Immediate loading of a final fixed prosthesis in the edentulous maxilla on Straumann BLX implants

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Introduction

For many years, practitioners and patients have been concerned about bone resorption leading to reduced retention and therefore stability of conventional dentures.[1] Full-arch implant-supported fixed dental prostheses may provide more comfort and substantial improvements in prosthetic function, adaptation and stability compared with conventional treatment options.[2]

The rise and spread of digital dentistry have significantly influenced clinicians specialising in implant dentistry and full-arch restorations.[3] The continued development of CAD/CAM technology and 3D printing has revolutionised the manufacture of tooth-borne and implant-supported fixed dental prostheses.[4] Using digital technologies for fabricating full-arch fixed dental prostheses supported on implants can result in less expensive laboratory and clinical chairside time and lower overall cost.[5] Furthermore, owing to an excellent survival rate, implants immediately loaded with a fixed prosthesis have become a feasible choice in the rehabilitation of edentulous patients.[6]

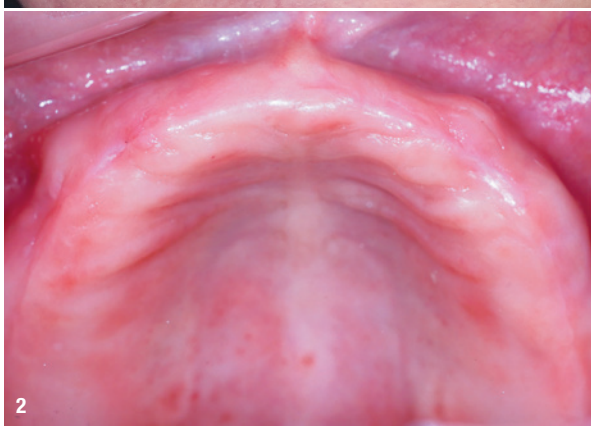

Fig. 1: Medium smile line and loss of the vertical dimension of occlusion. **Fig. 2:** Loss in width and height of the maxillary alveolar ridge.

The following case report aims to show a successful treatment involving immediate loading of a final fixed prosthesis in the edentulous maxilla on Straumann BLX implants.

Initial situation

A systemically healthy 59-year-old female non-smoker on no medication and with no allergies presented to our clinic with the chief complaint of her complete dentures lacking retention, preventing her from eating and speaking normally. She had worn complete dentures for a number of years and desired a solution that would improve her situation without requiring complex surgeries or a long treatment time.

Extra-oral examination with the patient wearing her dentures found a medium smile line and loss of the vertical dimension of occlusion due to the wearing of dentures. Without the dentures, inadequate soft-tissue support was evident, affecting the facial aesthetics (Fig. 1).

Intra-oral examination showed that the supporting soft tissue was slightly inflamed. The alveolar ridge of the maxilla and mandible showed a loss in width and height, although it had sufficient width and was covered by relatively healthy keratinised mucosa (Fig. 2).

The initial radiographic evaluation included dental panoramic tomogram (Fig. 3) and a CBCT scan. The CBCT

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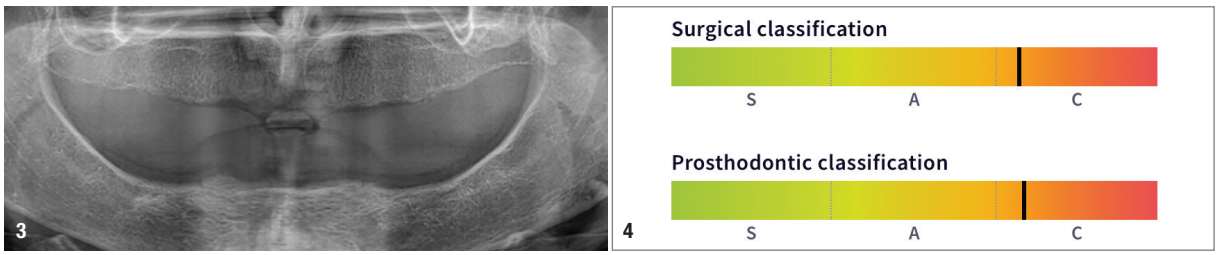

Fig. 3: Initial radiographic evaluation by dental panoramic tomogram. **Fig. 4:** The SAC classification of the treatment.

