

How to build up the perfect tooth

Ulf Krueger-Janson¹

The natural appearance of a tooth can be successfully reconstructed with a composite resin that is based on an integrated shade and layering system. Restorations of this kind blend in seamlessly with the natural dentition in accordance with biomimetic principles. Choosing the most suitable material for the task at hand is decisive for the successful outcome. The shade range of IPS Empress® Direct composite resin comprises five dentin materials in A shades (high opacity) and five matching enamel shades (high translucency). In addition, stronger as well as more translucent shades are available, some of which are opalescent, for designing the lateral enamel areas and incisal edges. This well-rounded range of shades and layering materials facilitates the creation of natural-looking restorations with composite resin. The following article describes the fabrication of a composite resin restoration in an anterior tooth using IPS Empress Direct. The procedure is described chronologically, starting with shade selection and ending with the final design adjustments.

¹ Ulf Krueger-Janson, Frankfurt am Main/Germany

Contact details:

Ulf Krueger-Janson
Stettenstrasse 48, 60322 Frankfurt am Main, Germany
ulf.krueger-janson@t-online.de

Assessment of the preoperative situation

The appearance of the upper anterior teeth in the preoperative situation was unsatisfactory. Tooth 11 looked particularly unattractive. Neither its shape nor its shade satisfied the standards of a high-quality dental restoration. In order to obtain a clearer picture of the preoperative situation, a greyscale image was produced (Figure 1). This image illustrates the insufficient brilliancy as well as lack of translucent areas. Furthermore, surface structures and their various transitions as well as wavelike white striations are visible. From the incisal aspect the vestibular contour looks distinctly uneven (Figure 2). As a result, the right incisor leans



Figure 1: Preoperative situation: The unattractive composite build-up on tooth 11 needs to be replaced. The image is shown in greyscale to emphasise the shade nuances and the surface quality.

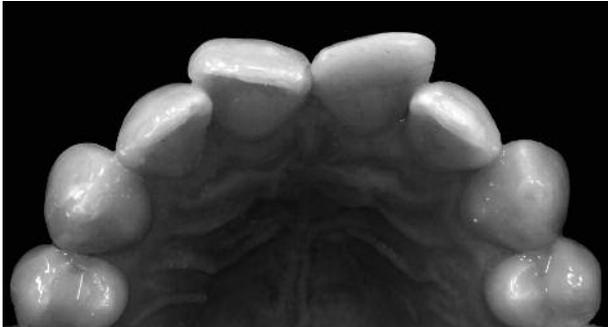


Figure 2: Incisal view: Uneven vestibular contour. The neighbouring tooth 21 shows that in order for the tooth to appear lifelike, it needs to be positioned like a "butterfly wing".

towards the labial aspect. The "wing effect" of the teeth in this particular case could not be reconstructed. Consequently, tooth 11 looks out of place.

The shade system of IPS Empress Direct comprises various dentin shades, which exhibit a high opacity. They are suitable for achieving bright effects (Bleach L/XL) or providing complete coverage (IVA5/A6). The system also includes matching enamel materials with more translucent Bleach



Figure 3: Individual shade samples from the composite range in use are applied to the neighbouring tooth 21 as a shade reference.



Figure 4: After the removal of the old restoration, the layering process begins.

and Incisal shades as well as shade components called Trans Opal (opalescent).

A straightforward method is available for gaining a general impression of the shade layers of the natural neighbouring tooth. Various shade samples of IPS Empress Direct are applied on the untreated enamel surface of the adjacent tooth – in this case tooth 21 – and polymerized (Figure 3). Shade variations should be eliminated due to the polymerization process. The prepared tooth is then illuminated from various angles with the operator light. As a result, the viewer gains a good idea of what the individual shades will look like in the mouth of the patient. The shade impressions obtained in this way provide the operator with valuable information regarding the shade behaviour of the composite resin system in use and the shades required for building up the restoration. In the present case, for example, the opalescent material Trans Opal was applied to the sides of the restoration in order to imitate the bluish-white areas of the natural adjacent tooth.

