Anterior restoration in the maxilla with non-prep veneers in times of digitization

DENTAL PROSTHETICS 4.0 MEETS 2.0

Dr. Luise Krüger

Jacqueline Meier

The world is changing – also from the perspective of dental prosthetics. There is already talk of Industry 4.0, referring to a future project which will lead to a comprehensive digitization of industrial production processes. This will affect not only large branches of industry, but also the field of dental prosthetics where the trend towards more and more digitization and automation is clearly recognizable. But let's keep the young horses reined in. For a project remains a project. Time and again, we see that we are still far from being able to manufacture many forms of artisanal work in a fully-digitized process. Using an example of non-invasive restoration with veneers on anterior teeth, the authors show how digital processes can be successfully combined a manufacturing process that is essentially craftwork.

Fig. 1 — The 23-year old patient presented with the request for brighter anterior teeth in the maxilla with less gaps. The anterior teeth in the maxilla were inconsistent and somehow "not finished".

Initial condition

The female patient, 23 years young, presented at our dental practice with the wish to have brighter teeth. She also requested that the gap in the anterior region (image 1) be corrected at the same time. It was of great importance to her that a procedure was chosen that was minimally invasive and therefore gentle on the tooth substance. The aim of the treatment was to create a harmonious smile in line with current ideals of beauty.

Task

Since veneer restorations have to be paid privately, it seems vital to us that we visualize the possible outcome for the patient in the form of temporary mock-ups. A try-in with mock-ups also offers the opportunity to recognize and eliminate any phonetic or functional problems in advance.

Digital impression - taking and virtual planning

Since the patient suffered from an extreme gag reflex, digital intra-oral impression taking proved a good alternative to traditional methods. This may sound like an easy decision, but in many cases it involves a lot of effort. This refers mainly to the large amount of time lost since Dentsply Sirona use a closed system which will not be transformed into an open system until some time in the future. Our procedure for the fabrication of larger constructions or printed models generally involves using the CAD program DentalCAD as this facilitates the processing of digital data as well as the workflow both with our milling machine and external partners.

To fulfil the patient's request for a minimal invasive procedure, we chose to use non-prep veneers. This is a purely additive process and seemed to be the best solution since the primary aim was gap closure and the aesthetic finish of the tooth shape of the small teeth.

In order to gain an initial impression of the aesthetic changes, we created our veneers using the DentalCAD 2.3 Matera software from exocad (image 2) and milled the resulting product from three-shaded multi-layer acrylic as a test (image 3). We purposefully created the incisors in three variations (one somewhat 1.5 mm longer) to explore the limits. Using the intra-oral scan data as a base, the models were printed and articulated, and the milled acrylic veneers were fitted. The finishing touches were made using a handpiece in a completely analog procedure to achieve the most harmonious result possible. This is important, despite all possibilities offered by digitization, in order to avoid errors and to give the structure a final finish. Generally speaking, aesthetic planning carried out with CAD/CAM and a milled mock-up can be achieved quickly and easily. Yet knowledge and ability in analog procedures are indispensable.

