More efficient posterior restorations, solidly based on science and practice

Palodent®Plus, Sectional Matrix System and SDR®, Smart Dentin Replacement

Dr Philip Ganter

The fact that today's patients place high aesthetic demands on direct restorations is becoming increasingly obvious even in the posterior segment. Dental manufacturers have realised this and developed advanced composite materials that, due to convincing properties validated by material science, have become established as state-of-the-art for anterior and posterior direct restorations.

Advanced composites have numerous different ingredients that influence their properties. The restorative material is expected to resist abrasion, offer low polymerization shrinkage, and satisfy high aesthetic demands. According to the guidelines of the German Society of Dental, Oral and Craniomandibular Sciences (DGZMK), composites may be used for class I and class II lesions in the posterior segment. As a major advantage, they offer defect-driven tooth preparation, thus helping to preserve dental hard tissue.

Processing of these restorative materials does require a good deal of care. For example, incremental application and light curing of composites is relatively time-consuming. Depending on the matrix technique, composite techniques are also more demanding than the amalgam packing technique with regard to the modelling of adequate proximal contacts. Compared to amalgam, processing today's composites is more exacting, technique-sensitive and time-consuming overall. Even though the newer generation of low-contraction composites are maintained to require 10 seconds or less of light curing, they need extra time for uniform layering and

polymerization – not to mention the time already spent on any preceding steps such as the application of rubber dam, seating of matrices, and adhesive pre-treatment of the tooth.

SDR® is quick and secure – and even quicker with Palodent®Plus

A significant step in improving this situation is made by combining the Smart Dentin Replacement (SDR®) flowable composite developed by DENTSPLY with the Palodent®Plus sectional matrix system, which has been introduced to the market only recently. SDR® is a low-viscosity restorative composite based on conventional methacrylate monomers and has been available for 2 years. It is a flowable material that can be introduced into tooth cavities by layered increments up to 4mm thick, has a self-levelling effect, and involves minimal shrinkage stress.

Several in-vitro investigations have analyzed the polymerization stress and shrinkage offered by SDR® and have demonstrated by way of comparison that the same values can be achieved with SDR® as with conventional composites and flowables. However, other things being equal, SDR® does have a considerably broader spectrum of indications than conventional flowables. While the latter are primarily used as build-up materials, liners, fissure sealers or temporary obturation materials, SDR® is also a suitable base material for definitive class I and II restorations.

Frankenberger's studies from 2009 confirmed that SDR® can be readily combined with the widely used family of methacrylate-based composite materials. These combinations were found to offer an adhesive performance equivalent to other composites, which was true of both marginal adaptation in enamel/dentin and internal adaptation to dentin. SDR® is therefore a truly viable alternative base material for posterior restorations, offering simple and secure

processing for this application. Other commercial composites are applied to shape the occlusal relief over this base material.

An adequate matrix technique is needed for SDR® to be successfully employed. Matrix systems need to meet a variety of requirements, including user-friendliness, good retention on the residual tooth structure, possibilities for anatomical reconstruction of the tooth, creation of optimal contact points, and avoidance of excessive application by good adaptation. The Tofflemire system, one of the most popular choices, offers great convenience of use but has issues regarding the creation of anatomical contact points especially on composite restorations. Findings of conventional ring matrices, resulting in less pronounced contact points than sectional matrix systems, have been confirmed by several studies in the past few years.

DENTSPLY's new Palodent®Plus sectional matrix system, by contrast, is extremely well suited to the modelling of composite restorations in posterior segments. Among other components, it includes five differently sized matrices with special lugs to facilitate adaptation and sectional matrix rings featuring an open space to hold a wedge.

Palodent®Plus and SDR® used in practice – a case report

The clinical case discussed in the following paragraphs illustrates how the Palodent®Plus matrix system works together with the SDR® base material. Ceram•X® mono nanoceramic filling material was used to shape the occlusal surface of the restorations.