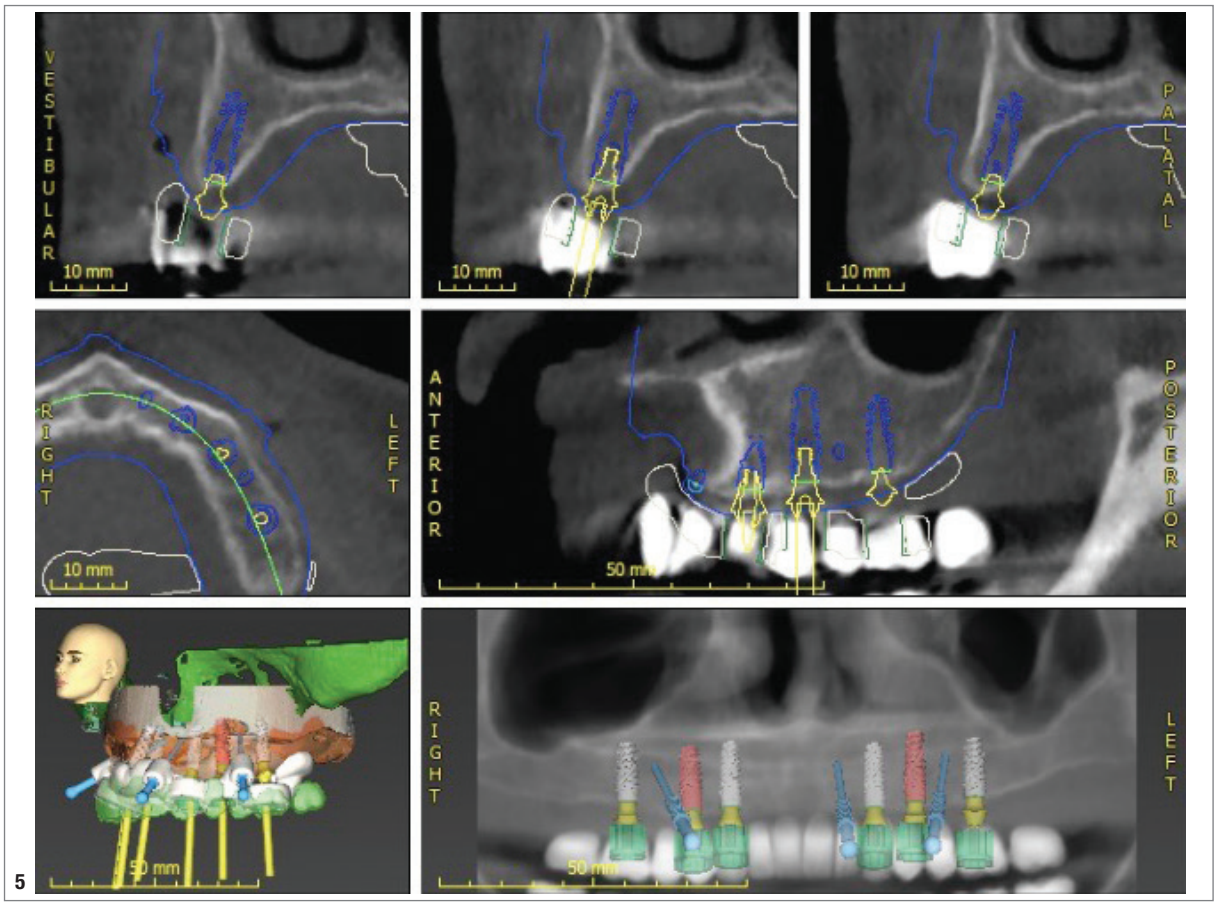

Fig. 5: Digital planning with coDiagnostiX.

