

A good option for the lifelike recreation of gingival tissue

Esthetic composite layering of implant-supported restorations in an edentulous jaw

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Careful planning is indispensable in the treatment of an edentulous jaw with implant supported restorations. The axes and positions of the implants must correspond to the given biological, mechanical and esthetic conditions. In situations where severe bone recession has occurred, the work of the dental team will involve not only the reconstruction of dental but also of gingival tissue. The dentogingival complex must primarily fulfil two aspects: function (chewing and speaking) and esthetics (alignment of the teeth and gums and lip support).

Clinical case presentation

When the 37-year-old female patient presented to our practice her teeth and the related bone structure were in very poor condition (Figs 1 and 2). Numerous teeth were missing in both the upper and lower jaw. Furthermore, the upper jaw showed considerable bone and gingival resorption. The patient wished to have fixed teeth again and regain an attractive appearance. Due to the extensive damage that had occurred, the complete restoration of both jaws with implants was indicated.

Surgical phase

As a result of sufficient bone structure in the lower jaw, this part of the mouth could be restored at once with four immediately loadable implants. During the reconstructive phase, the upper jaw had to be treated with a provisional removable denture due to the atrophied jaw ridge. The tooth extractions in the upper and lower jaw took place on one day. At the same time, the four lower jaw implants were inserted and loaded. An immediate denture was placed in the upper jaw.

During the osseointegration period of the mandibular implants, the bones in the upper jaw were reconstructed. The maxillary sinus and the jaw ridge were augmented in one appointment. At the next appointment, ten implants were placed according to the treatment plan. Six months after this intervention, the implants were exposed. As a result of a well-planned soft tissue management strategy, firm keratinized tissue had formed in adequate form. The permanent restorations for the upper and lower jaw were fabricated two months later (Figs 3 and 4).

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Figure 1: Initial portrait of the patient



Figure 2: Extremely poor oral condition: The teeth could not be rescued. The jaw ridge in the upper jaw was considerably atrophied.



Figure 3: After bone augmentation measures had taken place, ten implants were inserted. The picture shows the situation prior to the prosthetic phase.



Figure 4: Four implants were inserted in the lower jaw. Bone augmentation measures were not necessary in this case.

When the upper and lower jaw have to be restored, it is important to start with the upper jaw. Alternatively, both jaws can be restored simultaneously.

Prosthetic phase

The determination of the occlusal plane and the ideal incisal line allows the tooth arches to be integrated more easily in terms of esthetics and function.

Impression taking

Open tray impressions were taken with a special plaster (Snow White) and unsplinted impression posts. The considerable stiffness of the impression material completely immobilized the impression posts, which prevented any errors from occurring in the casting of the study models.

Articulation of the models

The articulator allows the kinematics of the jaw to be correctly simulated. The aim of this part of the treatment is of a functional nature. It is intended to ensure the optimal occlusal integration of the restorations and the proper jaw movements during chewing, speaking and swallowing. In this particular case, the upper jaw model was positioned with the help of a facebow. Four impression posts were screwed on the implants in order to provide strong support and enhanced reliability. Alternatively, this step can take place directly on the immediately loaded provisional restorations. For this purpose, however, the model has to be mounted in the articulator of the dental practice. In the present case, the masticatory model was positioned in the correct relation to the hinge axis-orbital plane.

Subsequently, we adjusted the bite patterns in order to record the vertical dimension of occlusion. The centric relationship is regarded as the reference position for adjusting the muscles to the centric and functional jaw relationship. The mandibular model was mounted in the articulator with the help of an antagonist jaw relationship record. If the centric and the vertical dimension of occlusion are correct, the immediately loaded provisional restorations can be used for this purpose. The restorations have to be

immobilized when they are mounted in the articulator. The Artex system allows the articulator of the dental practice and that of the laboratory to be synchronized.

Recording of the major facial criteria

The Ditramax® system was used to transfer the precise data related to the esthetic facial axes to the maxillary model (Figs 5a and b). Two axes were marked on the plaster base of the model (vertical and horizontal). The vertical axis represents the sagittal median plane. From the front, the horizontal axis is aligned parallel to the bipupillary line and from the side to Camper's plane. These markings, which should be very close to the working area, act as a guide for the dental technician in setting up the teeth. Therefore, the incisal line has a predictable parallel alignment to the bipupillary line. The incisal axis is aligned parallel with the sagittal/median plane. The Camper's plane markings indicate the alignment of the occlusal plane. All these elements provide a sound rationale for the tooth set-up according to esthetic and functional principles.

Tooth selection and set-up

We selected the tooth shade and the teeth on the basis of the SR Phonares® II tooth mould chart. Holding the teeth up against the lips of the patient quickly reveals whether or not they are in harmony with the facial features. The set-up of the teeth according to the Ditramax markings (Fig. 6) allows the situation to be clinically validated. In this case, particular attention was given to the esthetic integration of the dentogingival complex when the patient was smiling. The lip dynamics were shown with video clips. The functional criteria were also checked. The vertical dimension of occlusion had to be harmonious in order to achieve a balanced lower facial third and proper phonation.

