Replacement of defective metal-ceramic restorations with composites

Fig. 1: Post-operative situation showing a defective amalgam restoration on tooth 16.

Fig. 2: Selective etching of the enamel (15 seconds).

Fig. 3: Etching of dentine (10 seconds).

Fig. 4: The adhesive Tetric N-Bond completely coats the enamel and dentine. The surface of the tooth structure has a homogeneous shiny appearance.

Fig. 5: Reconstruction of the proximal box.

Fig. 6: The restoration material is applied in increments as is the case with composites. In the placement of amalgam, dentists prepare the teeth in such a way that the fillings are retained mechanically. Consequently, an excessive amount of healthy tooth structure usually has to be removed and accurate planimetry is requisite. In many cases, corrosion products are found in the tooth substance after the amalgam has been removed. These stains are very difficult to mask and therefore compromise the final aesthetic appearance of the new restoration.

The following case study demonstrates the outstanding results that can be achieved by replacing old amalgam fillings with Tetric N-Ceram and Tetric Color.

Clinical case

Marginal defects, secondary caries and increased sensitivity to temperature changes constituted the main reasons that this patient wished to have the amalgam restoration in tooth 16 replaced (Fig. 1). At the second appointment, the restoration and the various dental tissues were removed once the clinical and radiographic diagnosis had been made. In order to save as much healthy tooth structure as possible, the cavity was not enlarged. The working field was isolated.

Next, the tooth was conditioned with a clinically proven etchant, which was subsequently rinsed off before the adhesive was applied: total etch technique in conjunction with Tetric N-Bond. Selective acid etching is currently the most effective technique available for conditioning tooth structure. For this technique, dental enamel is conditioned for 20 to 30 seconds and dentine for 5 to 10 seconds (Figs. 2 & 5).

After the etching process, the adhesive is applied and allowed to infiltrate the most dentine substrate and then polymerised. It is essential that the adhesive cover the entire preparation in order to ensure hermetic sealing of the dentine tubules and the formation of an even and sound hybrid layer. Once the tooth structure is properly sealed, the risk of post-operative sensitivity can be excluded (Fig. 4).

In the case at hand, a stabilised metal matrix was used to create a tight proximal contact. The matrix was adapted to the tooth with rubber wedges. Subsequently, Tetric N-Ceram was placed in the proximal box (Fig. 5) and then on the occlusal surface. A pyramid-shaped build-up scheme was implemented in order to ensure the proper morphology and reduce the subsequent finishing and polishing work. Furthermore, this technique enables the adequate management of the unfavourable configuration factor (C-factor), which usually presents a problem in posterior cavities and those that were previously restored with amalgam in particular.

It is important to observe an increment thickness of a maximum of 2 mm. Polymerisation must be conducted properly to ensure a high conversion rate in the composite and to optimise the physio-mechanical properties. The different materials and levels of opacity selected for this case are shown in Figure 6. It was important to use a material that exhibits a high level of opaqueness and colour intensity for the first layer (Tetric N-Ceram, A3.5 Dentin).

Subsequently the restoration was characterised with Tetric Color ochre and white (Figs. 7 & 8). Next, an enamel layer was applied with which a high level of brightness was attained (Tetric N-Ceram Bleach L; Figs. 9 & 10).

Over the years, the placement of composite restorations has developed into a routine clinical procedure that produces outstanding aesthetic and functional results. The composition and structure of dental composites has been consistently refined in an effort to optimise them for these applications. As a result of patients’ growing demand for aesthetic solutions, amalgam fillings are often replaced with composite restorations. Patients feel that tooth-coloured restorations improve their well-being and make them look healthy.

The replacement of amalgam fillings, however, is a challenging task for the dentist. In most cases, the cavity shape is unsuitable for placing the composite material. Furthermore, contraction stress is more likely to build up when a fillable, tooth-coloured restorative material is applied in increments as is the case with composites. In the placement of amalgam, dentists prepare the teeth in such a way that the fillings are retained mechanically. Consequently, an excessive amount of healthy tooth structure usually has to be removed and accurate planimetry is requisite. In many cases, corrosion products are found in the tooth substance after the amalgam has been removed. These stains are very difficult to mask and therefore compromise the final aesthetic appearance of the new restoration.

