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Management of dental fluorosis with bleaching and ceramic veneers : Clinical report

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Abstract

This article describes a case of full mouth rehabilitation using ceramic veneers in combination with bleaching technique for the management of moderate dental fluorosis. A 42 -year-old male patient presented with a chief complain of poor esthetics. He was bothered especially about his smile and was asking for its improvement. Unesthetic smile was caused by eroded maxillary incisors and generalized detal fluorosis.

The treatment plan included a surgical crown lengthening and bleaching followed by prosthetic therapy consisting in ceramic veneers for anterior teeth and Zirconia based crown for posterior teeth. Thanks to a well-planned multi-disciplinary approach, the result was esthetically acceptable and the patient was satisfied.

Key words: Ceramic veneers, Dental fluorosis, Bonding, aesthetics, feldspathic ceramics.

Introduction

Dental fluorosis is a dental enamel defect caused by excessive systemic use of fluoride during tooth development. It results in stained or spotted enamel with reduced mineral content. Based on its severity, defects vary from earliest manifestations with increased enamel porosity forming white spots and chalk aspect to severe cases which are associated with brown color and possibility of tooth structure loss. White and brown opacities in permanent dentition have always been a concern for esthetics ; particularly when it affects anterior teeth because they are perceived as unesthetic [1,2].

For adequate clinical management, a correct diagnosis is important . In the this context, many classifications were proposed. thylstrup and fejerkos index (TF index) may be the most suitable. it is based on the obseverd clincal and pathological changes in fluorosed teeth. According to this index based on lesions severity , a score of zero through nine is assigned [3,4].

Depending on the dental fluorosis severity, several options exist to minimize its unesthetic effect. For mild cases, a conservative approach such as enamel micro abrasion can be indicated. However, in moderate to severe cases, bleaching and micro abrasion are either eneffective or may conduct to only transient improvment. [5].

Composite resins can be considered as an option for moderate to severe cases ; But such restorations have limited longevity which copromises the long-term esthetic results (6,7].Due to reduced mineral content of fluorosed enamel, bonding is a challenge in these cases and it requires knowledge of adhesive systems and techniques.

Recent studies, demonstrated that appropriate results were obtained with ceramic laminate veneers. They are considered as most durable restorative option for moderate to severe cases thanks to their color stability, marginal integration and wear resistance. In fact, they can completely mask the discolored tooth

with minimally invasive design preparation. In addition the advances of ceramic properties facilitate this process. The use of feldspathic ceramics with high content of glass matrix can optimize the bonding strength which is challenging because of reduced mineral content of tooth structure [5-8] .

Achieving aesthetic goals associated with high bond strength is associated directly with a solid knowledge of aesthe tic guidelines including tooth anatomy, incisal edge position, proportions, as well as smile line and material properties [8]

CLINICAL PRESENTATION AND PROTOCOL

A 42 year old male patient presented with a chief complaint of poor aesthetics ; His chief complaint was unpleasant smile caused by generalized tooth discoloration. Clinical examination revealed generalized fluorosis which is associated with attrition; tooth structure loss was detected in premolars and molars. Dental fluorosis was diagnosed according to Thylstrup and Fejerkos index (T-F). A score of 5 was assigned because of localised tooth structure loss.

Firstly, photographs were taken using CANON 700D Camera and preliminary analysis were performed. A comprehensive Esthetic assessment showed a reverse smile line, a squared teeth form and size discrepancy between incisors and minor malposition in anterior region . Inadequate width–to-height ratio in maxillary central and lateral incisors was noticed. Gingival zenith was evaluated as non-aesthetic as it occupies a location that does not coincide with the long axis of the tooth (Fig 1 -2).

