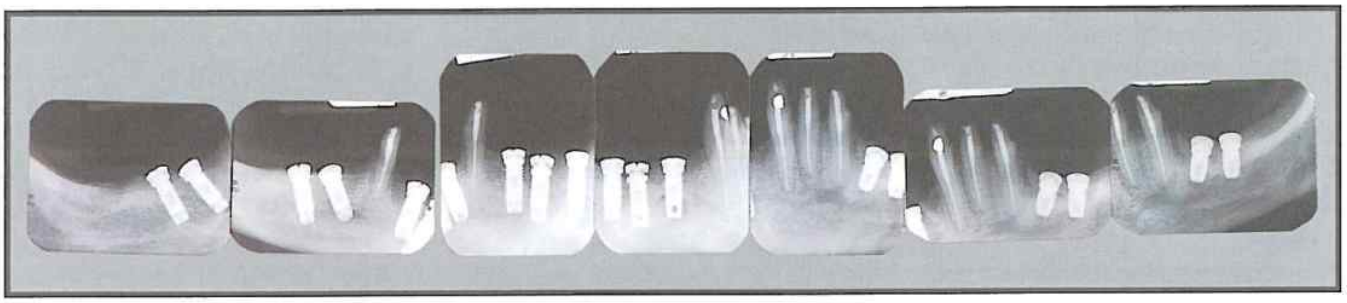


Fig 17 (right) Completely healed surgical sites under the anterior pontics are the future fixture installation sites.

Fig 18 (below) Complete radiographic series showing fixture placement immediately prior to abutment connection surgery.



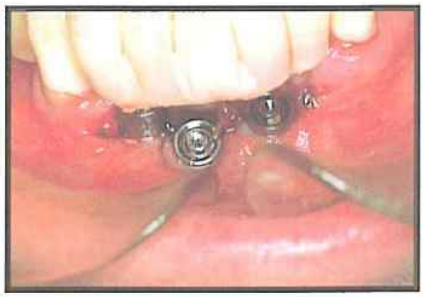


Fig 19 Abutments connected to the three anterior fixtures require alteration of the incisor pontic area.

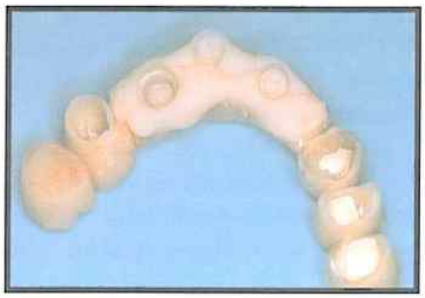


Fig 20 Soft acrylic resin has been added to the anterior pontics making contact with the prosthetic cylinders.

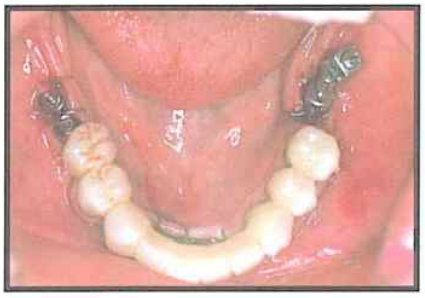
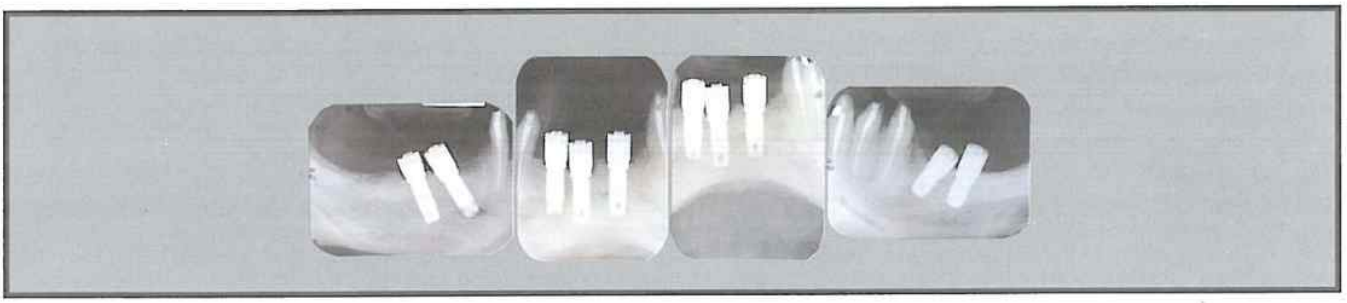


Fig 21 The provisional restoration can be recemented over the remaining abutment teeth. No cement is applied to the gold cylinders.

Fig 22 Radiographic series verifies the fit of the titanium abutment cylinders over the osseointegrated fixtures.



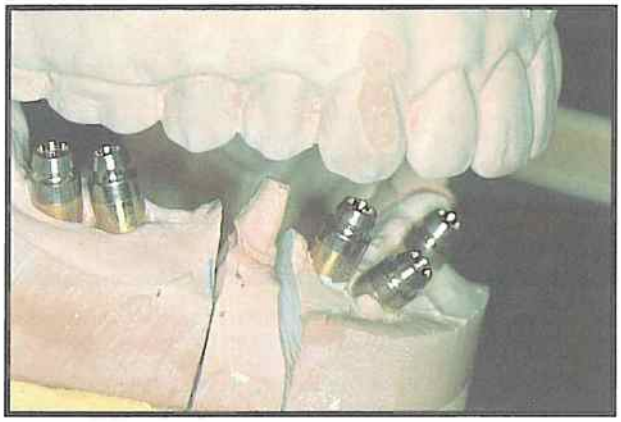


Fig 23 Working cast shows malposed fixture angulations in relation to the abutment tooth 28.

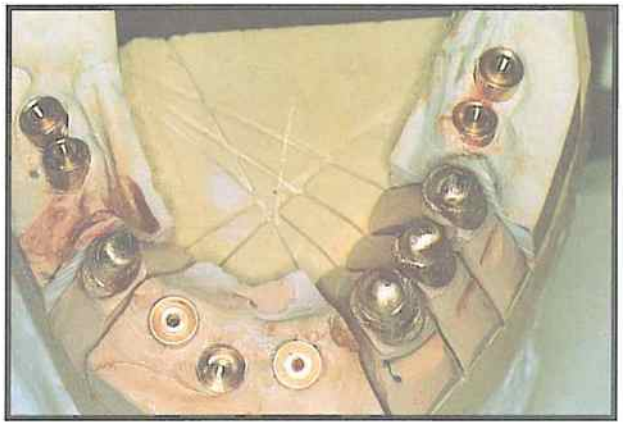


Fig 24 Telescopic copings for teeth 20, 21, 22, and 28 are designed parallel to the long access of the remaining teeth.

