

THE DENTAL
SOLUTIONS
COMPANY™



User Case

Metal Processing With inLab MC X5

IDS Edition
2017



More possibilities with inLab MC X5

Dentsply Sirona offers with the 5-axis production unit inLab MC X5 a universal CAD/CAM-partner for laboratories, combining a broad variety of indications with a free choice of materials. The milling and grinding unit is designed for processing zirconium oxide, polymers, composites, wax, glass and hybrid ceramics as well as sintering metal and titanium preforms.

The range of application of inLab MC X5 is growing continuously. It allows the dental laboratory a productive machine usage for a high added value.

Master dental technician Andreas Beining (Dental-technik Beining, D-Oberkotzau) and dental technician Jens Richter (Zahntechnik Straßburger, D-Rochlitz) documented these customer cases step-by-step.



Custom titanium abutments made in your own laboratory

As links between implants and superstructures, abutments are indispensable components in implant prosthodontics. They can be sourced from the implant manufacturer as prefabricated units or custom-made for a specific patient case. However, when producing custom one-piece titanium abutments, inLab users until recently had to work with an external milling center. The most recent version of the CAD and CAM software, inLab SW 16.0, now terminates this dependence by allowing these abutments to be fabricated on the laboratory's own 5-axis milling unit. Just how that works in detail is exemplified by the following patient case.

Case report: Titanium abutments

The patient presented at the dental practitioner's office with a strong inflammation in the posterior region of the lower left quadrant, which mandated extraction of all posterior teeth up to the canine and removal of some bone at site 34. The dentist and patient agreed that the newly edentulous region was to be rehabilitated using an implant-supported restoration (with implants to be placed at sites 34, 36, and 37). Since the removal of bone tissue had resulted in greatly divergent vertical dimensions, the dental laboratory was tasked to provide custom abutments.



Fig. 1



Fig. 2

The starting point for the laboratory procedures was a classic analog impression of the oral situation, based on which the master cast was poured and a gingival mask produced in the usual manner (Fig. 1).

In the software inLab CAD SW 16.0, a new case for the "Implant" restoration type was opened and the corresponding implant positions specified (Fig. 2).



Fig. 3



Fig. 4

This was followed by selecting "Implant Level" as implant connection type (Fig. 3) and "TiBase" as scanbody type (Fig. 4).



Fig. 5



Fig. 6

Next, "inLab MC X5" (Dentsply Sirona CAD/CAM) (Fig. 5) was selected as milling device and "Medentika Preface® Abutment" (Fig. 6) as the material. The administrative set-up phase was thus completed with just a few clicks.



Fig. 7



Fig. 8

To prepare the model for the scanning process, the gingiva mask is temporarily removed and the titanium bases (TiBase) with scanbodies (both Dentsply Sirona) are connected to the laboratory implants analogs (Figs. 7 and 8).



Fig. 9

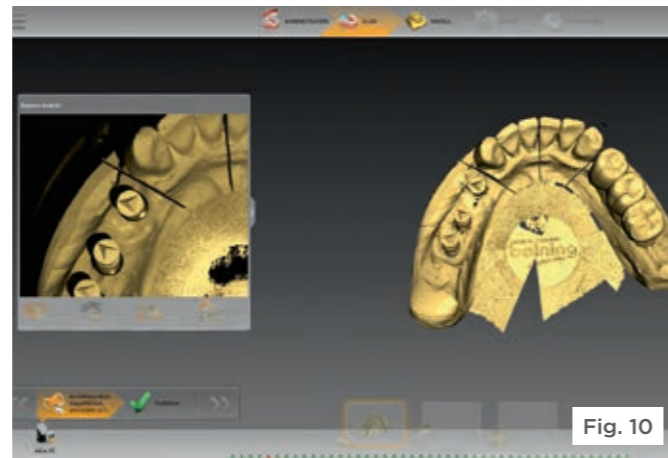


Fig. 10

This assures a precise detection of the implant positions during scanning. The prepared cast is then scanned in the inEos X5 laboratory scanner and, once the model has been calculated, the data is sent to the inLab CAD 16.0 software (Figs. 9 and 10).

