Processing of NPM sintering metal with inLab MC X5. User Case

Base-metal bridges from small to large

By Dentsply Sirona

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.

Fig. 1, 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, 4: A virtual version of the master model, including segmentation and pinning, was created for subsequent mounting on the perforated plate.

Fig. 5: 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. 6: The model axis, the jaw ridge line, and the insertion axis were defined in the inLab CAD 16.0 software (Fig. 6).

Fig. 7-10: Thanks to its integrated biogenetic 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.
Fig. 11-12: At the end of the design process, the connector lines were adjusted.

Fig. 13: The final check was performed on the preview screen, 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 — 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. 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. 17, 18: The software presents a reminder screen at this point (Fig. 17) to ensure that both the correct workplace 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. 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. 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.

Fig. 22-24: 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. 25-27: For the production, the resulting job was transferred to the inLab CAM SW 16.0 (Fig. 25), where the restoration, the sprue, and the sinter support, required for the subsequent sintering process (Fig. 26) were positioned and the milling job initiated (Fig. 27).

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.
Dental Technician Int’l Meeting
05 May 2018

By Dental Tribune MEA/CAPPmea

The Dental Technician International Meeting (DTIM) is the continuation and growth of CAPP’s Dental Technician Sessions during the last 10 years. These Dental Technician Sessions were accomplishments not only for dental laboratory owners and dental technicians but for the entire dental technology profession.

The DTIM will be held on the 5 May 2018 at the Madinat Jumeirah Conference Centre. Over 200 dental technicians, clinical dental technicians (CDTs), lab owners, trade visitors and more are expected to attend.

The DTIM takes place in conjunction with the 15th CAD/CAM & Digital Dentistry Conference which will be attended by over 2000 dental professionals.

Who Should Attend and Why?
- Dental technicians
- Clinical Dental Technicians (CDTs)
- Dental lab owners

Join the DTIM 2018 to ensure that you are at the very forefront of the industry.

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 55 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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Fig. 28-29: The milling job executed by the inLab MC X5 took 64 minutes to complete.

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

Fig. 32, 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.
Restorations at 35 minute intervals

By COLTENE

Whichever production times with zirconium of up to 14 hours are no exception, aesthetically appealing composite crowns can today be created within 35 minutes and only require quick polishing. For CAM/CAM experts of the renowned laboratory partner DT&Shop know all about the benefits of fast, high quality production and how to keep dental laboratories competitive in the long run. In this interview, Dr. Nicolas Rohde, Head of Digital & International Division, and dental technician Manfred Bildhäuser explain what is possible in the field of CAD/CAM with state-of-the-art materials research.

Dr. Nicolas Rohde is well acquainted with the notion of speedy delivery. The fast implementation of demanding customer orders is the daily agenda of the leading mail order company for dental laboratory equipment. Eight dental technicians produce highly aesthetic prosthetics for the company’s numerous customers in the in-house milling centre. No wonder the enthusiasm for the novel CAD/CAM composite blocs for example the BRILLIANT Cross zirconium hybrid composite from Swiss dental specialist COLTENE knew no bounds. The flexible all-rounders make life considerably easier for CAD/CAM production and are notable for their rapid polishability, among other things.

Dr. Rohde, it is difficult for dentists to bypass composites in classical filling therapy. Now this versatile material is also entering the arena of CAD/CAM technology. Is composite the new ceramic?

Dr. Rohde: This depends entirely on the indication! Indeed, the CAD/CAM composite blocs currently available on the market bring with them a number of excellent material properties. In many cases it is possible to create visually attractive results from this flexible material in virtually no time. Long sintering or crystallising of other dental materials can be eliminated completely. After roughly 35 minutes, the milling machine produces virtually finished crowns, partial crowns, inlays, onlays or veneers. Due to the high intrinsic gloss of high performance composites such as BRILLIANT Cross, brief polishing is all that is required. This allows fabrication of a top quality restoration within one hour.

How did you find out about the reinforced composite blocs?

Dr. Rohde: Based on our long-standing experience in milling, COLTENE asked us to grind a number of restorations from the material for their acrylic models. Amazingly, of the 700 units which we produced in record time, there was not a single restoration which did not leave the CNC machine in perfect condition. After this convincing result we immediately included BRILLIANT Cross in our portfolio and are already handling first enquiries for the novel material.

What can composite do which traditional CAD/CAM materials can’t?

