

Zirkonzahn[®]

Human Zirconium Technology

100% PRETTAU[®] BRIDGE

MADE BY CAD/CAM

**Occlusally Screw-Retained Maxillary
and Mandibular Rehabilitation
on Titanium Bases**

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BASELINE SITUATION

A patient presented at the dentist's office with inferior, severely worn complete dentures. Interestingly, these maxillary and the mandibular temporaries were occlusally screw-retained on high-quality implants. The five implants in the maxilla were located at sites 16, 14, 12, 24 and 26. In the mandible there were six implants at sites 36, 34, 31 and 42, 44, 46.

To assist us in designing the new restorations, we had at our disposal not only the worn old dentures but also an articulated impression of an older situation (**Fig. 1**); however, it turned out to be too imprecise and aesthetically inadequate to be used as a fully-fledged reference for the new prosthetic restorations.

To make matters worse, the patient and the dentist lived several thousand kilometres away from the lab, which was therefore faced with the challenge to design and produce a natural-looking, functional, biocompatible and well-tolerated rehabilitation for the patient without adequate references.

To allow us to consider the patient's physiognomy during the planing process at least to some extent, the dentist gave us a number of patient photos to serve as visual cues.

Today, of course, we would use the Face Hunter facial scanner in this situation (**Fig. 2**). This scanner produces a digital scan of the patient's face with one click within a matter of 0.3 seconds. The face scans are transferred to the modelling software and integrated into the situation 1 : 1, so the restoration can be accurately designed and aligned to match the patient's physiognomy (**Fig. 3**), resulting in more reliable case planning – not only for us dental technicians but also for the dentist and the patient.

Both the treatment team and our laboratory share the ambition to offer the patient a high-quality, stable and aesthetically pleasing solution. This is why we decided from the outset to work with Prettau® Zirconia as a restorative material. With its high translucency and excellent biocompatibility, this material not only meets the highest expectations but offers the added benefit that it can be built up to full contour without requiring a veneer. Especially when thinking about the heavily loaded functional areas, this also means that the risk of chipping is essentially zero – right from the start. In the case at hand, although not strictly necessary, the dentist requested a vestibular ceramic veneer in the anterior region for aesthetic reasons.



1 Impression of the patient's situation.



2 Face Hunter 3D face scanner scans patient faces with just one click.



3 Example of a face scan produced with Face Hunter. The face data are transmitted to the software and the virtual articulator in the appropriate positions.

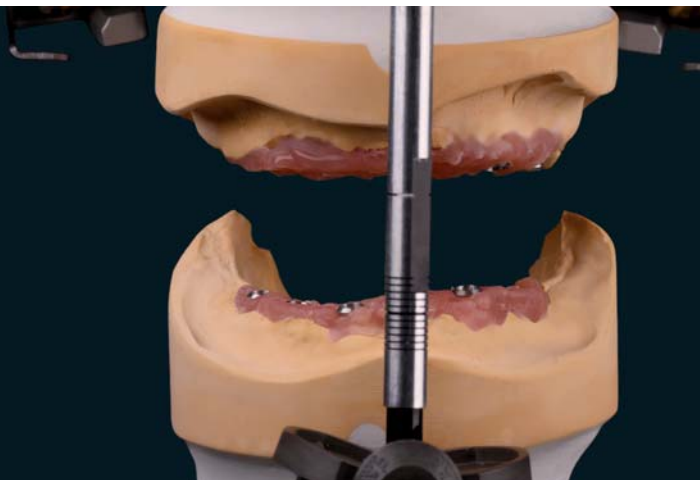
Since the implants in both jaws were spaced such that no critical spans had to be bridged, the situation was ideal for an occlusal screw-retained solution.

This retention mode is recommended both for hygienic reasons and because it helps extend the life of the restoration. Screw-retained Prettau® bridges can be easily removed by the dentist and cleaned, while at the same time checking the status of the implants.

Since the available impressions were distorted, the occlusion was difficult to reconstruct. After consultation with the dentist, we started by increasing the vertical dimension of occlusion by 2 mm (Fig. 4).

To transfer the baseline situation, the diagnostic and working casts were scanned in the S600 ARTI scanner using special scanning markers to transmit the exact position from the intraoral implants directly to the software.

As the casts had been positioned in the articulator on the basis of a facebow registration, we also scanned the dentist's articulator complete with the casts. The S600 ARTI scanner is capable of scanning any articulator and transferring the data acquired to the virtual articulator of the modelling software on a 1 : 1 basis (Fig. 5).



