KETTENBACHDENTAL
Simply intelligent

Easy and successful adhesion of indirect restorations
as demonstrated by three clinical applications

The dual-curing adhesive cementation composite Visalys® CemCore combines performance, flexibility, and user friendliness based on many years of clinical research. Examples of its clinical applications are described below using three patient cases from the French dentists Dr. Marc Apap and Dr. Florian Apap.

Visalys® CemCore: Easy to use – diverse applications

Kettenbach Dental is renowned as a developer and manufacturer of impression materials that have been established in dental clinics for decades, including the Futar® range with Futar® D, one of the leading materials for registering the occlusal situation. In recent years, the company has expanded its product range with the addition of a multifunctional acrylic composite to fabricate temporary crowns and bridges (Visalys® Temp) along with a dual-curing composite material for core build-ups and root post cementation (Visalys® Core) and for dual-curing, adhesive cementation of restorations made from various materials (Visalys® CemCore). At its market launch in 2015, Visalys® Core was already distinguished by its compatibility with almost every adhesive on the market thanks to a copolymerization procedure known as “Active-Connect-Technology”. Several studies conducted at the University Dental Clinic Marburg have verified this [1, 2].

Limitations in the compatibility of adhesives with conventional dual-curing composites

Dual-curing composite materials are generally not compatible with the latest generation of self-etching adhesives. The acids in the self-etching adhesives compete with the amines of the catalyst that ensure the chemical curing of the composite. So that the dentin adhesion and curing of the composite can proceed correctly even without light, a drop of activator must, with few exceptions, be added to the adhesive [3]. This not only increases the cost of the procedure but also increases the time needed and the number of steps to be performed. Even when used correctly, optimal adhesion is not guaranteed with such systems, and marginal gaps may form between the tooth and the restoration.

Some studies have shown that cementation of a root post with a self-adhesive and self-etching resin cement, which is less sensitive to technique, is more reliably successful [4]. The coronal restoration is fabricated by the clinician with a conventional light-curing composite. This only outwardly simple procedure is complicated by the use of several products and the time needed for the procedure is greatly increased.



Visalys® CemCore – the complete system

With the new adhesive cementation composite Visalys® CemCore, these problems are resolved elegantly and quickly. The flowable composite is suitable both for inserting root posts and creating core build-ups and for adhesive or dual-curing cementation of indirect restorations made from various materials. It is available in a self-mixing 1:1 automix syringe (5 ml) and is used together with two primers. The Visalys® Tooth Primer is used to prepare the dental hard substance to accept a restoration. The Visalys® Restorative Primer forms an adhesive surface on restoration materials. Selective phosphoric acid etching of the enamel is necessary for cementation of veneers and adhesive bridges and with uncut enamel. In other cases, depending on the clinical situation, selective enamel etching can be performed as an option.

Preparation of the tooth with Visalys® Tooth Primer for placement of the restoration

Visalys® Tooth Primer is used to create the adhesive bond to the dental hard substance (enamel and dentin). The product contains 10-MDP, an organic molecule that can bond chemically with both the dental hard substance and the monomer of the composite. To pretreat the dental hard substance, the clinician applies a drop of Visalys® Tooth Primer onto an applicator brush and rubs the primer on all surfaces of the cavity for 20 seconds. The surfaces are then carefully dried with compressed air to evaporate the water-based solvent. Do NOT light cure the primer.

Preparation of the restoration with Visalys® Restorative Primer

The Visalys® Restorative Primer is used to prepare the inside of the restorations. It also contains 10-MDP along with a silane in a highly volatile alcohol-based solvent. 10-MDP bonds chemically to zirconia, metal alloys, and ceramics and is highly resistant to hydrolysis, that is, against damage to the bond in the oral cavity [5]. Before applying the Visalys® Restorative Primer, the inside of the restoration must be pretreated as described in the manufacturer's instructions for the specific material.