Fig. 1 Initial situation (a,b,c)

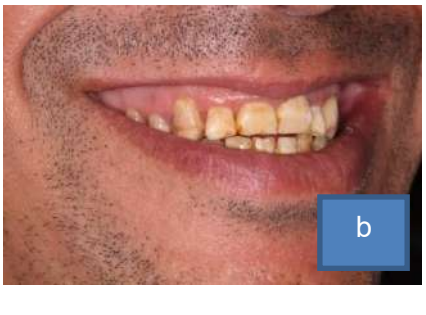

Fig 2 : occlusal Lateral views of intial situation (a,b)

B

Visual assessment and periodontal probing revealed a thick non healthy gingival biotype with gingival thickness of 2 mm associated with generalized inflammation. First mandibular molars and second right premolar are endodontically treated and required post and core build up ; followed by full coverage crowns.

After careful evaluation, diagnostic casts were waxed. The wax-up included all the desired elements in a smile design, from tooth proportion, axial inclination and gingival zenith, incisal arrangement and embrasures,gingival architecture, putting everything in what is called a frame of reference and occlusal plan situation.

To meet aesthetic goals, the treatment plan included aesthetic crown lengthening in incisor region ; followed by bleaching and all ceramic restorations consisting on ceramic veneers in anterior teeth and crowns in posterior teeth. Because the depth of the staining

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could not be ascertained, Tooth bleaching was indicated to reduce the discoloration of teeth before preparation. A more natural appreance of the final veneered teeth would be achieved using feldspathic ceramics. A conservative treatment consisting in bleaching in conjuction with feldspathic veneers was selected for anterior teeth. Full coverage restoration was recommended for posterior teeth.

Firstly, a periodontal treatment consisting in periodontal scaling was performed .Prior to treatment with laminate veneers; gingival corrections, in aesthetic zone, and bleaching were performed (Fig 3-4).

Fig 3: Crown lengthening (a, b)

Fig 4: The result after Bleaching

Crown lengthening has been suggested to correct the gingival architecture and obtain a correct gingival Zenith location; It increases the length of the clinical crown which permit the achievement of a proper height-to-width ratio for lateral and central incisors.

Several studies advocated that general periodontal stability is reached after 3 months. Bragger et al. found that changes occur for up 6 months after treatment for that, a period of 6 months in the aesthetic zone is recommended before dealing with any prosthetic treatment. According to Gibson et al. The time span between the surgery and the final positioning of the gingival margins has been stated about 4 months which defines a period of stability [9, 10 ,11]

After periodontal healing and color stability with bleaching procedure; The treatment plan begins by the restoration of posterior damaged teeth. Endodontic treatment was performed using microscope because of calcified roots (Fig 5).

Fig5: Endodontic treatment

Metallic post and cores were indicated in first mandibular molar and second premolar; followed by hand made provisional restorations (Fig 6).

Fig 6 : provisional restoration of posterior damaged teeth

B

Maxillary and mandibular posterior teeth were prepared for Zirconia based crowns. Handmade provisional restorations were performed according to correct occlusal plan (Fig 7).

Fig 7 : Provisional restorations according to correct occlusal plan

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B

Teeth preparation was performed according to minimally procedure using mock up drived from the diagnostic wax up after patient's approval about potential corrections of form and position of the teeth. The mock up enable the removal of the minimum amount of sound tooth tissue required. All margins were placed supra gingivally (Fig 8)

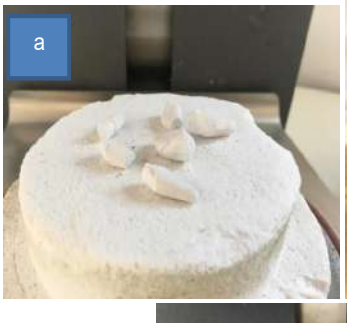
Fig 8 : Preparation technique using the mock up (a,b,c,d)

The preparation exposed small amount of dentin; Immediate Dentin Sealing was peformed (IDS). Temporary restorations were made chair side using an autopolymerizing acrylic resin. Impressions were taken using silicon materiel and retraction cords.

The posterior crowns were performed using CAD/CAM technique and cemented using glass Ionomer cement ; anterior ceramic veneers, both maxillary and mandibular, were performed using feldspathic ceramic; according to the manufacturer's instructions along with refractory die technique and bonded using light cured resin materiel (Fig9-13).

During try in stage, Form, adaptation and shade match of the restorations were checked using glycerin gel.

