

Comprehensive Strategy for a Compromised Esthetic Case: A Multidisciplinary Approach

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Abstract

Introduction: Esthetic outcome can be achieved even in challenging clinical situations. Severely fluorosed teeth in a high caries risk patient with a compromised medical and psychological background would be an example of such a challenge.

Clinical Report: A 28 years old Saudi female with uncontrolled diabetes came to the dental clinics at King Abdul Aziz University Hospital, with a chief complaint of severe pain related to tooth #11, also dark discolorations of all her teeth, which was diagnosed as severe fluorosis. The discolored teeth were found to be the reason behind unhappy masked facial expressions on her face. Multiple decayed teeth and oral hygiene neglect were evident. A comprehensive treatment plan was implemented including extraction of badly decayed teeth, multiple root canal treatments, gingival recontouring, implants, multiple restorations, and combination of bleaching and porcelain laminates and ceramic crowns.

Treatment Outcome: The patient appreciated the result and she is happy with her new smile. The long-term prognosis of the treatment outcome required controlled blood sugar and meticulous maintenance of oral hygiene.

Conclusion: With proper strategic planning, an outstanding esthetic outcome can be achieved. The patient has to be treated as a whole, taking into account mental and social factors, rather than just the physical symptoms.

Key words: Fluorosis, Fluorotic enamel, Thylstrup-Fejerskov index, Esthetic, Bleaching, Microabrasion, Porcelain laminate veneers, Ceramic crowns

Introduction

Esthetic excellence, mandatorily un-dissociated from biologic functionality, is the basis of modern dentistry. Restorations of dental malformations that compromise the smile harmony represent a challenge for dental practitioners [1,2].

Dental fluorosis was first described in 1916 by Black and McKay [3].

It is a specific condition caused by chronic ingestion of excessive fluoride during enamel formation [4]. Clinically it appears in different forms [5]. In its mild form, lusterless white lines or diffuse opacities are present, while in the more severe forms, generalized opaque and chalky appearance with confluent pitting and staining of hypomineralized tissues may be seen [5]. Fluorotic enamel is hypomineralized and porous and, following eruption, extensive mechanical breakdown of the surface enamel and secondary staining of the underlying hard tissues will occur in a severely affected dentition [5]. Therefore, severe form of fluorosis disturbs enamel significantly and thus affects aesthetics adversely and can cause psychological distress to the affected person [4].

The most important risk factor in determining fluorosis occurrence and severity is the total amount of fluoride consumed from all sources during the critical period of tooth development [6,7].

Fluorosis, however, is endemic in several areas of Saudi Arabia as for example, Mecca, Al-Qassim and Hail where drinking water contains excessive amounts of fluoride [8-11].

Fluorosed teeth can be treated by different treatment modalities including: bleaching [12], microabrasion [13,14], macroabrasion and composite or porcelain laminate veneers [15-17]. Selecting between non-invasive, minimally invasive, and invasive restorative procedures to aesthetically treat such fluorosed teeth, pose a significant challenge to the restorative

dentist [12].

This paper presents a case with successful aesthetic management of severe dental fluorosis by multidisciplinary approach and different treatment modalities in a Saudi female diabetic patient.

Case Report

A 28 years old Saudi female came to dental clinics at King Abdul Aziz University Hospital, Jeddah complaining of severe pain related to tooth #11; also dark discolorations of all her teeth. Patient was not smiling and hiding darkly discolored teeth, which were found to be the reason behind unhappy masked facial expressions on her face. During conversation with the patient, reverse smile was evident [18] (*Figure 1*).

Her medical history revealed that she had uncontrolled diabetes, which was started as gestational diabetes three years ago. Patient was neglecting her general and oral health and had low self-esteem.

Clinical findings

Extra-oral: Hard painless swelling in submandibular area

Intra-oral: Very poor oral hygiene, generalized marginal



Figure 1. Pre-operative smile.

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gingivitis, abscess related to tooth #11, sinus tract opening related to tooth #16, multiple decayed teeth, generalized

Enamel fluorosis (*Figure 2*).