M. Bildhäuser: Above all, the marginal stability of BRILLIANT Cross is extremely high. Compared with glass ceramics, the high performance composite is ideally suited for inlays or onlays requiring extremely thin walls. We also use the flexible all-materials in all cases where preparation was not so good. Dr. Rohde: From my days in implant dentistry, I know that removing part of the dental fibres for dentures with implants often leads to a lack of the natural damping effect of the ligament in the jaw. This makes it extremely pleasant for patients, if the crown itself has a slight damping effect. Many users have reported on the high wear comfort of composite based restorations. The dentine-like modulus of elasticity provides for a natural chewing feeling and is gentle on the opposite tooth at the same time.

Where exactly is the specific advantage in processing?

M. Bildhäuser: Initially I was amazed as how easy the novel material could be smoothed and polished. There are no interfering inclinations of the polishing paste and post-processing takes next to no time, be it for monolithic crowns, onlays or veneers, whereby we use a compact wet grinding machine also used by many of our customers. This is not difficult to reproduce even for smaller laboratories, for example the Finocam W is an inexpensive wet grinding machine which delivers better results than far more expensive chairside CNC machines.

What needs to be observed in general terms when processing CAD/CAM composite blocs?

M. Bildhäuser: Of course every technician has his own style. A somewhat slower speed is generally recommended for composite; it is important to apply only little pressure on the material. And as the processing time is short anyway, one can take a more relaxed approach. Of course, with a new material one always needs to first try out the pressure effects of the grinding tools. After one to two units, processing is possible with comparatively little effort. The final finishing and polishing is separated from the carrier with a thin disc. Then smooth the surfaces with a soft rubber polisher. For further processing I use the DIATECH Shape-Guard from COLTENE, this adapts perfectly to the respective surfaces. This is followed by meticulous post-polishing with the margin polishing paste and finished!

Which material is currently in particularly high demand in laboratories?

Dr. Rohde: Zirconium remains the gold standard in the industry, last not least because of its favourable price structure. At approximately 25 units per blank, the circular blank is certainly in a different price category than the conventional blocs for chairside grinding systems. At the same time, zirconium has a convincing flexural strength of over 1,000 megapascals. At approximately 600 megapascals the value is of course somewhat lower for highly translucent pieces. On the downside, zirconium needs to be sintered for a very long period to achieve an aesthetic solution. 14 hours for production is quite common. When using CAD/CAM composite blocs we can process orders from laboratory customers quicker as the firing process is eliminated if we have the data by 3 pm, our milling centre can generally deliver on the same day.

Who benefits most from rapid processing?

Dr. Rohde: If the dentist has a CAD/CAM device in the practice, a crown can be produced within an hour and be fitted during the same session. The patient saves the need for a second session and is pleased by the immediate treatment. Also in the laboratory, production only takes one hour, in other words: the patient can have his dentures a few days later which is still considerably faster than in the past.

...does this mean there are no limits to patients’ demands?

M. Bildhäuser: Today, patients obtain extensive information via the Internet on various indications and the treatment methods available. This increases the wish for highly aesthetic restorations and patients take a closer look. In view of the marked quality awareness of many customers, one is of course delighted to deliver work to laboratories distinguished by a fantastic gloss.

Dr. Rohde, how has the competition from the Far East changed the domestic laboratory market in your opinion?

Dr. Rohde: As leading mail order company we export to over 100 markets and monitor the development in Europe with mixed feelings. The pressure on margins is no doubt increasing if dentists outsource their laboratory work more and more to India or China. Investment into CAD/CAM technology is therefore a good approach for the individual dental laboratory: machine fabrication largely eliminates the intermediate labour-intensive steps, making production costs competitive again. Usually the unit labour costs are the deciding factor in the calculation.

M. Bildhäuser: Add to this that the starter models for CAD/CAM have meanwhile become affordable, to gether with a manageable learning curve. In the past you more or less had to be an engineer to operate the devices, these days dental technicians attend one of our training courses at the beginning, the rest follows automatically.

And finally: what properties would you want the dental material of the future to have?

Dr. Rohde: (laughs) The all-in-one solution for every solution for every purpose would be a material with the flexural strength of zirconium, the aesthetics of e max and the processing characteristics of composite, but we place our trust in the inventiveness of the manufacturers. The amazing development of modern high performance composites over the past years would suggest that it is not only processing time in the laboratory which will undergo rapid progress. And we would be pleased to actively support easing the work burden for dental technicians.

Manfred Bildhäuser

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