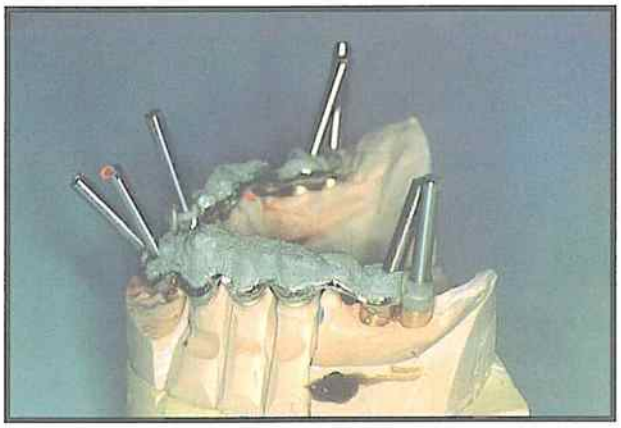


Fig 25 Laboratory guidepins are used to secure the one-piece gold casting to the brass analogs in order to check the fit over the telescopic gold copings. Note the angulation of the implant axis.

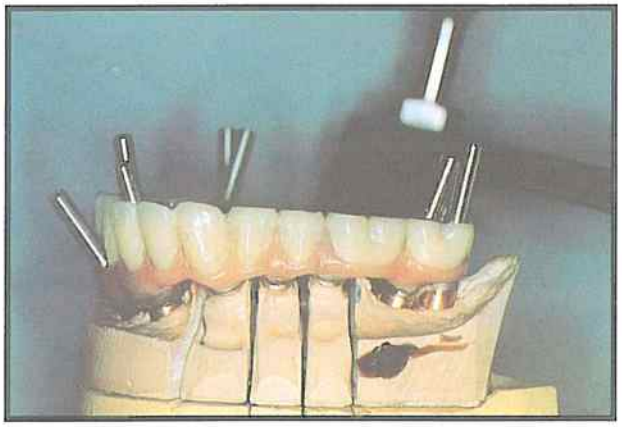


Fig 26 Denture teeth are set in wax in preparation for the esthetic try-in.

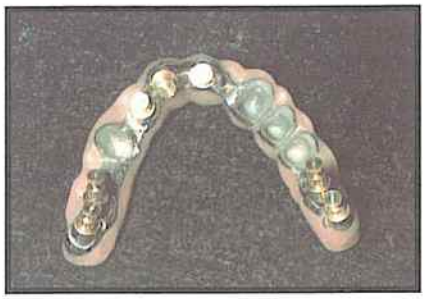


Fig 27 Completed tissue-integrated prosthesis shows the distribution of abutment teeth in relation to bone-anchored fixtures.

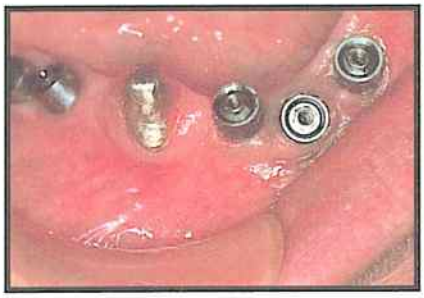


Fig 28 Cast-gold telescopic copings are cemented with zinc oxyphosphate cement.

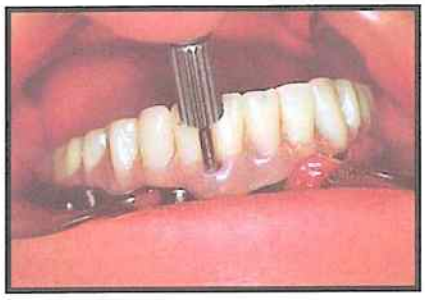


Fig 29 The tissue-integrated prosthesis is secured to the titanium abutments with gold prosthetic screws. No cement is used between the overcasting and the gold telescopic copings.

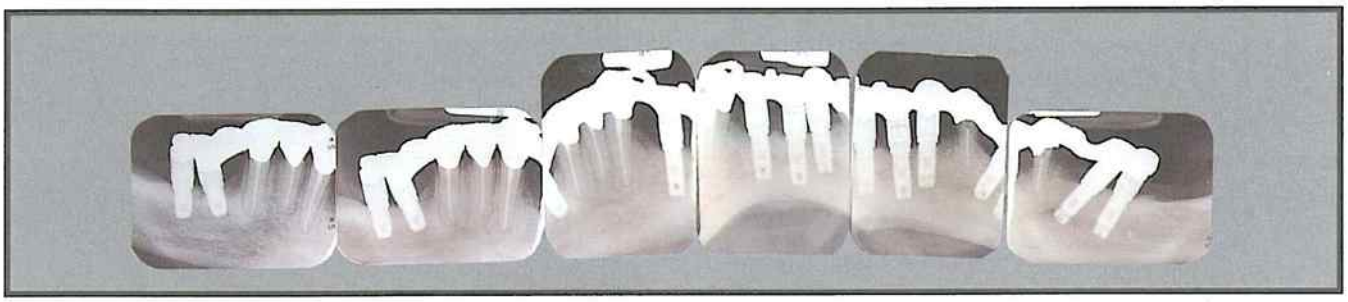


Fig 30 Postoperative radiographs show the relationship of the periodontally mobile teeth to the osseointegrated fixtures.

The ridge-facing view of this "perio-osseous prosthesis" showed the overcasting crowns between the areas of the bone-anchored units (Fig 27). Delivery of this prosthesis followed the traditional Brånemark method of stabilization with regard to the connection of the prosthesis to the abutment cylinders. No cements were applied between the cemented telescopic copings and the overcasting. Any thickness of cement in this area may inhibit appropriate metal-to-metal interface of the prosthetic gold cylinders to the titanium abutment connectors. Gold prosthetic screws were used to secure the overcasting to the abutment cylinders (Fig 29). The screw access openings were sealed on a temporary basis for several months using a cotton pellet to fill most of the screw chamber, which was then covered with a temporary cement. After final delivery of an osseointegrated telescopic prosthesis, the occlusion should again be verified and adjusted if necessary. The postoperative radiographs (Fig 30) show the distribution of the titanium fixtures and the natural abutment teeth splinting the entire arch.

Class III: Modification of the Brånemark method

The third therapeutic classification of treating severely periodontally compromised teeth focuses on transition from the naturally dentate state to the tissue-integrated prosthesis without relying on a removable appliance. This classification differs from class II in that none of the natural abutment teeth will remain part of the final prosthesis. The patient was a 55-year old woman in good general health who had a severely advanced periodontally compromised dentition. There was a combination of an anterior crossbite, extrusion of teeth, and a posterior bite collapse associated with missing and drifting teeth (Figs 31 to 33). The gingival tissues demonstrated moderate to severe inflammation and edema. The poor esthetic arrangement was the patient's chief complaint.

