Harmoniously integrated

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At first glance you wouldn't guess how many carefully planned steps are necessary to integrate tooth replacements into the oral cavity harmoniously. Materials that are consistently further developed and the efficient application of methods associated with these materials assist us in accomplishing our goal of creating "harmoniously integrated tooth replacements". This report describes how we created discreet tooth replacements involving an implant-supported restoration and several single crowns.

The patient presented at the practice with the desire to improve the esthetics and function of his dentition. His professional occupation requires a well-groomed appearance. He also suffered from severe pain caused by various carious lesions. Following an initial review and consultation, we decided, together with the patient, to opt for a high-end reconstruction consisting of crowns, inlays and an implant. All-ceramic materials were considered an appropriate choice for the tooth replacements. We decided to opt for lithium disilicate (LS_2) glass-ceramic (IPS e.max®).

This material offers a flexural strength of 400 MPa and is capable of meeting exacting esthetic demands. Given its inherent fluorescence and capabilities of individualized customization, the material enables users to achieve a natural looking esthetic result. We selected the pressed monolithic (fully anatomical) method for the treatment of the present case. In addition to conventional indications, such as inlay, onlay, and crowns, this material is suitable for three-unit premolar bridges or – as in the present case – for implant-supported hybrid restorations (in the combination of titanium basis and lithium disilicate glass-ceramic).

Pre-operative situation

The posterior teeth of the second quadrant showed fractured composite fillings, under which secondary caries had formed (Figure 1). The fractured restoration in the upper jaw caused non-occlusion and incorrect loading. In

Figure 1: Pre-operative situation: Fractured composite filling in the upper jaw, …

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Figure 2 … severely modified contours of a metal-ceramic bridge in the lower jaw and…

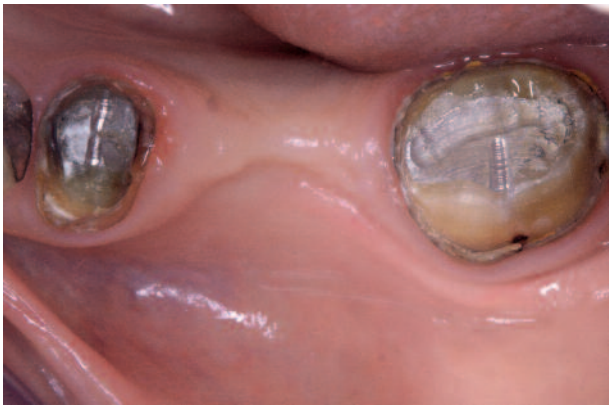


Figure 3 … unsightly root canal fillings in the lower jaw.

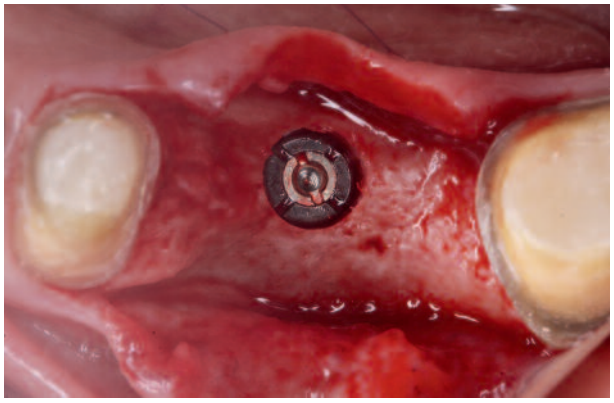


Figure 4: An implant was inserted in the region of tooth 36.

