Aesthetics and function
A systematic approach to full-mouth rehabilitation with all-ceramics

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This awarded entry in the Europe, Middle East and Africa category of the IPS e.max Smile Award 2016 describes the complex full-mouth rehabilitation of a female patient who consulted our practice because she was dissatisfied with the appearance of her smile. A reliable and efficient approach made the most of the interplay of aesthetics and function and all-ceramic materials.

Aesthetics and function—these two requirements are inseparable in restorative dentistry. The case outlined in this article highlights just how closely these two aspects are connected. The patient primarily wanted the treatment to enhance her appearance. The dental team, however, could not fulfill these aesthetic demands without taking into account the functional considerations. Our aim from the time of the treatment planning stage was to achieve a harmonious result. The extensive prosthetic work required a systematic treatment approach.

Case presentation

The young female patient consulted our dental practice about a smile enhancement. Her maxillary and mandibular anterior teeth were severely abraded and stained (Fig. 1). Moreover, she had received inadequate restorations in the past. The metal-reinforced bridges in the posterior region did not provide suitable function and aesthetics, and the patient was dissatisfied with the entire situation (Fig. 2). The unattractive appearance of her teeth was an embarrassment to her, especially when she smiled.

Diagnosis and planning

The first general diagnosis was based on the needs of the patient. Furthermore, specific aspects of the situation were assessed. A corresponding diagnosis was made and the patient was presented with a preliminary treatment plan. In accordance with our protocol, the plan focused on attaining a satisfactory balance between the functional and aesthetic requirements. Furthermore, mainly additive measures were planned, which would make the treatment minimally invasive. The clinical diagnosis revealed the extent of the damage. Severe abrasion had considerably shortened the anterior teeth, which showed well-defined wear facets. The vertical dimension of occlusion was clearly too low. The patient’s smile line was not ideal and therefore negatively affected her facial expression. The patient was in good general health. She did not complain of any temporomandibular joint pain or of tense jaw muscles.

In the development of the final treatment plan, we first concentrated on the functional requirements. In the process, we established that the vertical dimension of occlusion needed to be raised by 1 mm and a new occlusal scheme created. Therefore, we proposed the following steps: stabilise the situation with the help of long-term temporaries before starting the prosthetic treatment; place two implants to close the gaps left by the loss of teeth #46 and #36; restore the dentition with all-ceramic crowns, bridges and veneers (IPS e.max Press, Ivoclar Vivadent); and provide the patient with a bite guard to protect the teeth after the treatment. The patient agreed to this plan.

Prosthetic pretreatment

Photographs and video clips showing the patient when speaking and smiling constituted important diagnostic tools in the treatment process. They provided us with valuable information for the design of the diagnostic wax-up. Impressions were taken for the fabrication of the models. A face-bow record was taken for the skull-related transfer of the situation to the articulator. Furthermore, the new vertical dimension was verified in the mouth and it was raised by about 1 mm compared with the original situation.

From wax-up to mock-up

The models were articulated and then a diagnostic wax-up (Figs. 3–5) was created. The teeth were built up according to the new vertical dimension of occlusion. The anterior teeth were designed in such a way that their shape and length would suit the face of the patient. The aesthetic parameters, such as the smile line, midline and buccal corridor, were given as much attention as the functional requirements of the occlusion. Since we wanted to check the planned tooth length and shape in the patient’s mouth, we fabricated an acrylic mock-up on the basis of the wax-up (Fig. 6). The try-in of the mock-up allowed the dental team to obtain indispensable insight into the aesthetics and function of the restoration. It also provided the patient with a preview of the restoration and helped her to become accustomed to her new appearance.

“The all-ceramic restorations looked completely natural in the patient’s face.”
appearance. Actively involving patients in the planning process at this stage has a highly motivating effect and it positively influences the treatment result. During the try-in, the function of the restoration was tested in terms of the static and dynamic occlusion. Phonetic criteria were also checked in the process. Finally, some aesthetic details were discussed (Fig. 7).