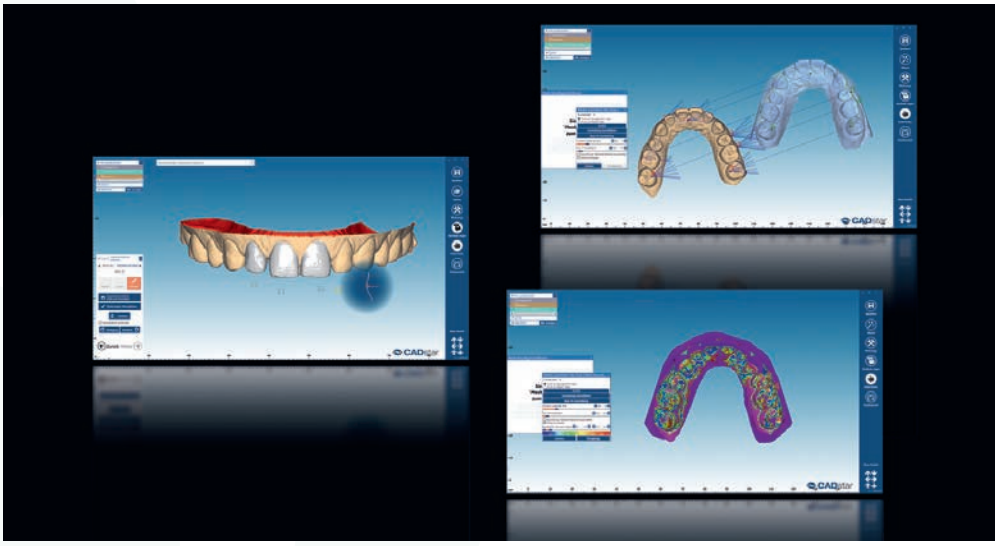

Fig. 2 — Veneers were designed using the DentalCAD 2.3 Matera software to gain an initial impression of possible aesthetic outcomes.

Fig. 3 — These veneers were then milled from a three-shaded multi-layer acrylic for test purposes. We milled all three variations in order to explore the limits of what was possible.

Mock-ups and provisional phase

Once the provisional mock-ups were ready, the patient was invited for a try-in.

Each of the three variations was tried and the results were documented. The results were then analyzed on the basis of photos, videos and feedback from the patient. For the try-in, a small amount of adhesive was applied to the teeth and the veneers were fixed using a drop of acrylic bonder.

This was necessary so that the patient was not limited in her natural movements, enabling her to assess the veneers. It was also possible to monitor the phonetic aspect. After the best alternative had been chosen, the mock-ups were adapted intra-orally.

Sof-lex discs were used to slightly round the incisal edges, thereby achieving a harmonious result which emphasized the patient's femininity despite the increase in size. The veneers did not appear either too large or unnatural. Acrylic veneers were then prepared for a try-in. This phase always proves to be a balancing act. One the one hand, the temporary veneers should sit firmly enough to withstand day-to-day situations, yet

Fig. 4 — To temporarily fix the veneers, the labial surface of the four anterior teeth in the maxilla were conditioned in the middle over a surface approximately 0.5 x 0.5 mm in size. The acrylic veneers were also conditioned and fixed with a small drop of acrylic bond on the teeth 13 to 23. The patient can wear these for one week at home.

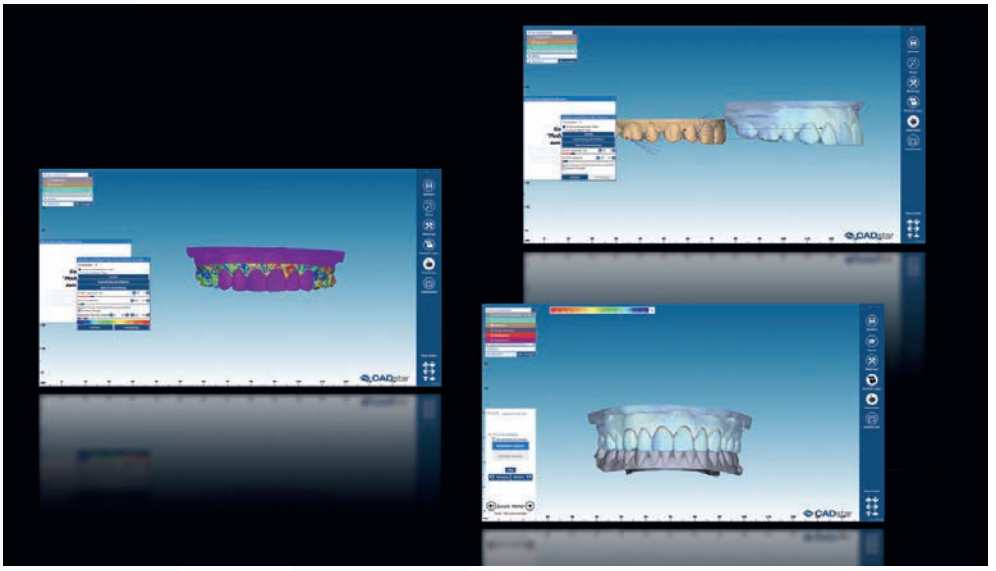

Fig. 5 — After a week's try-in, we listen to the patient's feedback and alter the veneers accordingly before scanning them again to obtain new construction data.

Fig. 6 — The modified veneers are milled from a burn-out wax using the new construction data.

