British Institute
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CPD Article

ISSUE 30

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1hr

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Ref No. 36/04/01

VITA Rapid Layer Technology

DT Jens Richter

Source: The periodical Dental Labor Issue 03/2011, Germany

The efficient fabrication of a high-quality all-ceramic restoration

With VITA Rapid Layer Technology (RLT), it is possible to fabricate fully anatomical crown and bridge restorations in an entirely computer-aided manufacturing process. VITA Zahnfabrik's innovative concept offers the dental laboratory an efficient manufacturing procedure as an alternative to the traditional layering technique. VITA RLT is recommended primarily for the fabrication of bridges with up to four units and single crowns in the posterior area.

The individual processing steps are illustrated in the following case example. On account of a missing tooth 36, the patient felt her chewing function to be impaired, and wished to have the gap filled with a three-unit full-ceramic bridge restoration.

Designing the construction

A digitised model of the preparation is required for the CAD design. To this purpose, the dental technician can either scan a plaster model fabricated conventionally on the basis of intraoral impression-taking, or utilise the data from an intraoral scanning procedure. In this case, the treating dentist took photographs of the jaw with the CEREC Bluecam and the CEREC Connect software (figs. 1 and 2), and made these available to us via the internet portal CEREC Connect. After testing in the laboratory, the data were forwarded to the milling centre infiniDent for the stereolithographic (SLA) production of an acrylic model, on which the fit of the restoration is later checked. The delivery time is three working days. At the same time, the restoration can be designed and milled.

In just a few mouse clicks, the biogeneric reconstruction of fully anatomical crowns and bridges with individual occlusal surfaces adapted to the particular patient is carried out using the inLab 3D software (from version 3.80 and upwards). Following the usual procedure, the initial design suggestion of the software is then modified by the user. In the case of VITA RLT bridge constructions, it is absolutely essential

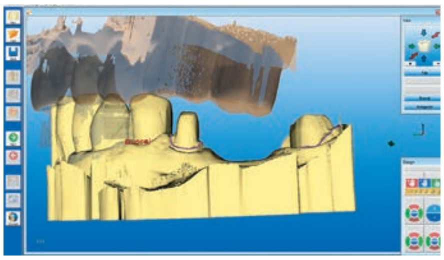

Fig.1: Digitalised intraoral preparation with the opposing jaw.

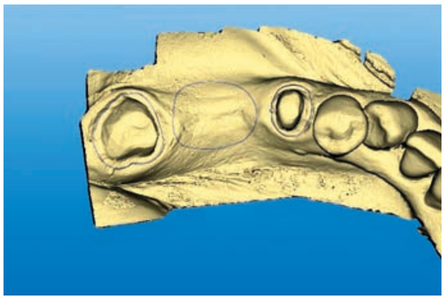

Fig. 2: The markings showing the preparation margins.

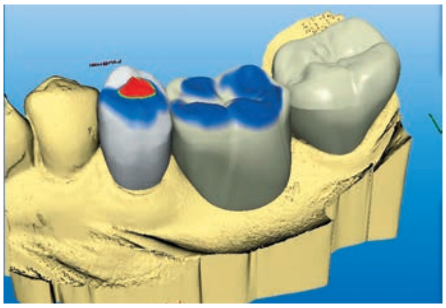

Fig. 3: The design suggestion made by the software can be modified.

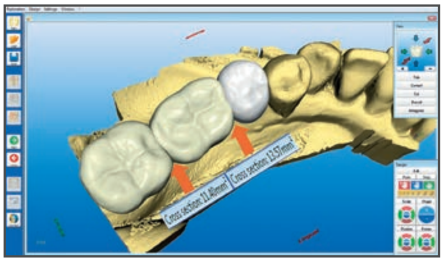

Fig. 4: Sufficiently large connectors are absolutely essential.

