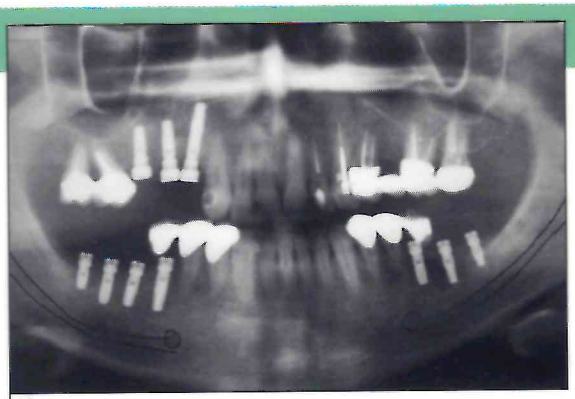
2001

A Fixed Whole-Mouth Rehabilitation Utilizing Natural Abutments and Implants: Treatment Concepts and Clinical Realization

Nitzan Bichacho, DMD*/Rafi Lahav, MDT**/Cobi J. Landsberg, DMD***

1a



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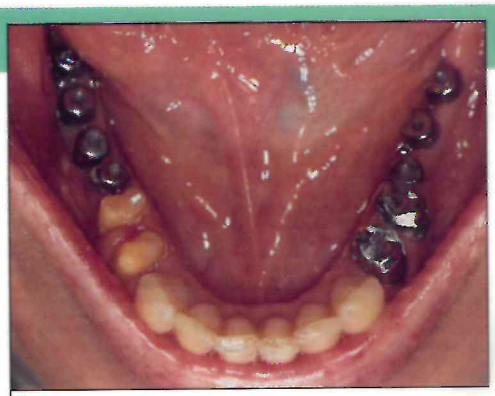

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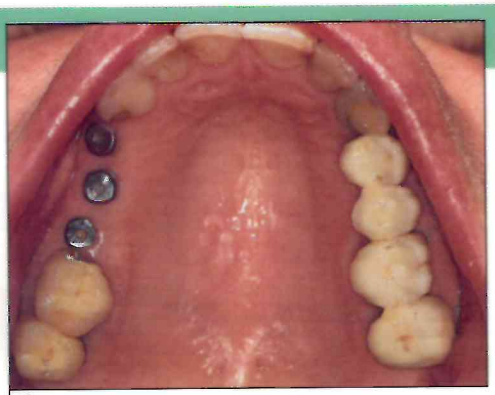


2b

*Private practice limited to prosthodontics, Tel Aviv, Israel.
**Master Dental Technician, Tel Aviv, Israel.
***Private practice limited to periodontics, Tel Aviv, Israel.
Reprint requests: Dr Nitzan Bichacho, Miriam Hahashmonait 16, Tel Aviv 62665, Israel. Fax: + 972 (3) 546-0415. Email: bichacho@bezeqint.net

1c

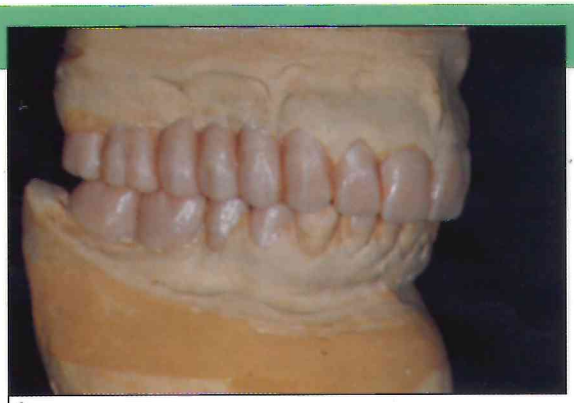
2c

Figs 1a to 1c A 45-year-old female patient presented to the clinic with a request to treat her deteriorating dentition that had been reconstructed 15 years ago with fixed restorations. Clinical examination revealed fixed partial dentures cemented to natural abutments in the maxilla, whereas telescopic restorations were cemented to natural abutments bilaterally in the mandible. The treatment plan included a whole-mouth rehabilitation utilizing natural teeth and implants. As the patient declined any surgical augmentation procedure, the hopeless teeth (maxillary right first premolar and mandibular bilateral third molars) were removed and following the alveolar ridge maturation, a surgical guide for implant placement was fabricated. However, due to anatomic jaw limitations and the patient's rejection of advanced bone augmentation procedures, ideal prosthetically driven implant placement could not be implemented. Three implants (Steri-Oss, Yorba Linda, CA, USA) were placed in the right maxilla, four implants in the right mandible, and three in the left mandible. The patient presented to the prosthodontist's clinic with the implants already in place, and the treatment plan was reconceptualized according to the existing situation from this stage.