Build-up and layering of the basic shape

After the old restoration had been removed from tooth 11, the first increments were placed (Figure 4). In order to imitate the saturated and intensive shade (opacity) of the neighbouring tooth, dentin shade A3 was placed at the base of the restoration. In addition, dentin and enamel shades A2 were applied in the incisal area. A lighter shade was required in the cervical region and therefore Dentin A2 layers were applied. Enamel A2 was placed on the sides (distal, mesial) of the restoration in order to impart more brightness to the tooth. Figure 5 clearly shows the different layers: The shade designations have been projected onto the image. Due to the dehydration of tooth 21, the shade had already changed compared with the samples shown in Figure 3. This serves

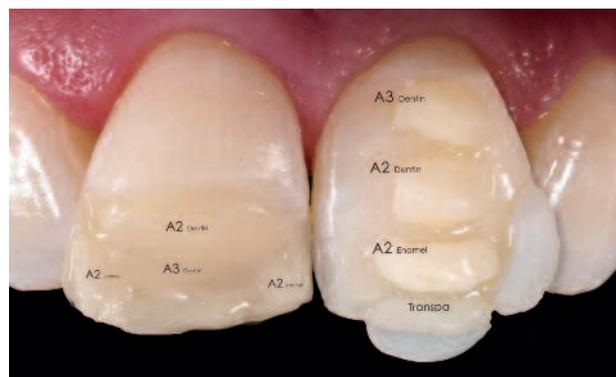


Figure 5: The image illustrates the layering process; the shade designations have been projected onto the image.



Figure 6: The basic shape and colour of tooth 11 have been recreated. The overall appearance corresponds to that of the adjacent tooth.

as an important reminder that shade selection must be done very quickly, since the neighbouring tooth no longer provides a reliable shade reference once it is dehydrated. The built-up materials were covered with a coating of Flow A2 and the vestibular surfaces were created.

Tooth 11 was built up according to the described layering protocol. The aim of this step was to copy the shading of the neighbouring tooth and create the basic shape of the restoration (Figure 6). The incisal area of this roundish tooth shape was difficult to recreate. The mesial edge was quite angular and only transitioned into the rounded body of the tooth towards the distal aspect. In this case, it was necessary to exaggerate the contours of this area when the composite was placed. This created ample scope for finishing the restoration. In all cases, the convex and concave areas have to be carefully finished. This task is often difficult to accomplish in the first attempt.

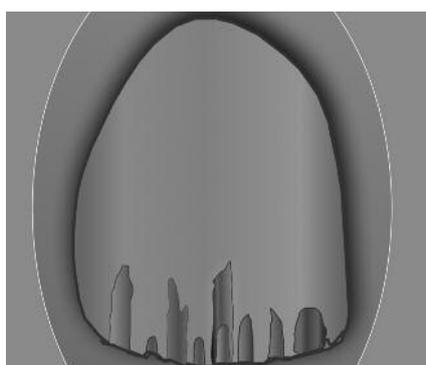
The functional parameters are also taken into consideration in this process. This approach has shown to be very effective in routine practice work. If time is tight, for

example, patients can be discharged with this type of “preliminary solution”. The final layering procedure takes place at a later stage. Before the patient leaves the practice, however, the surface of the build-up should be coated with a flowable product in order to give the patient a comfortable feeling in the mouth.

Customized shading

The restoration build-up was completed with different shades from the range of composite resin materials. Mamelon-like depressions were cut into the surface of the preliminarily shaped and shaded restoration with a finisher (red code, fine grit) using the cut-back technique (Figures 7 and 8). The individual shade effects were inserted into these grooves at a later stage (inlay technique). The neighbouring tooth provided a mirror-image example. Various depths and widths imparted vibrancy to the structure.

The ground composite resin surface was coated with an unfilled bonding agent. Subsequently, the bonding agent was dispersed with air (Figure 9) to prevent the accumulation of a thick layer of material in the marginal regions, which could cause an undesirable greyish transitional zone. The prepared vestibular tooth surface was filled with the selected flowable shades. The shades of Tetric EvoFlow® exhibit various whitish opacity levels. Different shade values ranging from yellowish (Bleach I) to bluish (Bleach L) are available. Bleach XL contains titanium oxide fillers and is therefore the most densely filled product (Figure 10). The wide spectrum of shades enables fine shade nuances to be created. In the present case, the surfaces between the mamelons were filled, beginning with the deepest point. For this purpose, the flowable material was placed and then “pulled” into the areas needing to be filled with a probe tip. This procedure prevented the formation of bubbles. Various levels of opalescence were created (T, Bleach L, I, M, XL). If a highly



Figures 7 and 8: The cut-back technique involves grinding out mamelon-like grooves. Various depths and widths impart vibrancy to the structure of the restoration.



Figure 9: The prepared surfaces are coated with a bonding agent.

