Core Build-up Using a Dual-Curing Composite and Ceramic Restoration

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Introduction
From an aesthetic viewpoint, the best results in anterior and posterior restorations are created by full ceramics. The outstanding aesthetics are only part of the reason why this type of restoration is on the increase. Furthermore, its excellent biocompatibility is encouraging patients' acceptance more and more.

In the case of crowns or bridges, where severe carious lesions or previous dental treatment has caused the tooth substance to be lost, it may be necessary to first reconstruct the area to be worked on using a core build-up material. A variety of materials can be used to build. Glass ionomer cements and their derivatives, as well as composites, are replacing amalgam which was often used in the past.

The adhesive structures made from composites are becoming especially popular, since they offer excellent bonding to the tooth substance when used in conjunction with appropriate adhesive systems. There is no longer a need for parapulpal pins to anchor the core material to vital teeth. This not only saves time but is also a safer option, since drilling for the placement of parapulpal pins causes iatrogenic damage to the pulp or perforations of the root surface. Moreover, due to the potential of adhesive technology, root canal posts are no longer needed in many clinical situations where endodontic treatment is being carried out. Further information on this subject is referenced in the comments of the DGZMK, DGZPF and DGZ from January 2002 with regard to the construction of endodontically treated teeth.

Composite core build-up structures can be prepared from conventional light-curing inlay composite, where in the case of larger defects, limited curing depth calls for the time-consuming inlay technique or else prefabricated core sleeves. In this situation, the latter are either chemically curing or dual-curing (pure light-curing core build-up composites are limited to small defects). The various core build-up composites differ enormously in their rheological characteristics. The system of using highly viscous materials, mixed by the dentist assistant using two types of paste and pressed into the partially exposed cavities to cover a number of smaller cavities competes with the free-flowing alternative, which, with its practical dual chamber mixing system, can be directly applied to the defective site. The low viscous core build-up composites demonstrate good wetting properties on cover tooth substance and root canal posts and screws alike.

The core build-up composite will normally be offered in a colour similar to that of dentin where a translucent ceramic restoration is being made, as well as in a contrasting colour to the tooth (e.g. blue or white), which makes it easier to estimate the distance between the edge of the core build-up material and the beginning of the preparation boundary. Blue contrasting colours are usually recommended with metal-based restorations, whereas white opaque composites allow for a contrast to the tooth substance without affecting the aesthetics of the finished full ceramic restoration.

The requirements of a core build-up material can be summarized in the following ways:

- Sufficient adhesion to the tooth substance (without leaving gaps and omitting the need for parapulpal pins)
- Simple and fast application (also in the case of large defects)
- Good wetting capabilities (bubble-free flowing into undercuts)
- Low curing temperature (avoiding irritation of the pulp)

Clinical case study
The following clinical case gives a step-by-step description of the reconstruction of two premolars in a 27 year-old patient, using a core build-up composite and a glass ceramic restoration.

The starting point shows the 'allo loco' with long-term temporary (teeth 24 & 25) made of glass ionomer cement (Figure 1). Both teeth reacted to cold stimulation with carbon dioxide snow and were not sensitive to percussion.

After removing the fillings of both premolars, large areas of soft carious dentin could be seen. Due to the proximity of the defect to the pulp in the case of tooth 25, a preventive rubber dam was inserted before removing the caries in order to prevent infection by saliva should the pulpal chamber be opened. Upon removal of the carious tooth substance, the strongly undermined palatal cusp of the second premolar fractured. Upon further removal of the caries, a small punctured opening in the pulp in the area of the buccal cusp occurred (Figure 2). Since the tooth had no case history of being painful, the patient was consulted and the exposed area of the pulp capped. After cleaning and disinfecting the surface with 3% hydrogen peroxide, a non-setting calcium hydroxide was applied to the area of perforation and pressure carefully applied using a small, clean cotton pellet. The area was then completely covered with a setting calcium hydroxide and then, due to caries, the mesial surface of the first premolar was included in the cavity preparation (Figure 3).

Following separation of the extensive defect of tooth 25 using a steel matrix for the upcoming restoration, 37% phosphoric acid gel was applied to the cavity's enamel edge. After allowing it to work for 15 seconds to etch the cavity, the cavity was filled with acid gel and the enamel and dentin were conditioned for a further 15 seconds following the principle of 'total etch'. The acid and loosened hard particles were then washed away with the high-pressure water spray and the cavity carefully dried using oil-free compressed air. Drying out the dentin must be avoided, as this would lead to a collapse of the three-dimensional collagen network in the dentin. This would have a negative effect on the ability of the adhesive to penetrate, leading to poor adhesion and an increased risk of post-operative sensitivity.

The primer component of the adhesive system Solobond Paste (VOCO) was applied to enamel and dentin using a disposable brush and rubbed into the dentin for 30 seconds. After using compressed air to dry the excess and to evaporate the acetone solvent, the adhesive components were applied evenly to all prepared enamel and dentin parts with a disposable brush and rubbed in for 15 seconds. Using oil-free compressed air the adhesive was spread thinly and evenly to form an even film layer. The adhesive was polymerized with halogen light for 20 seconds.

VOCO's dual-curing core build-up composite Rebel حد in white was introduced into the defect directly from the cartridge mixing tip, one of which a bent direct application tip can be fixed and rotated by 360°. Starting from the cavity base, the composite was carefully inserted, avoiding air bubbles (Figure 4). Illustration 5 shows the defect completely filled with core build-up composite. Using a halogen light, the dual-curing core build-up composite was light-cure the entire surface of the cavity. The composite was subsequently finished with a finishing kit (Figure 5). The caries was completely removed to the sound dentin. A thorough polishing with rubber wheels with a diamond paste was performed (Figure 6). The tooth was then filled with a glass ceramic inlay (Figure 7). The dental restoration with the glass ceramic inlay is shown in Figure 8. The occlusal view of the completed restoration is shown in Figure 8.
cured for 40 seconds (Figure 6). The reconstruction of the first premolar was subsequently carried out following the steps described above (Figure 7).

An inspection of the site for material residues or microleakage was carried out after removing the matrices and before removing the rubber dam. The cores were finished with finishing diamonds and any residue removed. Prepcooling followed using elastic composite polishers. The static and dynamic occlusion was checked for early contact and interference using coloured foils (Figure 8). Since the reconstruction inlays were supposed to act as long-term temporary fillings until a full ceramic restoration, the surfaces were polished to a high gloss with composite polishing paste to keep plaque accumulation to a minimum. The teeth dried out due to the reversible loss of water following the application of the rubber dam and therefore took on a considerably lighter colour. When checking the sensitivity of the second premolar after one week the teeth had returned to their normal colour (Figure 9).

Figure 10 shows the results of the full ceramic restorations after 3 months. Tooth 25 was given a glass ceramic crown and a three-surface ceramic inlay was fitted for tooth 24. In Figure 11 the two prepared teeth are shown immediately prior to the adhesive cementation of the restoration. Following cementation, both teeth demonstrate again the function and natural aesthetics in the arch (Figure 12).