

Mandibular dental reconstruction

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The mandibular reconstruction described in the following case report was performed using the Astra Tech Implant System® EV and the SmartFix® concept (Dentsply Sirona Implants).

The patient selected to have her mandibular dentition comprehensively rehabilitated with an implant-supported fixed prosthesis utilising four implants. The remaining five teeth demonstrated a suitable vertical dimension of occlusion in centric relation with the occlusal plane providing acceptable phonetics and aesthetics (Fig. 1). A panoramic radiographic image was taken to record the dentoalveolar status at the time when the patient initially presented (Fig. 2). The previous, failed posterior fixed dental prosthesis was removed prior to definitive treatment planning.

Following cone beam computed tomography (CBCT) based planning, the patient's remaining mandibular teeth were extracted. Implant treatment planning was performed in the SimPlant software (Dentsply Sirona Implants) revealing the proposed position of the teeth in occlusion and the estimated position of anterior implants (OsseoSpeed EV) and posterior implants (OsseoSpeed Profile EV) within the confines of the proposed final prosthesis (Fig. 3).

After surgical placement of the four implants, an alveolectomy was performed using a pilot guide approach. In the next step the appropriate abutments were placed in a tilted anteroposterior configuration to increase distribution according to the "Rules of 10" by Cooper et al.¹ Thus the abutments were torqued to 25Ncm. Anteriorly, straight abutments were used. Owing to its flexibility the polyether ether keton (PEEK) abutment holder was used to avoid the tongue and cheek and to confirm parallel alignment with the other three abutments (Fig. 4). Cylinders were then placed onto the abutments using the appropriate screws. According to the clinician's choice of opaque material the cylinders were filled with vinyl polysiloxane (VPS) impression material to protect the screws. Polymerisation sleeves were consequently placed on each abutment below the designated finishing line in order to protect the freshly sutured incision line (Fig. 5).

A CAD/CAM milled provisional was provided at the time of implant placement (Fig. 6). After attaching the prosthesis to the temporary cylinders using a closed mouth technique to assure its position in centric relation, the prosthesis was veneered with pink composite material to

replicate mucosal and alveolar architecture. It was then attached to the abutments using Multibase EV Bridge Screws torqued to 15Ncm (Fig. 7). Following this combined surgical and restorative treatment session a panoramic radiograph was taken revealing the alveolectomy, the relative implant positions, the angular correction using the posterior 17 degree multibase abutment and the general position of the radiolucent prosthesis (Fig. 8).

After eight weeks of uneventful healing, the relative health of the peri-implant mucosa was checked. The patient was extremely satisfied with the fit, function and aesthetics of the interim prosthesis (Fig. 9). The relatively immature nature of the mucosa and modest inflammation was observed on the alveolar ridge crest. The peri-implant mucosa adjacent to the abutments however proved to be well adapted to the cylinder margins and free of inflammation (Fig. 10).

In the next step a prosthetic guide was printed from the previously taken CAD/CAM files in order to design the milled poly(methyl methacrylate) (PMMA) prosthesis. The guide was used during surgery to assess the position of the implants and to help align the non-indexed 17 degree multibase abutments (Fig. 11). The occlusal view of the prosthetic guide demonstrated the orientation of the cylinders to the proposed prosthesis' occlusal table and incisal edges (Fig. 12).

A final impression was taken within the prosthetic guide by attaching the cylinders to the prosthetic guide using flowable composite. The mucosa/prosthesis interface was subsequently impressed by washing the impression with low viscosity VPS impression material (Fig. 13).

After completing the impression step, the prosthetic guide was used to record centric relation, thus the position of the implants, the vertical dimension of occlusion and the centric relation could be accurately transferred to the laboratory. The incorporated tooth position and morphology provided the technician with all information regarding the planned (and desired) tooth position, phonetics and aesthetics (Figs. 14 & 15).

