Technology meets craftsmanship

By Dr Dario Žujic, DT Velimir Žujic, Croatia, and DT Dragan Stolica, Slovenia

Many edentulous patients wish to have their oral functions re-established with a fixed esthetic restoration. We can meet this request by combining implantology with dental CAD/CAM technology.

Full-arch implant-supported superstructures can be achieved by various methods. Depending on the bone quality and number of implants, the patient may either receive a fixed or removable implant restoration. If a fixed prosthesis is indicated, the superstructure may either be cemented or, alternatively, screwed directly to the implant fixture, depending on the clinical situation. In the case described here, we opted for a cemented zirconium oxide bridge. Monolithic crowns were used in the posterior region. For the anterior region, the crowns were cut back and veneered. Translucent zirconium oxide (Zenostar® T, Wieland Dental) was utilized for the framework and IPS® e.max Ceram for the veneering of the anterior teeth. These materials allowed the desired strength and esthetics to be achieved.

Preoperative situation

When the patient came to our dental lab, she wore a classic full-arch denture in her upper jaw. She was unhappy about the esthetic appearance, functional qualities and the loose fit of the denture. Her oral condition was assessed with digital volume tomography (DVT) to confirm that adequate bone quantity was available to facilitate the anchorage of the implants. Although the placement of four implants would have provided adequate stability for a removable denture, the patient desired a fixed all-ceramic reconstruction. Having discussed the treatment options with her, we abandoned the idea of providing an implant-supported denture based on the “All-on-4” concept and instead chose to manufacture a fixed implant-retained bridge. The framework would be made of zirconium oxide and the anterior teeth would be individually veneered.

Implant treatment and healing phase

On the basis of the DVT examination, seven implants (Replace CC, Nobel Biocare) were planned and placed. An adequate primary stability of 30 to 35 Ncm was achieved. During the healing phase, the patient wore the existing denture that had been relined with soft silicone. After a six-month healing period, a satisfactory level of osseointegration was achieved, without any signs of bone resorption or inflammation. The implants were uncovered and gingiviformers inserted. Two weeks later, an impression was taken to transfer the position of the implants to the dental lab. After model fabrication, appropriate abutments were selected and adapted to achieve a common insert direction for the bridge (Fig. 1).

Digital technology was employed to manufacture the temporary bridge. The model was scanned using a Zenotec® E900 lab scanner (Wieland Dental) and the temporary bridge designed with the shape dental design software. Milling was carried out in a Zenotec select S2 milling unit (Wieland Dental) using a PMMA material (Telio® CAD).

Framework fabrication

As the patient was satisfied with the shape and function of the temporary bridge, the final framework was fabricated. The patient was provided with the final framework for evaluation and returned to the lab for final adjustments.

Fig. 1: The seven implants in the edentulous jaw were to be connected to a fixed bridge made of zirconium oxide

Fig. 2a and b: Digitized model with temporary restorations (above) and abutments (below)

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The fully contoured shapes of the posterior teeth and the palatal surfaces of the anterior teeth were left unaltered to ensure a maximum level of strength in the final restoration. There was a risk that the abutments might shatter through as grey areas. For this reason, we decided to use translucent zirconium oxide. The layer thickness appeared to be adequate to mask the abutments.

Milling

The completed CAD design divides a basic crown framework into 5 000 to 20 000 coordinates and generates a harmonious surface texture and perfect marginal seal.

The completed design was transferred to the CAM unit. We use the V5 CAM version, which gives us the opportunity to create perfect output formats. The Zirconac® 3.2 format is our preferred output option because, in contrast to the open STL format, it delivers information on the specified cement gap, implant axis and restoration margins.

The CAM software uses this information to calculate milling parameters that distinguish between the different areas of the restoration. For instance, when milling the restoration margins, the unit reduces the speed, instead and feed rate to prevent thin crown margins from breaking or fracturing. As a result, even wafer-thin cervical margins having a thickness of as little as 0.1 mm can be reliably milled and require only very little reworking after the sintering process.