A 29-year-old man presented at the Department of Operative Dentistry and Periodontology (University of Freiburg, Germany) asking for a dental check-up and treatment if required. The patient reported not having seen a dentist for several years. He presented

with a normal extraoral situation and a general medical history not indicating any relevant facts. The intraoral examination was started by evaluating oral hygiene indices, yielding an API of 14% and an SBI of 0%. Subsequently the patient's dental status was examined.

This examination (including bitewing radiographs) revealed carious lesions on teeth 16, 45 and 47, inadequate partial restorations on teeth 11, 15, 26, 35 and 37, and previous endodontic treatment of tooth 25. The latter had included a core restoration to be followed up with a full-coverage crown, which was never implemented because of budget constraints.

The clinical findings are reflected in the full-arch views of the initial situation (Figures 1 and 2). The periodontal screening index was

2	0	2
2	2	0

Given the size and location of the existing defects, it was decided to use composite restorations for treatment.

What follows is a comprehensive discussion, also including a step-by-step summary, of the restorative approach taken to deal with teeth 26, 35 and 37 of this patient. SDR® was used as base material, along with Ceram•X® mono to shape the occlusal surfaces, and XENO®V^{+} as a one-component self-etching adhesive.

Tooth 26 was restored first. The procedure started by cleaning its surfaces with AirFlow (does this need a reference?), followed by polishing, for adequate shade-taking. The latter was performed with the shade guide supplied by DENTSPLY. After application of rubber dam (Figure 3), the old occlusomesial restoration was removed and the carious lesion excavated. Since the lesion extended into the subgingival space, the intermediate bar of the rubber dam had to be

removed (Figure 4). Ultrasonically operated tips with unilateral diamond coating were used for proximal cavity preparation and breaking off edges.

After applying a new rubber dam, the appropriate Palodent®Plus matrix (Figure 5) was seated using the supplied matrix forceps. User-friendly and ergonomic application is ensured by prefabricated holes in the matrices. A resin wedge, supplied with the system and featuring a gingiva-friendly shape (Figure 6), was used to lock the matrix in place. These wedges can be readily applied with the matrix forceps, as they feature holes specifically for this purpose. Subsequently the appropriate matrix ring was grasped with the ring forceps (Figure 7). Placing the ring over the wedge was quick and simple, thanks to the open space of the ring (Figure 8).

The next step was to perform adhesive pre-treatment with the help of a microbrush by uniformly massaging XENO® V^{+} into the cavity for 20 seconds, followed by blasting with an air blower for 5 seconds and light curing for 20 seconds (Figure 9).

Subsequently SDR® was applied directly from the Compula® Tip into the cavity, using a layer thickness of 3−4mm. Care was taken to keep the Compula® Tip submerged in the dispensed material for as long as the flowing process continued, thereby avoiding bubble formation. Thanks to its self-levelling flow behaviour, the SDR® could be effortlessly and securely adapted to all surface areas of the cavity (Figure 10). Each 4mm-thick layer of the material was polymerized for 20 seconds. Note that SDR® offers quick replacement of the lost dentin by applying just one layer.

Layering of SDR® was stopped approximately 2mm short of the prospective occlusal surface for the final Ceram•X® mono layer, using shade M2 for surface shaping. Definitive refinements and

polishing were performed with yellow finishing diamonds, Enhance® composite polishers, polishing discs with different grit sizes, and an Occlubrush instrument for the final high-gloss polishing (Figure 11).

Teeth 35 and 37 were restored in a separate session, using exactly the same method as with tooth 26. What follows is a brief summary of the individual steps of the procedure for better overview.

Step 1 Initial situation following application of rubber dam and cleaning of teeth 35 and 37 (Fig. 12)
Step 2 Restorations removed and caries excavated (Fig. 13).
Step 3 Matrices and wedges applied (Fig. 14).
Step 4 XENO®V+ applied and polymerized (Fig. 15).
Step 5 View obtained during self-levelling of applied SDR® (Figure 16; picture taken with an orange light filter).
Step 6 Restorations placed, matrices to be removed (Fig. 17).
Step 7 Restorations placed, matrices removed (Figure 18).
Step 8 Finished restorations on teeth 35 and 37 (Fig. 19).