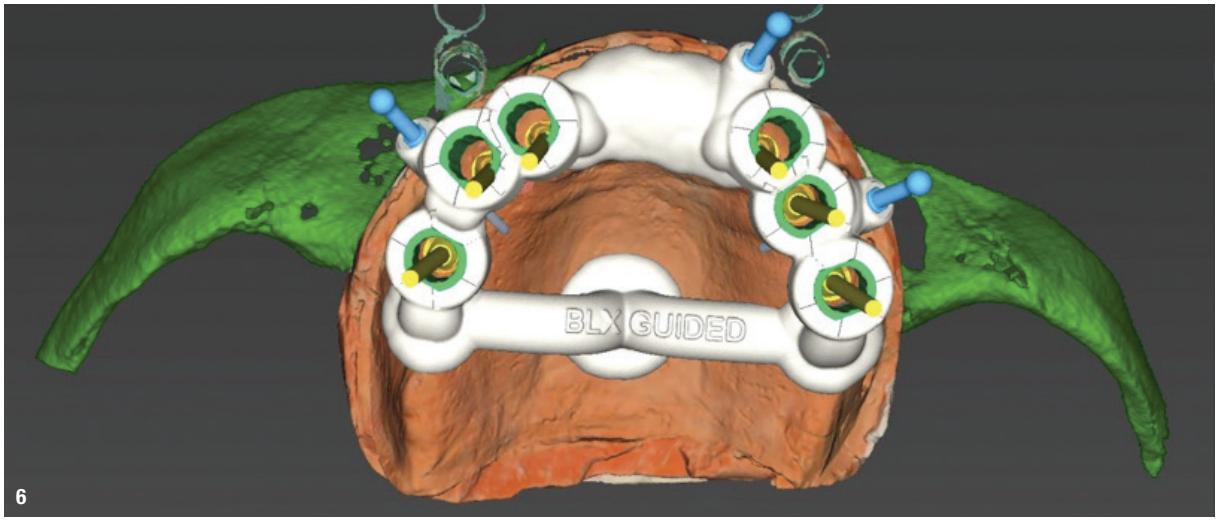

Fig. 6: Mucosa-supported guide design and planning.

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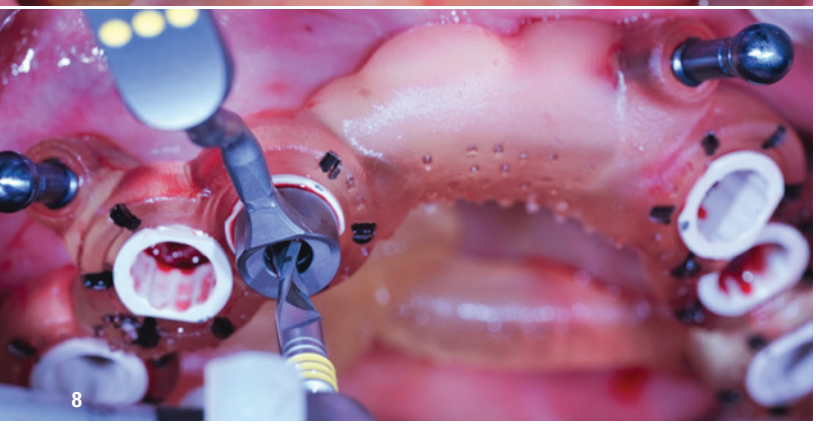


Fig. 7: Anchor pins inserted. **Fig. 8:** Implant bed being prepared with the Straumann Surgical Cassette.

Fig. 9: Implant being placed with the ratchet. **Fig. 10:** Position indicators on the implant driver and surgical guide.

scan was used to determine the amount and density of bone for implant placement. Sagittal sectioning revealed sufficient bone availability for implant placement. However, medium bone quality (Class D3) was also identified.

The SAC classification was used to determine the grade of difficulty of implant treatment for the patient. The case was determined to be surgically and prosthodontically complex (Fig. 4).

After the clinical and radiographic examination, and considering the patient's wishes and health, it was decided to place six Straumann BLX implants using a mucosa-supported guide in a flapless surgical procedure owing to the improved morbidity and to provide a full-arch implant-supported prosthesis.

The treatment workflow involved:
1. prosthetic and aesthetic analysis;
2. digital planning (Fig. 5) and mucosa-supported guide design and preparation (Fig. 6) with coDiagnostiX (Dental Wings);
3. placement of six Straumann BLX implants using the mucosa-supported guide;
4. fabrication, using a Straumann 3D printer, of a prosthesis prototype in resin-based provisional material with Variobase copings fixed to it;
5. immediate loading of Straumann BLX implants; and
6. fabrication of the final monolithic zirconia screw-retained prosthesis.

Surgical procedure

The mucosa-supported guide was checked on the edentulous area for proper fit. The flapless surgery was performed under local anaesthesia with 2% lidocaine and 1:100,000 adrenaline. The holes for the anchor pins were then drilled and they were inserted (Fig. 7). The implant beds were prepared using the Straumann Surgical Cassette following the pilot drilling protocol (Fig. 8).

