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Restoration of Severely Compromised Teeth With Modern Operative Techniques

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Clinical Relevance

The cases show that composites may be a valid alternative to indirect restorations.

SUMMARY

This case report illustrates how to restore severely compromised teeth with direct composite restorations. The size of the restorations presented is often considered by dentists as being a contraindication for direct composites. Hence, the technique is explained step by step, addressing the crucial points.

CASE 1

A 47-year-old male patient presented himself with an insufficient restoration on a first lower molar, displaying a fractured lingual cavity wall and multiple cracks in the buccal wall (Figure 1). The adjacent teeth were restored with old amalgam restorations that showed wear and small cracks in the restoration surfaces. However, these teeth were free of secondary caries, and the restorations were functionally intact.

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It was decided to replace the defective amalgam restoration on the first molar by a direct composite restoration and to keep monitoring the restorations on the adjacent teeth.

Clinical studies indicate that even large composite restorations including cusp replacements will perform clinically very well, provided the decisive steps in the clinical protocol are addressed adequately.[1-3]

Recently, every major dental manufacturer introduced a bulk-fill composite to facilitate the clinical protocol for direct composite restorations by allowing the operators to place layers of a thickness of 4 mm, thereby reducing the total number of layers that are needed to fill the cavity completely. At present, research confirms that these materials can be applied successfully with respect to the advocated layer thickness[4-7] without significantly compromising the marginal quality of the restorations[8-10] or survival rates.[11]

The downside of these materials is that they are quite translucent and no dark colors are available. Darker colors or higher opacity would counteract the polymerization of thick layers. Hence, the high translucency and rather light colors of bulk-fill materials may result in a certain optical mismatch to the surrounding dental hard tissues.

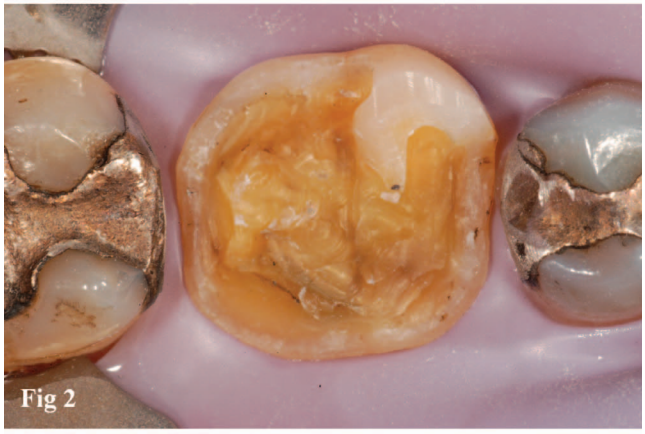

Figure 1. *Initial situation: The lingual cavity wall of a lower first molar was fractured. The buccal cusps displayed multiple cracks. The adjacent teeth showed old amalgam restorations with wear and small cracks in the restoration surfaces and marginal staining. However, these teeth were free of secondary caries and the restorations were functionally intact.*

Figure 2. *During preparation the distobuccal cusp came off. The remaining mesiobuccal cusp was reduced by approximately 1.5 mm.*

Figure 3. *The adhesive protocol included a selective enamel etching for 30 seconds and the application of a two-bottle self-etch adhesive. (AdheSE, Ivoclar Vivadent, Schaan, Liechtenstein).*

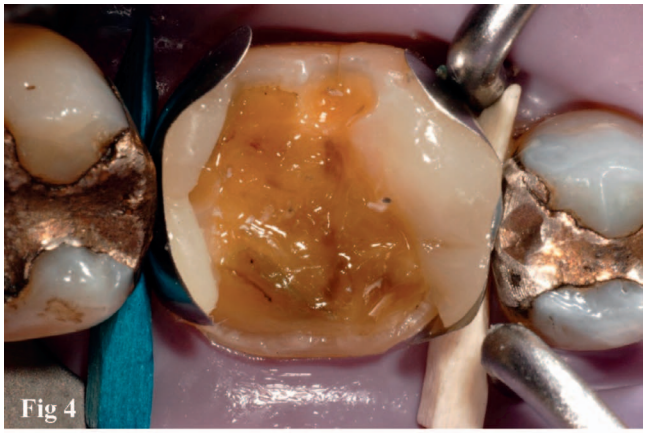

Figure 4. *After the application of sectional matrices (Composi-Tight, Garrison Dental Solutions, Spring Lake, MI, USA), the tooth was built up with a bulk-fill composite (Tetric EvoCeram Bulk-Fill, Ivoclar Vivadent), starting with the interproximal walls.*