Figs 2a to 2c The mandibular abutments consisted of four implants and two prepared premolars (from the previous rehabilitation) on the right side, and three implants and two telescopic copings on the premolars on the left side. Due to massive resorption of the edentulous ridge and implant placement according to the existing anatomic conditions, the left mandibular implants were placed with a pronounced lingual inclination. In the maxilla, the implants were again placed according to existing anatomic limitations. The esthetic zone exhibited six anterior maxillary teeth with composite resin restorations, an uneven and straight incisal line, and gingival recession of the right canine and lateral incisor. Adjacent to the mandibular incisors, labial gingival recession was noted.

3a

3b



4a

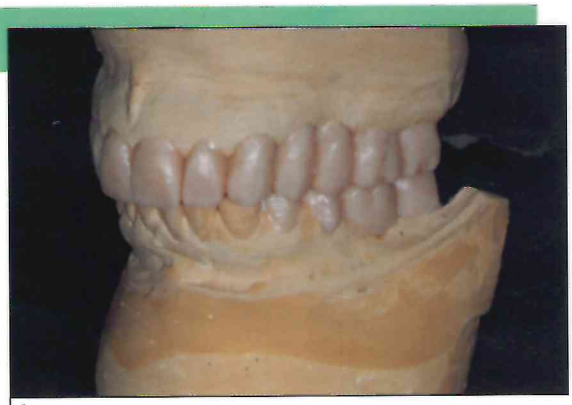
4b

5a

5b

3c

Figs 3a to 3c The lateral views of both sides depict overeruption of the previously restored maxillary molars, which resulted in decreased intermaxillary space and accentuated curves of Spee. The treatment plan at this stage would include a significant reduction of the maxillary molars' vertical height, with or without surgical crown elongation, and possible extraction of the inclined right first molar. The vital anterior maxillary teeth should be modified in shape and color either by full-coverage crowns or porcelain veneers, whereas the nonvital left lateral incisor and canine should be crowned. The mandibular incisors' recession should be treated by conservative periodontal treatment. To assess the different treatment steps for achieving an optimal prosthetic result, articulator-mounted diagnostic models are required.