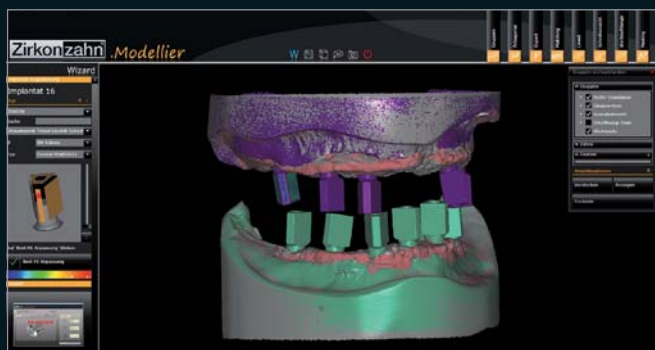
4 Master casts in the articulator.



5 S600 ARTI scanner. Its extra-large scanning range allows the scanning entire sets of casts complete with the articulator. Any laboratory articulator is suitable for scanning.

Both static and dynamic premature contacts can then be identified and corrected in the virtual articulator. The modelling software matches all scanned models in their correct relative positions. The scanning step is followed by designing the restoration, a process that starts by selecting the appropriate implant types and defining the emergence profiles. The software automatically generates the exact positions (**Fig. 6 to 10**).

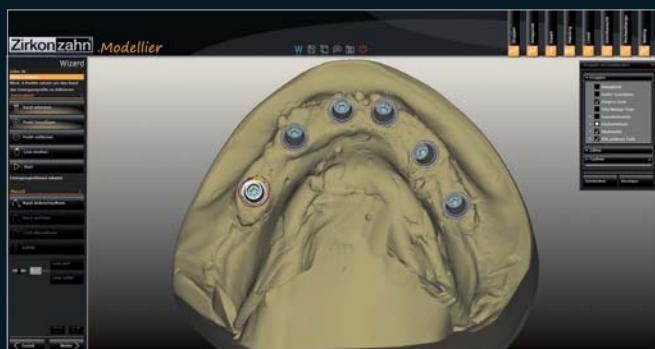
This is followed by the virtual setup of the teeth (**Fig. 11**).



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6-10 Selection of the desired implant types and definition of emergence profiles.

11 Representation of the situation in the software.

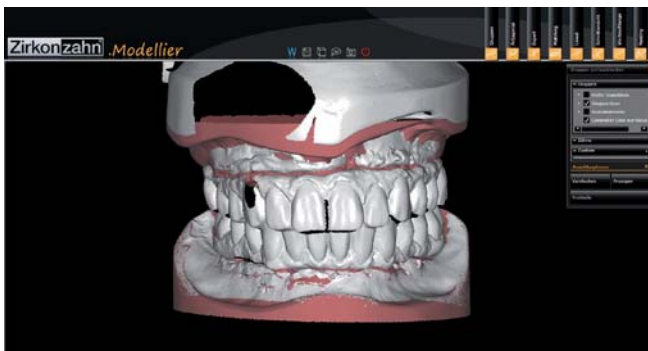
The old dentures are used as positional references for the bite situation (**Fig. 12**).

This is done in order for the difference between the old, heavily worn prostheses and the new restorations not to become insurmountably great, as this would greatly reduce the wearing comfort for the patient and result in functional shortcomings.

For the new teeth we selected the best-matching tooth shapes from the Heroes Collection natural-tooth library (**Fig. 13**) containing 10 sets of nature-like teeth. In our case, the choice fell on the Heroes Collection Hermes.

The virtual tooth library is loaded into the case and placed in occlusion based on the stored positional reference (**Figs. 14 to 18**).

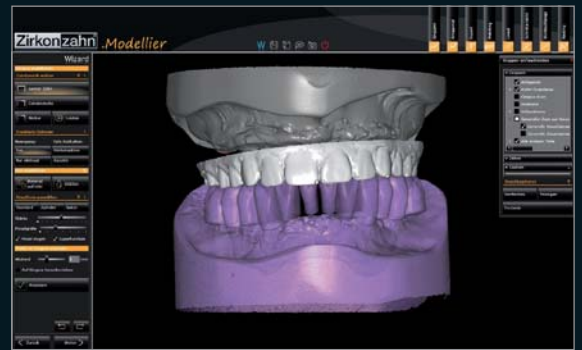
The virtual articulator simulates the jaw movements (protrusion, retrusion, lateral excursions), identifying dynamic and static premature contacts and automatically correcting them.