The following case study demonstrates the outstanding results that can be achieved by replacing old amalgam fillings with Tetric N-Ceram and Tetric Color.

Clinical case

Marginal defects, secondary caries and increased sensitivity to temperature changes constituted the main reasons that this patient wished to have the amalgam restoration in tooth 16 replaced (Fig. 1). At the second appointment, the restoration and the various dental tissues were removed once the clinical and radiographic diagnosis had been made. In order to save as much healthy tooth structure as possible, the cavity was not enlarged. The working field was isolated.

Next, the tooth was conditioned with a clinically proven etchant, which was subsequently rinsed off before the adhesive was applied: total etch technique in conjunction with Tetric N-Bond. Selective acid etching is currently the most effective technique available for conditioning tooth structure. For this technique, dental enamel is conditioned for 20 to 30 seconds and dentine for 5 to 10 seconds (Figs. 2 & 5).

After the etching process, the adhesive is applied and allowed to infiltrate the most dentine substrate and then polymerised. It is essential that the adhesive cover the entire preparation in order to ensure hermetic sealing of the dentine tubules and the formation of an even and sound hybrid layer. Once the tooth structure is properly sealed, the risk of post-operative sensitivity can be excluded (Fig. 4).

In the case at hand, a stabilised metal matrix was used to create a tight proximal contact. The matrix was adapted to the tooth with rubber wedges. Subsequently, Tetric N-Ceram was placed in the proximal box (Fig. 5) and then on the occlusal surface. A pyramid-shaped build-up scheme was implemented in order to ensure the proper morphology and reduce the subsequent finishing and polishing work. Furthermore, this technique enables the adequate management of the unfavourable configuration factor (C-factor), which usually presents a problem in posterior cavities and those that were previously restored with amalgam in particular.

It is important to observe an increment thickness of a maximum of 2 mm. Polymerisation must be conducted properly to ensure a high conversion rate in the composite and to optimise the physio-mechanical properties. The different materials and levels of opacity selected for this case are shown in Figure 6. It was important to use a material that exhibits a high level of opaqueness and colour intensity for the first layer (Tetric N-Ceram, A3.5 Dentin).

Subsequently the restoration was characterised with Tetric Color ochre and white (Figs. 7 & 8). Next, an enamel layer was applied with which a high level of brightness was attained (Tetric N-Ceram Bleach L; Figs. 9 & 10).
The aesthetic result produced using this technique ensures the predictable and precise placement of the restoration. In addition, the composite features a ‘chameleon effect’, which enables it to blend in with its surroundings to enhance the overall aesthetics. Once the morphology of the tooth has been reconstructed, it is advisable to coat the entire restoration surface with a water-soluble gel and to polymerise the restoration for 60 seconds (Fig. 11). This step removes the oxygen inhibition layer and minimises the finishing and polishing work. The objective is to keep adjustments and corrective measures to a minimum and to maintain the obtained shape if possible. Astropol and Astrobrush are suitable for finishing the margins. These auxiliary aids help to achieve a high gloss surface finish (Figs. 12 & 15). The quality of the finish, however, is not only based on the use of a suitable polishing system, such as the one employed in the present case. The size, distribution, amount and type of composite particles also play an important role. These factors need to be in perfect equilibrium to achieve an ideal combination of mechanics, aesthetics and minimal contraction.

Conclusion
Today, the direct restoration of posterior teeth with composites is considered a clinically proven restorative option that produces highly predictable results. Adhesive dentistry offers numerous benefits, which not only concern the aesthetics of teeth, but also the management of healthy teeth and optimal marginal seal. Nevertheless, we must work precisely and observe the clinical protocols to achieve the desired results. An important step in this process is the use of a composite that fulfils all the prerequisites related to optimal clinical behaviour. We chose to use Tetric N-Ceram to solve the present clinical case because it demonstrates all the properties necessary for producing a highly aesthetic and functional restoration.

Acknowledgements
I would like to thank Dr. Manuel Gajardo G and Dr. Ramón Schlieper C, who were instrumental in compiling the pictures and preparing the layering scheme for this clinical case. I would like to take this opportunity to express my appreciation for their continuous support of our academic work.

Fig. 12: Occlusal view of the completed restoration one week later. The aesthetic integration of the composite in the tooth structure has been achieved.—Fig. 13: Lingual view of the completed restoration made of Tetric N-Ceram.