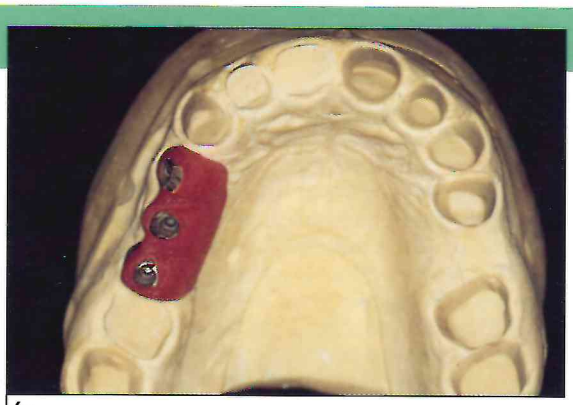


4c

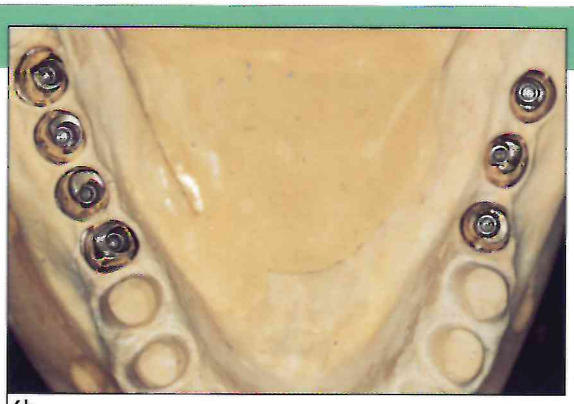
Figs 4a to 4c The diagnostic wax-up revealed that correction of the curves of occlusion was possible only by prosthodontic redesigning, with minimal to no need for surgical modification of the posterior maxillary teeth. Together with the laboratory technician, with the patient present, an esthetic analysis was conducted at this stage. Because of a low upper lip line and a restricted gingival display, it was decided not to treat the gingival asymmetry of the maxillary anterior teeth. However, it was decided that the incisal line of these teeth should be corrected and the color of all teeth enhanced.

5c

Figs 5a to 5c The diagnostic wax-up models served to create the external form of the provisional acrylic restorations through silicone matrices as well as constructions of custom-made gold transmucosal abutments to be connected to the implants. The implant abutments were designed such that their gingival part would blend with the surrounding soft tissue (with a pronounced chamfer finish line configuration), whereas their coronal part was designed to match the crown forms as duplicated from the optimal shape of the diagnostic models. In normal treatment planning, the implants would have been placed according to the diagnostic models as well, thus enabling the use of prefabricated abutments to support the overlying crowns. However, to bridge the discrepancies between the existing implants' platform location and orientation to that of the planned crowns, the connecting abutments had to be custom-designed for each crown.



6a



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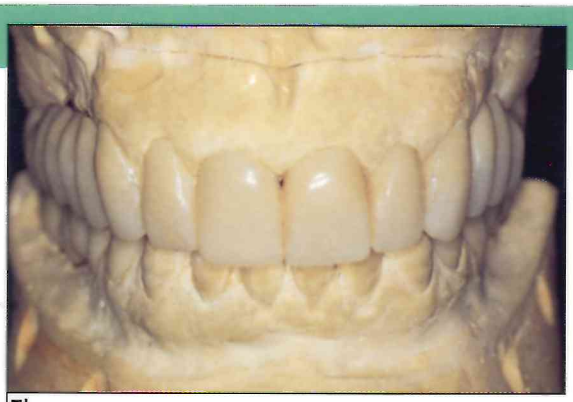
7a



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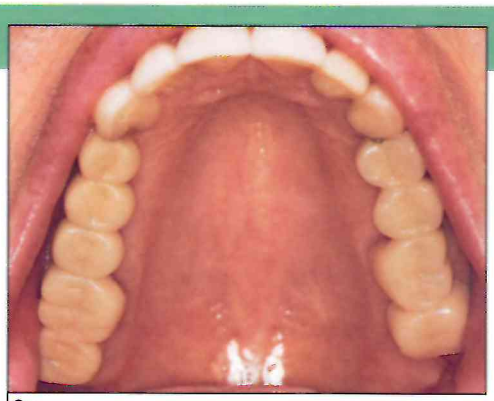

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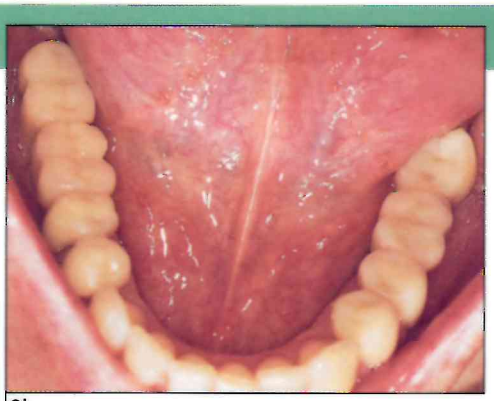

