

# Midline Diastema Closure with Partial Laminate Veneers: A Case Report

## SUMMARY

*This case report describes a treatment of big diastema with hybrid ceramic restorative material, using chairside CAD/CAM system with veneer technique.*

**Keywords:** Diastema; CAD/CAM; Laminate Veneer

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**CASE REPORT (CR)**

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## Introduction

Progress in adhesive technologies has made possible to perform more conservative restoration techniques. Bonded porcelain veneers have been widely used to address aesthetic dental problems for more than 3 decades<sup>1,2</sup>. Aesthetic parameter plays an important role when deciding the treatment choice of a patient with diastema. Development of the adhesive materials allows the dentist to construct more longevity and conservative restorations as laminate veneers<sup>3</sup>. Also CAD/CAM technology allows the dentists to prepare aesthetic and good fitted restorations in one chair-time by using big variety of materials. Conservative tooth preparation facilitates optimizing the emergence profile and overall contour and provides a definite finishing line<sup>3</sup>. Recently, minimally invasive veneer preparation designs have become popular. These involve less tooth reduction, partial coverage, and minimal porcelain thickness. Thicknesses of 0.3 mm has been reported for minimally invasive veneers<sup>4-6</sup>, whereas conventional porcelain veneers generally range from 0.3 to 1.0 mm in thickness<sup>7-10</sup>.

Laminate veneers involve less tooth reduction, partial coverage, and still aesthetic outcome comparing to other treatment alternative: ceramic crowns<sup>7-9</sup>. Due to the trend in the conservative approaches for the dentists and the patients, tooth preparations are not well accepted in most cases. Therefore, composite laminate veneers by constructing with direct technic gained importance and were accepted as an alternative treatment for some dentists. However, the difficulty of fabricating with direct

technic, polymerization shrinkage of the restorative materials, deficiency of colour adjustments, polishing and discoloration of composite materials are still some of the disadvantages of this technique.

Hybrid materials, which have themselves both ceramic and resin properties, seem to be a good choice for adhesive restorations with good bonding ability, and with aesthetically more stable and predictable results. These kind of materials may have a better ability to be repaired or modified with resin materials. In this case report, the minimally invasive, partial restoration was fabricated with hybrid material by CAD/CAM technique. By using this fabrication technique, it was easier to prepare the restoration comparing to composite build-up with direct technique. It was also an advantage to modify the restoration with composite restorative materials.

## Case Report

A 46-year-old female patient presented herself at the Department of Prosthodontics, Izmir Katip Celebi University with midline diastema and aesthetic concerns about her anterior teeth (Fig. 1).

After study models had been prepared and radiographic images of the anterior teeth and digital intraoral photographs had been examined, a treatment plan was designed to address the patient's concerns. Various treatment approaches were considered, including orthodontic treatment option, which was immediately refused owing to its long duration and much more

expenses. The patient was more interested in alternative approaches that would be less time-consuming but still aesthetic and conservative. Regarding visual examination, the facial surface of central incisors had vertical crack lines and staining caused by leakages. Also staining was observed at lateral tooth. It was difficult to completely mimic this natural look with porcelain veneers and a conservative approach.



Figure 1. The diastema between maxillary central incisors

Therefore, it was decided to perform partial laminate veneer for diastema treatment. In this case, partial veneers were decided to be constructed without tooth preparation, just by using anatomically/clinically existing depressions on the surfaces of crowns for retention. Mock-up with direct composite restorations was performed in order to obtain patient's confirmation. Patient was informed about the possible complications such as debonding, triangular dark gingival embrasure between central incisors and discoloration of the restoration by time.

An optical impression was made with the digital camera of the CEREC acquisition unit (Omnicam CEREC Sirona Bensheim, Germany) from the stone model (Fig. 2). Optical images of the antagonist teeth were also taken and the bite registration was recorded with buccal scanning technique. In this technique, optical bite registration images were taken from buccal direction with the teeth occluded in maximum intercuspal position. In the next step, manual alignment of the preparation and antagonist models with the buccal bite registration images were required. The buccal bite registration image was dragged with the mouse approximately to the corresponding parts of the preparation and antagonist models. The software then recognized similar surfaces and automatically articulated the models in maximum intercuspal position. Once the models were virtually articulated, the occlusal contact strength of the crowns could be adjusted digitally between  $-200$  and  $+200$   $\mu\text{m}$ , where negative values meant disocclusion.

