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User Case

Processing of NPM sintering metal with inLab MC X5

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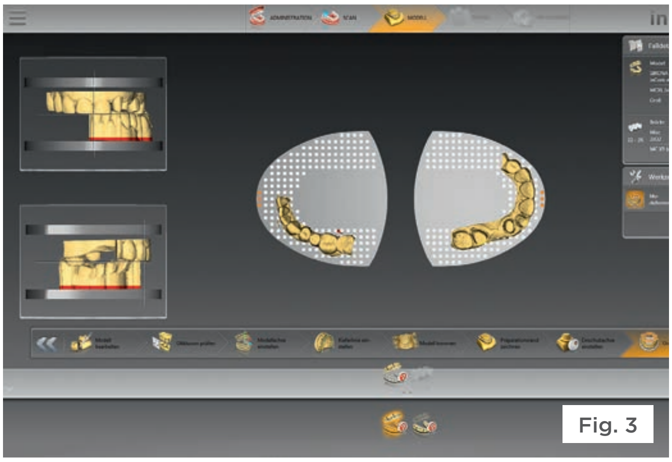
Base-metal bridges from small to large

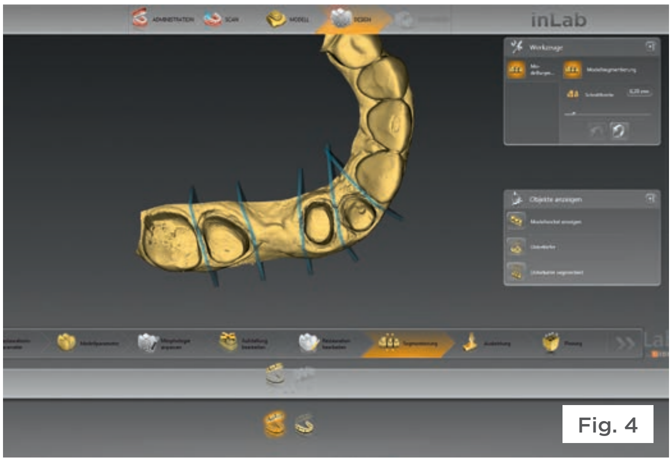
The CAD/CAM-based in-house production of crown and bridge frameworks made of non-precious metals (NPM) has opened up new possibilities in the dental laboratory for some time now, as it presents a faster, more economical, and more reliable alternative to conventional casting methods. The scope of this 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.

Case report 1: 4-unit bridge

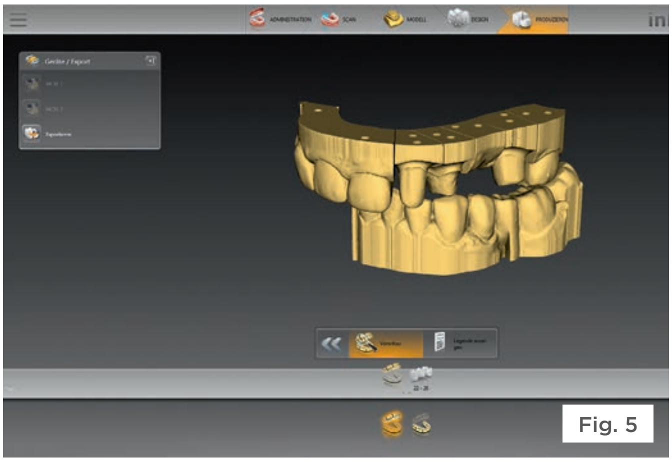
The patient presented at the dental practitioner's office has a failing bridge in her upper left quadrant (tooth 22 to 26). Due to agenesis of the canine, a four-unit bridge with one pontic at site 25 was required. As the patient wished to bring the cost down as low as possible, the dentist agreed to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

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.





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



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).

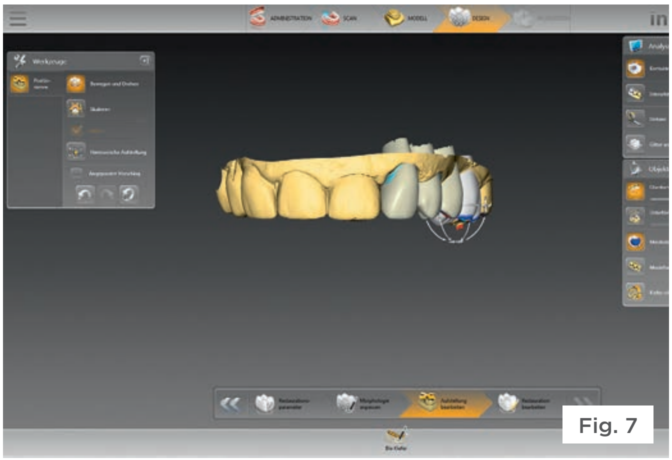


Fig. 7

Fig. 8

Fig. 9

Fig. 10

Thanks to its integrated biogeneric 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).

