

Midline Diastema Closure Following Post-Orthodontic Treatment Relapse Using Metal Free Restorations

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Abstract

Porcelain is known to be the most aesthetic material for dental restorations. It can imitate nature and at the same time maintain oral harmony which is a complex theme in the field of anterior tooth restoration. The knowhow about the synthesis, form, function and superficial structure and the color finish of the natural teeth, together form the basis of aesthetic restoration. A new generation of ceramic substance which distinguishes itself by unique light optic relation feature has facilitated the reproduction of natural teeth. The concept which has been outlined in this article informs about a systematic and rationale advance in the field of anterior tooth restoration while fulfilling highly aesthetic requirement. This case study presents the management of midline diastema using two different types of metal free ceramics.

INTRODUCTION

Dental ceramics may consists primarily of glasses, porcelain, glass ceramics or highly crystalline structures. The properties of ceramics are customized for dental applications by precise control of the type and amount of the components used in their production. Ceramics are more resistant to corrosion than plastics. They do not react with most liquids, gases, alkalis and acids. They also remain stable over long period of time. They exhibit fair to excellent flexure strength and fracture toughness.¹

All-ceramic systems can be categorized broadly into two groups, based on the ceramic core they have.

- Translucent core
- For example, Leucite Core - IPS Empress Esthetic
- Lithium disilicate Core - IPS e.max

Opaque core

For example, Lithium disilicate Core - IPS e.max Alumina core - In ceram Alumina, Procera AllCeram ,lava, cercon, procera zirconia, cerona

All-ceramic crowns with translucent core are superior in aesthetics, but weaker in strength. These crowns can be used to cover acceptably colored dentin and at times for anterior fixed partial denture prostheses (FPD), where the masticatory load is less. Crowns with an opaque core are

indicated for teeth with heavily discolored dentin or over metal posts and can be used for posterior crowns and some can be used for posterior FPD as they have superior strength.²

CASE REPORT

A 27 year old man with midline diastema and discolored maxillary right central incisor reported. The midline diastema had occurred because of relapse of orthodontic treatment he had undergone 2 years back as a result of failure to wear retainers as directed. The patient also had a low frenum attachment which was thick and fibrous and was probably the cause of relapse of the diastema. Fixed retention was not given post-orthodontic treatment as is usually indicated. Color alteration had occurred after endodontic treatment was performed on his tooth. Clinical and radiographic examination revealed a successful endodontic effort. The patient was advised fixed orthodontic treatment to close the diastema followed by fixed retention and frenectomy. Pre-treatment records were taken and an 0.022" slot preadjusted edgewise appliance was fixed. Initially an 0.016" Niti was used for alignment which took about 2 months and then space closure was started on an 0.018" SS wire. But after a month of space closure, the patient wanted to get his braces removed as his marriage got fixed and he wanted to get immediate space closure done. Therefore a cosmetic closure of the remaining space was planned with porcelain laminates and crowns. The patient

was given an explanation of the risks, benefits and limitations of treatment options available to restore the aesthetics.

Figure 1

Figure 1: During Orthodontic Treatment



TREATMENT PLAN

All ceramic crowns were opted for closure of diastema .Since the maxillary right central incisor was discolored, option of more opaque ceramic that is zirconia crown was considered. At the same time we wanted to restore the diastema with minimum loss of sound tooth structure in the maxillary left central incisor, so E.max veneer was considered.

TOOTH PREPARATION FOR PORCELAIN E-MAX LAMINATE

The tooth reduction involved placement of multiple depth wells or horizontal grooves prepared with round diamond burs positioned so that limiting shank is laid parallel against the enamel .Bur depth wells were placed at the gingival surface in the mesiodistal center ,at both proximal angles .Three more were placed in the midincisogingival surface .Incisal reduction was required as the incisal thickness was not enough to support the veneer ,so a half round bur 9[0.07 mm]was used to notch the incisal edge in 3 parallel positions .Anesthesia was required ,although preparation was confined to enamel., patient was having sensitivity. As the preparation approached gingiva ,enamel became thinner and tissue retraction was required to dilate the intracrevicular space to observe the CEJ and to avoid laceration of gingiva .Gingival chamfer was placed at the height of gingival crest using a coarse tapered diamond bur . The margin was made to continue into the inter proximal areas to the height of labio palatal contours to avoid display of cement lines . Incisal preparation was modified to get incisal wrap as the

incisal thickness was too thin to support the veneer .Facial surface was uniformly reduced with the fine diamond bur to the peripheral margins and labial depth guides .The preparation was progressively refined and polished to remove contour irregularities ,internal line angles ,and bur striations to minimize stress to thin porcelain veneer .The natural lusture was maintained so temporization was not required. ³

