

Direct composite restorations for large posterior cavities – extended range of applications for high-performance materials

A case study by Ann-Christin Meier, Dr. med. dent., Stapelfeld, Germany

When large defective fillings with secondary caries have to be replaced, the prepared cavity will often be quite extensive. Until recently, indirect restorations would clearly have been indicated in many of these cases, especially in the posterior region, where high masticatory forces occur. Extensive direct composite restorations in this area were previously derided as “plastic crowns” by critics within the industry, but this has given way to a more nuanced view. Modern adhesives and high-performance composite restoratives such as Ceram-X[®] mono+ and SDR[®] Smart Dentine Replacement (both by DENTSPLY) have contributed significantly to this re-evaluation. The following case study by Dr. Ann-Christin Meier (Stapelfeld, Germany) exemplifies one of the most common indications in daily clinical practice. Less commonplace is her use of two well-conceived composites to minimise polymerisation stress and optimise aesthetics for a mandibular right first molar.

Handling and material characteristics inform composite choice

With natural aesthetic results, easy handling, and low postoperative sensitivity, combined with 10 years of clinical success, Ceram-X mono+ (DENTSPLY) is a perfect and reliable partner for posterior restorations. The nano-ceramic technology of Ceram-X mono+ makes it possible to use substantially less conventional resin resulting in an extremely low monomer release. The attritional wear was found to be comparable to enamel in a chewing simulation study. Against this background, I feel confident restoring even extensive carious lesions with a direct restoration using this universal composite.

Case report

Following a recall, a 26-year-old woman presented at our practice for replacement of a failing amalgam filling in tooth 46. Tooth 47 had already been treated on a previous occasion (Figs. 1 and 2).



Fig. 1 Baseline situation.



Fig. 2 Bitewing radiograph.

Tooth 46 was vital and showed no obvious sensitivity despite radiographically visible caries in the vicinity of the pulp. The margins of the existing restoration were clinically insufficient, with an easily palpable marginal gap and associated secondary caries.

A treatment concept to match the patient's wishes

The patient's esthetic expectations were very high; for her, an "invisible" restoration was the only acceptable treatment alternative. The well-informed patient requested a minimally invasive treatment to preserve the remaining tooth structure and to maintain the vitality of the pulp.

Ceram-X mono+ in combination with the DETREY® Conditioner 36 and Prime&Bond XP (formerly XP Bond) (all DENTSPLY) have been used in my dental practice for the past seven years. The restorative results are excellent, not least with regard to long-term stability. Based on this clinical experience, I was confident I would be able to place a clinically sufficient and esthetically pleasing direct composite restoration that would satisfy the patient.

Uncomplicated shade matching

As with any aesthetic restoration, the shade was taken before the treatment itself begins. With Ceram-X mono+, finding the right shade is easy. This single-translucency system uses only seven shades of intermediate translucency, to cover the entire VITA range – natural aesthetics made easy.

The shade should be taken before placing the rubber dam, because the treatment dehydrates the tooth and makes it difficult to determine the correct shade at a later point. In addition, we routinely polish the tooth with a fluoride-free polishing paste before treatment in order to remove plaque and minor discoloration.

Occlusion checks as groundwork for economical finishing

A first occlusion check was made before the actual treatment began. This check provides important information about the available vertical space for the restoration. It allows the restoration to be finished quickly and efficiently at the end of treatment; only minimal time is required for removing what little excess material appears.

Excavating the lesion and choosing the right matrix

After removing the old amalgam filling and its phosphate-cement lining, the deep caries became evident. The carious tissue was excavated with the aid of a caries detector. It is worth remembering that tertiary dentine, too, is easily stained by Caries Detector. Undercut areas can safely be left intact for maximum tooth-structure preservation.

After applying the rubber dam, the matrices were placed. Sectional matrix systems offer important advantages. In our practice, the Palodent[®] Plus system (DENTSPLY) has proven useful – perfect proximal contacts can be created with this pre-contoured sectional matrix.

The tab in the upper part of the matrix was engaged with a pair of tweezers, allowing the matrix to be easily positioned in the contact area from the occlusal aspect (Fig. 3).

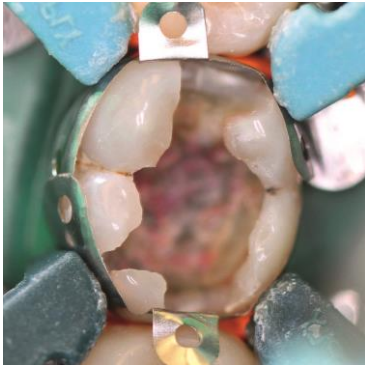


Fig. 3 The Palodent Plus sectional matrix in place.