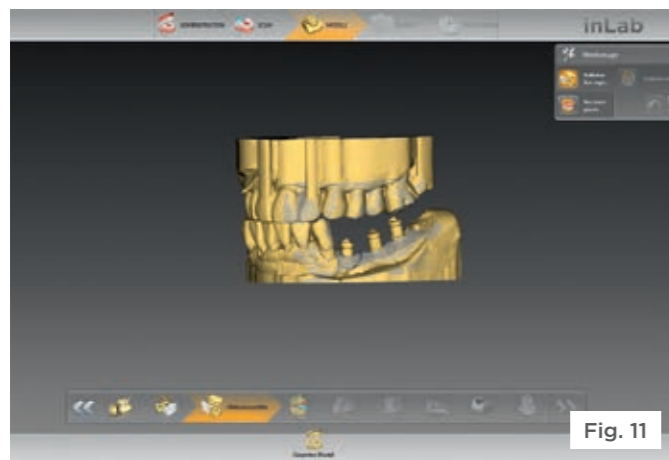


Fig. 11

This is followed up by checking the occlusion (Fig. 11).



Fig. 12

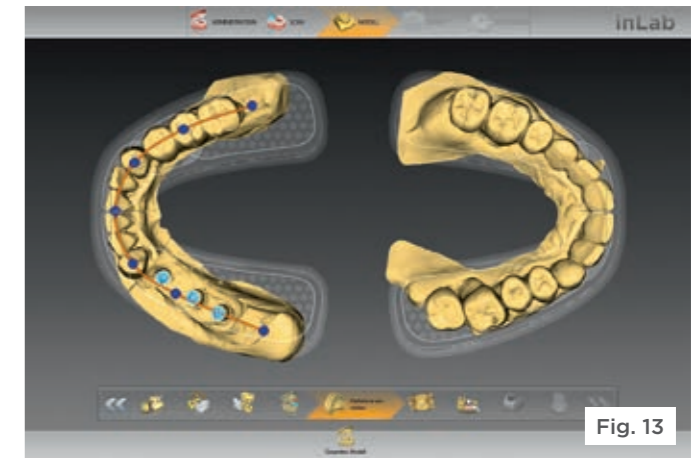


Fig. 13

The next step includes the aligning of the model axis (Fig. 12), and drawing the jaw line (Fig. 13).

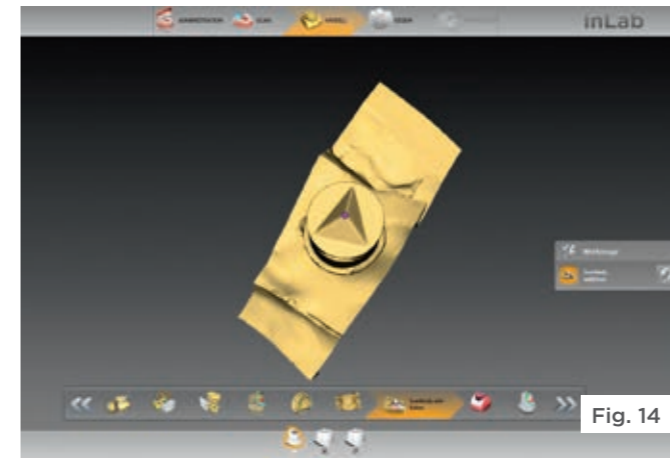


Fig. 14

Finally, the individual model segments are trimmed for the areas to be restored and the scanbodies are marked (Fig. 14).

