VITABLOCS RealLife: a “novel” approach to solving a CAD/CAM challenge

By Dr Gerhard Werling

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The applications of CAD/CAM technology in dentistry continue to evolve at a rapid pace. The advent of systems like CEREC from Sirona has meant it is now becoming commonplace for patients to be scanned intraorally, their restoration designed on computer and then made completely by machine.

Restorations built-up by hand by talented ceramists have always had the edge, however, simply because machine made restorations have not been able to accurately mimic adjacent and opposing teeth to reflect the “real life” dentition. Particularly in the aesthetic zone, this has always been an issue.

There have, however, been a number of approaches to bridge the gap between milled restorations and bespoke handmade restorations. An example of this is the “stain and glaze” technique, whereby the milled restoration is stained by hand to add characterisation and help it blend-in.

The downside of this technique is three-fold: firstly, whoever is doing the staining and glazing must have a talent for it; secondly, it is time consuming and detracts from the many efficiencies that CAD/CAM is supposed to offer; and finally, the restoration must be fired in a furnace before cementation. For CEREC dentists, the latter typically necessitates purchasing a furnace for their surgery.

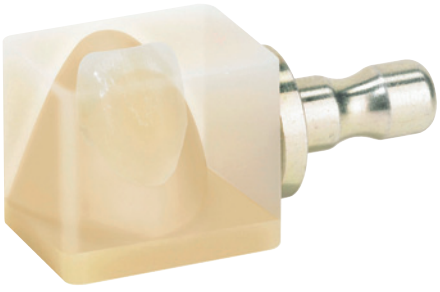

Figure 1. VITABLOCS RealLife have a three-dimensional block structure.

Figure 2. Test crown.

Figure 3. Initial situation.

Figure 4. Tooth 21 had received an endodontic treatment.

Figure 5. Equigingival chamfer preparartion.

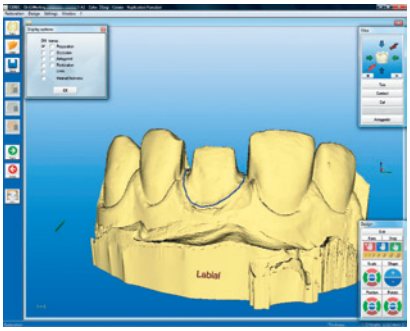

Figure 6. Digitized model with marked finishing line.

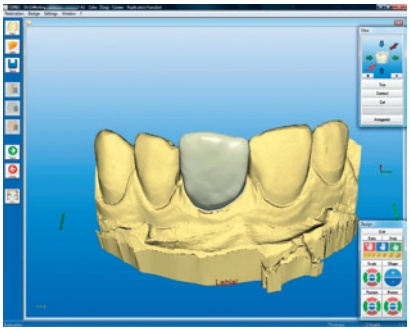

Figure 7. Full contour crown design.

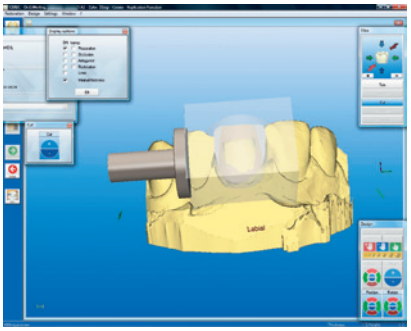

Figure 8. In the milling preview...

In June 2010, VITA Zahnfabrik launched a new ceramic material for CAD/CAM as an alternative. The novel VITABLOCS RealLife combine tradition and innovation. The blocks are based on the fine-structure feldspar ceramic material VITABLOCS, which has proven itself in millions of restorations worldwide. The innovative part of the block concept is the three-dimensional block structure, which imitates the build-up of the natural tooth (Figure 1).

VITABLOCS RealLife were specifically developed for highly aesthetic anterior restorations and are available for CEREC or inLab MC XL (Sirona Dental Systems). Along with the new material, version 3.80 of Sirona's design software incorporates functionality to maximise the aesthetics obtained from the material and is hence a prerequisite.

In order to test the practicability of the "novel" block concept, a zirconia crown as well as a crown made from VITABLOCS RealLife were produced for a real patient case (Figure 2).