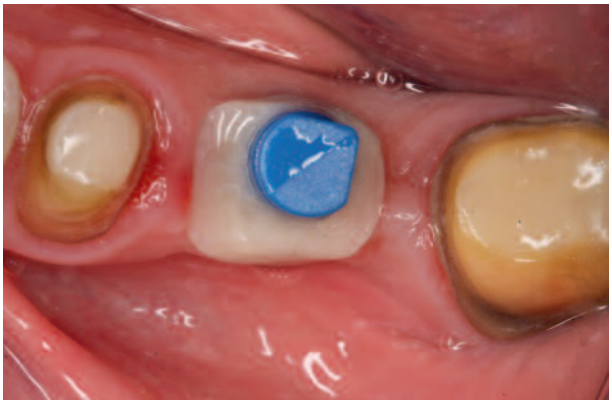


Figure 5: Try-in of the customized impression cap.

addition, the fillings on teeth 24 to 27 were in an irreparable state and had to be removed. To improve the bite, the metalceramic bridge on teeth 35 to 37 had been heavily adjusted by grinding in the past (Figure 2). This restoration was also in a state of disrepair and was therefore removed. The root canal fillings under the restoration were extremely unsightly (Figure 3) and were consequently replaced with tooth-coloured composite. This measure helped us to achieve a natural looking substrate. The patient desired a fixed lower jaw restoration that is easy and convenient to clean. To achieve appropriate stability and long-term durability, an implant was inserted in region 36 (Figure 4) after the preliminary treatment had been completed. The primary stability of 50 Ncm allowed us to place a temporary bridge immediately after the insertion of the implant. This bridge was also instrumental in the contouring of the gingiva.

Selection of the shade and press ceramic ingot

To achieve a natural looking restoration, both the die and tooth shade were determined. The die shade plays an essential role because it significantly affects the final result, particularly in conjunction with translucent materials.After shade selection, we chose a low-translucency IPS e.max Press LT ingot for the abutment to prevent the titanium base from shining through (LT = Low Translucency). High-translucency IPS e.max Press ingots were chosen for the inlays, partial crowns and crowns (HT = High Translucency).

Preparing the models

At the first step, a customized impression cap was fabricated to help the contouring of a natural emergence profile. A try-in allowed us to check the fit and afforded us the opportunity to estimate the effect on the soft tissues (displacement) (Figure 5). After impression taking, the

Figure 6: Wax-up of the maxillary restoration.

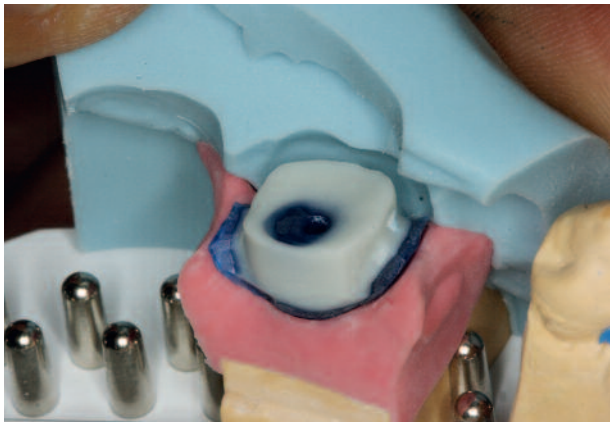
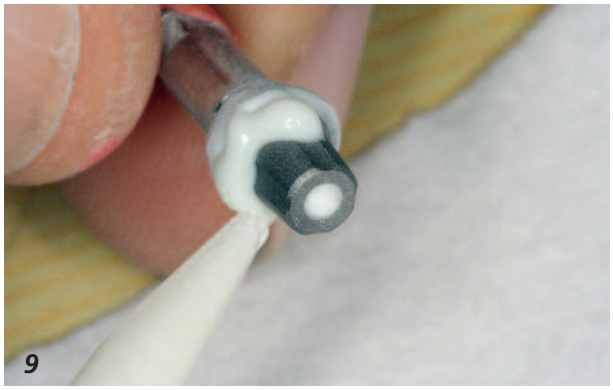


Figure 7: The abutment was checked with a silicone rim.



Figures 8 and 9: The abutment was bonded to the titanium base.

models were poured and fitted together in the correct position and with an accurately fitting occlusion.

