A mosaic of numerous individual pieces

Treatment plan for restoring a badly abraded dentition

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Many different therapeutic components combine to produce a treatment solution that focuses on both functional and aesthetic parameters. However, the different pieces have to be carefully matched in order to obtain a satisfying, long-lasting result. A well-structured treatment plan is requisite, particularly in extensive restorative procedures. Continuous interaction and communication between the practitioner and the dental technician throughout the treatment and the patient’s confidence in these specialists represent important components in the process of restoring the aesthetics and function of the patient’s dentition.

In addition, materials play a pivotal role. In this regard, the high-strength lithium disilicate glass-ceramic IPS e.max Press (Vivadent) offers excellent physical strength and aesthetic characteristics, making it the ideal choice for many indications. Apart from its high strength, the material has a very attractive appearance, allowing exceptionally aesthetic results to be achieved, even if space is limited.

When the patient consulted our practice for the first time, he had severely worn anterior and posterior teeth. He was of a strong build and had been participating in competitive sports for many years. His facial muscles were exceptionally pronounced (Fig. 1). Dental professionals are increasingly faced with cases demonstrating this type of pathological loss of tooth structure today. Causes include erosion, attrition, loss of occlusal contacts or abrasion (mechanical processes and bruxism).

Preoperative considerations

The patient originally presented to the dental practice to have a carious lesion in tooth 46 repaired. Owing to the obvious dysfunction of his jaw, we explained to him the medical importance of undergoing a suitable treatment. In order to achieve the long-term success of the treatment, we first had to regain the physiological vertical dimension of occlusion. Therefore, we needed to establish the cause of the destruction, as this significantly influences the treatment planning and the choice of the materials to be used in the process.

In many cases, wear is caused by a number of different factors. Here, the strenuous physical activity of the patient appeared to be the main contributor to the loss of tooth structure. We devised a minimally invasive treatment plan, which was discussed with him. All the necessary patient details were recorded. Owing to the extensive loss of vertical occlusion, the patient’s physiognomy had changed dramatically. His facial features were asymmetrical and his smile was crooked. The corner of his mouth was not properly aligned. Contrary to aesthetic guidelines, the curve of the lower lip was not parallel to the upper incisal edge. The incisors had been so severely abraded that they no longer formed an upward curve. Furthermore, the lower lip drooped on the right side. The patient reported that he often clenched his teeth, especially during physical exertion. He also complained of tinnitus of his jaw.

Planning phase

The initial diagnosis involved the evaluation of intra-oral and extra-oral photographs and a clinical functional analysis. In addition, study models were assessed. A diagnostic wax-up based on a digital aesthetic analysis (Digital Smile Design according to Dr Christian Coachman) gave us essential information about aesthetic aspects, the vertical dimension of occlusion, the occlusal design and bite-elevation. The existing structures were rebuilt in wax using an additive method, and the physiological state was restored. In this case, the wax-up was used not simply to evaluate the initial situation and guide the treatment process, but also as a communication device. The wax-up allowed the patient to visualise the treatment result. Furthermore, the model gave him the motivation to persevere in pursuing the challenging and time-consuming treatment goals.

In the first part of the treatment, the patient was fitted with a customised occlusal appliance. The aim of the splint therapy was to restore the physiological bite of the patient before the appliance was fabricated, a comfortable physiological rest position was evaluated. Furthermore, a 2.5 mm increase in the vertical dimension was required. Several days after the splint had been placed, the patient reported that he felt comfortable with the old-but-new vertical dimension of occlusion. He wore the appliance for three months, during which time he did not experience any functional problems. The muscles relaxed quite visibly.

The occlusal situation that could be established with the appliance was stabilised by treating the patient with long-term temporary restorations. We decided to provide him with non-invasive occlusal veneers made of composite, which would be adhesively cemented on the lower jaw. For this purpose, the study models were set up in the articulator in the arbitrary hinge axis position on
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the basis of a functional analysis. The anticipated final situation was waxed up according to the diagnostic set-up (Fig. 3). The wax-up restorations were recreated with composite and the help of a clear silicone matrix (Fig. 4). The occlusal veneers were then completed. In the process, we paid particular attention to functional and morphological principles. Next, the veneers were adhesively cemented in the patient's mouth and the functional parameters were checked. This temporary restoration represented a decisive step in the treatment procedure and a significant component in achieving a lasting result: the patient could not be expected to wear the occlusal appliance continuously for 24 hours. The long-term temporaries, however, enabled the movement patterns to be optimally established, since they were cemented in place (Fig. 5).

