Combination of digital and analogue techniques

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Nobody will deny that aesthetics play a crucial role in the restoration of anterior teeth, irrespective of whether the restorations are placed in male or female patients. As the final outcome is dependent on the skills of the clinician, the aesthetic differences may be tremendous even if state-of-the-art techniques and materials are utilised. For the anterior restorations in the case presented, I used IPS Empress CAD leucite glass-ceramic blocks. These blocks are offered in two different levels of translucency by the manufacturer. Additionally, a Multi block featuring multiple shades is available. As these blocks are industrially processed, restorations of consistent quality are achieved. The glass-ceramic material is easy to polish or reduce, which enables the milled restoration to be veneered subsequently. As a result, the final aesthetic outcome can be optimised in a simple fashion.

I usually work with the polychromatic IPS Empress CAD Multi blocks, as they feature a true-to-nature gradation of shades combined with optimum levels of brightness and translucency. Consequently, they blend in seamlessly with the natural oral environment. In addition, they demonstrate lifelike fluorescence.

Today, patients’ needs and expectations differ widely. They may include quick healing, but also long-term stability or enhanced aesthetics. The use of IPS Empress CAD Multi blocks in combination with the CEREC 3 (Sirona) chairside CAD/CAM system allows restorations to be fabricated that meet the needs of today’s patients. In the case presented, a restoration was fabricated with an IPS Empress CAD Multi block. A highly aesthetic result was achieved that left nothing to be desired.

Case study

A 32-year-old female patient presented to my office dissatisfied with the aesthetic appearance of her upper anterior teeth. The incisal edges showed an irregular contour and discolouration was present (Fig. 1). The initial examination revealed an inconsistent incisal line and dark discolouration visible during smiling. Tooth #12 had previously been restored with a crown, while tooth #22 had received a composite restoration (Fig. 2). Prior to the start of the treatment, a CRT test was conducted. The results indicated a low caries risk level and good oral hygiene. Therefore, the restorative treatment could be started immediately.

The restorative options available to the patient were discussed with her. Her priorities included the lightening of the discoloured teeth, as well as the creation of softer, more feminine tooth shapes and the creation of long-lasting restorations.
Based on her wishes, an anamnesis and a diagnostic analysis were conducted. In the next step, I set up a treatment plan that included teeth #11, 12, 21 and 22.

First, I fabricated a mock-up, which was to serve as a basis for the discussion with the patient. Her wish of having teeth with a more rounded shape and thus with a softer, more feminine appearance was taken into account during the fabrication of the mock-up. The teeth were prepared according to standard procedures (Fig. 3). A fibre-reinforced endodontic post and core was seated in tooth #12. This was done to prevent root fracture but still ensure an aesthetic restorative result. In tooth #11, caries was detected in the area of the mesial angle. Following removal of the carious tissue, the cavity was filled with composite resin. Tooth #21 received a full-crown preparation. A rounded shape was prepared to ensure even distribution of the force to which the restoration would be exposed. In tooth #22, composite material was applied in the area of the medial angle.

The CEREC software features a tool termed correlation mode. This mode enables users to take an optical impression. As the patient had a very clear idea of the future appearance of her teeth, I decided to use this mode to match my ideas with hers. Therefore, a silicone impression was taken after the teeth had been prepared and a model was poured (Fig. 4).

Based on the mock-up, which had been discussed with the patient earlier, a wax-up was created on the model and an optical impression was taken (Fig. 5). The recorded model served as a guide for the construction procedure, which was carried out using the quadrant mode.

In the fabrication of anterior restorations, it is advisable to check the size and dimension of the incisal build-up from the palatal aspect continuously by means of a silicone matrix. This significantly facilitates the modelling procedure. Moreover, by proceeding in this way it becomes apparent immediately if data has been lost during optical impression taking. A loss of information in the area of the incisal edge usually renders the construction of anterior restorations considerably more difficult. The precise recording of data is of utmost importance, especially if the patient requests a particular tooth shape (Fig. 6).

The 3.6 version of the CEREC 3D software has a milling preview feature, which allows users to ‘place’ the restoration in the virtual block as needed in accordance with the gradation of shades from cervical to incisal (Fig. 7). This enables the operator to make use of the opaque/translucent areas or the gradation pattern of the block in an optimal fashion. If several teeth are restored simultaneously, there are now various options to utilise the different areas efficiently. Consequently, it is even possible to fabricate restorations that do not require individual characterisation or cutting back.

**Fig. 4.** The die model constituted the basis for the mock-up.

**Fig. 5.** Creation of the wax-up; as desired by the patient, tooth shapes that were more rounded were established.

**Fig. 6.** The restoration was designed on the computer screen. The silicone matrix was scanned in order to be able to construct the incisal area easily and quickly.

**Fig. 7.** Virtual positioning of the restoration in the IPS Empress CAD Multi block.
The versatility and flexibility of the IPS Empress CAD Multi block is thus further enhanced. After the restoration had been milled, it was seated on the model. The restoration had an excellent fit. Owing to the gradation of opaque and translucent shades from the cervical to the incisal region, the restoration had a very natural appearance (Fig. 8).

In the case presented, the restorations were glazed but did not have to be characterised because of the IPS Empress CAD Multi block’s lifelike aesthetics. The reason that I glazed the restoration was not primarily to improve its aesthetic appearance, but to impart it with even higher strength. In the literature, glaze firing is generally referred to as a means of increasing the strength of IPS Empress CAD restorations. I would like to point out however that IPS Empress CAD restorations also possess sufficient strength to ensure successful, long-term results if they are merely polished. Following try-in, the restorations were adhesively cemented (Fig. 9).

Particularly in the cementation of veneers, strict adherence to the cementation protocol is crucial to ensuring long-lasting results. Normally, I use Variolink II luting composite, since it allows (thin) all-ceramic restorations to be reliably, durably and aesthetically cemented. In the case presented, I decided to use the universal luting composite Multilink Automix, as it is very easy to use and convenient. The restorations were reliably cemented in just two steps. The high bond strength and long-lasting adhesion that are achievable with this system have been confirmed by numerous studies conducted in recent years. In contrast with Variolink II, Multilink Automix is only available in three different shades (yellow, transparent and opaque). As the patient’s teeth did not show any severe discoloration, the choice of materials was sufficient in this case.

Figure 10 shows the restorations three years after completion of the treatment. The restorations still look attractive and the gingival tissue has a healthy colour. We are proceeding on the assumption that the dark triangle between the two front teeth will become smaller over time. The four teeth were restored with IPS Empress CAD Multi block in a very satisfactory fashion, and the patient was very pleased with the result.

Summary

In Japan, it is generally assumed that conventional, laboratory-based restorative procedures are superior to computer-assisted techniques. Some experts are of the opinion that CAD/CAM-based systems even pose a threat to the profession of laboratory technician as a whole. In my opinion, this is a huge misconception. On the contrary, CAD/CAM technology and the manual skills of laboratory technicians can be ideally combined to achieve optimal results. The flexible use of digital and analogue techniques helps to better fulfil patient needs and advances modern dentistry. This position is corroborated by the case presented in this article, which was restored by making full use of the possibilities offered by the CEREC system and the IPS Empress CAD Multi block. I will continue to provide my patients with high-quality restorations, also by using sophisticated procedures. These procedures ensure that durable results and thus a high level of patient satisfaction are achieved.

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