Fig. 7 — The wax veneers are adapted using analog methods on the 3D printed model and given the final touches.

on the other hand, the surfaces of the teeth should remain intact as far as possible until the final veneers are fitted. After placing a rubber dam, we chose to condition a surface of approximately 0.5 x 0.5 mm in the middle of the teeth in question. To this end, the tooth structure was etched for ten seconds, then rinsed with water. Hybrid Bond was then applied to the teeth and massaged in, then light-cured. The veneers were fixed on teeth 13 to 23 (image 4) using a small drop of acrylic. The veneers had been prepared with a composite primer.

Final phase: milling, pressing and individualizing

Once we received feedback from the patient after one week of wearing the veneers and we were sure that the patient was happy with the result and how the veneers felt, we proceeded to the next steps. This means, the veneers that have been optimized by hand can be scanned again and re-milled, however using a burn-out wax this time (images 5 and 6). Since it was easier to adapt the veneers using analog rather than virtual methods, this step was carried out on the wax facets (image 7). Sprues were then attached to the adapted wax veneers which were then simply pressed into lithium disilicate ceramic. The pressed veneers were fitted to the model and contrast powder was applied to the surfaces (image 8).

We have a lot of experience with various stains and types of ceramic and have carried out many test phases. We recently began working with the lithium disilicate press ceramic ceraMotion® from Dentaurum. Since this was highly suitable for the case in hand, we worked with the ceraMotion® One Touch paste ceramic set which is part of the ceraMotion® system. The paste ceramic set contains special 2D and 3D pastes and is an excellent choice for the aesthetic finish and characterization of monolithic all-ceramic restorations (image 9). The pastes were very easy and

Fig. 8 — The wax veneers are pressed into ceraMotion® LiSi lithium disilicate ceramic. The surfaces are covered with contrast powder.

Fig. 9 — We used the press ceramic system ceraMotion® One Touch for an aesthetic finish. The 3D pastes can be used to adjust the surface structure and shade as required.

uncomplicated to process. They are ready-mixed and can be applied directly from the pot onto the veneers with no need for grinding. The result is a highly aesthetic veneer surface. 3D pastes in particular lend structure and luster to the veneers – in only one firing. The effects of the shades can be assessed before firing thanks to the quality of the ceramic pastes. By using the One Touch pastes to finish the veneers, we were able to create the look that our patient requested.

Appointment for veneer placement

Intra-oral placement took place on completion of the veneers. The veneers were conditioned for one minute with 9% acid, then rinsed with water and silanized. At the same time, the tooth surface was prepared intra-orally by etching the labial enamel first with 35% phosphoric acid, then applying Monobond Plus. Then the veneers were placed tooth by tooth using Synamel

A1 (image 10). This acrylic has the advantage that it prevents the veneers from slipping due to its slightly higher viscosity and thixotropy. Residue material was removed and the acrylic bonder light-hardened for 1 minute each. When all veneers had been placed, the phonetics and aesthetics as well as the static and dynamic occlusion were monitored once more in the presence of the dental technician. Small corrections were then made and the area between the ceramic and the tooth structure was aligned with the help of a special ceramic polisher, then finished.

In image 11, we have outlined the materials used from the ceraMotion® One Touch set on the two middle incisors to individualize and characterize them.

Fig. 10 — The veneers, now finished using ceraMotion® One Touch pastes, are then placed tooth by tooth with Synamel A1. This acrylic prevents the veneers from slipping due to its slightly higher viscosity and thixotropy.