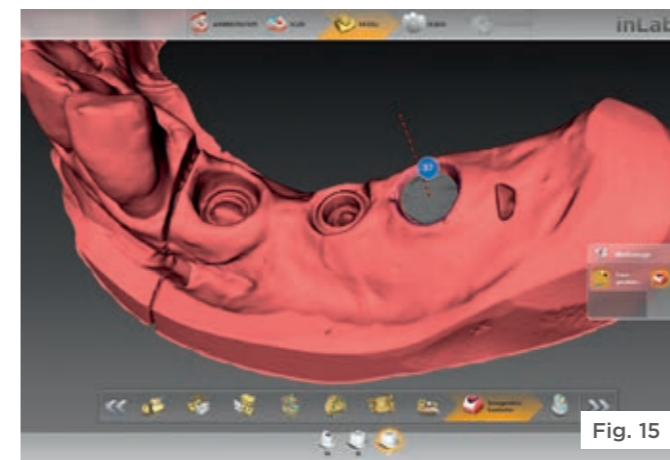


Fig. 15

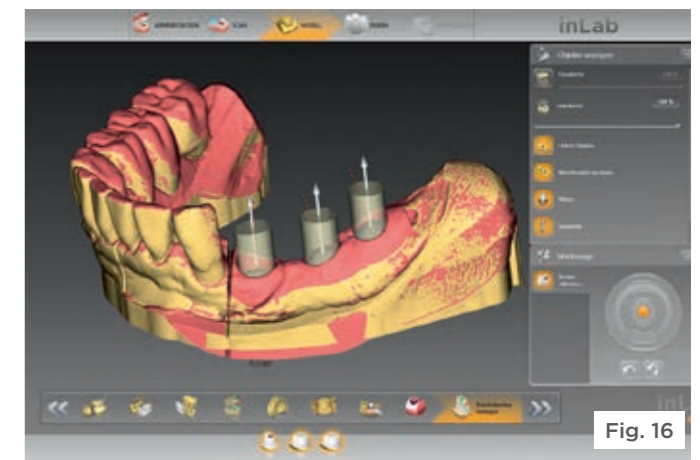


Fig. 16

The position and orientation of the implant shoulders are adjusted in the "Edit Base Line" (Fig. 15) and finally the insertion axis is determined (Fig. 16).



Fig. 17

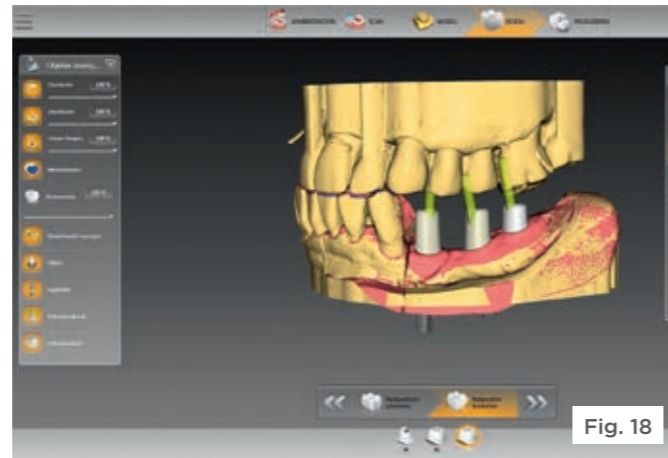


Fig. 18

After parameter setting selection (Fig. 17) such as the occlusal shoulder width, the telescope angle, the gingival placement pressure and the implant length, the software presents a good first proposal for the abutment design (Fig. 18). If necessary, this proposal can be individually adjusted (for example by providing more space on the occlusal surface or increasing or decreasing its diameter), but as in most of these cases, the proposal could be confirmed without further modifications.

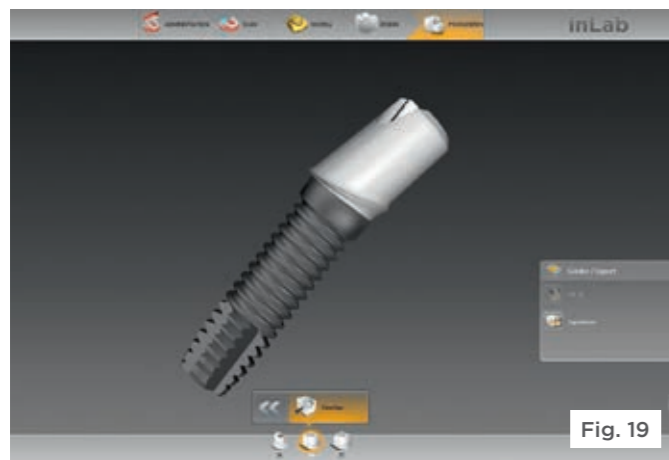


Fig. 19

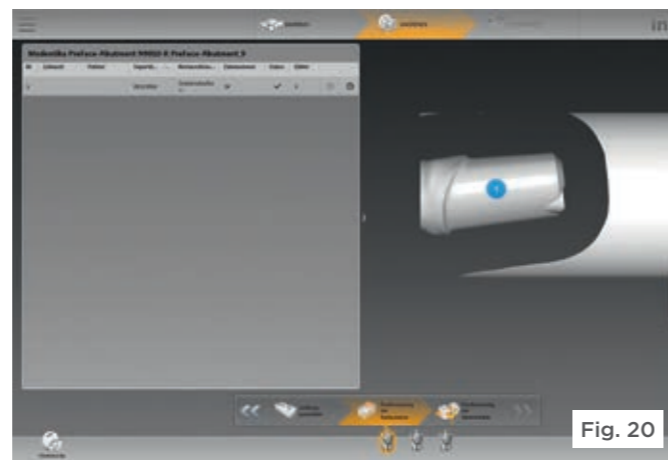


Fig. 20

Following a final review of the design in the preview (Fig. 19), the data (Fig. 20) is transferred to the inLab CAM Software 16.0.

