Star Concept: Guided Surgery 3.0

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A 63-year-old female patient visited the private clinic in Overijse, Belgium. The patient had a healthy status, was under no medication, and quit smoking 7 years ago. The patient's chief complaint was marked increased mobility of the upper teeth and inferior esthetics. The patient's wish was for an esthetic and preferably fixed solution that would enable her to eat, interact and maintain hygiene properly.

Data acquisition:

- Medical and dental history.
- Comprehensive clinical (extra-oral, intraoral, dental, periodontal, functional, esthetic) and radiologic examinations were performed. Standardized extra-oral and intraoral photographs of the initial situation were taken.
- Intraoral scans of both jaws (3Shape, Copenhagen, Denmark)
- Panoramic radiographs were performed.
- Facilitated communication with a treatment team. All data was uploaded to a cloud-based platform (SmileCloud, Dentcof, ADN3D Biotech srl, Timisoara, Romania).

Fig. 1 Initial Situation

Diagnosis

Based on the clinical and radiographic findings, the following diagnoses were determined:

- Extra-oral: Non esthetically-pleasing smile, no facial asymmetries
- Intraoral: No abnormalities
- Dental: Multiple insufficient restorations, multiple secondary and cervical caries
- Periodontal: Terminal Stage IV Grade A Periodontitis1
- Function: Sufficient contacts in maximal intercuspation position, canine-protected dynamic guidance
- Radiographic: Generalized horizontal bone resorption, multiple insufficient restorations and root canal treatments, multiple secondary caries and multiple periapical lesions
- Prosthetic: Insufficiently restored adult dentition
- Esthetic: Compromised esthetics

Based on the diagnosis, the prognosis of the upper teeth was set as poor, leading to a case of terminal dentition.

The available treatment options; complete dentures, implant-retained removable dental prosthesis, implant-supported removable dental prostheses, implant-supported fixed partial dentures were presented to the patient along with their advantages, limitations, required treatment time, as well as financial requirements. In addition, the initial plan of the smile design was presented to the patient to educate her about the different possibilities of tooth shapes, as well as proposed smile outcome. The patient chose the option of implant-supported fixed partial dentures.

Treatment plan

The treatment was divided into 4 phases:

1. Hygiene phase, education and instruction of the patient to optimize her oral hygiene, control after 6 weeks
2. Pre-prosthetic phase 1
3. Pre-prosthetic phase 2
4. Prosthetic phase

1. Hygiene phase

Education and instruction of the patient to optimize her oral hygiene, control after 6 weeks.

2. Pre-prosthetic phase no.1

The initial extra-oral and intraoral photographs were matched using cloud-based algorithms and helped to provide an initial smile design with individual tooth shapes (SmileCloud, Dentcof, ADN3D Biotech srl, Timisoara, Romania).