12 Denture impressions used as positional reference.



13 The Heroes Collection - a virtual and intelligent tooth library. Ten natural upper and lower sets were selected by Enrico Steger from 1,000 moulds and encoded in the software.



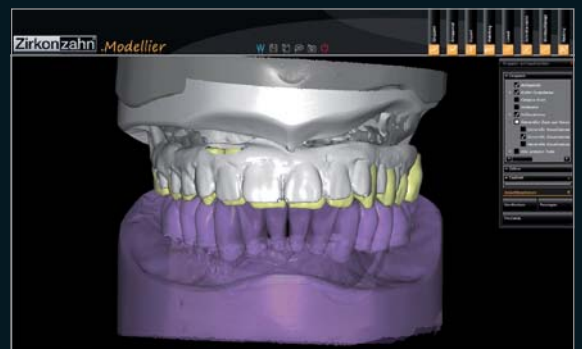
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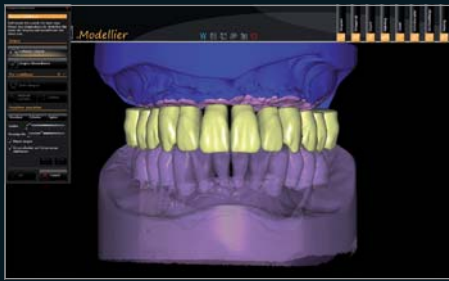
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14-18 The virtual tooth library is loaded into the case and placed in occlusion based on the stored positional reference.



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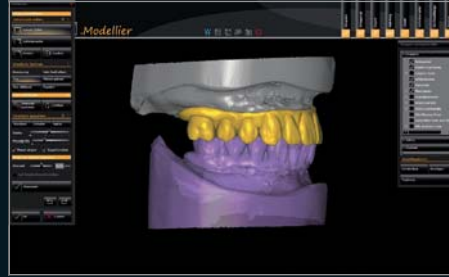
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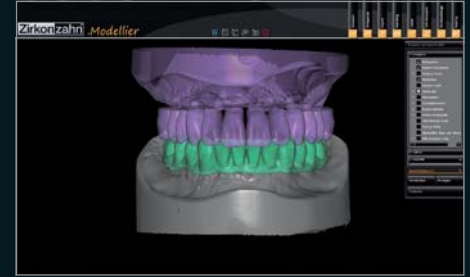
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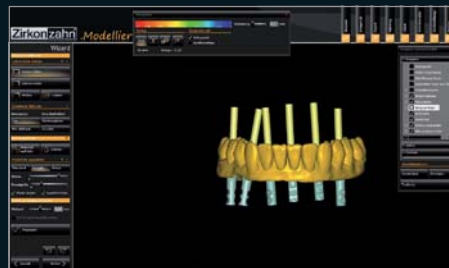
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19–25 Adapted maxillary and mandibular wax-ups.