After the implant bed preparation, the six implants were inserted (Fig. 9). The implants were placed manually with a ratchet in a clockwise direction to a final torque of 35–50 Ncm (Fig. 10). Position indicators on the implant driver and surgical guide were aligned as anticipated to indicate implant depth and connection orientation as planned in coDiagnostix (Fig. 11). Primary stability was achieved in all implant sites, which allowed us to proceed to the planned immediate loading protocol.

Prosthetic procedure

Seventeen-degree angled Straumann screw-retained abutments (SRAs) with a rounded shape designed for emergence profiles were placed on the implants in posi-

tions #16, 24 and 26. In addition, straight SRAs were placed on the implants in positions #16, #24, and #26 (Fig. 12). The Straumann SRA connection ensures long-term mechanical stability and protection against rotation. The SRAs are intended to allow versatility, especially when treating edentulous patients with Straumann BLX implants.

Open-tray impression copings were splinted together using PTFE and light-polymerised pattern resin (Fig. 13). During the laboratory phase, protective caps were placed to protect the implants and maintain the soft-tissue shape (Fig. 14).

Thereafter, the laboratory technician made the prosthesis prototype design (Fig. 15), and the prototype was produced from a resin-based provisional material using a Straumann 3D printer (Fig. 16), increasing efficiency and shortening the workflow. Variobase copings were fixed to it.

Two days after the surgery, the prosthesis prototype was screwed on to the abutments. Passive fit, occlusion, vertical dimension, position of the teeth and relationship of the teeth to the soft tissue were evaluated intra-orally and extra-orally (Figs. 17 & 18).

The prosthesis was produced monolithically using Straumann fourth-generation zirconia discs from the STL file of the design of the prosthesis prototype via CAD/CAM technology (Fig. 19). After the sintering and glazing procedures, Variobase copings were cemented to the hybrid prosthesis with self-adhesive resin cement. The gingival part of the hybrid prosthesis was stained using OPTIGLAZE (GC; Fig. 20).

Six days after surgery, a follow-up visit took place, during which it was established that healing had been uneventful (Fig. 21) and the hybrid prosthesis was screwed on to the abutments in the patient's mouth (Fig. 22). Proper extension and the prescribed occlusal scheme were checked. Mutually protected articulation with anterior guidance had been achieved (Fig. 23).

Eight months after implant placement, the patient returned for a follow-up visit (Fig. 24), and a dental panoramic tomogram was taken (Fig. 25). Furthermore, the patient was involved in a yearly maintenance programme, in which oral hygiene instructions were reinforced and a complete clinical and radiographic assessment was performed.

Treatment outcomes

This clinical case report has described the successful management of and outstanding outcome for an edentulous patient who desired a fixed, fast and atraumatic

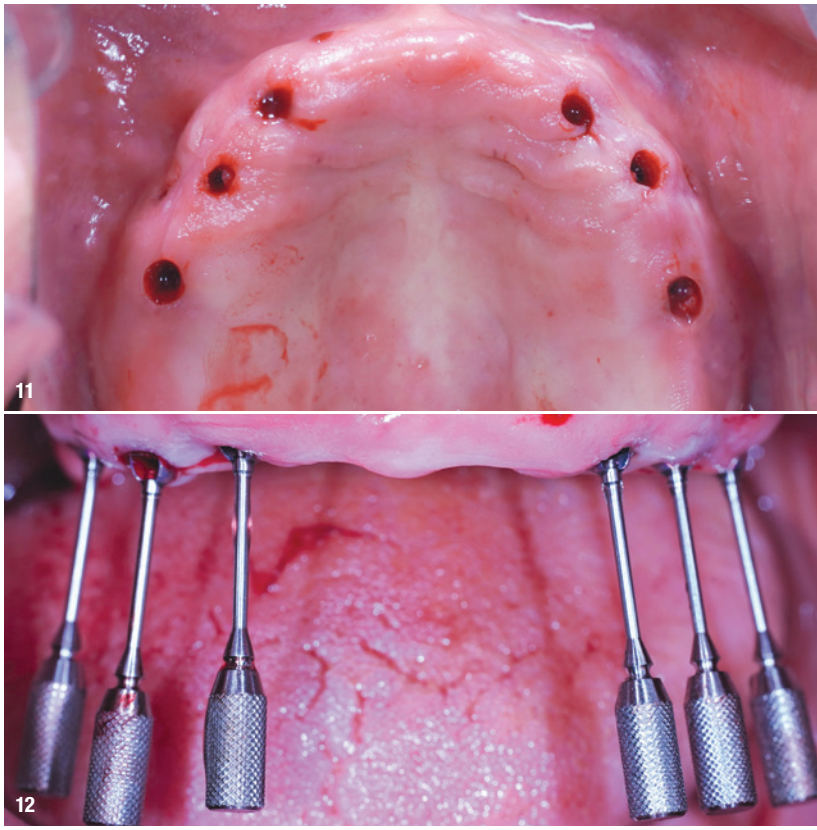


Fig. 11: Six Straumann BLX implants inserted using the flapless guided procedure. **Fig. 12:** Screw-retained abutments placed on the implants.

