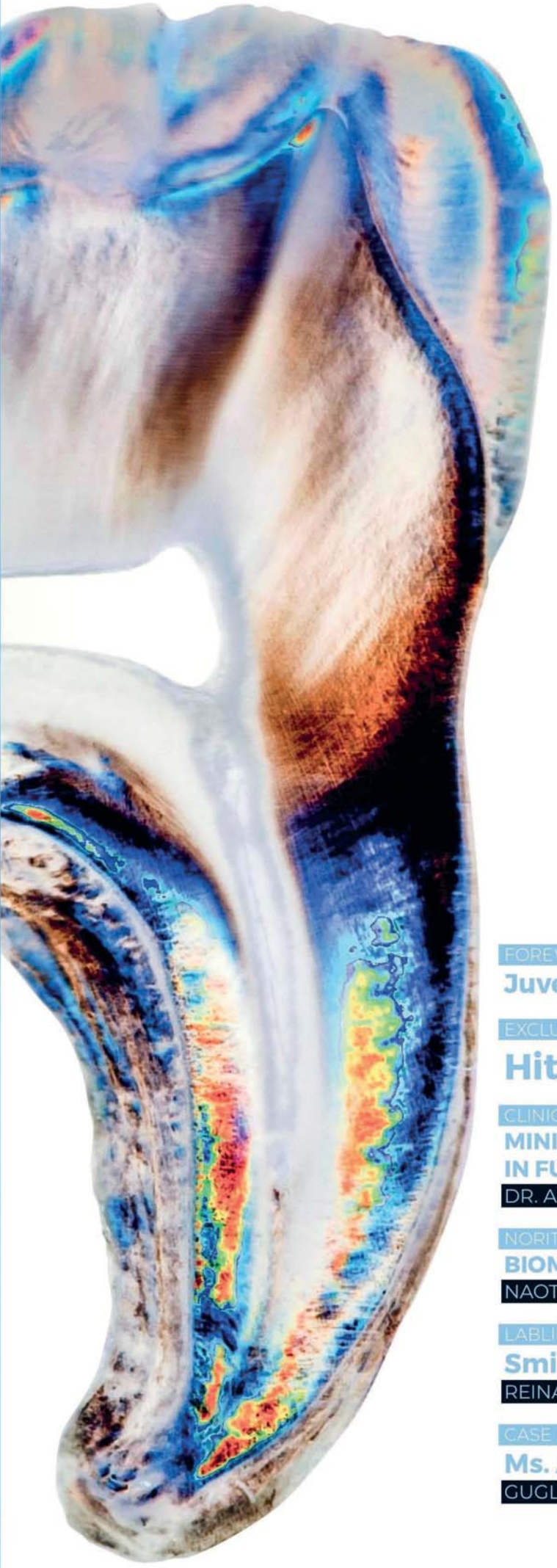

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Zirkonzahn®

THE DIGITAL WORKFLOW

IMPLANT-SUPPORTED COMPLETE REHABILITATION MADE WITH THE NEW PRETTAU® 2 ZIRCONIA

Every case is a challenge, because every physiognomy is unique. Treating fully edentulous patients with fixed restorations is certainly a demanding task, which requires the dentist to have an even more thorough understanding of how the prosthesis interacts directly with the patient's body as well as how the implants can be optimally positioned considering aesthetics.

Failure to have a complete understanding of the patient's situation may cause inaccuracies in the final restoration. Modern digital workflows based on CAD/CAM technologies can provide great help to dentists and dental technicians in improving the quality of the restorations provided. A digital workflow greatly minimises errors but, according to the workflow used, it can also allow the dentist to provide his clients with a comprehensive consultation on the treatment, improving patient care through greater educational awareness.

The main challenge of the case described in this article was to manufacture a complete fixed rehabilitation to an edentulous patient by means of a full digital workflow. The case demonstrated the potentials and high accuracy of a working procedure based on cutting-edge digital instruments for a complete patient analysis and helped to enhance the engagement of the patient, who could feel part of the treatment plan.

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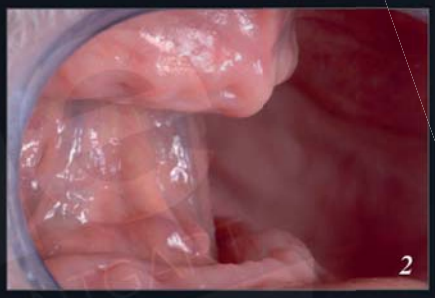
Sassuolo, Italy

INITIAL SITUATION AND AGREED SOLUTION

The edentulous patient, a smoker, affected by bruxism and TMJ issues, presented with the desire of replacing his removable prostheses with a fixed, high-quality dental restoration. After evaluating the situation, the treatment team agreed on an implant-supported complete rehabilitation created with the last innovation in zirconia, Prettau® 2, with titanium bases and a stabilising titanium bar in the mandible to avoid cantilever effects. The restorations were created by means of backward planning and digital patient analysis.