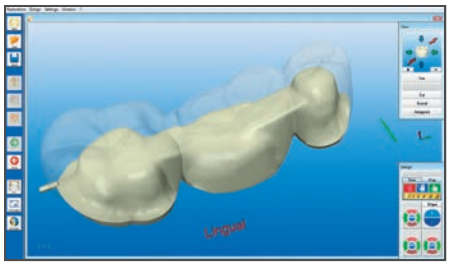

Fig. 5: Calculation of the bridge substructure with full-contour anatomy.

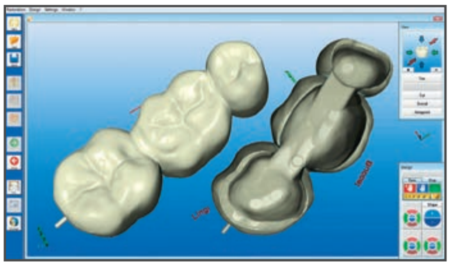

Fig. 6: Milling preview of the veneer and framework structure.

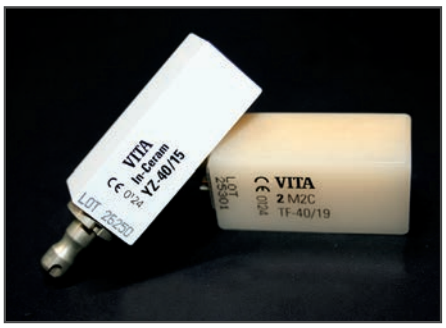

Fig. 7: The substructure is milled from zirconium dioxide, the veneer from feldspar ceramic.

to ensure sufficiently dimensioned cross-sections of the connectors (figs. 3 and 4). The values are displayed in the status bar for verification. Finally, the design is divided into sections by the software, which automatically calculates the data sets for the substructure (framework structure) free of undercuts and the veneer (veneer structure) – each in a defined optimum minimum layer thickness (fig. 5). Both of these elements are displayed individually in the milling preview (fig. 6).

Milling procedure and adjustments

The substructure is milled from high-performance zirconium dioxide, the veneer from feldspar ceramic (fig. 7). After milling in the inLab MC XL milling unit, the fit of the veneer structure is checked on the densely sintered substructure. In order to avoid damaging the ceramic, any subsequent processing should be carried out with diamond instruments under water cooling.

The zirconium dioxide VITA In-Ceram YZ is milled in a presintered condition, and then densely sintered in a high-temperature firing unit (e.g. VITA Zyrcomat). The blocks are available unshaded or in an industrially preshaded version in shade LL1p. For the partial or complete shading of the substructures, the VITA In-Ceram YZ COLORING LIQUIDS are being introduced at the IDS 2011 with a new shade formula. The optimised coloring liquids are available in four shade nuances: light, medium, intense and neutral. The basic shades light and medium are used for the reproduction of the actual basic shade, and subsequent case-specific adjustments can be made to the intensity of the basic shade using the additional shades intense or neutral.

The veneer structure can be milled from the multichromatic VITABLOCS TriLuxe forte – or, as from the IDS 2011, from the monochromatic VITABLOCS Mark II. In this case the multichromatic version was used; this is available in the three shades 1M2C, 2M2C and 3M2C, and its structure replicates the colour gradient of natural teeth.

Shade characterisation

Thanks to the biogeneric technology, the veneer structure, generally speaking, requires no occlusal adjustment, or if so only a slight adjustment of the contour in the occlusal area. The VITA AKZENT or VITA SHADING PASTE stains can be used for surface characterisation (staining technique), and VITA VM 9 (layering technique) for individualisation. This is carried out before the adhesive bonding of the structures. We have found that a good transition to the veneer structure can be achieved obtained by applying stains to the shoulder of the framework structure.

Bonding of framework and veneer structure

A secure bond of the framework to the veneer structure is achieved using the adhesive technique. This working step can be carried out in the laboratory or, as was the case here, directly in the dental practice. Thus the substructure was checked before adhesive cementation to ensure a perfect marginal fit in situ.