For metals, oxide ceramics, or composite, for example, blasting with aluminum oxide powder (≤ 50 µm) is required, while for silicate ceramics such as feldspar or glass ceramics as well as for hybrid ceramics, etching with hydrofluoric acid is required. After the pretreatment, the clinician applies the Visalys® Restorative Primer to the inside surfaces of the restoration or the root post using a single-use applicator and leaves the primer to work for 60 seconds.

After the tooth and the restoration have been prepared for final insertion of an indirect restoration or a root post, the clinician uses the fine mixing cannula to place Visalys® CemCore into the cavity or the root canal and on the inside of the restoration or the root post for canal-anchored build-ups. The composite is fully chemical cured after five to six minutes. It is recommended, however, to supplement polymerization with 20 to 40 seconds of light curing to increase the degree of conversion and the final hardness of the material.

Tips for the clinic

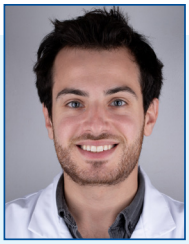
You can wait two to three minutes until the gel phase of Visalys® CemCore is reached to remove any excess luting composite. To be able to work more quickly, cure the material by briefly exposing to the light from a polymerization lamp (two to three seconds). Excess can now be easily removed before the final curing.



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CASE 1: CORE BUILD-UP AND RELUTING EXISTING SPLINTED CROWNS (DR. MARC APAP)

Mr. H. is an older patient who has already had many sessions on the chair to rehabilitate the second quadrant. His current problem is related to two crowns splinted together on endodontically treated teeth 35 and 36. Although the crowns had the correct morphology, they had loosened easily. The abutment teeth of Mr. H. had carious lesions that fortunately were sufficiently limited that the teeth could be preserved. The crown on 36, a metal-ceramic crown with an integrated, relatively short root post, was splinted with the completely hollow metal-ceramic crown on tooth 35 **(Fig. 1 & 2).** The periodontium was healthy and the X-ray showed acceptable endodontic treatments without any symptoms **(Fig. 3)**.
The patient did not want any more lengthy and expensive prosthetic treatments. We therefore decided to preserve the existing crowns and to build up the tooth cores directly with composite. Using Visalys® CemCore, tooth 35 could be built up and, in a second step, the two crowns on abutments 35 and 36 were definitively cemented.

Step 1: Caries removal and gingivectomy

The crowns were cleaned and cement residue was removed. The carious dentin was removed and a gingivectomy was performed with the Gingibur® bur using a turbine without water cooling to expose the cervical margins of the preparation. The two crowns were cemented with a temporary luting cement until the soft tissue was healed.

Step 2: Root post and core build-up on tooth 35 (Fig. 4)

The crowns were removed and cleaned 15 days later. On tooth 35 the root canal was prepared to receive a root post. After the try-in of the post and shortening to the correct length, the root post was pretreated with the Visalys® Restorative Primer. Visalys® Tooth Primer was applied to the root canal walls and all dentin surfaces of tooth 35 and dried with the air syringe. Visalys® CemCore was inserted into the canal and then inserted into the crown of tooth 35 that had first been isolated with petroleum jelly. The post was inserted into the canal and the splinted crowns were then placed and held in position with finger pressure. Shortly before the final curing of the composite, the patient should carefully bite the teeth together to ensure that there are no occlusal problems. After six minutes, the crowns were removed and the core of tooth 35 was light cured for 30 seconds. The peripheral excess was easily removed with a finishing bur. The two crowns were initially luted with temporary cement.

