

Full arch rehabilitation: Double zygomatic implants with multiple monolithic zirconia crowns on a milled-titanium framework

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CASE PRESENTATION

The patient presented with an ill-fitting upper full-arch prosthesis associated with bilateral maxillary sinusitis. Her existing prosthesis was placed in 2004 at a private dental clinic in Thailand, and consisted of six implant-supported metal-acrylic hybrid restoration (Fig. 1a to 1e). Periapical and panoramic radiographs revealed six failing implants associated with right infected maxillary sinus (Fig. 1f).

After a thorough clinical examination, analysis and diagnosis, the treatment plan was formulated. It included the surgical removal of all six upper implants and replacement with double zygomatic implants followed by an immediate interim maxillary fixed complete denture¹. After the implants integrate and stabilise, a maxillary definitive prosthesis would be delivered simultaneously with the replacement of denture teeth for the existing mandibular implant-retained RPD.



Fig. 1a



Fig. 1b



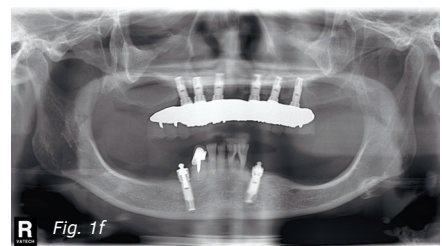
Fig. 1c



Fig. 1d



Fig. 1e



R Fig. 1f



Fig. 1g



Fig. 1h

Fig. 1a-1c: Intraoral frontal and occlusal views
Fig. 1d-1e: Close-up frontal and lateral view of the patient's smile
Fig. 1f: Initial radiograph of upper and lower jaws
Fig. 1g-1h: Maxillary prosthesis after surgical removal

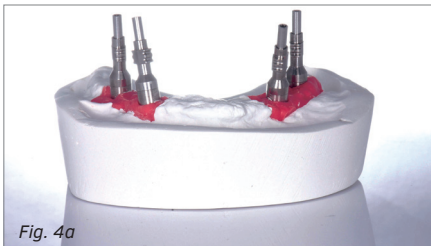
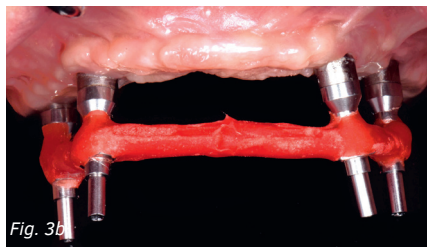
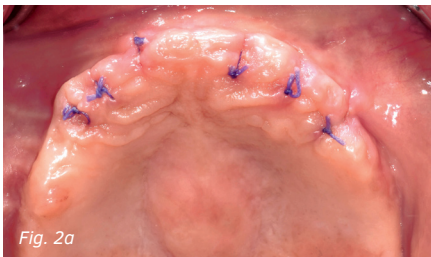


Fig. 2a: Maxillary arch after removal of failing implants
 Fig. 2b-2c: New maxillary complete denture fabricated for the healing period
 Fig. 3a: Zygomatic implants after healing
 Fig. 3b: The open-tray impression coping connected using Duralay

Fig. 3c: Final impression with polyether
 Fig. 4a-4c: A verification jig fabricated on the master cast with dental plaster
 Fig. 5a-5c: A full contour diagnostic wax-up was created and tried in the patient's mouth

SURGICAL PHASE

All six failing implants were surgically removed under local anaesthesia by an oral surgeon (Fig. 1g-1h) followed by the treatment of bilateral sinusitis. During the healing period, a conventional maxillary complete denture was fabricated to re-establish aesthetics and function while acting as an interim denture (Fig. 2a-2c).

After two-months healing period and confirmation of healthy tissue, the double zygomatic implants (NobelZygoma, Nobel Biocare) were placed under general anaesthesia. After primary stability was achieved in all four implants, the interim denture was converted to a fixed-complete denture following the immediate loading protocol¹.

