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Aesthetic Rehabilitation of Anterior Teeth Affected by Dental Fluorosis Using Emax Veneers: A Clinical Approach

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ABSTRACT

Dental fluorosis is a developmental condition caused by excessive fluoride exposure during tooth formation, often resulting in discoloration and surface irregularities that affect both function and aesthetics. Addressing the aesthetic concerns of patients with anterior teeth affected by fluorosis requires a minimally invasive and highly effective approach.

This case report highlights the use of lithium disilicate (Emax) veneers to restore the aesthetic appearance and function of anterior teeth in a patient with moderate to severe dental fluorosis. The treatment process involved meticulous planning, including shade selection, tooth preparation, and adhesive bonding techniques, to ensure optimal outcomes. The use of Emax veneers provided exceptional aesthetics, strength, and durability while preserving the underlying tooth structure.

The results demonstrated a significant improvement in the patient's smile and confidence, with a natural, harmonious appearance achieved through careful material selection and precise clinical execution. This approach underscores the value of contemporary ceramic veneers as a reliable solution for managing aesthetic challenges associated with dental fluorosis.

Keywords: Dental Fluorosis; Emax Veneers; Aesthetic Rehabilitation

Introduction

Dental fluorosis is a developmental enamel defect caused by excessive fluoride ingestion during tooth formation. This condition leads to hypo mineralization of the enamel, resulting in intrinsic discolorations and surface irregularities that can range from mild white spots to severe brown stains and pitting. The aesthetic implications of dental fluorosis, particularly in anterior teeth, can significantly affect a patient's self-confidence and quality of life.

Mild cases of dental fluorosis can often be managed with non-invasive techniques such as bleaching or micro abrasion. However, moderate to severe forms frequently require restorative approaches to address both aesthetic and structural concerns. Among the various treatment options, lithium disilicate veneers (Emax veneers) have emerged as a popular choice due to their superior aesthetics, durability, and minimal invasiveness.

Table 1 Dean's Fluorosis Index

Normal	Normal translucent enamel
Questionable	Few white flakes or some white spots
Very mild	Small plaque or white area covering 25% of tooth structure
Mild	Mottled patches covering half surface of a tooth
Moderate	Mottled enamel with brown discoloration
Severe	Complete coverage of tooth with brown discoloration

CASE REPORT

A 35 years old male patient reported to the Department of Prosthodontics with the chief complaint of un-aesthetic appearance due to discoloured upper and lower front teeth (Figure1). Patient had no gross extra-oral facial deformity, muscle tenderness, TMJ pain and no deviation while opening and closing