Step 3: Definitive placement of the splinted crowns

In another session, the crowns were removed and cleaned as were the cores. A ball of Teflon® tape was wedged between teeth 35 and 36 to prevent intrusion of cement residue into this difficult to reach interdental space (subgingival). The core of tooth 35 was treated with Visalys® Restorative Primer as was the inside of the metal crown **(Fig. 5)**. The dentin surfaces were treated with Visalys® Tooth Primer **(Fig. 6)**. After inserting a moderate quantity of Visalys® CemCore into the crowns **(Fig. 7)** and onto the preparations **(Fig. 8)**, the crowns were placed until the material had completely bonded **(Fig. 9)**. The quickly solidifying excess could be easily removed **(Fig. 10 & 11)**. A final X-ray check confirmed that the crowns fit well and showed that there was no residual cement subgingivally between the abutments after removing the Teflon® protection **(Fig. 12)**.

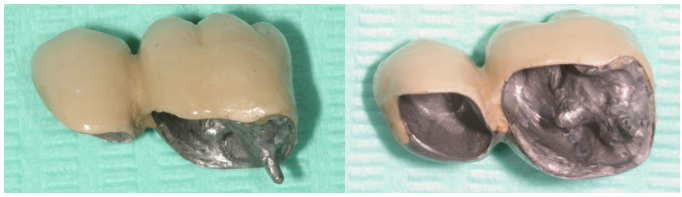


Fig. 1 & 2: Metal-ceramic crowns splinted together on teeth 35 and 36

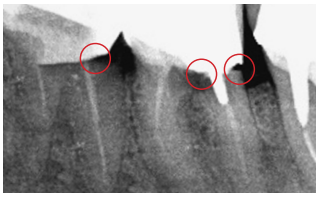


Fig. 3: Preoperative X-ray image of the carious lesions on teeth 35 and 36

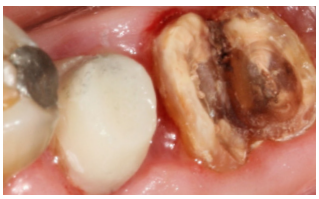


Fig. 4: Preparations after caries removal and core build-up on tooth 35



Fig. 5: Application of Visalys® Restorative Primer on the inside of the crowns

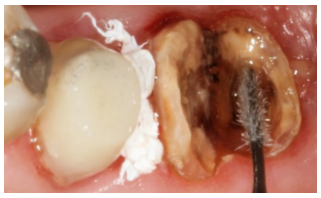


Fig. 6: Application of Visalys® Tooth Primer on the dentin surfaces

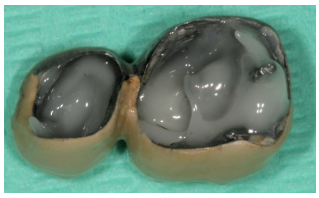


Fig. 7: Insertion of Visalys® CemCore into the crowns

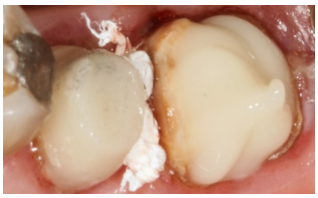


Fig. 8: Application of Visalys® CemCore onto tooth crown 36



Fig. 9: Insertion of the crowns in the mouth

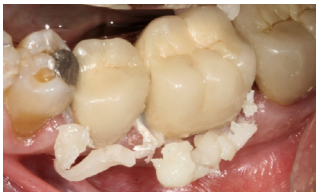


Fig. 10: Simple removal of the quickly solidifying excess



Fig. 11: Final result after complete removal of excess and removal of the Teflon tape

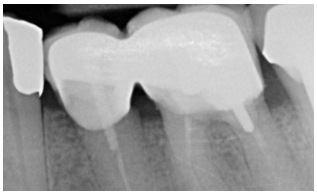


Fig. 12: Postoperative X-ray check

CASE 2: ADHESIVE INSERTION OF MONOLITHIC ZIRCONIA CROWNS (DR. MARC APAP)

Ms. B., a young mother, was unsatisfied with her smile because her incisors had already been restored several times with increasingly voluminous composite build-ups. These build-ups had become very discolored. We decided to prepare monolithic zirconia crowns for her vital anterior teeth, which are more durable and have a better fitting morphology than the existing composite build-ups. Because the cores only had a certain length, in each case three crowns were splinted together to improve the friction.

