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Zirkonzahn®

ANTI-SNORING DEVICES: THE DIGITAL WORKFLOW WITH THE 3D DIGITAL PATIENT

The present article illustrates a new workflow conceived by Zirkonzahn (South Tyrol, Italy) to fabricate individual oral sleep appliances. The therapeutic starting point is no longer a conventional dental impression, but the digital acquisition of the patient's situation via intraoral scanner and the PlaneSystem® method (MDT Udo Plaster, Germany). Manufacturing anti-snoring mouth guards using a digital workflow has several advantages:

- By avoiding delays in data transfer between the clinic and the laboratory, the treatment time can be significantly shortened.

- The accuracy is significantly increased using the state-of-the-art technology.

- The chairside time reduction will help improve patient experience and increase the chance of them going through the treatment.
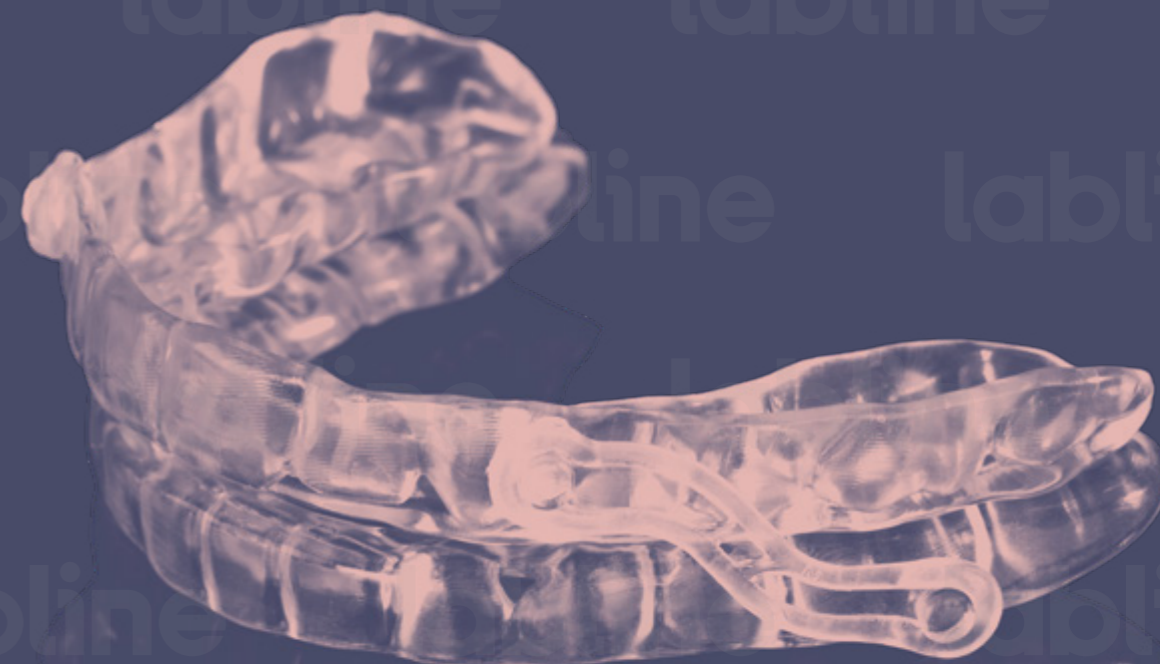
PATIENT DATA ACQUISITION

[Fig. 1]

Patient data is acquired by means of the PlaneSystem®, the Face Hunter 3D facial scanner and the intraoral scanner **[Fig. 1-4]**. The new Detection Eye intraoral scanner is used (Zirkonzahn). The scanner, even though it comes as an open-system device, is optimally integrated into Zirkonzahn's data management system, allowing for a smooth data transfer and compatibility with the company's entire software and hardware. After selecting the most appropriate scan tip for the patient, the scanner allowed for the digitisation of the patient's jaw in less than 60 seconds, providing real-time scanning with realistic colours and clear preparation margins. The scanning areas didn't need preparation with powder, which simplified the acquisition process. The software was operated via motion sensing technology: by moving the scanner, the dentist could send commands to

the software, simplifying handling and ensuring a hygienic digital impression. Concerning the PlaneSystem® (MDT Udo Plaster, Germany), this is an innovative working approach that allows to acquire the patient's specific reference planes and transfer them into the virtual world 1:1 with no loss of information. In Zirkonzahn.Software, the data acquired can then be matched with the 3D scans of the patient's face taken with the Face Hunter, as well as with other data available. To provide a position reference to match data with the intraoral scans, a Transfer Fork Reference Cover was used **[Fig. 5]**. Using this digital acquisition method, the techno-clinical team can work at any time on the 3D virtual reproduction of the patient physiognomy and oral situation, virtually articulated according to the patient's individual planes.

