



## Empowering Beautiful Smiles - a Case of Digital Smile Designing with Resin Infiltration

**Dr. Padmapriya Puppala\*<sup>1</sup>, Dr. Charushila Sardar<sup>2</sup>, Dr. Gaurang Mistry<sup>3</sup>, Dr. Swapnita Vaity<sup>4</sup>, Dr. Anoushka Banerjee<sup>5</sup>, Dr. Vidhi Desai<sup>6</sup>**

<sup>1</sup>Professor, Department of Prosthodontics, DY Patil University School of Dentistry, Navi Mumbai  
[padmapriya.puppala@dypatil.edu](mailto:padmapriya.puppala@dypatil.edu)

<sup>2</sup>Professor, Department of Prosthodontics, DY Patil University School of Dentistry, Navi Mumbai  
[charshila.sardar@dypatil.edu](mailto:charshila.sardar@dypatil.edu)

<sup>3</sup>Professor, Dean and HOD, Department of Prosthodontics, DY Patil University School of Dentistry, Navi Mumbai

<sup>4</sup>Associate Professor, DY Patil University School of Dentistry, Navi Mumbai) [Swapnita.vaity@dypatil.edu](mailto:Swapnita.vaity@dypatil.edu)

<sup>5</sup>MDS, Post graduate student, DY Patil University School of Dentistry, Navi Mumbai  
[Anoushkabanerjee2301@gmail.com](mailto:Anoushkabanerjee2301@gmail.com)

<sup>6</sup>BDS, Post graduate student, DY Patil University School of Dentistry, Navi Mumbai  
[Vidhi.ddesai1998@gmail.com](mailto:Vidhi.ddesai1998@gmail.com)

\*Corresponding author's E-mail: [padmapriya.puppala@dypatil.edu](mailto:padmapriya.puppala@dypatil.edu)

Article History	Abstract
Received: 06 June 2023 Revised: 05 Sept 2023 Accepted: 06 Nov 2023	<i>Dental fluorosis, especially if present in moderate to severe grades, can render an unaesthetic appearance to the dentition. An esthetic makeover creates a smile where the stomatognathic structures function with no hindrance to each other, a perfectly balancing orofacial structure reciprocates each other. With the advent of Digital Smile Designing, the outcome and predictability of the treatment is significantly enhanced. The present case report describes one such case of dental fluorosis treated with a multidisciplinary approach using Digital Smile Designing and resin infiltration.</i>
CC License CC-BY-NC-SA 4.0	<b>Keywords:</b> Dental fluorosis, resin infiltration, smile design, veneers

### 1. Introduction

Dental fluorosis, especially if present in moderate to severe grades, can render an unaesthetic appearance to the dentition.<sup>[1]</sup> This, in turn, can significantly affect the individual's self-esteem and social confidence. Restoration of esthetics in such cases is of utmost priority for which tailoring an appropriate treatment plan plays a key role.<sup>[2]</sup> An esthetic makeover creates a smile where the stomatognathic structures function with no hindrance to each other, a perfectly balancing orofacial structure reciprocates each other.

Resin composites are considered to have a wide spectrum of color and translucency.<sup>[3]</sup> Other than the advantage of their esthetic appearance, they also have durable mechanical properties. This allows to conduct of procedures with minimal or no removal of healthy enamel while producing optical properties of natural dentition.<sup>[4]</sup>

With the advent of Digital Smile Designing (DSD), the outcome and predictability of the treatment are significantly enhanced.<sup>[5]</sup> The clinician is able to communicate effectively with the patient as well as the technician pertaining to the expectations of the patient and the possible treatment course. A multidisciplinary approach coupled with DSD can aid clinicians in achieving optimal aesthetic outcomes.

