



Conceptual Approach to Complex Rehabilitation of a Patient with Bulimia Nervosa: A Case Report

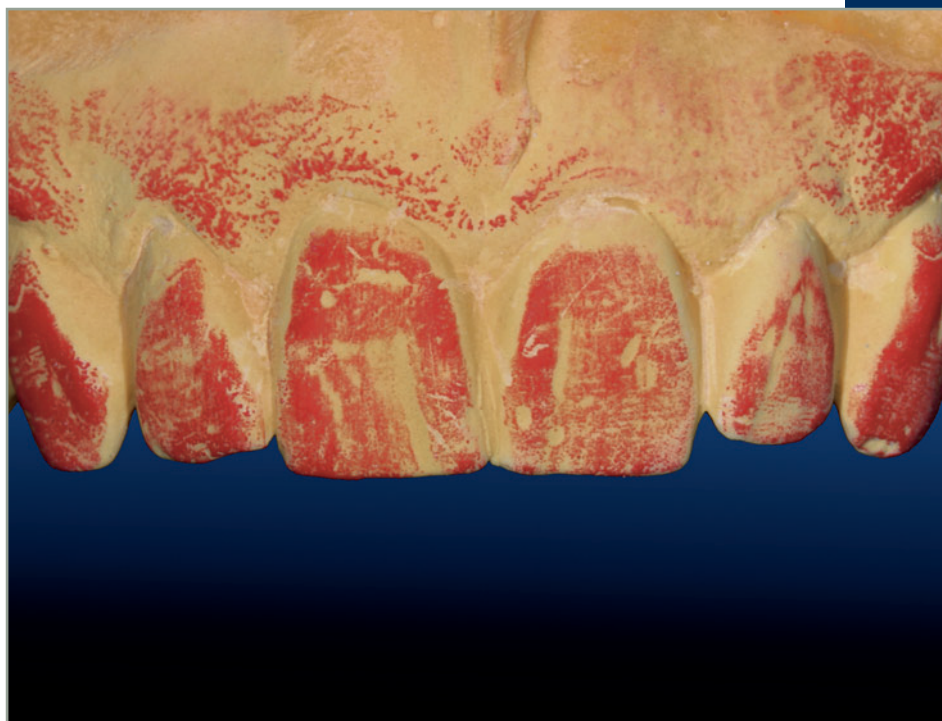
Stefan Schunke, MDT [Au: degree correct?]

Fürth, Germany

Markus Schlee, Dr med dent

[Au: Private practice?]

Forchheim, Germany



Correspondence to: Stefan Schunke

Alte Reutstr 170, 90765 Fürth, Germany; e-mail: st.schunke@gmx.de.



Abstract

This case report presents the clinical and technical protocol involved in treating a 32-year-old patient whose teeth and dental appearance were severely compromised as a result of bulimia nervosa. Patients suffering from this disorder have a high incidence of erosion of dentin and enamel,

which over time may cause loss of vertical dimension. This has an impact on the patient's overall appearance, with effects such as sunken lips, lack of support, and creases at the corners of the mouth.

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Fig 1 (a and b) The esthetics of the anterior teeth is severely compromised.

The modern patient comes to the dental practice already with a certain amount of information found on the Internet or in magazines or heard by word of mouth. This information gives patients certain expectations for their treatment outcome. However, one of the most difficult tasks in medicine is to achieve predictable successful results. This can only be done if a thorough case history is taken, model analyses are performed, and good communication takes place between patient, dentist, and dental technician. The requirements are good function and longevity and, of course, excellent esthetic results. To achieve this, particularly for complex cases, a treatment concept must be established.

Case background

A 32-year-old patient consulted the practice wanting to achieve a more esthetic smile. As a result of bulimia nervosa, her whole dental appearance was in a very compromised condition. Bulimia nervosa is an eating disorder classified as a psychogenic disease. Because of the purging

habits associated with the disorder, individuals with bulimia have a high incidence of enamel and dentin erosion, making this disease of interest to dentists. Studies suggest the age of patients affected ranges from 17 to 50 years, but most are between 18 and 25 years old. Ninety-five percent of patients affected are women. The incidence of bulimia nervosa is generally thought to be on the increase in Western society.¹

The patient had received treatment for bulimia nervosa, and there were no other disease symptoms.