Figure 3

Figure 3: Post Treatment



TOOTH PREPARATION FOR PORCELAIN ZIRCONIA CROWN

Initial preparation was similar to E-max crown. The incisal reduction was modified to a plane perpendicular to the inclination of the mandibular teeth, usually at 45 degree angles to the long axis of the tooth in a normal occlusal relationship. This allows compressive forces to be tolerated by the porcelain. Mesial and distal areas are reduced to a 2-5 degree taper establishing a shoulder of 1mm at the margin which will help isolating the tooth. Lingual convergence is given by using a long tapered diamond bur. Lingual surface is reduced in two planes. First a cingulum shoulder is placed with a flat ended tapered diamond bur with a 2-5 degree taper. Then a wheel shaped diamond bur is used to form the lingual concavity. Facial reduction is performed with a coarse,flat ended diamond bur using smooth, controlled, sweeping motion. The incisal two-thirds of the facial surface should be inclined lingual to provide uniform porcelain and ensure suitable esthetics. ^{4,5}

SELECTION OF MATERIAL

Crowns with translucent core are good in aesthetics but they can not be used for discolored teeth. ² As in this case, maxillary right central incisor was discolored so temporary crown was used as a guide to know if its shade is influenced

by underlying substrate. So for maxillary right central incisor zirconia crown was chosen and for maxillary left central incisor porcelain laminate was chosen as material of choice.

IMPRESSION

The impression was recorded using elastomeric impression [rubber base impression] material using a combination of putty and light body for the reproduction of finer details.

SELECTION OF SHADE

Shade selection was done using vita shade guide and was matched with the adjacent teeth.

TRY IN OF THE PORCELAIN LAMINATES

The fabricated laminates were examined for fracture and excessive thickness. Color accuracy was verified. The preparation and inter proximal embrasures were cleaned. Each veneer was trial seated with the help of glycerine and checked for color, fit and placed simultaneously to check for displacement from bulky proximal contacts. Excess proximal contacts were relieved using abrasive polishing wheels. Using a neutral composite shade under the laminate color was checked and confirmed.

BONDING OF PORCELAIN LAMINATES

TOOTH PREPARATION

The prepared tooth surface was etched using 37% phosphoric acid for 45 seconds. Enamel-dentine bonding agent was applied on the etched tooth surface.

LAMINATE PREPARATION

Etching -using hydro fluoric acid the under surface of laminates were etched for a minute.

The laminates were placed in a padded ultrasonic cleaner with the solution of acetone and alcohol to remove contaminants. They were then rinsed, dried and arranged in left and right sides respectively. A thin layer of silane coupling agent was brushed on the etched laminate surface and air dried for 1 minute. Then a thin layer of light-cure enamel -dentine bonding agent was applied but not cured, the laminate and the crown were uniformly loaded with low viscosity/flowable composite resin and placed on the tooth surface ready for bonding. In case of laminate, it was first placed facially then pressure was applied gingivally because of presence of lingual wrap at the incisal edge for complete seating. The excess was removed from the proximal margins while maintaining the steady finger pressure. The laminate

and the crown were cured first for 20 seconds, and the excess composite was removed again and later cured for 1.5 to 2 minutes.

{image:3}

DISCUSSION

With the availability of a variety of metal-free restorations, clinicians have to be aware of their various properties in order to ensure that they select the right restoration for a given case. For anterior full coverage restorations, where aesthetics is the prime concern, all ceramic crowns with a translucent core are an excellent choice. Although crowns with translucent core are good in aesthetics, they are poor in strength, so they are recommended for anterior teeth with dentin that are not heavily discolored. In heavily discolored teeth a temporary crown is a useful guide⁶ to know if its shade is influenced by the underlying substrate, in which case a crown with an opaque core can be used. While using translucent crowns tooth preparation with an equigingival margin is recommended.⁶ They will require resin cement for cementation, which will enhance the strength of the crown through bonding. It is advisable to use light cured resin luting agents, as they are more color stable compared to dual cure resin cements, which may discolor due to the release of amines, over a period of time. Crowns with opaque cores are superior in strength, with good aesthetics, and can be used for anterior and posterior teeth. Crowns with the Zirconia core are recommended for fixed partial dentures. One can use resin or conventional luting agents for cementation as the color of the cement will not affect the shade of the crown. When restoring anterior teeth with these crowns it is advisable to end the margin subgingivally, as there could be a mismatch in shade between the tooth margin and the restoration. It is advisable to use an opaque core in teeth with heavy discoloration. The strength of these restorations is dependent on the ceramic material used, the Core-Veneer bond strength, the crown thickness, and the design of restoration.⁷

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