26 The angulation of the screw access canals can be displayed and controlled in the software.

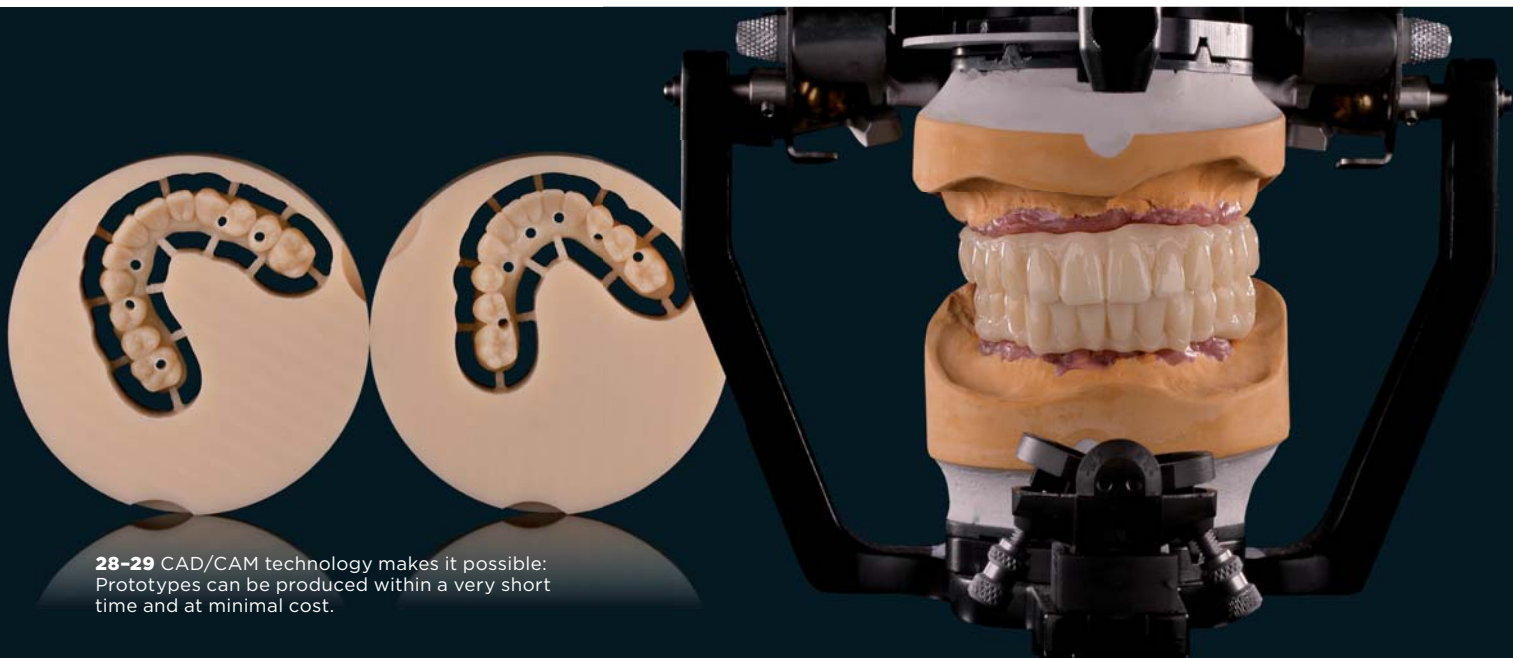


27 Completed maxillary and mandibular wax-ups.

Now the gingival aspects of the restorations could be defined. The free-form tool allows both tooth shapes and portions of the gingiva to be shaped freely or adapted (Figs. 19 to 25).

Next, the emergence contours of the implants and the angulations of the screw access canals are checked in the software.

This completes the wax-up of the maxillary and mandibular bridges (Fig. 27).



28-29 CAD/CAM technology makes it possible: Prototypes can be produced within a very short time and at minimal cost.



30 Resin prototype on the articulator, ready for the intraoral try-in.



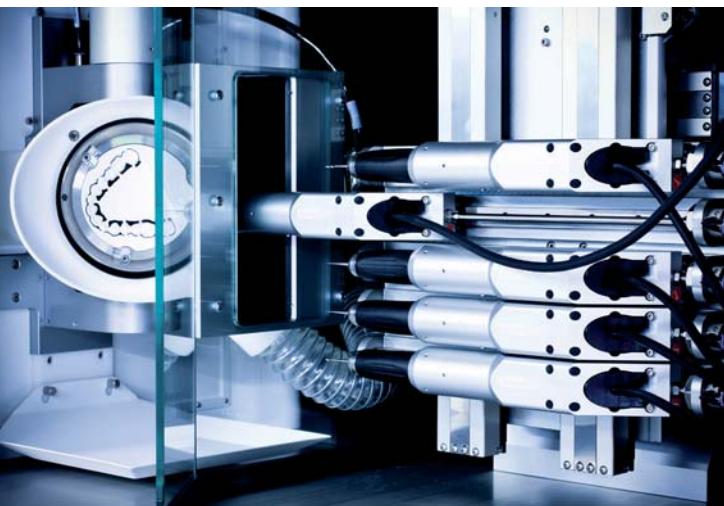
31 Positioning the finished virtual maxillary wax-up in the Prettau® Zirconia blank 22 mm in height. A sintering support for distortion-free sintering is also provided.

The time has now come to implement the restoration in zirconia. Even with the closest coordination with the dentist and a meticulous alignment of the restoration, it still happens that the patient or the dentist require changes after the first try-in that, if the definitive restoration were already used at this stage, might require considerable time and effort. We therefore routinely include a control step at this point where, instead of milling the restoration in zirconia directly, we produce a resin prototype first (**Figs. 28 and 29**).

With the CAD/CAM system, this is no problem at all, and the cost is minimal. The patient will ideally wear this prototype for several weeks on a trial basis and examine it with regard to its fit, function, aesthetics and phonetics. To make the prototype as realistic as possible, we veneer the resin framework with gingival composites and ship it to the dentist for the try-in (**Fig. 30**).

After the resin try-in, the prototype is returned to us with the required changes incorporated. By rescanning the temporary restoration with the S600 ARTI scanner, the changes are digitally transferred to the case. The finished design complete with sintering supports is now positioned in a Prettau® Zirconia ingot (**Fig. 31**).

