Reliable reconstruction of adjacent approximal defects – Matrix and layering technique using a highly viscous bulk-fill composite

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Adjacent Class II defects must be filled in stages. A good matrix technique is essential in order to ensure successful layering. The following patient case shows how this can be achieved both carefully and rationally.

A good working technique (1) is required to fill deep Class II cavities successfully with composite. The principle has remained essentially unchanged over the past 20-30 years; the improvements have been in the details. Bulk-fill composites have been available now for a number of years which, given their low level of shrinkage stress and improved translucency, can be polymerised in layers of, for the most part, 4 mm. As with other composites, the largest possible free surface should be ensured (2).
In terms of success rates, studies show hardly any differences between the various materials and methods (3). Irrespective of this, a restoration can only prove successful if a tried-and-tested technique is used in the appropriate manner. As such, matrices must be adapted and wedged precisely for good marginal adaption and approximal contacts (4, 5). To this end, a series of ready-made systems and individual components are available for use.

Adjacent defects

It is very often the case that two approximal defects have to be built up in one session; this can be due to contact-related caries or because existing fillings need to be replaced. In such cases, one filling is firstly always completed with, as far as possible, an anatomically correct design. This is ideally achieved by building up the approximal wall, including the marginal ridge, and conversion to a Class I cavity to guarantee an optimal response to light polymerisation (6). Work on the second restoration is not commenced until the first filling has been polished. The following example describes the relevant work steps for medium-sized defects.

Case report

In the case of a 31-year-old male patient, several posterior restorations had to be replaced or restored due to primary and secondary caries. In the second quadrant, the restorations which were created without an adequate adhesive technique were already defective or not properly sealed which meant that food remains could collect there (Fig 1). The bitewing X-ray confirmed the clinical findings; fortunately the secondary caries was not very widespread (Fig. 2).

Figure 3 shows the situation following primary preparation, smoothing of the margins and excavation (without a rubber dam) and positioning of the rubber dam. The thin sectional matrix (Quickmat Deluxe Contoured Sectional Matrix Molar 0.04 x 6.4 mm, Polydentia) for the filling in tooth 27 was easy to adapt and seal cervically (Fig. 4). After application of the adhesive (Futurabond U, VOCO), the cavity surface was firstly covered with a thin layer of a flowable nanohybrid ORMOCER (Admira Fusion Flow, VOCO) (Fig. 4).

To convert from Class II to Class I, the marginal ridge was built up with a highly viscous nanohybrid bulk-fill composite (GrandioSO x-tra, VOCO) (Fig. 5 and 6). Since the material can be easily sculpted and the 0.04 mm steel matrix is sufficiently stable, a matrix ring was not required for this step. This ensured a better overview and access for the sculpting instruments.

When building up the marginal ridge, it must be ensured that this has a rounded edge to the adjacent tooth to enable the use of dental floss. A special sculpting spatula was used for the release step (Composite 4, American Eagle Instruments) (Fig. 5). In addition or as an alternative, an 8A Carver from the same provider or a 3A probe (HuFriedy) are suitable.

After building up the occlusal surface, the matrix could be removed. The minimal excess was removed using a scaler and the filling was completed and polished (Fig. 7). For the filling on tooth 26, a super-thin steel sectional matrix was put into place (Quickmat Deluxe Contoured Sectional

Matrix Molar 0.04 x 6.4 mm), sealed cervically using a wedge and a clamping ring (Palodent, Dentsply Sirona) was then inserted (Fig. 8).

Following application of the flow and bulk-fill material using the tried-and-tested technique, the partial matrix could only be removed by applying substantial force, which, in turn, indicates a good approximal contact (Fig. 9). The second filling was then finished and polished (Fig. 10).

Discussion

The same principle is applied for building up two adjacent fillings as for a single filling. If there is a purely approximal Class I defect in the proximal region, this is firstly treated before working on the Class II cavity (5). With two adjacent Class II cavities, the reconstruction of the first marginal ridge may prove difficult given the lack of orientation on the adjacent tooth. If possible, the opposite side is used for orientation. Furthermore, the upper matrix strip should be kept as low as possible to keep the adjacent tooth substance in view (Fig. 5).

In the author's experience, ready-made, contoured partial matrices made of steel (Polydentia) are ideal for "veneering" approximal cavities. These are very thin to guarantee good contact points; they are also stable and, just like other steel matrices, can be cut to size. Moreover, compared to other products they are relatively cost-effective.

Clamping rings: what really matters

Teeth and thus cavities are all very different, both as regards their size and their anatomy, for example, the position of the tooth equator and the nature of cervical tapering. For this reason, to ensure minimal excess removal and good results, several clamping ring options from various suppliers should be available. In this example, the clamping rings from the Palodent system (Dentsply Sirona), which was launched onto the market some time ago, were used (Fig. 8). In addition, depending on the situation, the author also uses various rings form the Palodent V3 systems (Dentsply Sirona) and Composi-Tight 3D system (Garrison).

From a biomechanical perspective, the point in time when the clamping ring was applied is of relevance. With deep defects and delicate remaining tooth substance, the undercuts are firstly built up using highly viscous composite and the cusps are thus stabilised (5). The clamping ring is not inserted until after this step. Otherwise rings with a high restoring force can result in the fracture of fragments or even complete cusps.

On the other hand, irrespective of the cavity size, the clamping ring should be inserted as soon as possible, and at the latest before the bonding agent has hardened in small cavities or the application of composite in the approximal contact area of larger cavities. This is because the matrix in the contact area is shifted when the clamping ring is inserted and, in the worst-case scenario, the previously created contact is lost.

