

Case Report

Blending the Appearance of All-Ceramic Crowns in Fluorosis Condition with Direct Chair-Side Technique

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Abstract

Dental fluorosis incidence had been reported to be affecting children widely, especially in water-fluoridated areas. As these children grow into young adults, perceived aesthetic problems arise mainly due to their concern with generalized mottled and stained teeth appearance. Fixed prosthodontics treatment involving single anterior tooth in patients with generalized fluorosis condition had been found challenging due to aesthetic restorability to blend with fluorosis condition. **Clinical considerations:** A simplified procedural direct chair-side technique of mimicking fluorosis condition onto anterior all-ceramic crowns are discussed in this paper. The mimicked fluorosis is reversible and has the opportunity to be adjusted according to the patient's fluorosis condition thus hindering the need to redo the crown in the future. **Conclusions:** The appearance of anterior all-ceramic crowns with direct chair-side staining technique provided blended and harmonized well with the dental fluorosis condition in both patients thus, giving natural looking smile.

Keywords: *Dental fluorosis, all-ceramic crown, chair-side resin staining.*

Introduction

Dental fluorosis is a developmental disturbance of dental enamel, caused by successive exposures to high concentrations of fluoride during tooth development, leading to enamel with lower mineral content and increased porosity¹⁻². Compromised aesthetics in permanent dentition are the greatest concern in dental fluorosis condition³.

Once these affected children grow into young adults, different types of cosmetic dental treatment can be provided for dental fluorosis condition includes bleaching, enamel abrasion, direct

restorations and fixed prosthesis restorations⁴⁻⁶. This case report highlights a simplified procedural technique of blending and mimicking the dental fluorosis condition of patients onto a single anterior all-ceramic crown restoration, to provide an aesthetically balanced and harmonized dental appearance. The cases were done with the patients' request to omit any cosmetic dental treatment for the fluorosis condition due to time and financial constraint.

Case Report

Case 1

An 18-year-old male was referred to Centre of Restorative Dentistry Studies for management of recurrent failure of his upper left central incisor (21) composite resin restoration. He was involved in a motor vehicle accident 6 months

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ago and sustained uncomplicated fracture of 21. Direct composite resin restoration was provided, however the direct restoration had poor aesthetical value and did not blend with the patient's generalized fluorosis condition (Fig 1A).

Case 2

A 22-year-old male was referred to the Centre of Restorative Dentistry Studies for further restorative management of his unsightly endodontically treated upper left central incisor (21) (Fig. 1B). Radiographical investigation found a poorly done endodontics treatment with insufficient length of post on the tooth, which denotes the need for endodontics re-treatment.

Case Management

Treatment planning.

Both patients were advised and given the available treatment modalities by the prosthodontist for restoring the complaint teeth. They agreed to the option of bonded all-ceramic crowns. Both patients also have significant generalized dental fluorosis conditions, therefore various treatment options was given to reduce the fluorosis before starting the fixed prosthesis treatment. However, due to time constraint and fi-

nancial, both patient refused any treatment for their fluorosis condition.

Tooth preparations for all-ceramic crowns.

Shade selection was taken under natural light using the shade guide (VITA Toothguide 3D-Master, California USA). A 1.0mm labial and palatal reduction and 1.5mm incisal reduction was made with supra-gingival shoulder margin all around (Fig 2A & 2B). A provisional crown was fabricated using bis-acryl material (Protemp™ 4 Temporisation Material, 3M ESPE USA) to provide provisional optimum aesthetical and functional values.

Master impression for both tooth preparations were taken using polyvinyl siloxane (PVS) impression material with heavy and light-body one-step wash technique (Aquasil Ultra LV and Heavy Smart Wetting® Regular Set Impression Material, Dentsply USA).

Fabrication of the all-ceramic crown.

Lithium disilicate ceramic (IPS e.max Press, Ivoclar Vivadent, Liechtenstein Switzerland) was the material of choice for the fabrication of the bonded all-ceramic crowns for both patients. Written instructions and photographs were sent to the laboratory together with the



Figure:1A- Pre-operative condition of tooth 21 (Case 1)



Figure: 1B- Pre-operative condition of tooth 21 (Case 2)



Figure: 2A- Tooth preparation for bonded all-ceramic crown on 21 (Case



Figure: 2B- Tooth preparation for bonded all-ceramic crown on 21 with composite core and fiber post (Case 2)



Figure: 3A- Crown 21 before and after characteristics staining (Case 1)



Figure: 3B- Crown 21 before and after characteristics staining (Case 2)

master impressions, face bow transfers and bite registrations. The unique dental fluorosis characteristics were not done in the laboratory and were planned clinically. Thus the finishing glaze of the crowns did not include the labial surface to allow further characteristics to be done chair-side.

Direct chair-side staining of all-ceramic crowns.

The fabricated crowns were seated intra-orally and the contacts and occlusion with adjacent and opposing teeth were checked. Once satisfied, the crowns were removed from the tooth preparations. Direct staining methods started with the extra-oral application of a porcelain-etching agent (hydrofluoric acid 7-9%) on the labial surface of the crown for 10 to 15 seconds.

The acid was then washed thoroughly for 60 seconds and dried completely. Next, silane was then applied and left to dry. Place the crowns intra-orally and the fluorosis condition of the adjacent teeth was then mimicked and matched on the all-ceramic crowns by using a light-cured resin color modifier and opaquing kit (Kolor+Plus, Kerr). The resin colour modifiers were applied in very thin layers; bit-by-bit to create the fluorosis characteristics using a fine tip brush. Once the characteristics coloring completed, the composite resin staining material was light cured for 15 seconds. Then the crowns were removed from the intraoral environment and a thin layer of translucent composite resin (acts as a protective layer) was placed covering the whole labial surface of the characterized crowns. The protective layer is light-cured for 30 seconds and the labial surfaces were then polished until smooth and shiny.

Fitting procedure

Cementations of the crowns were done with composite resin luting cement (Calibra[®] Esthetic Resin Cement, Dentsply) in a strictly practiced moisture control. Patients were happy and satisfied with the prosthesis provided to them (Fig 3A & 3B).

Discussion

Bonding silica-based dental ceramic (lithium-disilicate) to composite resin is common in cementations procedure and repairing chipped porcelain in fixed prostheses. In this case reports, the addition of direct staining with resin colorant to treated surface ceramics also imply the same concept of bonding to silica-based dental ceramics.

There are few factors that can increase the bonding durability, such as the silanization

process and surface treatment. Bonding strength resulted from silanization to a silica based dental ceramic is known to be high, predictable and excellent around 25-35 Mpa⁷⁻⁸. Silane has been a medium of choice to provide chemical interaction between the dental ceramic and resin luting cement. Studies also concluded that surface treatment with hydrofluoric acid etching does produce greater bond strength of silica-based dental ceramic to resin⁹⁻¹⁰.

In both case studies discussed, decision to go for direct staining chair-side procedure was due to the severe fluorosis condition of both patients. Although both patients has been advised on different treatment to reduce the fluorosis condition before fixed prostheses, they refused due to time and financial constraint. However, they both expressed the desire to undergo more comprehensive whitening regime in the future. This direct chair-side technique gave us the opportunity to adjust accordingly the dental fluorosis features on the crowns to blend with the rest of the dentition in the future. This will eliminate the need to fabricate new crown once the fluorosis condition has changed.

Conclusion

The restorations provided to these two patients comprise the combination of both dental ceramic and composite resin materials, thus making the prognosis for aesthetical value remains favourable with a prolonged longevity.

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