Easy and efficient: Composite resin blocks for the CAD/CAM technique

By Dr. Hidetaka Sasaki, Japan

Composite blocks for CAD/CAM applications are on the rise, particularly for producing small restorations, such as inlays, onlays and occlusal veneers. And quite rightly so, for this type of material has a lot to offer: it exhibits sound mechanical properties combined with an extraordinary grinding accuracy and it is easy and efficient to process in day-to-day procedures.

The following clinical report describes the workflow to create an aesthetic single-tooth restoration using the new Tetric CAD® composite block. The blocks are available in two degrees of translucency — HT and MT — and in a variety of shades. They exhibit a pronounced chameleon effect to provide restorations that blend in well with the optical characteristics of the surrounding residual tooth structure. The material can be polished to a high gloss in a few seconds both intraorally and extraorally. In addition, it can be easily repaired intraorally with conventional composite resins.

Clinical case

The pre-op showed a defective amalgam filling in the lower posterior region. The filling needed replacing (Fig. 1). The indication for a multi-surface inlay was given.

It was the patient’s wish to have an esthetic, i.e. tooth-coloured restoration, where the core of the tooth was preserved. Pre-operatively, the patient was informed about the possibilities and the pros and cons of the treatment. In the present case, a try-in was performed immediately after the grinding process to check the fit of the inlay with the natural residual tooth structure (Fig. 2).

Designing the restoration

Shade selection is performed on the natural dentition, primarily on the neighboring teeth. We decided to use shade HT A2. The HT blocks are a good choice, particularly when it comes to producing fairly small restorations such as inlays as they provide a pronounced chameleon effect. Once the old amalgam was removed, the tooth was prepared in line with the recommended preparation guidelines (Fig. 2). Then, an optical impression was taken using an intraoral scanner and the inlay was designed in the CAD module (Fig. 3). Subsequently, the restoration was ground from the block.

Grinding times are considerably shorter for CAD/CAM composite resins compared with other materials. Although the core is softer to grind, the restoration is not affected by this. It only means that the grinding tools are less quickly worn and offer a long service life, maximizing the cost efficiency of the practice.

Composites are “flexible” materials: Their modulus of elasticity is similar to that of dentin. High flexural strength provides adequate resistance and stability. Given their low brittleness, composites can be ground to exhibit highly homogenous surfaces and to obtain accuracy, thinly tapered margins without loss of strength. Marginal chipping or crack formation are unlikely to occur.

In the present case, a try-in was performed immediately after the grinding process to check the fit of the inlay with the natural residual tooth structure (Fig. 4).

Conditioning the restoration

The attachment point was easy to smooth out with fine-grit diamonds. This was followed by extraoral polishing using composite polishers (e.g. OptraPol®) (Fig. 5). Particularly noteworthy was the speed with which the restoration was polished to a high gloss. It only took a few seconds to achieve a glossy surface (Fig. 6). Composites do not require an additional glaze firing cycle. This has a positive effect on the time resources of the practice.

It is essential to condition and pretreat the bonding surface correctly. This requires the use of an adhesive system that is appropriate for this type of material to ensure the longevity of the restoration. The manufacturer’s instructions should be followed at all times.

In the present case, the bonding surface of the inlay was air-blasted with aluminium oxide (50-100 µm) at a pressure of 1-5 bar, followed by thorough rinsing (Fig. 7). The restoration can be cleaned either in an ultrasonic unit or with a steam cleaner. It is recommended to additionally clean the restoration with 70% ethanol to disinfect it. Pre-treating the restoration in this way is mandatory for Tetric CAD because air-blasting increases the surface area and creates a retentive pattern that acts as a basis for the adhesive cementation. Pre-treating therefore ensures a reliable bond between the luting material and the restoration.

To condition the restoration, Adhese® Universal adhesive was applied and scrubbed into the pre-treated bonding surface for 20 seconds using a microbrush (Adhese® Universal is also available in the VivaPen® delivery system for direct applications). It is important to observe the recommended agitation time to ensure that the adhesive can penetrate sufficiently. Excess material is carefully dispersed using compressed air until a glossy, immobile film results. Pooling must be avoided.

It is not necessary to light-cure the adhesive at this point: the adhesive will be cured together with the luting composite when the inlay is seated and retained in position. The restoration can be cleaned easily and efficiently: Composite resin blocks are microwavable in an industrial polymerization process, allowing the new Tetric CAD® composite blocks to be pre-cured blocks that exhibit superior strength and a higher filler content than direct restoratives. Because they have undergone an industrial polymerization process, shrinkage stress is not an issue with Tetric CAD.