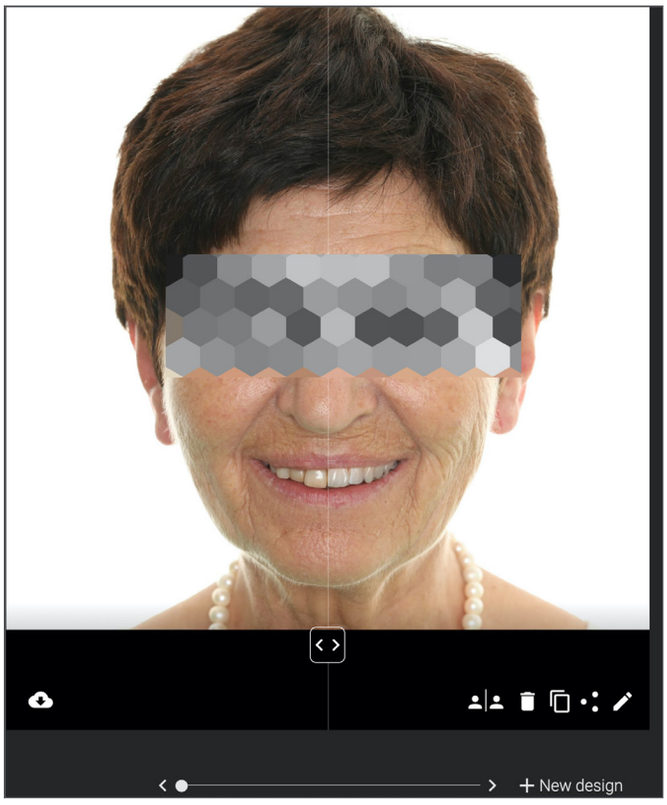
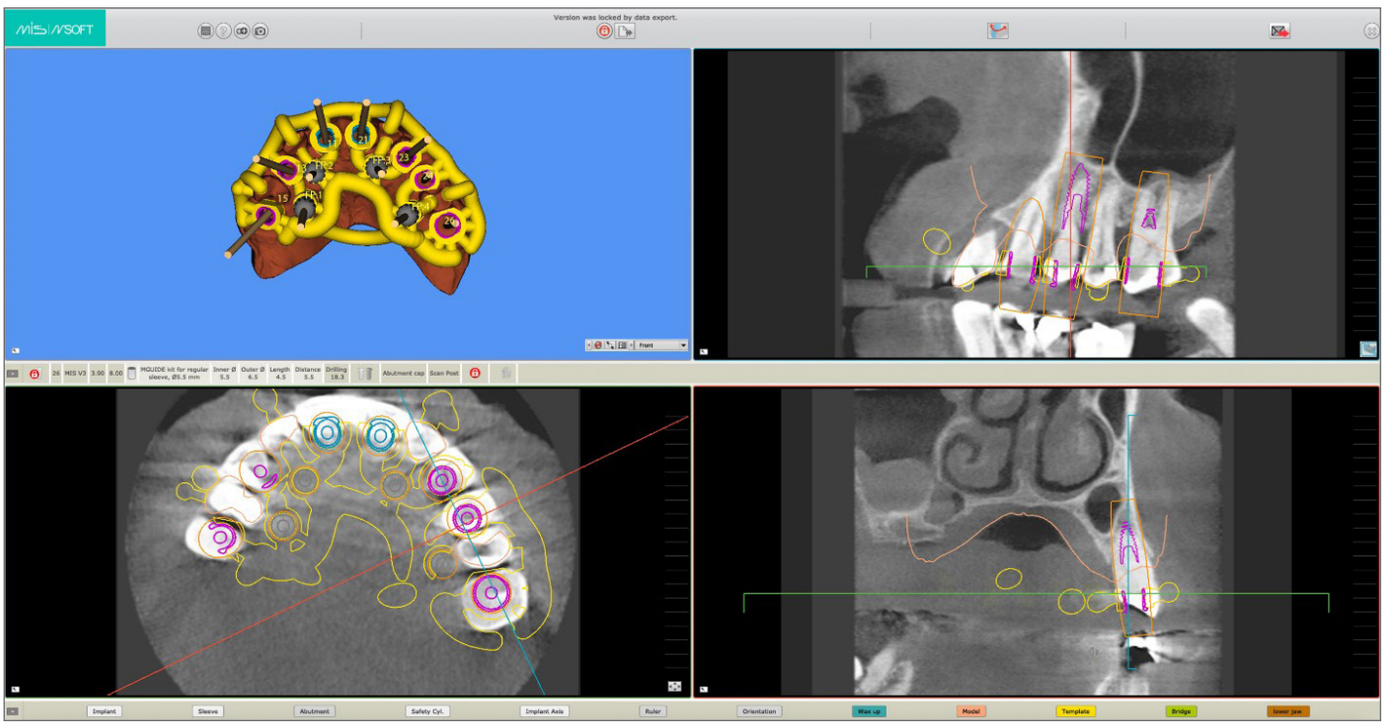


Fig. 2 SmileCloud design with natural shapes

A cone-beam computed tomography was performed (Pax i3D- Vatech, Seoul, South Korea). The CBCT data was imported into an implant planning software, along with intraoral scan data. In addition, STL data of the future restoration was uploaded and matched in an implant planning software (MSOFT by SMOP, MIS Implants) (Fig. 3). Afterwards, the data was used to virtually plan implant positions in the upper jaw.

Fig. 3 Planning of the implants in MSOFT



The teeth were virtually removed except for 14-12-22-25. The remaining teeth were kept to serve as temporary stabilizers of the surgical guide during the immediate implant placement procedure (Fig. 4). Then, 7 implants were virtually planned in the maxilla in positions 11, 13, 15, 21, 23, 24, 26. Multi-unit abutments (V3, MIS) were virtually connected to the implants 13-15, 23, 24, 26 and CONNECT abutments (CONNECT, MIS) on implants 11-21. In addition, 4 anchor pins were virtually planned for the implant surgical guide, which will serve in positioning of the immediate temporary restoration at a later time point. The pins were distributed in between the implants in the palatal area (Fig. 5).