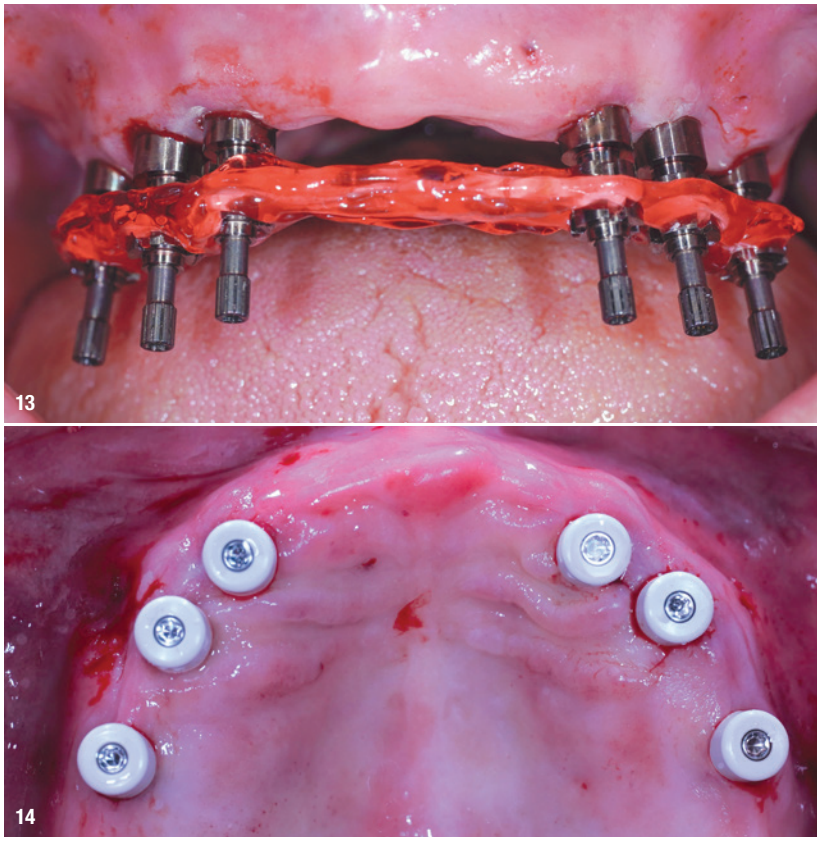
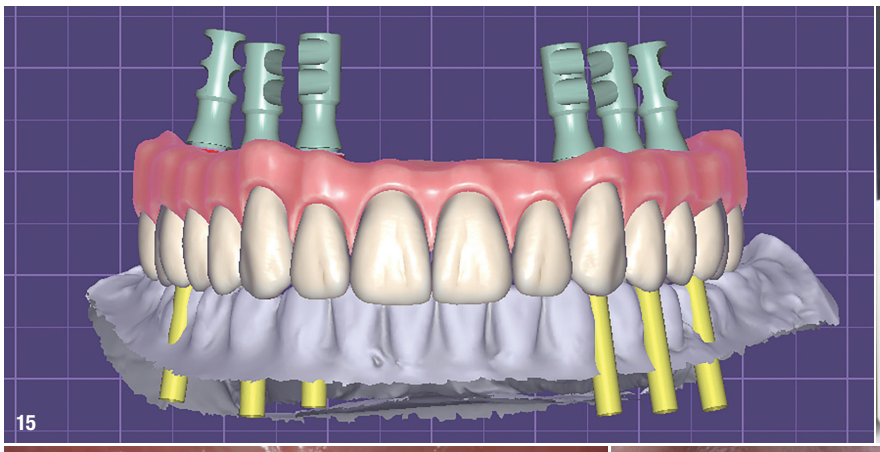


Fig. 13: Open-tray impression copings splinted together. **Fig. 14:** Protective caps placed.



