Easy, fast and precise
Implant-prosthetic restoration of an edentulous maxilla

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Creating an esthetically pleasing smile in an edentulous patient is no easy task. Effective collaboration, combined with suitable materials and procedures, empowers dental professionals to address this challenge effectively.

Rehabilitation of the edentulous jaw can be achieved with various treatment modalities. Removable implant-supported overdentures can provide a comfortable, aesthetic and functional option even in circumstances where only a reduced number of implants can be used. This treatment option is frequently practised due to the fact that the number of patients wishing to find an alternative to complete dentures is rising. The patients’ expectations regarding their prosthetic tooth replacements are similarly high as for fixed ceramic veneered restorations. With the emergence of new materials and their combinations with CAD/CAM technology, outstanding outcomes can be achieved for this indication. An adequate solution can be found for almost every patient and budget. Generally, overdentures offer several advantages over conventional removable prosthodontics. These advantages include stability, functionality, comfort, confidence in the ability to interact socially, straightforward rehabilitation and easy maintenance for the patient, or, simply put: a significant improvement in quality of life.

Clinical case
A 58-year-old patient presented at the practice with discomfort caused by her complete upper denture. At history taking, we found a prosthetic restoration retained on six implants in the lower jaw and a complete maxillary denture that was esthetically and functionally inadequate (Fig. 1).

An initial esthetic evaluation revealed that the shape and shade of the teeth were inappropriate. In addition, the midline was misaligned and the curvature of the maxillary anterior group was shaped incorrectly. The poor stability of the denture was caused by insufficient prosthetic support and by the method of manufacture. Taking into account the patient’s requirements, financial possibilities and clinical condition of the maxillary prosthetic field, we decided in favour of an implant-supported prosthetic treatment modality. The plan was to insert four maxillary implants to retain an overdenture prostheses using the double-crown method. This procedure is frequently practiced in such cases and has been improved with the emergence of new technologies and materials. Our protocol required primary telescope crowns milled from zirconia at an incline of 2° and secondary copings obtained by galvanofoming. This approach combines the advantages of zirconia (primary telescopes) with the advantages of hydraulic retraction (galvanic copings).

Following a complication-free period of healing and osseointegration, the four implants were uncovered and a preliminary impression was taken. From the resulting model, a customized tray was created. Next, a functional impression that would transfer the exact position of the implants was required to proceed to the next stage of the treatment. The four impression posts were splinted together on the customized tray using composite material (Figs 2 and 5). After creating the working models (Fig. 4), we determined the patient’s vertical dimension of occlusion (VDO), length of future teeth and gingival smile line by means of an occlusal plate (bite rim). In the upper jaw, the occlusal rim was shaped in such a way that two millimetres of the edge were visible when the upper lip was in rest position. The lower edge of the rim was aligned in parallel to the bipillary plane and smoothly followed the curve of the lower lip when the patient smiled. On the maxillary rim, the midline, the smile line and the line of the canines were outlined. A faebow was used for the transfer of the maxillary position in relation to the base of the skull.

Once the relevant ratios had been obtained, the models were mounted on the articulator (Fig. 5). The difficulty of this case was that we had to make allowance for the existing mandibular restoration in the design of the maxillary rehabilitation. The implant axes of the mandibular prosthesis in particular posed some problems. Shade selection was dictated by the mandibular restoration and, consequently, our room for decision making was reduced to deciding on the shape of the teeth. To this end, a photo of the patient as a young adult came in handy, as it was her wish that the shape and size of her teeth as they were when she was young should be maintained in the prosthetic reconstruction. With the aim to attain as perfect a prostheses as possible and to make the most of the available space, we created a wax setup using prefabricated denture teeth (Srl Phonares® II).

Primary structure
A try-in of the setup was performed to check the phonetics, esthetics and occlusion (Fig. 6) and then a silicone key was created over the setup. The silicone key acted as a guide in the subsequent working steps. To manufacture the primary structure, the four titanium abutments were customized (Fig. 7), the resulting abutments were scanned together with the model and setup (double scan) and these data sets were imported into the design software. The CAD program proceeded to suggest the shape, height and angulation of the telescope crowns, which we adjusted and optimized as required (Fig. 8). The primary telescopes were milled from zirconia and sintered to their final density at 1500°C. After checking the accuracy of fit, the zirconia crowns were permanently bonded to the titanium abutments (Multilink® Hybrid).

