Two approaches, one goal: Digital expertise versus manual skill in the fabrication of ceramic veneers

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Recently developed restorative materials have opened up a myriad of exciting possibilities for dental practitioners. In the restoration of anterior teeth, clinicians have to select the most appropriate material for the case at hand on the basis of specific criteria. In situations where teeth show signs of erosion, abrasion, abfraction or a combination of these phenomena, practitioners will tend towards using ceramics or composite resins, depending on how much intact tooth structure remains available. Traditionally, composites are used for Class III, IV and V defects. However, ceramic veneers are preferred in cases where a large amount of tooth structure is missing or a major change is planned (e.g. smile makeover).

The challenge

When two central incisors need esthetic enhancement, the choice of approach is not so clear. Irrespective of the material used a minimally invasive route involving very little preparation of the tooth structure can be taken nowadays due to the high strength of modern materials (e.g. lithium disilicate glass-ceramic). Nevertheless, it is important to remember that minimal preparation is an option only if the teeth are properly aligned. As long as the desired changes of the tooth shape and shade are small, preparation can be limited to the enamel. In many cases, however, orthodontic treatment is needed before the tooth position and/or shape can be optimized by means of restorative procedures. This minimally invasive approach requires the dental practitioner to convince the patient of the necessity of undergoing preliminary orthodontic treatment.

The solution

It is our aim to remove as little of the tooth structure as possible in every case that we treat. With modern materials such as lithium disilicate or leucite-reinforced ceramics, we can confidently press or mill veneers that are as thin as 0.6 mm and even 0.3 mm. One of the main advantages offered by this type of ceramic is its wide range of applications. Until a few years ago, the treatment with indirect restorations required at least two appointments.

Fig. 1: Initial situation: The patient was referred to an orthodontist.

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Fig. 2: One year later when the patient returned to the practice, the teeth showed unsatisfactory composite veneers.

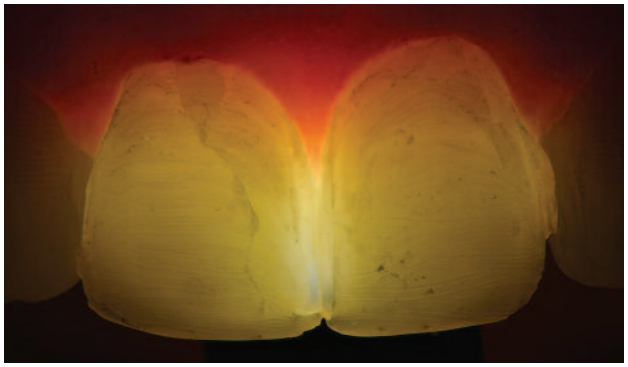

Fig. 3: The veneers were removed and the teeth were transilluminated to identify any composite residue.

Fig. 4: The two-cord technique was used for the impression. The retraction cords remained in the sulcus.

With the advent of CAD/CAM technology, clinicians now have the possibility of making semi-direct restorations.

Ceramic materials such as IPS Empress® CAD allow dental practitioners to produce polychromatic monolithic veneers and crowns in less than one hour, without having to glaze them. Nonetheless, many dentists still believe that dental technicians with their well-honed manual skills produce better esthetic results than a machine, and they do not see the need to embrace digital technology. As a result of this point of view and the high acquisition costs of the milling machines some clinicians are reluctant to invest in this technology. On the basis of the present clinical case study we would like to highlight the following aspects: the importance of having the right treatment plan, the possibilities currently available for the fabrication of veneers, the potential of the press and CAD/CAM techniques and the latest improvements made in the field of cementation.

Clinical case

Patient history

A thirty-one-year-old female patient came to our office because she was dissatisfied with her anterior teeth. She complained about the misalignment of the upper and lower central incisors (Fig. 1). A detailed clinical examination revealed that the composite restorations in these teeth were defective. As a result of erosion, a considerable amount of tooth structure had been lost. In addition, the misalignment of tooth 21 and 41 in particular was quite obvious. The

Fig. 5: Temporary restoration

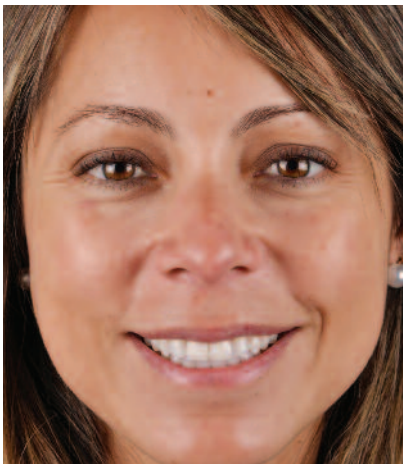

Fig. 6: Try-in of the IPS e.max Press HT A1 veneers (fabricated in the laboratory)

Fig. 7: Try-in of the polished IPS Empress CAD Multi A1 veneers (fabricated in the dental office)

treatment plan presented to the patient included initial orthodontic treatment followed by minimal preparation of the two central incisors for two ceramic veneers. The patient was subsequently referred to an orthodontist for treatment. Unfortunately, it took more than a year before she presented to the practice again. At this consultation, we were quite surprised to find that the two central incisors had been restored with poorly finished direct composite veneers (Fig. 2). Many clinicians simply underestimate the challenging nature of this type of restoration, and this was a case in point. In addition to preventing any contamination of the working field, the clinician must also accomplish the arduous task of creating an appropriate emergence profile, proper contours and contact areas and producing a suitable micro and macro-texture, and all this within a single appointment.

