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Porcelain Veneers: An Alternative for Esthetic Treatment

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Abstract

Porcelain laminate veneers are one of the most conservative and esthetic restoration that can be used for enhancing esthetics. The current porcelain veneers are esthetically superior, conservative and durable treatment modality. Ceramic veneers can be offered as the treatment option in a variety of cases such as correcting tooth defects, diastema, tooth discoloration, coronal fracture or to adjust occlusion. This case report describes the restoration of the anterior teeth with porcelain laminate veneers.

Keywords: CAD, CAM, Resin composite

Introduction

In recent times patient's demand for aesthetic treatment has increased rapidly. Advancements in the field of aesthetic dentistry has offered an affordable and quality treatment options to improve smiles, thereby providing patients with the satisfaction and confidence they seek. With various treatment options missing teeth can be replaced, broken teeth can be repaired, and also the shape and size of unpleasant looking teeth can be improved.

In the past aesthetic correction of anterior teeth was mainly achieved by preparation of full ceramic crowns, which was considered the most enduring and predictable treatment option.[1] However, this method is certainly the most invasive aesthetic treatment option, as it leads to considerable loss of sound tooth structure and has potential detrimental effects on the adjacent pulpal and periodontal tissues. Recently, with the advancement in adhesive dentistry, conservation of tooth structure is feasible while attaining the restorative needs and aesthetic desires of patients.[2]

Aesthetic restoration of anterior teeth is considered as one of the greatest challenges in restorative dentistry, and in these circumstances porcelain veneers have become a popular treatment option.[3] They can be used to correct or improve the morphology of tooth in relation to shape, size, colour, contour, volume, and position.[4]

Porcelain veneers have proven to be a durable aesthetic treatment alternative to full ceramic crowns since their introduction in the field of aesthetic dentistry.[5] In recent years with the tremendous advancements in dental adhesive systems, bonding to enamel and dentin has become more predictable and promising. Thereby more conservative restorative techniques have become possible for treatment of unaesthetic teeth.[6]

Resin composite restorations can also be used for correction of tooth shape, size and to mask tooth discolorations. However, these restorations have limited longevity and tend to discolour over the time, thereby reducing the aesthetic treatment outcome.[1] Porcelain veneers have superior colour stability and aesthetics.

The technique for porcelain veneers involve minimal tooth preparation and bonding of a thin porcelain laminate to the tooth surface by using dental adhesive bonding systems and a luting resin composite material. The success of porcelain veneers is significantly influenced by the strength and durability of the bond between the three dissimilar components of the bonded veneer complex, i.e., the tooth surface, the luting resin composite and the porcelain veneer.[1]

Two types of porcelain materials are indicated for veneers: sintered feldspathic porcelain and pressable ceramic. These materials have superior aesthetics properties like translucency and can be used in small thickness without compromising the strength. They can also be milled using computer-aided designing/ computer-aided manufacturing technique (CAD/CAM).[7]

Various clinical studies have confirmed the clinical performance of these veneers, as they have superior aesthetics with high patient satisfaction and no adverse effects on gingival health.[3, 8] Most of the authors reported a low failure rate (almost 0% to 7%). Therefore, porcelain veneers are considered more enduring than direct composite veneers, depending on the clinical demand, occlusion, preparation of the tooth surface and adhesive system used.

Thus, the aim of this case report is to describe a minimal intervention dentistry approach to improve smile of the patient using indirect lithium disilicate ceramic-laminated veneers.

Case Series

Case 1

Diagnosis and treatment planning

A 25-year-old female patient reported to the dental clinic with the chief complaint of yellowish discoloration on her upper front teeth and wanted cosmetic rehabilitation for the same. An intraoral examination revealed maxillary anterior teeth with dental fluorosis. All the teeth were vital with no relevant history of hypersensitivity. The patient was informed about and given the opportunity to explore several treatment

alternatives, including bleaching, composite veneering, and porcelain laminates veneers. Owing to the requirement of minimum preparation, porcelain laminate veneers were planned on the upper maxillary anterior teeth. The patient's consent was gained following an explanation of the treatment strategy.