In a treatment planning, the role of professional dental laboratories goes beyond the mere delivery of restorations to the dentist and should include counselling services for the best choice in terms of materials. The patient was rehabilitated with Prettau® 2 zirconia, a new material provided by Zirkonzahn, selected for its relevant qualities. Indeed, Prettau® 2 is set midway between the highest resistant zirconia materials and the highest translucent ones, creating a perfect combination between function and aesthetics. The material's high translucency permits the creation of fully anatomical restorations, avoiding tooth chipping and the abrasion of the antagonist tooth, while the high flexural strength makes Prettau® 2 particularly suitable for full-arch restorations, even though it can be used for any kind of structures. Monolithic teeth in Prettau® 2 zirconia can be coloured before sintering by means of specifically developed colouring techniques. In this case, however, characterisation with ceramics was applied in the anterior sector, to reach an even more natural and customised outcome.



The edentulous patient prior to the treatment (figs. 1–2).

DIGITAL PATIENT ANALYSIS AND DIGITAL WORKFLOW WITH THE PLANESYSTEM® APPROACH

For the treatment of this case, the team utilised Zirkonzahn's digital workflow. This working method is exclusively and perfectly combined with the PlaneSystem®: developed by MDT Udo Plaster in collaboration with Zirkonzahn, the PlaneSystem® is an innovative approach for the accurate acquisition of the patient's data, which considers how the maxilla and the mandible relate to the rest of the body based on the patient's Natural Head Position. The patient's specific situation acquired by means of the PlaneSystem® tools can be transferred 1:1 to the virtual world, allowing for a better achievable function and aesthetics design of restorations in the digital environment. In such a way, dentists can provide their patients with a comprehensive consultation based on 100% individual and predictable outcomes, resulting in a greater engagement of the patient.

The digital acquisition of the gingiva with the intraoral scanner (figs. 3–4).

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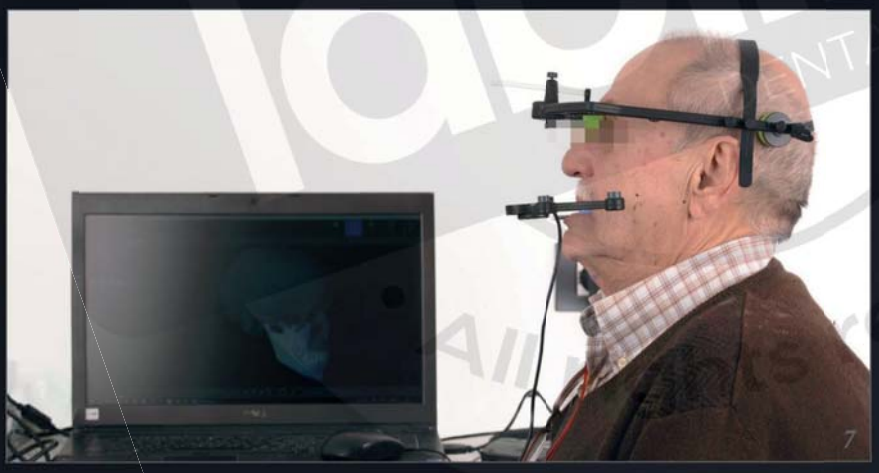
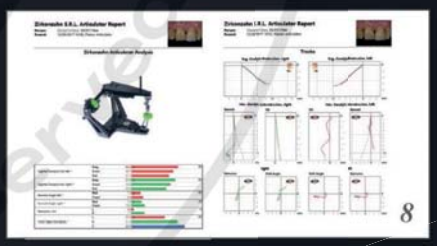
The PlaneSystem® is composed of several avant-garde tools such as the PlaneFinder®, the PlanePositioner® and the PS1 physical and virtual articulator, which integrate perfectly with the Zirkonzahn.Software and with other tools for digital data acquisition, such as intraoral scanners, the Face Hunter 3D facial scanner and the Plane Analyser (digital axiograph).

