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Paradigm change in the field of composite restorations

Achieving reliable results in a few steps with bulk-fill composites

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Major advances have been made in composite materials in recent years. With the advent of the bulk-fill technique, dentists can perform esthetic restorations very rapidly.

We are guided by paradigms in many areas in our lives and dentistry is no exception. For instance, for many years we placed implants and then waited for several months before fabricating the final prosthetic restoration. Then implants for immediate loading came along. While at first we were sceptical about this new technique, immediate loading has in the meantime become a proven treatment option for certain indications. Similar examples hold true for the direct restorative technique.

Not so long ago, we were told at dental school that composites had to be applied in several increments as this was the only way to control polymerization shrinkage. Over the years, new – and allegedly revolutionary – composite materials were developed. However, most of them failed to deliver their promise. Only recently has this begun to change and we are finally experiencing a true paradigm shift in composite technology.

Heavy body or packable composites represented initial attempts at developing composites that can be processed in similar ways as amalgams. These restoratives were designed for the restoration of Class I and II lesions in posterior teeth. They were also aimed at meeting the requirements of general dental practitioners, enabling a cost-effective application method. However, these packable materials were similar to the already existing hybrid composites in terms of their handling and material properties and did not show any improvements such as increased polymerization depth, improved sculptability or tighter contact areas.

What are known as bulk-fill composites were launched on the market a few years ago. These materials are available in a sculptable and a flowable consistency. The flowable composites are mainly used to replace dentin; manufacturers recommend covering the "dentin layer" with a universal composite. In Class II cavities, however, this is possible only to a certain extent because the material is in contact with the matrix on one or two sides and these areas cannot be covered with composite material at a later stage. As a result, the material is unprotected in the interproximal area and that is where the problem lies. Most of these materials should not be used without a covering layer. They contain large fillers, which diminish their polishability and increase their wear and surface roughness to clinically unacceptable levels. In this context, it should be pointed out that the filler sizes used in these materials vary largely.

By contrast, sculptable bulk-fill composites can be applied in a single increment. Nonetheless, the materials of this group also differ significantly from

one another: For instance, Tetric® N-Ceram Bulk Fill contains considerably smaller filler particles than QuiXfil® and x-tra fil® (Voco, Germany).

Requirements on the bulk-fill technique

A look at the properties of conventional composites and curing lights reveals several areas that should be improved to enable the application of the bulk-fill technique:

1) Polymerization shrinkage (especially shrinkage stress) should be considerably reduced. Reason: the amount of composite to be cured in one step will be comparatively high.
2) The depth of cure and light penetration should be at least 4 mm. Reason: "true" bulk fillings can only be placed if this parameter is met.
3) The working time of the material should be sufficiently long. Reason: the clinician needs time to adapt the composite properly to the cavity walls and remove any excess material.
4) Fast, easy and reliable access to all surfaces in need of restoration is a must, especially in the treatment of pediatric patients and patients with restricted capability of opening their mouth or TMJ problems. Reason: one-step curing should be ensured even in large cavities.

Below follows a clinical presentation that describes the restoration of two Class II cavities using the bulk-fill technique in line with the latest conventions.

Clinical case

A 28-year-old female patient presented with inadequate amalgam fillings (Fig. 1). The oral situation was assessed and the restorative treatment discussed with the patient. Then, a rubber dam was placed (OptraDam®) to prevent her from accidentally swallowing toxic particles during removal of the existing fillings (Fig. 2). Figure 3 shows the dimension and depth of the cavities after the amalgam was removed.

Mesial caries was additionally detected in both teeth. In such cases, a careful procedure is required.

When preparing proximal boxes, the rotary motion of the instruments is often of concern.

No matter how cautious we are when cutting the proximal tooth structure, the enamel of the adjacent tooth will often become damaged in the process. For this reason, oscillating instruments should be used. For instance, the Sonicflex handpieces (Kavo, Germany) oscillate in the sonic frequency range. Additionally, the Komet sonic tips (Brasseler, Germany) have been especially designed to feature a smooth

Fig. 1
Preoperative view

Fig. 2
A rubber dam was applied prior to removing the fillings to protect the patient from inhaling amalgam particles.

Fig. 3
The amalgam fillings were removed.

Fig. 4 An especially designed Komet sonic tip was attached to the oscillating Sonicflex handpiece to prevent the adjacent teeth from being damaged during cavity preparation.

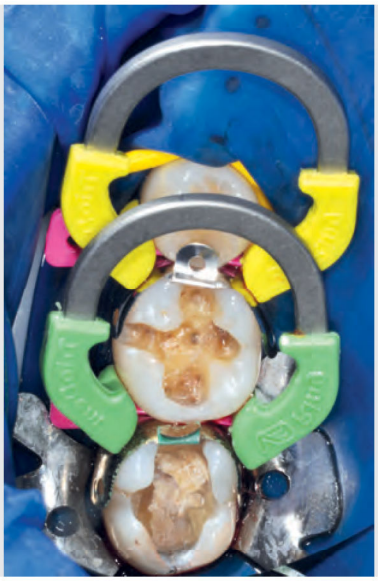

Fig. 5 Wedges and matrices were placed.

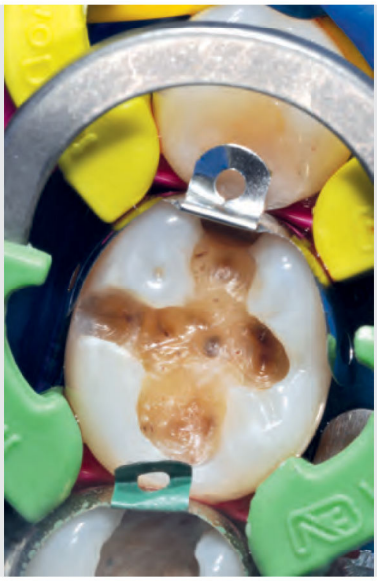

Fig. 6 The anatomical design of the matrix enables users to achieve tight contacts and an excellent adaptation.

Fig. 7 After enamel etching, self-etching Tetric N-Bond SE was applied.

side that stays in contact with the adjacent tooth during preparation and a diamond-coated side for cavity preparation (Fig. 4).

After preparation of both teeth, sectional matrices and anatomically shaped wedges and rings were placed (Triodent, New Zealand) (Fig. 5). Figure 6 shows the anatomical fit of the matrices to the proximal contours of the teeth. After enamel etching, a one-step bonding agent (Tetric

Fig. 8 The cavity was lined with a thin coating of Tetric N-Flow.

Figs 9a and b Then, Tetric N-Ceram Bulk Fill was applied in a single increment.

Fig. 10 Given their perforations, the matrices and wedges were easy to remove with specially designed Triodent tweezers.

Figs 11a and b One week later – a natural integration of the restorations

N-Bond Self-Etch) was applied (Fig. 7), followed by an initial layer of Tetric N-Flow composite as a cavity liner. The mechanical and physical properties of this flowable composite optimize the adaptation of the restorative material to the cavity walls (Fig. 8). Since the cavities were less than 4 mm deep, Tetric N-Ceram Bulk Fill was applied in a single increment in the bulk-fill technique (Figs 9a and b) and polymerized. Given the specially designed perforations, wedges and matrices were easily removed using Triodent tweezers (Fig. 10). Both restorations were polished with OptraPol® NG. Figures 11a and b show the completed restorations after one week. Esthetically and anatomically the restorations blend in well with their natural surroundings.

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