Figure 5. *Third and fourth increment built up the buccal and lingual cavity walls.*

Figure 6. *The last two increments finished the occlusal part of the restoration.*

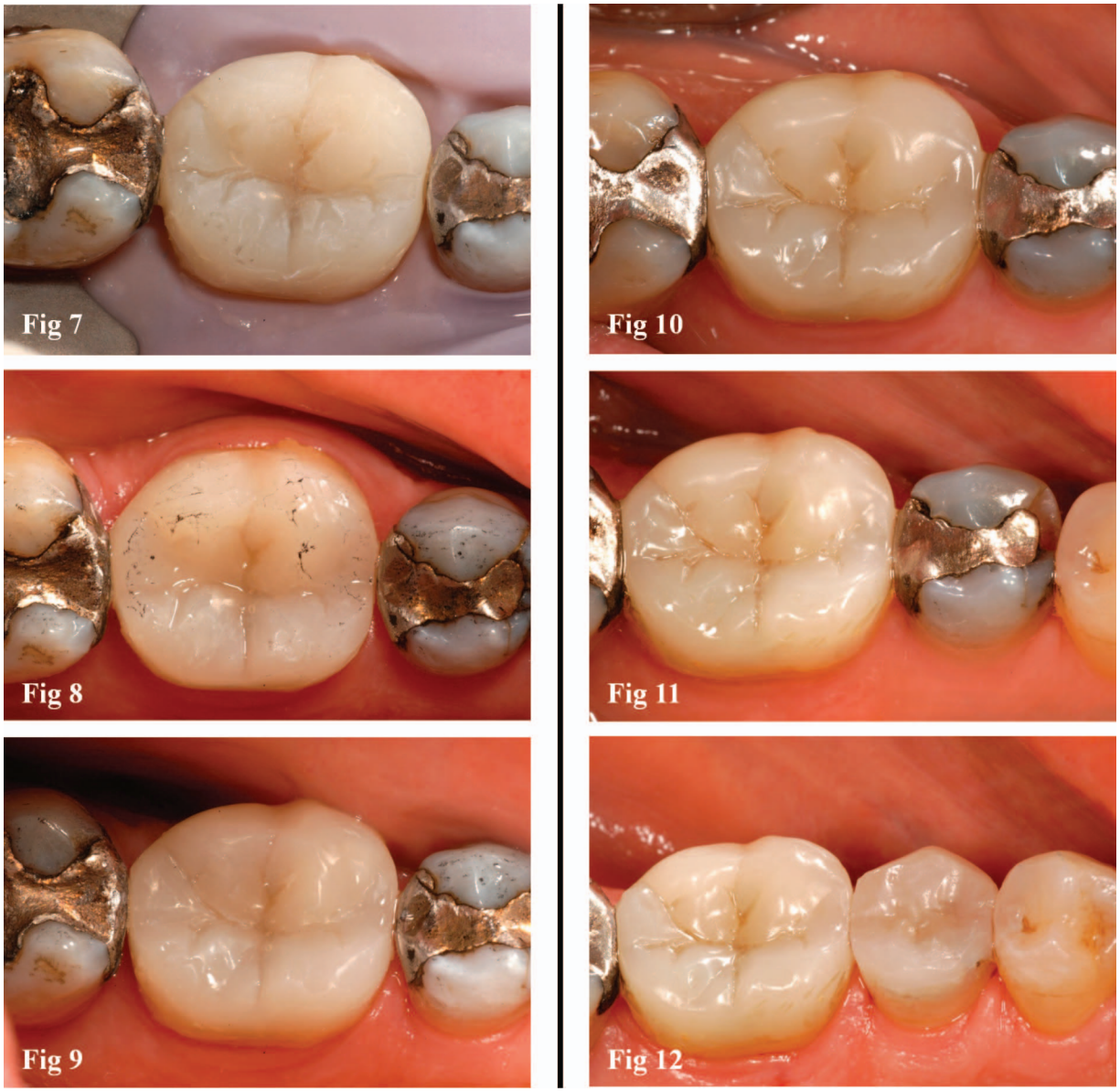

Figure 7. *Fine-grit diamonds and flexible polishing discs were used to adjust the shape of the restoration.*

