VITA

VITABLOCS® TriLuxe forte

VITABLOCS as validated laboratory material: Like natural enamel from the milling unit

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There have been a lot of technological developments since VITABLOCS, the world's first CAD/CAM material, came onto the market over 35 years ago. The combination of several factors, including the significant increase in the computing power of processors, the production of precise designs through CAD software and the utilization of CAM software, in conjunction with 5-axis CNC machines, is able to produce even more precise grinding and milling results. To this day, VITABLOCS are often regarded as the gold standard for individual restorations in the digital workflow by the scientific community.[1] This is supported not only by a wealth of clinical studies[2,3,4,5] and laboratory studies,[6,7,8,9] but also by the sale of more than 30 million VITABLOCS blanks to customers all around the world.

[1] Labban N, Al Amri MD, Alnafaiy SM, Alhijji SM, Alenizy MA, Iskandar M, Feitosa S. Influence of Toothbrush Abrasion and Surface Treatments on Roughness and Gloss of Polymer-Infiltrated Ceramics. Polymers (Basel) 2021 Oct 27; 13(21): 3694.

[2] Otto T, Mörmann WH. Clinical performance of chairside CAD/CAM feldspathic ceramic posterior shoulder crowns and endocrowns up to 12 years. Int J Comput Dent 2015; 18(2): 147-61.

[3] Morimoto S, Rebello de Sampaio FB, Braga MM, Sesma N, Özcan M. Survival Rate of Resin and Ceramic Inlays, Onlays, and Overlays: A Systematic Review and Meta-Analysis. J Dent Res 2016 Aug; 95(9): 985-94.

[4] Otto T. Up to 27-years clinical long-term results of chairside Cerec 1 CAD/CAM inlays and onlays. Int J Comput Dent 2017; 20(3): 315-329.

[5] Bindl A, Richter B, Mörmann WH. Survival of ceramic computer-aided design/manufacturing crowns bonded to preparations with reduced macroretention geometry. Int J Prosthodont 2005 May-Jun; 18(3): 219-24.

[6] Al Hamad KQ, Al-Rashdan RB, Al-Rashdan BA, Baba NZ. Effect of Milling Protocols on Trueness and Precision of Ceramic Crowns. J Prosthodont 2020 Aug 28. doi: 10.1111/jopr.13245. Online ahead of print.

[7] Aldosari LI, Alshadidi AA, Porwal A, Al Ahmari NM, Al Moaleem MM, Suhluli AM, Shariff M, Shami AO. Surface roughness and color measurements of glazed or polished hybrid, feldspathic, and Zirconia CAD/CAM restorative materials after hot and cold coffee immersion. BMC Oral Health 2021 Aug 30; 21(1): 422.

[8] Calheiros-Lobo MJ, Vieira T, Carbas R, da Silva LFM, Pinho T. Effectiveness of Self-Adhesive Resin Luting Cement in CAD-CAM Blocks-A Systematic Review and Meta-Analysis. Materials (Basel). Apr 10, 2023;16(8): 2996.

[9] Adawi HA, Al Mialeem MM, Al Ahmari NM, Shariff M, Qahhar MA, Muharraq SMH, Alghazali NA. Assessment of Color Stainability of Computer-Aided Design and Computer-Aided Manufacturing (CAD/CAM) Ceramic Materials After Hot and Cold Coffee Immersion at Different Time Intervals. Med Sci Monit Oct 3, 2021; 27: e932745.

Initial situation vs. final results

Initial condition with preparations at 16, 17 and 26.

Cranial view of the incorporated restorations.

Proven formula joins forces with the latest technology

In the following article by Norbert Wichnalek, Lukas Wichnalek, Arbnor Saraci and Patricia Strimb (all HIGHFIELD.DESIGN – Zahntechnik Wichnalek, Augsburg, Germany), the clinically proven polychromatic material variant VITABLOCS TriLuxe forte has joined forces with the modern CAD/CAM technology of the dental laboratory. As a part of the restoration performed by practitioner Dr Ioana Vasu (Augsburg, Germany) involving a full crown and two partial restorations in the posterior region, the feldspar ceramic blocks were given a chance to shine. The focus was on efficiency, precision and natural esthetics.