Occlusal views of the maxilla (Fig 32) and the mandible (Fig 33) demonstrate the removable appliances worn by this patient for the past 20 years. Radiographically, advanced bone loss was evident throughout the maxillary arch, and moderate to advanced bone loss was present throughout the remaining mandibular dentition. Close inspection of the radiographs indicated that the remaining maxillary molar dentition had been severely compromised by bone loss and furcation complications (Fig 34). These teeth appeared to have a questionable to hopeless prognosis.

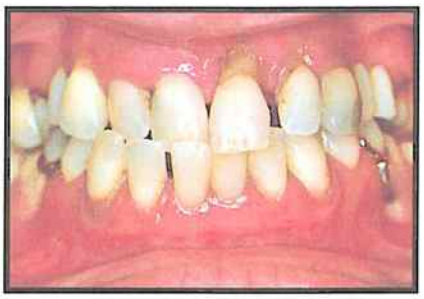


Fig 31a Labial view illustrates anterior crossbite.

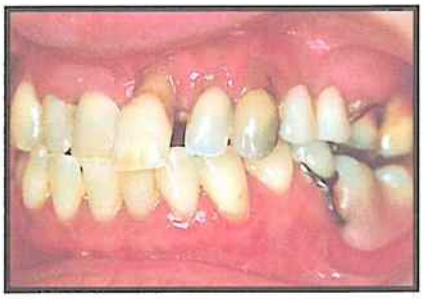


Fig 31b Left buccal view demonstrates lack of posterior support and unesthetic prosthetic dentition.

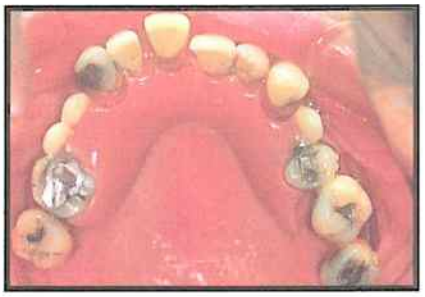


Fig 32 Preoperative view of the maxillary removable prosthesis worn by the patient for 20 years.

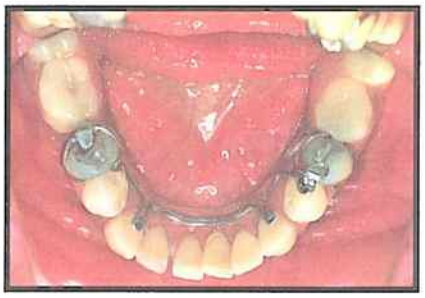
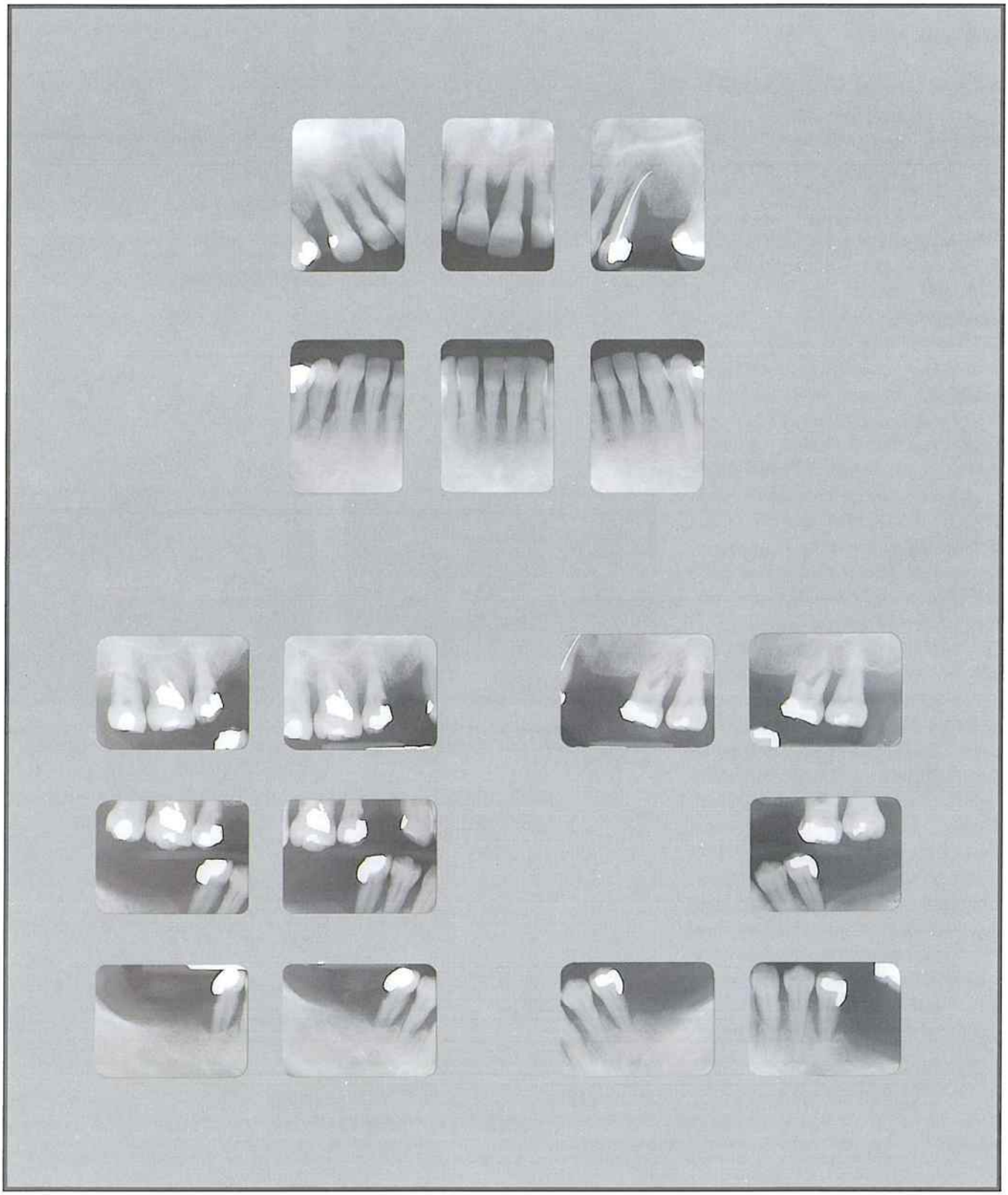


Fig 33 Preoperative view of the mandibular removable partial denture replacing the posterior teeth.

Fig 34 Preoperative radiographs illustrate advanced periodontitis in the maxillary arch and moderate to advanced periodontitis in the mandibular arch.



Diagnosis: Maxillary arch, primary considerations – advanced periodontitis, malocclusion, missing teeth, severe mobility, poor esthetics and function.

Mandibular arch – moderate to advanced periodontitis, missing posterior teeth, and moderate mobility.

Prognosis: Maxillary arch – questionable to guarded at the time of initial examination.