Clinical examination

The purging behaviors often associated with bulimia nervosa cause etching of the enamel, which results in erosion and shortening of the anterior teeth. As a result, the overall esthetic appearance of the teeth is compromised (Fig 1). If, as in the present case, the anterior teeth have been severely eroded, the patient also may not be able to perform normal oral functions, and the relevant reference and functional planes

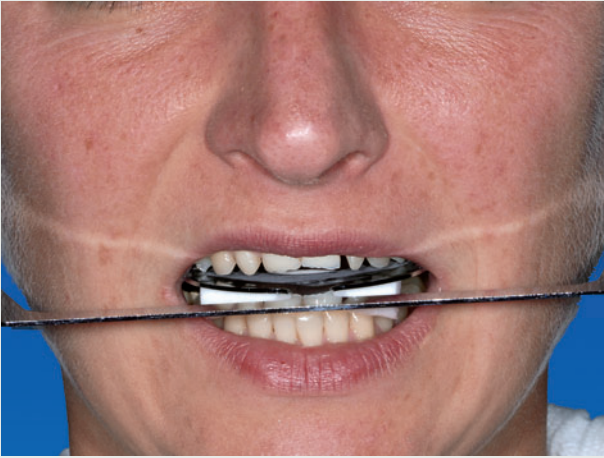


Fig 2 The altered esthetic and occlusal planes are evaluated using a Candulor bite fork with cotton rolls.

may be destroyed. To check the esthetic plane, a Candulor bite fork (Rielasingen-Worblingen) with cotton rolls was placed in the mandible against the maxilla; then it was placed in the maxilla against the mandible to check the occlusal plane (Fig 2). The patient reported no pain, and she had no abnormalities in the temporomandibular joint.

The next stage of the examination was cast analysis. A regular impression with vestibule and palate, as well as an arbitrary transfer, were required. As no other damage was found, it was not necessary to carry out time-consuming registrations. Considering the extent of wear, which was clearly evident during examination of the casts on the articulator (Fig 3), it was remarkable that the patient was not experiencing any pain.

Following the examination, it was decided that suitable restorations would be placed in the worn regions to restore masticatory function and appropriate esthetics.

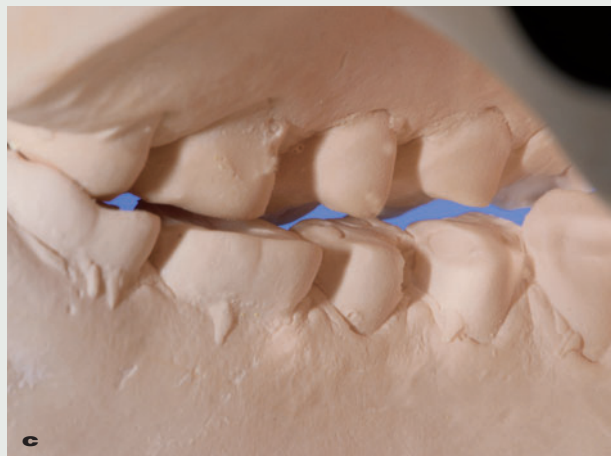
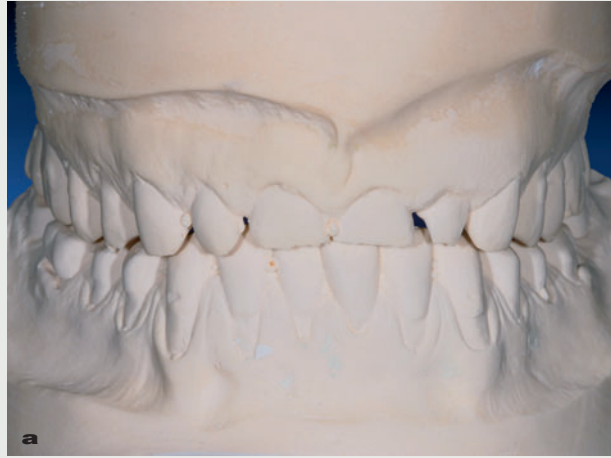


Fig 3 (a to c) The extent of wear and resulting masticatory problems became evident during cast analysis.

