Minimal invasiveness—maximal effectiveness

The paradigm of the present decade in restorative dentistry

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Introduction

This article describes a case in which severe tooth damage was presented and complex oral rehabilitation was planned. Part of the rehabilitation had been completed more than a decade before, and the rest only recently. Although there was only ten years between these two treatments (upper arch in 2005 and lower arch in 2015), a significant paradigm shift was evident concerning the treatment planning and with respect to the amount of tooth reduction.

Case report

A 25-year-old female patient reported to the dental office 12 years ago in order to improve her smile (Figs. 1–3). Her anterior maxillary and mandibular teeth were severely damaged owing to a past chronic eating disorder. In 2005, complex oral rehabilitation was planned for the patient, starting from the upper arch. For the maxillary posterior teeth, full-ceramic onlays were planned and placed, while for the maxillary anterior teeth, full-ceramic crowns were fabricated (Figs. 4–6). A decade ago, this
was the standard procedure in such a case of structural damage.

The patient, happy with the appearance of the maxillary teeth when smiling, did not present for the completion of the complex rehabilitation until 2015. During the past ten years, some of the full-porcelain crowns had sustained minor chipping (Figs. 7–9), which was a result of the unfinished rehabilitation. After a decade of advances in dental technology and treatment planning, we could propose to the patient a new option, one that was minimally invasive and without the extent of tooth reduction associated with the work carried out ten years earlier.

Treatment planning
The Kois deprogrammer was employed in order to register the centric relation and articulate the models in this position. A wax-up of the lower arch was obtained, and the vertical dimension of occlusion (VDO) was slightly increased, based on aesthetic analysis. The obvious benefit of the VDO increase was also the fact that there would then be enough space for the restorative material without additional tooth reduction. The appropriate mock-up procedure and phonetic analysis were performed to confirm this. In the posterior area, lithium disilicate onlays were used, while direct composite resins were planned for the anterior teeth.

Restorative phase: Posterior teeth
For the mandibular posterior teeth, minimally invasive preparation took place, generally only in order to produce sharp, visible borders for the laboratory preparation procedures. The entire preparation surface was meticulously polished, with the exception of the borders, to remain sharp and evident for the dental technician. In order to ensure sufficient occlusal volume for the restorative space, a pattern resin jig was fabricated on the articulated study models with increased VDO and transferred to the mouth for control (Fig. 10). Impressions were taken, and the lithium disilicate (IPS e.max, Ivoclar

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**Fig. 4** Fig. 5 Fig. 6

**Fig. 7** Fig. 8 Fig. 9

**Fig. 10** Fig. 11

**Fig. 12** Fig. 13 Fig. 14
Vivadent) onlays were fabricated in the laboratory (Fig. 11). At the next appointment, the onlays were tried in for correct marginal adaptation and adhesively luted under rubber dam isolation (Figs. 12–20).

**Restorative phase: Anterior teeth**

The teeth were cleaned with pumice, and the incisal parts were abraded with 50 µ aluminium oxide particles. On the incisal vestibular edge, a 1 mm chamfer was obtained using a diamond ball tip (001-006-2, Olident), and the lower part of the chamfer was delicately elongated using an 80° bevel (around 0.5 mm; Figs. 21 & 22). The mandibular anterior teeth were found to be tight and crowded; consequently, the operator found it easier to restore the teeth without rubber dam isolation.

The enamel and dentine were etched with 38% phosphoric acid for 20 seconds, then OliBOND adhesive (a fifth-generation prime and bond adhesive, Olident) was meticulously applied to the dentine and enamel, rinsed with water, air-dried and light-cured for 20 seconds.

The restorative phase of the anterior teeth consisted of creating an external box, placing inside a layer of inner composite followed by a final outer composite layer. The procedure does not have to be too complex to
achieve a predictable result; one can obtain correct layering with only two syringes of composite resin (Fig. 23).

Based on the wax-up (Fig. 24), a silicone index was made and cut in the frontal plane. With the lingual part of the index, the back shell of the reconstruction was created using a thin layer of nano-filler composite (OliREVO, Shade A3, Olident). In the next stage, the approximal surfaces were built up with the same composite material, and by means of the BlueView VariStrip (Garrison), which provides an anatomical shape mesially and distally (Figs. 25a & 26). When all of the boxes had been prepared, the inner, more opaque layer (OliREVO, Shade OA2) was applied, and the mamelons were shaped before polymerisation in order to create natural internal characterisation (Figs. 25b, 27 & 28). The inner layer was polymerised, and finally the outer layer of composite (OliREVO, Shade OA2) was applied in a thickness of more or less 0.5 mm (Figs. 25c & 29). This layer was meticulously brushed with the modelling brush and finally polymerised with slight time extension (40 seconds for each of the surfaces). After minor bite corrections, the final characterisation was done. First, the primary anatomy was achieved by contouring the transition angles and incisal edge. The next step was to start reproducing the secondary anatomy: the division of the lobes. These were drawn in pencil (Fig. 30) and formed with a diamond bur (831-204-012, Komet Dental/Brasseler; Fig. 23). Next, a rubber point was used to smooth the rough surface left by the bur. The rubber point was also used to give an initial gloss to the restoration. The restoration was polished with 1 µm diamond paste applied with a natural goat hair brush used at 1,000 to 10,000 rpm.

The satisfactory clinical result of the lower arch restorative rehabilitation can be seen in Figures 31 to 33. The 24-month clinical control showed excellent clinical behaviour with respect to the lithium disilicate onlays and anterior composite resin restorations (Fig. 34).

Conclusion

By increasing the VDO, it is possible to achieve additional space for the restoration, and in this way to minimise the tooth reduction and maximise the adhesion owing to residual enamel. Correct treatment planning and utilisation of a wax-up and silicone index allow predictable results for the final shape and shade of the composite restoration.

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