

CASE REPORT

Laminate veneer - CAD/CAM: case reports

Koray Soygun, DDS, PhD,^a Evrem Gülnahar, DDS, PhD,^b Giray Bolayir, DDS, PhD^c

^aDepartment of Prosthodontics, Faculty of Dentistry, Cumhuriyet University, Sivas, Turkey

^bPrivate Dental Practice, Afyon, Turkey

^cDepartment of Prosthodontics, Faculty of Dentistry, Cumhuriyet University, Sivas, Turkey

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ABSTRACT

The recent increase in the variety and functionality of materials and the innovations in the application techniques invigorated the conservative efforts within dental prosthetics to achieve natural looking aesthetic results. Porcelain laminate veneers are very effective tools in terms of both aesthetic and functional rehabilitation. This study narrates and explains the clinical application and cementation stages of porcelain laminate veneers techniques.

INTRODUCTION

Porcelain laminate veneers (PLV) are one of the most conservative techniques applied in order to improve dental aesthetics.¹⁻⁴ These veneers are better longevity and the resistance.^{5,6} Porcelain laminate veneers can be applied in various cases such as discoloration, surface defects, diastema, malformation.¹ Porcelain laminate veneers that are mostly used in the restoration of upper incisors teeth and also, to a limited extent, the lower incisors and premolar teeth.⁷

These case reports described the improvement of the aesthetics and function of the patients teeth using the minimally invasive technique of the porcelain laminate veneers.

CASE REPORT 1

A-35-year-old male patient reported his discontent with the appearance of his maxillary anterior tooth (Figure 1). As a result of the examination of the patient, brushing defects on the cervical regions of teeth numbers 12 and 11, as well as composite fillings in the cervical regions of the teeth numbers 21, 22, and 23 were observed. Additionally, roughness and related discoloration were found at the medium and 1/3 of the incisal parts of the the labial surface of these teeth. As a result of the consultations, restoration of these teeth using the aesthetically pleasing and minimally damaging CAD/CAM manufactured porcelain laminate veneers was decided.

Corresponding author at: Giray BOLAYIR, Department of Prosthodontics, Gsm: +90 532 655 5283, Fax number: +90 346 219 12 37, E-mail: giray_bolayir@mynet.com



Figure 1. Appearance of the teeth before the restoration.

Before beginning the preparation of the tooth surface, the patient's tooth color in the daylight was selected using a color scale (VITA Toothguide 3D-Master). Although only a small amount of tooth preparation is required, retraction process was performed under local anesthesia for comfort of the patient. Tooth preparation was performed with the standard technique of cutting laminate veneers just above the gingiva with an approximate depth of 0.5-0.8 mm, taking contact surfaces and jaw movements into consideration.^{8,9} This procedure was performed using chamfer line burs. While the shaping of incisal edge for tooth number 11 was in the form of overlapped preparation, for the other teeth window preparation was performed, without including the palatal surface. After finishing preparation, occlusal contacts were checked during jaw movements. Following this, retraction was performed using a number #2 retraction cord (Ultrapak, Ultradent Product Inc. Utah) (Figure 2). Then, by using light-curing composite, temporary restorations were prepared. These restorations were cemented on the tooth surface by applying a single point etching (Fine etch37, Spident Co. Ltd, Korea) and bonding (DMP single bond, DMP Ltd, Greece).

CAD/CAM processed zirconia is used in the construction of Laminate veneers. The resulting upper and lower jaw models were scanned and transferred to the computer



Figure 2. Teeth prepared for restoration.

and their three-dimensional designs were prepared. (3 shape Inc, USA) (Figure 3). Occlusal relationships with the opposite arc model were checked digitally. After that, using the appropriate color dental zirconia blocks (Zirkonzahn, Switzerland), were produced by using the CAM (Charly Robot SAS, France) part. The zirconia cores were controlled on the model and they were treated with low-temperature porcelain in preparation for the fitting.

Restorations were placed on the surface of the teeth with temporary luting cement, and gingival compatibility, contact compliance, relations and contacts during occlusion, as well as the color and design of the restoration were checked (Figure 4). After the checks were completed, the bonding process began. Adhesive resin cement (Variolink II, Ivoclar Vivadent, Schaan/Leichtenstein) was used for the bonding process. 2-2 bonding method was used, which is the most common method. Inner surface of restorations were washed and dried.¹⁰ Subsequently, silane (Monobond S) was applied to the inner surface of restorations, which was left to sit for a minute to dry.

After applying 37% orthophosphoric acid (Total etch) to the teeth surface, and waiting for 30 seconds, teeth were washed, cleaned and dried. Cotton pellets were used to avoid contamination of the lips. Enamel and dentin bonding (Syntac Primer - Syntac Adesive) system was applied as prescribed

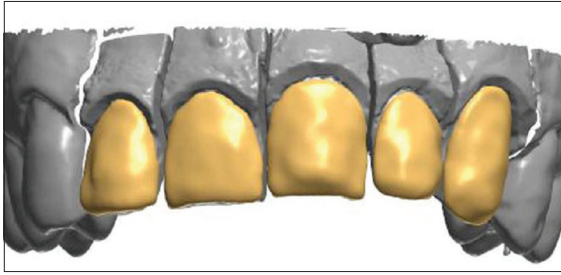


Figure 3. CAM image of the restorations.



