Long-term documentation of an 11-year old restoration

A case of complex aesthetic and functional rehabilitation using glass-ceramic materials

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Resin-bonded single-tooth glass-ceramic restorations such as veneers and onlays have been routinely used for many years in dentistry. Nonetheless, their use for complex rehabilitations such as in patients with generalised hard-tissue defects, for example, is still much debated. These concerns are increasingly being resolved in view of the beneficial preliminary results reported in controlled clinical studies and the experiences gained in specialist practices.

It is essential for the long term and reliable application of this method to accurately coordinate the stages between the dentist and technician and allow the patient to be actively involved. These stages consist of a careful treatment planning process, including a study wax-up/mock-up (esthetic evaluation), an adequate pretreatment phase, including a functional evaluation, selection of the correct materials, combined with a preparation and placement technique appropriate for the materials selected, and implementation of an adequate occlusal design. This case report first describes the use of glass-ceramic restorations for the complex rehabilitation of a patient with extensive loss of tooth structure and then evaluates the restorations after they have been in situ for more than 11 years.

Clinical situation and treatment

A 40-year-old female presented at the practice requesting restoration of her dentition, which was severely worn. She said that she had begun to experience increased sensitivity to thermal and chemical stimuli and complained about the unfavourable aesthetic appearance of her teeth (Fig. 1). When we recorded her dental history, she told us that she had become aware of an untoward change in her anterior teeth and in the fullness of her lips, particularly evident in photographs of herself.

The clinical findings and dental history showed large and, at times, extensive destruction of her tooth structure, as well as extensive changes in the proportion and exposure of dentine owing to the reduction in VDO. When we recorded her dental history, she told us that she had become aware of an untoward change in her anterior teeth and in the fullness of her lips, particularly evident in photographs of herself.

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Fillings were placed on the teeth, some of which were severely damaged, with help of an adhesive composite system (Syntac and Tetric EvoCeram, both Ivoclar Vivadent) prior to planning of the permanent restoration. This way, we were able to better assess the severity of the destruction and obtain a better idea of where the potential preparation margins would be located. In order to achieve an aesthetic and functional rehabilitation, we had to create an adequate tooth morphology on the basis of a suitable width–length relationship of the teeth, establish an anterior canine-protected dynamic occlusion and rebuild the VDO.

The destructive processes to which the damaged teeth had been exposed had to be stopped and a stable occlusion had to be created. The patient wanted a long-lasting rehabilitation based on a minimally invasive procedure and tooth-coloured restorations. The final restoration would include adhesively bonded glass-ceramic veneers and onlays. Glass-ceramic crowns would be used for those teeth that were severely damaged (Fig. 8c–g).

IPS e.max Ceram, both Ivoclar Vivadent) were used for the maxillary anterior region, which showed a high degree of tooth destruction (large composite fillings, Fig. 8a). The onlay of tooth #24 after more than six years of clinical performance. This way, we were able to better assess the severity of the destruction and obtain a better idea of where the potential preparation margins would include adhesively bonded glass-ceramic veneers and onlays.

IPS e.max Ceram, both Ivoclar Vivadent) were used for the maxillary anterior region, which showed a high degree of tooth destruction (large composite fillings, Fig. 3a). In the mandibular anterior region, glass-ceramic veneers layered on refractory dies (IPS eSIGN, Ivoclar Vivadent) were placed (Fig. 3b). Full-contour onlays pressed from leucite-reinforced glass-ceramic similar to the other veneers, this area was in direct contact with the lithium disilicate crowns on the maxillary anterior antagonists during dynamic occlusion.

**Conclusion**

Given the enamel-like properties of the glass-ceramic material, the minimally invasive methods used for this case provided a long-lasting approach to restoring the function, aesthetics and biomechanics of the dentition while minimising the damage to the biological structures.

**Clinical implementation and long-term evaluation**

Crowns made of lithium disilicate ceramic in the layering technique (IPS e.max Press and and customised using the staining technique were placed in the posterior region (IPS Empress Esthetic, Ivoclar Vivadent). The onlays exhibited a minimum occlusal thickness of 1.5 mm (Fig. 4).

Cementation was achieved with a multicomponent adhesive system in conjunction with the total-etch technique (Syntac) and a dual-curing, low-viscosity luting composite, using rubber dam isolation where possible (Fig. 5).

At a follow-up examination conducted more than 11 years after the restorations had been placed, it was found that the 15 posterior onlays showed no damage (Figs. 6a & b). However, we had noticed a cracking on the glass-ceramic onlay of tooth #14 after more than six years of clinical performance. For this reason, the onlay had subsequently been replaced. Close inspection of the mandibular anterior veneers revealed a severe wear facet on veneer #43 (Figs. 7a–c).

Combined with a diagnostic matrix, this technique allows for a conservative approach to tooth preparation and helps to preserve the remaining enamel during preparation. In addition, an in vitro investigation has shown encouraging data regarding the stress distribution in ceramic onlay restorations. It is, however, important to note that preparations should have soft and rounded transitions to prevent stress peaks from occurring.

In recent years, we have mainly used glass-ceramic onlays based on lithium disilicate in conjunction with the staining technique. Given its increased strength, this material allows the minimum thickness to be reduced by one-third to just over 1 mm, further increasing the amount of tooth structure that can be preserved during preparation.

Owing to their extremely high strength and optimal marginal integrity, glass-ceramic onlays appear to be ideally suited for restoring the function, aesthetics and biomechanical properties of abraded and eroded posterior teeth. They offer an opportunity to circumvent traditional prosthetic measures that are more invasive and involve higher biological costs.