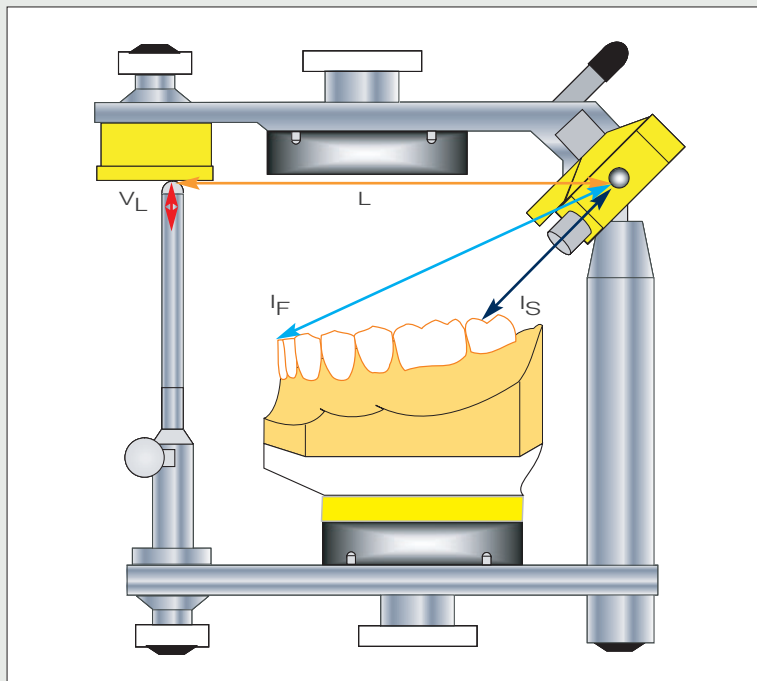


Fig 4 Factors in the Lotzmann formula for determining occlusal loss of substance. L = the distance from the condyle to the tip of the incisal pin running perpendicular to the articular axis, V_L = the vertical change measured at the incisal pin, and I = the distance from the condyle to the relevant contact (anterior [I_F] or posterior [I_S]).

Calculating loss of vertical dimension

Over time, vertical dimension may be lost because of erosion and wear of the teeth. Loss of vertical dimension is evident in the overall facial appearance, which is characterized by sunken lips, lack of support, and creases at the corners of the mouth. The difficulty lies in determining the proper amount by which the bite should be raised. The authors have been using the method presented here successfully for several years and have found it to be a quick and efficient approach.

Prof Dr U. Lotzmann published a formula with which an “approximate calculation of the occlusal loss of substance” (V_1) can be carried out²:

$$(V_L \times I) / L = V_1$$

where L = the distance from the condyle to the tip of the incisal pin running perpendicular to the articulator axis, V_L = the vertical change measured at the incisal pin, and I = the distance from the condyle to the relevant contact (anterior and posterior) (Fig 4).

In this case, two values were used for V_L , 6 and 7 mm, to determine the impact on the vertical dimension. The associated measured values were: L = 120 mm and I = 110 mm in the anterior area and 70 mm in the posterior area (Fig 8).

The results were:

- When the support pin was raised by 6.0 mm, V_1 was 5.5 mm in the anterior region and 3.5 mm in the posterior region.
- When the support pin was raised by 7.0 mm, V_1 was 6.4 mm in the anterior region and 4.0 mm in the posterior region.



Fig 5 The distances from the TMJ to an anterior **(a)** and a posterior **(b)** contact are measured.



Fig 6 A natural mandibular second molar should have a crown height of approximately 7 mm from the cementoenamel junction to the cusp tip.

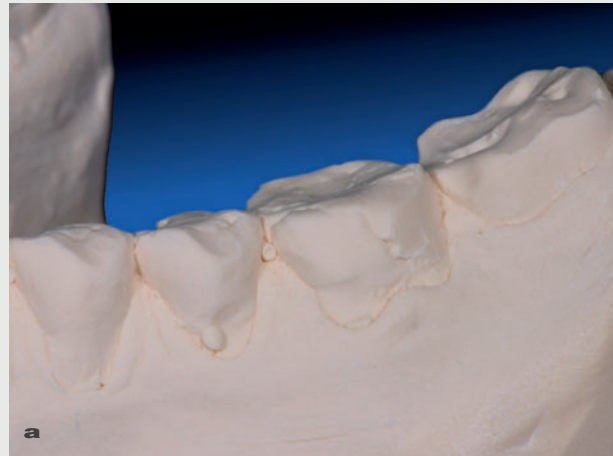


Fig 7 (a to c) According to tooth measurements, this patient could manage a 4-mm augmentation of the teeth in the mandible alone.