Mandibular arch – favorable, contingent on advanced periodontal and prosthodontic treatment.

Tentative treatment plan: Phase I – presurgical prosthodontics for both the maxillary and mandibular arches.

Phase II – reevaluation consisting of confirmation or modification of the tentative treatment plan based on procedures performed during the first phase.

Phase III – the final restoration, which is dependent on decisions made during the second phase reevaluation and includes the delivery of the final prosthesis.

Clinical treatment

During the first phase of treatment, presurgical prosthodontic care required immediate stabilization of the maxillary dentition with a heat-processed acrylic resin provisional restoration (Fig 35). Limited orthodontic tooth movement was necessary to realign the mandibular remaining dentition prior to its provisionalization. Periodontal therapy was then performed to determine the feasibility of maintaining some of the maxillary abutment teeth.

The surgically treated area was allowed to heal, and the phase II reevaluation was subsequently completed. Considerations during this reevaluation included: (1) the length of the remaining clinical roots; (2) the functional stability of the splinted prosthesis; (3) the biomechanical factors regarding the distribution of the abutment teeth to support the splinted prosthesis; (4) the individual mobilities of each abutment tooth; (5) the achievable esthetics of the proposed periodontal prosthesis; (6) phonetic complications; (7) potential plaque control difficulties created by the final prosthesis; and finally, (8) the long-term prognosis for a telescopic coping "periodontal prosthesis."

The final phase II reevaluation will either confirm or modify the tentative treatment plan. When the prognosis for the remaining dentition is poor to hopeless, the use of a tissue-integrated prosthesis should be considered. With this prescription, the installation of fixtures is scheduled. Surgical guidestints should be used to accurately determine the position and long axis angulation of the fixtures.[9] The fabrication of this guidestint is very specific and should be made on a stone cast containing the unrestored abutment teeth (Fig 36).

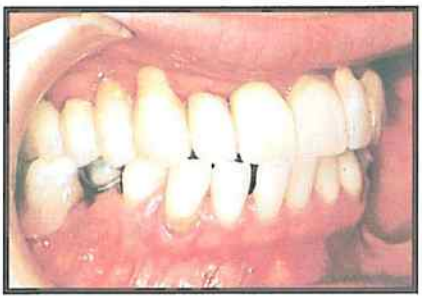


Fig 35 Immediate stabilization of the maxillary arch with a high-impact heat-processed acrylic resin fixed prosthesis.

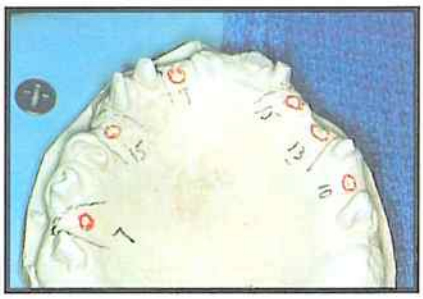


Fig 36 Diagnostic cast of remaining abutment teeth with fixture sites marked in red. The adjacent numbers indicate the length of the fixtures to be used during the surgical installation procedure.

Fig 37 Fixture installed between the palatal roots in the maxillary right quadrant.

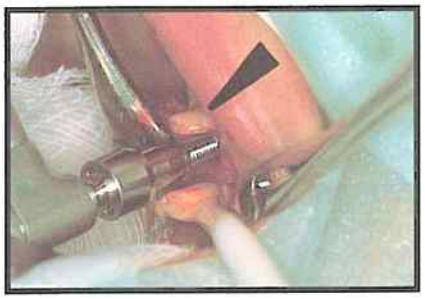


Fig 38 The hemisected mesiobuccal root of the maxillary right first molar has extreme mobility.

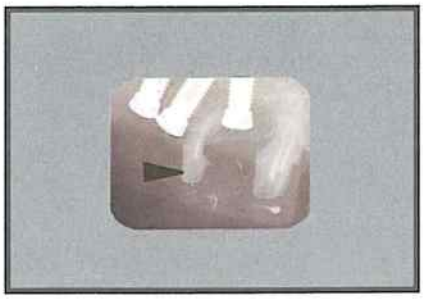


Fig 39 Radiograph following fixture installation shows proximity to the mesiobuccal root to the fixture installation sites.

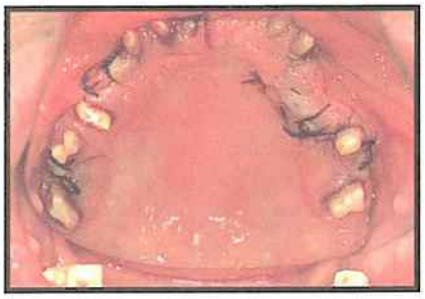


Fig 40 Individual fixture locations are securely closed.

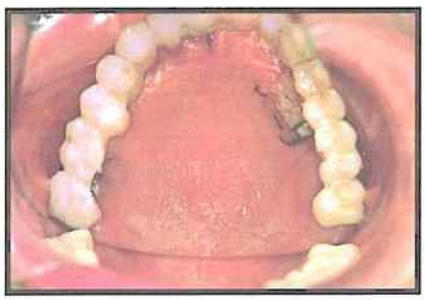


Fig 41 Provisional restoration is recemented with a soft temporary cement to facilitate easy removal.

Fixture installation

The degloving of the maxilla frequently presents the surgeon with an osseous environment that is different than that evidenced on the diagnostic cast. Use of the CT scan and other imaging techniques will identify these configurations in advance. Skillful free-hand surgery is often, however, the only option available to surgeons when placing fixtures in narrow residual ridges. Special care must be taken during fixture installation to ensure that the adjacent abutment teeth are not in contact with the fixture installation sites (Figs 37 to 41). Ideally, fixtures should be 2.5 to 3 mm away from the remaining teeth.

The provisional prosthesis was removed to facilitate suture removal. The maxillary left mesiobuccal root of the first molar (Fig 42) was inadvertently removed in the provisional prosthesis, evidencing the already poor prognosis noted for the remaining natural dentition. Radiographic evaluation of this area indicated that removal of the remaining root did not affect the fixture installation (Fig 43).

After the sutures were removed, the provisional restoration was modified to create esthetic enhancements and phonetic improvements. Use of denture repair acrylic resin to create an esthetic gingival façade also served to improve air flow and phonetic ability (Fig 44). The provisional restoration was then recemented with a long-term temporary cement for the remaining healing period (Fig 45). All during this healing period, continued periodontal maintenance was necessary to minimize infection and inflammation around the periodontally hopeless abutment teeth. This is particularly important when the abutment teeth are close to the fixture installation sites.

During the maxillary arch healing period, conventional prosthodontics was completed in the mandibular arch. A porcelain-fused-to-gold fixed prosthesis was used for the mandibular anterior and premolar teeth. A precision attachment removable partial denture replaced the missing posterior teeth (Fig 46).