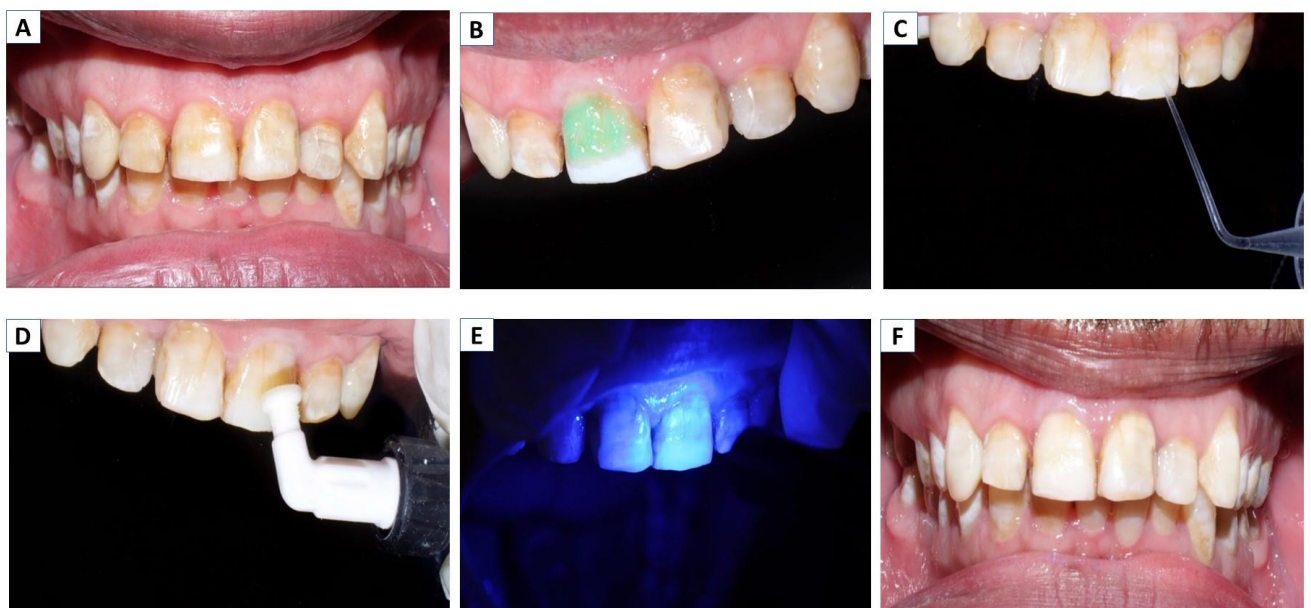
The present case report describes one such case of dental fluorosis treated with a multidisciplinary approach using DSD and resin infiltration. The aim of this report is to provide clinicians with a guide or suitable reference should they encounter similar cases in their practice.

### Case Report:

A 31-year-old male reported to the Department of Prosthodontics, D.Y. Patil Dental Hospital, with dissatisfaction about the appearance of his smile. The patient was systemically healthy. On clinical examination, the patient's maxillary anterior teeth limited to canines bilaterally were discolored owing to the presence of distinct brownish patches on the enamel surface. The periodontal health of the teeth was acceptable and radiographic findings showed no anomalies of surrounding tissues. Since the demineralization pattern exhibited white and yellow-brown spots, a diagnosis of mild to moderate fluorosis was discerned and infiltration by resins was considered to be a dependable treatment option.

A treatment plan was formulated which included lightening the fluorosis stains with low-viscosity resin infiltration followed by Emax CAD milled veneers for the maxillary anterior teeth. Oral prophylaxis was performed to get rid of any extrinsic stains and plaque build-up. Thereafter, upper and lower arch impressions were made using irreversible hydrocolloid material (Tropicalgin, Zhermack). The operative field was isolated by means of cotton rolls following which the resin infiltration procedure was commenced on the labial surfaces of the teeth.