[Fig. 1] Intraoral scanning using Detection Eye. Depending on the patient, it is possible to choose between two different tip sizes, which can be autoclaved and reused up to 100 times.

[Fig. 2]

[Fig. 3]

[Fig. 4]

[Fig. 5]

[Fig. 2] The patient in front of the PlaneFinder® (a component of the PlaneSystem® that permits the acquisition of the patient's Natural Head Position). The Natural Head Position is a reproducible orientation that a person assumes using the eyes, neck muscles and vestibular system, that implies that the visual axis is horizontal. This position can be reproduced at any time, for example just by looking at oneself in a mirror.

[Fig. 3-4] The patient in front of the PlaneFinder® and the Face Hunter 3D facial scanner.

[Fig. 5] The patient with the Transfer Fork Reference Cover, used to provide a position reference to match data with the intraoral scans in the software.

DESIGN STEP

In the Zirkonzahn.Archive software, the patient case is created [Fig. 6]: all patient information and the treatment needed is registered, all data previously acquired is matched and the digital patient is articulated according to her individual reference plane. In this case the bite has been opened by 3 mm to guarantee enough space.

The design workflow is carried out in Zirkonzahn.Modifier. Zirkonzahn.Modifier is an additional design software provided by Zirkonzahn, complementary to Zirkonzahn.Modellier. The software is provided with new set-up concepts and extensive individual design options and includes several modules dedicated to model production, mock-ups, bite splints and removable dentures. The workflow for producing anti-snoring devices is an add-on feature to the "Bite Splints" module. The design process starts with the block-out of all undercuts and the selection of the insertion direction. After selecting "snoring", the margins of both arches are created, since the module is set by default to design both upper- and lower- devices [Fig. 7]. In this step, the minimum thickness value has to be set to close possible holes that might be created accidentally in the subsequent steps.

Once the bite is generated, a plane is created in the "modellation" area [Fig. 8-10]. This plane, which has to be positioned between the two arches, will separate the bite into two parts. In the case of contact areas, holes will form, which can be left open or closed at a later step.

Anchors are loaded after the margins have been smoothened using the free-form tool [Fig. 11]. The user chooses the anchor considering the distance between the first molar and the canine [Fig. 12-13]. The anchor must be inserted slightly into the bite, so that enough space is left for the connector. The software also enables to load a connector display to check it virtually. At this point, bite and anchors are merged in both arches.

[Fig. 6]

[Fig. 7]

[Fig. 8]

[Fig. 9]

[Fig. 10]

[Fig. 11]