Fig 42 Radiograph illustrates the mesiobuccal root of the maxillary left first molar.

Fig 43 Radiograph following extraction of the mesiobuccal root indicates the fixtures have been unaffected.

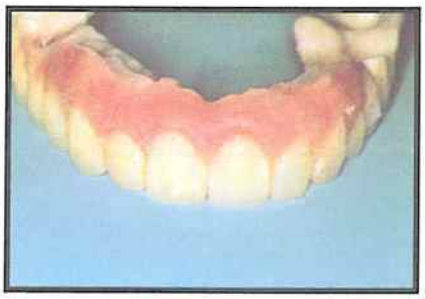


Fig 44 Acrylic resin was added to the pontics and the abutment teeth following fixture installation. Denture repair acrylic resin was used to simulate gingival tissues in the pontic span area.

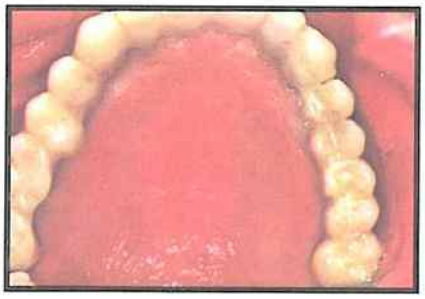


Fig 45 Provisional restoration is cemented with a long-term temporary cement for the duration of the 6-month osseointegration period.

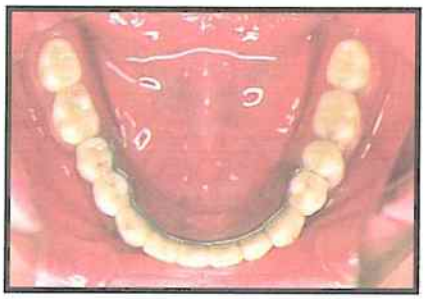


Fig 46 The mandibular final restoration consists of a porcelain-fused-to-gold fixed prosthesis extending from tooth 21 through tooth 29. The missing posterior teeth are replaced with a precision attachment removable partial denture.

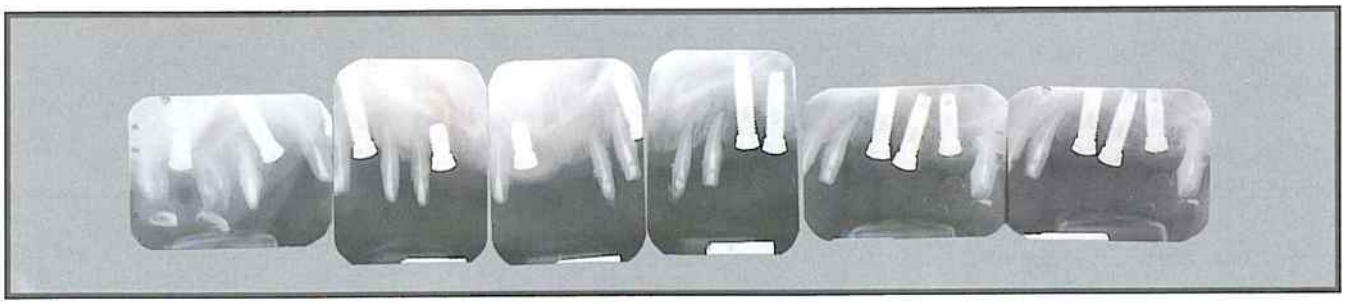


Fig 47 Radiographic series checks the condition of the remaining abutment teeth and the fixtures immediately prior to the abutment connection surgery.

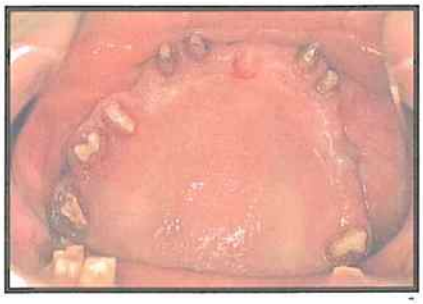


Fig 48 Clinical view of the remaining maxillary hopeless abutment teeth immediately prior to the abutment connections surgery. Note that all of the temporary cement and plaque accumulations have been vigorously cleansed from the area.

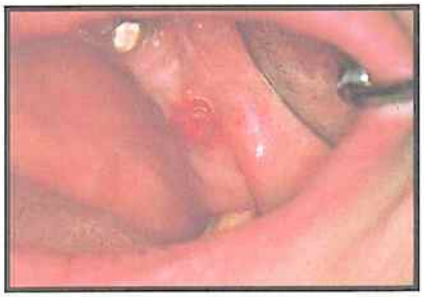


Fig 49 Circular plug of tissue to be removed will expose the osseointegrated fixture.

Fig 50 Titanium abutments securely fastened to the osseointegrated fixtures. Note that the abutment teeth have not yet been removed.

Fig 51 Provisional restoration has been modified and relieved to accomodate the gold prosthetic cylinders.

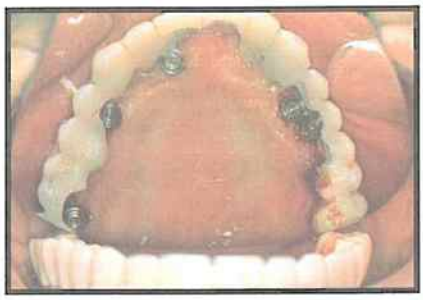


Fig 52a Many areas of the provisional restoration have been weakened by relief during the cylinder pickup procedure.

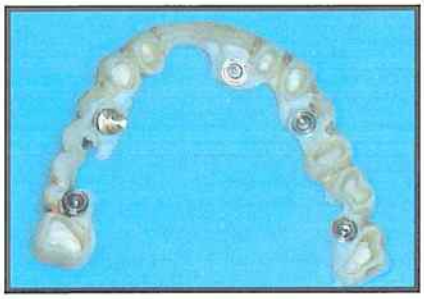
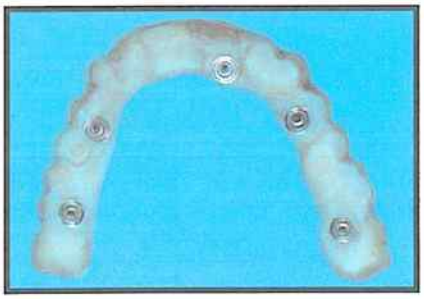


Fig 52b Abutment teeth have been completely filled with acrylic resin and the conversion prosthesis has been recontoured.



After a 6-month healing period, there was a radiographic examination of the maxillary fixtures and abutment teeth. This explored any additional periodontal breakdown of the hopeless teeth and the potential effect it may have had on fixtures (Fig 47). At the abutment connection visit, the provisional restoration was carefully removed (Fig 48). It is extremely important to properly prepare the surgical site after removal of the provisional restoration but before beginning the abutment connection procedure. All temporary cement, plaque, and calculus must be removed from the remaining abutment teeth.

