

# An Insight into Therapeutic Management of Dental Fluorosis - A Case Report

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**Abstract:** *Esthetic changes in permanent dentition are greater concern in dental fluorosis. Laminate veneers are considered highly functional and esthetically appealing indirect restoratives for unesthetic anterior teeth with minimally invasive preparation. The clinical report describes a conservative treatment in porcelain laminate veneer replacement in management of moderate to severe dental fluorosis patients.*

**Keywords:** Dental fluorosis, Porcelain laminate veneers, incisal overlap

## 1. Introduction

Dental fluorosis is the condition caused by chronic intake of excessive fluoride during development of tooth. It is a developmental anomaly of enamel, leading to enamel with lower mineral content and increased porosities.

Excessive fluoride ingestion during enamel maturation adversely affects cleavage and removal of enamel proteins, such as amelogenins. Retention of the proteins and water interferes with enamel crystal growth, resulting in varying degrees of subsurface porosities. The volume and depth of the subsurface porosities increase with the severity of fluorosis.

Clinical presentation of dental fluorosis depends upon the severity, which ranges from narrow white lines following the parenchyma to discrete white opaque areas or to an entirely chalky white tooth surface. In some patients, the enamel may become so porous that the outer layers break

down (pitting) and the exposed porous subsurface becomes discolored, from light to dark brown in color.

Different treatment options for management of dental fluorosis depends upon the thickness of enamel involved and includes micro abrasion, macro abrasion, bleaching, composite resin restorations, veneers, or crowns with esthetic appeal.

## 2. Case Report

The patient named Ranju, came to the department of Prosthodontics, Crown and Bridge and Implantology, with the chief complaint of brownish discoloration of teeth in upper front tooth region of jaw (fig. 1). Patient was 19 years old with the main concern for esthetics. She was born at Mandya district, Mysore, India, from where cases of fluorosis have been reported. Age, sex, tooth number, clinical features of the case are tabulated below:

Age	Sex	Tooth number	Chief complaint And History	Clinical features	Diagnosis and treatment
19	F	11,12,21,22	Brownish discoloration since birth. Her birth was in Mandya district, Nagamagal, Mysore, India where fluoride content of water is reported to be high and many cases of fluorosis has been reported.	Opaque patches with brownish discoloration seen in 11,12,21,22. Also, opaque white patches seen in 13,23,24,31,32,33,34,41,	Dental fluorosis
				42,43,44.	Porcelain laminate veneers with overlap incisal edge, 0.8 mm preparation, butt joint with slight bevel.
				11, 21 were proclined, long with overjet and overbite of 3mm.	
				Class 1 molar and canine relationship.	
				Periodontal health was good and no carious lesions were found.	

After recording patient's history, clinical findings, and dean's index, moderate to severe dental fluorosis was diagnosed. According to the age of the patient and grade of fluorosis porcelain laminate veneers were given as the treatment option.

Diagnostic impressions were made and cast were poured using type 3 gypsum. Primary casts were articulated using

mean value articulator. Putty index was made from 14 to 24 using addition silicone impression material. Diagnostic wax up was done. Smile curve, occlusion, overjet, overbite were analysed.

In this case, we initially planned for micro abrasion, in which we used abrasive pumice paste and 37% phosphoric acid gel over the discoloured area for 10 sec, followed by

rinsing with water for 20 sec. But following this treatment brown staining still persisted. Then we used water cooled fine finishing flame shaped diamond points for macro abrasion, again slight brownish discoloration was left. Hence, porcelain laminate veneers were chosen as the treatment option.

The depth of the preparation was maintained at 0.7 mm in the enamel so that there is maximum bonding.

The Overlap incisal edge technique was used, in which labial reduction of 0.7mm with supragingivalshamfer margins were given. Axial reduction of 0.5mm was done maintaining the proximal contacts, 0.8mm of incisal reduction was done as crown length was more with vertical overlap of 3mm. Incisal reduction was done, and butt joint with slight bevel was given. This technique has proven to provide adequate retention. On the same visit shade selection was done, final impressions were made and post operative photographs were taken. Temporary heat cure crowns were not made as tooth preparation was minimal and finish lines were supragingival. Pressable ceramics IPS EMPRESS were used for the veneers.