In less sensitive areas, the unit uses a higher milling speed. After the output format has been entered, the milling strategy is chosen. In this case, a milling strategy using 2.5 mm, 1.0 mm and 0.7 mm bars was selected for the manufacture of the bridge. The option of using a 0.3 mm bar was not taken as it was not needed for the restoration in question.

Next, the job was placed in a virtual Zentron® blank (Fig. 4). We decided to use a translucent, pre-shaded Zentron® T zirconium oxide disc in the shade T sun, because the posterior teeth from 14 to 16 and 24 to 26 were planned to be restored with monolithic zirconium oxide. The warm, reddish shade of this disc closely matches the selected tooth shade and allows the A – D shades to be recreated efficiently and repositioned in the patient’s mouth, eliminating the need for any adjustments by grinding, e.g. on the insides of the crowns. The advantages of the translucent zirconium oxide used were obvious at this stage. Due to the colouring liquids, the cervical and dentin areas were beautifully accentuated. The incisal areas exhibited a slight greyish transluency, which should facilitate the subsequent layering procedure. Figure 8 shows the smooth transition of the shades. The simulation in figure 9 demonstrates how difficult it would have been for us to achieve the desired tooth shade if we had used opaque white zirconium oxide for the framework. Despite the high translucency of the zirconium oxide, the titanium abutments do not show through the framework.

Individual framework refinement

An optimum esthetic outcome is only achieved if the restoration exhibits ideal optical properties. A controlled brightness value, adequate saturation and translucency and minimized light reflection are essential to achieve a pleasing esthetic outcome.

If these parameters are not met, the result will never be satisfactory, even if the restoration is veneered with ceramics.

Anterior area

Staining the zirconium oxide prior to sintering is the first measure to control the light reflection effects. Application to the layers is the second measure. The bridge was veneered with IPS e.max Press. As the framework already exhibited a pleasing basic shade, we applied a concept of using a max Ceram Zirkonzahn Clear and Incolor (70:30). Zirkonzahn Incolor reduces the light reflection of zirconium oxide at an angle of 45°. Figure 5 shows an example of this process. To model the Zirkonzahn Clear and Incolor (70:30), Zirkonzahn Incolor was mixed with yellow Zenostar Visualizer (Zenostar Visualizir). First, the anterior surfaces of the crowns were stained and allowed to dry for two hours, then the framework was sintered in a Programat® St sintering furnace.

After the sintering process, the restoration exhibited an excellent accuracy of fit, not necessitating any adjustments by grinding, e.g. on the insides of the crowns. The advantages of the translucent zirconium oxide used were obvious at this stage. Due to the colouring liquids, the cervical and dentin areas were beautifully accentuated. The incisal areas exhibited a slight greyish translucency, which should facilitate the subsequent layering procedure. Figure 8 shows the smooth transition of the shades. The simulation in figure 9 demonstrates how difficult it would have been for us to achieve the desired tooth shade if we had used opaque white zirconium oxide for the framework. Despite the high translucency of the zirconium oxide, the titanium abutments do not show through the framework.

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The result would simply be a restoration that looks good on the model but appears too bright in the mouth.
Custom-made titanium abutments produced in your own laboratory – with inLab MC X5 from Dentsply Sirona

By Dentsply Sirona

Dentsply Sirona CAD/CAM is extending the range of applications of its 5-axis milling unit inLab MC X5, with the production of custom-made one-piece titanium abutments with pre-fabricated connection geometries in authorized countries. With the latest version of the inLab Software 16.0, inlab users can now create implant supported prostheses that are even more closely matched to the individual needs of the patient.

Practitioners who are not prepared to accept any compromises in prosthesis quality turn to custom-made abutments. These enable the creation of a tailor-made implant abutment for the individual patient, thereby making special allowances for the specific implant situation. In addition, they offer dental technicians an even better basis for standard abutments for the creation of a functional and esthetically pleasing dental prosthesis.

With the latest inLab software update 16.0 from Dentsply Sirona, inlab users can now design and mill custom-made one-piece titanium abutments in their own labs. With the 5-axis milling unit inLab MC X5, for the first time it is now possible, not only to manufacture restorations from inlab design data but also to create design data from another CAD software via the open inLab CAM interface. The one-piece abutments are machined from PreFac® abutment blanks from Medentika with prefabricated connection geometries.

