The mock-up: A clinician’s everyday tool for aesthetic dentistry

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For a wax-up, also known as a diagnostic wax model, laboratory wax is used to create an aesthetic concept model based on the patient’s plaster model. However, its aesthetic and functional use is limited. From an aesthetic perspective, even though the wax does not reproduce the tooth shade perfectly, it facilitates visualisation of the shape and position of the teeth in the concept model. As far as function is concerned, even when a high-performance articulator is used, it is still difficult to replicate the full range of masticatory movements.

The mock-up, essentially a preview produced from composite, is a technique all too rarely employed by dentists, but that proves exceptionally practical in a wide variety of situations all too rarely employed by dentists. As far as function is concerned, even when a high-performance articulator is used, it is still difficult to replicate the full range of masticatory movements.

The mock-up phase follows validation of the wax-up. In this phase, the concept model is adapted directly in the mouth after validation on the plaster model. This facilitates transfer of the wax-up data from the patient model directly to the mouth. The trial fitting in the mouth offers the opportunity to verify the concept model from an aesthetic, functional and psychological perspective. This last aspect is of particular significance, considering that it imparts an important principle of patient acceptance, namely being able to first try out a solution and then make an educated final decision. In this way, the patient plays an active role in the decision-making process, which considerably improves communication.

It is important to note that communication with the dental technician must be optimised in the any corrections, a duplicate of the mock-up is sent to the laboratory. The dental technician now has at his or her disposal additional information, with which he or she can achieve a predictable aesthetic result.

**Treatment plan**

Mock-ups are suitable for treatment in the anterior region requiring corrections to the shape of teeth through the addition of material and, to a lesser extent, adaptation of the position of the teeth. The main indications are loss of substance on vital teeth, missing individual teeth, diastema or other congenital aesthetic defects that permit a bio-aesthetic approach.

Once a diagnosis has been established and the type of treatment selected, the dentist orders a wax-up based on the patient’s tooth model. Of course, he or she needs to inform the dental technician in the laboratory of what he or she expects in terms of shape and position, but not yet the shade. The first step is for the dentist to validate the wax-up on the model, this allows him or her to make any necessary corrections directly in the practice using suitable materials. In such cases, it is always worth asking the dental technician to send additional wax with which any corrections requiring addition of material can be performed. The wax-up is then shown to the briefed patient (it is a 3-D simulation of the concept design) — and the limitations (the tooth shade cannot be replicated in a wax-up) mentioned — and it is compared with the plaster model without any corrections in order to demonstrate the improvements objectively. Once the patient has accepted the wax-up and any necessary corrections have been made, the wax model is transferred from the plaster model to the patient’s mouth in order to simulate the treatment intraorally. These steps are described in the “Step by step” section.

The mock-up is shown to the patient in order to determine the optimal tooth length and the general proportion of the new smile. It is still possible to make corrections at this stage. After any corrections, the dentist and patient approve the mock-up and an impression is taken, which is then sent to the laboratory, where it serves as a reference for the final production of the concept model.

**Materials**

Mock-ups are easy to produce in routine clinical practice as long as there is sufficient material available and the user masters the necessary skills in advance. In this article, I describe a technique in which a self-curing composite (Structur 3, VOCO; Fig. 1), which is usually employed in the production of temporary crowns, bridges, inlays and onlays, is deployed in the scope of an off-label use. In contrast to laboratory wax, which is used for wax-ups, the visual properties of this material allow reproduction of the natural tooth shade (within a sufficiently large range of A1 to A3.5, including the Shades B, C and Bleach Light). The mechanical resistance of the material makes it possible to simulate the occlusion of the mock-up in the mouth. Self-curing composites are similar to conventional light-curing composites. As a result, the composite can be adhered to the mock-up in order to compensate for defects or change the shape (tooth elongation, curvature of vestibular tooth surface, incisal cut-back, etc.). The retention occurs mechanically, that is no cement is required. In contrast to a temporary crown, the mock-up is ultimately destroyed upon removal.