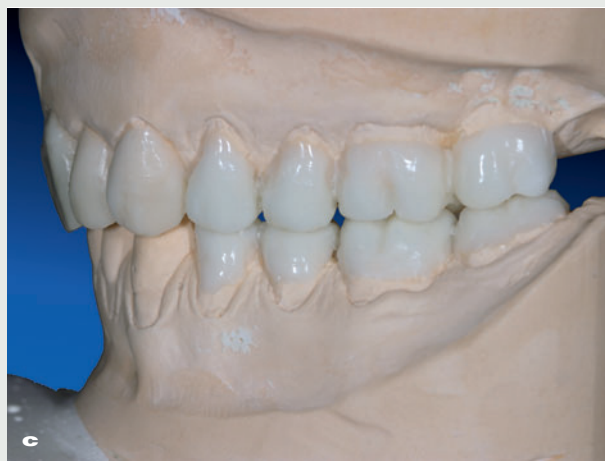
Fig 8 The incorrect functional and esthetic planes are demonstrated by the morphology of the maxillary teeth alone.



Fig 9 (a and b) The waxup is initiated using prefabricated teeth to obtain an overview quickly and efficiently.



Fig 10 (a to c) The waxup is finished.





These values initially may seem quite high, but, when distributed equally between the maxilla and mandible, the amount is actually reasonable. Measurement of natural teeth or reference to a suitable anatomy text³ would reveal that the second molar (used as the reference because this was the contact used to determine the I value for the present case) should have a crown height of 7.0 mm in its unworn state (Fig 6). Assuming that some of the erosion in the present case may be due to natural abrasion, the sliding callipers were set to 6.0 mm. As shown in Fig 7, the calculated values of a 3.5- to 4.0-mm rise almost could be achieved in the mandible alone (Fig 7). Considering the extent of erosion in the maxilla as well (Fig 8) and the inadequate functional and esthetic planes, the probability of attaining this bite augmentation was very high.

Waxup

The aim of a diagnostic waxup is to define the final outcome, but the amount of time and effort invested in this process should be balanced with the cost involved. In this case, it was still uncertain what the patient was willing to bear in terms of surgery and preparation, so the costs had to remain manageable. Rather than building up the wax, which is a laborious, time-consuming, and hence cost-intensive work, the dental technologist slightly ground back the anterior teeth on the cast and created a horizontal plateau in the posterior dentition, then set up prefabricated wax facets with a colorless, slightly elastic wax. Prefabricated wax occlusal surfaces were also placed (Fig 9). Once the maxillary and mandibular casts were thus set up and the planes



Fig 11 The planes established in the waxup are verified on the articulator by means of the Candulor bite fork.

had been checked, the waxup was refined and finalized (Fig 10).

Although the waxup provided only an overview of the desired outcome, and not details such as specific tooth contacts, it was not difficult to see that this was a distalized dentition. Therefore, only a direct tooth-to-tooth relationship was possible. As a good overbite existed, it was reasonable to think that a deep cusp-fossa relationship could be built up. As the morphological appearance of the molars is influenced by the TMJ, the cusp-fossa relationship should remain relatively flat. [Au: Edit OK?]

Finally, the planes were checked on the waxup (Fig 11). With the casts mounted on the articulator, it was determined that the top of the articulator was aligned with the bipupillary line. The Candulor bite fork, which should run roughly parallel to this plane from the anterior aspect, was inserted between the casts on the articulator. The lateral arms of the fork were aligned with the occlusal plane, which runs parallel to Camper's plane. However, this is only a preliminary evaluation and must be confirmed intraorally. [Au: Edit of above paragraph OK?]