Conventional case study

A patient was diagnosed with extensive defects in the posterior region of the upper jaw on 16, 17 and 26. After removal of the old fillings and the secondary caries, it became clear due to the extent of the defect that long-term stabilization would only be possible with indirect restorations. After placing composite build-up fillings, a crown was planned on 16 and a partial crown made of the feldspar ceramic VITABLOCS TriLuxe forte, on 17 and 26. During the follow-up session, preparations were made, the situation was scanned intraorally (itero, Align Technology, Tempe, Arizona, USA) and the data set was sent to the laboratory.

Fig. 2: The virtual model was created in the exocad software based on the intraoral scan.

Recipe for success: Validated workflow

To achieve precise, dimensionally accurate and efficient grinding results, the CAD and CAM software, the grinding unit, the tools and the milling strategy all need to work harmoniously. That means perfect interaction has to be tested in advance, a process known as validation. Material, software and machine manufacturers work together to find this recipe for success. They ensure that the CAM software used can provide the machine with precise step-by-step control commands regarding which tools need to be used when, how and in what sequence in order to achieve optimum grinding results with the lowest possible instrument wear and in the shortest possible time. The material manufacturer checks the grinding results of the technology partner until the ideal production process has been found. The relevant hardware and software requirements can be requested from the corresponding CAD/CAM system partner.

Proven grinding strategy

In this case, the imes-icore CORiTEC 350i PRO machine must first receive precise control commands from the CORiTEC iCAM V5 smart CAM software (both imes-icore, Eiterfeld, Germany) in order to carry out actions at the appropriate speed and feed rate in the individual production steps on the blank. This results in only one defined grinding speed. The immersion depth, the angle and the movement pattern of the grinding path for a specific tool geometry or grain size also needs to be defined for each work step for a restoration. The closer the grinding paths are to each other, the smoother the surface of the workpiece will be.

Fig. 3: Function check of the exocad software's virtual articulator.

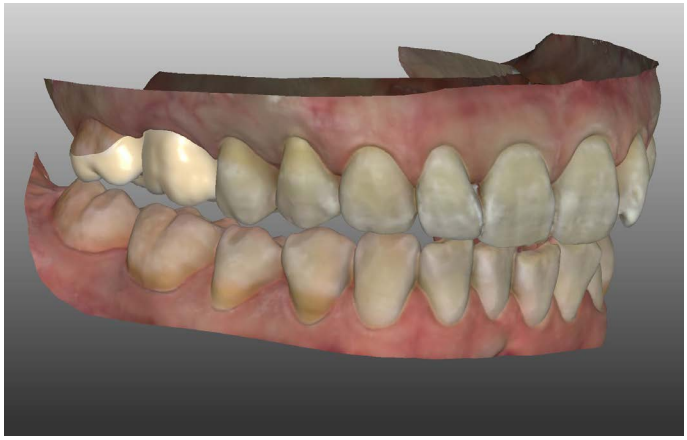

Fig. 4: Dynamic occlusion with laterotrusion to the right.

Fig. 5: Dynamic occlusion with laterotrusion to the left.

Controlled processes

The penetration depth determines how much material is removed with one tool revolution or how deep the tool enters into the material. Here, the following applies: the greater the penetration depth, the greater the flexural load on the instrument. As a result, it is important to weigh the time saved versus the load placed on the instruments. The geometry is first coarsely preground, which is known as roughening. Here, coarse-grained tools are used for oversized work. The final dimensions are then created during the finishing process using finer-grained tools. Information for a validated digital workflow can be found here:

1. System compatibility: After the appropriate material has been selected, the material manufacturer VITA Zahnfabrik offers a System Compatibility tab on its website (www.vita-zahnfabrik.com), where the hardware used to validate the processing of the blank is listed.
2. Processing recommendation: If the user is using an open CAD/CAM system where no material-specific processing template is stored in the CAM software, a processing recommendation for the corresponding material can be downloaded from the Downloads tab under Instructions for Use. Among other information, it contains material-specific recommended tools, processing parameters and tool paths.
3. Generic strategy: If you prefer not to enter each step of the grinding strategy manually, you can always simply select a generic strategy in the CAM software as an "emergency plan." The choice of the blank is not product-specific but simply refers to a material class (e.g., lithium disilicate, wax, etc.). However, it is important to bear in mind that generic strategies usually do not deliver the best results.