The planning procedure and manufacturing of the surgical guide as well as temporary FPD were completed.

Fig. 4

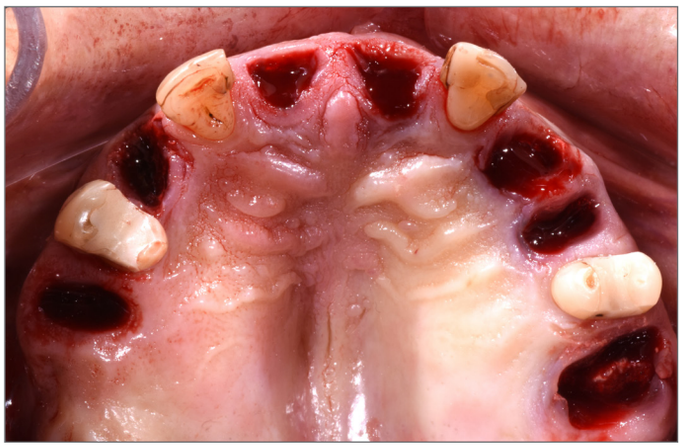
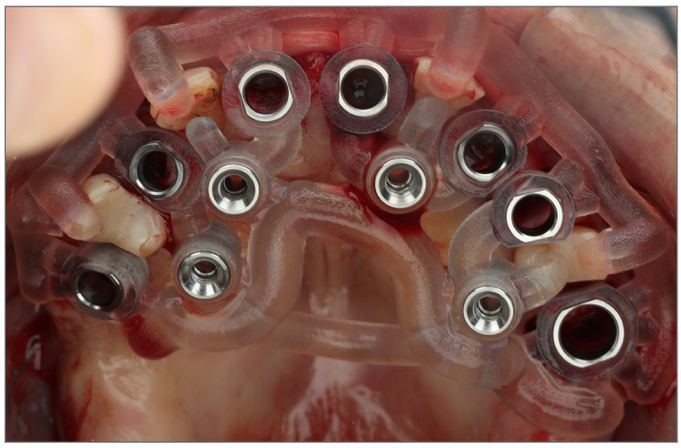


Fig. 5



3. Pre-prosthetic phase no. 2

Extraction of hopeless teeth along with implant placement and temporization were combined in one phase.

The implant surgical guide was secured onto the planned teeth and the fit was verified.

Afterwards, implant drilling took place using sequential drills, followed by fully guided implant placement (MGUIDE, MIS) protocol. In total, 7 implants were placed in the maxilla (V3, MIS) (Fig. 6).

After all implants were installed, drilling of the anchor pins took place. Then, the surgical guide was removed and teeth 14-12-22-25 were extracted (Fig. 7).

Fig. 6

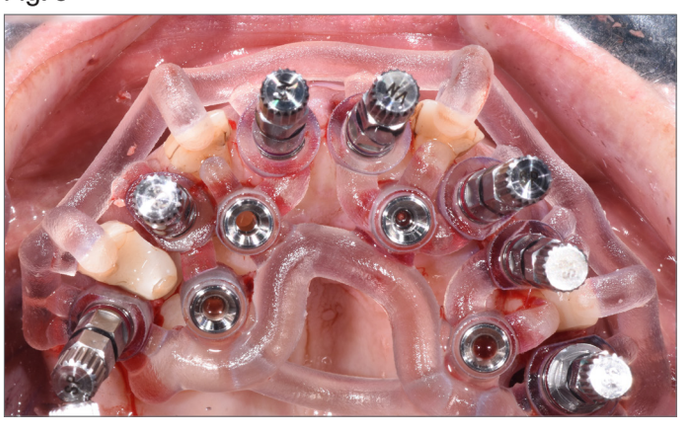
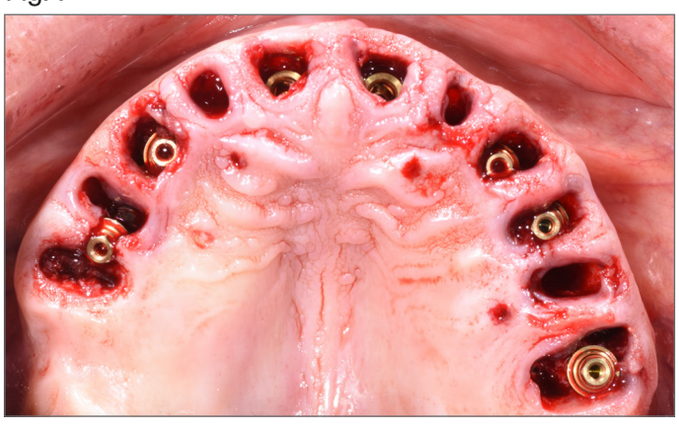
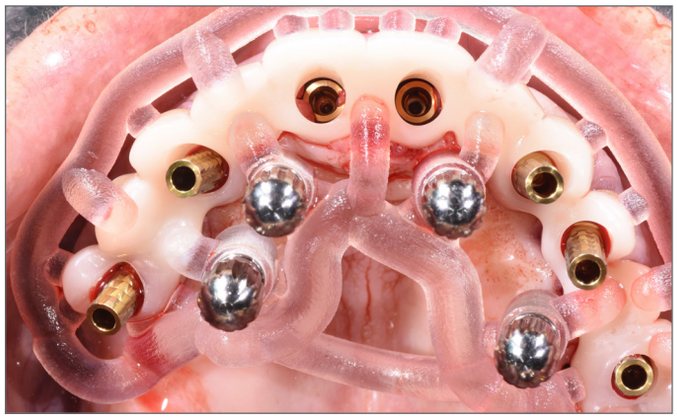