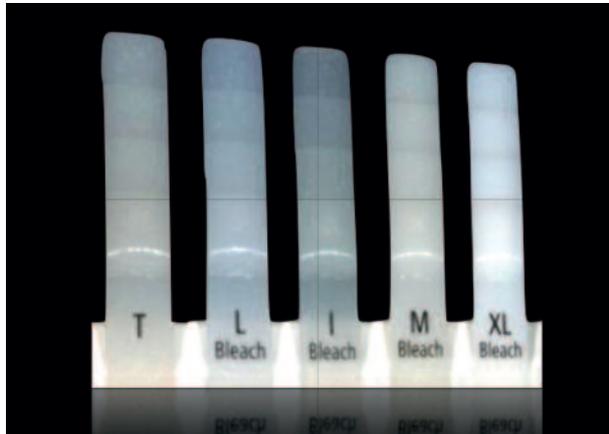


Figure 10: The different shade values of the Tetric EvoFlow range from yellowish (Bleach I) to bluish (Bleach L). Bleach XL contains titanium oxide fillers and is therefore the most densely filled product.

translucent shade such as Bleach I is used, the grey value is increased to achieve a greyish “intermamelon area”.

In order to illustrate the shade design more clearly, a shade map was projected onto the image in Figure 11. Finally, the



Figure 11: In order to provide a clear indication of the shading process, the shade areas have been projected onto the image.

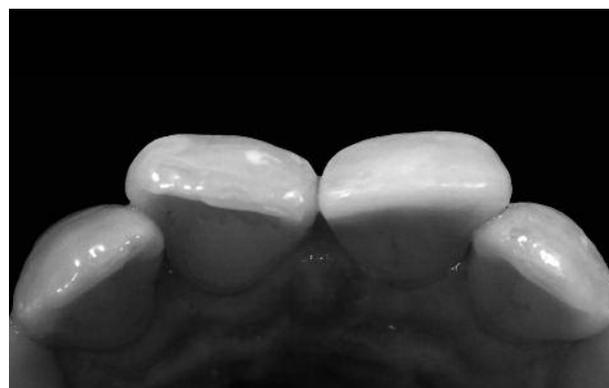


Figure 13: The morphological integration has succeeded. The incisal view shows the natural-looking “wing effect” and a vestibular contour that is identical to that of the neighbouring tooth.

restoration was coated with a flowable layer. In this case, Transpa (T) material was chosen. In situations where various shades are required to merge into each other, the flowable materials can be mixed with each other on the tooth surface. Nevertheless, close attention must be paid to preventing the inclusion of air bubbles.

Re-examination is important

One week after the completion of the restoration, the tooth 10 was clinically evaluated and checked with regard to the adaptation of the shade to that of the surrounding natural dentition (Figure 12). On closer inspection, very discerning operators may miss a bluish tinge in the incisal edge. If desired, however, this area can be optimized by cutting it back slightly and inserting Trans Opal to adjust the appearance.

The morphological integration of the restoration was successful. The view from the incisal aspect clearly shows the “wing effect” of the “butterfly teeth” and an even vestibular contour (Figure 13), resulting in a natural appearance. The



Figure 12: One week after completion: Critical evaluation – a perfectionist may miss a bluish tinge in the incisal region. Nevertheless, the patient and the operator are completely satisfied.



Figure 14: Final evaluation of the composite build-up.F

incisal-to-cervical curvature was adjusted with a file from the Eva System (KaVo). The final evaluation of the composite build-up was carried out by looking at the tooth from different angles (Figure 14). The light reflecting bands at the sides are a reliable indicator of the proper anatomic shape of the restoration. These bands are responsible for the three-dimensional effect of the tooth. These side areas are created by a ridge that results from the transition between the vestibular surface and the interdental area. As shown in Figure 12, it is particularly important to round the distal side of "butterfly teeth".

Conclusion

The success of a composite resin restoration primarily depends on the appropriate reconstruction of the tooth morphology. Furthermore, the recreation of natural shade effects should be given equal attention. The resulting

restoration will blend in smoothly with the surrounding dentition also in terms of biomimetics. In the case of complicated shapes, the contours of the neighbouring tooth should be copied as faithfully as possible. A three-dimensional design is a prerequisite for ensuring the overall integrity of the restoration. The incisal edge contours as well as the mesial and distal contacts are decisive to establishing the appropriate tooth shape. Modern materials allow discerning professionals to restore even very complex shade cases with composite resin layers. For this purpose, a composite that is available in true-to-nature shade components is requisite. The cut-back method simplifies the layering process, providing ample design freedom.

Reprinted with permission by Reflect 02/12