The primary crowns were manipulated (Fig. 9) prior to the transfer to the articulator, where they were scanned (Fig. 10). The scan was then transferred to the CAD program, where we created the maxillary and mandibular prostheses. The primary crowns were then reinserted into the articulator and the scan was performed again. From this, a wax setup was created (Fig. 11), following which the primary crowns were removed (Fig. 12) and 12 maxillary and mandibular crowns were cut (Fig. 13) and cemented (Fig. 14) in final position (Fig. 15). The maxillary denture was also cemented and the patient attended her follow-up appointment. The postoperative evaluation of the prostheses and the patient’s esthetics indicated good results. The patient was satisfied with the treatment outcome and the esthetics of the maxillary prosthesis, while the mandibular prosthesis was slightly shorter. The patient was referred to her prosthodontist for a final adjustment of her mandibular prosthesis. Finally, the patient felt that her smile was improved, especially when speaking and laughing.

Conclusion
This clinical case presented a severe challenge for the endodontist, but we achieved a predictable and stable result that was highly appreciated by the patient.

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Abutment). Next, the zirconia telescopes were adjusted using a lab turbine and parallelograph. The walls of the telescopes were given a 2° incline and smoothed out using appropriate diamond grinding tools and sufficient water cooling (Figs 9 and 10).

Secondary structure

The primary crowns could now be prepared for the manufacture of the secondary crowns by means of the galvanoforming technique. For this purpose, the zirconia surfaces were covered in a thin coating of conductive silver using the airbrush method and the galvanof orming process was commenced. Upon completion of the galvanof ormation, the galvanized gold crowns were detached from the telescopes and the conductive silver coating was removed with a nitric acid containing solution. In the process, a highly accurate secondary structure was obtained.

Tertiary structure

All the components were repositioned onto the working model. Before the tertiary structure was fabricated, the galvanof ormed crowns were covered in a thin layer of wax to create the space necessary for the cement that would later be used. The tertiary structure was invested, cast in CoCr alloy using induction casting technology and then finished. The tertiary structure was intrasurally cemented onto the galvanof ormed telescopes (Multilink Hybrid Abutment, Monobond®) in order to obtain a tension-free restoration (Fig. 11).

Esthetic design

The structure thus obtained was covered in opaque light-cured lab composite (SR Nexco®) in pink and white prior to finishing the prosthesis. The silicone key was again used as a guide: the Phonares II teeth were repositioned from the wax setup to the framework. The occlusal parameters were again checked and then we proceeded to complete the restoration.

To reconstruct the pink gingival portion, we used the Ivoclar® injection system. First, the denture was invested into two especially designed flask halves using type III and IV plaster. After removing the wax and isolating the plaster surfaces, we prepared an Ivoclar capsule and placed it together with the flask into the polymerization chamber. The Ivoclear injection and polymerization process is fully automated and takes about 60 minutes. Users can choose between two program options: Running the standard program takes about 40 minutes. If the RMR program is additionally activated, the pressing time increases, as a result of which the monomer concentration is reduced to less than one percent. This aspect is beneficial to patients because the risk for allergies and irritations of the mucous membrane is virtually eliminated.

Upon completion of the injection program, the flask halves were opened, the denture di vested from the stone core and processed with milling and polishing instruments. In an effort to create a tooth replacement that closely meets the expectations of the patient, we decided to customize the visible areas of the denture by applying additional material (SR Nexco®). To this end, the vestibular surfaces of the anterior teeth and the corresponding pink parts were sandblasted. SHB Connect was applied and the teeth and prosthetic gingiva were characteri zed with SR Nexco® and the shape adjusted according to the requirements of the patient. Final polishing was carried out with buccal brushes and pads. This procedure yielded a result that was true to nature and adjusted to the specific requirements of the patient (Figs 12 to 15).

Conclusion

Many patients respond with reluctance to the idea of being given removable dentures, if dentures are optimized by adding the stability of implants and the effectiveness of telescopes, dental professionals will be able to dispel any clinical case, regard less of its difficulty.

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