[Fig. 12]
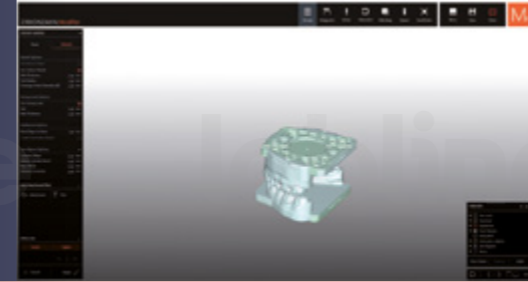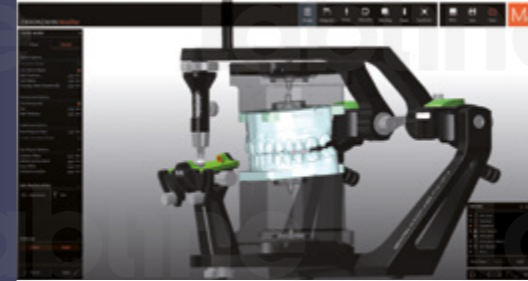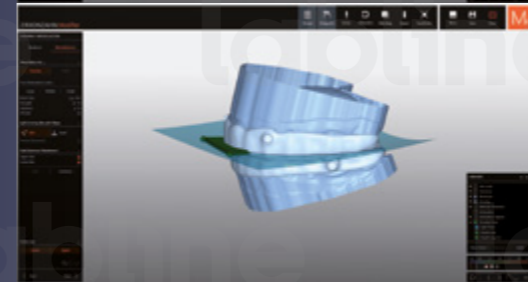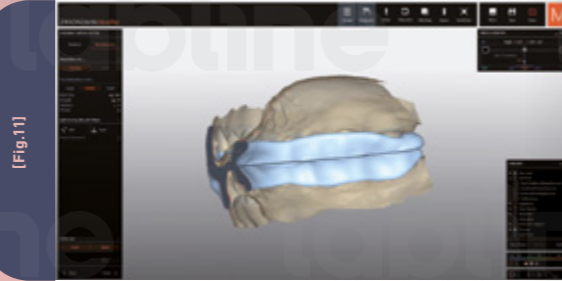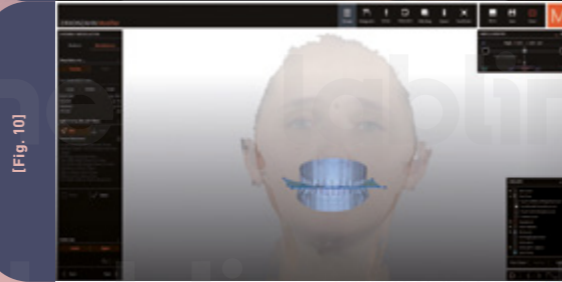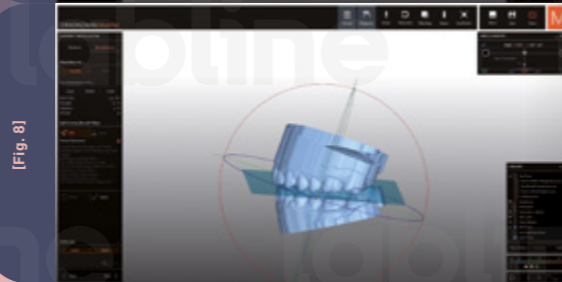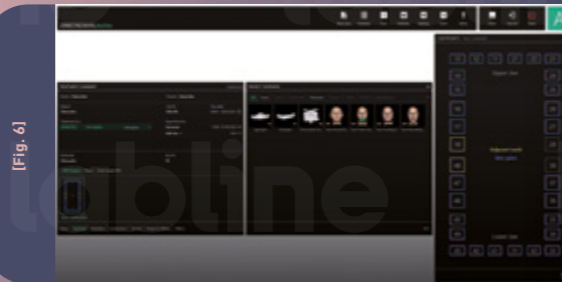
A breathing gap is loaded in the virtual design in the subsequent step. Breathing gaps appear as green plates in the virtual design, ensuring the patient can breathe while wearing the anti-snoring device. The breathing gap is inserted between the upper and lower incisal teeth according to the position of the previously placed plane. Once positioned, the portion of the breathing gap is subtracted from the upper and lower bite, creating a split in both oral devices [Fig. 14-15]. At this point, the user can choose whether using the free-form tool again or close the holes using the minimum thickness value set in the previous step. In this case, holes are kept open to avoid creating contact points. The anti-snoring device is complete and can be printed or milled [Fig. 16].

The workflow continues with the creation of models for 3D printing. This step takes place in the Model Maker software module of Zirkonzah.Modifier. During the design, special attachments are added to the modellation to articulate the models in the physical articulator using the JawAligner spacer plates [Fig. 17-18]. The JawAligners are magnetic spacer plates that permit the fixation of dental models in the physical articulator without plaster. They are available in different heights, ensuring material saving and model articulation independently of the model height.

The models are provided with a honeycomb structure for greater stability [Fig. 19] and then printed using the P4000 System (Zirkonzahn). The P4000 System is a pre-configured system for 3D printing composed of printer, software and post-curing lamp, which is ideally used in combination with Printer Resins and Printer Resins Waterbased Beige, available in many colours and for different uses.