Tooth preparation

Pre-operative images and impression of both arches were acquired for the diagnostic cast (Figure-A). In order to educate the patient about the treatment outcome and to establish a putty index for temporization purposes, a mock-up on a study cast was done before the teeth were prepared (Figure-B). Teeth surfaces were then cleaned with pumice and shade selection was done using a colour scale (VITA Toothguide 3D-MASTER, Germany), in the natural daylight. On the facial surface, depth orientation grooves with a depth of 0.3 mm on the gingival region and 0.5 mm on the incisal half were made using a depth-cutting diamond bur (Figure-C, D). Using a round end tapered diamond bur, the remaining tooth structure was removed (Figure-E). Chamfer finish line was set at gingival crest level. The tooth preparation was extended proximally to contact areas without breaking contact in order to maintain interproximal enamel (Figure-F). The choice of an overlapping incisal edge preparation was made because it offers a vertical stop to help with veneer positioning correction (Figure-G). The finish line on the lingual surface was made by connecting the two proximal finish lines with a round end tapered diamond bur. All the angles on the prepared tooth were rounded with an extra-fine, tapered-cylinder, round-end diamond burr (Mani Burs, Mani Inc., Japan), and the prepared surface was smoothed with silicone rubber and abrasive discs (Super-Snap Rainbow Technique Kit, Shofu Dental Corporation, San Marcos, California).

Impression making

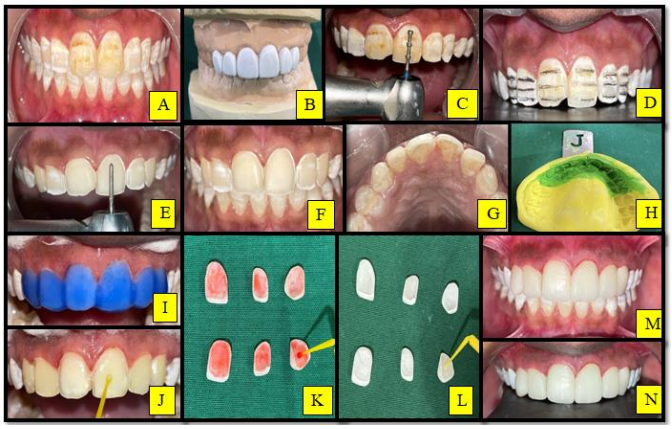
After tooth preparation, retraction cord (Ultrapack, Ultradent Products, Sao Paulo, Brazil) was placed in the gingival sulcus all the prepared teeth and a double step impression was made with double viscosity polyvinyl siloxane material (putty and light body consistency) (Figure-H). After impression making, provisional restorations were prepared with a bis-acryl resin (Vovo America Inc., U.S.A). Then the maxillary and mandibular casts were sent to the dental lab for pouring, creation of dies, and fabrication of porcelain veneers.

Cementation of Veneers

After receiving the veneers from the lab, they were carefully placed to verify alignment, marginal adaptation, size, shape, and color. The teeth were isolated and enamel surface was etched by using 37% phosphoric acid etchant for 30 seconds, and then, rinsed copiously with distilled water and subsequently dried (Figure-I). Two coats of adhesive agent (3M ESPE Adper Single Bond 2) was applied to the enamel surface with a brush tip, and light-cured for 20 seconds, using a light-emitting diode (LED) curing unit at 1000 mW/cm² (Figure-J). The veneers were then etched with 10% hydrofluoric acid at for 20 seconds, and rinsed with distilled water for 1 min (Figure-K). Afterwards, all the veneers were dried and silanization was performed for 1 minute by using M Bond of Variolink N System (Variolink N, Ivoclar Vivadent AG, Zurich) (Figure-L). Finally, dual cure resin cement (Variolink N, Ivoclar Vivadent AG, Zurich) was used to cement the porcelain veneers.

After cementation, the excess of cement was removed with a micro brush, and the photo activation was performed for 60 seconds with a LED curing unit at 1000 mW/cm². After that, a 12 number scalpel blade was used for careful removal of resin cement followed by

polishing with a flame-shaped diamond finishing bur. The final outcome of the treatment can be observed (Figure-M, N).



Case 2

Diagnosis and treatment planning

A 30-year-old male patient arrived at the dental clinic with the chief complaint of an unpleasant smile caused by generalized tooth discoloration. His medical history was not relevant. Upon clinical inspection, widespread fluorosis was observed. The patient was given treatment choices, including composite or ceramic veneers, along with the benefits and drawbacks of each choice. Given that he wanted a long-lasting and ideal cosmetic result, the patient agreed to smile enhancement utilising ceramic veneers for his upper teeth. The veneers would be placed on the patient's upper teeth, covering from his upper right second premolar to his upper left second premolar. Diagnostic models were taken to assess the occlusion, and a diagnostic wax-up was made (Figure-A, B).