Easy and efficient: Composite resin blocks for the CAD/CAM technique

Designing the inlay in the CAD module

The inlay was seated using Variolink® Esthetic luting composite. The luting composite was applied directly from the syringe onto the bonding surface and then dispersed (Fig. 9). The adhesive was air-blasted with aluminium oxide at 1 – 1.5 bar, followed by cleaning. The inlay was seated and retained in position using a power harvester (Variolink®). The adhesive was treated in this way: the adhesive was air-blasted with aluminium oxide at 50-100 µm at a pressure of 1-5 bar, followed by thorough rinsing (Fig. 7). The restoration can be cleaned either in an ultrasonic unit or with a steam cleaner. It is recommended to additionally clean the restoration with 70% ethanol to disinfect it. Pre-treating the restoration in this way is mandatory for Tetric CAD because air-blasting increases the surface area and creates a retentive pattern that acts as a basis for the adhesive cementation. Pre-treating therefore ensures a reliable bond between the luting material and the restoration.

To condition the restoration, Adhese® Universal adhesive was applied and scrubbed into the pre-treated bonding surface for 20 seconds using a microbrush (Adhese® Universal is also available in the VivaPen® delivery system for direct applications). It is important to observe the recommended agitation time to ensure that the adhesive can penetrate sufficiently. Excess material is carefully dispersed using compressed air until a glossy, immobile film results. Pooling must be avoided. It is not necessary to light-cure the adhesive at this point: the adhesive will be cured together with the luting composite when the inlay is seated and retained in position. The restoration can be cleaned easily and efficiently: Composite resin blocks are microwavable in an industrial polymerization process, allowing the new Tetric CAD® composite blocks to be pre-cured blocks that exhibit superior strength and a higher filler content than direct restoratives. Because they have undergone an industrial polymerization process, shrinkage stress is not an issue with Tetric CAD.

Easy and efficient: Composite resin blocks for the CAD/CAM technique

Single-tooth restorations with Tetric CAD

Designing the inlay in the CAD module

The inlay was seated using Variolink® Esthetic luting composite. The luting composite was applied directly from the syringe onto the bonding surface and then dispersed (Fig. 9). The adhesive was air-blasted with aluminium oxide at 1 – 1.5 bar, followed by cleaning. The inlay was seated and retained in position using a power harvester (Variolink®). The adhesive was treated in this way: the adhesive was air-blasted with aluminium oxide at 50-100 µm at a pressure of 1-5 bar, followed by thorough rinsing (Fig. 7). The restoration can be cleaned either in an ultrasonic unit or with a steam cleaner. It is recommended to additionally clean the restoration with 70% ethanol to disinfect it. Pre-treating the restoration in this way is mandatory for Tetric CAD because air-blasting increases the surface area and creates a retentive pattern that acts as a basis for the adhesive cementation. Pre-treating therefore ensures a reliable bond between the luting material and the restoration.

To condition the restoration, Adhese® Universal adhesive was applied and scrubbed into the pre-treated bonding surface for 20 seconds using a microbrush (Adhese® Universal is also available in the VivaPen® delivery system for direct applications). It is important to observe the recommended agitation time to ensure that the adhesive can penetrate sufficiently. Excess material is carefully dispersed using compressed air until a glossy, immobile film results. Pooling must be avoided. It is not necessary to light-cure the adhesive at this point: the adhesive will be cured together with the luting composite when the inlay is seated and retained in position. The restoration can be cleaned easily and efficiently: Composite resin blocks are microwavable in an industrial polymerization process, allowing the new Tetric CAD® composite blocks to be pre-cured blocks that exhibit superior strength and a higher filler content than direct restoratives. Because they have undergone an industrial polymerization process, shrinkage stress is not an issue with Tetric CAD.
Certificate & Diploma in Restorative Aesthetic Dentistry

Certificate & Diploma in Clinical Implantology

Certificate & Diploma in Clinical Endodontics

Mastership Programme Lasers in Dentistry

Organiser Partners

www.cappmea.com/page/diplomas
At the final curing stage, the adhesive on the bonding surface and the luting composite are cured together (exposure time: 10 seconds per mm of composite and segment). It is recommended to use a curing light that produces a light intensity of at least 1,000 mW/cm² for this step.

At this stage, the adhesive and the luting composite applied to the bonding surface are polymerized by the light passing through the restoration. In the process, a reliable adhesive bond forms. Upon completion of the light-curing step, Liquid Strip can be rinsed off (Fig. 14).

Finishing and outcome
An occlusal check was carried out and any interferences were removed using fine diamonds. In the present case, final intraoral polishing was performed with the OptraPol polishers (Fig. 15). This procedure resulted in a highly esthetic single-tooth restoration. Because of the chameleon effect, the inlay blends seamlessly into the surrounding natural tooth structure (Fig. 16).

Conclusion
Highly esthetic permanent single-tooth restorations can be achieved with the composite blocks of the Tetric CAD range in really short times. The guidelines for the adhesive technique need to be observed and a coordinated luting system must be used.

Easy and rapid processing and polishing procedures and the possibility for effecting intraoral repairs, similar to conventional filling composites, enable a highly efficient treatment workflow and increase the efficiency of day-to-day procedures in the dental practice.

About the author
Dr Hidetaka Sasaki
es Dental Office
www.es-dental.net