

## *esthetic demand ...*

... and perfect function – with Ankylos C/X

Winning case | Andreas Rauh



### THE OCCLUSAL COMPASS – THE GOLD MEDAL FOR DENTAL TECHNICIANS

Master dental technician Michael H. Polz developed his learning concept, the Occlusal Compass for prosthetic dentistry, into one of the most useful aids for teaching functional reconstruction of occlusal surfaces. The Occlusal Compass competition was initiated in his honor as the developer of modern dental technology, who died in 2000, and it has become established as one of the leading competitions for dental technicians in Europe.

The success of the treatment depends very much on the prosthetics and therefore on the quality of the dental technician's work. The goal of the competition, which is sponsored by Dentsply Friadent, is to promote functionally and esthetically demanding dental technology. The level of the submitted entries shows the achievements of modern dental technology. The editors of iDENTity requested the major prize-winner of the fifth competition, Andreas Rauh, to describe his work in the following article.



### THE INITIAL SITUATION

All entrants were required to develop a prosthetic restoration for a specific case (Fig. 1 and 2). The female patient – 80 years old – wanted a functionally and esthetically outstanding prosthetic restoration. She felt that the teeth of the old restoration were too small. A photograph of the patient at an earlier

age was included as a starting point. A situation model was also available. The maxilla was completely edentulous and had been restored with five Ankylos C/X implants in regions 15, 12, 21, 22, 24. In the mandible a non-indexed restoration was required on two Ankylos C/X implants in regions 41 and 31. At the patient's request the existing bottom denture was not to be replaced.

## THE TASK

A removable prosthesis (cover denture) was planned for the maxilla. It was to be fixed to the implants by a taper system. The number and arrangement of the implants meant that the gum was not to be covered by the prosthesis. Two anterior tooth crowns were to be fabricated on Balance Anterior abutments in the mandible.

A photograph of the setup was used as orientation for fabrication of the denture. The patient seemed very pleased with the shape of the teeth. The ideal situation was a maximum contact position as far as possible with the dynamic occlusion. The tooth shade was A3 and the shape of the teeth was designed to conform to the age of the patient.

## CONSIDERATIONS AND THE SOLUTION

Selection of the available procedures and materials for resolving this case was a complex process. There were a number of possible design solutions. Composite and synthetic teeth were available for the esthetic solution. Another “high-quality” and modern solution would have been a tertiary structure based on zirconium dioxide and with a ceramic veneer. **I decided in favor of a “classical” solution, which is still up to date and offers a high degree of esthetics and comfort for the patient.** “Keep it simple and smart” was my basic plan. The essential factor for every solution, including the one selected, is to plan the work back from the final result (backward planning) and to conform to the fabricated setup throughout.

## PREPARATION

**It is important for the complete therapy and particularly for implementing the dental technical processes to prepare a correctly trimmed setup** (Fig. 3–5). It was not necessary to replace the second molars in the maxilla, because the condition of the tooth and the restoration in the mandible along with the stable vertical distance allowed it to be retained. This prevents problems with the bottom second molars in the dynamic occlusion. The most important reason for not replacing the top second molars is biomechanical. Whenever the dentition is extended beyond the support of the implant this forms a lever and therefore in some cases the implants may be excessively loaded.

**After modeling the gum the model was duplicated several times and several impressions are prepared. Along with vacuum-molded foil the impressions are the most important aids and checks for manufacture of the denture.**

## DESIGN IN THE MAXILLA

The first step was to customize the abutments (Ankylos Regular /X) with a taper angle of 2 degrees. The impression was used as orientation (Fig. 6). The secondary components were modeled with an autopolymerizate. Then they were cast in a high gold content alloy (Fig. 7). **The advantage of cast secondary components is the option of easier adjustment of the withdrawal forces at a later date.** After trimming the caps, a plate osteosynthesis was used for the patient. (Fig. 8). This established the required cavity for accurate cementing-in of the caps into the subsequent prosthesis frame (tertiary structure).



- 1\_ The initial situation in the maxilla with Ankylos C/X implants  
 2\_ The initial situation in the mandible with Ankylos C/X implants  
 3,4,5\_ The detailed setup forms the basis for planning the perfect denture  
 6\_ The customized Ankylos Regular /X abutments with 2 degree taper angle

- 7\_ The impression clarifies the spatial relationships with reference to the planned external contour of the dental arch  
 8\_ The secondary telescopes are covered with a plate osteosynthesis to form a gap for cementing the caps into the tertiary structure  
 9\_ The waxing of the tertiary structure is checked with the aid of the impression  
 10\_ The tertiary structure fabricated from a non-precious metal alloy