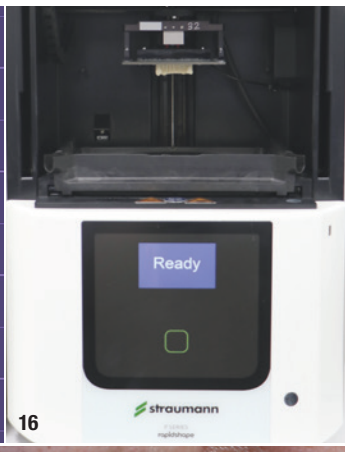
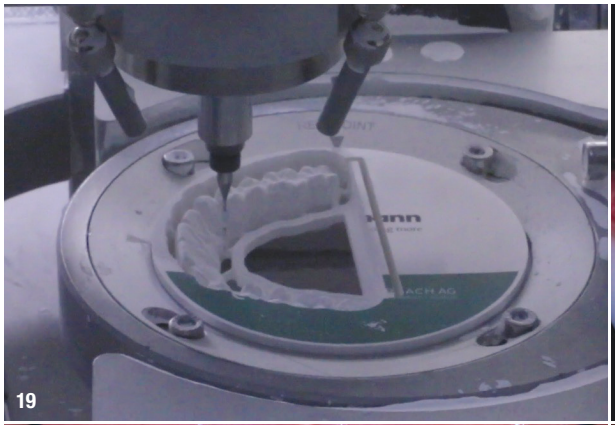


Fig. 15: Prosthesis prototype design. **Fig. 16:** Straumann 3D printer. **Fig. 17:** Intra-oral evaluation of the prosthesis prototype. **Fig. 18:** Extra-oral evaluation of the prosthesis prototype.



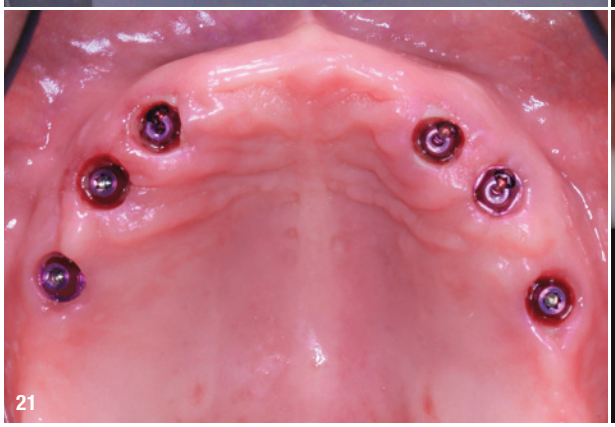
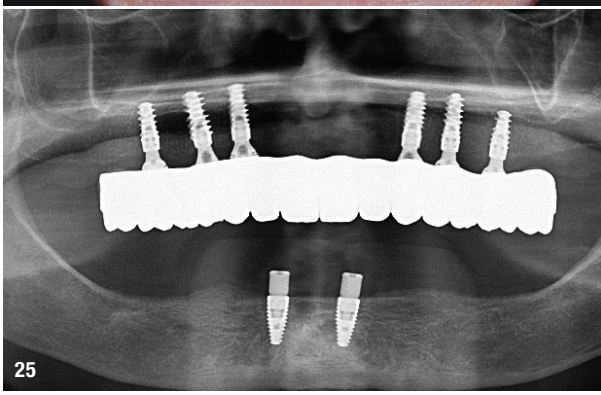


Fig. 19: Milling of the prosthesis monolithically from a Straumann zirconia disc. **Fig. 20:** Hybrid prosthesis with stained gingival area. **Fig. 21:** Excellent healing six days after surgery. **Fig. 22:** Hybrid prosthesis screwed on to the abutments.



Figs. 23a & b: Aesthetic final results. **Fig. 24:** Situation eight months after surgery. **Fig. 25:** Final radiographic evaluation by dental panoramic tomogram.

solution. The patient received six Straumann BLX implants and an immediately loaded final fixed prosthesis. The treatment was achieved in six days. The patient did not have to take any medication either, there being no morbidity. Finally, the facial aesthetics were improved owing to the adequate soft-tissue support.

Conclusion

Taking advantage of the digital workflow, dental implants can be placed with a flapless approach without disturbing the soft-tissue integrity. In that way, the final prosthesis can be loaded immediately, and the total treatment time is significantly shorter. In this case, the process of placing six Straumann BLX implants and immediately restoring them with a fixed prosthesis was completed in only six days.

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References