Recreating smile characteristics in dental restorations

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Our mouths do not have a biological function only. People respond to the way we use our mouths in a variety of ways. When we show our teeth, we reveal something about ourselves. When we smile, we show emotions.

The main task of every dental technician is to recreate the functional and anatomical characteristics of the teeth and their surrounding tissue. But what about the patient’s individual facial characteristics? This case report describes the case of an edentulous female patient who underwent a customised aesthetic restoration. Finding a balance between a high smile line, an extremely low mandibular vertical dimension and limited vertical space in the maxilla was the main challenge here (Figs. 1a & b).

The patient wanted to have her edentulous maxilla and mandible restored. At first sight, a high smile line and the short length of the upper lip were evident. The bone of the mandible showed signs of severe atrophy and the maxillary alveolar bone appeared to be unduly large by comparison. When determining a treatment plan that could meet the patient’s individual needs best, the clinical team first explained to her what a fixed aesthetic prosthesis would have to be skilfully fabricated. Findings between aesthetic preferences, the need to ensure an aesthetically pleasing restoration and the patient’s pronounced lip dynamics, which made it difficult to achieve good restorative aesthetics. The goal was to find a way of camouflaging the transition between the prosthesis and natural gingiva for a natural blend. Here, the lack of alveolar height proved to be a problem again because the maxillary restoration could not be designed to extend to the gingival buccal fold.

So what other options were available? After the models had been transferred to the articulator, a mock-up was created and tried in to visualise the prospective outcomes (Figs. 2a–d). Tooth-coloured material made of polyurethane was used to avoid the patient being distracted by an unnatural tooth colour. With the mock-up in the patient’s mouth, the clinical team was able to clarify all contingencies, whilst taking aesthetic preferences, function and phonetic aspects into account. At the mock-up stage, the following objective and subjective characteristics were assessed:

- Has the facial plane been faithfully transferred to the dentures (occlusal plane)?
- How do the maxilla and mandible relate to one another (vertical bite relationship)?
- Has a harmonious balance between pink and white aesthetics been achieved?
- Are pink and white aesthetics harmoniously balanced?
- How much white is possible and how much pink is necessary to ensure an aesthetically harmonious smile?
- Is the patient capable of articulating speech clearly (phonetics)?
- What are the patient’s feelings regarding the restoration and can she identify with it?
- Does she have any additional requirements or requests for adjustments?

In a rather tricky case like this, accurate groundwork requires time and a detailed analysis of the initial situation. For the maxilla, we decided to fabricate a telescopic bridge veneered with a laboratory composite. Additional locking components were required however owing to the lack in vertical height.

The sliding friction of the telescopes alone would not have kept the denture in place tightly. In the mandible, a bar-retained prosthesis was indicated. Aesthetic veneering with a composite was also the method of choice here. In order to achieve lasting friction, attachments (CEKA PRECI-LINE, ALPHAIDENTS) were used with the bar construction. As the existing bone was used for the setting of the implants, they were not ideally distributed over the entire alveolar ridge. Additionally, the extreme bite height appeared to pose difficulties to some degree. Physical stability undermined by leverage forces was another concern.

After we decided on the design of the superstructure, we duplicated the mock-up in a transparent flask (Figs. 1a & b). This method allowed us to retain all the specifications that we had worked out thus far. Utilising transparent duplicating silicone is essential to transferring the planned reconstruction to the final restoration.
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The primary and secondary retentive elements were finally fabricated. The frameworks were tried in on the patient and checked for accuracy of fit (Figs. 4a–c). Achieving a tension-free fit was paramount in this context. The frameworks were veneered with SR Nexco Paste (Ivoclar Vivadent), a veneering composite with micro-opal fillers that was specially developed for the needs of dental technicians in terms of its physical and optical properties. Compared with ceramic materials, it absorbs forces better and is therefore particularly suited to veneering applications in implant restorations.

At this stage, the benefits of our meticulous approach to planning and of our transparent flask method were evident. SR Nexco Dentin material in the appropriate shade was pressed on to the conditioned framework and polymerised in a curing device (Fig. 2). With this method, the prosthesis could be homogeneously reproduced in SR Nexco Dentin in a relatively short time. The reconstruction was removed from the flask and reduced to the dentine core using the silicone key as a guide, similar to the cut-back technique (Fig. 6). Customised layering is essential to achieving a true-to-nature effect, not unlike ceramic restorations.

For complementing the incisal area, the corresponding material was placed into the flask and pressed on to the dentine core using heat and then polymerised. In a few more steps, we transferred the planned restoration to the final reconstruction using an aesthetic dentine and incisal material build-up (Fig. 7). After the pressed frameworks had been finished and fitted on to the models, the functional parameters were checked in the articulator and adjustments were made.

The next stage was to create lifelike gingival parts. The gingival materials were manually layered on to the framework. The comprehensive range of SR Nexco shades demonstrated its true potential here with a multitude of gingival shades. Materials of various degrees of translucency and opacity are available, providing abundant scope for creativity. These materials were used selectively to create a natural-looking artificial gingiva in accordance with the requirements of this demanding situation (Figs. 8a–d).

The restoration was completed in the customary manner. Shape, morphology and surface structure were all given the same amount of attention. After finishing the restoration (Figs. 9a–c), it was tried in. All aspects of the restoration were checked again and the shade effect was assessed. The transition between natural and artificial gingiva in the maxilla in particular was carefully examined. Although the patient showed pronounced lip dynamics with her entire vestibular space visible when laughing, the aesthetic success was not compromised. All criteria had been satisfactorily met, and approval for surface finishing and polishing was given.

During polishing, the beautiful characteristics and homogeneous material properties became apparent (Fig. 10). The optimally co-ordinated combination of micro-opal fillers and a composite matrix endows SR Nexco with the ability to be polished to an unmatched durable high gloss. The natural-looking opalescent effect can be seen in Figs. 11 and 12, and is the result of the high content of inorganic opal fillers, among other things.

The optical properties can be best observed in transmitted and incident light. Studies have shown that SR Nexco offers long-lasting shade stability, a durable gloss and low plaque affinity, while providing the team with reliability. When the restorations were inserted, the patient was very satisfied with our efforts (Figs. 13 and 14). The patient was extremely content with her fixed restoration. The dentures blended in naturally with the features of her face (Fig. 15). In spite of the suboptimal preoperative situation, we managed to create a customised and highly aesthetic restoration. Both the hygiene capabilities and long-term stability of the restoration were ensured.

It was equally rewarding to see this patient again after a while and still be given the same smile of gratitude. A well-structured treatment plan and ideal materials enable us to fulfill the fundamental human need for individuality.