Fig9 : Laboratory technique ;Die refractory technique (a,b,c)



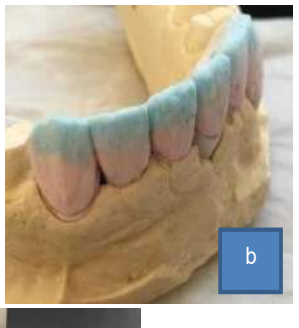


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Fig 10 : Final Restorations on mandibular arch

Fig11 : mandibular crowns

Fig12 : ceramic veneer thickness

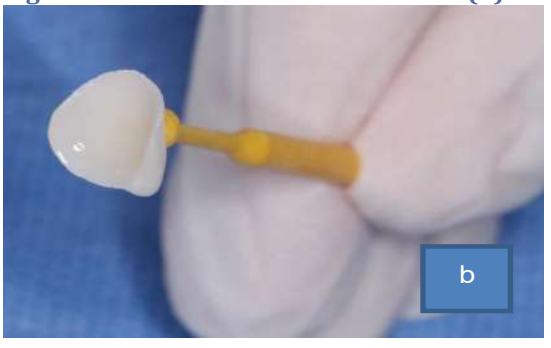
Fig 13: Mandibular ceramic veneers

The bonding protocol was performed according to Galip Gurel protocol using etch – rinse technique ; Firstly the external surface of the ceramic veneers was protected from etching by using an optrastick ; which facilitates also the final seating of the veneer with adequate pressure (Fig 14a).

Fig 14: Etching(a) and silansation of ceramic veneers (b)

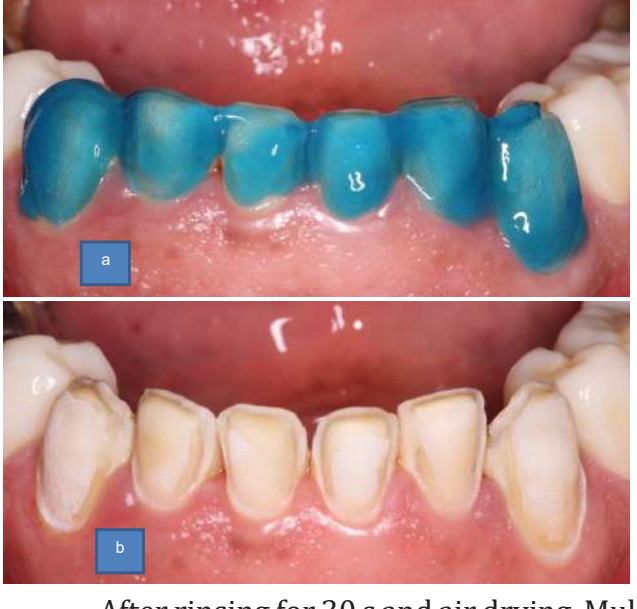
After cleaning with compressed air and water, the fitting surfaces of the laminates were etched with 9% hydrofluoric acid for 2 min, washed thoroughly for 1 min. Laminate veneers were then cleaned in distilled water for 5 min .The etched surfaces were silanized for 1 min (Fig14b).

Fig 14: silansation of ceramic veneers (b)



After that, adhesive resin was applied but not polymerized. Tooth Preparations were cleaned; dentin and enamel were etched with 35% for 10 s in dentin and to 30s in enamel (Fig 15).

Fig 15: teeth etching (a,b)



After rinsing for 30 s and air drying, Multilayers of adhesive materiel was then applied on both the tooth and the restorations surfaces for 15s, air thinned but not polymerized (Fig 16).

Fig16 : Application of adhesive materiel

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Variolink materiel was applied on ceramic veneer and the restoration was placed using optrastick with moderate pressure (Fig 17-18).

Fig 17 : application of bondiing agent

Fig 18 : Variolink resin materiel

The bonding sequence was performed respecting the facility of protocol. Excess cement at margins was removed immediately. tack-cured for 4 seconds to facilitate the clean-up of excess luting composite; then final light curing of all veneers for 40 seconds was performed (Fig 19-20).