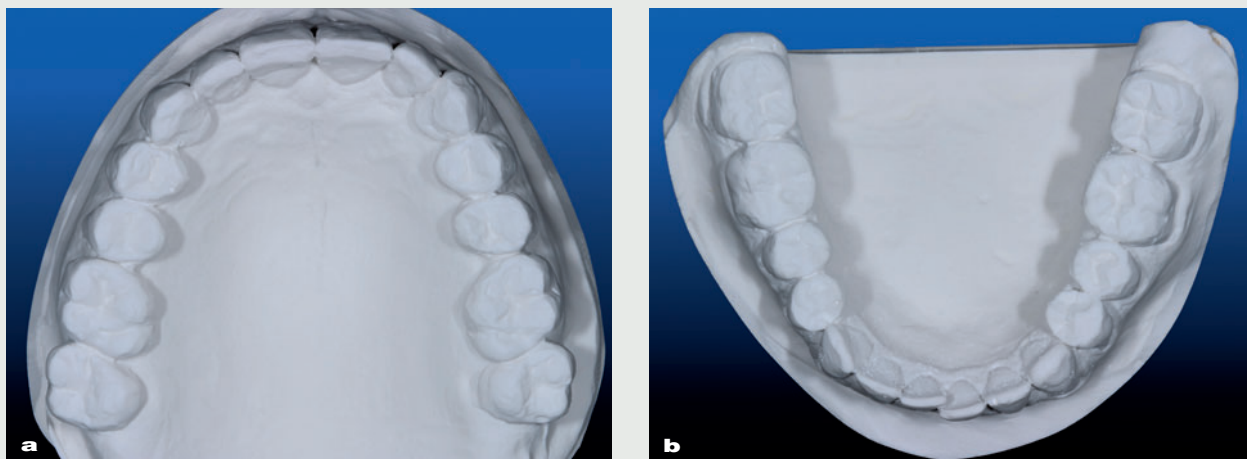


Fig 12 (a and b) The waxup is duplicated and cast in stone. [Au: OK?]Δ

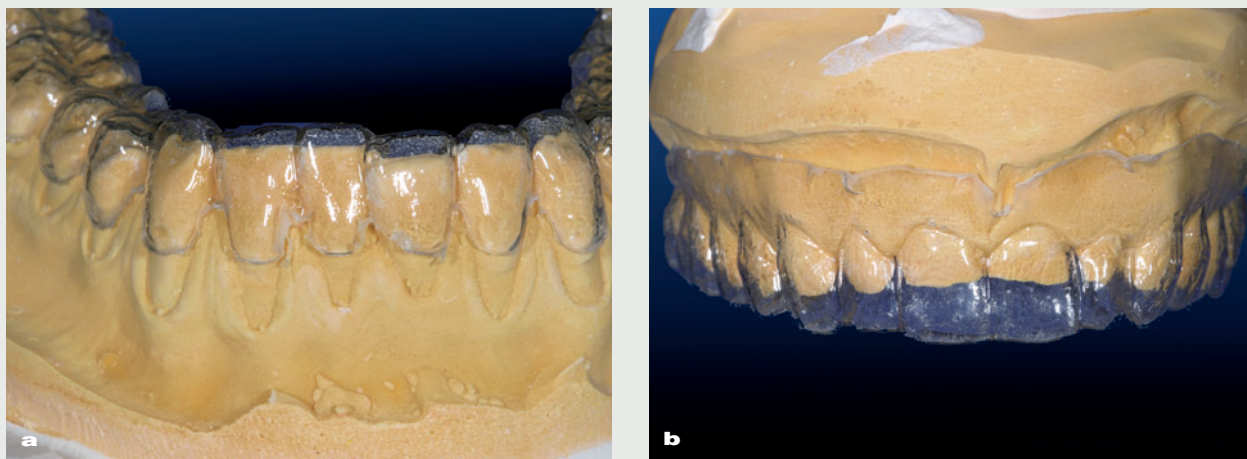


Fig 13 (a to c) The vacuum-formed templates created from the diagnostic waxup placed on the original casts, demonstrating the desired treatment changes.





Fig 14 The vacuum-formed template can be used as a preparation guide.

The diagnostic waxup was duplicated and cast in stone [Au: OK?] (Fig 12). Vacuum-formed templates of these casts were then prepared. The treatment changes could be visualized when these templates were placed on the original casts (Fig 13). The mandibular vacuum-formed template was trimmed at the cervical margin as appropriate to indicate where gingival grafts would be desirable. This would be benefit the esthetic appearance as well as the damaged cervical areas of the teeth.