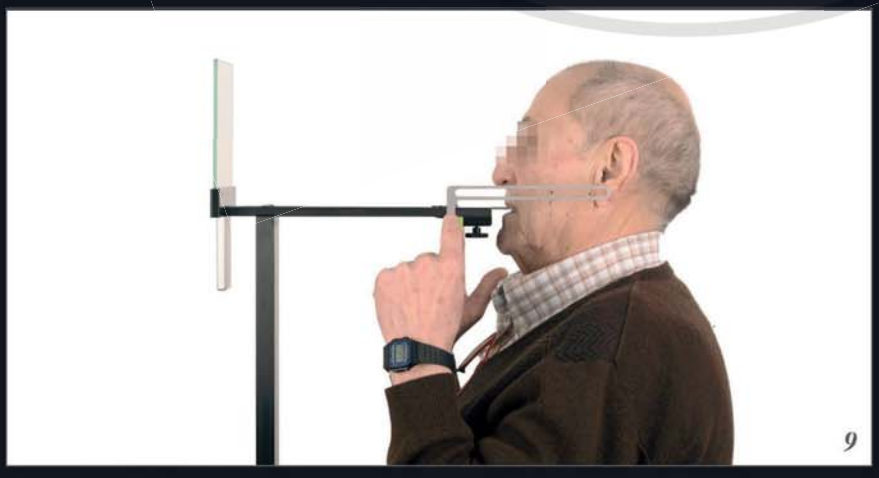
In treating edentulous patients, the ideal solution is to adopt a backward planning concept, in order to decide on the implant positions based on a rehabilitation planned in advance. The treatment started with the acquisition of the patient's situation. The dentist first scanned the patient's gingiva through the intraoral scanner. Then, with the patient in natural head position, the dentist and the dental technician captured the patient's individual reference planes by means of the PlaneFinder®. With the Plane Analyser (digital axiograph), instead, the patient's specific jaw movements were recorded, in order to detect any possible condylar problems and set the virtual articulator to the individual parameters. All of the data acquired was subsequently transferred 1:1 into the Zirkonzahn.Scan software and matched with 3D scans of the patient's face made with the Face Hunter 3D facial scanner. At this point, based on the digitally-recorded data and on the scanning of the old prostheses, new full dentures were designed. For the aesthetic design, the "Aida" tooth anatomies were selected from Zirkonzahn's Heroes Collection virtual tooth library. These prostheses served as an initial evaluation of tooth forms and inclination of the planes and as a setup for planning the implants according to a correct vertical dimension.

The design of the full dentures, which served for a first evaluation of aesthetics and as a reference for the implant planning according to a correct vertical dimension.(figs. 5–6).

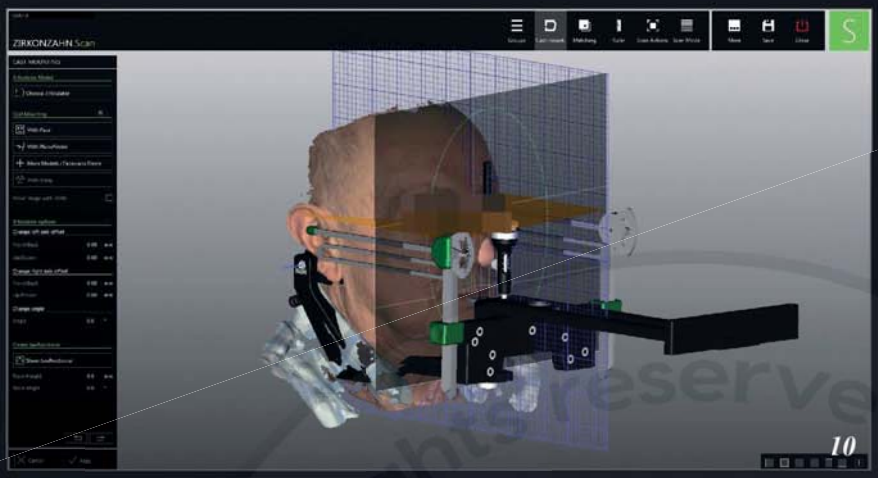


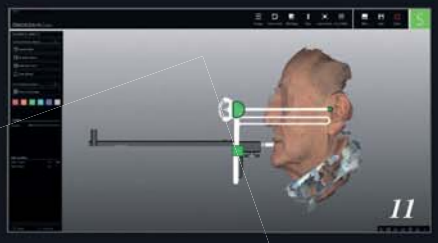


With the Plane Analyser (digital axiograph), the patient's jaw movements were recorded and transferred to the digital and analogue PS1 articulator (figs. 7–8).