After try-in and adjustment, cleaning and light blasting of the inside of the crowns, relative isolation of the teeth was carried out with cotton rolls **(Fig. 14)**. The peripheral enamel was etched for 30 seconds with phosphoric acid, the acid was then rinsed off thoroughly, and the surfaces were gently dried **(Fig. 15).** Visalys® Tooth Primer was generously applied to all the enamel and dentin surfaces that will form a bond with the zirconia crowns, then gently dried to allow the solvent to evaporate **(Fig. 16)**.

Parallel to this, the inside of the crowns was pretreated with Visalys® Restorative Primer and its solvent was then evaporated off with an air syringe. Such one-off chemical pretreatment is sufficient to cement the lightly blasted zirconia crown blocks **(Fig. 17)**.

An adequate quantity of Visalys® CemCore was inserted into the crowns **(Fig. 18 & 19)** and the crowns were then immediately placed and held in position for one minute applying finger pressure **(Fig. 20)**. After a brief light curing (5 seconds), the excess was easily removed **(Fig. 21)**. The cement was then light cured through the restoration for at least 40 seconds per side **(Fig. 22)**. During the check-up one week later, the gingival situation showed no irritation and the crowns fit well **(Fig. 23)**.



Fig. 14: Initial situation



Fig. 15: Etching of the enamel margins with phosphoric acid



Fig. 16: Rinsing of the teeth and gentle drying before and after application of Visalys® Tooth Primer

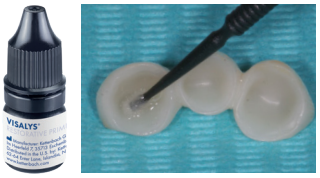


Fig. 17: Blasting of the insides of the crowns and subsequent treatment with Visalys® Restorative Primer, drying



Fig. 18 & 19: Insertion of Visalys® CemCore into the crowns



Fig. 20: Insertion of the crowns



Fig. 21: Removal of excess cement with a probe after 5 seconds light curing



Fig. 22: Light curing for at least 40 seconds per side



Fig. 23: Check-up one week later

CASE 3: CEMENTATION OF A PRESS-CERAMIC MOD INLAY (DR. FLORIAN APAP)

The 28-year-old patient Mr. L. visited the dentist because food residue was repeatedly getting stuck on the mesial side of tooth 26 **(Fig. 24)**. The X-ray image showed a large carious lesion on both the mesial and distal sides of tooth 26 **(Fig. 25)**. We decided to fabricate a MOD inlay from press ceramic (E.max®) to restore this molar after removal of the damaged dental hard substance.

After removal of the caries and preparation of the tooth, a rubber dam was applied. A thin layer of a liquid, light-curing composite was then applied to the axial surfaces of the cavity (immediate dentin sealing) **(Fig. 26)**. After taking the silicone impression, the inlay was fabricated on the master model **(Fig. 27 & 28)**. A rubber dam was again applied to ensure an absolutely dry field for adhesive insertion of the MOD inlay **(Fig. 29)**.

After etching the peripheral enamel, rinsing, and drying **(Fig. 30)**, Visalys® Tooth Primer was applied to all preparation surfaces that will be forming bonding surfaces with the restoration. Compressed air was then used to gently dry the surfaces **(Fig. 31 & 32)**. The inside of the inlay was etched with hydrofluoric acid, the acid was then rinsed off, and the surfaces were gently dried **(Fig. 33 & 34)**. The inside of the inlay was then pretreated with Visalys® Restorative Primer, dried, and placed to one side **(Fig. 35)**.