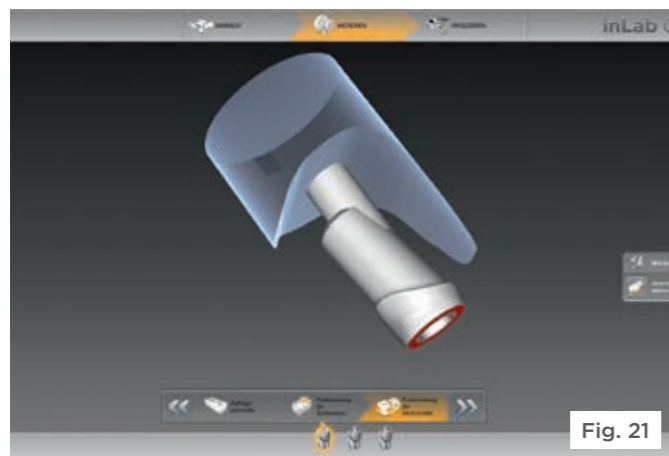


Fig. 21

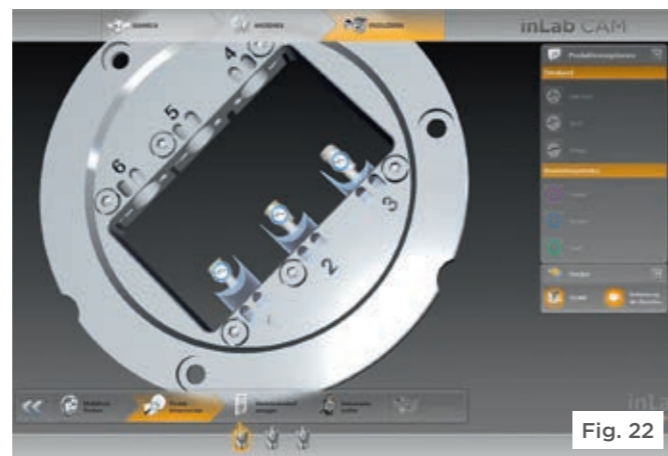


Fig. 22

Here it was possible to adjust the sprue locations (Fig. 21) and to place the virtual material on its holder (Fig. 22).

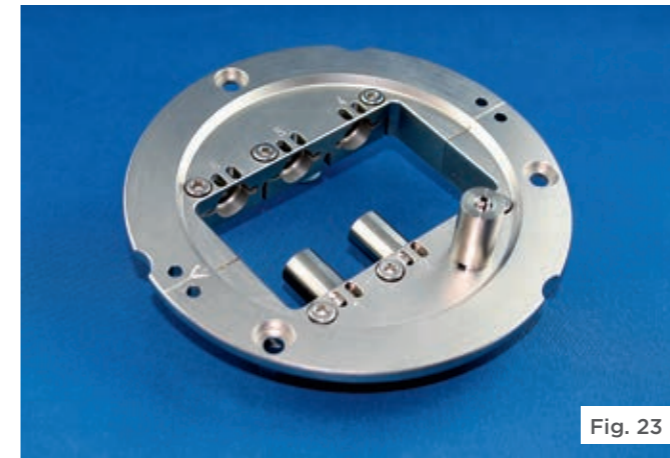


Fig. 23



Fig. 24

Meanwhile, the titanium PreFace® abutment blanks matching the implant system were clamped in place in the special inLab MC X5 abutment holder (Fig. 23). The blanks already contains the prefabricated implant connection geometry. The new holder is part of the Medentika PreFace® Abutments starter kit of Dentsply Sirona CAD/CAM (Fig. 24). This starter kit includes a torque wrench, special titanium burs (Bur 2.0 Metal and Bur 1.0 Metal), a separate tool magazine, tanks with filters for the inLab MC X5, along with a special cooling lubricant additive (DentaLub).



Fig. 25



Fig. 26

The holder is inserted into the milling unit (Fig. 25), and the milling process is launched by the CAM software (Fig. 26).