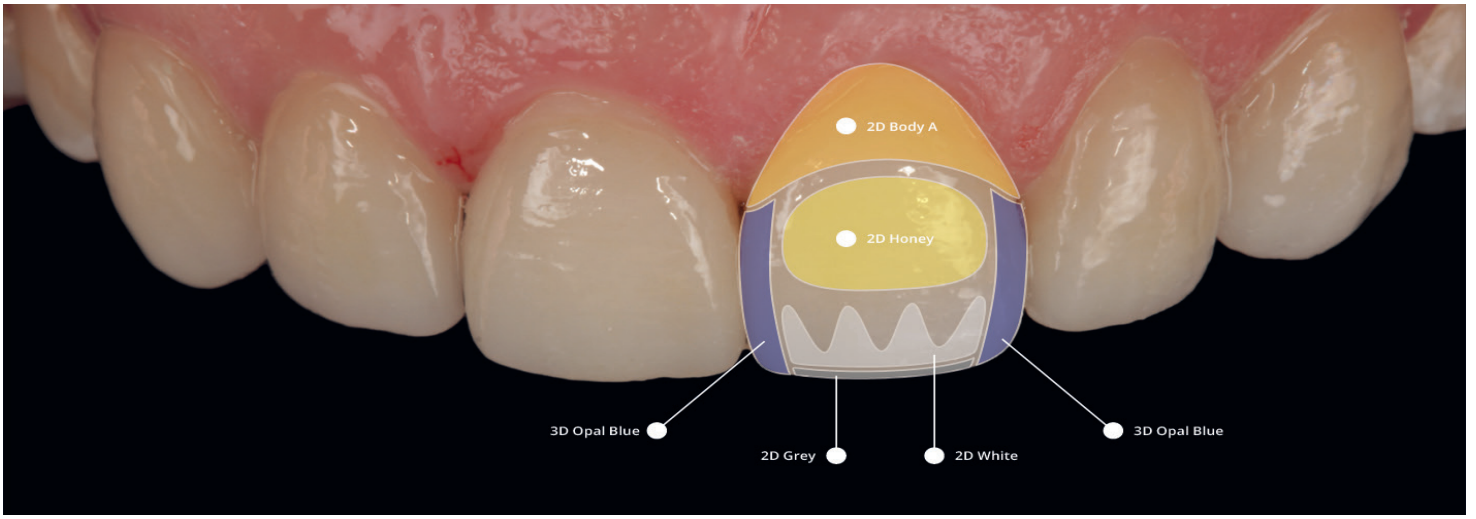

Fig. 11 — The materials used from the ceraMotion® One Touch set can be seen on the two middle incisors. The veneers are characterized by their shade and surface structure thanks to the special quality of the materials used.

Fig. 12 — It was possible to guarantee long-term stability for the veneers by working on a monolithic basis with a highly stable press ceramic and the adhesive technique. There are excellent ceramic systems available today for the aesthetic finishing of monolithic restorations, making it possible to create individual and aesthetic results despite limited space.

Fig. 13 — These before and after photographs (taken three months apart) demonstrate the changes achieved with the non-prep veneers.

Conclusions

The workflow involved in the restoration of the upper front teeth for aesthetic reasons is an example of modern dentistry. The task requires bridges to be built between digital dentistry and conventional craftsmanship. This requires that both disciplines involved (in this case dentistry and dental prosthetics) work closely together. The authors see the advantages of the workflow described in the predictability of the aesthetics and function, the avoidance of errors and, with this, the longer durability and stability of the restorations. It was possible to guarantee long-term stability for the veneers by working on a monolithic basis with a highly stable press ceramic and the adhesive technique. There are excellent ceramic systems available today for the aesthetic finishing of monolithic restorations, making it possible to create individual and aesthetic results despite limited space (image 12).

Image 13 visualizes the results with before and after photographs. They show not only the extent of the changes, but also demonstrate what the patient's wishes were. We were able to fulfill her wish for brighter, more harmonious upper teeth with less gaps whilst using a concept that was minimally invasive. SD

NOTE: Jacqueline Meier will soon give more details on the use of ceraMotion® One Touch pastes.

About the Authors

Jacqueline Meier completed her apprenticeship as a dental technician in the years 2009 - 2013 in a commercial dental laboratory in Landsberg am Lech in Germany. She then moved to a laboratory in the dental practice of Dr. Bayer, Drs. Kistler, Dr. Elbertzhagen and Dr. Neugebauer, also in Landsberg am Lech. Jacqueline Meier has published articles in national trade journals on the challenges of the dental technician's daily work.

Dr. Luise Krüger studied dentistry from 2010 to 2015 in the dental, oral and craniomandibular sciences department at the university clinic Carl Gustav Carus in Dresden, Germany. In 2012 she received a scholarship from the German Federal Ministry of Education. In 2013 she completed her clinical traineeship at the University of Alberta in Canada. She has been working as a dentist since autumn 2016, starting at the dental practice Krüger and Popp in Chemnitz, Germany and has been at the dental practice of Dr. Bayer, Dres. Kistler, Elbertzhagen, Neugebauer & colleagues in Landsberg am Lech since November 2016. Luise Krüger has completed various courses in further training and was awarded a doctorate in 2017. She is also a member of the German Society for dental, oral and craniomandibular sciences (DGZMK) and the German Society for Tooth Conservation (DGZ).