(Figure2). Intraoral examination revealed moderate form of dental fluorosis with respect to upper and lower arch with fair oral hygiene. There was no interference in protrusive and lateral excursive movements. There was 2mm of over jet and over bite in maximum inter-cuspation position. Based on clinical and radiographic investigations, the case was diagnosed as moderate form of dental fluorosis and taken up for rehabilitation with incisal lingual wrap type Emax veneers for maxillary anterior teeth (13,12,11, 21, 22, 23) and mandibular anterior teeth (31,32,33,41,42,43). **Clinical Procedure:** After complete examination, diagnostic impressions (Figure 3) were made with irreversible hydrocolloid (Dentsply Zelgan). Face bow orientation was done (Figure 4) and a wax mock-up of the diagnostic casts was done (Figure 5). Preparation guide was made from polyvinyl siloxane material and Index was cut horizontally from right to left into three sections at the level of Incisal, middle third and cervical (Figure 6). Shade selection (VITA Classical shade guide) was done under natural daylight. To maintain proper depth, preparation was started with horizontal depth grooves given by a diamond depth cutting bur on the labial surface of upper and lower anterior teeth. Depth grooves were extended from mesial to distal without damaging the adjacent soft tissues and teeth that were not being prepared. Bur was angled in relation to the contour of the labial surface to achieve the appropriate depth for these guide cuts. To achieve optimum bond strength, depth grooves were kept in enamel only and not extended into dentin (Figure 7,10,11). Even though dentin adhesives have improved dramatically, porcelain bonding to enamel is better than porcelain bonding to dentin. Depth of grooves was marked with lead pencil, which helps as a reminder to avoid over reduction. The finish line of the preparation for both upper and lower anterior teeth was kept at the gingival level, approximately 0.5 mm incisal to cemento-enamel junction (CEJ). Labial Reduction was done using a tapered diamond bur. Silicone reduction guide (Dentsply Aquasil soft putty) was used in order to check the amount of reduction required (Figure 8,12). The reduction guide was designed to evaluate the amount of reduction at the incisal, middle third and cervical third of the tooth (Figure 9). A chamfer finish line was prepared 0.5 mm incisal to the CEJ at gingival level. Interproximal tooth reduction was extended till contact area without breaking the contact point to prevent tooth movement during temporization. Incisal reduction was done with a 0.5 mm depth cuts on incisal surface of tooth. For Incisal Lingual Wrap Preparation, the mesio incisal and the disto incisal corners were reduced an additional 0.5 mm. A diamond bur was used for giving chamfer margins on the palatal surface for upper anterior teeth (Figure 13) and on lingual surface for lower anterior teeth (Figure 14). All incisal edges were kept rounded. The palatal chamfer line was kept above the centric lingual contacts to avoid occlusal contact on the interface between porcelain and tooth structure. Contact should be either completely on porcelain or on tooth structure. Once the preparation was done, tapered finishing bur was used to finish the preparation without further reduction. Digital Impressions were made with intra-oral scanner (Shining 3D) (Figure 16). Provisional restorations were given (Figure 17). Digital designing of the veneers was done (Figure 18) and prosthesis were fabricated (Figure 19). During cementation, Provisional restorations were removed, tooth surfaces were cleaned and washed thoroughly without inducing gingival bleeding. The teeth were dried, isolated for try-in procedure. Veneers were loaded with try in cement and placed over the prepared teeth to check fit and shade. For cementation, inner surfaces of veneers were etched with hydrofluoric acid (CEREC 5% Hydrofluoric Acid Gel, VITA North America) for 20 seconds (Figure 20) and Silane coupling agent (Kerr silane primer) was applied to the etched porcelain surface for 60 second followed by air-drying (Figure 21). Tooth surface was cleaned dried and isolated. Prepared tooth surface was etched with 37% phosphoric acid for 30 seconds (Figure 22), rinsed thoroughly and air dried followed by bonding agent (Adper single bond 3M ESPE USA) application according to the manufacturer's instructions and was light cured (Figure 23). Dual cure resin luting cement (PANAVIA F 2.0) was applied to the inner surface of veneers and placed gently onto the tooth in an inciso-gingival direction. Excess cement was removed and light-cure was done at gingival margins first for 10 seconds, followed by all other surfaces. Final cure for 60 seconds was done through the facial surface. Excess cement was removed using sharp hand instruments. A layer of glycerine gel (Liquid strip- IvoclarVivadent) was applied along the veneer margins. Fine and extra fine diamond finishing burs were used to remove excess resin cement. Polishing was done to regain a smooth porcelain surface. Occlusion was checked in protrusive and lateral excursive movements and final cementation was completed (Figure 24).