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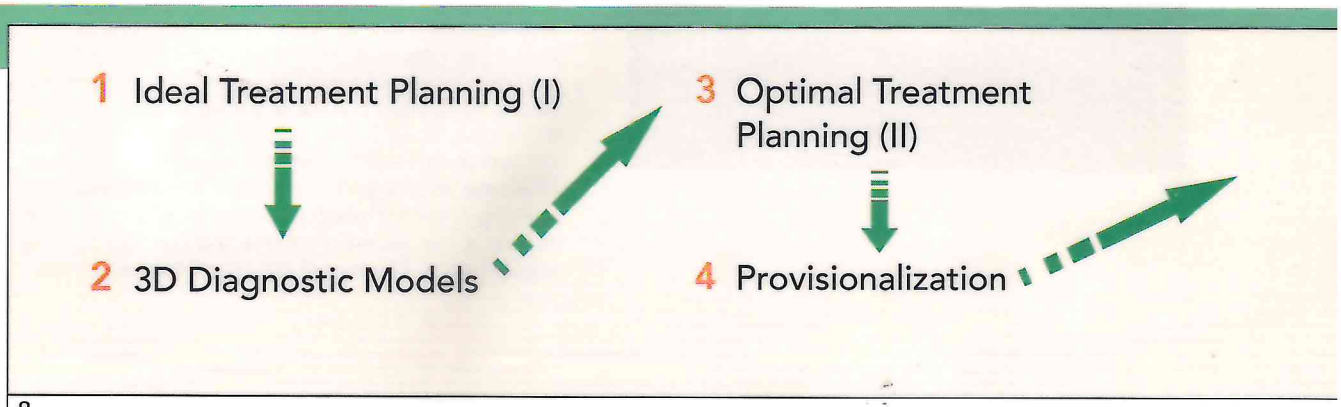

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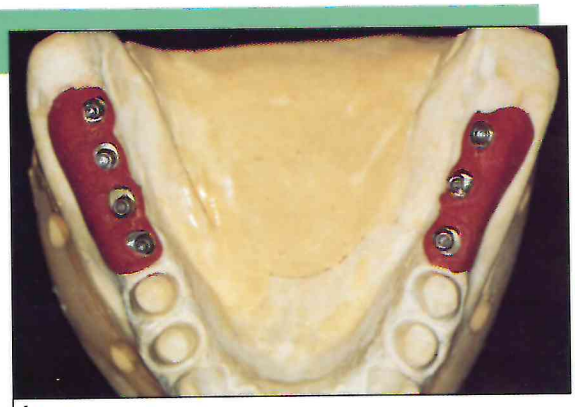

6c

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5 Intraoral Modifications

6 Realistic Treatment Plan (III)

Figs 6a to 6c The custom-made gold abutments were carried within an acrylic positioner to facilitate their delivery intraorally as well as to secure the abutments when screwing and connecting to the implants. Each abutment was shaped with a flat interproximal surface to avoid rotation of the abutments within the acrylic positioner and to have a definitive seating of each crown. Due to its superior esthetic, biologic, and physical properties, the Captek system (Precious Chemicals Inc, Altamonte Springs, FL, USA) was used to create all definitive restoration copings. The implant copings were fabricated directly onto the abutments to facilitate a later pick-up impression together with the natural teeth abutments using a full-arch impression technique.

Figs 7a to 7c The outer forms of the diagnostic provisional acrylic restorations were duplicated from the diagnostic wax-up. As for the inner aspects, the implant crowns were matched precisely to the implant gold abutments, whereas thin acrylic shells were created for the natural teeth abutments, to be relined after preparation. It was not yet determined whether the anterior maxillary teeth would be crowned or laminated. The overall provisionalization procedure of such treatment should be executed in one treatment appointment.

Figs 8a to 8c The transmucosal abutments were connected intraorally to the implants utilizing the acrylic positioner, and the natural abutments were re-prepared. The provisional crowns were adjusted intraorally several times while the patient was monitored for a period of 5 months. The provisional restorations were occasionally reexamined and readjusted to provide adequate function when assessing the supporting tissue reaction and when analyzing their esthetic appearance. It was then decided to restore the four vital maxillary teeth with bonded porcelain veneers (Creation, Klema GmbH, Meiningen, Austria). Despite potential periodontal involvement, it was also decided to use all of the right maxillary molars, including the steep mesially inclined second molar (which replaced the missing first molar). This was decided because the provisional restorations were functioning satisfactorily; they were properly cleaned and an excellent tissue reaction was maintained.

