Achieving a synergistic effect: Rehabilitation of an edentulous patient with partially removable, implant-supported zirconium oxide bridges

Sergej Starchiy[1]

Abstract

Synergy is a state in which knowledge, technologies and materials work successfully together. Similarly, the skilful combination of different materials and methods may also affect the final result in a particularly fruitful way in dentistry.

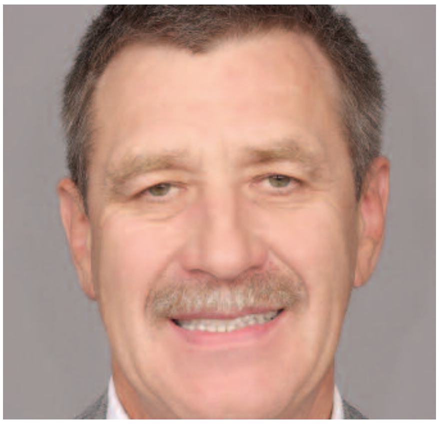
The issues involved in the rehabilitation of edentulous patients are usually not limited to the fact that they have no teeth. These patients often face deeper problems, for which there are several reasons. For instance, their articulation may be impaired or they may not be able to chew food properly because they are wearing dentures. Such inconveniences can usually be redressed with the help of implants. The prosthetic reconstruction depends on the location and number of implants. There are as many treatment options as there are limitations: implant-supported bar prostheses, telescopic prostheses, occlusally screwretrained prostheses – just to mention a few.

The patient's oral care status and age also play an important role in the selection of the treatment option. In this respect, the patient's ability to take appropriate care of the dental prosthesis including the implants and surrounding tissues should be critically assessed. Edentulous patients of a comparatively young age are normally willing to attend regular recalls and take appropriate measures of hygiene to maintain the improvement in oral health gained in the course of the dental treatment. This patient group may be offered advanced esthetic and functional dentures. Improvements in CAD/CAM applications and the resulting extensions of the range of indications have made it possible to offer this type of tooth replacements. Basically, these advances include the possibility of achieving extensive implant-supported superstructures using hypo-allergenic zirconium oxide in a high-precision fabrication method. The indications include long-span bridges, which are either cemented to customized abutments and adhesively luted or secured in place with screws. Both options have their advantages and disadvantages.

Furthermore, later corrective firings in the ceramic furnace may result in deformations of ceramic-veneered reconstructions. Another issue that needs addressing is the temporary restoration to be provided if repair work is necessary – after all, the entire superstructure has to be removed with only telescopes or bars remaining in the oral cavity. Screw-retained implant superstructures tend to ensure a more accurate and therefore more passive fit to implant platforms. In addition, they can be more easily removed in the case of repairs or adjustments. However, the question as to what remains in the oral cavity and as to how provide a

[1] Sergej Starchiy

Contact Details:
Prothetika in Lab
ul. Kuznechnaya d. 83
620075 Ekaterinburg
Russia
info@prothetika.ru
www.prothetika.com



Figures 1 and 2 Initial situation: 54-year-old patient with gingiva-supported complete dentures.

suitable temporary restoration remains.

My own observations and the experiences of my colleagues have shown that the removal and re-insertion of implantsupported dentures have adverse effects on the implants and the mucous membrane. Connective tissue adherent between the implant superstructure and mucous membrane may be damaged or destroyed during removal. For this reason, a sensible approach would be to find a compromise between these two treatment options: dentures that consist of a part that stays in the oral cavity and can be easily provided with a temporary restoration and parts that are subject to wear and can be exchanged.

Patient case

A 54-year-old edentulous male patient presented to our clinic. At the appointment, he was wearing complete resin dentures. However, he did not use his dentures all the time because they were functionally and esthetically inadequate (Figures 1 and 2). As he was the head of a large company and had a great deal of contact with other people, his concern was not to lose his high social status. These considerations were taken into account in the selection of an appropriate treatment.

Twelve NobelReplace implants (Nobel Biocare®), six each in the upper and lower jaw, were inserted to secure the reconstruction. What was special in this case was the fact that we used a partially removable, occlusally screw-retained superstructure with adhesive titanium bases as the mesostructure. The superstructure was to be completed with pink gingival elements and "prepared tooth cores". For this purpose, a diagnostic set-up was fabricated for the upper and lower jaw using the implant models as a basis (Figure 3). After the set-up had been approved by the practitioner and patient, it was duplicated with denture base material (Figure 4). Next, the teeth of this acrylic prototype were "prepared" and gingival sections were prepared by reducing the material by a specified amount (Figure 5). The prototypes were then scanned. The data generated from the scan were used as a basis to produce CAD/CAM zirconium oxide duplicates. Appropriate titanium bases were inserted into

Figure 3: Diagnostic set-up of implant-supported upper reconstruction

Figure 4: The upper and lower set-up were duplicated with denture base material and the resulting prototypes were reduced in a targeted fashion.

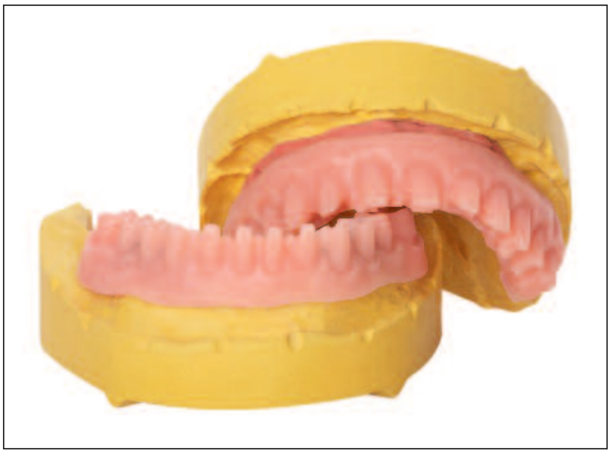


Figure 5: The reduced acrylic prototypes were scanned for the CAD/CAM procedure.

