

Challenging aesthetic restorations: combining materials from a different nature

by **Dr. Silvia Del Cid, Spain**



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Silvia Del Cid graduated in 1999 as a dentist at the University of Granada. She further specialised by enrolling in a Master in Conservative Dentistry and Endodontics at the University Institution Mississippi between 1999 and 2001. Her diploma of Oral Implantology and Implant Prosthesics, obtained in 2006, is supported by the European Implantology Forum. In 2013, she received a Diploma in Occlusion and Diagnosis in Oral Rehabilitation, from Dr. Aníbal Alonso. She is a speaker in demand at national conferences and hosts practical courses about layering techniques.

Currently, one of the major challenges in Aesthetic Dentistry is the requirement to combine materials from a different nature and with different optical properties in order to deal with clinical situations that require predictable aesthetic results, this while following the principles of maximum conservation of the dental structure.

The latest developments in materials for dentists and dental technicians allow us to handle complex cases with the best aesthetic outcome and durable results, as shown in the following case report.

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A 55-year-old patient came to the clinic because she was not satisfied with the aesthetic appearance of her teeth due to a defective crown on tooth 21 and diastema closure with composite on tooth 11, 12, 13 and 22 because of a periodontal disease, now stabilised. The patient had previously had an external whitening (Figures 1 and 2). We observed discolouration, marginal flaws, overcontouring and a dull aspect of the composites. We suggested the patient to replace the crown in 21 and the composite restorations in 11, 12, 13 and 22, without making veneers, as an option of minimum intervention. The patient agreed with the treatment plan. I contacted Carlos de Gracia, dental technician, and we planned which material would be the most appropriate to restore tooth 21. We decided first to restore tooth 11, 12, 13 and 22 with direct composite chairside and then proceeded to make the crown in the laboratory.



Figure 1: Frontal view of the patient



Figure 2: Lateral view of the patient

In order to get an optimal integration of the restorations in their surroundings, it is fundamental to respect the following parameters: shape, size, surface texture, value and translucency of the natural tooth. Shade and colour saturation are of secondary importance from the point of view of the final integration. It emerges from all this that in order to get an optimal aesthetic integration, the technique

and expertise of the operator are more important than the properties of the materials used.

Shade selection and cavity preparation:

In order to determine the shade, we used the Try Button technique. A sample of each dentin shade was applied directly on the clean tooth surface and light-cured. The process was repeated with enamel shades on the incisal third in extension towards the free edge. **This should always be done before isolation placement so that dehydration and the subsequent change in shade is prevented** (Figure 3).

Polarised light was used to obtain a more accurate interpretation of the colour by eliminating the specular highlights in the image, facilitating the visualisation of the different intensities and opacities of the tooth. In this case, the composite Essentia (GC) was selected. This composite has the feature of having a different composition for enamel (nanohybrid) and dentin (microhybrid), which allows for a greater dispersion of the light due to its different refractive indexes.

The selected colours based on the Try Button technique were: Essentia Light Enamel (LE) for the palatal walls, Essentia Light Dentin (LD) for cervical and middle third and Essentia Light Enamel (LE) for vestibular and interproximal



Figure 3: Shade determination using the Try Button method with different enamel and dentin pastes



Figure 4: Same view as in Figure 3 with polarised light



Figure 5: Complete isolation of the operative field



Figure 6: Bevelled and smoothed enamel for an increased bonding

enamel.

The accurate selection of the colour can be seen in the photograph with polarised light (Figure 4).

Next, the operative field was isolated completely (Figure 5) and surfaces to be prepared were cleaned in order to remove the biofilm and to improve the subsequent bonding process. Rubber cups and pumice paste were

used for this cleaning step. For the cavity preparation, the old restorations were removed first. Then, the aprismatic enamel was removed and the cavity margins were smoothed in order to optimise the surface for bonding (Figure 6). For the reconstruction of the anatomy of the interproximal cavity walls, metallic sectional matrixes (Composi-Tight, Garrison) were used (Figure 7).

The bonding procedure as the key step

The aesthetic demand of patients is growing, and this sometimes means that key steps in the restorative procedure which do not have an immediate impact on aesthetics (such as bonding) may seem less important to practitioners.

My professional experience has shown me that **most of failures in composite restorations are caused by mistakes during the bonding process.**

According to me, bonding is the most important and crucial procedure step in the restorative procedure when using resin composites. The main objective is to create a stable hybrid layer which will not degrade over time. Hence, it is crucial to use a dental adhesive system that does not contain hydrophilic

monomers (e.g. HEMA) that tend to trigger this degradation.

