Impeccable esthetic results with ceramic restorations

By Dr. Nelson Geovane Mansing, Brazil, Passo Fundo, Brazil, and Alexandre Santos, Brazil

The aim of any restorative treatment in anterior teeth is to re-establish proper function and a natural-looking smile. In addition to ensuring the function and longevity of the restoration, the aesthetic expectations of the patient have to be fulfilled.

Materials that are based on biomimetic principles allow the natural teeth to be faithfully reproduced in many different clinical situations. Furthermore, biomechanical aspects and light-optical characteristics have to be taken into consideration in the restoration process.

Clinical case study
The 55-year-old patient requested an aesthetic makeover for his front teeth. The slight gap (diastema) in the upper anterior dentition, which was visible when he smiled, displeased him in particular. The clinical examination also revealed dark stains on tooth 21, which had been caused by endodontic treatment and composite restorations (Figs 1 and 2). Models were created and photos taken in order to thoroughly analyze the existing situation and plan the anticipated result. The photographic documentation included portrait pictures of the patient as well as intraoral close-ups. Subsequently, the tooth shade (Fig. 3) was determined. The Digital Smile Design protocol was used and a wax-up was fashioned on the basis of the information acquired during the planning stage. A composite resin (Systemp® C&B) was used to fabricate an intraoral mock-up of the planned restorations.

Selection of the restorative material
A suitable restorative system was chosen on the basis of general aesthetic and functional considerations. In the following case, we decided to take advantage of the outstanding esthetic potential of feldspathic ceramic and the excellent biomechanical performance of the adhesive cementation protocol on natural tooth structure.

State-of-the-art adhesive luting techniques involving ceramic conditioning with hydrofluoric acid and silane produce reliable bonds between ceramic restorations and natural dentition. Moreover, adhesive cementation requires less invasive preparation of the tooth structure and it imparts the restoration with excellent biomechanical properties.

Preparation and impression taking
The other three teeth required only minimal preparation. The canines 15 and 25 remained untouched, since they were to be restored with veneers that do not require any preparation. A silicone matrix made according to the diagnostic wax-up was used as an orientation aid during preparation. Tooth preparation was confined to the dental enamel in order to ensure an effective and long-lasting adhesive bond.

The impression was taken with an addition silicone (Virtual®) using the double-cord technique. Subsequently, the prepared teeth were photographed together with the shade guide samples in order to ensure the best possible shade match in collaboration with the dental laboratory. The matrix which had been fabricated according to the diagnostic wax-up was used to produce the intrasoral mock-up. The composite material (Systemp C&B) was used for this purpose and for fashioning the provisional restoration.

Fig. 1. Preoperative smile: The patient was dissatisfied with the a 12-ligament of his frontal teeth.
Fig. 2. Close-up: Slight gaps are visible between the frontal teeth, and tooth 21 is discolorated.
Fig. 3. Determination of the tooth shade
Fig. 4. After minimally invasive preparation of teeth 12 to 22
Fig. 5. Custom-layered veneers in the laboratory on refractory dies
Fig. 6. The veneers were made of fluoroapatite leucite glass-ceramic (IPS e.max). As a result, light optical qualities that are similar to those of natural teeth were achieved.
Fig. 7. The delicate ceramic veneers were prepared for seating.
Fig. 8: The fit of the individual veneers was checked in the mouth of the patient.

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veneers and the canines were lightly finished.

Fig. 9. The transitions between the ultra-thin veneers and the canines were lightly finished.

Fig. 10. Final polishing

Fig. 11. After seating of the six veneers on teeth 13 to 23

Fig. 12. Inspection of the functional parameters

In the dental laboratory

The ceramic restorations were created on a refractory model using a fluorapatite leucite glass-ceramic (IPS d.SIGN®). Prior to this step, we selected the appropriate ceramic layering materials with the help of the shade determination photos. Then the veneers were conventionally layered on refractory dies. After the firing process, the restorations were carefully finished. Subsequently, the delicate ceramic veneers were prepared for placement (Figs 5 to 7).

Placement

The provisional restorations were removed and the prepared teeth were cleaned. Then the veneers were tried in the mouth (Fig. 8).

Try-in sequence:
- Dry try-in of each individual restoration for the inspection of fit
- Dry try-in of all the restorations together in order to check the proximal contacts
- Try-in of the restorations with glycerine paste (Variolink® N Try-In) for determining the shade of the luting composite
- Try-in paste in order to select the most suitable shade of the luting composite. In principle, a translucent material is selected for cementing ultra-thin veneers (for example Variolink N Clear Veneer), since the natural tooth structure and the restoration are expected to produce the tooth shade. Nevertheless, if the shade needs to be specially adjusted, try-in pastes in other shades can be tested and used.

Once the luting composite had been selected, the try-in paste was rinsed off with water and the restorations were conditioned with nine-percent hydrofluoric acid (HF) for 90 seconds. Then they were thoroughly rinsed with air-water spray. The prepared tooth surfaces were cleaned with 35-percent phosphoric acid for 20 seconds. A silane solution (Monobond® Plus) was applied and left to react for one minute, followed by the adhesive (ExciTE® F). A light-curing composite (Variolink N Clear Veneer) was used to cement the restorations in place.

The restorations were seated according to the corresponding protocol. After the excess cement had been cleaned up, the composite was polymerized for 60 seconds at high light intensity (1,200 mW/cm², Bluephase®). Since the canines did not require preparation before they received the ultra-thin veneers, the transitions between the restorations and the teeth had to be lightly finished with a diamond polishing system (Optifine®).

The surfaces were finished by moving from the restoration to the tooth structure in order to prevent any damage being done to the natural dental enamel (Figs 9 and 10).

Conclusion

The adhesive cementation of ceramic restorations offers a proven treatment strategy, which provides excellent biomechanical and esthetic results. In the described case, the natural-looking and esthetic result speaks volumes. A satisfied patient with a beaming smile was released from the dental practice (Figs 11 to 13).

Fig. 13. Final picture: The upper tooth row looks esthetic and very natural.