Initial situation

In February 2010, an 18-year-old female patient presented in my practice to receive a restoration of tooth 21, primarily for aesthetic reasons (Figures 3 and 4). After an accident in 2000, the tooth had been restored with an edge build-up and received an endodontic treatment a few months later. However, a crown was not produced before 2010, because growth of the patient was not yet completed.

Preparation and digitization

In April 2010, part of the existing root canal filling was removed to produce an inverted build-up following the shape of an endo crown. For this, the tooth surface was treated with the light-curing dentin/enamel bonding agent Syntac (Ivoclar Vivadent). The build-up was done with the universal composite Tetric EvoCeram (Ivoclar Vivadent). The patient decided against internal bleaching for reasons of cost. Amongst other things, due to a discoloured tooth stump the decision was made to produce a zirconia crown. According to the guidelines for all-ceramic restorations, a chamfer preparation was performed after having placed the retraction cord (Figure 5).

A subgingival preparation was not regarded as adequate in this patient case, since the patient has a thin, narrow and tight gingiva and a shift of the bone margin in the apical direction may have a negative impact on the biological width. If a new restoration is required at a later time, an even deeper preparation becomes necessary. After informing the patient of this situation, she was content with the preparation having an equigingival finishing line and also ready to tolerate a possible difference in colour at the transition between the crown and the tooth stump, since this area is covered by her upper lip.

Using a polyether impression material (Impregum, 3M ESPE), a conventional impression was taken and a temporary restoration produced with Dentalon Plus (Heraeus Kulzer). For the computer-aided production of the final restoration, a scan model was fabricated using super hard cast material CAM-base (dentona) which was utilized to digitize the preparation with the inEos scanner (Sirona) (Figure 6).

Design and production

The design with the modelling software of the system inLab (Sirona) follows the proven work steps. To enable a comparison, two crowns were designed - one anatomically reduced for the crown with a zirconia coping and one in full contour for the crown made from VITABLOCS RealLife (Figure 7).

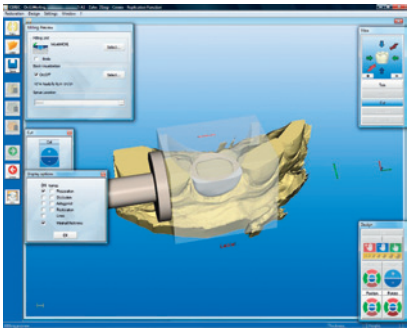

Figure 9. ...the construction is placed in the virtual block.

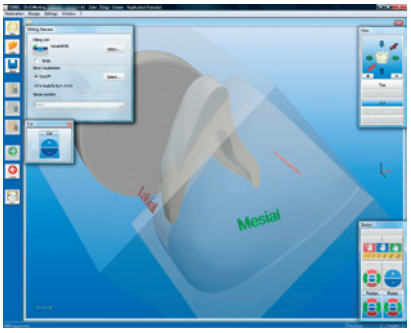

Figure 10. The positioning of the construction can be modified in all three dimensions...

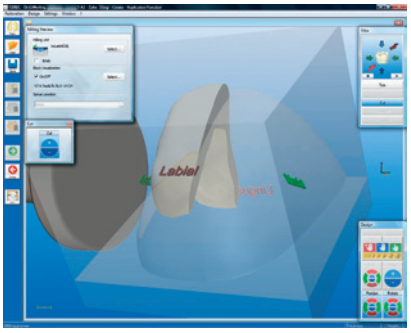

Figure 11. ...and individually adapted to the residual dentition of the patient.

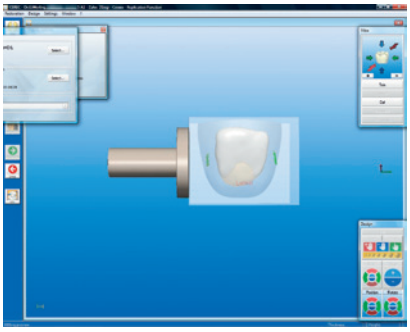

Figure 12. When the final position is achieved the data is transferred to the milling machine.

Figure 13. Crown made from VITABLOCS RealLife (right) and crown with zirconia coping (left).