Fig 9 The diagram describes the treatment concept to this stage. The *ideal* treatment plan should always be verified by three-dimensional diagnostic models. The models are a key factor in analyzing the different possibilities of the initial treatment planning, and they ensure that an *optimal* treatment plan can be executed. The diagnostic models are then duplicated into provisional restorations to be placed intraorally. Depending on the case, a diagnostic period for analyzing function, esthetics, phonetics, and tissue reaction has to be set up, and the patient should be regularly monitored and treated if needed. This stage might last from 2 to 18 months, depending upon the initial status of the

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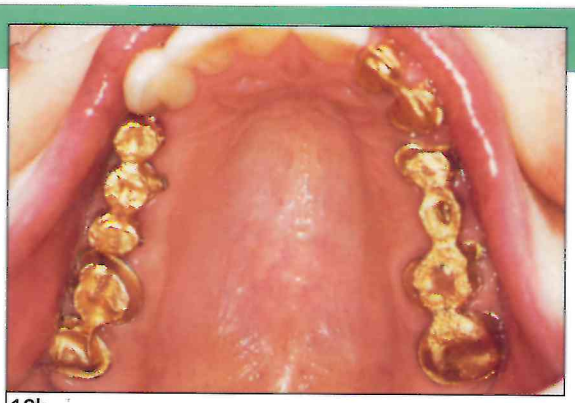

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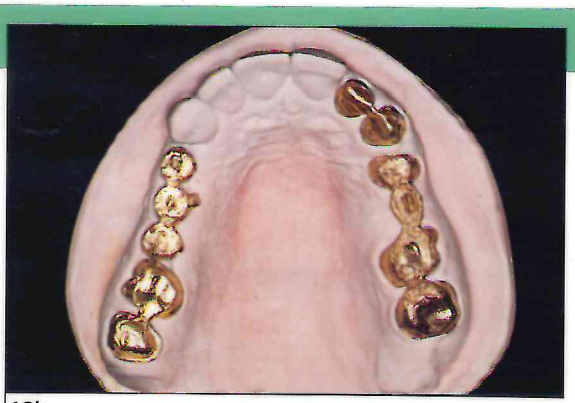

13b

supporting tissues and abutments, as well as the patient's cooperation and "dental IQ." The reaction and adjustment of the oral tissues to the provisional restorations and the necessary treatments that might arise accordingly are also looked for in the provisional stage. Only after complete healing of the oral tissues, and full satisfaction of the patient and the treatment team, is a realistic treatment plan determined. The definitive stage of the treatment can then take place.

10c

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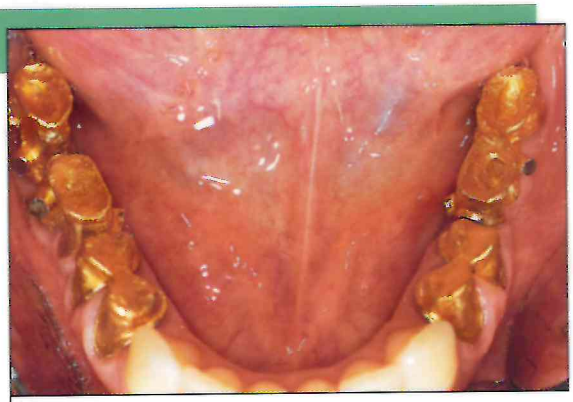

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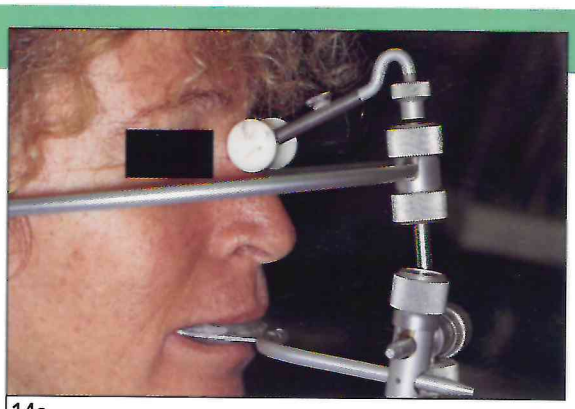
13c