The surface layer of enamel was etched using 15% hydrochloric acid gel (ICON-Etch, DMG) for 30 seconds and was subsequently rinsed for 30 seconds. The enamel surfaces were then desiccated with ethanol (ICON-Dry, DMG) for 30 seconds, followed by air drying. Low-viscosity resin (ICON Infiltrate, DMG) was smeared over the enamel surfaces of the teeth and allowed to infiltrate for three minutes. The excessive resin was wiped off and the tooth surface was then light-cured for 40 seconds. The resin application was then repeated once for one minute and cured for an additional 40 seconds. The procedures are summarized in **Figure 1**.



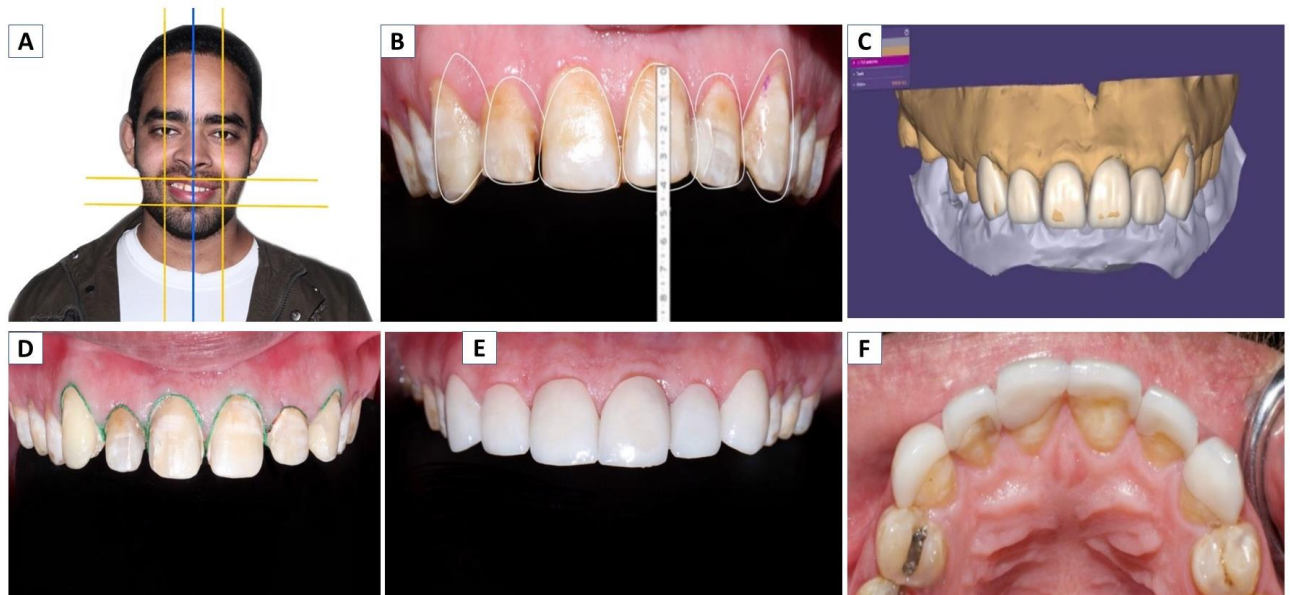
**Figure 1:** A) Generalized fluorosis; B) Surface etching; C) Ethanol application; D) Resin infiltration; E) Light curing; F) Post-infiltration with resin

The roughened tooth-restoration surfaces and interfaces were polished with a paste and cups. The patient was recalled after a week for follow-up to determine the degree of acceptability and satisfaction. On confirmation, the process of digital smile designing was initiated by creating an intraoral composite mock-up which was modified according to the patient's needs to gain a better understanding of the treatment outcome. An aesthetic wax-up was fabricated.

Digital face bow analysis was performed to evaluate the midline, cant in occlusal plane by constructing orofacial harmonization lines. The smile was analyzed as per the length, size, form of the teeth. It was found that the proportion of maxillary anteriors had to be modified to attain an aesthetically pleasing smile. A virtual template of the teeth was designed as per the patient's feedback and aesthetics. This new smile was superimposed on the extraoral photograph of the patient. A 3D-printed template was then fabricated using the digital data of the newly designed smile.