The situation stabilised over the next three months and the patient indicated that he felt very comfortable. The temporaries did not show any signs of wear and the patient was pain-free. The time had come for the final treatment phase to begin. We had carefully assembled all the strategic pieces up to this point. At this stage, the success of the permanent restoration would depend completely on the preparation technique. Neither the horizontal nor the vertical maxillomandibular relationship could be disturbed. The sequential preparation phase started with the occlusal veneers. In the first step, teeth 36, 46, and 43 were prepared (Fig. 6), and three-point support was established subsequently. The maxillomandibular jaw relationship was recorded (Fig. 7), and teeth 33 to 37, as well as 44 to 47, were prepared according to minimally invasive principles. This is currently the acceptable standard in aesthetic and functional restorative treatment, as it corresponds to the requirements of patient-oriented and responsible dentistry. The patient's teeth showed a number of cervical lesions (damaged fillings and untreated wedge-shaped lesions). As a result, the preparation strategy was adjusted to take these lesions into account. First, the damaged fillings were replaced with composite (Tetric EvoFlow; Ivoclar Vivadent), then the now intact fillings and the wedge-shaped lesions were included in the enamel preparation and sealed with the occlusal veneers. We ensured that the preparation margins were located in the enamel and were free of composites (Fig. 8). We decided not to prepare or build up the teeth with composite in the lower anterior jaw.

After the impressions had been taken, the study models were fabricated and mounted in the articulator in relation to the horizontal plane. Before the final mandibular restoration was completed, we discussed the aesthetic and functional reconstruction of the maxillary anterior teeth (veneers for teeth 913 to 923) with the patient. We helped the client to visualise the anticipated result by building up the teeth in wax. The wax allowed the patient to transpose the waxing to the patient. He was extremely pleased with what he saw and was completely satisfied with the wax-up solution. Nevertheless, he wanted our assurance that we would not grind any healthy tooth structure unnecessarily. State-of-the-art materials can be cemented with adhesive methods that enable us to fulfill his wish. In this case, we used ultrathin lithium disilicate veneers, which were bonded to the healthy tooth structure for long-lasting results.

Fabrication of the final restorations

High strength was a priority in the posterior dentition. Therefore, full-contour restorations (monolithic) were fabricated with IPS e.max Press (Figs. 9 and 10). The occlusal veneers were produced in wax according to customary methods. The restorations were created in ceramic using the press technique and then prepared for adhesive cementation. The teeth were conventionally prepared according to the requirements of the adhesive technique. For the permanent cementation of the restorations, we used a dual-curing luting composite (Variolink II; Ivoclar Vivadent).

The teeth in the lower jaw were built up with a highly aesthetic composite resin (Tetric EvoCeram; Ivoclar Vivadent). The maxillary anterior teeth (913 to 923) were prepared by removing a minimal amount of tooth structure. A model was produced and then the veneers were fabricated with IPS e.max Press HT ingots (high transparencies). The pressed veneers were cut back and customised with a veneering ceramic (IPS e.max Ceram; Ivoclar Vivadent, Figs. 13 and 14). In the final step, we strive to achieve a lifelike appearance and therefore paid a considerable amount of attention to this step. With the help of gold powder, we were able to produce a lifelike surface texture. We polished the restorations manually. All the parties involved were impressed with the result after the adhesive cementation of the restorations. The inclined all-ceramic restorations showed excellent fit and physiological function. As a result, a very natural-appearing appearance was achieved (Figs. 15 and 16). A lifelike interplay of colour was observed within the veneers.

Conclusion

A well-coordinated treatment plan composed of many pieces, like a mosaic, is required in situations where complex restorative treatment, including bite elevation, is necessary. In the process, it is important to treat patients responsibly and inspire them with the required confidence. Careful deliberation is particularly important in the establishment of the physiological bite elevation. In the case described, an invasive strategy was devised to re-establish a stable vertical dimension. The teeth were ground for the finalisation of the final restoration only after a suitably long temporary phase (occlusal veneers made of composite) and stabilisation of the bite elevation.