Today, direct composite restorations in posterior teeth are a part of the standard therapy spectrum in modern dentistry. The performance of this treatment method in the masticatory load-bearing posterior region has been conclusively proven in many clinical studies, even for extensive composite restorations with cuspal coverage.

These restorations are usually carried out in an elaborate incremental layering technique. Aside from the possibilities that highly aesthetic composites offer in the application of polychromatic multiple-layer techniques, there is also a great market demand for the most simple and quick and it is therefore economical to place bulk-fill composite materials for posterior teeth.

Introduction

In recent years, the indications for direct resin-based composite restorations were continuously expanded due to improvements in the technology of composite materials and related adhesive systems, as well as an optimisation of clinical treatment protocols in adhesive dentistry (Wolff et al, 2015; Hickel et al, 2004; Frese et al, 2014a; Frese et al, 2014b; Frese et al, 2014c; Frese et al, 2013; Roggendorf et al, 2012; Manhart and Hickel, 2014; Lynch et al, 2014; Stawarczyk et al, 2014; Manhart, 2011; Czasch and Ilie, 2013; Ilie and Stawarczyk, 2014).

Supplementary to bulk-fill composites based on traditional methacrylate chemistry, material options have recently been expanded by a nanohybrid ormocer version, demonstrates Juergen Manhart

Additional substance removal in many cases – are still the preferred option for most dentists (Lynch et al, 2014; Laegreid et al, 2014). Longevity studies on posterior composite restorations including cusp replacement show an acceptable performance and quality this treatment option as an alternative to conventional indirect restorations in selected clinical cases (Scholtanus and Ozcan, 2014; Laegreid et al, 2012; Deliperi and Bardwell, 2006a, Demarco et al, 2012; Scholtanus and Ozcan, 2014; Laegreid et al, 2014). The maximum preservation of hard tooth tissues using direct composites as an alternative to indirect onlays and partial crowns is one of the major advantages and key elements when restoring severely damaged teeth with cuspal involvement (Hickel et al, 2004; Lynch et al, 2014; Plotino et al, 2008; Denehy and Cobb, 2014; Brackett et al, 2007; Fennis et al, 2004; Segura and Riggin, 1999; Macpherson and Smith, 1994; Mondelli et al, 2013; Kois et al, 2013; Kantardziev et al, 2012; Xie et al, 2012; Elayouni et al, 2011; Kujs et al, 2006).

The replacement of single cusps with direct composite restorations is meanwhile an accepted treatment method and scientifically proven (Hickel et al, 2005). However, when the replacement of three or four cusps is needed in very large defects, indirect restorations – requiring additional substance removal in many cases – are still the preferred option for most dentists (Lynch et al, 2014; Laegreid et al, 2014). Longevity studies on posterior composite restorations including cusp replacement show an acceptable performance and quality this treatment option as an alternative to conventional indirect restorations in selected clinical cases (Scholtanus and Ozcan, 2014; Laegreid et al, 2012; Deliperi and Bardwell, 2006a, Demarco et al, 2012; Scholtanus and Ozcan, 2014; Laegreid et al, 2014). The maximum preservation of hard tooth tissues using direct composites as an alternative to indirect onlays and partial crowns is one of the major advantages and key elements when restoring severely damaged teeth with cuspal involvement (Hickel et al, 2004; Lynch et al, 2014; Plotino et al, 2008; Denehy and Cobb, 2014; Brackett et al, 2007; Fennis et al, 2004; Segura and Riggin, 1999; Macpherson and Smith, 1994; Mondelli et al, 2013; Kois et al, 2013; Kantardziev et al, 2012; Xie et al, 2012; Elayouni et al, 2011; Kujs et al, 2006).

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currently not suitable for placing clinically durable permanent restorations in load-bearing posterior cavities, since their mechanical properties are inadequate for this indication (increased risk of fracture or wear in the areas affected by masticatory loads).

Therefore, cements should only be used for intermediate restorations of long-term temporary use (Häckel et al, 2005; Frankenberger, et al, 2009; Lohbauer, 2010; Burke and Lucattari, 2009, Scholantius and Huymans, 2007). Moreover, core build-up cements are not approved for use as restorative materials and they are not suitable for this purpose due to their specific handling properties (e.g., lack of sculptability for the design of the occlusal surface anatomy).

Technically, the present bulk-fill composites that are available for the simplified restoration of posterior teeth are not really bulk-fill materials, because in particular many proximal cavities extend into areas that are deeper than the maximum curing depth of these materials (4–5mm) (Frankenberger et al, 2012b). Nonetheless, if suitable composites are used, cavities with a depth of up to 8mm – which includes most of the defects seen on a daily basis in dental clinics – can be restored with two increments.

Most dental restorative composite materials contain organic monomer matrices based on traditional methacrylate chemistry such as bisphenol A dimethacrylate (bis-GMA) and its derivatives urethane dimethacrylate (UDMA) and triethylene glycol dimethacrylate (TEGDMA) as being the most often used diluent monomer (Pfeutzfeldt, 1997). Alternative chemical formulations use silorane monomers (Guggenberger and Weinmann, 2000; Weinmann 1997). Alternative chemical formulations use silorane monomers.