FIGURE 1: Pre-operative intraoral photograph

FIGURE 2: Pre-operative extraoral photograp

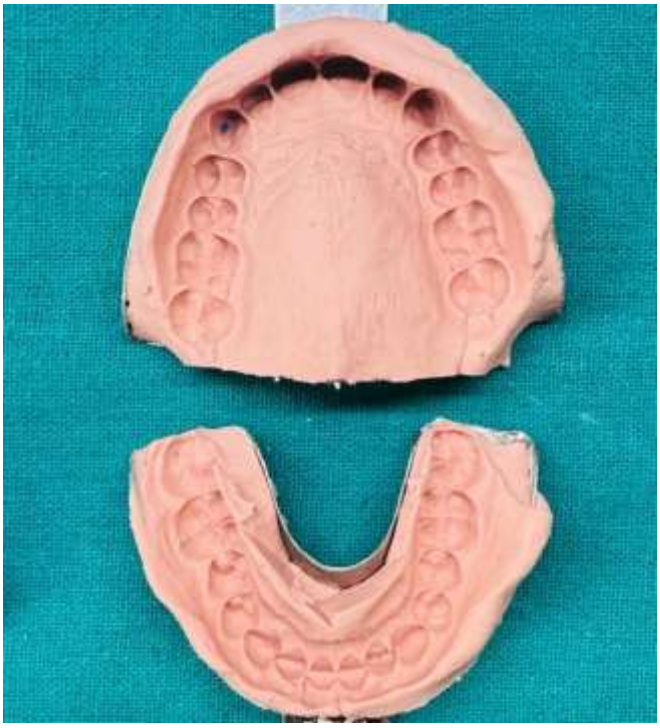

FIGURE 3: Diagnostic impression

FIGURE 4: Face-Bow record

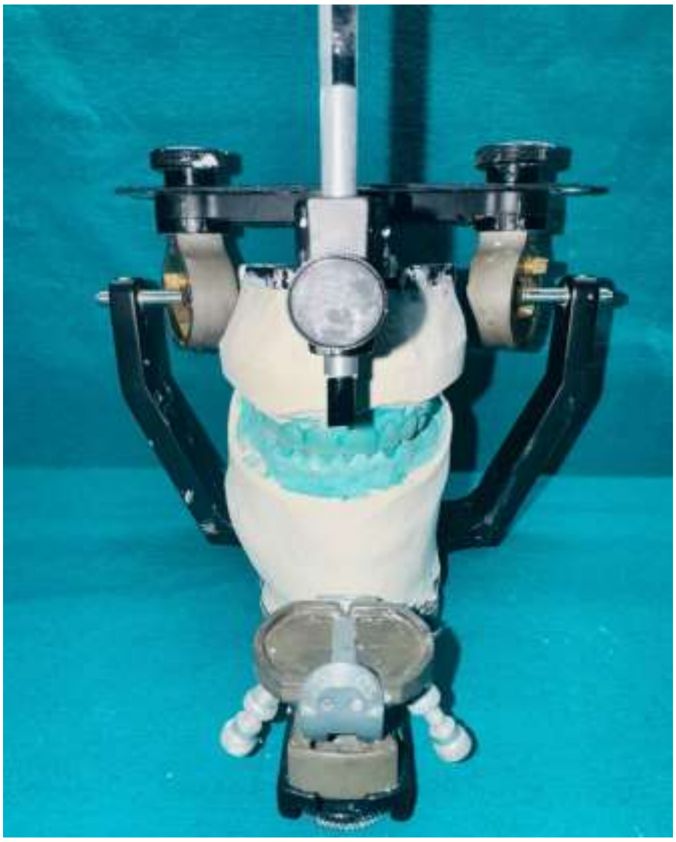

FIGURE 5: Diagnostic mounting and wax mock-up

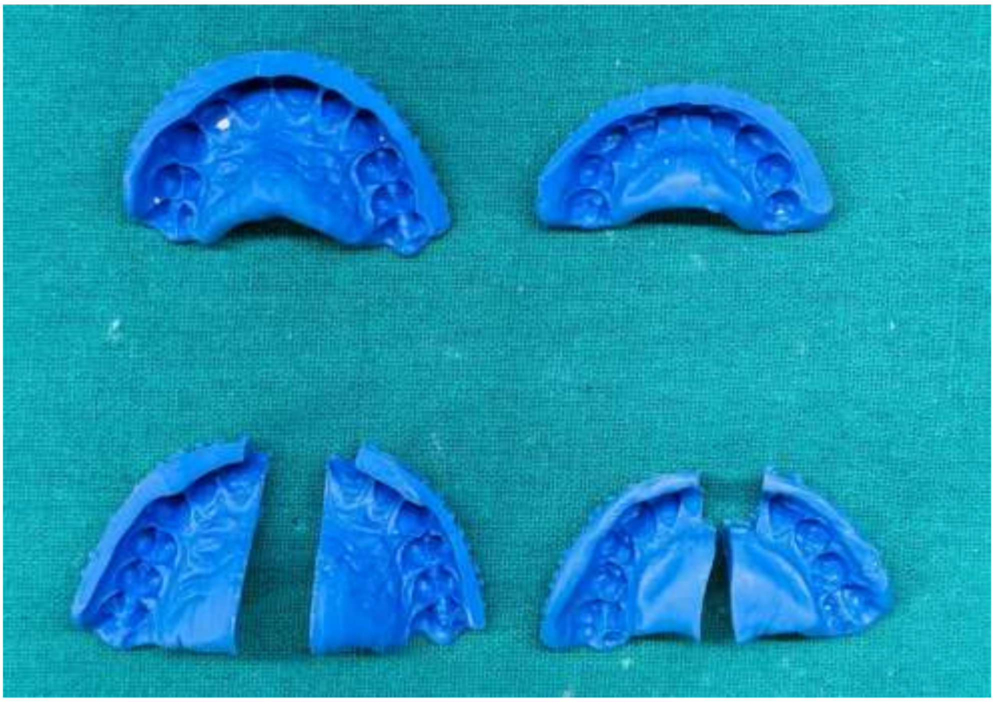

FIGURE 6: Preparation guide

FIGURE 7: Maxillary depth orientation grooves

FIGURE 8: Facial Reduction

FIGURE 9: Incisal Reduction of maxillary teeth

FIGURE 10: Mandibular depth orientation grooves

FIGURE 11: Mandibular incisal depth orientation grooves

FIGURE 12: Facial Reduction

FIGURE 13: Palatal prepartion of maxillary arch

FIGURE 14: Lingual prepartion of mandibular arch

FIGURE 15: Completed tooth prepartion of maxillary and mandibular arch

FIGURE 16: Digital impression

FIGURE 17: Temporization

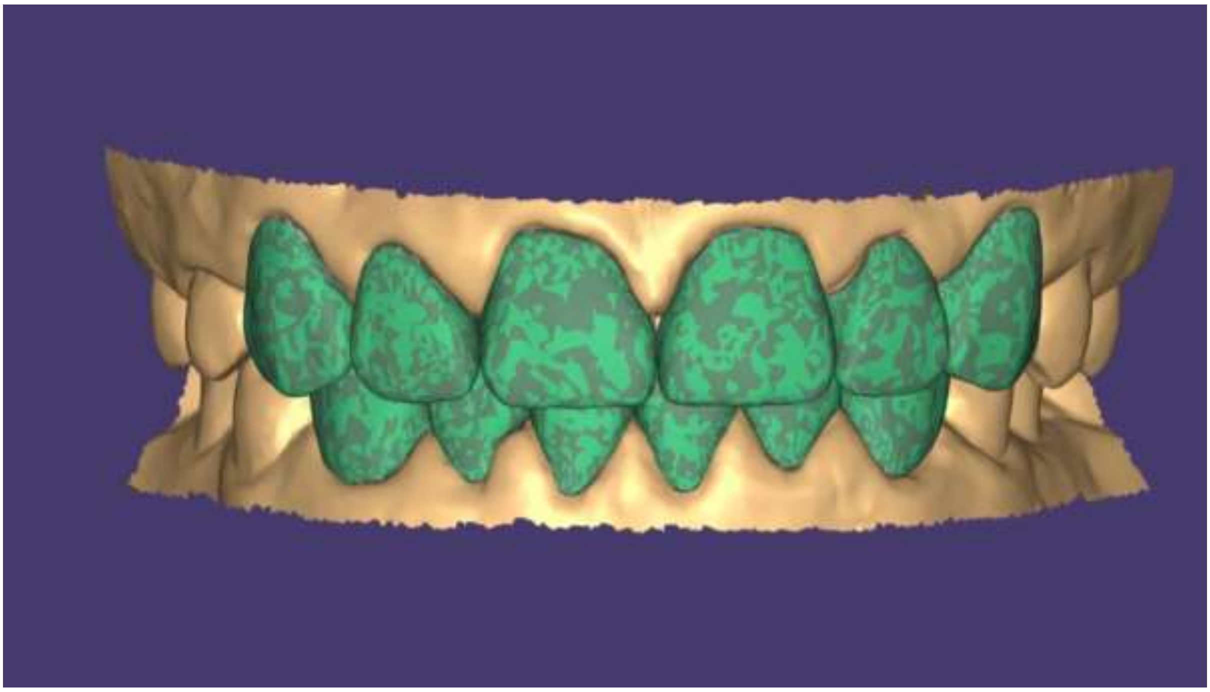

FIGURE 18: CAD/CAM designing

FIGURE 19: Final Prosthesis

FIGURE 20: Etching of veneers

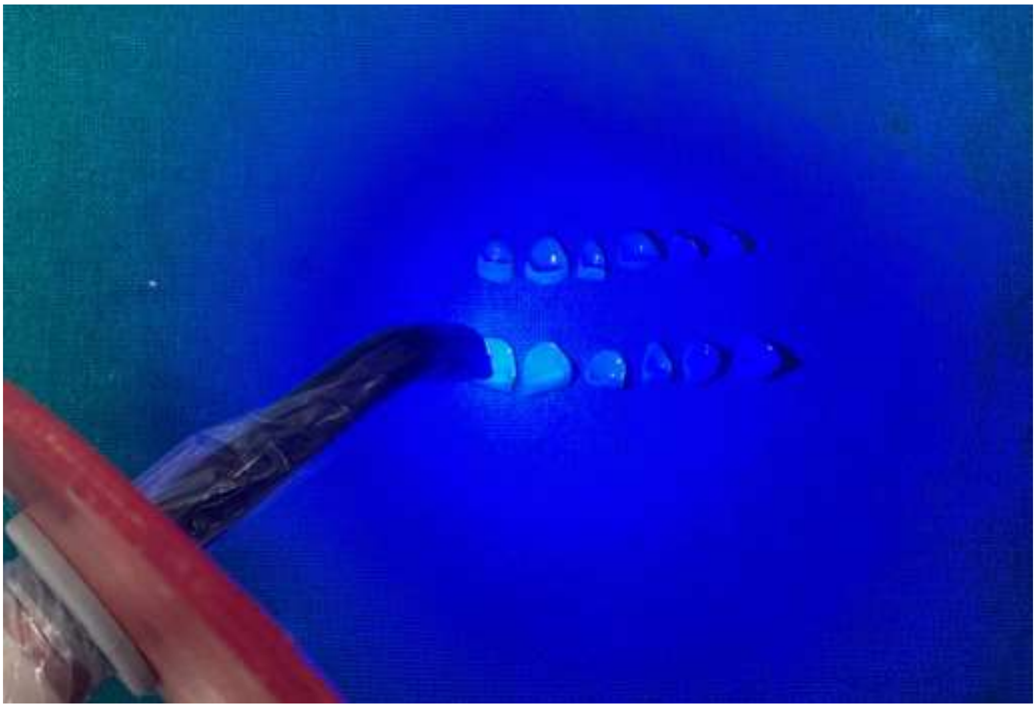

FIGURE 21: Bonding of veneers

FIGURE 22: Etching of prepared teeth

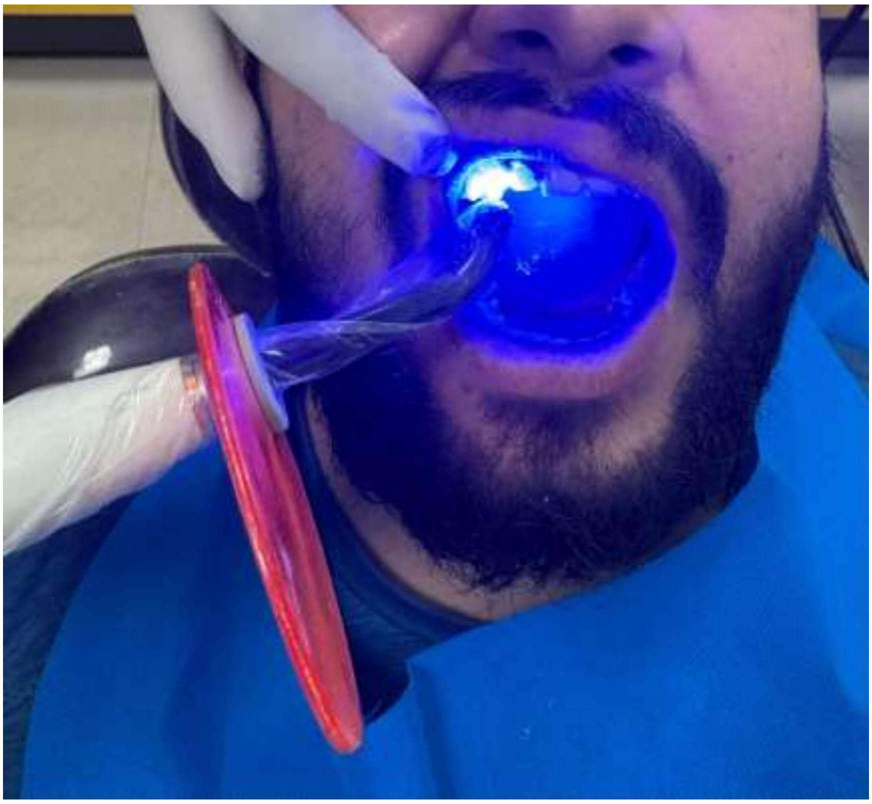

