**All-ceramic anterior restorations**

A clinical case involving a crown next to a veneer next to a crown

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Every intra-oral restorative treatment can change the character of a smile. Therefore, a controlled course of action is indicated. In prosthetic treatment, the achievement of a balanced smile is a very important step towards establishing a natural appearance.

A 22-year-old female patient and dental student presented at the clinic because she was dissatisfied with the appearance of the composite veneers on her maxillary anterior teeth. Moreover, she was unhappy with the inflammation of the surrounding gingiva (Figs. 1a & b).

The patient requested functional and aesthetic anterior restorations. Her dental history was recorded and she was examined intra-orally. In such aesthetically demanding cases, portrait photographs are essential. Ideally, these photographs should be taken from different angles. With the help of the photograph and additional information, the patient’s expectations and goals were discussed.

In the intra-oral exam, we found discolourations in the maxillary incisors, a lack of vitality, poor appearance and disproportionate dimensions of the composite veneers. Radiographs of the maxillary incisors revealed a good endodontic situation but little coronal tooth structure.

Preliminary impressions were taken to produce a study model, which would provide us with a physical reference on which we could draw lines, straighten long axes, adjust lengths and perform cosmetic contouring in relation to the adjacent teeth. Based on this initial planning, a diagnostic wax-up was made, followed by a silicone index, which is a proven and indispensable tool for the fabrication of temporary restorations and for use as a guide in tooth preparation.

**Preliminary treatment and preparation**

The treatment plan included the use of custom-shade fibre-reinforced composite post and cores owing to the previous extensive preparation of the canals, all-ceramic crowns for teeth 11 and 21, as well as all-ceramic veneers for teeth 12 and 22. The central incisors were prepared for receiving the post and cores. The final impressions of the canals were taken with condensation silicone.

The fibre-reinforced composite post and cores were fabricated in the dental laboratory and cemented after the try-in using the dual-curing composite system Variolink N (Ivoclar Vivadent).

The central incisors were prepared according to the general principles of all-ceramic crown preparation. For this, a 1 to 1.2 mm rounded shoulder was created subgingivally. The lateral incisors were prepared according to the general principles of veneer preparation. A 0.5 mm chamfer was created equi-gingivally with a 0.5 to 0.75 mm buccal reduction. In addition, a 3 mm bevelling was prepared at the incisal edge (Figs. 2a & b). The final impression of the maxillary arch was taken using the addition silicone Virtual (Ivoclar Vivadent).

With the help of the silicone index, the temporary restorations were fabricated directly in the patient’s mouth. In this way, she was able to see her expected post-operative appearance.

During the following two weeks, the patient visited the dental practice regularly for monitoring of her periodontal and gingival situation. No signs or symptoms of discomfort were observed or reported. Furthermore, the healing of the gingival tissue was satisfactory in terms of colour and positioning.

The temporary restorations allowed the patient to become accustomed to her new anterior teeth. At this stage, however, it was still possible to adjust the shape of the restorations intra-orally and to implement these changes in the permanent restorations.

The combination of all-ceramic crowns and veneers simplified the material selection in this case immensely. It was decided to use lithium disilicate, a material that numerous studies have confirmed to be both robust and aesthetic. The final decision was to use IPS e.max Press (Ivoclar Vivadent).

From a saturation point of view, shade A1 was indicated. However, the brightness was higher than that of the LT (low translucency) A1 ingot, especially in the middle third. If a lighter ingot in Bleach shade (LT BL4) had been selected, the saturation would have been too high for the veneers. The HT (high translucency) Bleach ingots might have been an option had there not been the two crowns in the middle, which may have influenced the level of brightness. Therefore, the V1 (Value 1) ingot worked perfectly here, since the data collected from the abutment colour and the thickness of the diagnostic wax-up were not contrary to the planned result.

It is generally recommended that the shade be selected in daylight. In this aesthetically demanding case, many photographs of the teeth were taken with the flash turned off and while holding lighter and darker shades next to the natural tooth at a similar angle. These were very helpful during the laboratory procedures.

In order to achieve a natural-looking restoration and to increase the light transmission and guarantee the shade match in depth, chroma, value and hue, an identical layering diagram had to be used for all the restorations (veneers and crowns). However, before this layering diagram was determined, the dentine background of the natural preparations from the patient’s mouth had to be transferred to the restorations. This approach ensured a perfect shade match through-out the fabrication procedure up to cementation.

The IPS Natural Die Material (Ivoclar Vivadent) was most helpful in this task (Fig. 1). Only then was the layering diagram created and were the required materials selected from the IPS e.max Ceramic (Ivoclar Vivadent) range.

Wash firing was performed on the pressed frameworks. The cervical and proximal areas were characterised with IPS e.max Ceram Stains (Shade and Essence) for the first firing, which enabled not only an optimum shade match but also a lighter shade. For the second firing...
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firing cycle, a thin layer of dentine body material was built up to adjust the long axes and even out the sizes.

The laterals were rotated 3 to 5 degrees on the long axis (mesial out and distal in), which imparted a soft aesthetic and youthful effect.

In general, the dental technician has to be aware that by changing the long axis the light reflective surface of one tooth in relation to another (central-lateral in our case) also changes. The structure of the mamelons in the mandibular teeth was clearly visible in the photographs. The IPS e.max Ceram Mamelon materials enable the lifelike reproduction of these structures. The natural effect of the mamelons and the opalescence should be achieved by means of the halo effect. From the incisal edge towards the tips of some mamelons, a mixture of Opal Effect 1 and Transpa blue was applied in the middle of the incisal area. Brighter IPS e.max Ceram Impulse materials (OE 3 and OE 4) were used to apply internal characteristics and contrast. The third firing cycle of the Transpa Incisal material served more to improve the shape of the restoration than to give it shade. After firing, considerate time was invested in contouring, surface texturing and finishing.

After the restoration had been finished in the laboratory, the patient came in for a clinical try-in, during which photographs were taken from all angles (Figs. 4–6). The dental technicians had the opportunity to discuss the expectations of the dentist and the patient. At the try-in, it was observed that the left central incisor was a little off-set. This important aspect would have been missed had the restoration not been tried in. The lip line in particular and the integration of the crown into the facial surroundings of the lips are crucial to the technician’s work. Subsequently, the necessary adjustments were made in the laboratory. In this case, a slight curving adjustment was made at the incisal edge to complement the feminine character of the patient’s face (Fig. 7).

Only after these final adjustments was glaze firing performed, which allowed the restorations to blend in harmoniously with their natural surroundings. Glaze firing is a critical step and its results are greatly influenced by manual polishing, glaze consistency and firing parameters.

The final restorations, now in line with the patient’s and dentist’s expectations, were delivered to the dental practice. The maxillary central incisor crowns were permanently seated with Variolink N (base and catalyst), while the maxillary lateral incisor veneers were placed with only Variolink N Base. Fine-grit diamond burs and finishing and polishing rubber heads from the OptraFine range (Ivoclar Vivadent) were used to remove excess cement and to eliminate any occlusal interference. The patient was highly satisfied with the result (Figs. 8 & 9).

During the follow-up appointment, another check-up was done and final modifications were made.

Conclusion

The analysis of the components inherent in a soft and delicate smile demonstrated that the lateral incisors (axis, inclination and rotation) have the largest effect on the personality and appearance of a person’s smile. It is important to note that if one central is slightly off-set from the other, an asymmetrical and unnatural look is produced. The dental technician and the patient may require some courage for this approach, but when the aesthetic parameters involved and the art of reproducing them are perfectly understood, the aesthetic result will reward all involved.

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