Achieving aesthetic diastema closure

Sidney Kina and Shigeo Kataoka

A 26-year-old male presented with diastemas in the entire anterior and canine region. Moreover, there was a lack of central dominance while the canines were very prominent. The left central incisor had previously been restored with composite resin. Overall, the patient's smile had an unbalanced appearance and lacked visual coherence and harmony (Figure 1).

First, a diagnostic wax-up was fabricated in order to establish the appropriate tooth proportions (Figure 2). The treatment goal was to close the diastemas and make the centrals more dominant. To balance the height/width proportions of the teeth 11 and 21, their mesio-distal width was to be extended and their length slightly increased. By closing the diastemas, a perfectly aligned row of teeth with defined contact points would be achieved.

In order to create space in the upper jaw, the anterior canine guidance had to be optimized. For this purpose, tooth 43 was adjusted by preparing it accordingly (Figure 3).

The next step involved the fabrication of a silicone matrix based on the diagnostic wax-up. With the help of the matrix, a mock-up was constructed using the composite resin Tetric®. This procedure is crucial for effective treatment planning and leads to predictable results (Figure 4). Apart from visual aspects, the importance of tactile sensation should also not be overlooked at this stage. In contrast to the dentist, patients not only judge the visual appearance of the mock-up, but also the "feel" of it. In general, the patients initially perceive the mock-up as a foreign object in their mouth and have the feeling that the planned restoration is too large in size. In order to prevent this impression the mock-up should only be seated in the mouth after polishing, so that its surface feels completely smooth. Despite the cohesive effect achieved by the closure of the diastemas and the greater visual weight given to the central incisors, the canines were still too prominent in this case. Prior to tooth preparation, subgingival probing was carried out to evaluate the possibility of locating the gingival margin in the sulcus (Figure 5).

After detailed aesthetic and functional planning, the teeth were prepared. For this purpose, a silicone matrix was fabricated based on the diagnostic wax-up. It gave a clear picture of the space required for the ceramic veneers

Figure 1: Preoperative situation.

Figure 2: Treatment planning by means of a wax-up.

Prof Dr Sidney Kina, Maringá/Brazil, and Shigeo Kataoka, Osaka/Japan

Contact addresses:
Prof Sidney Kina. Rio Branco Avenue # 942 room 17, 87015-380 Maringá, Paraná, Brazil.
www.sidneykina.com.br • sidneykina@gmail.com

Shigeo Kataoka. Daiei Bldg. 1-10-17 Kyomachibori, Nishi-ku, 550-0003 Osaka, Japan. octc@bc4.so-net.ne.jp

Figure 3: Preparation of tooth 43.

Figure 4: Try-in of the mock-up.

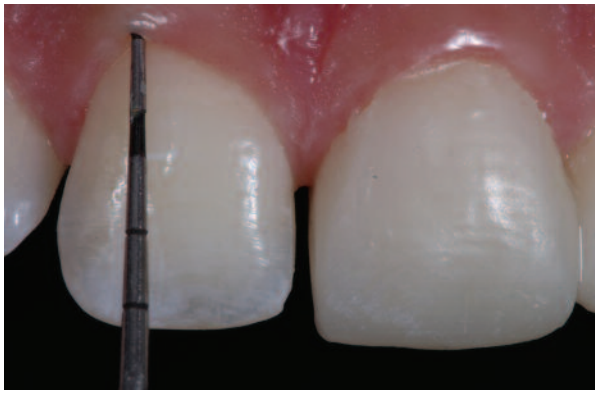

Figure 5: Subgingival probing prior to tooth preparation.

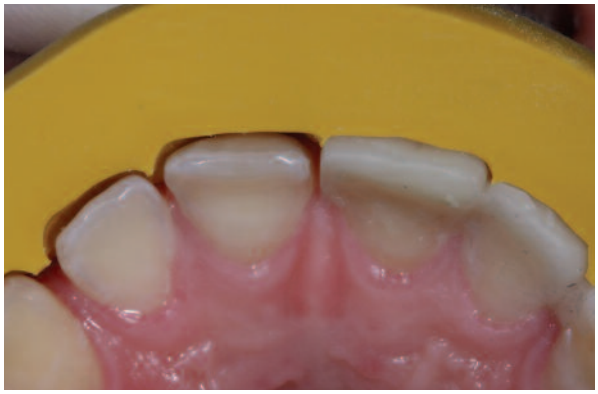

Figure 6: Silicone matrix serves as a guide for tooth preparation.

(0.5mm) and served as a guide for the layering of the restoration (Figure 6).

Based on the treatment plan, the dimensions of the teeth had to be enlarged. Therefore, only a chamfer preparation was made. This type of preparation allows good adhesion and mechanical retention to be achieved. Consequently, optimum function of the bonded ceramic veneers is ensured.

In order to create a harmonious smile, the first premolar on the right also had to be restored with a laminate veneer. The large composite restoration in tooth 21 was removed. The tooth was still vital.

Preparation of the remaining tooth structure of tooth 21 was started on the distal aspect, since the contact point between tooth 21 and 22 was located too far gingivally. It is essential to completely remove the proximal contacts in order to ensure optimum access during the subsequent procedures.

The prepared surfaces were finished using abrasive finishing discs. At this stage, only the edges of the protruding areas were rounded to ensure smooth outlines. If sharp edges and angles are present, stresses may build up in the ceramic.

Figure 7: Completed preparation.

Figures 7 and 8 show the teeth after completion of the preparation with the retraction cord, which remained in place during the whole preparation procedure. The cord prevents sulcus fluid from contaminating the tooth structure and helps to maintain the space created by the second cord for an extended period of time.