Figs 10 to 13, a to c Single Captek copings were manufactured and verified for individual seating intraorally. The copings were then connected according to the definitive treatment plan, and a Captek wax-pontic was added for the missing maxillary left second premolar. An occlusal supportive ring was constructed over the mandibular copings according to the Captek metal design, and tubes for transverse screws were added to the implant-supported retainers. To achieve the final desired metal form, Capcon-Capfil materials (Captek system, Precious Chemicals Inc) were added where indicated. The metal substructures were designed to support the veneering materials and to minimize stress build-up between the metal and the veneering materials, thus minimizing metal deformation. The connected retainers were again verified for their seating intraorally, and pick-up impressions were made to construct the definitive working casts and to provide the correct relationship between the restoration margins and the surrounding gingiva.



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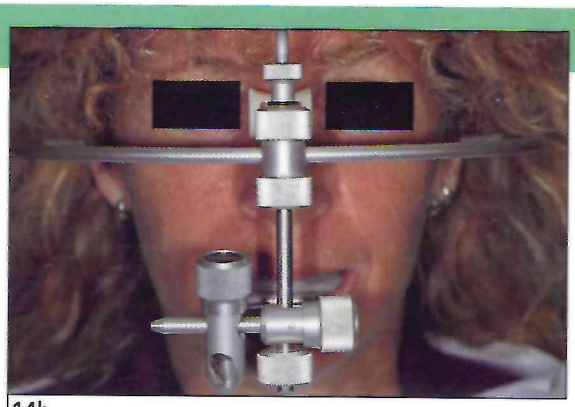

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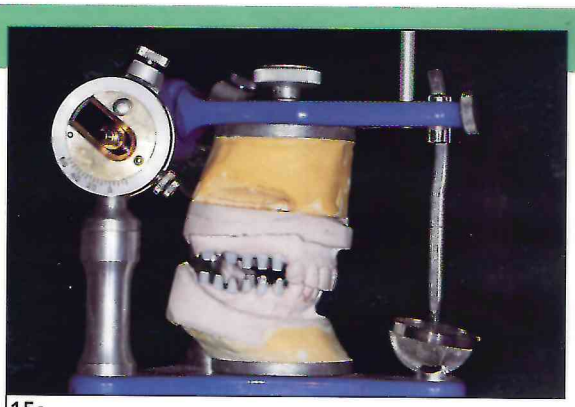

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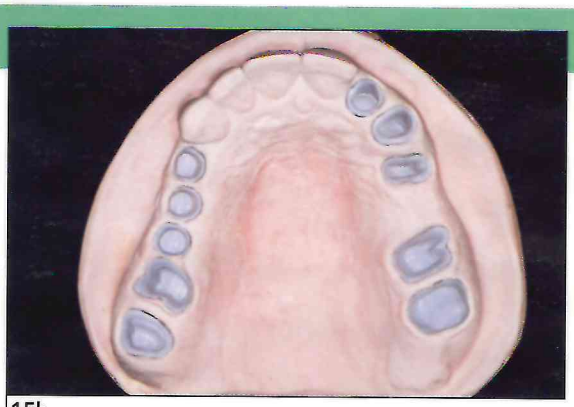

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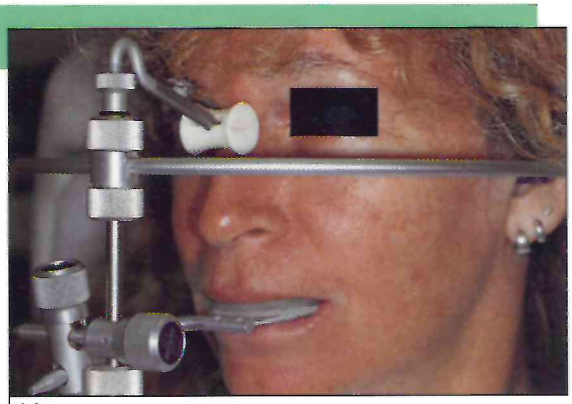