The final monolithic zirconia prosthesis was delivered and detailed supportive therapy instructions were provided. The practitioner should note that when proper alveolectomy is performed, the prosthesis will measure at least 10mm in height. Further gingival ceramic should

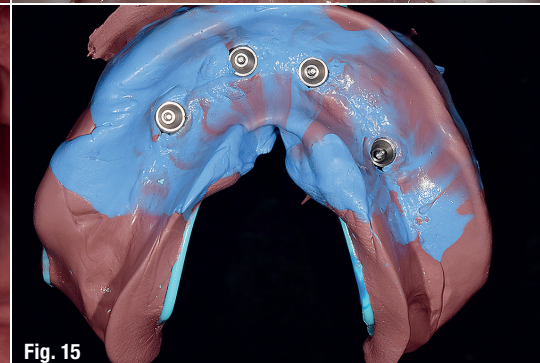
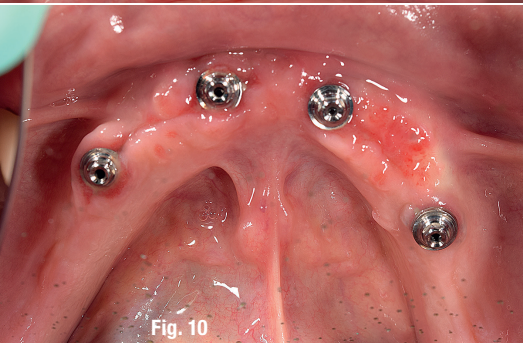
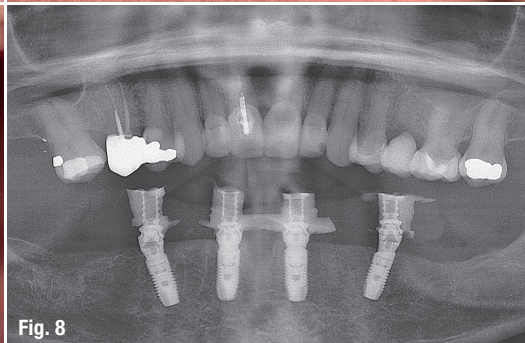
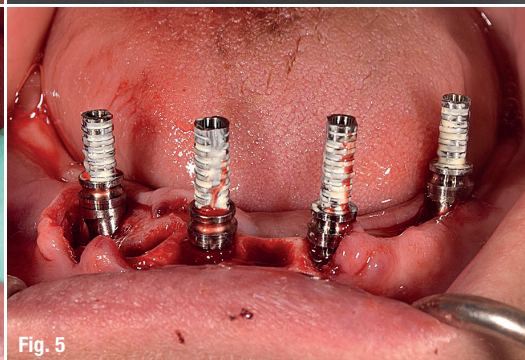
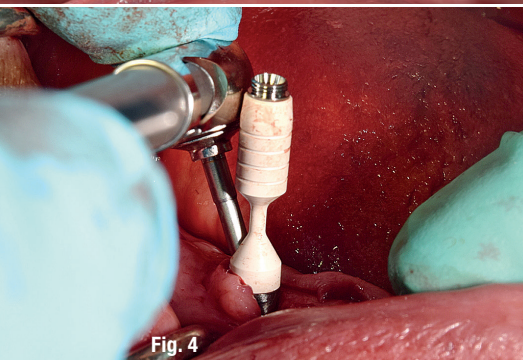
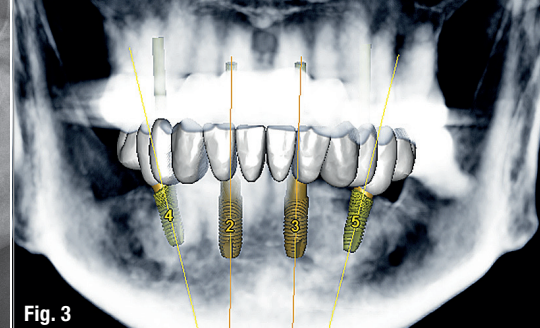
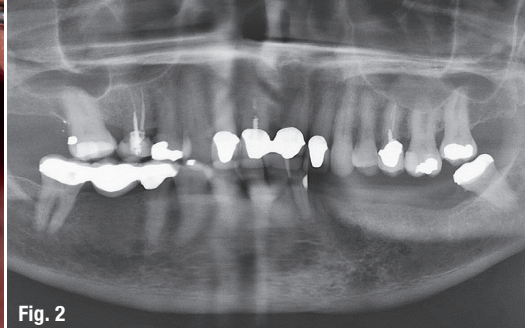
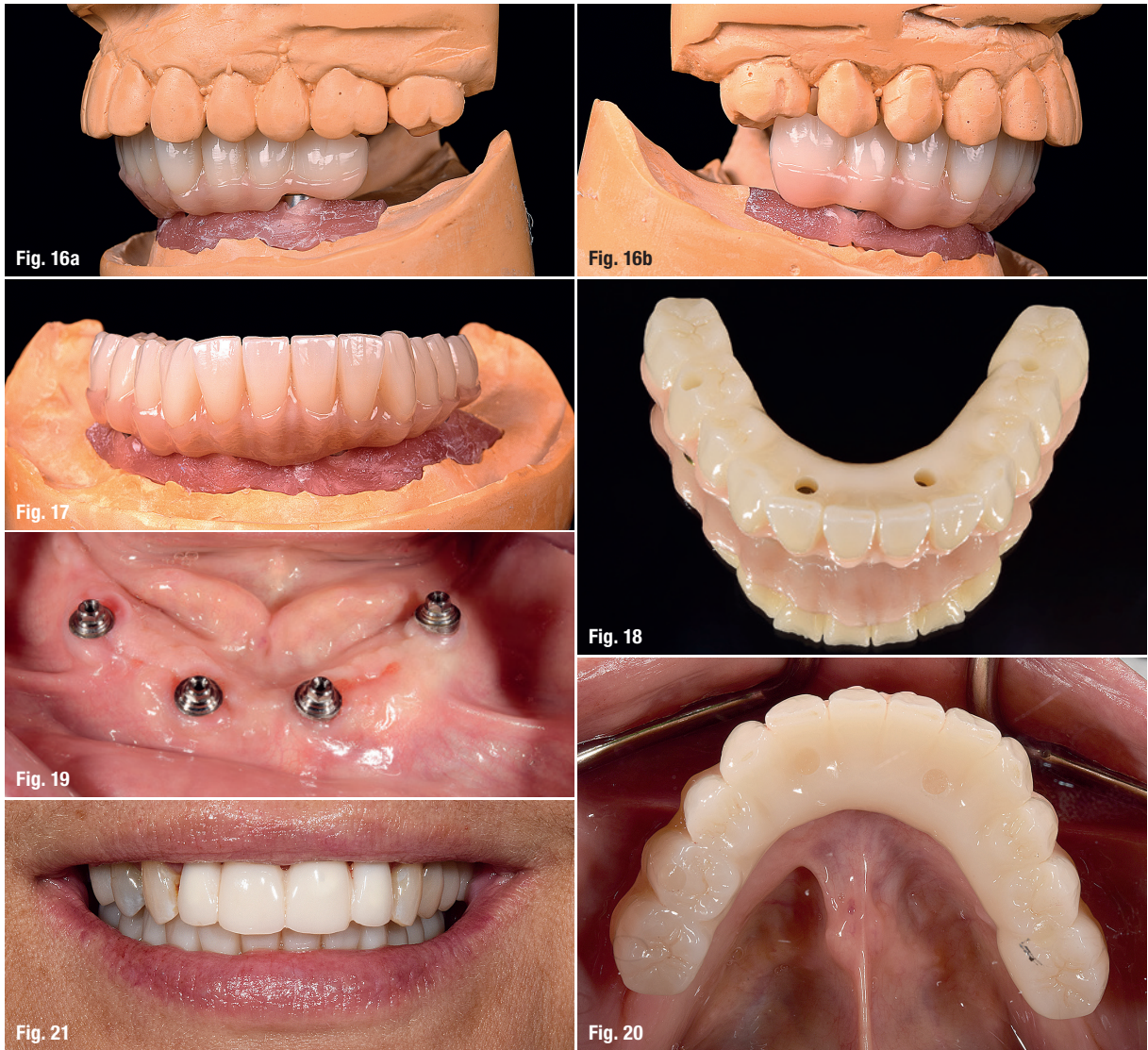