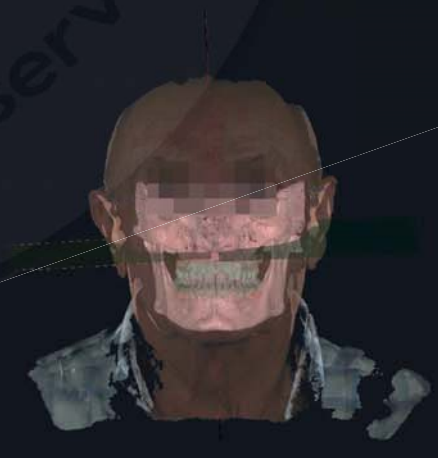
The patient in front of the PlaneFinder® for the acquisition of his reference planes based on the Natural Head Position (fig. 9).





The 3D patient in the Zirkonzahn.Scan software. With the PlaneFinder®, the patient's individual reference planes are transferred 1:1 into the digital world (figs 10–11).

The patient's situation articulated in the PS1 digital articulator, set according to the correct condylar movements, the individual reference planes and the new, correct vertical dimension (fig. 12).



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In the Zirkonzahn.Implant-Planner software, DICOM, STL data and the face scans were matched with the radiographic templates in order to detect the new, correct vertical dimension and plan the implant positions accordingly, taking bone structure and aesthetics into account (fig. 13).

THE IMPLANTS PLANNING AND POSITIONING

Based on the newly-created prostheses, radiographic templates were manufactured with radiopaque spots with the aim of aligning the face scans and the STL files with the CB data previously taken by the dentist. This allowed the dentist to obtain the correct vertical dimension in order to define the optimal implant positions in the Zirkonzahn.Implant-Planner software, taking the bone density and aesthetics into account. The dentist decided to place six implants in the mandible and six in the maxilla.

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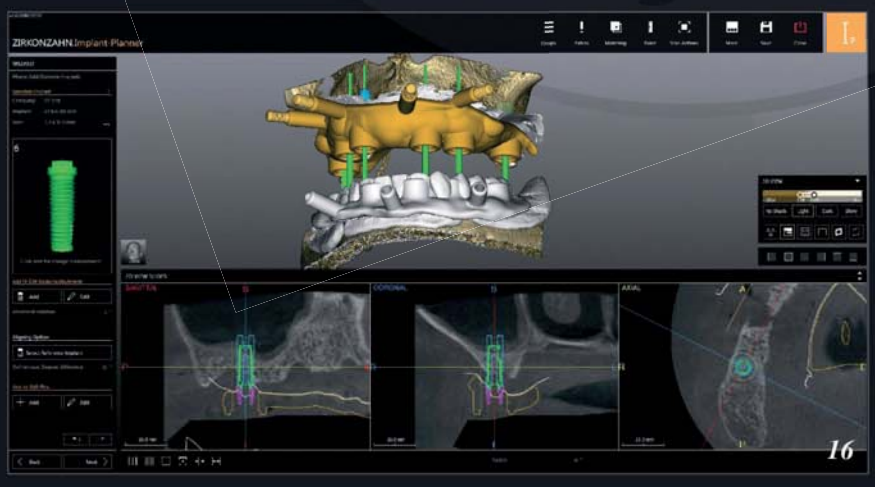
Zirkonzahn.Implant-Planner includes two versions of the software: one for the dentist and one for the dental technician. The software enhances and simplifies the cooperation between practice and laboratory, without losing the boundary between the competences and areas of responsibility of the two professional figures. Indeed, after the dentist approved the implant positions the dental technician had the ability to create the surgical guides, the resin restorations for immediate loading and the models with laboratory analogues.

Custom impression trays could have also been created: however, since the workflow followed is completely digital they were not created for this treatment. The dental technician utilised the M4 Wet Heavy Metal milling unit to manufacture in one single milling process both the immediate restorations, the models and the surgical guides, previously designed in the CAD software (Zirkonzahn.Modellier) according to the patient's acquired individual data. In this way, the dental technician could deliver the dentist all components required for an implant case simultaneously.

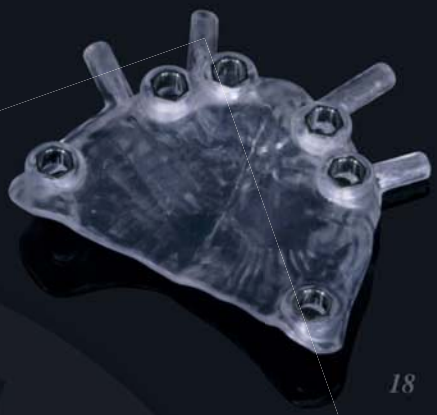
The radiographic templates (fig. 14).