The fiberglass-reinforced plastic tines of the NiTi rings facilitate ideal adaptation. This system achieves tightly sealed cavity margins and clinically reliable, anatomically ideal contact points.



Fig. 4 Etching.

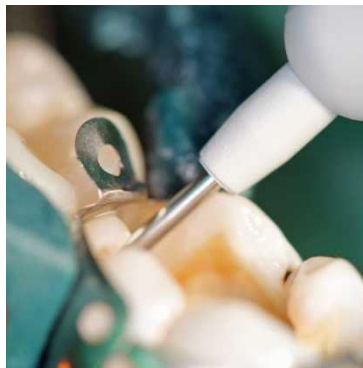


Fig. 5 Application of SDR.

Stress reduction with the SDR filling technique.

Once the cavity had been etched (Fig. 4) and bonded, any undercut areas had to be optimally filled. The self-leveling bulk-filling material Smart Dentine Replacement, SDR (DENTSPLY) has proven particularly useful for this purpose and serves as a stress-breaker for larger fillings. The polymerisation stress of SDR is comparatively low, even when efficiently placed in layers of up to 4mm. The restorative helps minimise the effects of the C-factor in the cavity, thereby reducing the risk of postoperative sensitivity, cusp fractures, or cracks. It has become truly indispensable in our practice. I personally find the clinical advantages and elegant handling of this “flowable” exciting: low polymerisation

stress, increments of up to 4 mm, fantastic adaptation to the cavity walls. The simplicity of processing SDR becomes evident on the very first attempt (Fig. 5).

Designing the occlusal contours using the incremental technique

The next step was the build-up of Ceram·X mono+ in the incremental technique to counteract polymerisation stress and to ease potential tension at the cavity margin. This further reduces the risk of marginal gaps, secondary caries, and especially postoperative sensitivity. It is recommended to start the build-up with the marginal ridges. Ceram·X mono+ supports this approach by offering prolonged working times. Using the matrix, the restoration can be shaped easily and quickly, with only very little excess (Fig. 6).



Fig. 6 SDR in the depth of the cavity; build-up of the marginal ridges with Ceram·X mono+.

Ceram·X mono+ adapts very well to the cavity walls and does not stick to the instrument. This is a crucial factor in esthetic modeling, designed to reproduce the natural structures of the cusps a section at a time (Figs. 7 and 8).



Figs. 7 and 8 Modeling with Ceram·X mono+.

Optional: Fissure shade characteristics for an even more natural appearance

The long working times of Ceram-X mono+ are a definite advantage when designing the occlusal relief. Depending on the clinical case, I like the option of adding a bit of extra naturalness by characterising the occlusal surface of the restoration to match the natural occlusal surfaces of the adjacent teeth. For example, a microbrush can be used to dab small fissures and cusp inclines into position. The modeling properties of Ceram-X mono+ makes it possible to apply some staining colors into a fissure with a small needle or a fine probe and then dab the Ceram-X mono+ back into place.

In the present case, the patient had opted against a “colour highlight” at the outset of treatment. It is useful to clarify this with the patient in a preliminary discussion to avoid possible later issues with “caries in the filling.”

Little excess to remove – easy finishing and polishing

After polymerisation of the final layer, the rubber dam was removed, and the restoration was polished. With advance planning and thanks to the easy handling of Ceram-X mono+, the amount of excess to be removed is negligible. A diamond finishing bur was used to quickly and easily finish the restorative margins and transition areas. Lower speeds without irrigation are usually appropriate for a better view of the already contoured surfaces. If needed, the occlusal relief can be easily modified with a red bud-shaped diamond bur. The Enhance® Polishing system (DENTSPLY) is ideal for obtaining an efficient, high-quality finish.



Fig. 9 An appealing result.

Appealing result with chameleon effect

As the tooth becomes dehydrated during the procedure, the filling will usually appear slightly darker than the rest of the tooth directly after placement. Experience has shown that it is useful to point this out to the patient prior to treatment. As water is naturally taken up by the hard tissue of the tooth, the difference in shade will usually no longer be discernible the following day. Ceram-X mono+ with its intermediate level of translucency exhibits a so-called chameleon effect. The result is very appealing, despite a persisting slight discoloration of the tooth caused by the old amalgam filling. The patient got what she wanted: a minimally invasive, tooth-colored, and invisible restoration – simple, natural, and beautiful.

Conclusion

As the present clinical case demonstrates, treatment economy may well be compatible with high expectations in terms of esthetics and stability. Restoratives such as Ceram-X mono+ and SDR set innovative standards for invisible, well-tolerated, and reliable direct restorations for extensive posterior lesions – a highly practical solution for one of the most commonly encountered situations in the dental office and a solution that offers long-term satisfaction to dentists and patients alike.