The tertiary structure was also cast from an autopolymerizate and wax was added. The impression was used as a control and shows the remaining space for the metal-ceramic (Fig. 9). The framework was cast from a non-precious metal alloy (Fig. 10). After trimming (Fig. 11) the secondary crowns were cemented into the tertiary structure (Fig. 12). **The procedure enabled an absolutely tension-free seating for the structure. The combination ensures a very load-resistant substructure of the denture and gives it the required strength.**

Metal copings were added to the tertiary framework as carriers for the subsequent ceramic veneer. **In the anterior tooth region I selected single-tooth crowns. This allowed a more natural shape for the individual teeth, which greatly improved the cosmetic effect of the restoration.** For example, well-nested teeth can be simulated much better (Fig. 19 and 20).

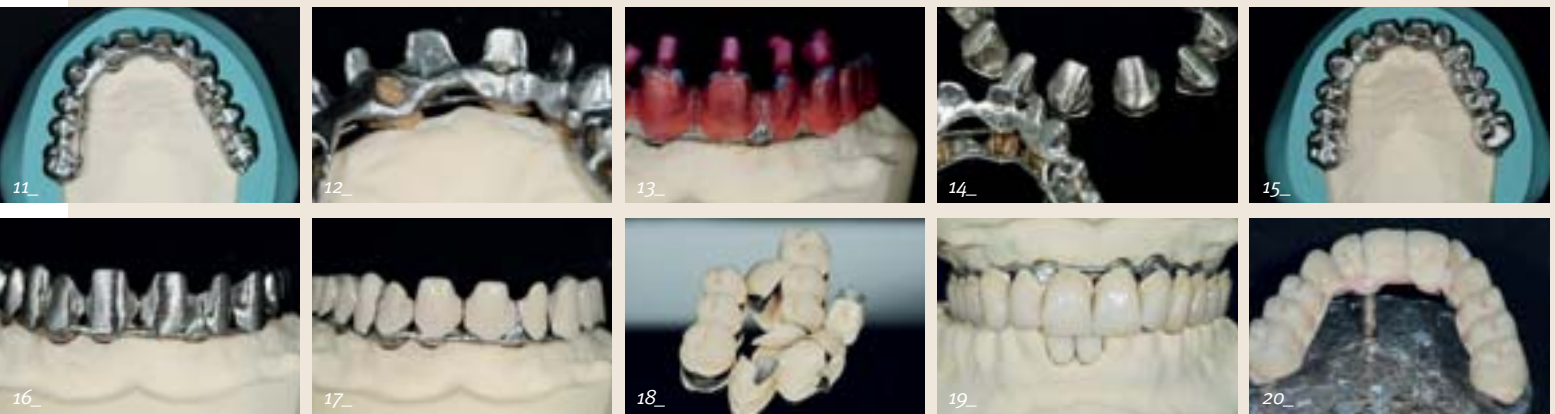
**The primary focus in the posterior tooth region was on the static requirements, so the individual copings are linked as a block here.** An autopolymerizate was again used for the waxing and supplemented by wax (Fig. 13). The framework was cast from a high gold content ceramic alloy. Then the trimming was carried out (Fig. 14). The veneering should be between 1 mm and 2.5 mm thick. The impression made it easy to check the work (Fig. 15). During trimming the transition between the future teeth and the gum must be defined very accurately,

because this region cannot be subsequently corrected (Fig. 16). A well-designed setup is ideal for assisting with orientation and comparison in this important step. The trimmed copings were coated with opaquer (Fig. 17) and then veneered.

When applying the ceramic it is important to ensure that the position and shape of the cusps and incisors conforms to the individual requirements as derived from the static and dynamic occlusion. The shading can be perfectly adjusted to the age of the patient by careful layering and it gives the prosthesis that essential natural appearance. After the final firing the surface is mechanically processed, including polishing, to give the ceramic additional brilliance (Fig. 18 and 19). The crowns are cemented to the tertiary structure with AGC Cem. This is followed by careful adjustment of the occlusion. This step is very important and very time-consuming.

The framework components that will later be concealed by the artificial gum are coated with pink opaquer (Fig. 20).

**The ceramic surfaces are sandblasted and etched at the transition areas and then silanized for a secure and above all gap-free bond between the material for the gum (composite) and the ceramic.** The artificial gum was customized with Gradia Gum (Fig. 21). Finally the surfaces are polished to a high gloss and the withdrawal forces for the tapers are set (Fig. 22 and 23).