Tooth Preparation, Impression making and Cementation of Veneers

The desired shade was selected using VITA Tooth guide 3D-MASTER (Germany). Tooth preparation was done similar to that of case 1 (Figure-C, D, E, F). A putty wash impression was made with polyvinyl siloxane after gingival retraction followed by temporization (Figure-G). Following the removal of temporary veneers, the teeth were cleaned and dried. The porcelain veneers were then fitted and inspected for appearance on the teeth. Acid etching, bonding of the teeth and veneers, and cementation of the veneers were performed similar to case 1 (Figure-H, I, J, K, L).

Case 3

Diagnosis and treatment planning

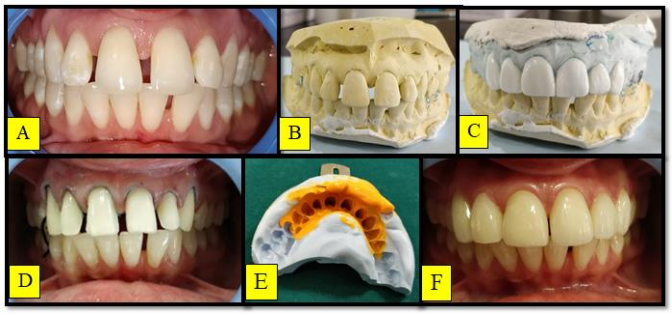
A 27-year-old female patient reported to the dental clinic with a chief complaint of spacing of anterior teeth and wanted aesthetic treatment for the same. A thorough case history of the patient was taken followed by diagnostic impression. After examination, the treatment objectives were to modify the contours of the teeth in most conservative method possible. Porcelain laminate veneers were proposed for the six maxillary anterior teeth. After explaining the treatment plan and informing the patient of their situation, their consent was obtained. A diagnostic mock-up was accomplished on study cast (Figure-A, B, C).

Tooth Preparation, Impression making and Cementation of Veneers

The shade selection was performed with a shade guide. Preparation for veneers should be uniform and, if possible should be limited exclusively to the enamel. This was achieved in this patient by means of calibrated spherical diamond burs at the cervical region and burs with a depth limiting device on the facial surface of the

tooth. The remaining facial enamel was reduced to the level of these grooves using a tapered-cylinder, round-end diamond bur (Mani Burs, Mani Inc., Japan). The incisal third was prepared by reducing only the labial surfaces and maintaining enamel in this region for adhesion of ceramic and resin cement. The preparation was enhanced by rounding the sharp angles to reduce stresses in the margins of the veneers. The final amount of reduction was around 0.8 mm at the middle third and 0.4 mm at the cervical third (Figure-D).

Utilizing retraction cords, gingival retraction was accomplished after tooth preparation. After gingival retraction, a putty wash impression was made with polyvinyl siloxane followed by temporization (Figure-E). Following the removal of temporary veneers, the teeth were cleaned and dried. Following their installation, the porcelain veneers were examined for how they looked on the teeth. The same procedures as in case 1 were used for acid etching, bonding the teeth and veneers, and cementing the veneers (Figure-F).



Case 4

Diagnosis and treatment planning

A 35-year-old female patient reported to dental clinic and requested for esthetic dental treatment as she was not satisfied with the shape and color of her upper front teeth. On clinical examination it was observed that her maxillary anterior teeth were discoloured and misshapen. Her oral hygiene practices were fair with satisfactory periodontal health in maxillary anterior region. The patient had no parafunctional habits such as clenching or bruxism. As the patient wanted an improvement in morphology and colour of her teeth, ceramic veneers as an aesthetic treatment option was provided to the patient. A diagnostic mock-up was made on study cast (Figure-A, B).

Tooth Preparation, Impression making and Cementation of Veneers

Using VITA Tooth guide 3D-MASTER, the desired shade was chosen. Similar method of tooth preparation was followed as of case 3 (Figure-C). A putty wash impression was made with polyvinyl siloxane after gingival retraction followed by temporization. The teeth were cleaned and dried once the temporaries were taken off. The porcelain veneers were then fitted and inspected for appearance on the teeth. Similar to case 1, acid etching, bonding of the teeth and veneers, and cementation of the veneers were carried out (Figure-D).