Diagnosis

Aneurysmal bone cyst related to mandibular anterior teeth that were confirmed by excisional Biopsy, Acute Apical Abscess related to tooth #11 which was having initial RCT, non-restorable teeth #18, #16, #15 and #26, #28, #38 and #48. Typical picture of generalized dental fluorosis of TFI = 4-7 with brown discoloration, based on the 1978 dental fluorosis classification Index of Thylstrup and Fejerskov [4] (*Figure 3*) patient was High caries Risk according to CRT which revealed a high *Streptococcus mutans* and lactobacilli bacterial counts and bad dietary habits. Regarding her occlusion, she was canine guidance in both sides and had over-erupted tooth #36 and mild crowding of mandibular anterior teeth.

Methods

Treatment plan: Objectives of the treatment were to eliminate etiologic factors and control pain and discomfort, motivate the patient to control blood sugar, improve her oral hygiene and modify her dietary habits, the multidisciplinary approach was oriented toward achieving functional and esthetic rehabilitation of the affected teeth, restore the patient's smile, hence her self-esteem.

A comprehensive treatment plan including: Control blood sugar, caries control and extraction of non-restorable teeth “#18, #16, #15, #26, #28, #38 & #48”, motivate the patient for meticulous oral hygiene and strict dietary habits, multiple root canal treatments”#17, #11, #21, #22, #23, #24, #25& #27”, multiple composite restorations”#37, #35, #45, #46 & #47”, We considered orthodontic treatment for mild crowding of mandibular anterior teeth and over-erupted tooth #36 but patient refused orthodontic treatment, gingival recontouring for maxillary anterior teeth to achieve consistent gingival margin, implants replacing extracted #16, #15 & #26, and combination of bleaching, porcelain laminates and ceramic onlay and crowns. Patient signed informed consent before treatment.

Treatment procedure

The treatment was carried out in five-treatment phases [19].

Phase I: Urgent phase: It includes: emergency treatment of tooth #11 (RCT) and incision and drainage of the abscess.

Phase II: Control phase: Records were taken include: Impression for study model to evaluate the occlusion and make diagnostic wax up [18], Radiographs “full mouth and OPG” and different extra-oral and intra-oral photographs (*Figure 3*).

Caries control including excavation of all carious lesions



Figure 2. Poor oral hygiene and generalized severe fluorosis.

and temporization using GI restorations, Scaling and root planning, fluoride application and meticulous oral hygiene instructions. Patient was referred to Endocrine department to control her blood sugar.

Phase III: Re-evaluation phase: Patient was highly motivated and responded to all our instructions; she was maintaining good oral hygiene and showed better dietary habits. There was healing of the gingival inflammation. Also her medical report showed great improvement of blood sugar level.

Phase IV: Definitive phase: We started bleaching of maxillary and mandibular anterior teeth using an in office opalescence Boost 35%hydrogen peroxide (Ultradent products) to whiten her teeth [1,13]. Bleaching was carried out under rubber dam isolation to protect the soft tissues. 37% phosphoric acid etching for 30 seconds was used to facilitate the effect of bleaching agent, then teeth were thoroughly washed and dried followed by application of 35% hydrogen peroxide according to manufacturer instructions [4]. The total inoffice bleaching application time was 30 minutes. Then the bleaching material was removed with high-volume suction and rinse with water for one minute. 2% neutral sodium fluoride (S. S. White) was applied topically for 3 minutes on the teeth surfaces as instructed by manufacturer to avoid post-treatment sensitivity. Post-operative instructions were given to the patient. Shade of the teeth became A2 with slight yellowish discoloration in cervical region. In-office bleaching was repeated again after 1 week following the same protocol to have more whitening effect. The patient was pleased with the result (*Figure 4*).

Microabrasion using Prema compound (Premiere Dental Products) was carried out to treat irregular buccal surfaces in posterior teeth and render them non-retentive to plaque accumulation. Teeth were isolated using rubber dam. Prema compound was applied on the enamel surfaces and rubbed with specialized brush at a speed of 1,000 rpm for 2 separate applications of 30 to 40 seconds each. Between each application the paste was rinsed and dried from the tooth surfaces. This procedure was repeated 2 times. At the completion of microabrasion the etched enamel surfaces