Fig. 27



Fig. 28

After a processing time of about 2.5 hours (an abutment requires approximately 50 minutes of milling time, depending on its size), the abutment holder with the finished milled abutments are taken out of the machine (Figs 27-28).



Fig. 29



Fig. 30

In a final processing step, the abutments were now separated from the rest of the blanks at the previously defined sprue interfaces by means of cutting disks. The subgingival portions were polished to a high gloss. It is recommended to sandblast the superstructures with alumina (110 microns) once the restoration is completed (Fig. 32).



Fig. 31



Fig. 32

The finished titanium abutments, where the connection geometry precisely matched the implant system used, is then directly connected to the implant analogs on the cast and are immediately ready for further processing (Figs. 31 and 32).

Advantages for the laboratory

Individual abutments have a number of advantages over their pre-fabricated counterparts. Their individual design that matches the specific patient case gives the dental technician a much better foundation on which to produce an outstanding restoration in terms of function and esthetics. When using standard abutments, by contrast, the laboratory will have to make compromises in many situations. In the present case, for example, standard abutments would have meant that the abutments at site 34 would have disappeared almost completely below the gingival line, while the other two would have had an artificially high emergence profile. The compensation of vertical differences, the feasibility of restorations that require a special abutment angle, as well as the possibility to provide individual emergence profiles all favor the use of custom abutments. Moreover, the diameter of a standard abutment is often too small, especially in the posterior region. Custom abutments design can achieve diameters similar to those of prepared natural teeth. In the case presented here, they helped avoid an unnecessarily large prosthetic superstructure.

With the inLab MC X5 5-axis milling unit and the new inLab CAD and CAM 16.0 software, it is now possible to design and mill custom titanium abutments directly in the dental laboratory. This new method is of interest to the dental laboratory for several reasons. Production directly at the laboratory is much faster than having to go through a central production facility, where, given the shipping delay and possible adjustments, it may well be a few days until the abutments are ready. In addition, the workflow is not disrupted during the milling process with this procedure. Rather, the inLab software gives the dental technician the option to use the virtually designed abutments as they are being physically milled and continue working with them. An additional benefit is that a greater part of added value stays in-house thanks to the new process.



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Base-metal bridges from small to large

The CAD/CAM-based in-house production of crown and bridge frameworks made of non-precious metals (NPM) has opened up new possibilities in the dental laboratory for some time now, as it presents a faster, more economical, and more reliable alternative to conventional casting methods. The scope of this option is now further extended by the new inCoris CCB disc (Dentsply Sirona CAD/CAM) that allows the fabrication of wide-span NPM restorations using the inLab MC X5 5-axis milling unit. These two concrete cases document the digital process.



Fig. 1



Fig. 2

The bridge restoration was first defined in the software inLab CAD SW 16.0 (Fig. 1), choosing the new inCoris CCB disc for the framework (Fig. 2). The digital impression of the intraoral situation was taken at the dental office using the CEREC Bluecam intraoral camera and transferred to the dental laboratory's inLab CAD SW 16.0 online via the Sirona Connect portal.



Fig. 3



Fig. 4

A virtual version of the master model, including segmentation and pinning, was created for subsequent mounting on the perforated plate (Figs. 3 to 4).