If possible, the circular punch method of abutment connection surgery should be used to minimize incision lines (Fig 49). When the healing screws are uncovered and the abutment cylinders are securely fastened, clinical inspection is used to determine osseointegration by visual observation of immobility of the bone-anchored fixtures as well as through auditory sounds when the abutment cylinders are percussed. Radiographic verification of the abutment cylinders ensures their proper connection to the osseointegrated fixtures (Fig 50). When all of the abutment cylinders have been properly installed, the conversion prosthesis is fabricated using the *tooth-supported provisional restoration* to maintain the occlusal vertical dimension as well as esthetic tooth position. Modification of the acrylic resin provisional restoration will follow steps similar to those for the conversion prosthesis used in the traditional Brånemark method. Greater accuracy, however, can be obtained with a *tooth-supported* conversion prosthesis (Fig 51).

Gold cylinder pickup depends on accurately reseating the provisional crowns on the abutment teeth adjacent to the fixture installation in areas. After the gold cylinders were picked up with self-curing acrylic resin (Fig 52a), the areas weakened by the relief required prior to the acrylic resin addition were reinforced. The acrylic abutment crowns in the provisional restoration were then filled with a self-curing acrylic resin, thus converting these retainers to pontics. The entire prosthesis was then trimmed and highly polished (Fig 52b).

The abutment teeth were very carefully removed, with an effort made to not disturb the mucosal tissues adjacent to the titanium abutments (Fig 53a). The provisional restoration, now converted, was fastened to the abutment connectors with the gold prosthetic screws (Fig 53b). The extraction sites are usually allowed to heal for a 2- to 4-week period before continuing treatment.

During this initial healing process, the patient was cautioned on rigorous plaque control procedures so as not to disturb the healing extraction sites. Frequently, plaque accumulations are found on both the titanium abutments and the prosthesis during the early weeks of conversion prosthesis use.

When extraction site healing was sufficiently completed (Fig 54), the master impression for the tissue-integrated prosthesis was made in the conventional manner (Fig 55).

If esthetic changes are required from the conversion prosthesis, a wax try-in is advocated. When esthetics have been approved by the patient, a silicon matrix is made of the teeth on the master cast (Figs 56 and 57). Once again, the conversion prosthesis is used to record the occlusal vertical dimension and incisal guidance during the articulation process (Fig 58).

From the time of the abutment connection to the delivery of the final prosthesis, the conversion prosthesis continues to provide occlusal function, esthetics, and phonetics.

Construction of the final prosthesis consisted of a rigid cast-gold framework (Fig 59) with modified denture teeth applied. The ridge-facing surface of such a prosthesis must be smooth and highly polished to minimize plaque retention.

When the patient returned for the final prosthesis installation (Fig 60), the screw access openings were initially sealed in a temporary fashion with cotton and Cavit cement (Premier Dental Products Company) for the reevaluation at 1-week and 1-month time intervals. The posttreatment radiographs should verify the precise fit of the tissue-integrated prosthesis casting to the abutment cylinders (Figs 61 and 62).

The changes evident in "before" and "after" clinical views (Figs 63a and 63b) demonstrate the esthetic improvement and the patient's satisfaction resulting from the class III modification of the Brånemark method of treatment.

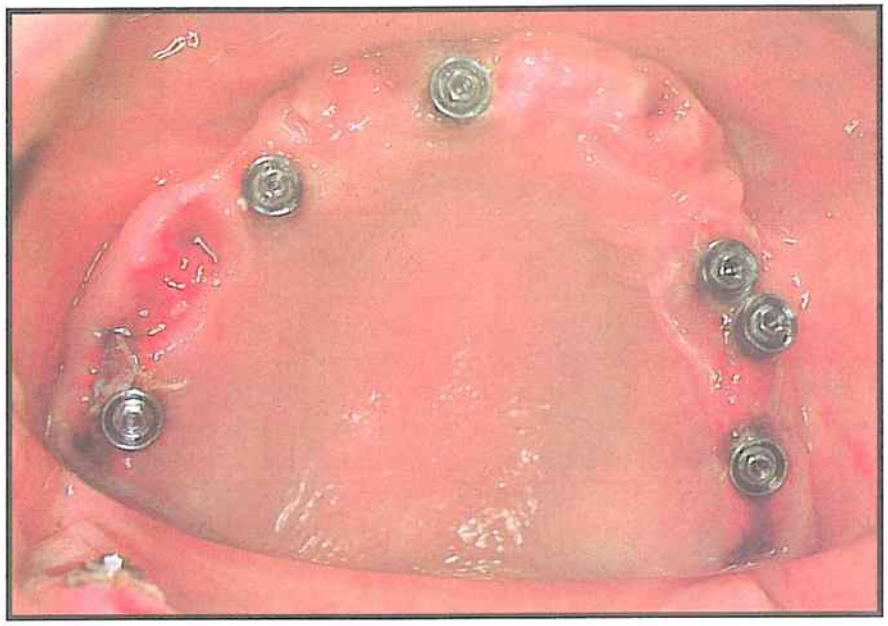


Fig 53a Palatal view immediately following the extraction of the remaining hopeless abutment teeth.

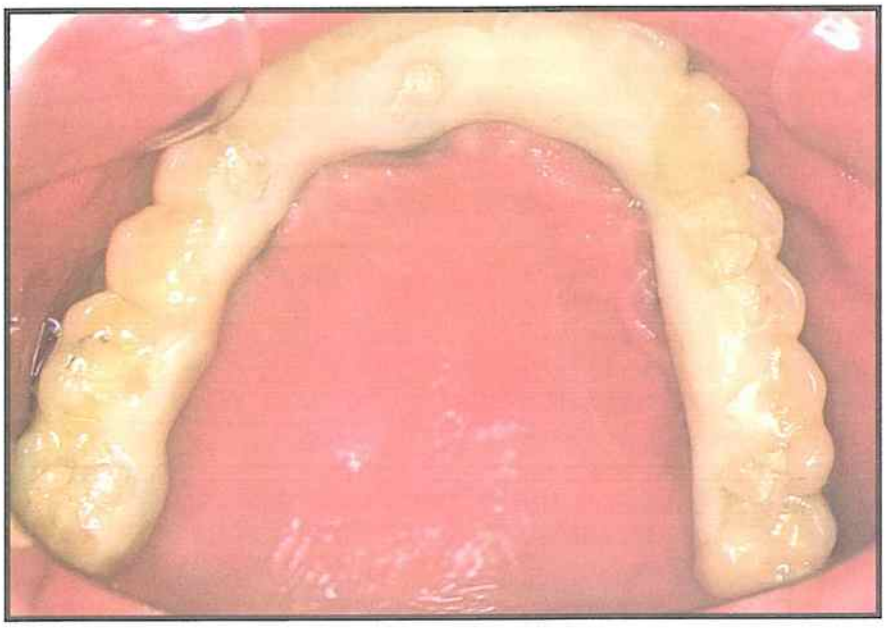


Fig 53b Installation of the conversion prosthesis immediately following extraction of the hopeless abutment teeth.