**Step by step**

The clinical case presented here to illustrate the workflow was a consultation for aesthetic reasons. The patient wanted to improve his smile considerably without resorting to invasive techniques. He restricts himself to the implementation of a mock-up in the mouth. The first step involves taking a number of photographs in order to analyse the initial clinical situation with the patient (Figs. 2–5). A plaster model serves as the basis for production of the wax-up (Fig. 6). An impression is taken of the wax-up (Figs. 7 & 8), which is used in the mouth as a guide for the implementation of the mock-up.

The guide is tried in the mouth, and any necessary corrections made with a scalpel. The shade of the self-curing composite (in this case, Shade A3) is now selected in accordance with the patient’s expectations and the tooth shade of the natural teeth.

The impression is filled with the composite (Fig. 9) and inserted into the mouth (Fig. 10). The impression is removed, at the earliest, 1.5 minutes after mixing (Fig. 11). However, final processing can only be performed after 4 minutes. The shape is adjusted either by means of contouring in conjunction with water cooling, as in the case of conventional composites, or by filling defects with a flowable composite (Grando Flow, VOCO; Figs. 12–14). Finally, the structures and dynamics of the occlusion are verified.

Once all adaptations have been completed, the mock-up is presented to
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“Patient compliance increases, as he or she can follow the treatment plan more calmly and is better informed.”

the patient for his or her aesthetic approval regarding shape, position and tooth shade. If necessary, further adaptations can be effected in the same way, that is via contouring or filling with composite. The data is sent to the laboratory as photographs (portrait, smile and intra-oral, Figs. 15 & 16), along with an impression of the mock-up and the analysis of the smile. The dental technician in the laboratory then has the necessary and sufficient information at his or her disposal to produce the actual prosthetic restoration in accordance with the patient’s and dentist’s wishes.8

At the end of the treatment session, the question remains as to what to do with the mock-up. The dentist has the choice of two possibilities. One option involves removing the mock-up and permitting the patient to leave the practice with the mock-up and permitting the patient to assess the desired result, but is not expected to follow the treatment plan more calmly and is better informed. In addition to improved patient communication, communication with the dental technician is facilitated. Owing to the impression and photographs of the mock-up in the mouth, the dental laboratory has at its disposal a wealth of invaluable information, which was not systemically provided in the past.9 The dental technician is then able to test the wax-up not only from a functional perspective (structural and dynamic occlusion, position of the free margin for articulation, lip support, etc.), but also from an aesthetic perspective (tooth shade, shape and volume of the teeth, smile symmetry, smile alignment with regard to facial aesthetics, etc.). The user friendliness of the material means this technique is suitable for use in routine clinical practice.

For the dentist, this technique is just as easy to perform as the production of temporary crowns. There is no need for a rubber dam, as the mock-up is produced under the same conditions as for a temporary crown. In addition, this non-invasive technique does not require preparation, retention, bonding or anaesthesia. The patient will certainly appreciate this tissue-preserving approach. As such, the patient will perceive the treatment as more of an adventure.10 Of course, however, mock-ups are not without their restrictions. Their indication is restricted to prosthetic restorations in the anterior region, with severe malformations representing a contraindication, as the teeth may be positioned outside of the plane of the wax-up. The technique is also not indicated in cases in which enameleplasty is required (too long or too severely curved tooth).

As production of a mock-up requires a certain degree of dexterity, it should be initially practiced on a plaster model before work is performed directly in the patient’s mouth. The therapeutic treatment of a patient may require a longer period; even though the mock-up phase can be very informative and useful for patient communication, it remains an additional, facultative phase. Furthermore, dentists who do not use self-curing composites for temporary restorations could view procurement of these materials as an additional cost factor. However, it is worth weighing up the fact that the mock-up could considerably improve patient acceptance in an extensive treatment and thus the investment could indeed be worth it. Nothing is more frustrating for a dentist than investing time and effort in the development of a long, complex treatment plan only for it to be rejected by the patient because it fails to meet his or her expectations.

From the dental laboratory’s perspective, this method provides the dental technician with additional information, which allows him or her to tailor his or her work precisely to the patient’s and dentist’s expectations. The improved communication reinforces the cooperation between the dentist, patient and dental technician.

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