11\_ Checking the dimensions and spatial relationships

12\_ The secondary telescopes are cemented to the tertiary structure

13\_ Waxing the crown caps

14\_ The crown caps are fabricated from a high gold-content alloy

15\_ Dimension check with the impression

16\_ The crown margins must be trimmed very accurately, because it will not be possible to make subsequent corrections

17\_ The crown caps covered with opaquer

18\_ The veneered crown caps

19\_ The crown caps are cemented to the tertiary structure and then the fine adjustment of the occlusion is made

20\_ Pink opaquer for framework components that are covered with the base plastic

## DESIGN IN THE MANDIBLE

**I selected an unconventional method for fabrication of the mandibular anterior tooth crowns of injection-molded ceramic, since the abutments themselves act as the crown framework.**

The abutments (Ankylos Balance Anterior C/) were ground to a taper. The dimensional control was again conducted with the aid of the impression (Fig. 24). In the next step opaquer was applied (Fig. 25) to cover the abutment and ensure maximum translucency for the crowns. The Ankylos Balance Anterior C/-abutments do not have an index. This requires a transfer key for setting the exact position (Fig. 26). **The crown bodies were cast in wax slightly underdimensioned (Fig. 27) and then injection-molded in ceramic (e.max). The reduced crown body (Fig. 28) allows application of additional ceramic layers for customizing the shape and color.** The ceramic layers applied after injection-molding (e.max) completes the crown in shape, color and natural translucency.

**This technique enables fabrication of a denture with a very natural appearance (Fig. 29).** The process was concluded by polishing the surface and fine adjustment of the anterior tooth guided occlusion (Fig. 30).

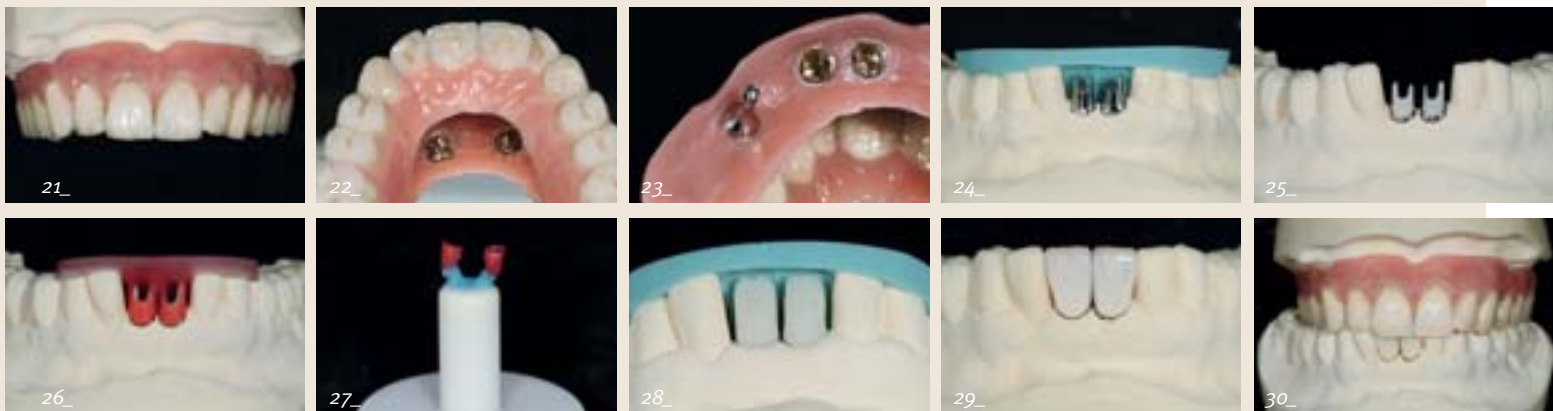
## CONCLUSION

The denture fabricated for the Occlusal Compass competition is nothing more than a phantom production. However, the procedure described is very relevant to the practice that is interested in fabricating high-quality and cosmetically demanding prostheses. **A significant factor for the success of the final product is a carefully prepared setup. It can be used not just as a cosmetic check but also to check the function.** The setup is transferred to plastic for this purpose. The fixing enables, for example, ball and socket connection (Ankylos Snap Attachment C/). If the patient wears the temporary denture for a few days, the dentist and patient can estimate the strengths and weaknesses of the restoration more accurately before fabrication of the definitive denture. I found this is the best path to the solution and it offers the greatest assurance of working efficiently and accurately. ■

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21\_The customized artificial gum

22\_The trimmed overdenture

23\_Adjusting the withdrawal force

24\_The customized Ankylos Balance Anterior C/abutments

25\_The opaquer is applied directly to the abutments

26\_Transfer key for securing the position of the abutments

27\_The crown caps prepared for molding the ceramic

28\_The finished crown caps of injection-molded ceramic

29\_The ceramic crowns imitate the age-specific changes of the teeth

30\_The denture is ready for delivery