With all planes corrected, the new dimensions were measured and compared. The residual crown length of the central incisors [Au: Maxillary or mandibular? Or both?] was approximately 3.7 mm. The length to be achieved was 9.7 mm. Considering the calculated values and the fact that a natural, unworn central incisor has an approximate length of 10.5 mm, these results were reasonable.

The vacuum-formed template can also act as a preparation guide. For example, if a small hole is drilled occlusally, the dentist can measure the spatial relationships accurately with the aid of a PA [Au: What does "PA" signify?] probe. This means that



Fig 15 An impression was produced using the diagnostic casts.

preparation is as accurate and conservative as possible (Fig 14).

Preparatory measures

The planned treatment can be carried out in various stages. In some cases, a plastic mock-up might be produced for try-in. The extent of the increased occlusal vertical dimension and resulting speech changes, as well as the esthetic outcome, could thus be clarified in advance.

However, the patient in the present case wanted to be treated immediately. No splints were prepared. The visual and, most importantly, the phonetic changes were explained to the patient. The risk for complications seemed minimal. Silicone impressions were made from the diagnostic casts (Fig 15). The idea was to produce provisional restorations chairside. After preparation, the clinician can fill these matrices with suitable material and produce direct provisional restorations. Support is provided to the silicone indices from the alveolar soft tissue.

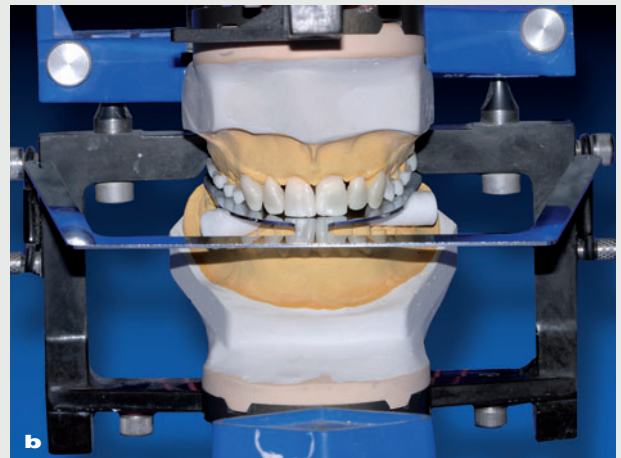


Fig 16 (a to c) The gingival recessions were addressed using periodontal surgical intervention.

Fig 17 A waxup (a) was produced for the long-term provisional restoration, and the reference planes were checked using the Candulor bite fork (b and c).



In the mandible, periodontal surgery was performed to address the gingival recession (Fig 16).

Restorative procedures

After the healing phase, the mandible was definitively restored and a long-term provisional restoration was placed in the maxilla. The provisional restoration was created in the laboratory to very closely approximate the final restoration in shape, position, and function. Esthetics, speech, and vertical dimension could then be analyzed using this long-term provisional restoration.

Meanwhile, the definitive restoration was placed in the mandible. The quadrants [Au: what is meant by "quadrants"?] and the canines were incorporated into the treatment to establish the new guidance.

The maxillary provisional restoration was fabricated chairside using prefabricated silicone matrices. The teeth were again oriented to the appropriate planes as previously calculated. In the articulator, the es-

thetic plane was checked with a Candulor bite fork (Fig 17). Once the maxillary situation was set, the mandibular definitive restoration could be planned, maintaining the established occlusal plane (Fig 18). Once the maxilla and mandible were in functional harmony, the waxup was complete.

After carving, the waxup was pressed in two different phases as a thermoplastic polymer (Fig 19). The principles demonstrated by Magne and Magne⁴ and used with highly successful results by Schoberer⁵ were followed. The restorations were then checked in static as well as dynamic function to ensure that no displacement had occurred (Fig 20). However, it is the intraoral try-in that determines success (Fig 21). The esthetic changes with only the placement of this provisional restoration were considerable. The patient stated that she immediately felt comfortable with the visual result and the subjective sensation of height and function. In approximately 2 weeks' time she was able to speak perfectly.

In order to finalize the work in an appropriate amount of time, the long-term provi-



Fig 18 The mandibular waxup was constructed, maintaining the established occlusal plane.



Fig 19 The waxup was then pressed in two stages using thermoplastic polymer.



sional restoration was followed by definitive work in the maxilla. Preparation refinement was undertaken as necessary, and the corresponding casts were produced (Figs 22 and 23).

