SMILE MAKEOVER OF DARK SUBSTRATE WITH VENEERS AND AN ANTERIOR CROWN — using the biologically oriented preparation technique in a digital workflow

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Introduction

This case report demonstrates the possibility of combining different materials and approaches in order to achieve a satisfactory result when it comes to treating teeth with a dark substrate. The focus is on the biologically oriented preparation technique (BOPT) applied in a digital workflow to achieve maximum predictability in the esthetic area.

The BOPT entails a vertical preparation or feather edge to achieve satisfactory results in the cervical area, especially in the case of dark substrate or a thin gingival biotype that is susceptible to reces- sions in the marginal area. Preparations without finish lines are more conservative and the crown margin is located at the root area. For vertical preparations, the laboratory technician positions the margin based on the gingival tissue information. The problem is that, for digital scanners and CAD/CAM restorations, a different protocol is required than for the classical BOPT, where the technician works on the cast in order to define the margin and create the crown’s emergence profile.

Case presentation

The patient was a 32-year-old man wishing to improve his smile (Fig. 1). He particularly did not like the color and shape of his teeth, especially the crown on the maxillary left central incisor and its darker appearance at the gingiva. His maxillary left central incisor had an old porcelain-fused-to-metal (PFM) crown (placed more than ten years before) with gingival recession at the cervical area and the metal margins of the crown showing (Fig. 2).

After a clinical and radiographic examination, we proceeded to a treatment plan according to the digital smile design (DSD) concept in order to create a predictable additive mock-up that would show us the end result prior to commencement of treatment (Figs. 3 & 4). Owing to the visual communication (DSD of the case and mock-up), we gained the patient’s acceptance of the treatment plan, which would entail removal of the old PFM crown and preparation of the adjacent teeth for laminate porcelain veneers (Fig. 5). The maxillary anterior teeth had vertical and horizontal cracks. This, combined with the initial dark substrate and the patient’s desire for a significantly whiter shade for final restoration, led to a less conservative preparation. Under the PFM, a golden post in good shape was encountered. It was decided that, owing to the differences in substrate color, we would first proceed with the laminate porcelain veneers and, after cementation, move forward with a new monolithic zirconia crown for tooth #11.

Impression taking was done digitally using TRIOS 3 (3Shape) for the laboratory to manufacture the desired restorations. The veneers were manufactured with a CAD/CAM core of lithium disilicate, allowing for a cutback and layered porcelain. After the veneers had been cemented, I proceeded to refine the old preparation according to the BOPT, then added composite (IPS Empress Direct, Ivoclar Vivadent; A2 dentin shade) to the substrate surface in order to achieve a homogeneous substrate (Figs. 6 & 7). A new digital impression was taken for tooth #11.

The laboratory used Zirkonzahn for the CAD restorations and modified the margins of the crown for these to be located in the sulcus for the tissue to have a new emergence profile (Fig. 8). Owing to accurate visual communication and shade matching, the laboratory technician was able to manufacture a monolithic zirconia crown for tooth #11 that would mask the dark substrate and match the adjacent restorations (Figs. 9–11).

Conclusion

The BOPT concept can be of great help for masking dark substrates, in the case of a thin gingival biotype or for a better emergence profile. Owing to the digital impression (which is less technique-sensitive than classical impression taking for the BOPT), good visual communication and the advances of CAD/CAM, the laboratory technician can now easily create better emergence profiles and thinner and smooth margins that will ensure the longevity of the restorations and better health for the surrounding periodontium.

Editorial note: A list of references can be obtained from the publisher.
Fig. 1
Initial situation.

Fig. 2
Intraoral view. Note the PFM on the maxillary left central incisor.

Fig. 3
DSD with the desired outcome.

Fig. 4
Additive mock-up in order to show the final outcome prior to the treatment.

Fig. 5
Stump shades of the prepared teeth. Note the dark substrate of the maxillary left central incisor.

Fig. 6
Laminate porcelain veneers cemented and preparation according to the BOPT for the maxillary left central incisor.

Fig. 7
Stump shade of the maxillary left central incisor for shade matching.

Fig. 8
CAD for the new crown on the maxillary left central incisor. (Image: Yuli Dental Studio)

Figs. 9–11
Final outcome.