[Fig. 13]

[Fig. 14]

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[Fig. 16]

[Fig. 17]

[Fig. 18]

[Fig. 19]

PRODUCTION PROCESS AND FINALISATION

[Fig. 20]

The bite was milled in Therapon Transpa, a particularly rigid and transparent resin ideal for producing bite splints, orthodontic splints and occlusal splints for bruxism. A material blank of diameter 106 mm was employed, using a special support compatible with the latest milling units developed by Zirkonzahn (in this case, the M2 Teleskoper milling machine), which are equipped with the extra-large Teleskoper Orbit with ø125 mm **[Fig. 20-22]**. With the Teleskoper Orbit, it is possible to mill material blanks with 95, 98, 106 and 125 mm diameters. In addition, materials discs with the corresponding holders can be removed from the orbit and re-inserted later at the same position with high precision in μm range. This is particularly helpful for adjusting the friction of telescopic jobs, performing the Stop&Go function, or for the two-stage fabrication of immediate restorations in the case of implant-supported prostheses (with the Double Milling technique). Once milled, the two anti-snoring devices were refined with burs and a polishing lathe **[Fig. 23-25]**. Then, connectors were inserted, choosing the most suitable size **[Fig. 26-30]**. The anti-snoring device was ready for the patient, who could improve her sleep significantly **[Fig. 31]**.

[Fig. 21]

[Fig. 20-22] The bite was milled in Therapon Transpa resin, using a blank of diameter 106 mm. The blank was mounted in the M2 Teleskoper milling unit using a special holder. Material discs with the corresponding holders can be removed from the orbit and re-inserted later at the same position with high precision in μm range.

[Fig. 23-25] Once milled, the two anti-snoring devices were refined with burs and a polishing lathe.
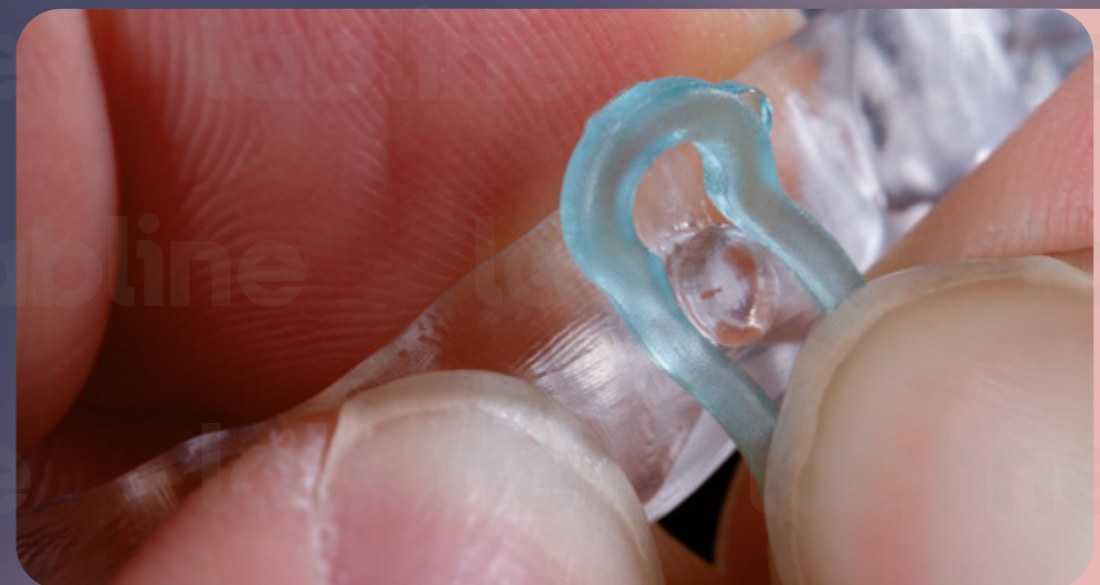

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[Fig. 25]

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[Fig. 29]

[Fig. 30]

Note:

The digital production of this anti-snoring device does not comply with the manufacturing recommendations, guidelines and certifications of the Erkodent Silensor-sl and the associated MDR class 2a. A corresponding warranty of the company Erkodent Erich Kopp GmbH, Siemensstraße 3, 72285 Pfalzgrafenweiler regarding the components used for this is therefore not applicable. The device created in this way is not a Silensor-sl and may not be offered as a Silensor-sl.

