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A DYNAMIC PROCESS TO IMPROVE NATURAL COLOR OF PORCELAIN FUSED TO METAL CROWNS

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ABSTRACT

Color plays a significant role in aesthetic aspect in order to achieve a good restoration. Type of restorative material and preparation techniques affect the color outcome. Metal-porcelain crown is a high-strength treatment associated with long-term success, but they have several disadvantages, mainly in terms of aesthetics. Currently, all porcelain crown is being used to get a better aesthetic outcome. Patient complaining that the three maxillary anterior porcelain fused metal crowns has different color with the natural teeth and splinted each other. Based on the clinical examination, it is known that crowns are loose and from radiograph examination, it can be concluded that root canal treatment of three maxillary anterior teeth is inadequate. Therefore, endodontic retreatment should be performed before the final restoration. All porcelain material is used in order to achieve better result in shape and color, so that the crowns look natural.

Keywords: Porcelain fused to metal crown; all ceramic crowns; esthetic

INTRODUCTION

Restoration of the severely broken tooth is one of the most challenging procedures in dentistry. In addition to restore the function, patient needs of the natural-looking tooth is quite high. Therefore, the procedure should be detailed in order to achieve good result.

Color plays a significant role in esthetic aspect in order to achieve a good restoration. Light scattering and absorption within enamel and dentine give rise to the intrinsic color of the teeth and since enamel is relatively translucent, the properties of dentine can play a major role in determining the overall tooth color.(1,2) The extrinsic factors are external stains formed due to the combined effect of diet, restoration, and smoking.(3,4) Gender, ethnicity, and age also affect the tooth color.(3) The teeth are darker in older people in comparison to the younger population because the continuous secondary dentin deposition.(3)

Before the development of ceramic materials, PFM was the gold standard of crown material for the great success rate on the long term use.(5,6) Because the high demand of esthetic restoration and the bio-
logically safe materials, there is an increase for metal-free restoration needs. Compare to ceramic material in the esthetic aspect, PFM has metal layer that absorb and reflect the light give the dreaded opaque appearance. In addition, the metal layer must be masked by placing a layer of very opaque porcelain over it. While the all ceramic crowns has translucent properties and there is no metal layer, the crowns naturally mimic the tooth enamel that transmits light.

Nowadays, all ceramic crowns has a great success rate as good as PFM. All ceramic is the most esthetic choice for full-coverage restorations. Because there is no metal to block light transmission, all-ceramic crown can resemble natural tooth structure better in terms of shade and translucency than any other restorative option. The primary indication for all-ceramic restorations is obviously improved aesthetics. All-ceramic materials have been developed to match dental requirements, offering increasingly greater performance from a mechanical standpoint.

Objective

The objective of this article is to present esthetic improvement of multiple anterior porcelain fused to metal crowns (PFM) using all ceramic crowns. Because of the teeth have inadequate endodontic treatment this procedure is preceded with endodontic retreatment.

CASE REPORT

A 52-year-old woman came to the clinic because of three maxillary anterior crowns #12, #11, and #21 has different color with the natural teeth and splinted each other. Patient was complaining the anterior cannot be use functionally and feel discomfort. She had endodontic treatment and porcelain fused to metal crowns 6 years ago. Based on the clinical examination it is known that crowns are loose, tenderness to percussion test and a microleakage on the servical area.

Figure 1. (A) Radiographic appearance of teeth #12, #11 and #21 (B) Porcelain fused to metal crown #12, #11 and #21 (C) Remaining tooth structure of the teeth #12, #11 and #21 after the PFM are removed

Radiograph examination show that the endodontic treatment on #12, #11, and #21 is in adequate because there is no apical seal and there is a radiolucency on the apical region. The teeth #12, #11, and #21 were then diagnosed as chronic periapical abscess.
CASE MANAGEMENT

Because there is a apical lesion on teeth #12, #11, and #21, endodontic retreatment should be performed before the correction of PFM crowns. All ceramic (IPS e.max Press / Ivoclar Vivadent) was chosen to improve the esthetic of PFM crowns. This material is lithium disilicate glass-ceramic (LS,) that offers excellent fit, form, and function combine with high strength of 400 MPa.(10) It offers a wide selection of ingots which users can choose that suits the needs.

