Meeting challenges successfully with esthetic posterior restorations

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In the forties, first attempts were made at developing dental restorative materials based on acrylic acid, a substance that had been discovered in 1843. The results were not very satisfactory, however, as the material showed proneness to discolouration and polymerization shrinkage. As a consequence, recurrent decay and inflammation of the pulp occurred very frequently. In the midfifties, the American Raphael Bowen succeeded in creating a composite material that was suitable for use as a dental restorative. Based on a resin molecule he had developed himself, he produced a resin matrix and added inorganic filler particles (quartz powder) to it. Even though from the sixties onwards composite materials were available that opened up new esthetic possibilities, they still did not represent a reliable clinical solution. In order to provide dentists with a restorative that would enable them to meet the challenge of restoring teeth both functionally and esthetically, the composite materials were consistently further developed. Simultaneously, the restorative procedures underwent several modifications, so as to ensure that perfect restorations could be created. Dental professionals who keep themselves updated on the most recent developments are clearly noticing a trend towards more shade nuances, smaller filler particles and improved processing properties.

Composite resins are primarily used to esthetically restore teeth using minimally invasive procedures. They allow dental professionals to place restorations that seamlessly blend in with the natural dentition while preserving valuable tooth structure. Suitable restoratives applied in combination with the respective techniques are requisite for the artistic reconstruction of the missing tooth structure and the establishment of a sound bond between the restoration and the natural tooth structure. Moreover, the procedure should be guided by the biological principles of natural tooth form and function. The low cost and the dentist's independence of laboratory work clearly speak in favour of composite restorations. As a result, it makes good sense to use composites rather than amalgam, gold or ceramic inlays wherever possible.

Only recently, a new generation of micro-hybrid composites have been developed, which incorporate nanotechnology and nano-particles. As the new materials are suitable for use both in the anterior and posterior region, they are referred to as universal composites. The formulation of the new universal composite Tetric N-

Figure 1: Preoperative situation.

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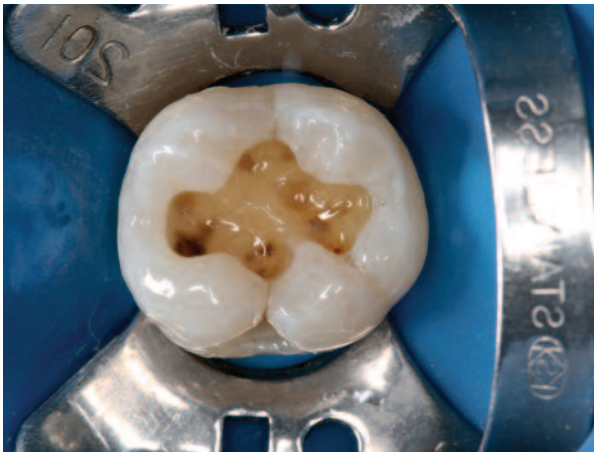

Figure 2: Pre-treatment of the cavity with Tetric N-Bond.

Figure 3: Reconstruction of the dentin layer using the incremental technique in conjunction with Tetric N-Ceram Shade A3.5 Dentin

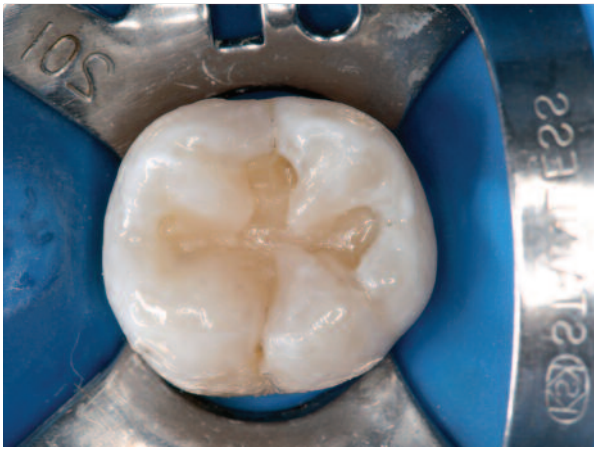

Figure 4: The occlusal surface design was created with Tetric NCeram A1.