Fig. 1: Intraoral appearance of the pre-treatment dental condition. **Fig. 2:** Panoramic radiographic image demonstrating the initial dentoalveolar status. **Fig. 3:** Implant treatment planning performed with SimPlant software (Dentsply Sirona Implants). **Fig. 4:** Multibase Abutment EV (Dentsply Sirona Implants) placed at a torqued of 25Ncm. **Fig. 5:** Multibase EV Temporary Cylinders (Dentsply Sirona Implants) filled with VPS material placed onto the abutments. **Fig. 6:** Polymerisation sleeves placed on each abutment to protect the incision line. CAD/CAM milled PMMA provisional sitting loosely over the abutments demonstrating the correct alignment of abutment and cylinders. **Fig. 7:** Prosthesis attached to the temporary cylinders. **Fig. 8:** Postsurgical panoramic radiograph. **Figs. 9 & 10:** Eight-week postsurgical check-up: Peri-implant mucosa is well adapted to the cylinder margins and free of inflammation, modest inflammation on the alveolar ridge crest. **Fig. 11:** Prosthetic guide used during surgery for assessment of implant position and to help align the abutments. **Fig. 12:** Occlusal view of the prosthetic guide. **Fig. 13:** The prosthetic guide being used for final impressions. **Fig. 14:** Prosthetic guide used for recording centric relation. **Fig. 15:** Intaglio surface view of the copings picked up in an open-tray impression using a stock dentate impression tray.