The treatment

The composite veneers had to be removed and replaced with new ones. In this particular case, the advantages of using the indirect technique were obvious. The patient agreed to have two ceramic veneers made for her. For this purpose impressions were taken and a master cast was produced. This working model provides the dental technician with the opportunity to evaluate the situation in detail. He or she has the time to think about possible ways of correcting the misalignment. Dentists do not have this "luxury" of time when they are treating a patient in the dental chair. They have to finish the restorations as quickly


Figs 8a and b: Try-in of the veneers with a light try-in paste (Light+)


Figs 9a and b: Try-in of the veneers with 6 a dark try-in paste (Warm+)

as possible in order to prevent contamination of the treatment field and keep chair time to a minimum for the comfort of the patient. In the present case, an additional hurdle had to be overcome: Any composite material that might have remained on the tooth structure had to be clearly identified and carefully removed without damaging the healthy tooth structure. Transillumination with white LED light came in useful for this purpose (Fig. 3). Next, the teeth were prepared, retraction cords were placed and an impression (Virtual(R)) was taken (Fig. 4). The patient was provided with a temporary restoration, which was made with a temporary crown and bridge material (Telio(R) CS C&B, shade A1) and cemented with a dual-curing luting composite (Telio CS Link) (Fig. 5).

Fabrication of the restorations

Two different routes were pursued in the fabrication of the veneers. We instructed our lab technician to make two ceramic veneers using the press technique with IPS e.max(R) Press (shade HT A1, stained). At the same time, we milled two ceramic veneers with our in-office CAD/CAM machine using an IPS Empress CAD Multi block (shade A1). The veneers made in the dental office were not glazed, just polished. Figures 6 and 7 allow the results to be compared from a facial perspective. This experiment illustrates the esthetic potential of modern ceramics. Both types of restorations blend in beautifully with their surroundings. The appearance of the veneers produced with the help of CAD/CAM technology came very close to that of the manually manufactured version. Nevertheless, in the end we opted for the lab-fabricated veneers (IPS e.max Press) with the consent of the patient, since we were able to achieve a slightly better match to the neighbouring teeth by staining the restorations.

Placement

Figures 8 and 9 show the try-in pastes (Variolink Esthetic LC) on the prepared teeth. The most suitable composite cement was determined on the basis of two differently coloured pastes. Two extreme options were compared:

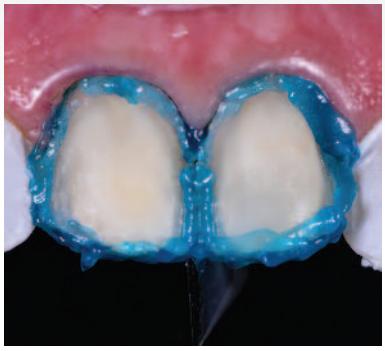

Fig. 10: Enamel etching with phosphoric acid

Fig. 11: Application of a single-component adhesive (Adhese Universal)

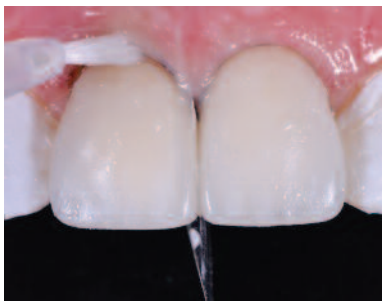

Fig. 12: Removal of excess composite cement

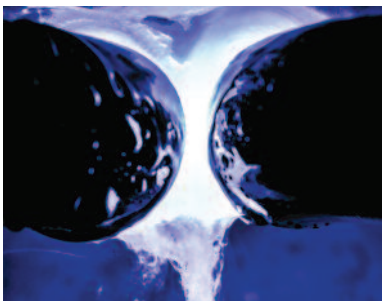

Fig. 13: Light-curing with Bluephase Style polymerization lights with water cooling

Fig. 14: The result: The patient with the ceramic veneers in place

Light+ and Warm+. The difference was clearly visible when the pastes were applied. Even though the darker shade (Warm+) was very close to that of the natural tooth structure and would have worked well with the veneers, we ended up choosing the lighter shade. This was a typical decision. In most cases, we tend to prefer the lighter version, since it provides a better contrast to the tooth structure and therefore renders the removal of excess cement easier and faster. Before the veneers were seated, retraction cords were placed and the enamel was etched; the dentin remained unetched. Adhese® Universal was used as the bonding agent to place the veneers (Figs 10 and 11). Then the excess luting composite was carefully removed and a glycerine gel (Liquid Strip) was applied (Fig. 12). This gel prevents the formation of an oxygen inhibition layer at the margins. The luting composite was cured with two curing lights (Bluephase® Style) simultaneously and cooled with plenty of water (Fig. 13). Figure 14 shows the harmonious result produced by the lithium disilicate veneers (IPS e.max Press).

Conclusion

State-of-the-art restorative materials have immense potential. Depending on the particular requirements of the patient and the indication, they allow a suitable treatment option to be found quickly and easily. The case presented here shows that highly esthetic ceramic veneers can be fabricated with minimal effort using in-office equipment (IPS Empress CAD Multi). Nevertheless, pressed ceramic veneers were chosen for this patient, since they offered the possibility of applying stains, through which a very close match to the neighbouring teeth could be attained. In principle, however, highly esthetic results can be achieved with both approaches if the appropriate treatment protocol is followed.

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