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.

Conventional glass ionomers were introduced in 1972, followed by metal-reinforced GICs containing either silver or gold. In 1992, the first resin-modified GICs appeared on the market. 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 decussant tooth fillings. Nevertheless, it is important to note that the adhesive strength of GICs is relatively low (only 3 to 7 MPa). 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, 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.

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. Moreover, GICs are capable of absorbing topical applications of fluoride and releasing this component over an extended period. Therefore, GICs are considered to have a cariostatic effect in clinical use. However, carious lesions are often found along the margins of GIC restorations.

The amount of fluoride to be released by GICs is not a critical issue. As is the case with many total-etch adhesives—irrespective of one-step or two-step systems—has reduced the entire treatment time, which is no longer possible with two-step systems—has reduced the entire treatment time. Moreover, the evaporation of the solvent after the application of the bonding agent and the smear layer is not removed. Instead, infiltration takes place. As a result, the dentinal tissue is easy to dry and post-operative sensitivity is reduced. Furthermore, the evaporation of the solvent after the application is not a critical issue. As is the case with many total-etch adhesives, a mixture of different solvents, rather than just one, is used. In this context, it is important to note that strong adhesion to dental enamel can only be achieved with phosphoric acid etching.

Nowadays, composite resins have the only two-step systems compared with GICs: they take longer to place and the application protocol is faster. The life difference is not significant if the entire resin procedure, including examination, diagnosis, anaesthetics, excavation, preparation, isolation, and finishing and polishing, is considered. The development of self-etching adhesives—irrespective of one-step or two-step systems—has reduced the entire treatment time considerably. The introduction of self-etching adhesives has also helped to reduce technique sensitivity and increase the reproducibility of results.

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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. Figure 7 shows an occlusal view of the filling before polishing. The natural-looking anatomy is clearly evident, as well as the worn eight-year-old filling in tooth #46 and its intact margins. 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.

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Fig. 1: View of the distal cusps after light-curing. — Fig. 2: Sculpting of the mesial cusps. — Fig. 3: Occlusal view of the filling before polishing. — Fig. 4: Final polishing in one step with a large “flame” tip. — Fig. 5: Result of the occlusal inspection.