DEFINITIVE DIAGNOSTIC WAX-UP AND FABRICATION OF AN AESTHETIC PROTOTYPE

After the placement of the zygomatic implants and four-months healing period (Fig. 3a), the preliminary impression was taken using closed-tray impression copings. A set of open-tray impression coping were splinted with dental floss and auto-polymerised acrylic (Duralay) on a stone cast. After the resin was fully polymerised, each impression coping was sectioned with a diamond-disk to compensate for shrinkage of the resin in the cast.

To obtain an accurate master cast, each open-tray impression coping was reconnected intra-orally before the final impression was taken with polyether impression material (Fig. 3b-3c). A plaster verification

Clinical Feature

jig was fabricated and placed intra-orally according to the One-screw test² to ensure accuracy of the master cast (Fig. 4a-4c). After the master cast was verified using the verification jig, a definitive diagnostic wax-up was created and tried in the patient's mouth (Fig. 5a-5c).

Once the patient was satisfied and accepted the proposed aesthetics, the diagnostic wax-up was scanned and digitally designed (3shape Dental System) to fabricate the milled-PMMA aesthetic prototype (Fig. 6a-6c). A gingiva cut-back was done to create sufficient space for pink composite layering (Ceramage gum colour set, Shofu) to enhance the aesthetic outcomes. The aesthetic prototype was delivered as per the patient's desired aesthetics and function³ (Fig. 7a-7c).

FABRICATION OF THE TITANIUM FRAMEWORK

The aesthetic prototype was duplicated and designed using the CAD software (Exocad, Zirkonzahn) for fabricating the milled-titanium framework (Titan5) designed to support the individual zirconia crowns. Subsequently, the framework was fabricated and tried in the patient's mouth to confirm fit and accuracy (Fig. 8a-8c).

A Lucia jig⁴ was fabricated to verify the vertical dimension of occlusion (VDO) and facilitate a jaw relation record in the centric relation (CR) position. The master cast with a titanium framework was mounted onto a semi-adjustable articulator (Fig. 9a-9c).

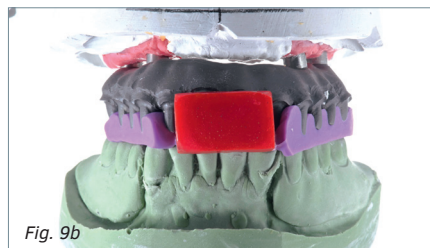
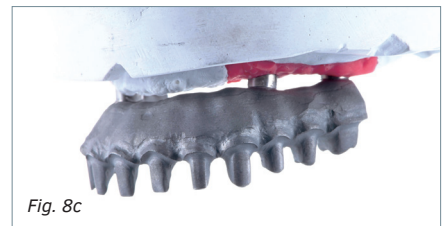
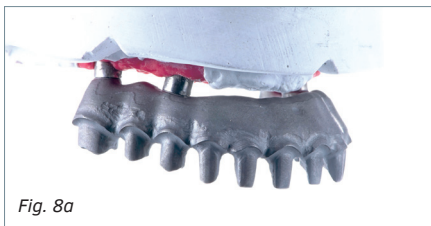
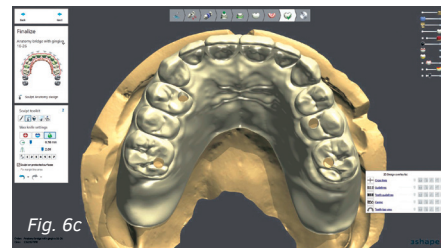
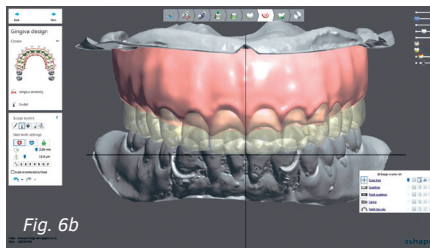
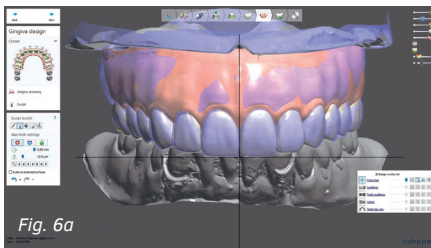