Figure 8. *Situation after adjusting the occlusion.*

Figure 9. *Finished restoration.*

Figure 10. *Situation three years postoperative. The restoration looked virtually unchanged. The adjacent old amalgam restorations were still in service.*

Figure 11. *Shortly after, the mesial cavity wall of the adjacent premolar fractured.*

Figure 12. *Situation after replacement of the old amalgam restoration with a bulk-fill composite-restoration including the buccal and lingual cusps of the premolar.*

However, it has to be stated that in posterior restorations this mismatch is hardly visible to the patient and therefore should not be overly emphasized.

After the placement of a rubber dam, the old amalgam was removed. During the preparation, the distobuccal cusp chipped as a consequence of the multiple cracks. The finished preparation displayed three missing cusps and the mesiobuccal cusp being reduced by 1.5 mm (Figure 2). Interproximal cervical margins were beveled using oscillating instruments (SonicFlex, No. 58 and 59, KaVo, Biberach, Germany).[12] All remaining enamel margins were beveled[13] and finished with a fine-grit (40-μ) diamond to remove microcracks caused by the preparation.[14]

The preparation was followed by selective enamel etching for 30 seconds and the application of a two-step self-etch adhesive (Figure 3).[15] A sectional matrix was applied and the tooth was built up with six increments of a sculptable bulk-fill material (Figures 4-6). Each increment was light cured with a broad spectrum LED curing light (Bluephase G2, Ivoclar Vivadent, Schaan, Liechtenstein) for 20 seconds at 1200 mW/cm^2.

Light curing should be considered as one of the most critical steps in the clinical protocol of composite restorations. The most common reason for failure of composite restorations is the fracture of the restoration itself.[16] One of the factors contributing to this is very likely that the energy dose applied by the operators to cure the composite is often inadequate,[17,18] whereas the clinical performance is linked to the degree of polymerization.[18,19]

After the layering, the occlusion was adjusted and the restoration polished (Figures 7-9).

At the three-year recall (Figure 10), the restoration appeared to be virtually unchanged. The adjacent amalgam restorations were still in service. However, shortly after, the mesial wall of the adjacent premolar fractured (Figure 11), and the restoration was replaced again by a bulk-fill restoration including both cusps (Figure 12).

The case illustrates that dental resin composites can be used successfully even for large, cusp-replacing restorations. It further emphasizes the importance of a conservative approach to the replacement of "nonideal" restorations. When the patient presented himself with the fractured molar, the adjacent teeth were restored with amalgam restorations that showed wear, stained margins, and, on the premolar, even small cracks in the enamel and the restoration. However, these teeth were caries free and without any functional problems. Hence, the decision to monitor these restorations slowed down the cycle of redentistry for the premolar by three years, and even more so for the second molar, because this restoration is still in place.

Figure 13. *Initial situation.*

The decision to replace an old restoration is subjective, especially for restorations that were not placed by the current operator but another dentist, often leading to early replacement of functional restorations or, in other words, overtreatment.[19] Therefore, dentists should concentrate on preserving the health of the tooth and the functionality of existing restorations rather than exhaust the esthetic possibilities of modern materials at the cost of premature redentistry.

CASE 2

A 69-year-old female patient came to the clinic with a fractured upper right lateral incisor (Figure 13). The clinical records showed that the patient only saw a dentist erratically, when a restoration fractured or she suffered from dental pain. Her oral hygiene was moderate, and several old restorations showed signs of wear and marginal staining or disintegration; however, no active carious lesions were present.