We also consider it of utmost importance that the chosen adhesive contains 10-MDP monomers, which improves stability of the hybrid layer over time, allowing a mechanical and chemical bond unlike traditional systems.

I prefer the self-etching technique: selective etching on enamel with orthophosphoric acid 35-37% during 10-15 seconds (depending on the pH of the adhesive system used) (Figure 8) and subsequent application of a self-etch adhesive on the enamel and the dentin in order to avoid routinely acid etching the dentin and triggering the release of matrix metalloproteinases (MMPs). It is important to ensure the complete removal of the residues of orthophosphoric acid through aspiration and rinsing during at least 15 seconds before continuing with the following step.

We applied G-Premio BOND on enamel and dentin during 15 seconds, rubbing the adhesive with a brush. In order to remove the solvent completely (one of the main reasons of the degradation of the hybrid layer) (Figure 9), the adhesive is dried with air for 5 seconds... before light curing for 20 seconds.



Figure 7: Sectional matrixes for the reconstruction of the interproximal walls



Figure 8: Selective enamel etching



Figure 9: Application of the universal adhesive G-Premio BOND

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Figure 10: Application of Essentia LE on the palatal and interproximal walls and Essentia Masking liner to mask the discolouration of the cervical third



Figure 11: Application of Essentia LD with a greater opacity, respecting the space for the vestibular enamel and not invading interproximal zones



Figure 12: Application of vestibular enamel with Essentia LE

Composite layering process

One of the current trends in dentistry is the simplification of the layering technique. **The composite Essentia (GC), which was selected for this case, allows to simplify layering with composite as much as possible through bilaminar technique (2 layers).** Due to the different composition of enamel (nanohybrid) and dentin (microhybrid), the light is dispersed in a natural way thanks to different refraction indexes.

We first restored palatal and interproximal walls with Essentia LE. In order to mask the change of colour of the cervical third on tooth 11, we also

used a thin layer of Essentia Masking Liner (ML). This shade is interesting because it is more translucent than standard opaquers and does not completely block the light, resulting in a more natural final restoration (Figure 10).

Essentia LD was used to restore the dentin in the cervical and middle third, because of its adequate level of opacity (more opaque than other dentins). It respects the space for the vestibular enamel and does not invade the interproximal zone (Figure 11).

The vestibular enamel was restored with Essentia LE (more opaque and

with a higher value than the Dark Enamel DE). We then light-cured the restorations under glycerine gel in order to remove the oxygen-inhibited layer and get a greater conversion factor on the surface (Figure 12). After finalising the shape and morphology, we proceeded to the creation of surface texture and the polishing steps. In this case a coarse-grit polishing disc (Sof-Lex, 3M) and Astropol/Astrobrush polishing systems (Ivoclar Vivadent) were used (Figure 13).

Figure 14 shows the fully rehydrated restorations on tooth 11, 12 and 13 with the provisional crown on tooth 21 in anticipation of the laboratory work.



Figure 13: Surface texture after finishing and polishing



Figure 14: Rehydrated restorations of tooth 11, 12, 13 and provisional crown in 21 in anticipation of the laboratory work.



Figure 15: Initial situation with discoloured tooth stump for the Initial Zr crown

Laboratory stage: fabrication of the zirconia crown

We sent the photographs of the initial situation as well as the ones taken with polarised light to the dental technician Carlos de Gracia. As shown in Figure 15, the metal core build-up was not in a favourable condition.

The milled substructure of Initial Zirconia Disk was layered with the different Initial Zr pastes (Inside, enamel, CLF, Opalescent...) in order to reproduce the colour of the adjacent teeth. As a colour reference, we also sent him a composite button made of Essentia composite during the clinical phase (Figure 16).

The opalescence of the finished crown is shown in Figure 17. We then proceeded to the luting phase with an adhesive resin cement (G-CEM LinkForce, Translucent; GC). Figure 18 shows the final situation after cementation.



Figure 16: Colour comparison between the Initial Zr crown and the sample button of Essentia composite



Figure 17: Finished crown on the model



Figure 18: Final situation after the Initial Zr crown was cemented on tooth 21

The handling of the materials we currently have at the clinic and the laboratory allows us to solve complex situations, like in the above case report. Even starting from an unfavourable situation, excellent aesthetic results can be obtained.