In this example, the cusps were sufficiently supported by healthy dentine and thus did not have to be stabilised. The clamping ring could therefore be inserted immediately, i.e., before the adhesive and flow layer (not shown).

Expedient layering

After wetting the surface with flowable material (here: flowable nanohybrid ORMOCER Admira Fusion Flow, VOCO), layering is always performed according to the same principle: each increment is applied to ensure the greatest possible free surface and polymerised separately. In this way, the stress on the boundary surface to the tooth is minimised and the configuration (C) factor is optimised.

In the example here, the marginal ridge was firstly built up in the relatively flat cavity of tooth 27 to create a Class I cavity (Fig. 5 and 6). This was followed by the occlusal surface with one increment for the palatal and one increment for the buccal cusp slope (Fig. 7). No primary, approximal wall was built up for tooth 26 due to the narrow cavity toward mesiodistal. Instead, starting from the cavity floor, the distopalatal cusp slope and the approximal wall were sculpted (Fig. 8), before the same procedure was applied to the buccal section. Here, too, the aim was to achieve the largest possible surface (5, 7, 8).

The principle applies regardless of the composite used; however, the layer thickness for bulk-fill composites may be greater. With these materials, in this example the highly viscous nanohybrid bulk-fill composite GrandioSO x-tra (VOCO), larger increments are possible. As such, this is an ideal choice for deep cavities; however, the configuration (C) factor must be observed.

Compared to other bulk-fill composites, the material used (GrandioSO x-tra, VOCO) is particularly hard both at the surface as well as at a depth of 4 mm. The exceptional polishability and good colour adaption to the surrounding tooth substance are also worthy of mention.

Conclusion

The two approximal fillings were placed both cleanly and efficiently using the technique and materials described. Despite the relatively small size of the cavities and the use of a bulk-fill composite, several layers were applied. This is advisable to achieve tight margins, minimal shrinkage and minimised stress loading on the boundary surfaces. This patient, who is subject to a high risk of caries, will undoubtedly benefit from this technique.

Clinical case

Fig. 4: A sectional matrix strip is adapted and wedged. Following selective enamel etching, a universal adhesive (Futurabond U, VOCO) and then a flowable nanohybrid ORMOCER (Admira Fusion Flow, VOCO) are applied.

Fig. 1: In this case of a 31-year-old male patient, the defective and secondary carious composite resin fillings on tooth 26 ODP and tooth 27 MO result in the impaction of food and an unpleasant taste, but not pain.

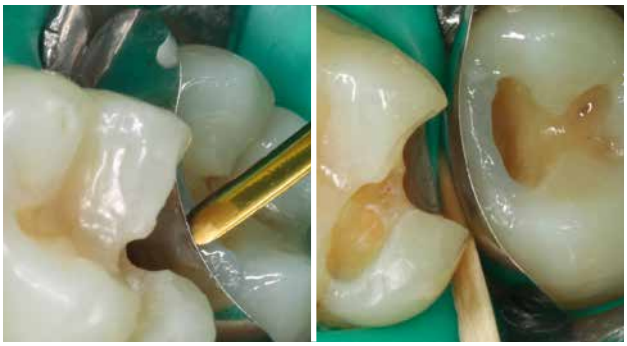

Fig. 5 and 6: The marginal ridge can now be built up with a highly viscous nanohybrid bulk composite (GrandioSO x-tra, VOCO). The rounded ridge can be modelled using a slightly elastic sculpting spatula.

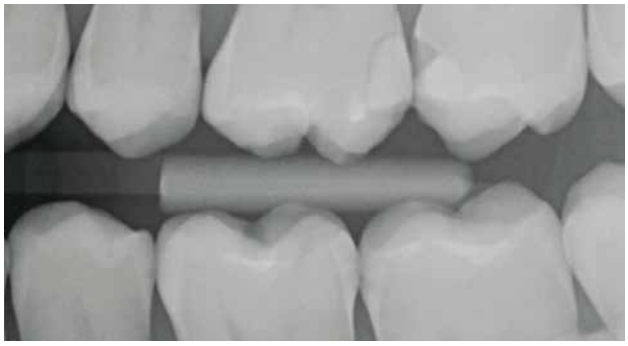

Fig. 2: The X-ray image confirmed the clinical findings in the second quadrant. With both tooth 37 mesial and tooth 36 distal approximal caries (C2) can be seen.

Fig. 7: Finally, the buccal and palatal cusp slopes are sculpted in stages using with the bulk-fill composite. Before placing the next matrix, the filling is finished and polished.

Fig. 3: The fillings are removed, the contour of the cavity is prepared and, in the same step, carious tooth substance is roughly removed. After smoothing the cavity margins, the teeth are isolated using a rubber dam.

Fig. 8: Tooth 26 after wedging the sectional matrix and application of a clamping ring: the distopalatal cusp slope and the approximal wall to the cavity floor are firstly built up.

Fig. 9: The matrix can only be removed from the approximal space by applying force; this is a sign of a good contact surface.

Fig. 10: After finishing, polishing and checking the functionality of both restorations, the patient is discharged.

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Dr. Walter Denner studied dentistry in Würzburg and then worked as a research associate in the Department of Restorative Dentistry and Periodontology at the University of Würzburg (Director: Prof. Dr. Klaiber). He was then employed as a dentist in Nuremberg (Dr. Lex's practice). He has been practising in the Denner & Denner practice in Fulda, Germany, since 2011. He became a member of the Neue Gruppe scientific association of dentists in 2013.

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