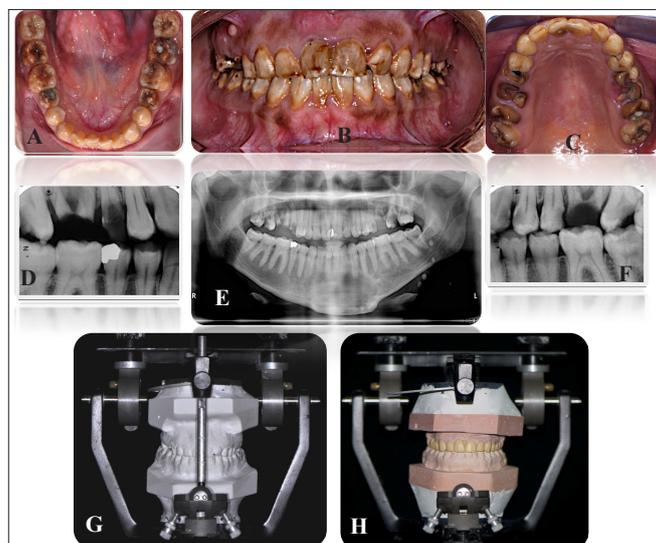


Figure 3. Pre-operative records, (A) mandibular view, (B) Frontal view, (C) Maxillary view, (D) Right bitewing radiograph, (E) Panoramic radiograph, (F) Left bitewing radiograph, (G) Study model mounted on Hanau semi-adjustable articulator and (H) Diagnostic wax up.

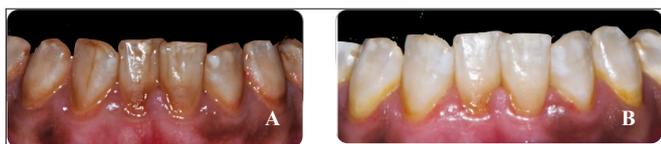


Figure 4. Before bleaching. (A) dark discoloration of the teeth), (B) after whitening the teeth.

were polished using porcelain-polishing rubber abrasive. Then the teeth were treated with a topical 2% neutral sodium fluoride (S. S. White) for 3 minutes followed by application of amorphous calcium phosphate paste (MI Paste Plus [GC America]) to avoid postoperative sensitivity.

Endodontic treatment: RCT of teeth #17, #11, #21, #22, #23, #24, #25 & #27 using lateral compaction technique of GP and AH plus sealer (Dentsply products) (Figure 5).

Restorative treatment: Composite Filtek Z350 XT universal restorative (3M ESPE Product) “shade A2 was used to restore teeth #37, #35, #46 & #47 following manufacturer’s instructions.

Pre-Prosthodontic/Surgical treatment: Cast post and core “gold” were done for teeth #17, #11, #24, #25, #27 and fiber-post with composite core for teeth #21 And #22 . HgA1C was 6%, which was safe level to perform surgical treatment [20]. CT scan was done to evaluate bone quality before implant placement and to assess the extension of aneurysmal bone cyst, which was treated by surgical removal. Implants were placed to replace extracted teeth #16, #15 and #26 using prima connex internal connection implants “4.1x 10 mm, 4.1x10 mm and 5x10 mm” respectively. Gingival recontouring for anterior teeth to have consistent gingival margin according to wax up done previously [18]. All surgical procedures were done under antibiotic covering preoperatively:

2 gm amoxicillin one hour before surgical procedure, post-operatively: 500 mg every 8 hours for 7-10 days and 0.12 % chlorhexidene twice a day for two weeks [20].

Prosthodontic treatment

Teeth Preparation: Crown preparation for teeth #17, #24, #25 and #27 “chamfer finish line”, abutments were selected for implants, veneer preparation in teeth #14, #13, #12 “ Chamfer finish line with incisal lab preparation”, crown preparation for #11, #21, #22, #23 “ Shoulder finish line”, Ceramic onlay preparation for tooth # 36 for treatment of over eruption” shoulder finish line”.

Impression: Following teeth preparation, gingival retraction cord was inserted gently into the sulcus (Gingi-pack Max Z-twist #00) and final impressions were taken with polyvinyl-siloxane material. Temporization was fabricated of Protemp

using silicon index which was fabricated according the accepted diagnostic wax up.