In addition to initiators, stabilizers, pigments and inorganic fillers, ormocers (Manhart et al, 1999a; Wolter and Storch, 1992; Ilie and Hickel, 2011). Thus, it is better to refer to these materials as ormocer-based composites.

According to the manufacturer (Voco), Admira Fusion x-tra, the bulk-fill ormocer newly introduced in 2015, does not contain any conventional dimethacrylates and instead contains a hybrid organic-inorganic Si-O-Si-glass network. Inorganic-organic copolymeric hybrid materials that are composed of an inorganic Si-O-Si-glass network (backbone molecule) and an organic polymer matrix (Wolter et al, 1998; Moszner et al, 2002; Moszner et al, 2003). In the meantime, a new material group was developed by Fraunhofer Institute for Silicate Research ISC, Würzburg, in cooperation with partners from the dental industry and showed an insufficiently shaped direct composite restoration in the area of the replaced distolingual cusp and distal marginal ridge, which resulted in frequent failures and negative consequences. In consultation with the patient and after an explanation of the possible restorative alternatives and treatment fee, the patient decided on a direct nanohybrid ormocer restoration using Admira Fusion x-tra (Voco).

Treatment started with thoroughly cleaning the affected tooth of external deposits using a fluoride-free prophylaxis paste and a rubber cup. Admira Fusion x-tra is only available in one single universal shade, which renders a detailed and sometimes time-consuming shade analysis unnecessary. After careful removal of the old insufficent composite restoration, while conserving the remaining hard tissues, the tooth was excavated and the root canal openings were covered with a glass ionomer base (Ionostat Plus, Voco).

The cavity was finished with a fine-grit diamond bur. The tooth was subsequently isolated with the application of rubber dam, and the defect was filled with a circular metal matrix (Figure 2). The rubber dam separates the operation site from the oral cavity, facilitates clean and effective work and ensures that the working area remains clean of contamination (eg blood, salus fluid and saliva). Contamination of the enamel and dentin would result in markedly poorer adhesion of the composite to the dental hard tissues and endanger the long-term success of the composite restoration with optimal marginal integrity.

Additionally, the rubber dam protects the patient from irritating substances such as the adhesive system.

**Clinical case presentation**

A 34-year-old male patient requested in our dental office the replacement of his composite restoration in his LL6 (Figure 1). The tooth was endodontically treated and showed an insufficiently shaped direct composite restoration in the area of the replaced distolingual cusp and distal marginal ridge, which resulted in frequent failures and negative consequences. In consultation with the patient and after an explanation of the possible restorative alternatives and treatment fee, the patient decided on a direct nanohybrid ormocer restoration using Admira Fusion x-tra (Voco).

Treatment started with thoroughly cleaning the
physiologically correct formed proximal area with tight contacts to the adjacent tooth (Figure 7).

By controlled pressure, the hand instrument is forced towards the mesial surface of the neighboring tooth, anatomically shaping the metal matrix and simultaneously forming a cervical composite ridge, which stabilises the matrix after polymerisation (20 seconds, light power >800mW/cm²) – the instrument is kept in place during light curing – and ensures a tight proximal contact (Figure 8). The formation of physiologically contoured proximal surfaces with tight contacts to neighboring teeth still represents a challenge when using direct composite restorations.

In contrast to amalgams, composites show a certain viscoelastic recovery from distortion, which is often seen as undesirable by the user and complicates the adaptation of matrices to the neighboring tooth by packing pressure (Manhart, 2001; Kunzelmann 2001).

**Final stages**

With the next increment of Admira Fusion x-tra the distal proximal wall was completed up to the marginal ridge and the outer contours of the missing distolingual cusp were built (Figure 9). The material was again polymerised with a high-performance curing light for 20 seconds – and ensures a tight proximal contact using the convexity of the cusps and triangular ridges. After the elimination of occlusal interferences and adjustment of the static and dynamic occlusion (Figure 13), the accessible proximal areas were contoured and prepolished with abrasive disks. The use of diamond-finishing sequence, a point-shaped fine-grit diamond was then used to finish the convexity of the cusps and triangular ridges.

**Conclusion**

Composite-based direct restorative materials will gain in importance in the years to come. These restorations present a scientifically proved, high-quality permanent treatment option for the masticatory load-bearing posterior region and their reliability has been documented in literature (Heintze and Rousson, 2012; Da Rosa et al, 2011; Van De Sande et al, 2015; Mahnart et al, 2004; Opdam et al, 2014). Even cuspal coverage direct composite restorations are meanwhile used frequently and prove to be a viable alternative to conventional indirect restorations in selected clinical cases (Scholz and Urban, 2014; Laegreid et al, 2012; Deliperi and Bardwell, 2006b; Opdam et al, 2008; Fennis et al, 2014). The growing economic pressure on the healthcare system and, in many cases, a lack of financial means on the part of patients with regard to additional payments adequate to services, are creating a need for reliable, easy-to-use, faster-to-complete and therefore more economical basic posterior restorative treatment options as an alternative to the time-consuming high-end solutions (Margaz, 2014).

In addition to the universal hybrid composites, which are available in various shades and levels of opacity, new bulk-fill composites with optimised depth of cure have lately emerged on the market. They are specially designed for use in posterior dentition, where they produce aesthetically pleasing restorations. The placement procedure is economically more efficient than that of conventional hybrid composites (Manhart et al, 2009; Fennis et al, 2014).

**References**


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