To see how much space was available, we first created the inlays and partial crowns (Figure 6) followed by a functional wax-up of the lower jaw. We also fabricated a silicone rim that would serve us as a reference in the subsequent fabrication of the abutment. The more accurately we work at this stage, the more precise the pressed restorations will be. As part of a backward planning approach, the mandibular wax-up was of considerable help in the fabrication of the abutment. The basic framework of the abutment was created using light-curing burn-out resin and then adjusted by grinding to match the path of insertion of the neighbouring teeth. Subsequently, the abutment was evaluated with the silicone rim and missing areas were completed with wax (Figure 7).

Pressing

The wax objects were invested using IPS® PressVEST Speed material. When spruing the pattern, we paid attention to align the wax wire in parallel to the screw channel to make sure that the investment material would not fracture. The investment material was poured slowly into the investment ring, allowing it to rise in the screw channel continuously without forming bubbles. The press procedure was carried out in a Programat® EP 3000 combination furnace according to the manufacturer's instructions.

After completion of the press procedure, the objects were divested with polishing beads (4 bar/58 psi). Fine divestment was carried out at a maximum pressure of 2 bar/29 psi. The reaction layer was first dissolved with IPS e.max Press Invex Liquid and then removed by blasting (Al_2O_3, 50 µm, 2 bar pressure at max.).

Figure 10: Wax-up of the mandibular restoration.

Figure 11: Accurately fitting maxillary restoration.

Figure 12: Individualized mandibular restoration on the model.

After the sprues had been separated, the attachment points were smoothed out. The inner aspect (screw channel) was checked under a microscope and then the object was carefully fitted onto the titanium base. Subsequently, the abutment was finished with ease using a diamond-coated silicone polisher. The other maxillary components were pressed, separated and fitted following the same procedure.

Bonding the glass-ceramic IPS e.max Press restorations to the titanium base

Prior to bonding, the glass-ceramic portions and titanium base were blasted with 50-µm Al_2O_3 at a maximum of 1 bar/14.5 psi pressure to achieve a clean surface (if the Ivoclar Vivadent Instructions for Use are followed, the glassceramic is not blasted but only cleaned). To obtain a retentive bonding surface on the all-ceramic restoration, IPS Ceramic Etching Gel (5% hydrofluoric acid) is applied. A small amount of wax may be applied to the external surfaces, i.e. glazed areas, to protect them. After the etching gel had been allowed to react for 20 seconds, the bonding surface was rinsed with water and dried. Next, the bonding surface was silanated with Monobond Plus primer for 60 seconds. This procedure provides a strong bond between the restoration and cementation material. Self-curing Multilink® Implant composite was applied to both the abutment and titanium base (Figures 8 and 9) and held in the final position for about 5 seconds, applying even pressure. Excess was removed while the material was still in a pliable state. Then the cementation joint was smoothed and polished with rubber polishers.

Completing and inserting the mandibular restoration

The geometry of the hybrid abutment facilitated the insertion procedure; excess cementation material was easy to remove. The possibilities for customized design of lab fabricated abutments allow us to achieve outstanding esthetics, high fracture resistance and excellent accuracy of fit.

We created a control key to insert the abutment. Burn-out resin was used to fashion a capping on top of the abutment and model the teeth (Figure 10). Subsequently, these patterns were sprued, invested, pressed and carefully fitted. The occlusal surfaces of all crowns were characterized with IPS e.max Ceram Essence. To individualize the tooth necks, IPS e.max Ceram Shades (Figures 11 and 12) were applied. With the help of the control key, the implant was secured in the mandible (Figure 13). The single crowns were also inserted without any difficulty. IPS e.max Press restorations can be placed adhesively, self-adhesively or conventionally, depending on the indication. Given their true-to-nature shade effect, the restorations blend seamlessly into the existing oral surroundings (Figures 14 and 15).

Figure 13: Inserted abutment.

Conclusion

Detailed planning and complete compatibility are decisive for the lasting successful application of materials for abutments and implant-supported restorations. Long-term studies have confirmed that the IPS e.max Press glass-ceramics show good compatibility with the oral soft tissues (see Scientific Report Vol. 01/2001 – 2011). The outstanding material properties and the customized fabrication in the laboratory offered us the opportunity to meet the esthetic demands of the patient.

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Figures 14 and 15: The restorations blend beautifully into their surroundings.