In third visit patient was called for cementation of porcelain laminate veneers. The fit of veneers was first checked on the cast, then on teeth and patient was satisfied. Both porcelain laminate veneers and teeth were prepared for bonding. PANAVIA F 2 complete kit was used for cementation. Porcelain laminate veneers were treated with 9% hydrofluoric acid for 20 sec, washed and dried.

Then silane coupling agent was applied on to the etched surface of porcelain laminate veneers using a microbrush. Allowed the material to react for 60sec and then applied stream of air on to it.

The teeth are isolated thoroughly. Clean the tooth surface with pumice slurry in a prophylaxis cup, and rinse thoroughly and dry it. Then enamel of the prepared surface was etched with 37% phosphoric acid gel for 40sec, rinsed with water and gently air dried. The etching time has to be doubled in dental fluorosis patients. Bonding agent was applied on the prepared tooth surface for 30 sec, and dried.

Resin cement was mixed and applied on the porcelain laminate veneers, and placed on the prepared teeth with gentle apical and labial finger pressure. All the excess resin cement was removed with an explorer before curing. Curing was accomplished with LED polymerising unit for 40 sec, which is done from palatal aspect and then labial surface so that shrinkage occurs towards the tooth, slightly longer curing time is preferred in dental fluorosis patients, curing and etching time has to be doubled. Excess cement was removed and premature contacts were evaluated. Photographs were taken after final cementation, post operative instructions were given (fig.2). Patient was called for follow up after year.



Figure 1: Pre operative picture of case of Dental fluorosis



Figure 2: Post operative picture of the case of Dental fluorosis

### 3. Discussion

Dental fluorosis is the developmental disturbance of enamel, caused by frequent exposure of fluoride during development of the tooth. The safe level of daily fluoride intake is 0.05 to 0.07mg/kg. Above this level, there is the risk of developing dental fluorosis due chronic consumption of fluoride above the safe diet intake level.

Prevalence of dental fluorosis can be attributed to high levels of fluoride (>1ppm) in drinking water (normal fluoride content in water should be 0.7 to 1 ppm, to prevent dental caries), Chronic exposure to fluoride supplements, topical fluoride. It is seen to occur in children who are excessively exposed to fluoride between 20 to 30 months of age.<sup>[1]</sup>

In dental fluorosis enamel has low mineral content and is porous. Dental fluorosis can be diagnosed as bilaterally symmetrical, diffuse opaque, white striations that run horizontally across the enamel. In moderate to severe cases brownish discolorations and pits can be seen as well.<sup>[2]</sup>

Management of dental fluorosis can range from micro abrasion, bleaching, and macro abrasion to porcelain laminate veneers and crowns depending upon the severity of fluorosis. As adhesive bonding to enamel produces more predictable outcome than bonding to dentin, laminate veneer is not recommended when more than 30% of the labial enamel has been lost.<sup>[3]</sup>

In this case, we initially planned for microabrasion and macroabrasion, but slight brownish discoloration still persisted. Also, disadvantage of his technique is post operative sensitivity in moderate to severe grades of dental fluorosis.<sup>[4]</sup>

Train et al reported marked enamel surface irregularities following treatment of severe fluorosis by microabrasion. Such surface irregularities/ due to exposed subsurface enamel porosities, predispose to recurrent staining. It has been suggested that porosities be sealed with low viscosity resin, but the longevity of such a seal has not been evaluated by randomised clinical trials. The alternative is to place laminate veneers preferably porcelain laminate veneers. If 0.5-0.7mm of surface enamel is removed during tooth preparation, bond strength of restoration luted by resin cement, would not be expected to be compromised by the severity of fluorosis. If the veneer is bonded to unprepared fluorosed tooth, however, bond strength would be expected to be relatively low. To maximize bond strength under this situation, etch-and-rinse bonding system should be used. In addition etching time with 35-37% phosphoric acid may be at least doubled.<sup>[5],[6]</sup>

In a prospective longitudinal study of 323 porcelain laminate veneers, survival rate, after 3-11 years, was very good, there being de-bonding in 9% of the restorations. Marginal integrity was excellent in 98% of the cases, and about the same percentage of the patients rated the treatment outcome to be excellent. There were very few fractures, but gingival recession occurred in 7.7% of cases, while gingival bleeding was observed in 21.6% of cases. Hypersensitivity and change in sensibility of the restored teeth were uncommon (about 3%) and recurrent caries in 3% of patients.<sup>[7]</sup>