Porcelain fused to metal crown was removed using trans-metal bar (Dentsply Maillefer, Switzerland) to separate the connection between teeth #12 and #11. Then, the crown was pulled out using crown retractor. The root canal filling material was removed using Hedstrom file (Dentsply Maillefer, Switzerland). Irrigation of the root canal system using 2.5% NaOCl and 2% CHX because of regimens are effective to eliminate endodontic microorganisms. Sodium hypochlorite is effective in eliminating bacteria, fungi, virus, and dissolving necrotic tissue.(11,12) The use of 2% CHX because effective to eliminate E. faecalis that commonly detected in endodontically treated tooth.(11) This 2% CHX is a broad spectrum antibacterial, active in eliminating gram positive and negative bacteria and fungi. After the root canal filling material is completely removed, the working length is measured using apex locator (Propex Pxi, Dentsply Maillefer, Switzerland) and confirmed with the radiograph. Then, the root canal preparation was done using K-file (Dentsply Maillefer, Switzerland) with circumferential filing technique. This technique was conducted because the endodontically treated teeth already had large root canal. During and after instrumentation, the irrigation solution was used to remove the debris, smear layer, and eliminate microorganism.(13) The master cone for teeth #12 45/19, #11 80/18 and #21 80/17. This master cone was confirmed with the radiograph. After the preparation was done, the root canal was dried with paper point and calcium hydroxide (Calcioplex® Sika-Nippon Yakuin, Shimomoseki, Japan) was placed as a medicament intracanal. Because the calcium hydroxide has alkali properties, it can eliminate bacteria. It also acts as a physical barrier to stop the contamination access of bacteria.

On the next visit, the obturation step was done with lateral condensation technique using gutta percha cone and resin sealer (AH Plus, Dentsply Maillefer, Switzerland). This lateral condensation is used to achieve a hemispheric obturation. The root canal obturation was confirmed using radiograph.

After the root canal filling was done and there was no sign of pathological sign then definitive restoration phase was taken. The root canal filling material was removed by using Gates Glidden Drill (Dentsply Maillefer, Switzerland) leaving 5 mm of root canal filling material in the apical. Then, using Poeso Reamer (Dentsply Maillefer, Switzerland) to shape the den-
tin wall of root canal. The root canal post and core impression was made using resin Duralay. The length of the post should be 2/3 the working length for better retention. Then the impression was sent to dental laboratory.

The post core was tried and confirmed by radiographic to evaluate the length of the post. GIC luting agent (GC Fuji I, Tokyo, Japan) cement was used for cementation of the post and core. Tooth preparation was done on the incisal, labial, proximal, and palatal until there is enough space for the crown material. The maxillary left lateral incisive was a guideline to confirm the space for crown materials on the labial and palatal surface. The incisal and proximal surfaces was confirmed by passing the explorer on the incisal surface from mesial to distal. Then shoulder type preparation for servical margin. The completed crown preparation should have a ferrule design that encapsulates the tooth. (14) It is important to preserve tooth structure during preparation in preventing stress concentrations at the cementoenamel junction of the endodontically restored tooth and provides resistance to tooth fracture. All surfaces must be rounded. (14,15)

Shade color selection using shade guide (VITA Classical Shade Guide, Germany) by comparing to maxillary left lateral incisive. Before the shade selection, the teeth should be clean. (16) Shade comparison should be made quickly, less than 5 s. (8,16) The color of maxillary left lateral incisive was D3.

**Figure 2.** Treatment sequence of the teeth #12, #11, and #21 (A) Radiograph of the obturation #12, #11, dan #21 (B) Radiograph of cementation post core #12, #11, dan #21 (C) After post core cementation #12, #11, dan #21

Before the impression was taking, the gingival must be retracted in order to get the detail of the margin of the preparation. The final impression was taken with the double impression technique. Bite registration was taken using bite registration wax. The instruction for dental technician, such as details about the material, color, shape, and size of the crowns is very important things. In this case, the type of material is HO (high opacity) ingots ceramic materials, the crown should has an oval shaped with the rounded margin and the color is D3. Then, all of those things was sent to the dental laboratory.
Gambar 3. (A) Application of retraction cord after the teeth was prepared (B) Color selection using VITA Classic shade guide

The trial fit of the all ceramic crowns in the mouth, including marginal adaptation, occlusion, articulation and color of the all ceramic crowns was performed before the cementation. The crowns fit well, no sign of blocking or premature contact and the patient satisfied with the color and shape of the crowns. Cementation was done using dual cure resin cements (Breeze®, Pentron, USA). Dental floss was used to clean the excess cement and evaluate the proximal contact.

Gambar 4. (A) Before the treatment, PFM #12, #11, dan #21 (B) After the treatment, all ceramic crown #12, #11, dan #21

CONCLUSION

The use of all ceramic crown (IPS e.max Press / Ivoclar Vivadent) to improve the esthetic of porcelain fused to metal crown on the anterior teeth successfully restore the natural color of the teeth. After 3 months follow-up presented an asymptomatic tooth and normal appearance of the gingival with no pathological sign.

REFERENCE