Figs. 16a & b: Buccal view of the final monolithic zirconia implant-supported fixed prosthesis with veneered gingival ceramic (Lee Culp, Sculpture Studios). **Fig. 17:** Facial view of final prosthesis. **Fig. 18:** Occlusal view revealing bulk of material designed to assure long-term function. **Fig. 19:** Progressed oral mucosal healing and keratinized tissue surrounding the abutment–cylinder interface upon final prosthesis delivery. **Fig. 20:** Intraoral occlusal view of the final prosthesis following delivery. **Fig. 21:** Facial view of the patient’s smile upon delivery of the mandibular prosthesis.

be displayed beneath the cervical contours of the mandibular teeth (Figs. 16 & 17). The bonded titanium cylinders within the monolithic zirconia prosthesis are a critical bonding step that must be performed with care (Fig. 18).

At the time of final prosthesis delivery, the oral mucosal healing had progressed. The patient’s hygiene efforts had improved and the peri-implant mucosal architecture included the presence of keratinized tissue surrounding the abutment–cylinder interface (Fig. 19). The occlusion demonstrated bilateral symmetric contacts with the maxillary natural dentition as verified using shim stock. Only minor polishing was required to achieve this result. The screw access holes were filled with Teflon tape and colour-matching flowable composite resin in order to achieve a maximum aesthetic result (Figs. 20–22).

Literature

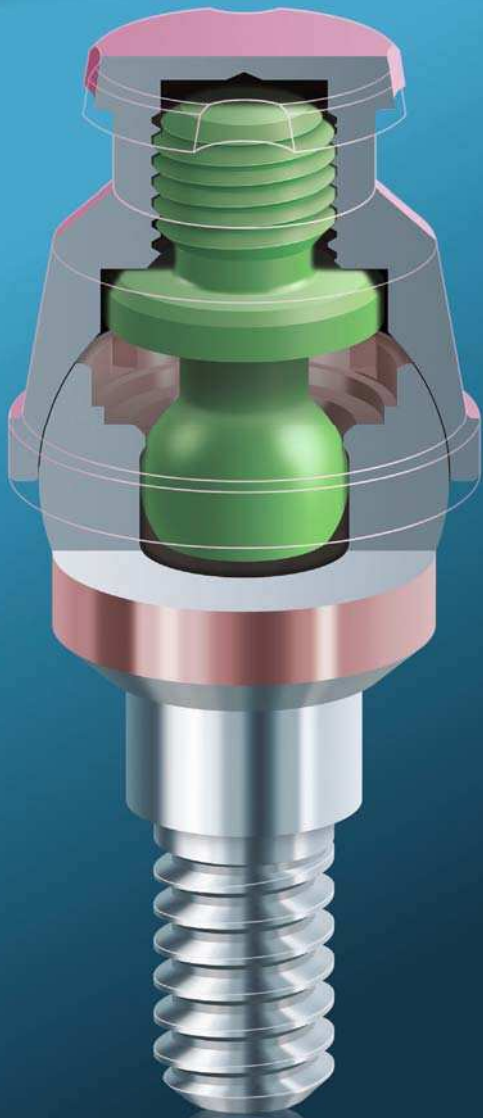
1 Cooper, L., Limmer, B. et al. “Rules of 10” – Guidelines for Successful Planning and Treatment of Mandibular Edentulism Using Dental Implants. *Compendium* May 2012; 33(5):328–34.

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