Fig. 7



Afterwards, the temporary FPD was loaded into the positioning appliance and secured in the planned position using the anchor pins (Fig. 8).

Fig. 8



The temporary cylinders were screwed onto the multi units and the voids with the access holes in the temporary FPD were filled using a flowable composite (Filtek Z250XT, 3M, St Paul, USA) in the upper third of the access holes.

After all cylinders were attached, the anchor pins were removed, followed by the appliance and the FPD. The remaining voids between the cylinders and the temporary FPD were filled extra-orally with PMMA resin (Unifast, GC, Tokyo, Japan) (Fig. 9).

Fig. 9

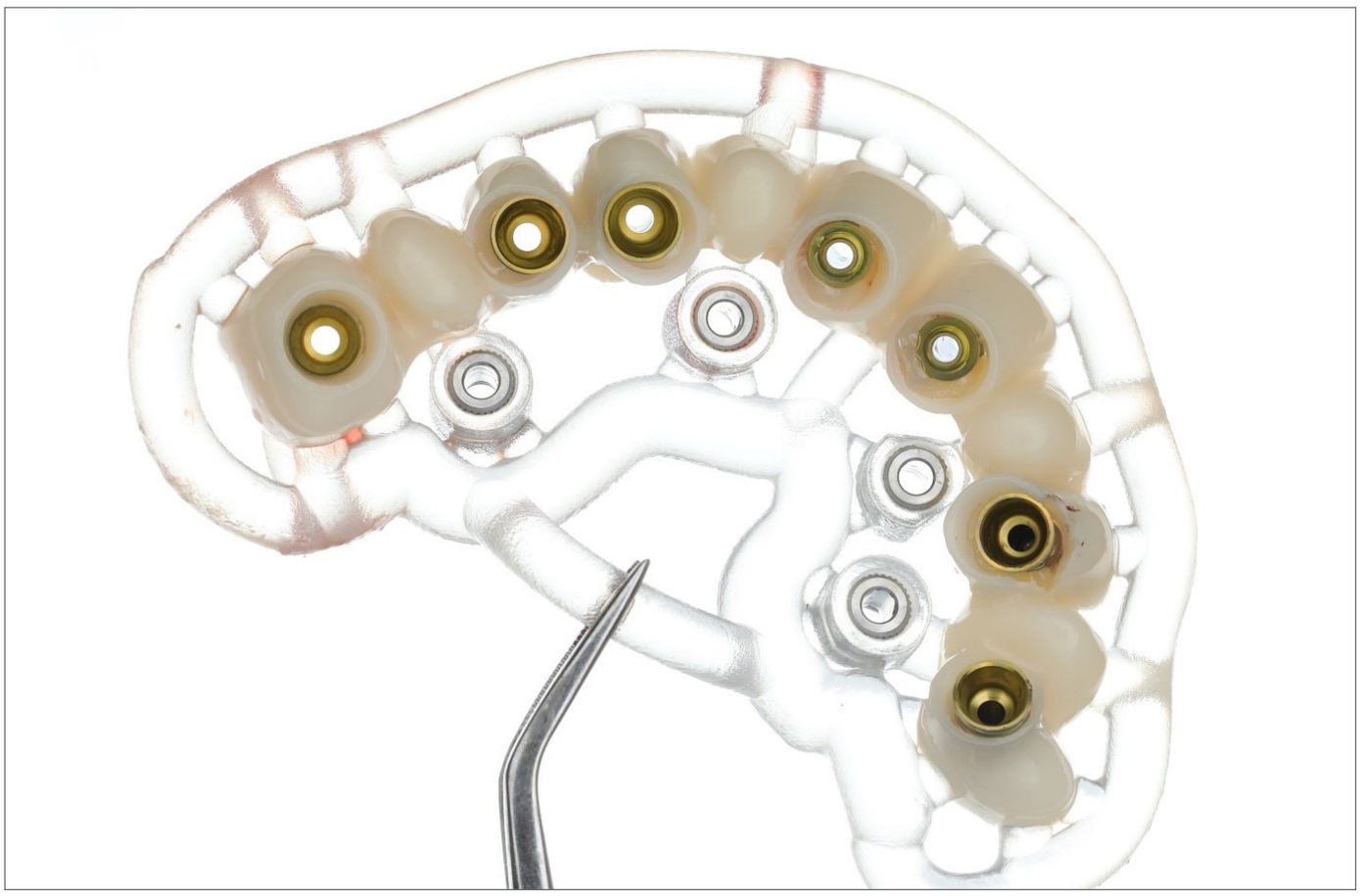


Fig. 10 Post-operative instruction, including having soft diet for 8 weeks after the procedure.

Fig. 11 After a healing period of 3 months

Conventional impressions using impression copings and a polyether material (Impregum, 3M Espe, Seefeld, Germany) along with custom-made impression trays were made.

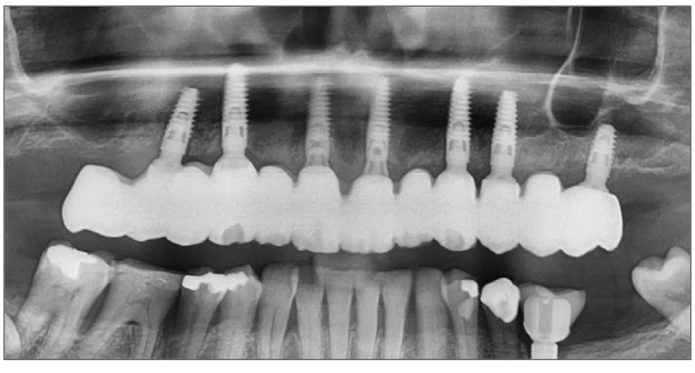
Fig. 12

Fig. 13

STL files were imported into the design software (exocad, exocad GmbH, Darmstadt, Germany) and superimposed with the design files in order to construct the final restoration. After the design was finalized, the final FPD was milled out of a zirconia material (Prettau, ZirkonZahn ,Gais, Italy). Then, the FPD was individually colored and sintered to final dimensions. Further esthetic enhancements were carried out by applying veneering ceramic to the facial surfaces of all teeth (Fig. 13).

After verification of the function, esthetics, phonetics and hygiene, the final FPD was delivered onto the implants. Two weeks after delivery, the patient was recalled for verification of the integrity of the restorations. The patient reported no issues with the newly delivered restorations and is very satisfied with the outcome.

Fig. 14 Final Outcome.



Conclusion

This case report presents a workflow that aims to improve the accuracy of immediate guided implant surgery and simplifies the procedure of delivering immediate temporary restorations for edentulous arches. The simplification of the clinical procedures and the immediate approach shorten the treatment time, reduce the patient's morbidity and improve the overall quality of life. Although the clinical procedures can be significantly simplified, the digital workflow presented requires an experienced and well-trained treatment team.

Acknowledgments

The authors would like to thank MIS Implants MCENTER (MIS Implants, Bar Lev, Israel) for their support in the design and manufacturing of the surgical guide, positioning appliance and immediate temporary FPD as well as the support of MetaLab (Timisoara, Romania) in the design and manufacturing of the final rehabilitation.

This clinical case has also been published in the 'Seattle Study Club Journal' - https://seattlestudyclubjournal.com/case-studies/special-report-12/