An adequate quantity of Visalys® CemCore was applied to the cavity **(Fig. 36)** and the inlay was immediately placed on the tooth and pressed into place so that composite cement was uniformly pressed out on all sides **(Fig. 37)**. Brief light curing enabled easy removal of the cured cement excess. Visalys® CemCore cures chemically within five to six minutes; 10 seconds of light exposure on each side accelerated the curing **(Fig. 38)**. The clinical and radiological outcomes after insertion and cleaning and after removal of the rubber dam confirm that the inlay fits well **(Fig. 39 & 40)**.



Fig. 24: Initial clinical situation

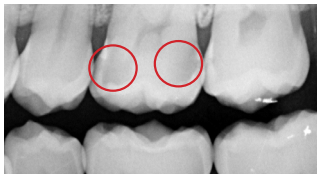


Fig. 25: Preoperative X-ray image

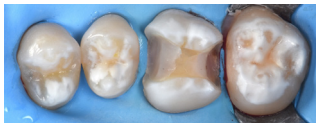


Fig. 26: Removal of carious tissue, preparation of the cavity, protection of the pulp, and immediate dentin sealing (IDS) using liquid composite on the axial surfaces



Fig. 27: Working model



Fig. 28: MOD inlay fabricated from press ceramic (E.max®)

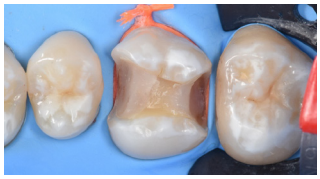


Fig. 29: Prepared surgical field

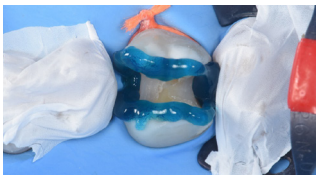


Fig. 30: Etching of the peripheral enamel

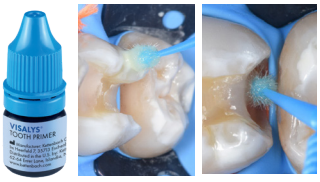


Fig. 31 & 32: Application of Visalys® Tooth Primer to the cavity walls



Fig. 33: Etching of the inlay with hydrofluoric acid



Fig. 34: After rinsing and drying

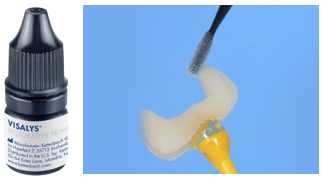


Fig. 35: Application of Visalys® Restorative Primer



Fig. 36: Insertion of Visalys® CemCore into the cavity

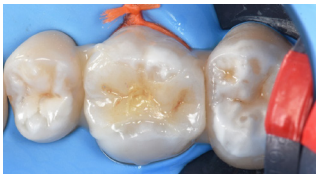


Fig. 37: Inserted inlay before light curing of the excess



Fig. 38: After removal of the excess and final light curing



Fig. 39: After removal of the rubber dam

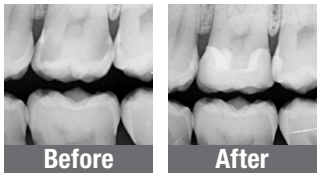


Fig. 40: X-ray image before and after the surgery

Literatur

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[4] Scientific report: Oper Dent. 2014 Jan-Feb; 39(1):E31-44. doi: 10.2341/13-070-LIT. Epub 2013 Aug 12. The role of resin cement on bond strength of glass-fiber posts luted into root canals: a systema c review and meta-analysis of in vitro studies. Sarkis-Onofre R, Skupien JA, Cenci MS, Moraes RR, Pereira-Cenci T.
[5] Scientific report: Materials (Basel). 2019 Mar; 12(5): 790. doi: 10.3390/ma12050790. 10-MDP Based Dental Adhesives: Adhesive Interface Characterization and Adhesive Stability–A Systematic Review Eunice Carrilho, Miguel Cardoso, Manuel Marques Ferreira, Carlos Miguel Marto, Anabela Paula, and Ana Sofia Coelho