Fig 19 : Bonding sequence (a,b,c,d,e)

Fig 20 : Excess removal

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Occlusal adjustments were performed after bonding of ceramic veneers to avoid the fracture of fragile restorations (Fig 21).

Fig 21 : Occlusal adjusments after bonding

Thanks to a well-planned multi-disciplinary approach, the result was esthetically acceptable and the patient was satisfied (Fig 22-25).

Fig 22 : Linguial view of ceramic veneers

Fig 23: Final result ; occlusal views

Fig 24 : Final result ; lateral views showing occlusal integration of the final restorations

Fig 25: Final result showing harmonious smile (a,b,c,d,e,f)

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DISCUSSION

Dental fluorosis, as a development defect of enamel, results in hypomineralized enamel with increased porosity. It affects the patient's quality of life due to the discoloration.

In epidemiology, classification systems, including Dean's fluorosis index and TF index, are based on severity using esthetic defects as a parameter for classifying dental fluorosis. The TF index, with a score ranging from zero (0) to nine (9), is complete and sensitive index evaluating dental fluorosis in all severity levels [12].

In clinical practice, the treatment approaches are also depending on severity of dental fluorosis. In reference to TF index, non-invasive and minimal invasive methods are indicated for TF scores 1- 4 while invasive methods for pitted fluorosis with TF scores ≥ 5 [13]. Non invasive methods including micro abrasion, enamel resin infiltration, and bleaching or combination of techniques are based on removing stained surfaces areas. Meanwhile, invasive approaches include veneers or crowns. The efficiency of resin infiltration has already been demonstrated for bringing immediate esthetic changes with stable results on long term . This technique is gighly recommended for the improvement of white spots. Studies, including systematic review, demonstrated significaltly better results than bleaching [14, 15].

Authors reported satisfactory results in case of fluorosed teeth over 6 years follow up [16] with ceramic veneers which can completely mask the discolored tooth with minimally tooth preparation. They report also, Acceptable aesthetic outcomes for moderate to severe cases [17]. In this case, bleaching was necessary before minimally invasive restorations. It reduced the discoloration which facilitates the use of ultra thin and translucent feldspathic

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veneers. Due to physical and morphological changes, bonding to fluorosed teeth is a clinical challenge as fluoro apatite is more resistant to acid dissolution than hydroxyapatite [18].

The application of phosphoric acid before adhesive application, in etches –and rinse (ER) technique, is commonly recommended for the improvement of bonding to enamel. But in fact, it adds an extra step to the bonding protocol. Regarding its application on fluorotic enamel there is no confirmed consensus for that [19, 20].

Recent studies demonstrated that active application of universal adhesives in the 1 step self etch (SE) mode exhibited, generally, similar bond strength results for enamel compared with the same universal adhesives in the etch rinse approach; That's why scientists have suggested the application of multiple layers of SE adhesive [21].

According to recent study, the active and prolonged application of universal adhesives on fluorotic enamel for 40s in self etch mode increases the degree of conversion and and conduct to more pronounced enamel etching pattern. When compared to the use of phosphoric acid, similar results in terms of adhesive enamel bond strength are confirmed [22, 23].

Three ceramic materiel are currently available for laminate veneers: feldspathic porcelain, leucite reinforced ceramic and lithium disilicate-reinforced ceramic [24].

Feldspathic porcelain veneers, which is manufactered using sculpting powder/liquid with a layering process,has a high degree of translucency and according to studies they present a survival rate more than 90% over 10years. This materiel is highly recomended ; it offers acceptable bond strength thanks to materiel properties.It also permit miimal thickness of tooth reduction.It enables the achievment of a thickness less 0.5 mm [25,26, 27]. Thanks to a well-planned multi-disciplinary approach, the result was esthetically acceptable and the patient was satisfied.

Conclusion

Dental fluorosis leads to esthetic deviations. Its management depends on the severity of condition and includes both invasive and non invasive techniques. The combination of bleaching and feldspathic ceramic veneers is an elective approach that can permit minimal tooth reduction. Aesthetic outcomes are obtained thanks to a well-planned multi-disciplinary approach.

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