Shade selection was performed using the Vita Classic shade guide. Tooth preparation of 0.7 mm was done in the incisors and canines using a 0.5 mm bur on the labial surface. It was ensured that the palatal margin was placed above the centric contact. A tapered chamfer diamond bur was used to prepare the labial wall to create gingival and interproximal margins.

Retraction was done using 000 cord and full arch impressions were made with polyvinyl siloxane impression material. Occlusal bite registration was made. Instructions regarding the final shade, length and decided position of the teeth were given to the technician. The 3D printed model of the new smile was used to fabricate temporaries using Bis Acrylic composite (Protemp™). CAD-CAM milled lithium disilicate veneers were fabricated. The try-in was done using glycerine and the fit, marginal adaptation, translucency, and shade of each veneer were checked. The DSD procedures are depicted in Figure 2.



**Figure 2:** A) Smile analysis with orofacial harmonization lines; B) Virtual template; C) CAD design for final restoration; D) 0.7 mm preparation with chamfer margins and retraction; Post-operative outcome in E) Front view and F) Occlusal view

After the teeth were pumiced and rinsed, enamel surfaces were etched with 37% phosphoric acid (Etching Gel, Kerr) for 15 seconds followed by rinsing and drying. A bonding agent (Adper Single Bond, 3M ESPE) was then applied in layers on the etched tooth surface. After etching and silanating the laminate with 9% hydrofluoric acid, cement was added (Variolink N, Ivoclar). The veneers were placed and held in position while light curing for five seconds. The initial excess cement was removed. The laminates were then completely cured for 60 seconds labially and palatally. Occlusal adjustments were made and the patient was recalled after a month. The comparative demonstration of pre- and post-treatment smile is illustrated in **Figure 3**.



**Figure 3:** Comparison of smile A) before and B) after the treatment procedures.

## Discussion:

Dental fluorosis, particularly when manifesting in moderate to severe grades, can significantly impact the aesthetic appeal of an individual's dentition, leading to profound consequences for their self-esteem and social confidence.<sup>[1]</sup> The complexity of managing such cases necessitates a strategic and tailored treatment plan to restore not only the visual harmony of the smile but also the functional aspects of stomatognathic structures.<sup>[6]</sup> The amalgamation of contemporary approaches, such as resin composites and DSD, with traditional prosthodontic techniques has emerged as a comprehensive solution to address the multifaceted challenges posed by dental fluorosis.

The choice of resin composites is underpinned by their versatility, offering a broad spectrum of color and translucency.<sup>[3]</sup> Beyond their aesthetic appeal, these materials boast durable mechanical properties, allowing clinicians to execute procedures with minimal or no removal of healthy enamel while mimicking the optical characteristics of natural dentition.<sup>[4]</sup> The pivotal role played by resin infiltration, in the present case, exemplifies its efficacy in mitigating fluorosis stains, laying the groundwork for subsequent esthetic enhancements.

The integration of DSD represents a paradigm shift in treatment planning and execution. DSD not only enhances the predictability of outcomes but also serves as a powerful communication tool between the clinician, patient, and technician.<sup>[5]</sup> The digital platform facilitates a detailed analysis of orofacial structures, enabling an improved understanding of the patient's expectations and guiding the treatment course effectively.<sup>[7]</sup> The multidisciplinary approach, enriched by the incorporation of DSD, empowers clinicians to navigate the intricate balance between form and function, resulting in optimal aesthetic outcomes.

The case report details the stepwise procedure undertaken to address the patient's concerns. Commencing with oral prophylaxis to eliminate extrinsic stains and plaque, the treatment plan progressed to resin infiltration using 15% hydrochloric acid gel and low-viscosity resin application (ICON Infiltrate, DMG). The iterative process of resin application and light curing was conducted with precision, ensuring the infiltration of the affected enamel surfaces. Post-treatment, a week-long follow-up confirmed the acceptability and satisfaction of the resin infiltration procedure.