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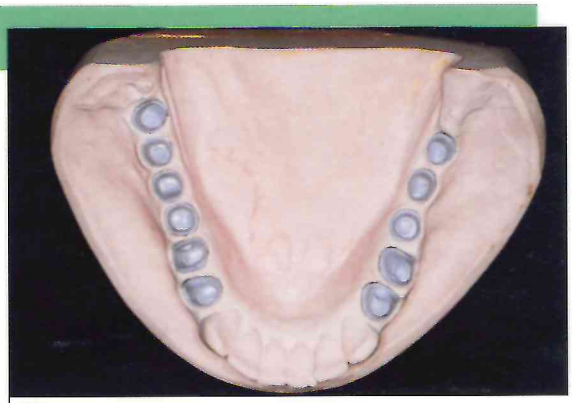
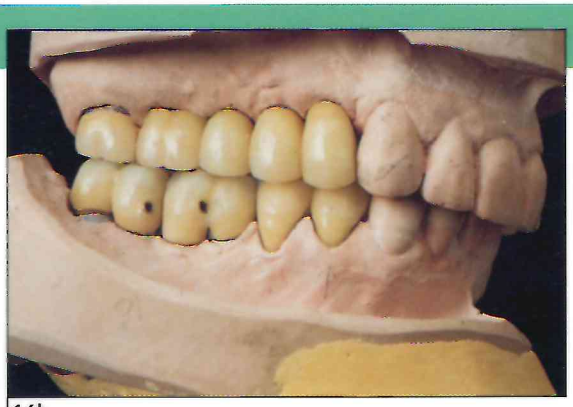


15c

Figs 14 and 15, a to c In the authors' team experience with full-mouth rehabilitation treatment, the use of a semi-adjustable articulator is sufficient for transferring the intermaxillary and intraoral data to the laboratory, with minimal intraoral adjustments required. A spring-loaded universal face-bow (Face Bow AEA, Dentatus, New York, NY, USA) has been used to record the orientation data and transfer it to the articulator (Dentatus Articulator ARH), and the casts were mounted.

16a



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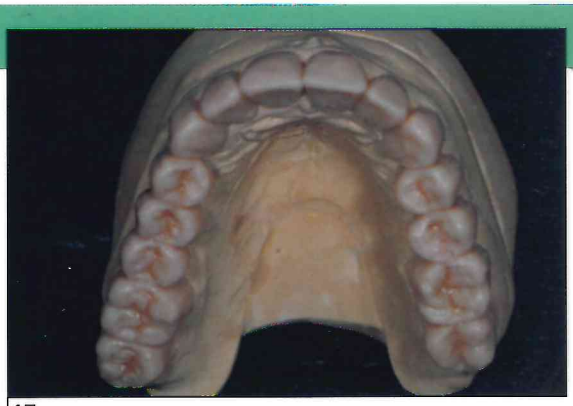

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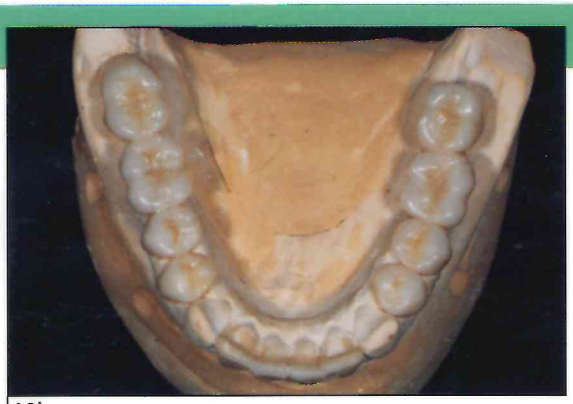

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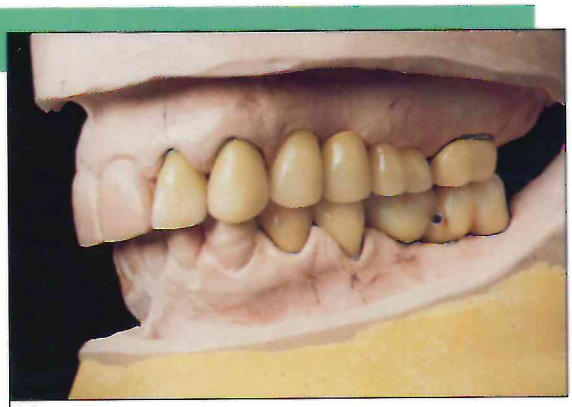