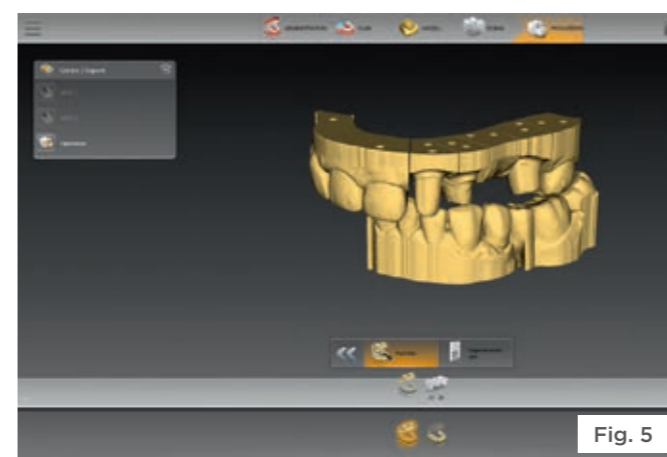


Fig. 5

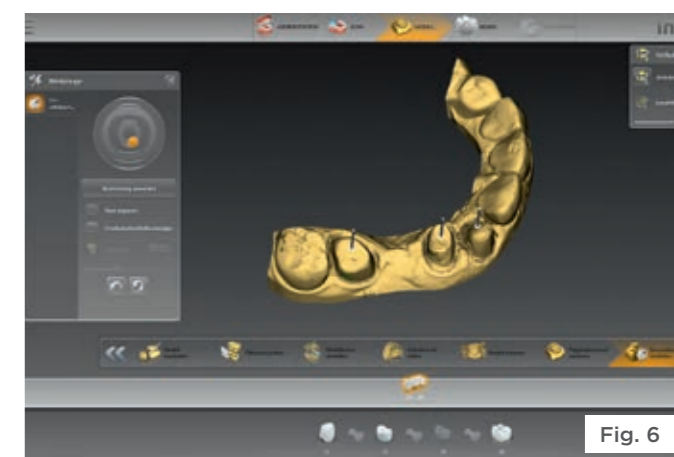


Fig. 6

The model data were exported in STL format by way of the interface module of the inLab CAD software and used for in-house production of the physical model with a 3D printer (Fig. 5).

The model axis, the jaw ridge line, and the insertion axis were defined in the inLab CAD 16.0 software (Fig. 6).

Case report 1: 4-unit bridge

The patient presented at the dental practitioner's office has a failing bridge in her upper left quadrant (tooth 22 to 26). Due to agenesis of the canine, a four-unit bridge with one pontic at site 25 was required. As the patient wished to bring the cost down as low as possible, the dentist agreed to provide a veneered bridge with an NPM framework.



Fig. 7



Fig. 8



Fig. 9



Fig. 10

Thanks to its integrated biogenic function, the CAD software supplied a design proposal. Only minor modifications were made: the contact points were individually adjusted and the thickness of the framework was reduced somewhat (Figs. 7 to 10).

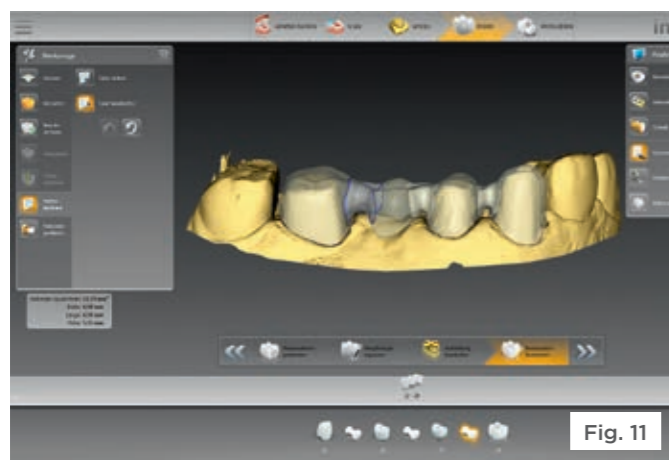


Fig. 11



Fig. 12

At the end of the design process, the connector lines were adjusted (Figs. 11-12).

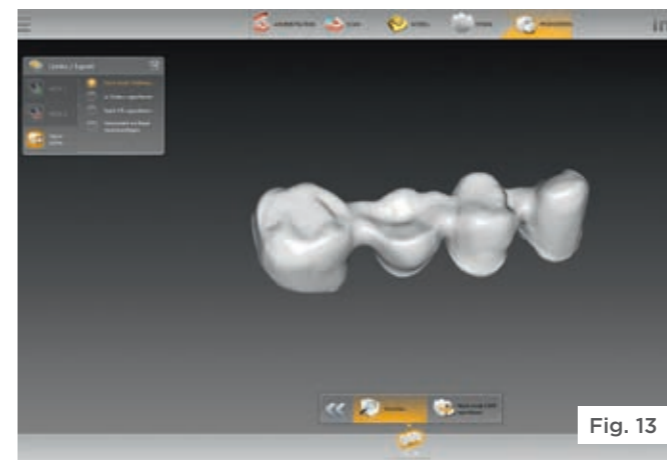


Fig. 13

The final check was performed on the preview screen (Fig. 13), from where the data was exported to the inLab CAM 16.0 software.