[Fig. 26-31] The final anti-snoring device.

For more information about the workflow:
www.zirkonzahn.com, +39 0474 066 660, info@zirkonzahn.com

[Fig. 31]

Zirkonzahn®

NEW! PRETTAU® SKIN®

MINIMALLY INVASIVE TREATMENT WITH ULTRA-THIN ZIRCONIA VENEERS (0.2 mm) MADE OF PRETTAU® 3 DISPERSIVE® ZIRCONIA

The entire Prettau® line by Zirkonzahn can be used to manufacture Prettau® Skin®, however, Prettau® Dispersive® zirconia is particularly suitable, as it is already provided with a natural colour gradient from dentine to enamel during the manufacturing process.

The dental technician can design and manufacture a patient-specific preparation guide, marking the tooth areas that the dentist has to prepare for veneers application. This mock-up is a useful planning and communication tool between dental technician and dentist, for the final benefit of the patient.

Preparation guide
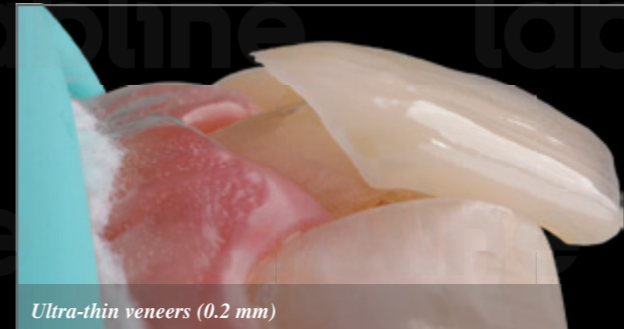
Ultra-thin veneers (0.2 mm)

"Sandwich technique"

This treatment was made for a young patient suffering from caries, missing restoration of teeth 46 – 47 and different composite fillings.

The planned treatment consisted of minimally invasive preparation of tooth enamel followed by tooth restoration with Prettau® Skin® zirconia veneers, with a minimum wall thickness of 0.2 mm. Based on the patient-specific model articulation and on the selection of a digital Monsons Sphere with Ø 240 mm, the areas to be prepared in the occlusal region were highlighted and a preparation guide for the upper jaw was created. After tooth preparation with a minimally invasive approach, the dentist performed a final intraoral scan of the oral situation.

After determining the centric relationship, it turned out that, due to the new occlusal height, the canine 23 needed a palatal support surface to optimise function. Therefore, a vestibular and a palatal veneer were designed to avoid overly invasive preparation of the natural tooth. During cementation, the vestibular veneer was applied first, followed by the palatal one, using the "Sandwich technique".

A HEALTHY SMILE – PRETTAU® SKIN®

M6 TELESKOPER BLANK CHANGER

OPEN-SYSTEM MILLING UNIT WITH AUTOMATIC **BLANK CHANGER FUNCTION,** STORAGE FOR 16 OR 64 BLANKS (UPGRADABLE) AND TELESKOPER ORBIT M6 (Ø 125 mm)

+ *Fully automatic blank changer*

+ *Blank storage for 16 or 64 blanks (can be upgraded)*

+ *Teleskoper Orbit M6 (Ø 125 mm) for processing material blanks with Ø 95 mm, 98 mm, 106 mm and 125 mm*

+ *Tool magazine (2x30) with automatic tool changer function*

+ *Performance Spindle M6 with permanent-magnet synchronous motor (PMSM)*

+ *Intelligent selection and checking of blanks as well as milling tools via a QR code scanner*

+ *Newly developed door for easy and fast maintenance*

+ *Automatic self-cleaning and drying function*

+ *Ioniser for the electrostatic discharge of resin shavings, for a cleaner processing*

+ *Integrated PC with 15" touch screen*

+ *Cleaning Kit with shower and suction system*

Ø 95, 98, 106, 125 mm
16 OR BLANKS **64**
(UPGRADABLE)