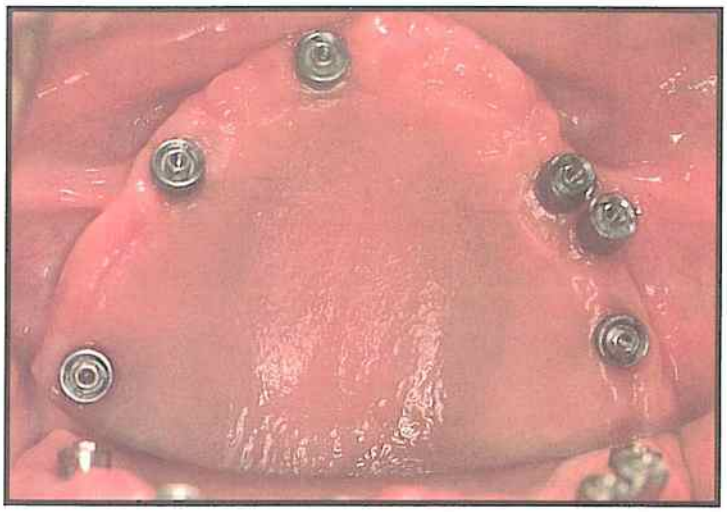


Fig 54 Removal of the conversion prosthesis 4 weeks following the abutment connection indicates adequate healing of the extraction sites.

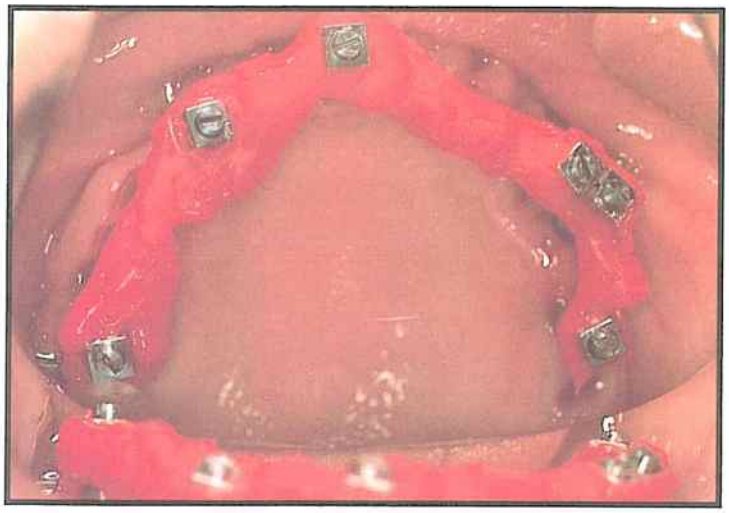


Fig 55 The impression copings are joined prior to making the master impression.

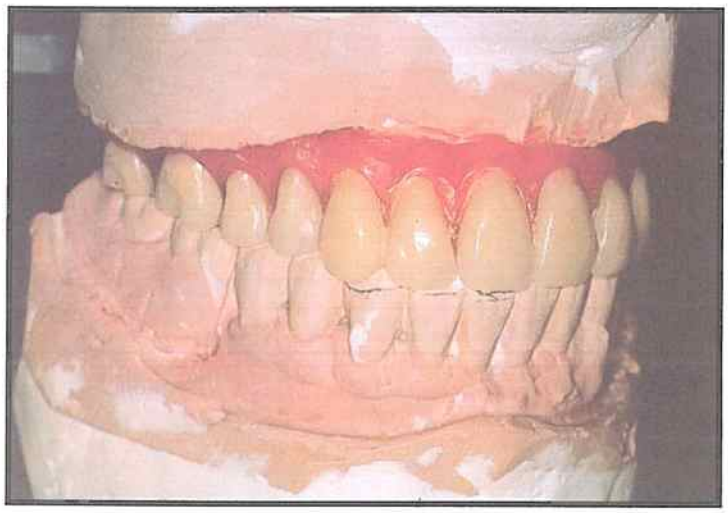


Fig 56 Denture teeth are set in wax.

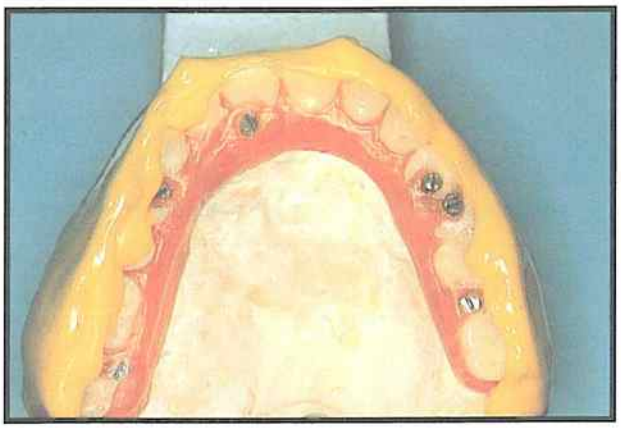


Fig 57 Silicon labial index records the spacial position of the denture teeth in relation to the abutment analogs.

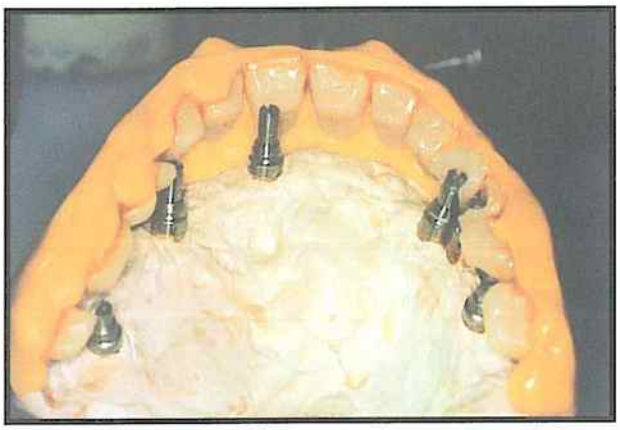


Fig 58 Base-plate wax has been removed, showing the area prepared to accomodate the tissue-integrated prosthesis substructure framework.

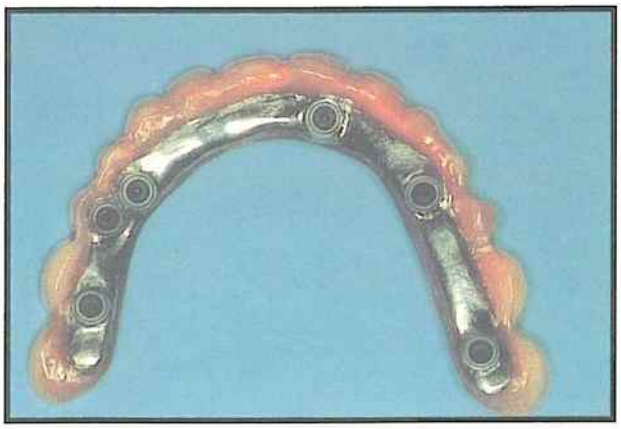


Fig 59 Gold substructure framework provides strength for full-arch tissue-integrated prosthesis.