Figure 5: Result after characterization with Tetric Color.

Ceram combines high-tech components with the proven ingredients of the predecessor product Tetric® Ceram. The result is a composite material that features outstanding optical and mechanical qualities. Tetric NCeram is thus suitable for use in conjunction with state-of-the-art procedures that use a straightforward approach and are capable of reproducing the fine details of the natural tooth anatomy.

Clinical case

A 32-year-old female patient requested that a defective Class I amalgam filling in tooth 37 be replaced with a more esthetic restoration. The clinical and radiological examination neither revealed secondary caries below the restoration nor along its margins (Figure 1).

Removal of the old filling and cavity preparation

The amalgam filling was removed with diamond grinders at high speed. This was followed by cavity preparation. The cavity walls were designed perpendicular to the tooth surface and the inner line angles were rounded. Moreover, a one-surface cavity was prepared on the vestibular aspect.

Subsequently, the shade was determined with the help

Figure 6: Verification of occlusion.

Figure 7: Completed restoration after final polishing.

of the Tetric N-Ceram shade guide. From the range of shades available, A3.5 was chosen for the dentinal portion and A1 for the enamel portion. To ensure complete moisture control, OptraDam® rubber dam was placed and solely attached to tooth 37 with a rubber dam clamp (KSK no. 201). This was done to protect the adjacent teeth during the procedure.

Application of the adhesive

For the etching procedure, 37% phosphoric acid was used. In a first step, the enamel margins were etched for 30 seconds. To condition the dentin, etching gel was applied into the cavity for 15 seconds. Following this, the entire preparation surface was rinsed with copious amounts of water to remove the etching gel. Subsequently, first the enamel and then the dentin were dried with absorbent paper. This ensured better control of the amount of moisture that remained on the dentin and thus allowed more reliable adhesion to be achieved.

The adhesive used was Tetric® N-Bond. A thin coat was applied to the entire cavity (Figure 2). The adhesive had to be brushed into the prepared surface for 10 seconds prior to applying a second layer, as only in this way is it capable of performing its function. The second layer was again brushed in for 10 seconds. Excess adhesive can be removed with microbrushes or absorbent paper. The solvent was cautiously evaporated with blown air. Following this, the adhesive was light-cured for 10 seconds using bluephase® in the Low Power mode.

Composite build-up

The lost dentin was replaced by applying Tetric NCeram Shade A3.5 Dentin in small increments (Figure 3). This procedure was chosen to minimize possible negative effects due to polymerization shrinkage. Due to its high content of inorganic filler, Tetric N-Ceram shows only low polymerization shrinkage. This is achieved by means of the pre-polymer technology employed, which provides the material with improved properties.

Each composite increment was light-cured for 15 seconds using the Soft Start program. Tetric N-Ceram Shade A1 was used to replace the enamel layer and reconstruct the occlusal anatomy. First the central portion and then the sides of the cusp slopes were re-built. The main fissure was sculpted using a fine probe. Throughout the entire procedure, each new increment placed was light-cured for 15 seconds using the Soft Start program. For characterization, Tetric® Color Dark Brown was applied to the centre of the main fissure. If required, Tetric Color White can be selectively placed along the cusp slopes (Figures 4 to 6). The stains were then light-cured for 20 seconds using the High Power program.

Prior to final polymerization, the entire restoration was coated with a gel in order to prevent exposure of the restoration surface to oxygen. Then the restoration was light-cured for 40 seconds using the High Power program.

The use of high-quality materials in combination with suitable techniques ensures predictable reconstructions which seamlessly blend in with the natural tooth structure (Figure 7). Composites are the material of choice particularly for repairing front teeth, but also for the restoration of small defects in the posterior region.

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