The authors chose all-ceramic Procera crowns (Nobel Biocare) fabricated by the dental technologist Ernst A. Hegenbarth for the definitive maxillary restorations. The anterior teeth were quite short; therefore, in order to maintain adequate stability, the substructure was built up, similar to a metallic core, by a double-scanning technique (Fig 24). A new ceramic material called NobelRondo, developed by Nobel Biocare together with Hegenbarth,⁶ was used in the layering of the crowns. The authors found the handling of this material to be very simple; the layering technique was similar to their customary methods (Fig 25).

In the fabrication of the final maxillary restorations, the appearance of the labial aspect, in particular, was copied and transferred as accurately as possible from the long-term provisional restoration. Articulating paper, pulled from the incisal to the gingival aspect, was used for checking



Fig 20 Functional movements are evaluated on the cast with the finished long-term provisional restoration in the maxilla and the definitive work in the mandible.



Fig 21 (a to c) The success of restorative treatment ultimately depends on the intraoral appearance.



Fig 22 The maxillary teeth are prepared again as necessary **(a)** before creation of the casts for fabrication of the definitive restorations **(b)**.

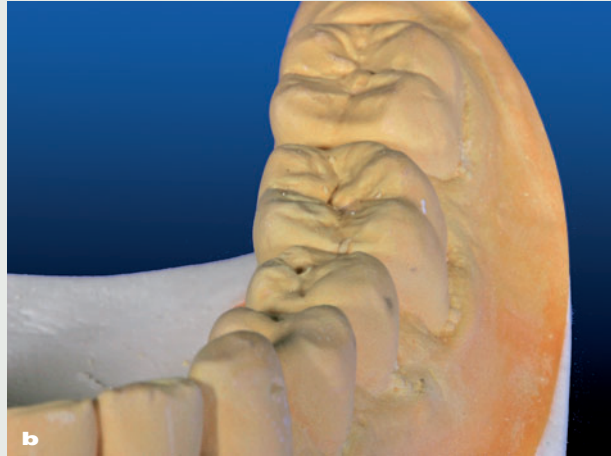


Fig 23 The finalized maxillary **(a)** and mandibular **(b)** casts for fabrication of the definitive maxillary restorations.



Fig 24 The Procera crowns were produced using a double-scanning technique.



Fig 25 (a to c) The Procera crowns coated with base liners. The first firing has just been carried out in the anterior area, and the conical distribution can be seen on the posterior teeth.



Fig 26 (a and b) Articulating paper is ideal for revealing all convex and concave structures when duplicating restorative situations.



Fig 27 (a to f) The definitive maxillary restorations on the cast.