Teeth 15, 16 and 45 were again restored in exactly the same way. Furthermore, tooth 11 was provided with an edge build-up restoration and tooth 47 was endodontically treated. Full-coverage restorations for teeth 25 and 47 are planned in the medium term.

Conclusions

SDR® is a composite material used to restore masticatory surfaces. Combining this material with the Palodent®Plus sectional matrix system makes for a quick and simple, high-quality alternative to conventional incremental techniques of creating these restorations.

Palodent®Plus offers convincing advantages in this connection over ring matrix systems and other sectional matrix systems, due to its elegant and secure application. The rings can be securely applied to

the tooth and the tweezers facilitate effortless and ergonomic seating of the matrices. The wedges are well suited to lock the matrices in place without unduly encroaching on the gingiva. Applying an excessive amount of the material can be avoided thanks to the anatomical shape of the matrices. Hence Palodent®Plus is a convenient and well-conceived system meeting all requirements one would expect from a matrix system for class II restorations.

Figure 1

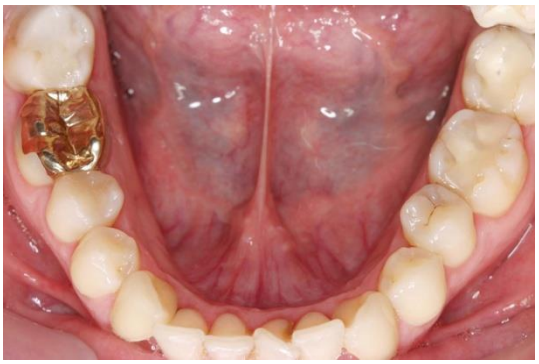

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

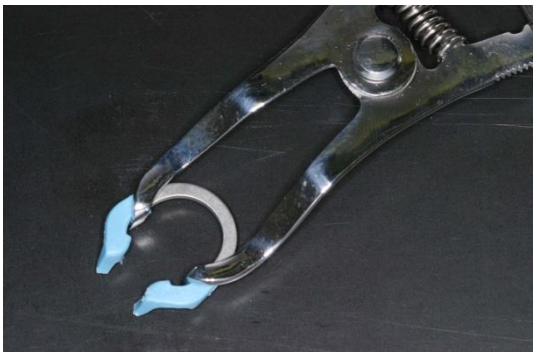

Figure 7

Figure 8

Figure 9

Figure 10

Figure 11

Figure 12

Figure 13

Figure 14

Fig. 15

Figure 16

Figure 17

Figure 18

Figure 19

Photographs by Ganter

Figure 1	Top view of maxilla.
Figure 2	Top view of mandible.
Figure 3	Initial situation of tooth 26.
Figure 4	Restoration removed and caries excavated (tooth 26).
Figure 5	Palodent®Plus – matrix grasped with forceps.
Figure 6	Palodent®Plus – wedge grasped with forceps.
Figure 7	Palodent®Plus – matrix ring grasped with forceps.
Figure 8	Matrices applied to tooth 26.
Figure 9	XENO®V+ applied and polymerized.
Figure 10	SDR® applied.
Figure 11	Fully refined restoration, including the Ceram•X® mono surface layer.
Figure 12	Initial situation of teeth 35 and 37.
Figure 13	Restorations removed and caries excavated (teeth 35 and 37).
Figure 14	Matrices applied to teeth 35 and 37.
Figure 15	XENO®V+ applied and polymerized.
Figure 16	SDR® applied.
Figure 17	Layering of Ceram•X® mono completed, matrices to be removed.
Figure 18	Matrices removed, restoration to be refined.
Figure 19	Finished restorations on teeth 35 and 37.

References:

All studies quoted are included in DENTSPLY's scientific compendium on SDR®, which is available for download at http://www.dentsply.de.

Author:
Dr Philip Ganter
University Clinic Freiburg
Department of Operative Dentistry and Periodontology
Hugstetter Strasse 55
79106 Freiburg
Germany
E-mail: philip.ganter@uniklinikum-freiburg.de