Advantages for the dental lab

One major advantage for the dental laboratory is in the characteristics of the one-piece solution: although partially ceramic hybrid abutments on TiBase create optimum esthetic results, only one-piece solutions are possible to certain clinical cases due to a lack of space, for example. The custom-made one-piece titanium abutment is the perfect solution in such cases, without requiring an additional joining step. Moreover, inlab users can seamlessly proceed with the workflow and, parallel to the milling process, virtually implant the designed abutment with the inLab CAD-software so that further prosthetic treatment can be planned. This means that production control and the added value remain in the lab.

Preform starter kit for inlab MC X5

The prerequisite for the milling of titanium preforms is the new inlab MC X5 starter kit for Medentika Preface® abutments from Dentsply Sirona CAD/CAM. This comprehensive kit can be ordered from dealers in all authorized countries. It contains, for example, a preform holder that has been specially developed for inlab MC X5, new inlab MC X5 titanium milling tools, a special cooling lubricant additive [DentaLab], separate container tank and other accessories.
Renfert: Making the dental technician’s work easy

By DTI

NEW YORK, N.Y., USA: Renfert is one of a record 42 German dental companies exhibiting their products at the Greater New York Dental Meeting (GNYDM). With the 100th anniversary of the Association of the German Dental Industry (VDDI) taking place simultaneously, the meeting is sure to have a celebratory tone. Dental Tribune International spoke to Greg Luengen, head of Marketing and Product Management, about the appeal of the American market for Renfert.

What is the reputation of the German dental industry in the U.S. market?
Greg Luengen: Positive, I would say. Firstly, the claim “Made in Germany” has a lot of clout, and many German companies have been around for quite a while: Renfert, for example, just celebrated its 90th anniversary, which demonstrates a certain understanding of our customer base. To be fair, most German dental products are not on the low end of the price scale and cannot really be compared to some domestic manufacturers that prioritize price. However, customers are definitely willing to pay that little bit extra because of the benefits and advantages our products offer. Value for money is an argument that resonates throughout the world, not just in the U.S. That is probably the foremost reason that Renfert introduced its new slogan — “Making work easy” — this year. Through intelligent solutions, the performance, quality and durability of our products, and reliable service, we can help our customers’ work better and more efficiently.

How has the relationship between the German and American dental industries developed?
I conducted some research in this regard a few years ago and came to the conclusion that, through the dramatic increase in the use of digital and social media, the ability and the desire to share information, views and opinions have grown immensely. Today, we can find out what dental technicians and dentists are doing in any part of the world. Such information allows companies like Renfert to respond more quickly to the needs of the different markets, and this ultimately results in a win-win situation for both the user and the industry.

How does Renfert regard the U.S. market?
The U.S. is very important to Renfert, one of our top five markets. It is so important that we have developed new products just for the American market, like the Basic eco sandblaster. This unit incorporates the same sandblasting technology as our other, larger units, is perfect for the smaller dental laboratory or practice, and comes at an extremely competitive price.

What is Renfert looking forward to exhibiting at GNYDM?
We are extremely excited to be showcasing our class-leading equipment, instruments and materials to an appreciative audience of dental professionals at GNYDM. We are particularly proud to be presenting our new SILENT compact and SILENT compactCAM dust collectors. Attendees will also be able to view the new Basic eco compact microsandblaster with powerful blasting technology, being offered at an attractive price–performance ratio.

At the Renfert booth, we will be giving live demonstrations of the Easy clean ultrasonic and SYMPRO denture cleaning units. 

inLab MC X5: DENTAL LAB FREEDOM OF CHOICE.

Experience new freedom in your lab processes breaking the chains of former dependencies with inLab and the new 5 axis milling and grinding unit inLab MC X5. Open for all restoration data, combining the largest material range and the possibility to machine both wet and dry disks and blocks — for no limitations to your production. Enjoy every day.

With Sirona.

The SILENT compactCAM dust collector has been specially designed for optimal use with CAM units.

(Photograph: Renfert)