The patient requested light teeth and bold tooth shapes.

**Implant placement and tooth preparation**

The prosthetic restorations in the lower jaw were removed and implants were placed in the gaps left by teeth #46 and #36. The wounds took about three months to heal. After the osseointegration of the implants and conditioning of the soft tissue, the teeth were prepared for receiving the prosthetic restorations. The premolars and molars required only light preparation. The maxillary anterior teeth were prepared for 360° veneers and the mandibular anterior teeth for ultrathin veneers (Fig. 8).

We pursued a minimally invasive strategy, which was quite easy to implement owing to the additive approach of the treatment plan. An impression of the situation was taken. Based on the mock-up, long-term composite resin temporaries (Telio Lab, Ivoclar Vivadent) were fabricated. During the next three months, the patient was able to accustom herself to the new situation. She was given the opportunity to test the new vertical dimension of occlusion and inform us about any aesthetic or functional needs.

**Permanent prosthetic restorations**

The patient had no trouble adjusting to the new situation and eagerly anticipated the placement of the permanent restorations. At this stage, she emphasized her requirements again: beautiful and, above all, light teeth. We decided to create the veneers with the press technique using a very light material (IPS e.max Press, LT BL3). The crowns for the crowns in the upper and lower jaws were fabricated with the press technique (IPS e.max Press, LT BL3) and individually veneered (IPS e.max Ceram, Ivoclar Vivadent). The long-term temporaries served as a template. The restorations were produced according to the established protocol. The requirements of both function and aesthetics were fulfilled. As requested by the patient, the anterior teeth were given a bold shape. The surface of the ceramic was imparted with a distinctive micro- and macro-texture, producing an interplay of light similar to that of natural teeth (Figs. 9 & 10).
Placement of the restorations

In preparation for the adhesive cementation of the restorations, the temporaries were removed and the teeth cleaned. The anterior restorations were checked in the mouth using a try-in paste and the aesthetic results were subsequently assessed. The occlusion was checked in detail. Next, the ceramic restorations were etched with 5% hydrofluoric acid for 20 seconds. They were cleaned in an ultrasound bath and dried. Their contact surfaces were silanised (Monobond Plus, Ivoclar Vivadent). Thereafter, a bonding agent (HelioBond, Ivoclar Vivadent) was applied. The individual ceramic components were temporarily stored in a container to protect them against light and contamination. The teeth were then conditioned. A rubber dam was placed and the teeth were carefully air-abraded with aluminium oxide (0.5 µ). Subsequently, a 37% phosphoric acid gel was applied and thoroughly rinsed off after a reaction time of 15 to 20 seconds. The preparations were dried to the extent that a slightly moist, shimmering dentine surface was visible. The application of the bonding agent (Syntac, Ivoclar Vivadent) followed. The restorations were placed with the light-curing luting composite Variolink Veneer (Ivoclar Vivadent). First, the veneers of the two central incisors were seated and their fit checked. Then one restoration after the other was placed on both sides. Before the restorations were light-cured for the last time, the margins were coated with glycerine gel to prevent the formation of an oxygen inhibition layer. We removed the excess with a fine diamond paste and polishers and then we polished and smoothed the margins. After the final examination, we checked the aesthetic and functional parameters in particular (Figs. 11 & 12). We provided the patient with a protective bite guard and then released her from the practice.

Result

The all-ceramic restorations looked completely natural in the patient’s face and her facial expression had completely changed. The young woman appeared to be relaxed and enjoying her new smile (Fig. 13). The first recall examination took place three days after the restorations had been placed. At that stage, the condition of the soft tissue was excellent. It had fully adapted to the ceramic surfaces (Figs. 14 & 15). The success of the treatment was confirmed at the six- and 12-month recalls (Fig. 16).

Conclusion

Sound functional principles, excellent aesthetic design skills and an outstanding materials system combined to fulfill the patient’s ardent wish for a smile makeover. The restorations gave her a new zest for life and improved her health at the same time.