Fabrication of the framework

We felt that a CAD/CAM-fabricated titanium framework (e.g. Procera® from Nobel Biocare) would best fulfil this indication. The double scan technique allowed the implant model to be superimposed on the tooth set-up to construct

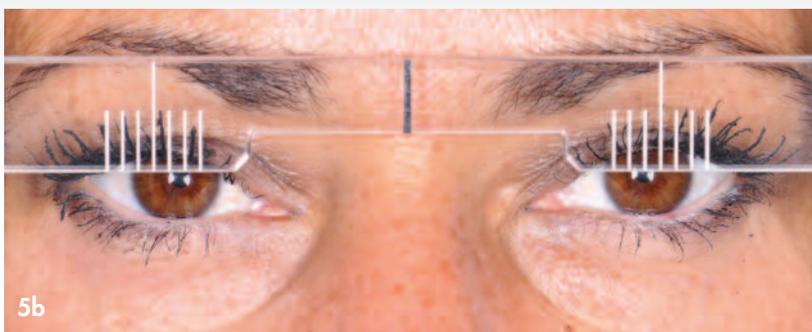


Figure 5a & b: Recording of the esthetic facial axes with the Ditramax system.

the framework. In the next step, the framework was machined and then tried on the model and in the patient's mouth (Fig. 7). The cast impression and the high-performance processing systems significantly contributed to ensuring the optimal passive (tension-free) fit of the framework, which is decisive for the long-term success of the restoration.

Preparation of the framework for veneering

The areas that needed to be built up with Gingiva materials were blasted with aluminium oxide using 2 to 3 bar pressure. Subsequently, the SR Link bonding agent was applied, followed by a thin layer of the light-curing SR Nexco® Gingiva Opaquer to mask the metal framework. The opaquer was polymerized and then a second coating was applied and polymerized. The resulting inhibition layer was removed. The conventional flask technique with a heat-curing

denture base material (ProBase® hot) was used to produce the denture. After the polymerization process, the denture base was ground and space was made for building up the Gingiva composite. The surface was conditioned by blasting it with aluminium oxide (50 µm) at 2 bar (Fig. 8). Then, a bonding agent was applied, which was left to react for three minutes before it was light cured.

Veneering of the gingival areas

In order to achieve very lifelike results in the layering of the gingival tissue, saturated (intensive) materials were used first (SR Nexco Paste Intensive Gingiva) (Fig. 9). Next, translucent, light-curing Gingiva materials (SR Nexco Paste Gingiva, SR Nexco Paste Basic Gingiva) were used to impart the gingival areas with the desired depth (Fig. 10). The colours of the Gingiva composites range from pale pink



Figure 6: The denture was set up with pre-fabricated teeth (SR Phonares II).



Figure 7: Try-in of the CAD/CAM-fabricated titanium framework in the upper jaw.



Figure 8: The ground down composite resin areas were conditioned for receiving the light-curing laboratory composite SR Nexco.



Figure 9: Application of the colour saturated intensive Gingiva materials (SR Nexco® Paste Intensive Gingiva).



Figure 10: The application of various translucent materials imparted the prosthetic gingiva with the desired depth effects.



Figure 11: Lifelike, vital, esthetic – the white and pink esthetics have been optimally imitated.



Figure 12: The restorations on the implants in the upper and lower jaw.

to reddish and orange and purple. A certain learning curve is necessary to master the necessary mixing techniques and achieve a harmonious interplay of the intensive and the translucent materials. Practice is essential and it will pay off. With some technical skill, the gingival areas can be naturally reproduced in shape, texture and shade.

All the individual layers were precured (Quick) in segments. A high-performance curing light was used for the final polymerization. Prior to this step, a coating of glycerine gel (SR Gel) was applied to the surfaces to prevent oxygen inhibition, which could lead to an unattractive and difficult-to-polish result. The surfaces of the teeth were characterized with a vertical and horizontal macrostructure. Particular attention was paid to mechanical polishing. Once the glycerine gel was removed, the restorations were finished with different polishing instruments (various grit sizes, pumice, leather buffing wheels and universal polishing paste) (Fig. 11). In the present case, mechanical polishing was preferred to glazing with light-curing composite in order to prevent premature ageing of the surface.

Attachment of the permanent dental restorations

The dentures were inserted manually with the help of multiunit abutments from Nobel Biocare (Fig. 12). The screw channels were sealed with Teflon and light-curing composite resin. The position of maximum intercuspation was checked and the occlusal pathways were adjusted to the protrusive and laterotrusive movements. In addition, the restorations were checked in terms of the ability to clean them with interdental brushes, and the patient was given special instructions regarding her oral hygiene.

Discussion

For a long time, ceramics were considered to be the esthetic benchmark. With the introduction of state-of-the-art industrially fabricated acrylic teeth, which are specially designed for implant applications, the bar for esthetics has been raised in this category of materials. The teeth used in this case exhibit a true-to-nature morphology, which allows the restoration to



Figure 13: Close-up view: The macro- and microstructure of the teeth and the characteristic play of colour of the gingiva is clearly visible.

be functionally integrated without any problems. Using the laboratory composite SR Nexco to recreate gingival tissue is a good restorative approach. In contrast to ceramic materials, the composite resin is easy to handle and delivers exceptionally esthetic results (Fig. 13). The light weight of the material is an added bonus. An all-ceramic restoration (zirconium oxide framework, layering ceramic, gingival mask) weighs almost twice as much as a titanium-composite resin denture. Another advantage of the type of restoration described here is its long service life.

Conclusion

The success of an implant-retained denture depends on the systematic coordination of all the surgical and prosthetic requirements. A strict procedure needs to be followed from the treatment plan to the final outcome. Layering gingival portions with a laboratory composite represents a genuine improvement on previous materials and methods with regard to esthetics, handling and hygiene (Fig. 14).

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Figure 14: The complex restoration gave the patient a new lease on life.