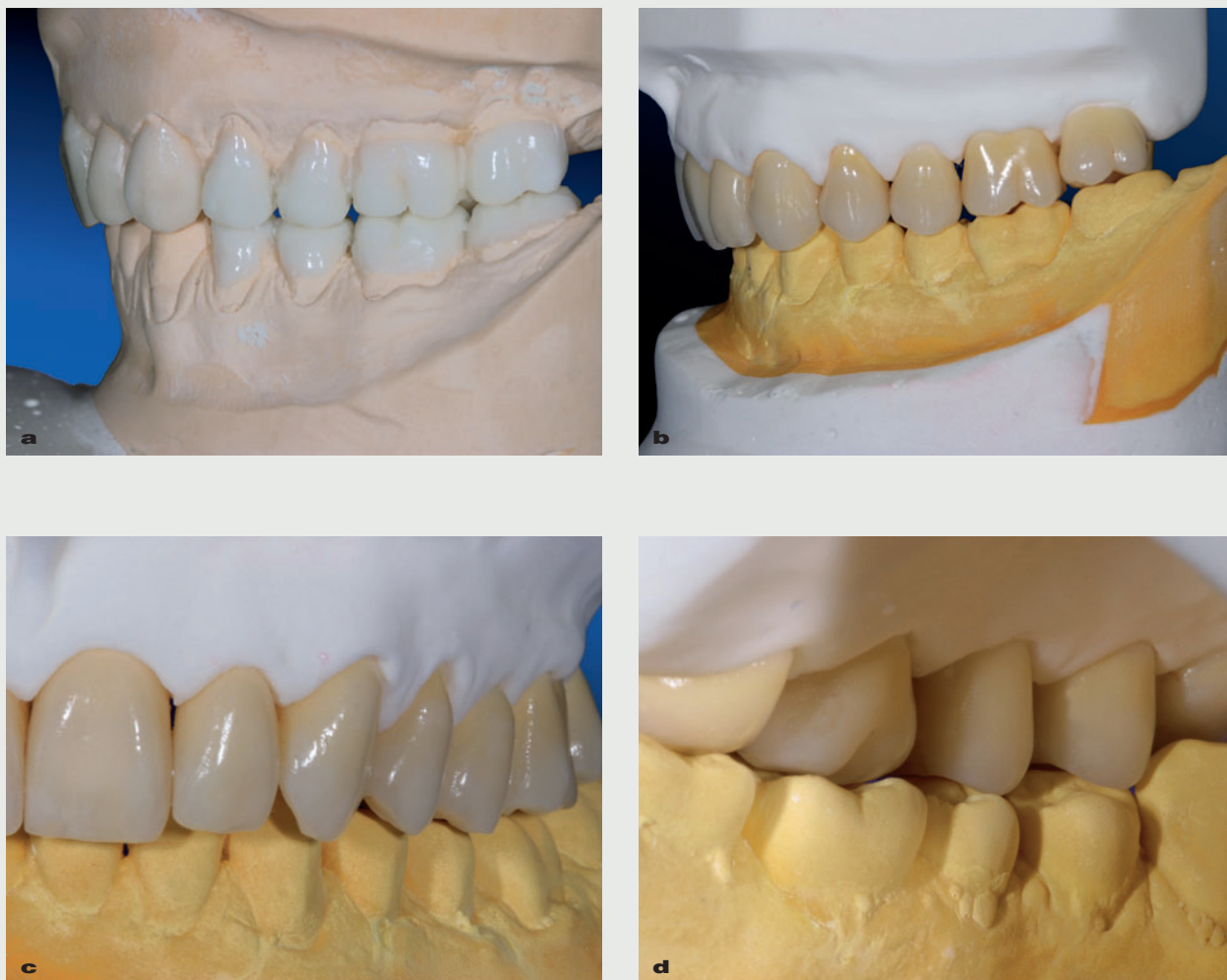


Fig 28 The planned outcome **(a)** should be compared with the actual outcome **(b)**. In addition, the cusp inclination and the cusp-fossa relationship should be checked **(c and d)**.

anatomic detail and labial fullness. Comparison of the raw firing with the anatomic cast revealed other important aspects, such as a difference between the convex and concave structures (Fig 26). For example, the interdental space had no contact with the articulating paper, while the actual facial surface did have contact. The convex-concave structures were also pronounced in the surface structure. The crowns tapered slightly at the neck of the tooth and again had no contact with the ar-

ticulating paper, and hence the gingiva. The final results were excellent, both in terms of the overall appearance and small details (Fig 27).

A final step before placement of the restorations was the comparison of the planned with the actual outcome (Fig 28). As previously mentioned, this patient had a distalized bite. To that extent, it was only possible to create a cusp-to-cusp relationship. Although all the guiding elements were built up, no excessively deep cusp-



Fig 29 (a to c) The emergence profile is evaluated.

fossa relationship could be created. The frontal view of the emergence profile and the horizontal view of the relationship of the gingiva to the teeth also had to be evaluated in both the anterior and posterior regions (Fig 29).

The final restorative outcome is shown in the images in Fig 30. Direct comparison reveals that the color of the maxillary teeth is slightly lighter than that of the mandibular teeth (see Figs 30c to 30e). The patient decided that she wanted the dentition to be

a slightly later shade following placement of the provisional maxillary restorations and the definitive mandibular restorations. It was explained to the patient that the lighter shade could only be used in the maxilla, and she agreed to this situation. The detailed photographs in Figs 30f to 30h convey excellent gingival conditions, and the extraoral images in Figs 30i to 30k demonstrate the pleasing overall appearance.



Fig 30 Final restorations in place. **(a and b)** Occlusal views. **(c)** Frontal view. **(d and e)** Lateral views. **(f to h)** Detailed views. **(i to k)** Extraoral views.



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