Fig. 6a-6c: Scanned diagnostic wax-up to design the monochromatic milled-PMMA aesthetic prototype
Fig. 7a-7c: A milled-PMMA prototype with Ceramage pink composite layering delivered to evaluate aesthetics and functions
Fig. 8a-8c: A definitive titanium framework for individual crowns was milled according to the data from the milled-PMMA aesthetic prototype
Fig. 9a-9c: A Lucia jig was fabricated to verify the VDO and facilitate the CR record

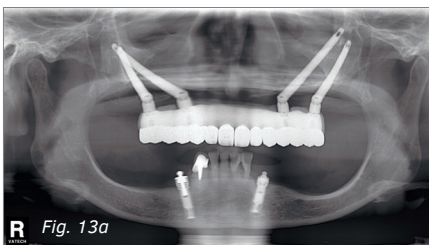
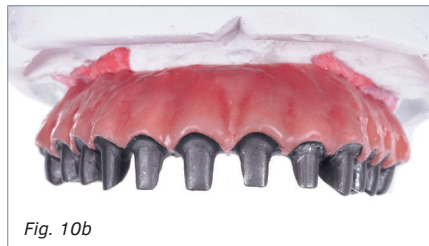


Fig. 10a-10c: The pink composite (Ceramage, Shofu) was layered to replicate gingiva in the titanium framework prior to the cementation of zirconia crowns
 Fig. 11a-11f: A definitive screw-retained prosthesis was delivered to the patient's mouth
 Fig. 12a-12c: The patient's smile with a definitive prosthesis
 Fig. 13a: Post-operative radiographic examination

The gingival portion was designed to have sufficient space for composite layering. The opaquer was applied to mask the greyish framework colour. The gingival portion was then layered and finished with the pink indirect composite (Ceramage, Shofu) (Fig. 10a-10c).

MONOLITHIC ZIRCONIA CROWNS FABRICATION

The monolithic translucent zirconia crowns (Vita YZ ST A3 blank) were milled using previous data from the CAD software (3shape

Dental System). These zirconia crowns were 3D stained externally (Vita YZ ST shade liquids) to mimic the natural appearance. The occlusal plane, contour, and alignment were designed according to the PMMA aesthetic prototype. Screw access on teeth 14, 25, 16, and 26 were drilled to hold the screw-retained prosthesis.

All zirconia crowns were internally sandblasted. The MDP-contained primer was applied onto the intaglio surface of the zirconia crowns

(Single bond universal) and cemented on titanium framework using resin cement (Rely X ultimate TR).

DELIVERY OF THE SCREW-RETAINED IMPLANT-SUPPORTED DEFINITIVE PROSTHESIS

The CAD/CAM maxillary screw-retained implant prosthesis with the monolithic zirconia individual crowns were cemented on the titanium framework and delivered to the patient (Fig. 11a-11f and Fig. 12a-12c). All screws were torqued at 35Ncm according to the manufacturer's instruction. A new set of denture teeth (Endura posterio A3, Shofu) were placed in the existing mandibular implant-retained RPD to improve the aesthetics and function of the lower arch.

The specific design selected for the implant-supported maxillary prosthesis provided two key benefits: Ease of retrievability and strength of the restoration⁵.

For instance, if there is a damage to an individual crown, a new zirconia crown can be milled before the patient's appointment using the existing CAD data and cemented independently. Secondly, this design allows the possibility of repairing only the damaged crown without having to replace the entire restoration which saves valuable time and minimises cost. Lastly, the strength and durability of monolithic zirconia crowns are superior to the acrylic resin teeth commonly used in the conventional metal-acrylic hybrid design.

In conclusion, the above clinical case highlights a patient-centric approach where a CAD/CAM maxillary screw-retained implant prosthesis with monolithic zirconia individual crowns were selected to provide a highly aesthetic and functional restorative solution with ease of repairability.

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