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Esthetic rehabilitation of maxillary anteriors with porcelain laminate veneers.

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Abstract

Introduction: Restoring anterior teeth is a big challenge for dentists today because of the esthetic concerns and also the patient's expectations for a natural looking smile. An unpleasant smile traumatizes the patient psychologically as it decreases their confidence and is a cause for social embarrassment.

Case report: This case describes a patient who reported with a complaint of open spaces and irregular incisal edge of maxillary anterior teeth, desiring enhancement of esthetics and was treated successfully with porcelain laminate veneers.

Conclusion: Porcelain laminate veneers are a conservative approach. With the latest in dentistry, believing in the concept of minimal invasive procedures for preservation of tooth structure, porcelain laminate veneers would be the ideal choice for restoring spacing in the anterior teeth.

Keywords: Maxillary anterior spaces, minimally invasive, Porcelain laminate veneers.

Introduction

Management of anterior teeth to enhance esthetics is one of the most difficult tasks encountered by a dentist. The patients may have discolored, fractured, attrided, malformed or malaligned teeth.[1] For many years, full-coverage crowns were indicated in this situation, but this treatment option is now considered invasive because of the need to remove tissue. Progress in adhesive technologies has made possible a variety of more conservative restoration techniques. For example, when the colour of the existing substrate (the patient's teeth) is acceptable, thin porcelain laminate veneers (0.3- 0.7 mm) may be suitable. The term "minimally invasive" is also

used to describe full veneers that wrap around the teeth, although such restorations actually cover the buccal and palatal surfaces of the prepared teeth.[2] restoring diastema in anterior teeth with laminate veneer is the most conservative and esthetic approach for management of anterior spacing. Veneers may be direct composite laminates or indirect porcelain laminates. However, the porcelain laminate have a greater advantage of esthetics over the composite laminate and give a life like appearance to the restoration. They have good survival rate if the case is correctly selected. The most important factor is the adhesion between the laminate and the underlying tooth surface. Therefore, the amount of enamel present plays an important role in the success of porcelain laminate veneer.[3] to achieve predictable results, it is very important for the clinician to understand the philosophy of esthetic dentistry, the indications and contraindications. Selection of laminate material, knowledge of tooth preparation and luting of laminates.

Case Report

A 20-year-old male patient reported to the department of prosthodontics and crown and bridge with the chief complaint of spacing in upper anterior teeth. The patient was unhappy with the appearance of his teeth and restrained himself from smiling due to self-consciousness. A detailed family history, medical history and dental history was obtained. In family history, none of his family member had similar problem. Medical history was also not relevant. Extra oral examination could elicit no abnormal findings. Intraoral examination revealed spacing in maxillary anterior teeth and irregular incisal edges (Figure.1, 2). All teeth were vital and had no hypersensitivity. No carious teeth were present. Moderate amount of calculus was present. Treatment for oral hygiene improvement was done.

Figure.1: Pre-operative view of the patient's face.

Figure.2: Intraoral view showing spacing in upper anterior teeth.

During the first appointment, Photographs and radiographs were obtained, and alginate impressions were made. No periodontal problems or carious lesions were found. After relevant data were collected using a checklist of esthetic items and a schematic description of the clinical procedures had been presented, the treatment options were discussed with the patient.[4,5] which included porcelain laminate veneers, composite veneering and full coverage crowns. Owing to its minimally invasive nature and excellent esthetic qualities it was decided to enhance his appearance using porcelain laminate veneers. Porcelain laminates veneer for anterior maxillary segment from canine to canine teeth was planned.

Description of Procedure

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Scaling was done before the treatment. Shade selection (VITA classical) was done before the tooth preparation. After thorough examination impressions for the diagnosic model were made with irreversible hydrocolloid impression material. The impression was poured. Diagnostic mounting done with the help of facebow transfer (Figure.3a, 3b, 4)

Figure.3a: Facebow transfer recorded

Figure.4: Diagnostic mounting

On this model a diagnostic wax up was done to access the final outcome of the restoration (Figure 5).

Figure.5: Diagnostic wax up

Putty index was prepared over diagnostic wax up which will be used during temporization of patient. Wrapp around type of preparation was chosen. Depth orientation groove of 0.3mm and 0.5 mm on the gingival and incisal half respectively. The structure in between the grooves was removed with round tapered diamond and a chamfer equigingival finish line was given. Mesially and distally the finish line extended beyond the contact area. The lingual finish line was placed with a round end tapered diamond. The finish line should be minimum 1mm away from centric contacts. After the preparation was done retraction was done with retraction cord soaked in viscostat (Figure 6).

Figure.3b

Figure.6: Preparation for porcelain laminate

Impression was made with two stage putty wash reline technique. (Figure.7)

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Figure.7: Final impression

Although, the veneer preparations extended into the enamel only (not into the dentin), an acrylic resin provisional restoration was positioned over all prepared teeth using the spot etch technique (Figure.8a, 8b).