By adding certain types of fillers that are uniformly dispersed throughout the glass, increased strength in glassy ceramics is achieved. Zirconia, aluminum, leucite, magnesium, and lithium di-silicate are examples for these types of fillers. Such glassceramics were stronger with a higher melting point than non-crystalline glass and also had variable coefficients of thermal expansion. First, the glass-ceramic material called (Dicor) was introduced. It was made by using a lost-wax and centrifugal casting process. The translucency was the main disadvantage of the material because it necessitated the external application of all shading. A few years later, another reinforced glass-ceramic system called (leucite) was introduced. The material is heated to a high temperature and pneumatically pressed and the resultant microstructure is similar to that of powder porcelains; however, less porous and a higher crystalline content is the main advantage of the porcelain laminate veneer constructed from leucite system. Due to its favorable strength and shade, the manufacturer's instructions recommend its use for inlays, onlays, veneers anterior or posterior crowns and implant crowns.<sup>[8]</sup>

Bond strength was significantly higher with etch and rinse bonding systems than self etch adhesives. The bond strength of 2mm x 3mm ceramic discs was investigated (IPS EMPRESS II) to fluorosed and non fluorosed tooth surfaces, using etch and rinse or self etch luting resin cements. Shear bond strength was significantly higher with the etch and rinse resin cement.<sup>[9],[10]</sup>

So we planned for porcelain laminate veneers in which we followed overlapped incisal edge technique. Tooth preparation that incorporated an incisal overlap was

preferred because the technique has proven to provide pleasant esthetics, broader stress distribution, better strength and a positive seat during cementation. The advantages of incisal overlap include masking of the otherwise noticeable incisal finish line, thicker ceramic and reinforcement of incisal edge, and positive seating of ceramic veneers.<sup>[11]</sup> The butt joint preparation design exhibited more favorable stress distribution. Dentist should be able to choose the proper preparation technique, according to the situation of the case to achieve long lasting veneers. Better results were obtained when palatal surface and incisal edge preparation were guided by silicone index than with depth gauge bur.<sup>[12]</sup>

Some authors advocate no-preparation especially with window type when a minor tooth discoloration confined to facial surface. Others advised a conservative interproximal preparation with no contact area opening. Supra-gingival finish line is more hygienic and biological for gingival tissues but less esthetic. Breaking the contact is often used in changing the shape or position of teeth. With the additional space interproximally, this allows the ceramist freedom to adjust the contours and position of the teeth and address any width discrepancies between them. Preparations may extend further proximally with the presence of caries and existing restorations.<sup>[12]</sup>

The gingival margin can be placed supragingival, at the height of tissue, or subgingival. This margin determination is dictated primarily by the esthetic goals. Ideally, subgingival margins should be avoided unless necessary because of the existing tooth colour that needs to be blocked out and/or a dramatic change in the higher value of the porcelain shade requested.<sup>[13]</sup> It will be more beneficiary for ceramics technician to determine where to build and construct the porcelain laminate veneers. Sub-gingival finishing line is less biocompatible for gingival tissues. This type can be used efficiently in case of severely discolored teeth like in case of tetracycline stains to mask the undesirable discoloration at cervical margins. At cervical region fluids secreted from gingival crevice impair a good seal between the fitting surface of laminate veneer and the tooth structure. Most studies concluded that if the tooth preparation was more conservative and confined to enamel, the bond strength between recent resin cements and enamel will be better than with dentin.

#### 4. Conclusion

Compromised esthetics in permanent dentition is main concern in dental fluorosis. Porcelain laminate veneers are alternative treatment options due to conservative design, minimal tooth preparation and excellent esthetics for anterior teeth. Proper diagnosis, systematic and strategic treatment planning leads to smile with esthetic appeal.

#### 5. Conflict of Interest Statement

All persons who meet the authorship criteria certify that they have participated sufficiently in the work to take public responsibility for the content, design, analysis and writing. Similar material will not be submitted and has not been submitted or published in any other journal.

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