Designing the virtual restoration was similar to that of the traditionally performed at the laboratory. The first step was trimming the virtual model to attain

a virtual die. Removal of neighbouring teeth in this manner revealed interproximal margins in detail and also facilitated to shape interproximal contact points of the final restoration. Once the virtual die was approved, the preparation margins were outlined with the manual margin drawing option of the software, and the insertion axis was determined. Parameter settings for the present case were: proximal contact strength:  $0$   $\mu\text{m}$ ; occlusal contact strength:  $0$   $\mu\text{m}$ ; minimal thickness:  $300$   $\mu\text{m}$ ; spacer:  $-30$   $\mu\text{m}$ . The biogeneric crown proposal was then automatically seated to the virtual die according to the adjusted settings (Fig. 3). Interproximal and occlusal contact points were verified and the desired changes were accomplished with software's design tools. In the milling stage the restoration was placed in the resin nano-ceramic block (LAVA Ultimate, 3M ESPE, USA) with the shade of A2 LT Size 14.



Figure 2. Virtual models



Figure 3. The CAD/CAM design of the restorations

After milling was completed (Fig. 4), restoration was removed from block adaptation of the restoration performed (Fig 5) and the occlusion was checked, then polishing was done by using Soflex polishing system (3M,

ESPE USA). Then restorations were cleaned with alcohol and dried. Bonding surface was sandblasted - 50 $\mu$ m particle size of Al<sub>2</sub>O<sub>3</sub> restorations were ultrasonically cleaned and dried. The restorations (Fig. 6A & 6B) were cemented with a resin cement (Rely X Ultimate 3M ESPE,USA). Final adaptation was performed with Sof-lex disc (3M, ESPE USA).



Figure 4. Restoration after milling process



Figure 5. Restorations after adaptation and occlusal relationship control



Figure 6A. Final view after adhesive cementation



Figure 6B. Final view after adhesive cementation

The patient was satisfied with the result and has not reported any problem, except colour changes during a 2-year follow-up.

## Discussion

Various treatment choices are available to rehabilitate the anterior diastemas. According to technological developments, crown restoration options are now considered to be non-conservative. Adhesive systems are accepted as conservative treatment options.

Restoration of diastemas with direct resin composites are also an alternative treatment; this technic is quick and minimally invasive and sometimes inexpensive, but these restoration types require more clinical skills and they are not easy to be prepared with direct technic, and also the aesthetic results are not predictable. Preservation of enamel tissue during preparation improved the adhesive bonding<sup>7</sup>.

Recently, Gresnight et al<sup>7</sup> has reported a case about partial veneers. They used glass ceramics as a restorative material, which were fired on the refractory dies. In our study, restorations were fabricated with prefabricated hybrid ceramics blocks by using CAD/CAM system. The advantage of this system is easiness, chairside system, rapidity and the fact that restoration might be designed and shown to the patient for his approval before the manufacture. In cementation process there is no need to be etched with hydrofluoric or phosphoric acid for hybrid ceramics. Hybrid restorations were pre-treated with sandblasting in the current case.

No-preparation design may cause an over-contoured restoration, threatening soft tissue health at the margin. Another disadvantage is difficulty in fabricating thin porcelain. In our patient, the margins of restorations were far away from gingival margin. Hybrid ceramic block was preferred because it has more capability to bond composite filling materials and if needed filling materials could be used for adaptation of the restoration and to set margins without over-contoured. Colour changes by time are expected and the case is under the control.

Hybrid ceramics are getting popular with their combining advantages of the ceramics and composite materials. They have an aesthetic appearance and durability but also the good adhesive properties with the resin materials. Dentists can achieve better edge quality and smooth margins. Lava Ultimate restorative was formulated with a total nano-ceramic material content by weight of approximately 80%. The addition of nanomer particles to formulations containing nanoclusters reduces the interstitial spacing of the filler particles, leading to higher nano-ceramic content<sup>11</sup>.

## Conclusion

In this case report, diastema closure without tooth preparation was reported. It can be concluded that clinicians could perform aesthetic restorations without preparation with hybrid ceramic blocks by using CAD/CAM technique. In such cases, hybrid ceramic provides better adhesion with teeth and preparation design has diminished its importance. But follow-up studies and clinical outcome data for unprepared veneers need to be carried out for predicting the results.

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