Figure.8a: Intraoral view of provisional restoration

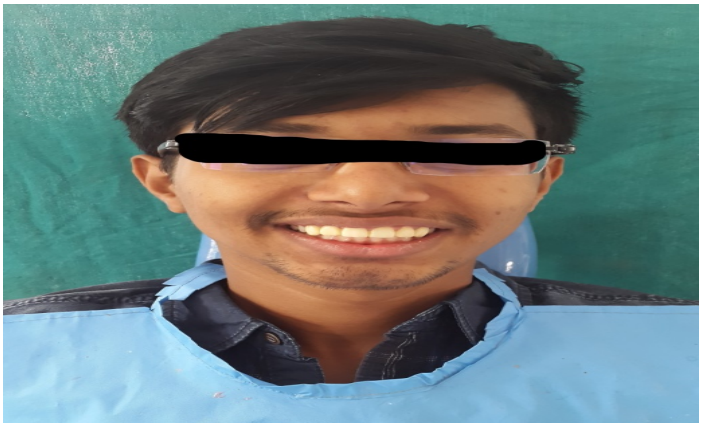

Figure.8b: Provisional restoration

The impression was send to the lab for fabrication of porcelain veneers. Once the veneers were fabricated the patient was recalled for trial of the prosthesis (Figure.9)

Figure.9: Trial of the prosthesis

The esthetics and fit were verified in the mouth. After the verification was done the veneers were removed from the mouth and dried. And, cementation done (Figure.10a, b).

Figure.10a: Intraoral view of final prosthesis

Figure.10b: Post-operative view of the patient's face

Cementation

The sequence for surface conditioning of the inner surface of the porcelain laminates is presented in **Table 1**, and the

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cementation sequence for these restorations appears in **Table 2**.

Table1. Surface conditioning sequence for inner surface of porcelain laminate veneers.

STEPS	ACTION
1.	Etching with hydrofluoric acid (1 min)
2.	Rinsing with copious amounts of water (1 min)
3.	Ultrasonic cleaning in distilled water (5 min)
4.	Application of silane coupling agent, with allowance of time for evaporation (1 min)
5.	Application of adhesive (no photopolymerization)
6.	Application of resin cement on cementation surface of porcelain laminate veneers

Table2. Surface conditioning sequence for teeth and/or restoration complexes

STEPS	ACTION
1.	Application of rubber dam
2.	Roughening of enamel with diamond bur and air abrasion
3.	Etching of enamel with 37% phosphoric acid (30 s)
4.	Rinsing with water (1 min)
5.	Application of adhesive (no photopolymerization)
6.	Positioning of veneer with cement
7.	Photopolymerization (10 s)
8.	Removal of excess resin cement with probe
9.	Application of glycerine gel
10.	Photopolymerization from multiple directions (40 s each direction)
11.	Removal of excess resin cement with diamond burs
12.	Polishing of margins with polishing rubbers and polishing paste

Surface Conditioning of Ceramic

The ceramic restorations were cleaned with copious amounts of water and then dried, after which the cementation surfaces were etched with 5% hydrofluoric acid (IPS Empress ceramic etching gel, Ivoclar Vivadent). Hydrofluoric acid selectively dissolves the glassy matrix or crystalline components of the ceramic to produce a porous, irregular surface.[6-8] The microporosities on the ceramic increase the surface area and allow mechanical interlocking of the resin composite.

The laminates were then cleaned ultrasonically to remove any remnants of particles of porcelain on the surface, which would diminish access of the adhesive to the undercuts.[9]

The next step was silanization with Monobond S silane coupling agent (Ivoclar Vivadent). Silane couples the inorganic particles present in the glass ceramics to the organic matrix of the resin cements. Use of hydrofluoric acid followed by silane facilitates the creation of high bond strengths, exceeding the cohesive strength of ceramic and the bonding strength of resin composite to enamel.[9]

Surface Conditioning of the Teeth

Before any adhesive procedures were applied to the teeth, the superficial outer layer of enamel was removed with diamond burs. After preparation, the enamel surfaces were conditioned with an etch-and-rinse adhesive bonding procedure, specifically, etching with 37% phosphoric acid (Ultradent, South Jordan, UT) for 30 seconds, followed by application of an adhesive (Excite, Ivoclar Vivadent).

Cementation of Laminate Veneers

For veneers, which are very thin restorations, the thickness of the luting cement may affect the distribution

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of stress at the interface between the adhesive and the restoration.[10] If the internal fit of an indirect restoration is poor, higher stresses may occur at this interface.[10] In this case, the adaptation of the restoration was controlled under microscopic examination. In addition, during the laboratory procedures, no dye spacer was used, so as to achieve optimal adaptation of the restoration with minimal thickness of resin composite cement. Adhesive cement was applied on the inner surfaces of the restorations before insertion. After removal of excess cement, glycerine gel was applied at the margins to prevent an oxygen inhibition layer. The restorations were photopolymerized from the buccal and palatal directions. Excess resin composite was removed with an explorer, and the margins were finished and polished with diamond burs, rubber points and diamond polishing paste. The final result met the patient's expectations.

