Paring down a complex case

Extensive all-ceramic restoration for the upper and lower jaws

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This awarded entry in the Asia-Pacific category of the IPS e.max Smile Award 2016 describes the case of a patient who was treated with tooth-supported and implant-borne restorations. This initially complex case was expertly resolved by using a straightforward treatment approach and establishing a uniform colour base for the all-ceramic restorations.

The abundant variety of solutions offered by contemporary dentistry—diverse materials, different technologies, customised approaches—is very much appreciated by patients and clinicians alike. Nevertheless, complex cases continue to present many challenges. In prosthetic dentistry in particular, extensive restorations in the upper and lower jaws are often necessary. In these cases, it is important to obtain a full view of the situation and to analyse it in detail and then to develop a treatment plan. The main aim is to pare down the complex situation to a simple and sound base for the fabrication of the restorations. Well-grounded planning is the key element in this process.

Clinical case

The 66-year-old patient complained about her inability to chew properly, as well as the unattractive appearance of her teeth. In the upper jaw, she had various defective metal–ceramic restorations, of which some had already become loose (Figs. 1a–c). In the lower jaw, a free-end gap extended from tooth #13 to #17. The crowns on tooth #34 were also loose. The gingival margins of tooth #13 had clearly shifted towards the apical aspect. The curve of Wilson (transversal curvature) deviated, which added to the general disharmony. The shade of the different restorations varied quite considerably. Furthermore, the optical properties of the individual restorations did not match properly. The patient requested restorations that would look and function like natural healthy teeth.

The main goal was to establish a stable occlusal situation that would enable natural masticatory functions and a harmonious aesthetic maxillofacial situation. For this purpose, the existing crowns and bridges had to be replaced and the gingival contour had to be adjusted. Tooth #14 had to be replaced with an implant, which would function as an additional abutment. Further treatment with implants was planned for the mandibular posterior region.

From wax-up to provisional

The diagnostic wax-up is generally considered to be an indispensable part of complex treatment planning. The loss of tooth substance, which is the vertical dimension of occlusion, is verified in wax. The teeth are then adjusted on the model using additive (in some cases subtractive) means to achieve the desired situation.

The treatment plan was discussed with the patient and modified as necessary. In this case, the diagnostic wax-up served as the foundation for all the subsequent working steps. The horizontal and vertical aesthetic lines and planes were determined and the upper and lower facial heights were evaluated by means of a radiographic image (Fig. 2). In addition to the clinical and aesthetic diagnosis, a manual functional and structural analysis provided important reference points for the treatment plan.

For the wax-up procedure, the incisal plane was lowered in the articulator. The incisal edges were slightly reduced (3 mm) to obtain an ideal lower face height. In addition, the angle of the occlusal plane was tilted (6°) anticlockwise. The chewing surface was successively modelled until optimum occlusal conditions were achieved (Fig. 3). The cross-mounting method—articulating the upper wax-up against the lower jaw and vice versa—was used to fabricate the provisional composite restorations (Figs. 4a–f).

Once the old restorations have been removed, we were faced with an additional challenge (Fig. 6). Metal build-ups and various fillings in the abutment teeth created a rather patchy overall impression. As a result, the appearance of the abutment teeth...
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The patient was given a local anaesthetic and then an implant was placed in the region of tooth #14. Tooth #33 was extracted. The gingival contours of tooth #33 needed to be improved significantly. Therefore, targeted soft-tissue conditioning measures were initiated. For the next few months, the patient had to wear the temporary restorations, which had previously been fabricated. The area around the implant was healed and then the patient was released from the practice. During the subsequent months, the patient was satisfied with the aesthetic appearance and the maxillary canines were non-vital and discoloured. When stained areas of prepared teeth have to be concealed and tooth shades are suitably adjusted, it is important to visualise the completed crown for each of the individual teeth (Fig. 7). Changing the perspective from full view (maxillofacial) to detailed view (soft tissue) simplifies the visualisation process and tooth preparation.

Impressions and provisional restorations

The peri-implant soft-tissue contour around tooth #14 was optimally shaped by the provisional restoration. As a result, an impression could be taken of the emergence profile (Figs. 8a & b). The impressions of the prepared teeth in the upper and lower jaw were taken with the double-cord technique, and the master casts were produced in the laboratory. The long-term temporary was fabricated in three segments. The first segment comprised teeth #23-12, the second segment, the restored posterior teeth #21-7, and the third segment, teeth #44-47 (Figs. 5a & b). Once the first segment had been finished, the occlusal pin of the articulator was lowered in order to create a space of approximately 1 mm in the anterior region. This gap was closed with the provisional of the other two segments. The temporary restoration was now ready for placement in the mouth (Fig. 9).

After the provisionals had been placed, their functional and aesthetic parameters were checked and the patient was released from the practice. During the subsequent months, the patient managed very well with the long-term temporary and was satisfied with the aesthetic aspects. The implants that would replace teeth #31-37 had not yet been placed at this stage. Experience has shown that a step-by-step treatment approach minimises the risk of error. Therefore, the implants were placed eight months later.

Owing to the focused approach, the complex initial situation was reduced to a comparatively straightforward case that could be treated with permanent all-ceramic restorations. The main challenge for the dental laboratory technician was to conceal the differently coloured abutment teeth effectively. The objective was to cover the non-vital and stained teeth with zirconium dioxide frameworks. In order to fulfil all of the functional and aesthetic requirements, the decision was taken to press ceramic materials on to the frameworks and then customise the restorations with layering ceramics. This approach may sound somewhat complicated, but it would ultimately help to reinforce the stability and reliability of the treatment result.

Fabrication of the restorations

First, the provisional restoration, or rather its functional characteristics, had to be copied. The cross-mounting method was used for this purpose. Subsequently, a precision wax-up was fabricated and digitalised. It was correspondingly cut back prior to the CAD/CAM fabrication of the zirconium dioxide frameworks.

In the next step, these zirconium dioxide copings, which were used to conceal the discoloured tooth structure (Fig. 10), were covered with pressed ceramic. The press technique allows the wax-up and its functional details to be reproduced in ceramic with utmost precision. In preparation for the ceramic press process, the restorations were built up in wax on the copings and then pressed with the fluorapatite glass-ceramic IPS e.max ZirPress in Shade A3 (Ivoclar Vivadent). Next, they were cut back as required, ensuring the full contour of the functional parts and the incisal area. Finally, the restorations were layered with IPS e.max Ceram veneering ceramic (Ivoclar Vivadent, Figs. 11 & 12).

The teeth were characterised in accordance with the age-related requirements of the patient using Dentin, Incisal, Impulse and Mammek materials. The all-ceramic restorations were tried in after the first firing and then completed.

After the last try-in, the restorations were permanently placed according to the established protocol. The stained tooth structure was optimally concealed. The healthy natural soft tissue successfully adapted to the ceramic surface. The implants healed completely and the radiograph showed a stable situation. The vertical dimension, incisal edge contour and occlusal plane corresponded to the conditions established during the provisional phase (Figs. 13a-c, 14 & 15). The shape and shade of the ceramic restorations successfully matched those of the natural mandibular anterior teeth and harmonised with the face of the patient.

Conclusion

Comprehensive restorative therapy demands a clear and well-organised treatment strategy. The route and the goal must be defined right at the beginning in order to establish a sound and straightforward basis for the treatment procedure even in complex cases. This approach simplifies the treatment for all the parties involved and meets their highest demands.

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