Figure 4. Fitting of the restoration.

by the manufacturer. The transparent adhesive resin cement base and catalyst pastes (Variolink II, Ivoclar Vivadent, Schaan/Leichtenstein), mixed in a 1/1 ratio in accordance with the manufacturer's instructions, were applied and the excess was overflowed. The cement was polymerized with light curing unit (Poliled, Faro, Italy) for a period of 1-2 seconds. The excess cement was removed with the help of a probe. Contact points were checked with a transparent tape, and irradiated for a period of 40 seconds in each direction. After cementation, using discs and finishing burs, edge corrections and polishing were performed (Figure 5).

CASE REPORT 2

22-year-old female patient came to our clinic concerned about teeth discoloration on the maxiller 11, 12 and 13 numbers teeth due to extrinsic factors (Figure 6). Composite restorations had been tried to



Figure 5. The image of the completed restorations.



Figure 6. Appearance of the teeth before the restoration.

relieve the patient's aesthetic concerns, but the attempt had not been enough to please the patient with the appearance of her teeth. As a result of the consultations, restoration of the patient's vital teeth using aesthetically pleasing porcelain laminate veneers was decided.

Before proceeding to the preparation, the patient's tooth color in daylight was determined using the porcelain color scale. Cosmetic preparation was performed as described in the previous case (Figure 7). After the preparation, occlusal contact points were controlled during jaw movements. Impressions of the upper and lower jaws were taken with polyether impression material; hard plaster cast model was formed. Then, by using light-



Figure 7. Teeth prepared for restoration.

curing composite, temporary restorations were prepared.

The models were transferred to a computer for the digital design (Figure 8) and zirconia cores were produced. The obtained zirconia cores were prepared for the fitting by application of the low-temperature porcelain.

The gingival and contact compliance of the restorations, their relations and contact during occlusion, as well as the color and the design were checked. After the final controls were done, the cementation process began. Dual-cure adhesive resin cement Variolink II (Variolink II, Ivoclar Vivadent, Schaan/Leichtenstein) was used for this process. After cementation, using discs and finishing burs, the edge corrections and polishing were performed (Figure 9).

DISCUSSION

Porcelain laminate veneers are a preferred treatment option, especially after the increased application of the CAD/CAM technology in dentistry.^{11,12} The most important advantage of this treatment is the minimal tooth tissue removal.^{8,9,12,13}

Another factor that contributed to the widespread use of this treatment option is the development of adhesive systems. The development of adhesive cement systems enhanced bonding of the tooth and the restoration. However, disadvantages to

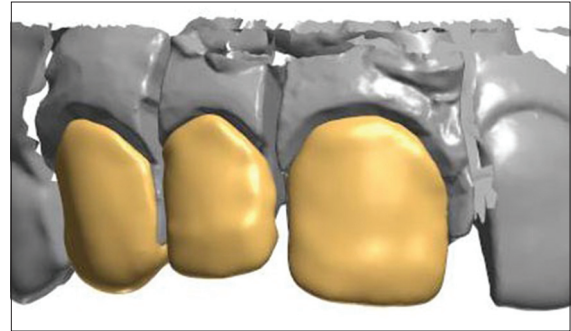


Figure 8. The design of the restoration on the computer.



Figure 9. Image of the restorations after cementation.

this treatment also exist. Some of these disadvantages are the required precision in the laboratory work, lack of color alignment and falling of the restoration.¹⁴

In the literature, various depths and shapes are defined for the preparation of the teeth for porcelain laminate veneer restorations.^{15,16} Some of the dental ceramic manufacturers propose deep preparation to increase the strength of the ceramic, but these recommendations generally only apply to restorations that evaluate the material. Using thicker ceramics may require preparations that penetrate the dentin. In the meanwhile, thick ceramic applied to minimally prepared tooth may lead to less aesthetically pleasing appearance due to over contour as well as periodontal problems.¹⁶ Piemjai *et al.*¹⁷ found that even though 0.5 mm porcelain that require minimal preparation of the teeth yields better results than the 1 mm porcelain that requires deeper preparations

in terms of fracture strength, this difference is not statistically significant. Based on this finding, teeth were prepared within the range of 0.5-0.8 mm. There are three types of incisal edge preparation forms that have been described for porcelain laminate veneers. These are window, overlapped and feathered preparations.^{2,15,16} In our first case, since tooth number 11 was positioned in the palatal arch, we performed overlapped preparation in order to increase support for the restoration, while the incisal edge shaping for the remaining teeth were done as window preparation.

Tensile bond strength is influenced by the type of the adhesive. Breschi *et al.*¹⁸ found that total-etch and self-etch adhesive yield better bond strength compared to the simplified all-in-one adhesives. Accordingly, in all our cases, we used the total-etch adhesive system.

CONCLUSION

Porcelain laminate veneers are an important option for a cosmetic dentist in the treatment of aesthetic problems. The most important advantage of this option is the minimal amount of preparation of the tooth tissue. However, the clinical process requires great attention to all the details of the application in the most sensitive way. In particular, adhesion, finishing and polishing operations are crucial for clinical success.

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