An intraoral composite mock-up during DSD served as the canvas for modification, allowing the patient and clinician to collaboratively visualize the anticipated treatment outcomes.<sup>[8]</sup> The subsequent digital face bow analysis provided a comprehensive evaluation of midline alignment, occlusal plane cant, and the proportions of the maxillary anterior teeth.<sup>[9]</sup> This analysis informed the creation of a virtual template, superimposed onto the patient's extraoral photograph, and ultimately translated into a 3D printed model of the newly designed smile.

The transition from digital planning to the physical realm involved meticulous shade selection using the Vita Classic shade guide. Tooth preparation, carried out with precision to preserve healthy tooth structure, was followed by full arch impressions and occlusal bite registration. The 3D printed model facilitated the fabrication of temporaries and the ultimate creation of CAD-CAM milled lithium disilicate veneers. The try-in phase, crucial for evaluating fit, marginal adaptation, translucency, and shade, exemplifies the commitment to achieving both functional and esthetic success.

In conclusion, the comprehensive treatment of dental fluorosis outlined in this case report provides a detailed roadmap for clinicians encountering similar challenges. The seamless integration of resin infiltration, DSD, and CAD-CAM technology underscores the dynamic evolution of prosthodontics. This report serves not only as a clinical documentation of a successful case but also as a valuable educational resource, emphasizing the importance of precision, advanced technologies, and a patient-centered approach in achieving optimal esthetic outcomes.

## 4. Conclusion

The present case report showed that the resin infiltration technique is a conservative approach that enhances the aesthetic look for mild to moderate fluorosis in a brief time period. This in conjunction with veneers, can bring aesthetic success. Smile designing not only aids the clinician in communicating the desired outcome to the technician but also helps in treating the patients with an individualized, interdisciplinary approach.

## References:

1. Clark DC, Berkowitz J. The influence of various fluoride exposures on the prevalence of esthetic problems resulting from dental fluorosis. *Journal of Public Health Dentistry*. 1997 Sep;57(3):144-9.
2. Khandelwal V, Nayak UA, Nayak PA, Ninawe N. Aesthetic management of dental fluorosis. *Case Reports*. 2013 May 22;2013:bcr2013010029.

3. Kamishima N, Ikeda T, Sano H. Color and translucency of resin composites for layering techniques. *Dental materials journal*. 2005;24(3):428-32.
4. Pratap B, Gupta RK, Bhardwaj B, Nag M. Resin based restorative dental materials: Characteristics and future perspectives. *Japanese Dental Science Review*. 2019 Nov 1;55(1):126-38.
5. Jafri Z, Ahmad N, Sawai M, Sultan N, Bhardwaj A. Digital Smile Design-An innovative tool in aesthetic dentistry. *Journal of oral biology and craniofacial research*. 2020 Apr 1;10(2):194-8.
6. Akpata ES. Therapeutic management of dental fluorosis: A critical review of literature. *Saudi Journal of Oral Sciences*. 2014 Jan 1;1(1):3-13.
7. Coachman C, Van Dooren E, Gürel G, Landsberg CJ, Calamita MA, Bichacho N. Smile design: From digital treatment planning to clinical reality. *Interdisciplinary treatment planning*. 2012 May;2:119-74.
8. Garcia PP, Da Costa RG, Calgaro M, Ritter AV, Correr GM, Da Cunha LF, Gonzaga CC. Digital smile design and mock-up technique for esthetic treatment planning with porcelain laminate veneers. *Journal of conservative dentistry: JCD*. 2018 Jul;21(4):455.
9. Xia JJ, Gateno J, Teichgraeber JF. New clinical protocol to evaluate craniomaxillofacial deformity and plan surgical correction. *Journal of Oral and Maxillofacial Surgery*. 2009 Oct 1;67(10):2093-106.