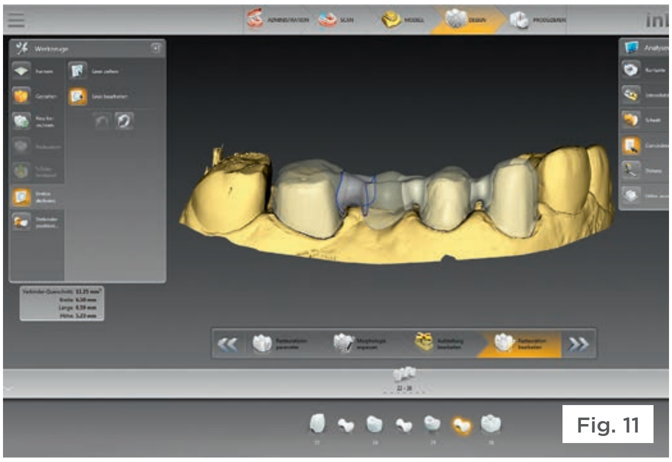


Fig. 11

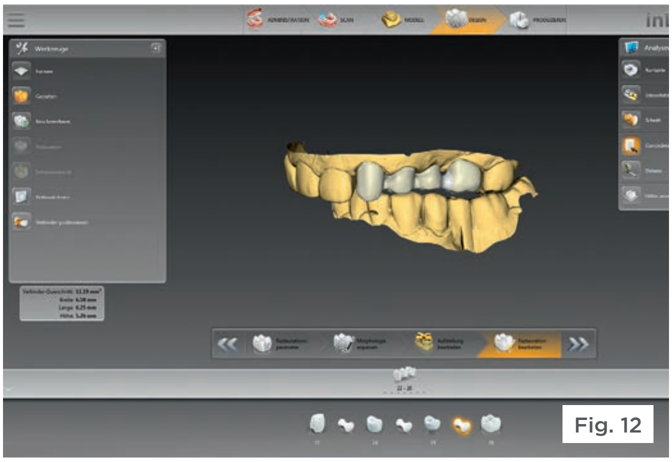


Fig. 12

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

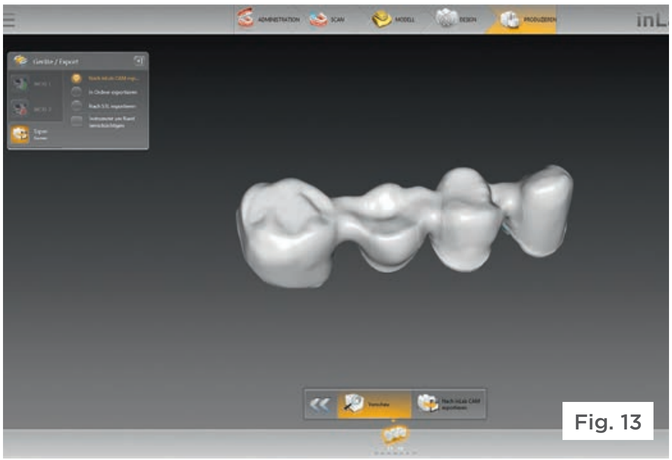


Fig. 13

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).

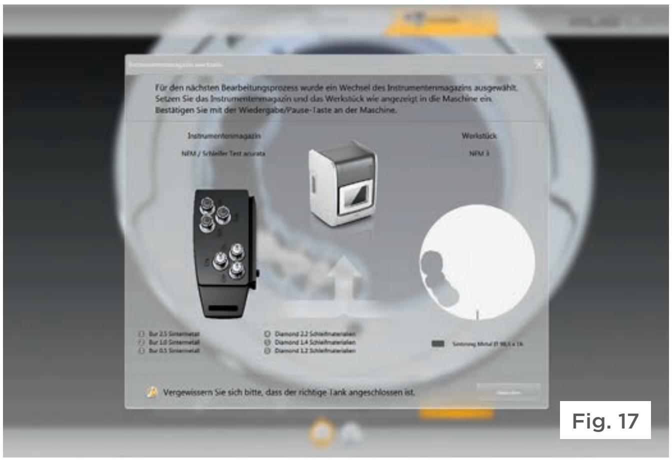


Fig. 17

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


Fig. 20

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.