For the adhesive cementation, the outer surfaces of the framework structure are sandblasted with Al2O3 and the inner surfaces of the veneer structure – after being thoroughly cleaned – are etched and silanised with 5% hydrofluoric acid gel. A suitable adhesive composite, such as RelyX Unicem (3M ESPE) and PANAVIA 21 (Kuraray) is used. Ideally, there should be sufficient excess material to enable the composite to flow out circumferentially at the shoulder, or basally between the primary and the secondary structure (fig. 8) in order to achieve a high-strength, homogeneous and bubble-free bond. The excess must then be removed very carefully. To this purpose, fine diamond instruments and diamond rubber polishers should be used. Provided that care is taken to ensure that all transitions are smooth, no gingival irritations are to be expected.

Fig. 8: The adhesive luting of these two structures with composite (photo supplied by VITA).

Fig. 9: Buccal view of the three-unit VITA RLT bridge in situ.

Fig. 10: Occlusal view of the bridge restoration.

Results

The seating of the restoration is performed with the same material that is used for bonding the two restorative structures. VITA RLT crowns and bridges are distinguished by their high degree of material strength and their pleasing aesthetics, and can be perfectly morphologically and functionally integrated into the patient's remaining natural dentition (figs. 9 and 10).

With the VITA RLT technology, the treating dentist can offer the patient an all-ceramic restoration within a short space of time. Further benefits include the moderate price and attractive aesthetics. Aesthetic limitations are given only in the anterior area, since, depending on the individual case, the margin of the framework ceramic may still show slightly despite individualisation.

Advantages

With the VITA Rapid Layer technology, the economically efficient manufacture of fully anatomical bridges and crowns with a CAD/CAM-fabricated restoration is possible. The user benefits from the comparatively lower brittleness of the VITABLOCS TriLuxe forte, which makes a design with very finely tapering margins possible. Furthermore, the primary and secondary structure are perfectly matched to one another from the point of view of process engineering, which gives optimum support to the ceramic. The bonding of these two structures is particularly straightforward, and tension-free bonding is guaranteed, since no thermal sintering process is required.

The results of the shearing tests by VITA demonstrate that the bond strength values obtained using the adhesive technique as part of the VITA RLT procedure lie in the range of values found for veneering ceramic systems established for many years. Furthermore, static fracture tests confirm that VITA RLT bridges are able to withstand a load of up to 2,400 Newtons. By comparison, values of 1,420 Newtons (VITA VM 9 on VITA In-Ceram YZ frameworks) are achieved with classically veneered bridges.

Fig. 11: DT Jens Richter.

Thanks to the entirely computer-aided manufacture, a saving of 30 – 40% can be made on the manufacturing costs. Thus, a VITA RLT restoration is an excellent alternative to non-precious metal restorations, and also patients with limited financial means are able to benefit from restorative treatment with high-quality, biocompatible materials clinically established a million times over.

DT Jens Richter

1989 Completed training as a dental technician in Leipzig Since 1994 Employed as a dental technician in Rochlitz in the fields of CAD/CAM and implant prosthetics Since 2004 CAD/CAM user Practical trainer at in the field of CAD/CAM and speaker/ course instructor Technical design and implementation by sofg.de and consulting services for sofg.de

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Q1.) What two procedures can be used to obtain the digitised model of the preparation?

Q2.) What is essential when constructing the VITA RLT Bridge?

Q3.) What materials are the structure and the veneer milled from?

Q4.) How can a good transition to the veneer structure be achieved?

Q5.) What are the outer surfaces of the framework blasted with?

Q6.) What was the weight of the load that the VITA RLT bridges were able to withstand?

Q7.) Which instruments are used to remove the excess material?

Name:

GDC Number:

Address:

Postcode:

Telephone no: (in case of any queries)

Signed:

Date:

British Institute of Dental & Surgical Technologists

44-46 Wollaton Road,

Beeston,

Nottingham

NG9 2NR

Telephone: +44(0)115 968 3181

Fax: +44(0)115 925 4800

Website: www.bidst.org

Email: secretary@bidst.org