To bridge the gap between the try-in and production of the final restoration for the patient with as little discomfort as possible, it is possible to create not one but two resin prototypes with gingival veneers. While one of the prototypes incorporating the desired changes is returned to the lab, the patient can wear the other prototype as an aesthetic short-term temporary until the final restoration is ready.



32 5+1-axis simultaneous Milling Unit M5 with innovative orbit technology, which ensures that any point on the object, including undercuts can be reached.

After nesting the maxillary and mandibular restorations, the 5+1-axis simultaneous Milling Unit M5 is used to realize the final restoration in Prettau® Zirconia (**Fig. 32**). The CAD/CAM Milling Bur 0,3 C is used for extra delicate details such as fissures.

After the milling process, we separate the maxillary and mandibular restorations from the remaining blank material (**Fig. 33**).

To prepare the anterior region for the ceramic veneer, the milled, unsintered Prettau® Zirconia restoration is reduced manually, making sure that the incisal edge and, hence, the wear facets were left fully contoured as a “protective edge” to reduce or exclude the risk of ceramic chipping right from the beginning. Rather than reducing the anterior region manually, this task could also have been performed virtually by software.

The, still unsintered, maxillary and mandibular zirconia structures are now stained with Colour Liquid Prettau® Aquarell (**Figs. 34 and 35**).

After staining, the maxillary and mandibular restorations are placed under an infrared lamp to dry for 40 minutes, then sintered at 1,600°C in a sintering furnace Zirkonofen 700. A nice natural shade gradient will already be discernible after sintering (**Fig. 36**).



33 Milled maxillary restoration in the Prettau® Zirconia blank.



34 Milled but still unsintered maxillary Prettau® bridge with manually reduced anterior surfaces.



35 Example of a zirconia bridge stained with Colour Liquid Prettau® Aquarell.



36 Maxillary restoration after sintering. The shade effect is already quite pleasing.



37-38 The sintered mandibular structure is screwed in place on the master cast and titanium bases to examine its fit.



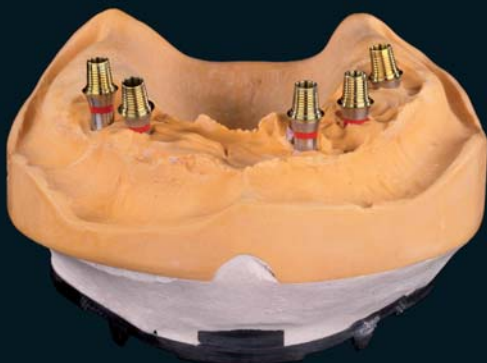
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39 The completed and veneered zirconia restoration.



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40-41 The titanium bases are anodized (gold-coloured) with the Titanium Spectral-Colouring Anodizer. This has no effect on the biocompatibility of the titanium bases.



42 Completed mandibular Prettau® bridge with six gold-coloured anodized titanium bases.

Before veneering, the sintered structures are screwed in place on the master casts with their titanium bases to control the fit **(Figs. 37 and 38)**.

Since there were no discrepancies in fit either in the maxilla or in the mandible, we can now proceed to the veneering step. We first perform a wash firing using ICE Zirkon Dynamik Dentin and Ceramic Tissue and then combine various incisals and transparents in the incisal region, followed by more Ceramic Tissue. After the ceramic firing, diamond cutters are used for minimal adjustments to the morphology and texture of the Prettau® bridges before applying and firing the definitive stains and glazes **(Fig. 39)**.

Before adhesively connecting the titanium bases to the Zirconia frameworks, we anodize them with Titanium Spectral-Colouring Anodizer to give them a golden colour **(Figs. 40 and 41)**. This change in colour ensures that the titanium bases are less visible through the zirconia restoration and that the greyish tint is reduced.

After anodizing, the titanium bases are adhesively connected to the Prettau® bridges **(Fig. 42)**.



43-45 Finished restoration in situ.

The finished Prettau® Zirconia bridges were now ready for intraoral delivery; we shipped them and eagerly awaited the dentist's and the patient's reactions. Somewhat later, the dentist sent photos of the restorations in place in the patient's (**Fig. 43**), commenting that both she and her patient were very happy with the result.

A close cooperation between the dentist and the dental technician in combination with precise CAD/CAM technology has thus "bridged" a distance of several thousand kilometers, to the full satisfaction of the patient.



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- If he wouldn't had become a dental technician, he would had become optician or goldsmith.