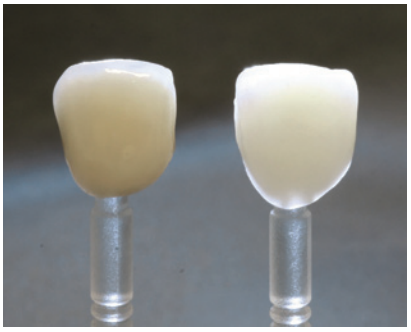

Figure 14. Crown with zirconia coping (left) and crown made from VITABLOCS RealLife (right) in transmitted light.

Block structure

While the polychromatic VITABLOCS TriLuxe and TriLuxe forte are composed of several different layers of material, VITABLOCS RealLife have a three-dimensional block structure with dentine core and enamel coat. Due to the curved shade transitions between dentin and incisal edge, the natural play of colours of anterior teeth is imitated exactly. The software automatically places the planned restoration on the enamel-dentin margin of the virtual block. Thus the restoration is completely covered with enamel. Subsequently, the CEREC or inLab user can individually modify the position and thus precisely adjust the restoration to the residual dentition. For this, the position of the construction can be modified as desired in all three spatial dimensions (Figures 8-12).

Comparison

Figure 13 shows the crown produced from VITABLOCS RealLife with the milling machine inLab MC XL on the right and the crown with zirconia coping on the left. In Figure 14, the opaque core of the zirconia restoration (left) becomes clearly visible compared to the feldspathic crown (right) due to transmitted light.

At try-in, it became apparent that the restoration with zirconia coping could be assessed as suboptimal (Figures 15 and 16). The result could have been optimized by an adjustment of shade, shape and transparency. However, the crown made from the new three-dimensional block convinced with a great performance and thus, the original plan was dismissed and it was decided to permanently cement the "test" crown. Prior to placement, the restoration made from VITABLOCS RealLife was finalized: The distal incisal edge was lengthened and a high-gloss polishing was done (Figsures 17-20). To allow for an optimal material effect, finally, the crown was definitively bonded with transparent Multilink (Ivoclar Vivadent).

Material characteristics

The fine-structure feldspar ceramic material VITABLOCS consist of regularly achieves excellent results in clinical studies. For example, a survey confirmed a survival rate of 94% was found after seven years (Christensen, G.: Clinical trial revealed a 94 % success rate for VITABLOCS Mark II. In: CRA News, April 2006). Additionally, the ceramic material exhibits enamel-like abrasion properties and, due to standardized industrial production of the blocks, a highly homogeneous microstructure with consistent material quality is ensured.

VITABLOCS RealLife are available in the geometry RL-14/14. This corresponds to dimensions of 14 x 14 x 18 mm. The shade offering according to the standard VITA SYSTEM 3D MASTER includes 0M1C, 1M1C, 1M2C, 2M1C, 2M2C as well as 3M2C.

Conclusion

Doubts that the dark tooth stump of the endodontically treated tooth might lead to an aesthetic constraint due to a higher translucency of feldspar ceramic material compared to zirconia were shown, in this case example, to be unfounded. Dentist, dental technician and patient were pleas-

Figure 15. Crown with zirconia coping...

Figure 16. ...at the try-in in the patient's mouth.

Figure 17. Feldspathic crown...

Figure 18. ...in situ after finalization.

Figure 19. Crown after lengthening of the distal incisal edge...

Figure 20. ...and final polishing.

antly surprised by the result, particularly in direct comparison with the restoration that had been originally planned. The three-dimensional block structure offers an outstanding aesthetic result (Figure 21).

The correct positioning of the crown construction in the milling preview seems to be slightly complex at the first attempt, but turns out to be easily practicable after a short period of training thanks to the software. When compared to the CAD/CAM materials for aesthetically demanding areas which have been available on the market so far, VITABLOCS RealLife represent a quantum leap. In this way, the practiced CEREC or inLab MC XL user can very easily and quickly produce highly aesthetic restorations.

Acknowledgement

My thanks go to my nieces Dr Ute Werling for the dentist and MDT Cathrin Werling for the technological implementation of this patient case.

About the author

Dr Gerhard Werling is in private practice in Bellheim, Germany. He originally trained as a dental technician before studying dentistry. Since 1993, he has lectured nationally and internationally on dental implants and in 2005 established a special laboratory for CAD/CAM technology. Apart from working in private practice, Dr Werling is a scientific consultant for several dental companies and medical faculties.