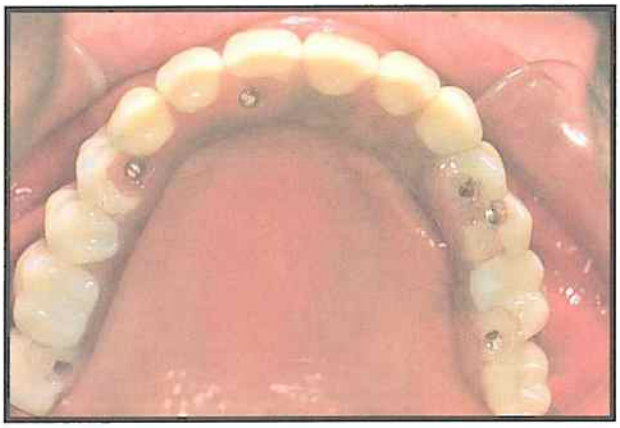


Fig 60 Clinical view of the maxillary tissue-integrated prosthesis at the installation visit.

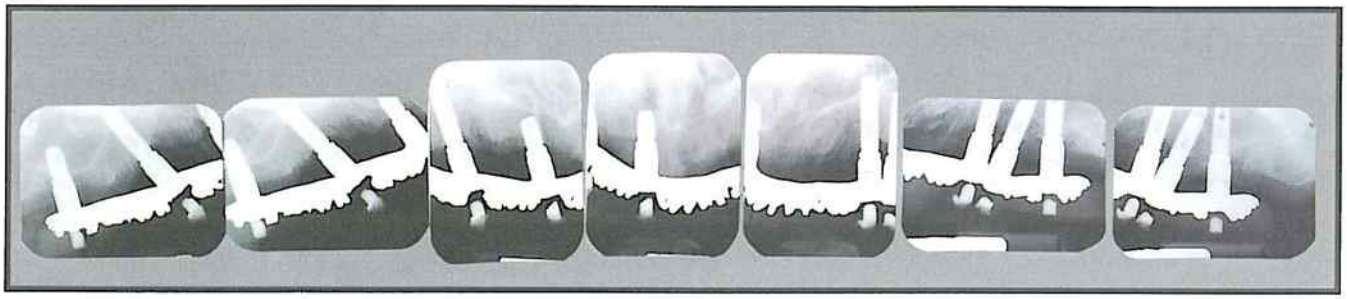


Fig 61 Postoperative intraoral radiographs verifying the fit of the gold castings to the abutment cylinders.

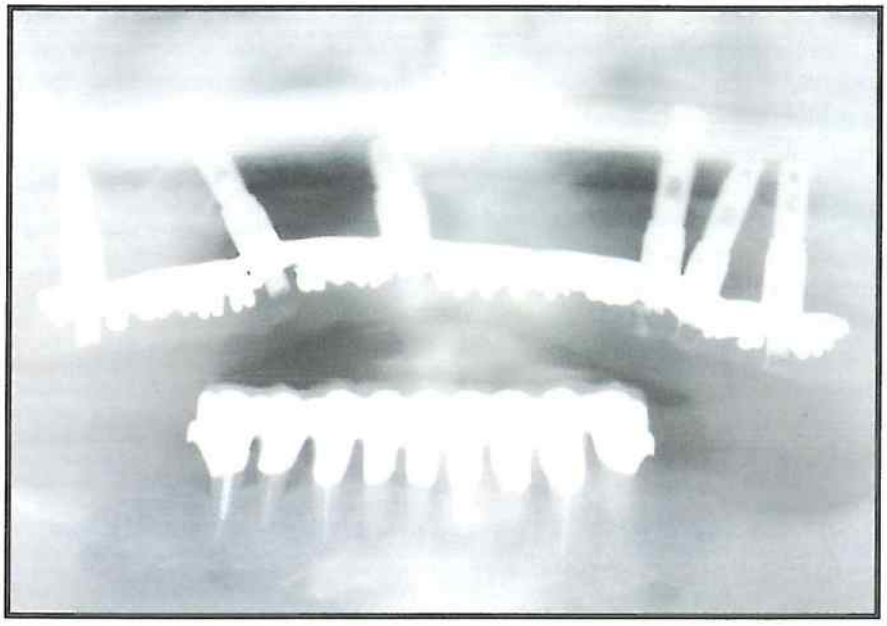


Fig 62 Pantographic view of the final tissue-integrated prosthesis in the maxillary arch with conventional fixed prosthodontics in the mandibular arch.

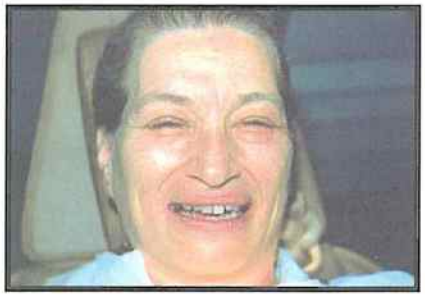


Fig 63a Preoperative facial view of the patient.

Fig 63b Postoperative facial view.

Discussion

Treatment of the periodontally compromised dentition may be managed in three fundamental categories. The class I method applies the traditional Brånemark protocol following the removal of all periodontally hopeless teeth.

In the class II modification of the Brånemark method, the long-term effects of splinting periodontally mobile teeth to osseointegrated fixtures has not yet been determined. Further investigation is required to ascertain the effects of a full-arch tissue-integrated prosthesis not only on tooth mobility but also on the periodontal ligament of teeth under such immobile long-term stabilization. In addition, the posterior distribution of fixtures incorporated in a mandibular full-arch tissue-integrated prosthesis has not had long-term documentation. Clinical research and other studies should be designed to determine the effect of opening and closing the mouth on the structure of the mandible, the temporomandibular joint, the implant, the bone-titanium interface, and the prosthodontic components of the tissue-integrated prosthesis.

In the class III modifications, continued observation is required to determine if the extraction sites intimately adjacent to the fixtures will have any effect on the long-term prognosis of osseointegration.

Summary

Three classifications of treatment for a severely compromised periodontal dentition have been described in conjunction with the use of osseointegration via the Brånemark method. A tissue-integrated prosthesis has been described to include the stabilization of mobile abutment teeth in the class II category. The class III modification described a treatment method particularly ideal for patients who cannot use a removable prosthesis during the treatment program.

Acknowledgment

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