Fig. 14

In the current version of the CAM software, the inCoris CCB blank can easily be identified by QR code detected by a webcam (Fig. 14) — a convenient feature that can also be used for all other inCoris blanks. The QR code provides all of the necessary information on the current blank without the inconvenience of manual data entry; the software even recognizes already partially milled blanks.



Fig. 15

As this case shows, the restoration to be milled could be positioned within the blank quickly and without any complications (Fig. 15).

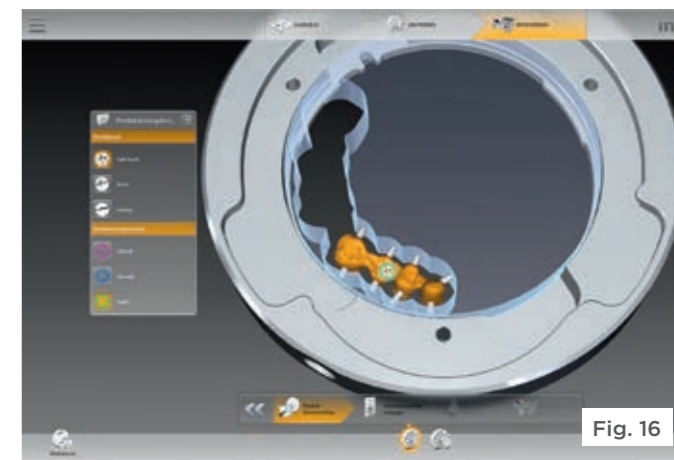


Fig. 16

In the production preview, the sprue connections were reduced and the milling job passed on to the laboratory's own inLab MC X5 5-axis milling unit (Fig. 16).



Fig. 17



Fig. 18

The software presents a reminder screen at this point (Fig. 17) to ensure that both the correct workpiece and the corresponding tool magazine are loaded into the unit (Fig. 18).



Fig. 19

After 20 minutes of wet milling, the workpiece with the milled bridge framework is removed from the inLab MC X5 (Fig. 19). The blank was allowed to dry overnight and the framework separated the next day.



Fig. 20

Since the inCoris CCB blank is made of a sintering metal, the next step was the sintering step that brought the framework to its final size and strength (Fig. 20). This step was performed in the inFire HTC speed sintering furnace (Dentsply Sirona CAD/CAM). For NPM sintering, the furnace is fitted with an argon gas connection and a separate sintering platform.



Fig. 21

After the framework, in its final dimension, could now be tried on the model (Fig. 21). A tension-free fit was noted, meaning that the framework was now ready to be veneered.

Case report 2: 11-unit bridge

The second case involved a much more extensive restoration. Due to the extraction of a tooth that had previously served as an abutment tooth, several bridges had to be replaced by a large 11-unit bridge. The workflow and approach were similar to that described for case #1. Again, the impression was taken digitally by a CEREC Bluecam and transmitted to the laboratory's own inLab CAD SW 16.0 unit via Sirona Connect.



Fig. 22

The virtual design of the master model (Figs. 23 to 24) was followed by its physical production using an STL data export and a 3D printer.



Fig. 23

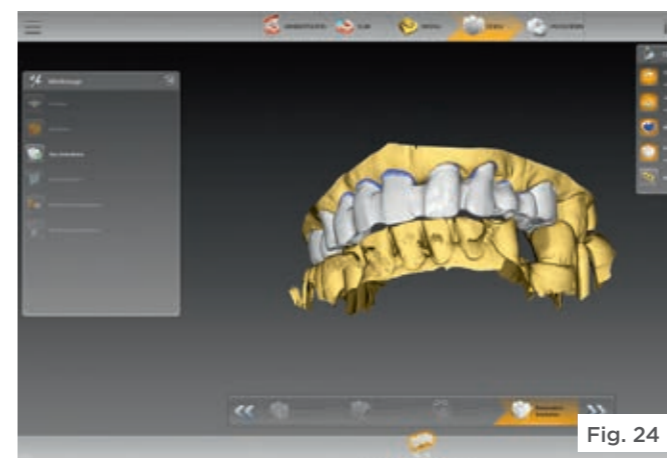


Fig. 24

The bridge framework was subsequently designed using the biogeneric function of the software, as in the previous case (Fig. 24).



Fig. 25



Fig. 26



Fig. 27

For the production, the resulting job was transferred to the inLab CAM SW 16.0 (Fig. 25), where the restoration, the sprues, and the sinter support, required for the subsequent sintering process (Fig. 26) were positioned and the milling job initiated (Fig. 27).