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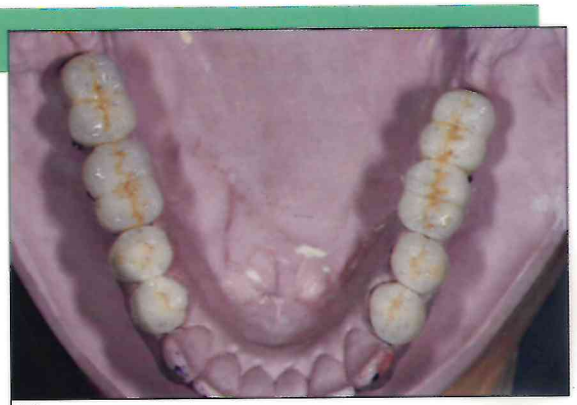
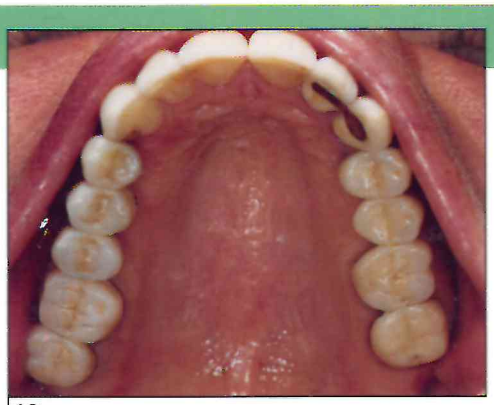


18c

Figs 16 to 18, a to c The veneering outer forms of the definitive restorations have been duplicated from the intraoral modified acrylic provisional restorations after serving for 5 months. The natural teeth crowns were veneered with porcelain (Creation) fused to the Captek copings. The implant-supported crown copings were veneered with a laboratory composite resin (ArtGlass, Heraeus Kulzer, South Bend, IN, USA). It has been the authors' experience that the Captek system provides maximum support and adherence to laboratory composite resin veneering materials, and that a composite resin veneer in transverse screw-retained crowns is more durable and long lasting than a ceramic veneer. It should also be noted that the implant-supported crowns, in addition to their transverse screw connections, are cemented with provisional cement (Improv, Steri-Oss) and are retrievable, if needed, for possible future repairs and enhancements. The restorative three-dimensional shape was initialized with an optimal design in the diagnostic models, duplicated into provisional acrylic restorations, modified intraorally as needed during the diagnostic monitoring phase, and then duplicated in form to the definitive restorative materials.



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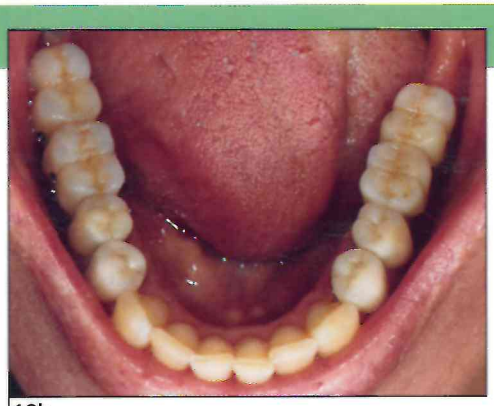

19b

20a

20b

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19c

20c

Figs 19 and 20, a to c During a routine recall visit, 18 months postoperatively, the implant crown restorations were retrieved for examination of the provisional cement status and the gingival reaction surrounding the transmucosal prosthetic units. Satisfactory results were observed, and marked functional and esthetic improvements to the preoperative status were noted. The various types of definitive restorations—the porcelain veneers of the anterior maxillary teeth, the porcelain-fused-to-Captek crowns over the natural abutments, and the ArtGlass-fused-to-Captek retainers connected to the (gold custom-made abutments screwed to the) implants—exhibited complete integration with healthy surrounding tissues.

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