Following this, a low-viscosity silicone (Virtual Light Body polysiloxane) was injected into the sulcus. In this procedure, the syringe should be constantly kept in contact with the

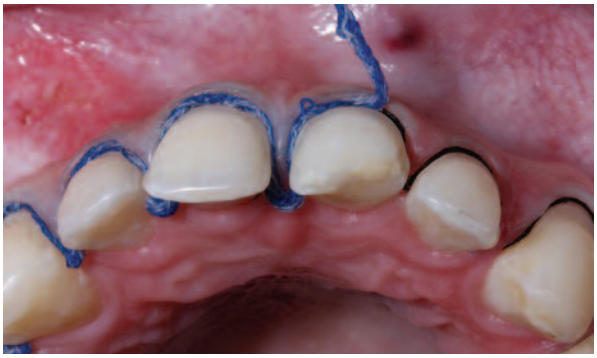

Figure 8: Removal of the second retraction cord.

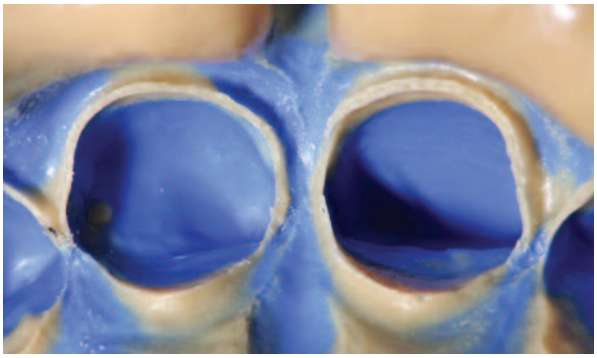

Figure 9: Definitive impression.

Figure 10a: Completed ceramic restorations (IPS d.SIGN) on the model …

Figure 10b: … and individually.

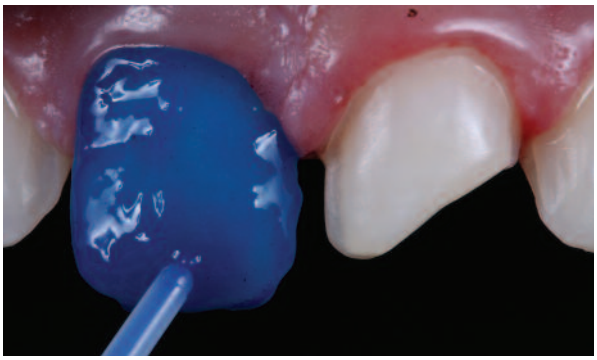

Figure 11: Etching with phosphoric acid.

Figure 12: Tooth surface after the application of dental adhesive.

tooth structure so that the silicone is forced into the gingival sulcus space with greater pressure. The formation of voids on the sulcus floor should be avoided. After the silicone has been injected, a gentle stream of air is applied to better adapt it to the dental tissues.

Then an impression tray was loaded with an impression material of higher viscosity (addition-curing Virtual Putty) and seated with a continuous, gentle movement.

The resulting double-mix impression was very accurate and easy to read. The details of the tooth neck section were precisely reproduced (Figure 9).

In order to achieve balanced proportions, the proximal contacts were slightly relocated in a palatal direction. Hence, the mesio-distal region was closed and space was gained on the vestibular aspect. Moreover, the reflection of light along the transition areas was maintained.

Figures 10 a and b show the completely layered ceramic veneers on the model as well as the individual veneers. If a backward planning approach is chosen, minimally invasive procedures are much easier to conduct and the high strength of the ceramic material can be still be used to advantage. The ability to clearly visualize the end result is the key to achieving predictable high-quality restorative solutions.

Figure 13: The excellent collaboration with Shigeo Kataoko has resulted in …

Figure 14: … a highly aesthetic restoration.

Figure 15: Harmonious overall appearance.

Preparing the ceramic surface for adhesive cementation

The internal aspects of the ceramic veneers were etched with 5% hydrofluoric acid for 60 seconds. Next, the veneer restorations were thoroughly rinsed with water and cleaned in an ultrasonic unit (plastic tank) with 90% alcohol for four minutes.

Then a silane was applied for 60 seconds (Monobond S). The solvent was evaporated. In order to improve the chemical bond, the ceramic can be warmed with eg a hairdryer.

Subsequently, a coat of adhesive was applied (Heliobond). Excess bonding agent was removed very carefully in order to ensure that a thin, uninterrupted adhesive layer remained. The adhesive did not need to be light-cured.

Preparing the tooth structure

Prior to adhesive cementation, the tooth structure was etched with 37% phosphoric acid for 30 seconds (Figure 11). Then the etching gel was rinsed off and the prepared surfaces were dried to reveal a mat-white appearance.

Following this, a dental adhesive (ExciTE® DSC) was applied and dispersed with a gentle stream of air. The tooth structure then had a slightly glossy appearance (Figure 12) and was covered with a thin layer of adhesive. It is important to note that the adhesive did not need to be light-cured.

The layered ceramic veneer was coated with composite cement (Variolink® Veneer) and inserted with a smooth, continuous movement. Back and forth movements were avoided to prevent the inclusion of air bubbles in the cement.

After the ceramic veneer had been seated in place, excess cement was removed with an explorer (a flat brush can also be used). Then the cement was lightcured alternately from the vestibular and palatal aspect for ten seconds, until both sides had been exposed to polymerization light for a total of 60 seconds. In this way, the generation of excessive heat was avoided.

Apart from closing the gaps between the teeth, the objective of the treatment was to make the central incisors more dominant and thus impart more coherence to the whole tooth arch. A balanced, harmonious appearance was achieved (Figures 13 to 15).

Published with permission from Reflect 02/09