Discussion

In recent times, due to high aesthetic demands, porcelain veneers are considered as a routine treatment option for unaesthetic anterior teeth. Aesthetic rehabilitation with porcelain veneers is a way to preserve sound tooth structure, especially in young patients with high aesthetic demands. Porcelain laminate veneers are considered the most conservative, aesthetic, and cost-effective treatment option, especially in cases where there are no occlusal discrepancies.[10]

Some common indications of porcelain laminate veneers as a conservative treatment option to an aesthetic problem includes: 1.Discoloured anterior teeth which are non-responsive to vital bleaching procedures, 2. Disagreeable shapes, contours and/or insufficient size and/or volume, 3. Any need for modification in morphology of the teeth, for example, closure of midline diastema, minor changes in tooth alignment, fluorosis with enamel mottling, restoration of localized enamel malformations, teeth with minor chipping and fractures, and misshapen teeth.[3] When there is reduced inter-occlusal distance, deep bite, severe bruxism, or any other parafunctional activity, veneers are generally contraindicated.[11]

Porcelain veneers are usually fabricated from low fusing conventional feldspathic porcelain. There are primarily two techniques for fabrication of porcelain veneers. These are: 1. Platinum foil technique and the refractory die technique.[1] Presently, the refractory die technique is preferred as compared to the platinum foil technique in most of the laboratories. The inner side of the porcelain veneer is etched by hydrofluoric acid and later this etched surface is silanized by using a silane coupling agent. The bond strength of etched porcelain to a luting resin cement is much higher as compared to the bond strength of etched enamel to a luting resin cement.[12] By etching of the inner side of veneer with hydrofluoric acid (HF) produces an etch pattern which helps in retention. SEM analysis of this etched porcelain surface shows a micro-structure with various porosities.[13] The surface area for bonding increases due to these micro-porosities and thereby, leading to formation of a micro-mechanical interlocking of the resin composite. Various factors like the duration of etching, concentration of the etchant, fabrication method of the porcelain veneer, and type of porcelain used for fabrication determines the etch pattern and subsequently the bond strength of the resin composite to the etched porcelain surface.[14]

According to Meijering et al,[15] the veneer's survival rates were almost 94% for porcelain veneers, 90% for indirect composite veneers, and almost 74% for direct composite veneer type of restorations. Some other studies have established that the survival rate for porcelain laminate veneer restorations is greater than 90% over 10 years of clinical service.[9] A study done by Della Bona and Kelly et al. (2008),[16] compared clinical evidence for all ceramic restorations and reported that porcelain are well suited for veneer restorations and have a very low failure rates (including loss of retention or fracture) of almost less than 5% at five years of time interval. Few other researchers found that the feldspathic type of porcelains showed similar long-term survival rates at different time intervals: 96% at five years, 93% at 10 years, and 91% at 12 years.[16]

Presently, computer-aided design/computer-aided manufacturing (CAD/CAM) systems make the fabrication of veneers a lot easier as compared to traditional fabrication methods. CAD/CAM veneers have a real life, natural appearance because the ceramic blocks used for milling have a translucent quality that imitates enamel and they are also available in a wide variety of shades.[17] The success rates are almost 98.8% high as compared to conventional veneers.[18] The best part of CAD/CAM fabricated veneers are that the quality of ceramic material is consistent as the prefabricated ceramic blocks are free from any internal defects and the computer software is well designed to produce customized size and shapes that will stand up to any wear due to occlusion.[17]

Clinician should be able to assess the choice of material, fabrication method and type of luting cement on the requirements of the tooth being restored to improve its

aesthetics and function. The clinical success of laminate veneers majorly depends on the cementation procedure of the indirect restorations.[19] As the ceramics are brittle in nature, adhesive cements are used to improve their fracture resistance property by penetrating in the flaws and irregularities present on the internal surfaces and thus minimizing propagation of cracks and thereby allowing a more effective stress distribution from the restoration to the supporting tooth structure.[20] However, the cementation technique of adhesive cement is highly technique sensitive and also associated with a high incidence of postoperative sensitivity.

Conclusion

Porcelain veneers are indicated in cases of teeth needing alterations in colour and shape and with extensive restorations. This treatment presents advantages, such as a minimum thickness of tooth reduction, bonding between ceramic and enamel and dentin, and a satisfactory aesthetic result due to the inherent properties of the ceramics.

Currently, the properties of ceramics indicate that they are the materials which are capable of mimicking human enamel and also their mechanical properties are expanding their clinical applications. Therefore, it is possible to conclude that the clinical success of laminate veneers depends on both the suitable indications of the patient and the correct application of the materials and techniques available for that, in accordance with the necessity and goals of the aesthetic treatment.

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