The mandibular situation in the Zirkonzahn.Implant-Planner software. The dentist can define the implant positions working on the matching of DICOM data, a previous tooth setup and the 3D patient. Sectional views of X-ray images help find the best possible implant positions (fig. 15).



The virtual surgical guide for the implants positioning in the maxillla, created by the dental technician after the dentist's approval (fig. 16).

After loading the implants, the dentist proceeded with the conversion of the immediate loading restoration made of Temp Basic resin, which the patient wore for three months until a complete osseointegration had occurred, and which was used to perform a first evaluation of aesthetics and function.



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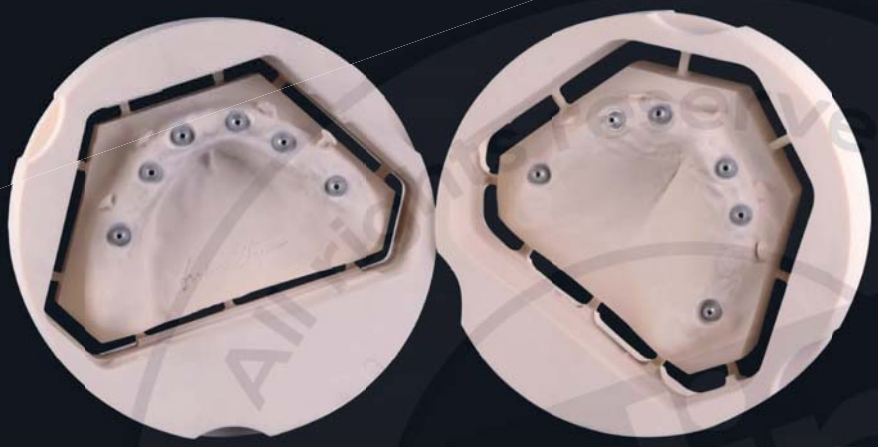
The maxillary surgical guide and the milled models made with laboratory analogues (figs. 17–18).



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VERIFICATION OF THE IMPLANT POSITIONS

For reasons of higher accuracy, after the healing phase the patient and the treatment team met at the practice to carry out a further try-in in the patient's mouth. This was performed by means of resin prototypes with aluminium bars, which prevented the prototypes from flexing. Such prototypes allowed the dentist and the dental technician to check not only aesthetics, occlusion and the relation between implants and soft-tissues but also to confirm the implants positions by checking through x-rays whether the bars fit to the implants connections.

The try-in confirmed the implants positions and the accuracy of the work done with the intraoral scanner and the digital workflow. The treatment team could then proceed with the design and milling of the final prototypes.

20

Checking the fit of the aluminium bar with the implant connections (fig. 20).

19

The prototypes and the aluminium bars (fig. 19).

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THE PROTOTYPE CREATION BASED ON THE PLANESYSTEM®

The final prototypes were milled out of Multistratum® Flexible resin. The patient wore the prototypes for three months, following which, a further patient analysis using the Plane Analyser was carried out. This analysis helped the dentist and the dental technician detect if the initial condylar problems were solved by the new restoration created according to the patient's individual reference planes. The assessment proved that adequate measures were taken to help the patient overcome his condylar problems.

21

The final maxillary prototype made with Multistratum® Flexible resin (fig. 21).

THE FINAL RESTORATION IN PRETTAU® 2 ZIRCONIA

In light of the positive results obtained, the final rehabilitations in Prettau® 2 zirconia could be manufactured, based on the digitisation of the functionalised prototypes. Both the full arches and the titanium bar for the maxilla were milled in the M1 Wet Heavy Metal milling unit. After milling, the two restorations were coloured with colouring liquids and sintered. Due to the translucency of Prettau® 2, only the anterior region was layered with ceramics to enrich the teeth with an even more natural beauty.

22

The maxillary restoration after colouring with the specifically developed technique for Prettau® 2 zirconia (fig. 22).

23 24

The lower restoration before and after the first firing (figs. 23–24).

The titanium bar and bases were anodised in different colours, bonded to the zirconia structures and placed in the patient's mouth, using resin sealing screws to seal the screw channels. Finally, a bite splint was created to prevent damages on the restorations due to bruxism.

25

The anodised titanium bar and bases bonded to the restorations (fig. 25).

