Not all dental filling materials are equal
Selecting the best choice for posterior restorations

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Glass ionomer cements (GICs) and composite resins have been successfully used for a variety of indications in direct filling procedures for many years. Both materials are considered to be excellent amalgam alternatives, but they both have their respective strengths and weaknesses. Over time, the spectrum of their applications has grown wider and more sophisticated.

GICs chemically bond to the tooth structure and release fluoride over time. Moreover, they are easy to use and biocompatible. GICs are composed of polyalkenoic acid and glass powder, mainly aluminiumfluorosilicate glass. An initial acid-base reaction occurs when the powder and liquid are mixed. A salt gel matrix is formed and a completely cross-linked structure results, which assists in the setting of the cement.1,4

Conventional glass ionomers were introduced in 1972,3 followed by metal-reinforced GICs containing either silver or gold.4 In 1992, the first resin-modified GICs appeared on the market.5,6 Current research efforts are focused on using acids with a high molecular weight, which would heighten the viscosity of the product and accelerate curing.

The applications of GICs range from cementation and lining procedures to the placement of Class V restorations and small dentinious tooth fillings. Nevertheless, it is important to note that the adhesive strength of GICs is relatively low (only 3 to 7 MPa).8,9 Furthermore, the problem of marginal integrity and seal must be taken into consideration. Even though GICs demonstrate a thermal coefficient of expansion similar to that of natural tooth structure,10 glass ionomer fillings often show marginal leakage. Several studies have found that composite resins have higher success rates with regard to marginal integrity than GICs in enamel.4

The most important characteristic of GICs is probably their ability to release fluoride when the components are mixed. This continues gradually without negatively influencing the mechanical properties of the material.11 Moreover, GICs are capable of absorbing topicaly applied fluoride and releasing this component over an extended period.12 Therefore, GICs are considered to have a cariostatic effect in clinical use.13 However, carious lesions are often found along the margins of GIC restorations.

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distinct appearance of a GIC. Secondary caries had formed in the distal area. According to the patient, it had been placed less than two years previously. Furthermore, we took note of a filling made of Tetric Ceram (Ivoclar Vivadent) in tooth #46 that had been placed in our surgery more than eight years ago. The restoration was clearly worn out after all this time. Nevertheless, the margins were still intact (Fig. 1).

We recommended that the filling in tooth #47 be replaced. Figure 2 shows the working field isolated with a rubber dam (OptraDam Plus, Ivoclar Vivadent) to ensure clean and safe placement of the restorative material. The old filling was removed and carious tissue was excavated. An adhesive (Tetric N-Bond Self-Etch) was placed directly on the tooth structure and scrubbed in for 30 seconds (Figs. 3a & b). The solvent was evaporated with a strong stream of air. Then, the surface was light-cured with a third-generation LED polymerisation unit for 10 seconds.

First, a layer of flowable composite resin (Tetric N-Flow) was placed in the cavity (Fig. 4) and light-cured for 10 seconds. Subsequently, the filling was built up with shade A2 of the universal composite resin Tetric N-Ceram. A non-stick modelling instrument (OptraSculpt, Ivoclar Vivadent) was used, with which the cusp slopes and tips were faithfully reproduced. This instrument is supplied with various working tips to satisfy different clinical indications. In this case, the chisel shape with the pointed tip end was used to sculpt the fissures.

The restoration was built up in four steps. One cusp was modelled and light-cured at a time. Figure 5 shows the situation after the distal cusps had been polymerised. In Figure 6, a mesial cusp is sculpted. Only as much composite resin as was necessary was applied and light-cured.

As a result, very few occlusal adjustments were necessary. After occlusal grinding, the restoration was polished with OptraPol Next Generation rubber tips (Ivoclar Vivadent, Fig. 8), which have a high diamond crystal content (72 wt %). This high diamond content achieved excellent polishing results in only one step. Figure 9 shows the finished filling with the marked contact points.

A complete list of references is available from the publisher.