Laboratory fabrication: PFM crowns were fabricated using white gold and feldspatic porcelain (Shade A2). Ceramic crowns and veneer were fabricated using e.max with high opacity core of shade A2. The flexural strength of this type of ceramic is well documented.

Try in and cementation: The crowns and veneers fit, form and color were checked on the master cast both individually and collectively. The teeth were cleaned with slurry of pumice and PFM crowns of posterior teeth were checked for fitting, contacts and occlusion. Anterior veneers and crowns were checked also using try-in paste, included in Variolink® N cementing kit (Ivovalr Vivadent Dental Products). Once everything was approved, sandblasting of fitting surface of PFM crowns was done using 50 micron ALO₃, and etching of fitting surface of ceramic onlay, crowns and veneers using 9% hydrofluoric acid for 1 minute as per the manufacturers' instructions. Then, it was treated with two layers of silane coupling agent (monobond-S) [21].

Teeth re-cleaned with slurry of oil free pumice. Posterior PFM crowns were cemented using GI cement following manufacturers' instructions. Teeth, which would receive ceramics, were etched using 37% phosphoric acid for 30 seconds [22], rinsed and blot dried without desiccation using oil-free air. Thin layer of adhesive bonding on both the silane treated ceramics and etched teeth without light curing, as per manufacturers' instructions. Pre-selected shades of luting cement were applied to the internal surface of the ceramics and were carefully placed onto the teeth until fully seated [23]. Excess cement was removed from the margins to facilitate the finishing process by using micro brush. Holding ceramics in their places the incisal tip was light cured for 5 seconds for better removal of excess cement and less stress concentration and cracks, followed by a complete polymerization from all the surfaces.

Excess hard cement was removed using blade #15, Finishing strips were used to clean interproximal areas. Final photographs and OPG were taken.

Adequate oral home-care regimen was strongly emphasized for the patient (Figures 5-7).

Treatment Outcome: The patient appreciated the result and she is happy with her new smile (Figure 8). The long-term prognosis of the treatment outcome required controlled blood sugar and meticulous maintenance of oral hygiene.

Phase V: Maintenance phase: Patient was visited every 3 months for monitoring of the restorations placed. One-year follow up (Figure 9) patient showed meticulous maintenance



Figure 5. Peri-apical radiographs after RCT of teeth “From left to right “: #17, #11, #21, #22, #23, #24, #25 & #27



Figure 6. Post-operative photographs. (A Maxillary view), (B) Frontal view and, (C) Mandibular view.



Figure 7. Post-operative panoramic radiograph.



Figure 8. Post-operative smile.

Note: Patient's smile converted from reverse smile to normal one.

of oral hygiene and great satisfaction with our treatment and had no complaints except that she was so curious to know how she could preserve these ceramics for a longer period.

Discussion

The prevalence of severe enamel fluorosis is high in endemic areas of Saudi Arabia, and the discoloration of the fluorosed teeth may be a source of psychological ill health [23].

Tannir reported the prevalence of mottled enamel in Mecca to be 90% [8], while Al- Khateeb et al. observed dental fluorosis in 70% of 12-year-olds in the same area of the kingdom [9]. Al-Shammery et al. also observed that a high prevalence of severe dental fluorosis exists in endemic areas of Saudi Arabia, particularly in the villages dependent on local wells for drinking water [10]. Akpata et al. correlated fluoride content of well drinking water in Hail rural areas with the severity of dental fluorosis [11]. The condition was prevalent in 90% of 12-15-year-old Hail children exposed to 0.5-2.8 ppm of fluoride and severe, with pitting, in 45% of the children. In 1999, Almas K et al. found that rural population have more prevalent and severe dental fluorosis as compared to urban population of Al-Qaseem province [24]. In 2010, AlDosari

et al. found inverse relationship between fluoride exposure and caries experience, but the prevalence of dental fluorosis increased with increase in fluoride concentration. There was no significant difference in caries experience or in the prevalence of dental fluorosis when fluoride levels increased from 0.3 ppm to 0.6 ppm. In contrast, caries experience was lower, while severity of fluorosis was significantly higher at fluoride levels above 0.6 ppm [25].

Although there is considerable literature on the characteristic features of dental fluorosis little appears to have been written on its management.