Fig. 28



Fig. 29

The milling job executed by the inLab MC X5 took 64 minutes to complete (Figs. 28-29).

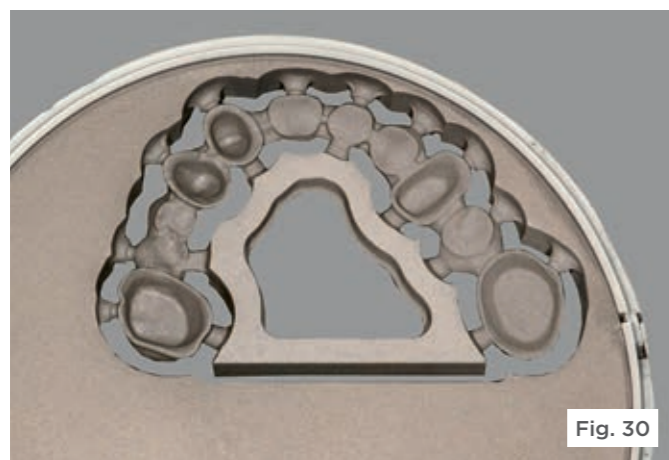


Fig. 30

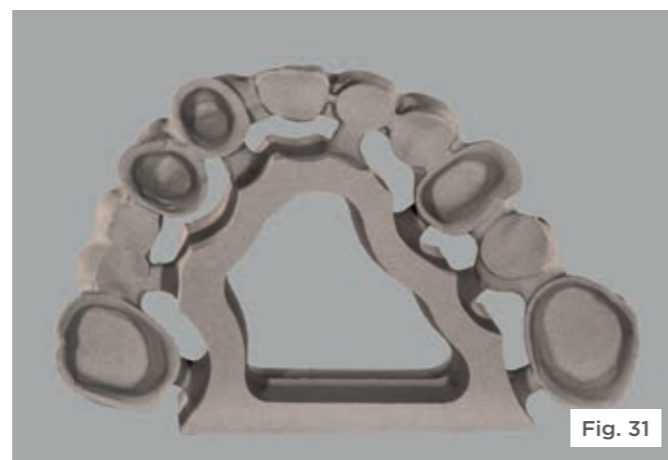


Fig. 31

The bridge framework is then removed from the milling unit (Fig. 30) and separated for overnight drying (Fig. 31).



Fig. 32

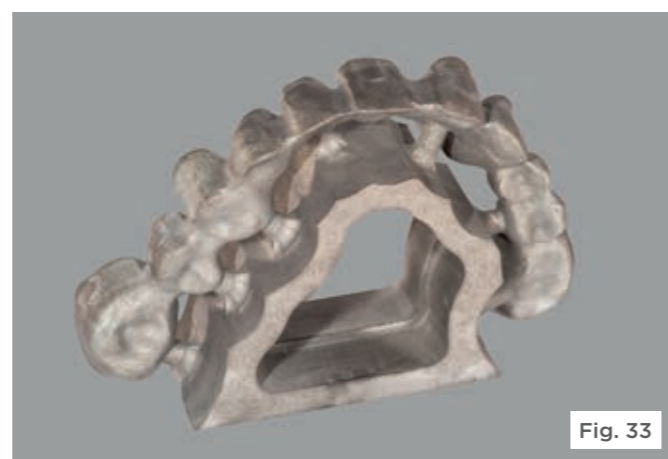


Fig. 33

The final dimensions of the bridge framework were once again obtained by sintering in the inFire HTC speed (Figs. 32-33). Due to the large dimensions of the framework, sintering was performed with the aid of a sinter support – a procedure generally recommended for 6-unit and larger frameworks. The sintered framework was then veneered and finished.

Conclusion

The CAD/CAM-based processing of NPM provides various advantages over the traditional casting process. A quick and clean procedure reliably produces high-quality results. Complex workflows have become a thing of the past, as have porosities and voids, distortion, impurities or other problems associated with the casting process. With the new inCoris CCB disc, an even greater number of cases can benefit from these advantages. After all, in combination with the inLab MC X5 5-axis milling unit, it is suitable for smaller objects as well as large-span bridges, as the two cases described here have shown. Thus, the laboratory can resort to this simple and economic process in almost all situations where economic aspects play a significant role for patients. Moreover, the profits generated by the CAD/CAM-based process accrue to the laboratory itself.



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