Fig. 6: VITABLOCS TriLuxe forte offers a natural shade gradient...

Fig. 7: ...and has toothlike optical properties even as a block.

Reliable recipe for success

The validated grinding strategy with the associated CORiTEC grinding tools glass ceramics with diameters of 2.5/6.0mm, 1.0/6.0mm and 0.6/6.0mm conical were stored in the CAM software CORiTEC iCAM V5 smart (imes-icore, Eiterfeld, Germany) and were available when the material blank was selected. This was followed by nesting the constructions in the VITABLOCS TriLuxe forte blanks. The three blanks were then clamped in the block holder of the imes-icore CORiTEC 350i PRO grinding unit, and the grinding task was issued. On average, the grinding machine needed approximately 18 minutes for each restoration. The tool wear amounted to approximately 3.50 euros per restoration, with the larger diameters naturally being subjected to more of a load due to the longer use, and the smaller diameters successively less, resulting in different service lifespans. The validated grinding strategy was successful from the very start and produced absolutely precise and highly monolithic, esthetic restorations.

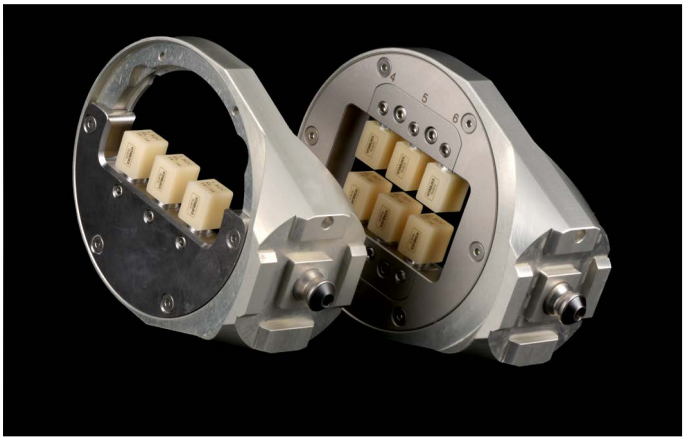

Fig. 8: Block holders for three or six blanks are available for the imes-icore CORiTEC 350i PRO grinding unit.

Fig. 9: The validated CORiTEC grinding tools glass ceramics with the various radii and geometries.

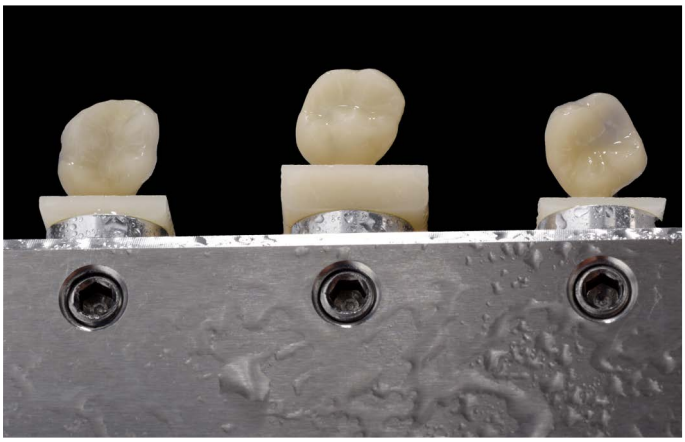

Fig. 10: In a very short time with the validated grinding strategy...

Fig. 11: ...absolutely precise and lifelike restorations were created.