In Saudi Arabia, we frequently see young and adult patients with a varying degree of dental fluorosis, seeking a permanent solution to their aesthetic problems. Clinically, mostly moderate to severe types of fluorosis are the cases that require a definite dental attention [23].

An understanding of all available treatment modalities of fluorosed teeth is vital to the dentist's approach. Conservative treatment options such as tooth whitening and microabrasion can dramatically improve severely discolored fluorosed teeth. This can provide a satisfactory interim outcome or minimize the removal of discolored enamel and dentine prior to the provision of composite veneers [14]. Severe, intrinsic staining of teeth may successfully be masked with the use of dental ceramics, or direct restorative dental cements [15-17].

The severity of fluorosis has no significant effect on shear bond strength of composite resin to enamel [26]. However, increasing etching time from 60 to 120 seconds resulted in a significant increase in shear bond strength for teeth of patients aged <40 years [26].

No significant effect of fluorosis on bond strength to enamel and dentin [27,28].

However, grinding of the surface layer of fluorosed enamel and then acid etching resulted in an increase in tensile bond strength [29].

Conclusion

With proper strategic planning, an outstanding esthetic outcome can be achieved even in challenging clinical situations. The three pillars of such a successful outcome are knowledgeable and skillful dentist, properly selected materials and patient-dentist communication. The patient has to be treated as a whole, taking into account mental and social factors, rather than just the physical symptoms.

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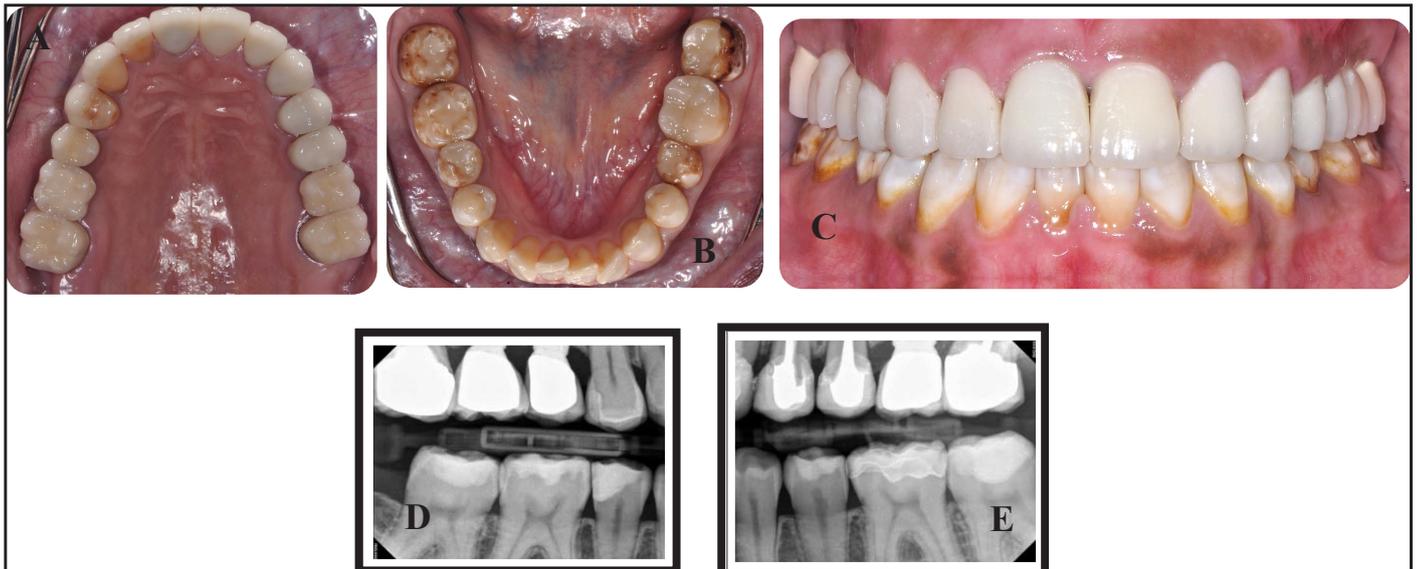


Figure 9. One year follow up: (A) Maxillary view, (B) Mandibular View, (C) Frontal View.

Note the healthy gingiva and good oral hygiene. Right and Left bitewings (D & E).

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