Discussion

Porcelain laminate veneers allowed successful restoration of function and esthetics with a minimally invasive procedure, resulting in a natural and pleasing smile. There are several options for treating anterior spaces, such as direct composite restorations, full veneer crowns, laminate veneers and, among these, the laminates are proved to be ideal restorative option as it requires a minimal invasive tooth preparation, resistance to discoloration unlike composites[11] and has high degree of success rate. Treating patients with porcelain laminate veneers need to have a blue print prior to carrying out the preparation. Preparing the pre-evaluated temporaries[12] helped both the dentist and the patient to visualize and analyse the final outcome of the laminates. This could be done directly on the teeth intraorally or a diagnostic wax-up on the cast. In this case, the diagnostic wax-up was carried out and silicone index was made to prepare the pre-evaluated temporaries intraorally. This saved the chair side time. Minimum preparation of the tooth also helped to preserve the enamel to get a more effective bond between the laminate and the tooth surface when luted with the resin cements.

Numerous previous studies provided information that helped to guide the treatment plan in this case. To begin, the selection of restoration type was an important consideration. In one clinical study, there was no significant difference in patient satisfaction with composite or ceramic laminate veneers immediately after placement, but after 2 years of clinical service, patients were significantly more satisfied with the ceramic restorations.[11] In another study, survival rates for veneer restorations were 94% for porcelain restorations, 90% for indirect composite restorations and 74% for direct composite restorations.[13] However, the material used for the restorations had no significant influence on absolute and relative failures. In yet another clinical study, direct resin composite veneers had a failure rate of 14% over 3 years of service, with a low incidence of marginal staining.[14]

Various clinical studies have shown that the survival rate for bonded porcelain laminate veneer restorations is more than 90% over 10 years of clinical service.[15-18] In those studies, the failures reported were either cohesive ceramic fractures (the majority) or failures of the adhesive between the cement and the tooth surface.[15-18] Adhesive-related failures could be attributed to the extent of tooth preparation. Particularly with deep preparations in dentin, less adhesion can be expected relative to enamel. In fact, the bond strength of composite cement to enamel is in the range of 40 MPa, sometimes exceeding the cohesive strength of enamel itself.[19] Failure of the adhesive between cement and enamel was rarely observed. In addition to fractures, other types of failure, such as microleakage and debonding, have been reported.

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As noted above, various preparation depths and types of preparation forms have been described for porcelain laminate veneers. Some manufacturers of dental ceramics recommend deep preparations to increase the strength of their ceramics, but these recommendations are based on studies performed with the materials alone, without consideration of the material–adhesive-tooth complex. The adhesion of thicker ceramic materials to teeth indicates tooth preparations that extend deep into the dentin. Conversely, the presence of thick ceramic veneers on minimally prepared teeth may lead to periodontal problems and bulky, less esthetic restorations because of overcontouring. It has been stated that laminates bonded to sound enamel have a good survival rate and that enamel adhesion should be considered the gold standard.[17] Piemjai and colleagues[20] concluded that minimal preparation, to achieve 0.5-mm porcelain thickness, resulted in better fracture strength than bonding to deeper preparations in dentin, to obtain 1.0-mm porcelain thickness. However, the differences were not statistically different.

In another study, preparations of 0.5 mm depth buccally, restored with bonded porcelain veneer (Empress), exceeded the strength of intact unprepared teeth.[21] Comparable results were obtained when pressed ceramic veneers were cemented with Variolink II photo- and chemical-polymerized resin cement (Ivoclar Vivadent) to teeth with different preparation designs. The mean fracture strength of the unprepared teeth (713 N) was greater than but not significantly different from that of groups with other preparations. Therefore, minimal preparation seems advisable for adhesive bonding. However, it should be noted that shallow preparation often results in laminates with thin edges, with a high risk of fracture or chipping during the bonding procedures.[22]

As noted above, the thickness of the luting cement may affect the distribution of stress at the interface between the adhesive and the restoration.[23] In one in vitro study, thin laminates were cemented with a greater thickness of luting composite, but flaws were observed at the margins after cyclic loading.[24] According to this study, the ratio of ceramic to luting composite should be above 3.0.[24]

Conclusion

Porcelain laminate veneers are a conservative approach. With the latest in dentistry, believing in the concept of minimal invasive procedures for preservation of tooth structure, porcelain laminate veneers would be the ideal choice for restoring spacing between the anterior teeth. If properly indicated and executed, these restorations have a long-term success rate. Following a strict protocol of evaluation, pre-evaluative temporization, tooth preparation, properly selected material for fabrication of laminate and meticulous luting will enhance the outcome and the longetivity of the treatment.

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