FIGURE 23: Bonding of prepared teeth

FIGURE 24: Final cementation of veneers

FIGURE 25: Post-operative extraoral photograph

Discussion

Dental fluorosis is a prevalent condition in the Indian population and often presents significant esthetic concerns for affected individuals. Among the available treatment options, veneers are considered a conservative and effective solution for restoring esthetics. Various materials can be used for veneer fabrication, such as composite for direct veneers and porcelain for indirect veneers.

Feldspathic porcelain was the first ceramic material used for indirect veneers, fabricated through the sintering technique. This method has been extensively studied in the literature. Subsequently, the lost-wax hot-pressed technique, introduced by Brodkin, became a significant advancement. In this technique, a wax-up is used to create a mold, into which pre-sintered lithium disilicate blocks of various shades are pressed. Although limited clinical data are available on this technique's long-term outcomes, it is recognized for its superior marginal adaptation compared to other methods.

Another popular approach involves the use of CAD-CAM technology, where veneers are digitally designed and milled. However, in the present case, veneers were fabricated using the lost-wax hot-pressed technique with lithium disilicate (IPS e.max Press by Ivoclar Vivadent). This material is composed of 65% lithium disilicate crystalline phase, providing enhanced strength, with a fracture strength of 3.3 MPa and a flexural strength of 400 MPa. Its excellent optical properties, including natural translucency, make it a preferred material for veneers. However, its high translucency limits its use in cases with darker underlying tooth shades, where opaque materials like zirconia are more suitable.

For optimal performance, lithium disilicate requires precise preparation and strong bonding with luting agents. Unsupported ceramics are prone to fractures, so retentive preparations are crucial. Lithium disilicate demonstrates excellent bonding with resin cement, enamel, and dentin. Adhesion is further enhanced by etching the veneer’s intaglio surface with 10% hydrofluoric acid and applying silane coupling agents. On the tooth surface, 37% phosphoric acid and dentin bonding agents are recommended to improve the bond strength.

Lithium disilicate veneers have shown excellent clinical outcomes, with failure rates ranging from 0% to 5% over 1 to 5 years. This durability, combined with its natural esthetics and functional strength, makes lithium disilicate an ideal choice for veneer fabrication, as demonstrated in this case report.

Conclusion

Ceramic veneers are among the most widely used restorative materials in esthetic dentistry due to their ability to deliver exceptional esthetic outcomes. Achieving optimal results requires careful treatment planning and adherence to clinical and laboratory protocols during fabrication. This case report demonstrates the successful use of ceramic veneers to restore the esthetics of fluorosed teeth, significantly enhancing the patient’s smile and boosting their self-confidence.

Conflicts of Interest The author declares no potential conflicts of interest with respect to the authorship and/or publication of this article.

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