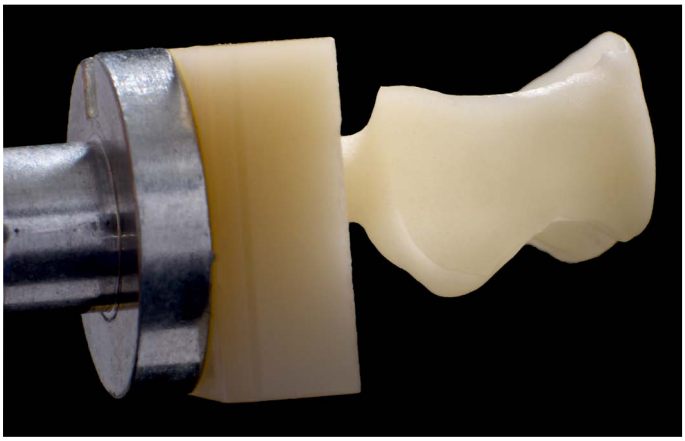

Fig. 12: The razor-sharp grinding results and the high edge stability of a partial restoration.

Fig. 13: VITABLOCS TriLuxe forte appeared like natural enamel from the grinding unit.

Finishing and integration

After separating and leveling the grinding pin, the restorations were finished with fine diamond grinders and smoothed with rubber polishers. In this case, a slight characterization with VITA AKZENT PLUS CHROMA STAINS B (reddish-yellowish) was also applied in the cervical area to give it a slightly warmer appearance. EFFECT STAINS 12 (gray-blue) were used to create a translucent effect at the cusp tips. The occlusal marginal ridges were highlighted all around with EFFECT STAINS 01 (white) and localized calcifications were replicated with EFFECT STAINS 02 (cream). Afterwards, VITA AKZENT Plus GLAZE LT was used to establish a consistent level of gloss, as well as a homogeneous surface. The high-gloss polishing was performed with the diamond polishing paste VITA Polish Cera, a leather buff and a brush with goat hair bristles. The fully adhesive cementation revealed a precise fit of the feldspar ceramic restorations, which essentially merged with the tooth structure due to their pronounced chameleon effect and natural shade effect.

Fig. 14: Minimal characterizations were performed with the VITA AKZENT Plus stain system.

Fig. 15: Even outside of the mouth, the three restorations looked lifelike.

Fig. 16: The fine surface morphology can be seen from a macro perspective.

Fig. 17: The restorations after completion during plasma sterilization.

Summary

The history of VITABLOCS must be rewritten and clarified. The historical misconception that this is only a CEREC material has been clearly refuted. In the case presented, a validated grinding strategy was able to quickly demonstrate that feldspar ceramic blanks have provided true added value to laboratory portfolios for many years. The ceramic formula, the shade fidelity to the VITA shade standard and the natural shade gradient provide a fundamental basis for achieving the right shade and a toothlike effect.[10] With the block holders, up to six blocks can be processed simultaneously on the imes-icore CORiTEC 350i PRO, ensuring that the grinding unit is used to its full capacity. In a very short time, economic and highly esthetic single-tooth restorations were created with absolute precision in the digital workflow, representing added value for any laboratory.

[10] Masek R. Reproducing natural color effects on milled ceramic restorations. Int J Comput Dent 1999 Jul; 2(3): 209- 17.

Fig. 18: The welded-in restorations were ready for delivery.

Fig.19: Full adhesive integration was carried out using VITA ADIVA FULL-ADHESIVE SET.

Fig. 20: The ceramics were etched on the bonding surfaces with VITA ADIVA CERA-ETCH.

Fig. 21: The integration was carried out using VITA ADIVA F-CEM A2 Universal composite cement.

Fig. 22: Cranial view of the incorporated restorations.

Fig. 23: Palatal view of feldspar ceramic crowns and partial crowns.

Fig. 24: The restorations on 16 and 17 essentially fused with the tooth structure.

Fig. 25: Palatal view of the partial restoration on tooth 26 made of VITABLOCS TriLuxe forte.

Fig. 26: Harmonious transition between restoration and tooth on partial restoration 26.

Additional information and case reports at:
https://hs.vita-zahnfabrik.com/en/vitablocs

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