The fractured lateral was free of caries and vital. The patient asked for a cost-effective, functional solution to the problem. The stained margins on the other anterior teeth were of no esthetic concern to the patient.

It was decided to restore the tooth with a direct composite buildup at the same appointment.


Fig 14


Fig 18


Fig 15


Fig 19


Fig 16


Fig 20


Fig 17


Fig 21

Figure 22. *Final situation, one week postoperative. The restoration had a natural appearance, displaying an incisal translucency and a halo effect.*

Figure 23. *One-year recall: The restoration showed excellent physical and optical stability. The stained restorations on the adjacent teeth were still in place and functional.*

After preparation, the enamel was selectively etched for 30 seconds, followed by the application of a two-bottle self-etch adhesive.

When no silicone key is available, the easiest way of building up an anterior tooth is the "finger-tip technique," where the index finger is used as an oral matrix on which to adapt the composite (Figure 14).[21,22] However, it has to be kept in mind that gloves do not prevent the penetration of dental monomers.[23,24] Hence, touching the uncured adhesive and composite can lead to direct skin contact with the monomers. Research has shown that the prevalence of allergic reactions of dental staff to monomers is rather high, with the most common allergen being 2-hydroxyethyl methacrylate.[25]

However, the penetration of monomers through dental gloves does not take place immediately. Depending on solvent of adhesive and type of gloves, breakthrough times were shown to be from 2.8 to 30 minutes, with nitrile gloves generally being better than latex gloves.[26] Therefore, it should be possible to use this technique without any risk by simply exchanging the glove after completing the finger-tip technique.

Modern composites allow rather simple anatomical layering techniques. The clinical crown in the

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Figure 14. *Finger-tip technique: The finger serves as an oral matrix, allowing to easily build up the oral wall. For this first layer of composite, an enamel color must be chosen (Empress Direct, enamel A4, Ivoclar Vivadent, Schaan, Liechtenstein). The layer should be kept as thin as possible (<1 mm). When done right, the finger-tip technique allows excess-free layering and brings the incisal edge into the right position. This way, later adjustments on the oral aspect of the restorations are minimized.*

Figure 15. *The polymerized first layer.*

Figure 16. *After the first layer was polymerized, a matrix was wrapped around and a wedge was placed. The finger then tightly adapted the matrix to the oral aspect of the first layer.*

Figure 17. *The mesial increment was placed, again using an enamel shade.*

Figure 18. *After repeating this technique likewise for the distal interproximal increment, the matrix and the wedges were removed.*

Figure 19. *The next step was the application of a dentin shade. This layer is decisive for the final translucency of the restorations. As with natural dentin, composite dentin shades are more opaque than enamel shades. Hence, the thicker the dentin layer that is placed, the more opaque the restoration will be. At the same time, lightness of the restoration will be increased because the opaque dentin shade will optically block out the dark background (the oral cavity) and reflect more incoming light. The key to success in anterior restorations is matching translucency. As a general guideline, for older patients, lower amounts of dentin shade are used because natural teeth become more translucent with age.*

Figure 20. *Finally, the oral aspect was covered with a layer of enamel shade.*

Figure 21. *The surface was polished with flexible discs (Sof-Lex Discs, 3M Espe, St Paul, MN, USA) and a one-step silicon polisher (OptraPol NG, Ivoclar Vivadent).*

present case was built up with just five layers (Figures 15-21) with a nano-hybrid composite, using an enamel shade and a dentin shade.

One week postoperative (Figure 22) and at the one-year recall, the restoration showed excellent stability and a harmonic integration (Figure 23).

The direct approach successfully addressed the needs of the patient without having to compromise on esthetics. Even though esthetics was not of concern to the patient, dentists should always try to achieve an ideal optical integration in the anterior section, especially given that this goal is quite easy to achieve with direct composite buildups.

Regulatory Statement

This study was conducted in Etzwilen, Switzerland, at the author's private practice.

Conflict of Interest

The author of this manuscript certifies that he has no proprietary, financial, or other personal interest of any nature or kind in any product, service, and/or company that is presented in this article.

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