26

The resins screws milled out of the Screw Blank resin. They can be screwed directly in the patient's mouth to seal the screw channels and easily removed by the dentist through a specific extractor (fig. 26).

27

The bite splint created to prevent damages on the restorations due to bruxism (fig. 27).

PRETTAU® BRIDGE MADE WITH PRETTAU® 2 ZIRCONIA

CREATED WITH ZIRKONZAHN'S DIGITAL WORKFLOW

All software, hardware and materials used for the realisation of this case are provided by Zirkonzahn.

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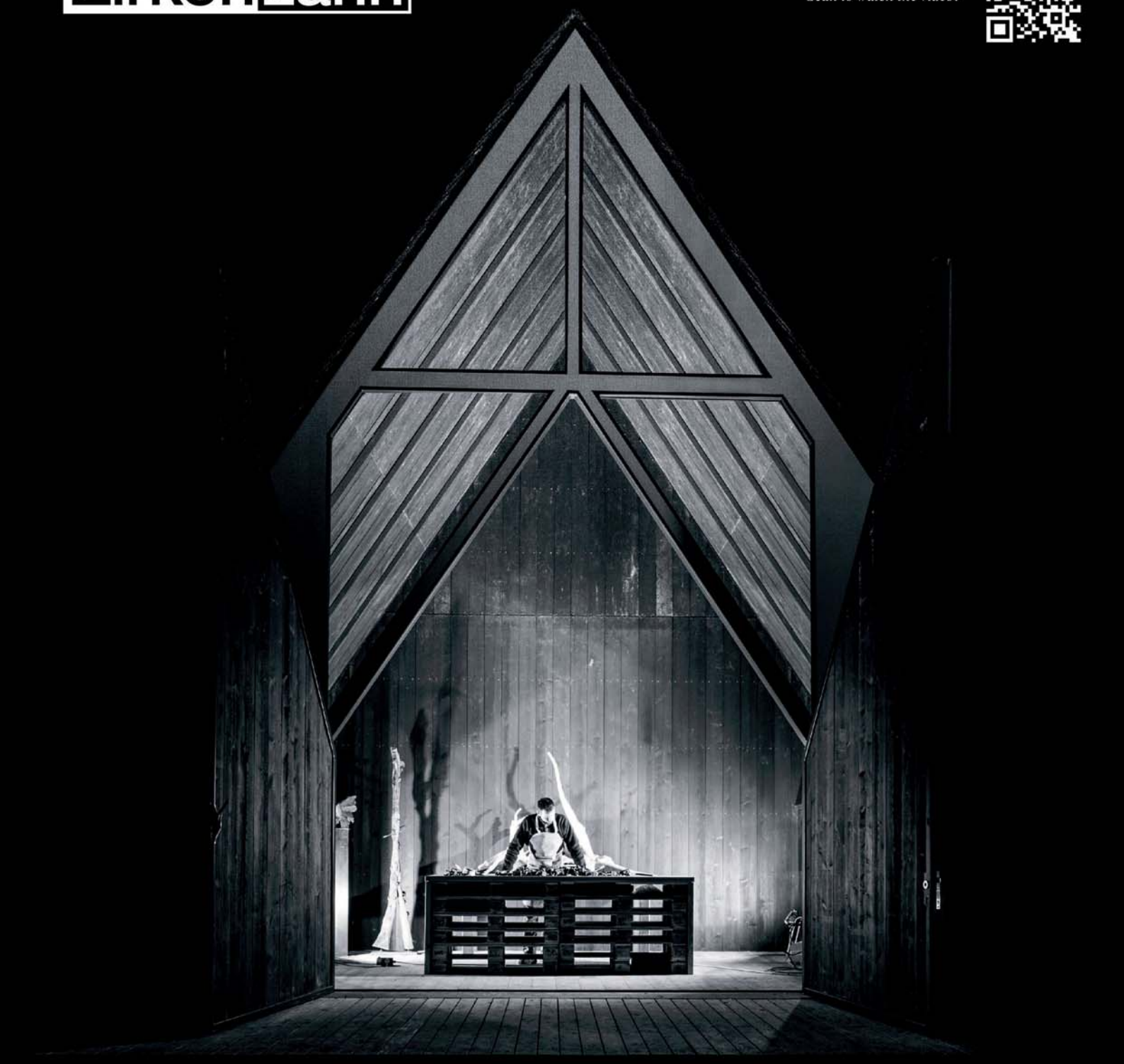
Scan to watch the video!



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