Figure 6: Upper model with zirconium oxide framework. The titanium bases were temporarily placed.

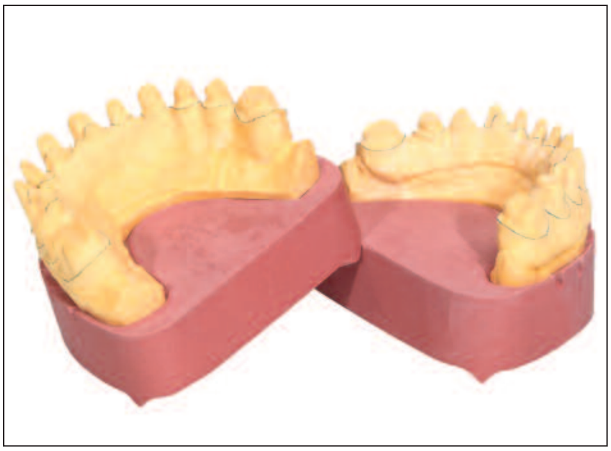


Figure 7: The zirconium oxide frameworks were duplicated on the model to produce a model with detachable segments.

Figure 8: Single frameworks were waxed up, invested and pressed using IPS e.max Press MO ingots.

Figure 9: All single-crown frameworks were veneered with IPS e.max Ceram.

these zirconium oxide frameworks (Figure 6).

Next, the models including the zirconium oxide mesostructures were again duplicated to fabricate models with detachable segments (Figure 7).

Ceramic-veneered single-crown restorations were planned for the superstructure. Conventional single-tooth frameworks were waxed up (Figure 8), invested and pressed using IPS e.max® Press MO ingots. Subsequently, the pressed ceramic frameworks were individually veneered using IPS e.max Ceram (Figure 9). The only exceptions were the single crowns in the region of teeth 13, 35 and 45, as screw access canals were centred at the cores. For this reason, the frameworks for these cores were made of zirconium oxide and veneered with IPS e.max Ceram, which is an inherent

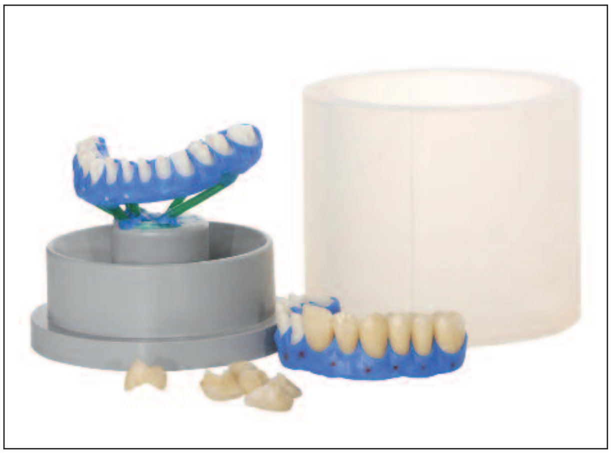


Fig. 10 The gingival sections were directly waxed up on the zirconium oxide framework and pressed using pink IPS e.max ZirPress ingots.

material of this system. The decision to use zirconium oxide frameworks was based on the fact that the crowns on these frameworks had to be placed with a temporary cement. All the other crowns were bonded to the mesostructure with RelyX U100 (3M Espe). This adhesive resin was the material of choice because these all-ceramic crowns were based on lithium disilicate frameworks. Had they been based on zirconium oxide frameworks, the adhesive effect would have been unpredictable. Before proceeding, the single crowns were placed on the zirconium oxide mesostructure, kept in place with holding gel and then assessed in the articulator for proper functioning. The gingival sections were waxed up directly on the zirconium oxide framework and pressed with pink IPS e.max ZirPress ingots (Figures 10 to 12).

To etch the ceramic-veneered IPS e.max pressed frameworks we used IPS® Ceramic Etching Gel. Next, all those all-ceramic crowns that did not cover a screw access canal were carefully cemented in place in the laboratory (Figure 13). To take a picture of the final work in the laboratory, the zirconium oxide based crowns were placed on the mesostructure with the help of holding gel (Figures 14 and 15). At the insertion appointment, the practitioner cemented the zirconium oxide crowns in the region of teeth 13, 35 and 45 using a temporary cement.

Conclusion

In my opinion, the reconstruction presented in this report provides a viable treatment method to combine functionality and reparability. If fractures or chippings occur

Figure 11: Upper denture and …

Figure 12 … lower denture with pressed IPS e.max ZirPress gingival sections.

Figure 13: The lithium disilicate crowns were carefully placed.

Figures 14 and 15: The zirconium oxide-based crowns were placed on the mesostructure using holding gel.

Figure 16: A smiling patient at the end of the treatment.

in any of the single crowns, which are the parts of the reconstruction that are subjected to the most stress, they can be easily repaired. The crown can be removed from the mesostructure in the oral cavity and be repaired or replaced in no time at all. If necessary, a temporary restoration can be fabricated chairside, without the need to remove the entire reconstruction, which is no doubt a significant advantage.

The use of an advanced all-ceramic system such as IPS e.max results in a uniform shade effect and outstanding esthetic results. The high fracture strength of the IPS e.max press ceramic in both the coronal and gingival areas ensures the longevity of the restoration. As the individual teeth can be shaped individually, the esthetic and phonetic features can be optimally designed to meet the needs of the individual situation – to the satisfaction of the patient (Figure 16).

Acknowledgement

Clinical work: S Rjavkin, dentist at private clinic

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