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.

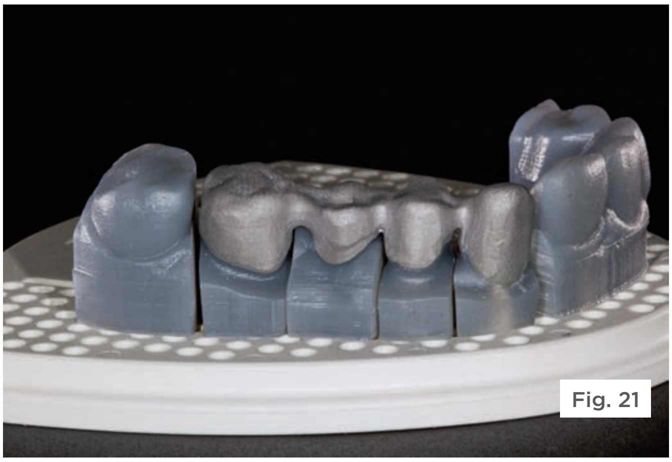


Fig. 21

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


Fig. 23

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.

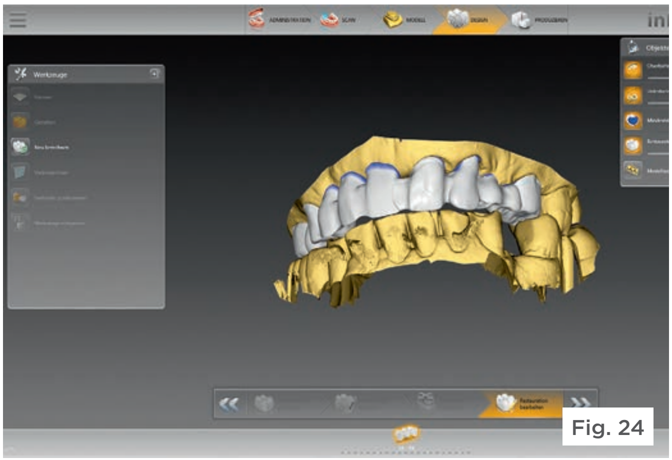


Fig. 24

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).

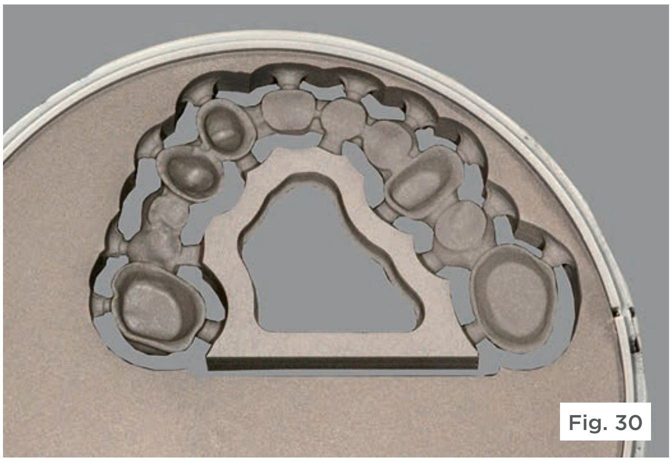


Fig. 30

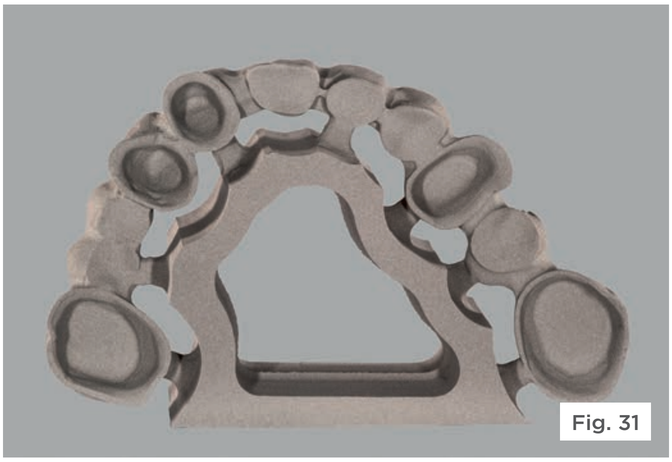


Fig. 31

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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