CASE REPORT

Management of fluorosed teeth using porcelain laminate veneers. A six-year recall case report

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استعمال الأوجه الخزفية في طب الأسنان في ازدياد مستمر لحل عدة مشاكل جمالية وعملية. ويعتبر التسمم الفلوري للأسنان مرضاً وبائياً في بعض مناطق المملكة، بسبب ازدياد شرب مياه الآبار. في حالته البسيطه التسمم الفلوري للأسنان لا يؤثر على الناحية الجمالية بشكل ملحوظ ولكن في حالته المتقدمه فانه يؤثر سلبياً على بنية السن و على حالة المريض النفسيه. وهذه الدراسه تقدم متابعة حاله دراسيه على مدى ستة سنوات والطريقه الجماليه لعلاج التسمم الفلوري المتقدم لمريض سعودي الجنسيه.

Porcelain dental veneering has become a popular method of solving many aesthetical and functional dental problems. Fluorosis is endemic in some areas of the Kingdom of Saudi Arabia as a result of drinking well water with high fluoride content. Although fluorosis in its mild form is not considered to be of cosmetic significance, the more severe forms affect tooth structure and can cause psychological distress to the affected individual. This paper presents a six-year recall case of a Saudi male patient with severe dental fluorosis who was managed for dental aesthetics.

Introduction

Dental fluorosis is a disturbance affecting the enamel formation related to excessive ingestion of fluoride during the time of enamel mineralization. The clinical appearance reflects a spectrum of changes. In its mild form, lustreless white lines or diffuse opacities are present, while in the more severe forms, generalized opaque and chalky appearance with confluent pitting and staining of hypominerlized tissues may be seen.[1] 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.[1] Therefore, severe form of fluorosis, not only disturbs enamel significantly but also affects aesthetics quite adversely and can cause psychological distress to the affected person.

There is evidence to suggest that the prevalence of dental fluorosis has increased over the past decades. This indicates that in both populations of water fluoridation and nonfluoridation, water supply may be affected by other sources of fluoride, such as exposure to the higher intake of fluorides from foods and soft drinks,[2] or the use of fluoride dentifrices and supplements.[3] 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.[4,5,6,7] Tannir,[4] in 1959, reported the prevalence of mottled enamel in Mecca to be 90%, while Al-Khateeb et al,[5] three decades later, observed dental fluorosis in 70% of 12-year-olds in the same area of the kingdom. Al-Shammery et al[6] 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. Akpata et al[7] correlated fluoride content of well drinking water in Hail rural areas with the severity of dental fluorosis. 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.

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.

Bleaching or microabrasion of severely fluorosed teeth is often ineffective or gives transient results,[8,9] while composite resin laminates veneers not only discolor and wear with time, but quite often become chipped or debonded.[10] As glazed porcelain retains its color and is wear resistant and biocompatible,[11,12] laminate veneers made from this material can be the restoration of choice for severely fluorosed

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teeth.[13] In-addition, these veneers involve conservative tooth preparation, unlike full crowns.[14] This paper presents a 6-year follow-up case with successful aesthetic management of severe dental fluorosis in a Saudi male patient.

Case Report

A 36-year-old Saudi businessman, whose job involved dealing with public on daily basis, presented to our clinic complaining of unpleasant smile due to generalized discolouration and the presence of a "big gap" between his upper anterior teeth (Fig. 1). His medical history was non-contributory. The patient was very much concerned with the discoloured teeth and came to seek dental treatment for aesthetical reasons. The staining is attributed to the endemic fluorosis, as the patient gave a history of living in Al-Rass City/ Qassim.

Fig. 1. Generalized enamel fluorosis affecting all of the permanent teeth. Note midline diastema and chipped incisors.

Clinical Examination

The patient had generalized enamel fluorosis affecting all of the permanent teeth (Fig. 1). Confluent pitting was present on most of the surfaces of the upper teeth and only the second premolars of the lower teeth, with wide spread of yellow-brown stains. Surfaces of lower anterior teeth were, however; relatively less affected than others. Incisal and occlusal surfaces of some of the upper incisors and premolars were worn out due to loss of enamel structure as a result of post-eruptive trauma. He had also a mid-line diastema of 4 mm in width. Occlusion was in a Class-I relationship. Oral hygiene was good and the gingival tissue was in a good healthy condition, except in the lower anterior, where there was a slight marginal gingivitis. Radiographic examination showed no caries or alveolar bone loss.

Fig. 2. Facial view of the prepared teeth.

Fig. 3. Occlusal view of the prepared teeth.

Diagnosis

The clinical findings on this patient as shown in Fig. 1 were: Typical picture of dental fluorosis of TFI = 4-7 with yellow/brown discoloration, based on the 1978 dental flourosis classification scheme of Thylstrup and Fejerskov, presence of midline diastema between tooth # 11 and # 21, and Incisal edge fracture on tooth # 11, 12 and 22.

Methods

Treatment Plan

Given the age of the patient and the severity of fluorosis as well as the presence of diastema, the treatment plan accepted by the patient was constructing 10 porcelain laminate veneers (PLV) on the upper teeth # 15 to # 25 and only on # 35 and # 45. Regarding the lower anterior teeth, the patient was advised to do generalized scaling followed by bleaching. Treatment goals were to achieve better aesthetics and function.

Fig. 4. Facial view of the veneers after cementation. Note the margins.

Fig. 5. Occlusal view of the veneers after cementation.

Fig. 6. Facial view after 6-year follow-up. Note the gingival health.

Fig. 7. Occlusal view after 6-year follow-up.

Treatment Outline

The procedure was carried out in four phases.[15,16] Phase I: Smile analysis, preliminary shade selection, photographs and study models to evaluate the occlusion and make diagnostic wax up.

Phase II: Minimal tooth preparation (Figs. 2, 3), final shade selection and impression, followed by tooth desensitisation. No temporization was required. PLVs were fabricated using heat-pressed ceramic system IPS-Empress (Ivoclar AG, FL-9494 Schaan/Liechtenstain, Germany).

Phase III: Verifying the correct fit of veneers both individually and collectively on the model then on the teeth. Final cementation was made once the patient was satisfied and agreed on the form, shape and colour of veneers. The contacts and occlusion were checked and gross finishing was performed.

Phase IV: Final finishing and polishing after 24 hours and end-treatment photographs taking (Figs. 4, 5). Post-operative instruction was given to the patient concerning oral hygiene relevant to veneers and avoidance of habits causing trauma to veneered teeth.

Treatment Results

Figures 4 and 5 show ten laminate veneers after cementation. The patient was very satisfied with the results and decided not to do the lower veneers or the bleaching since these teeth do not normally show during talking or smiling. Six-year recall (Figs. 6, 7,) showed that the combination of a glazed etched-porcelain-to-prepared tooth interface and maintaining good oral hygiene gave satisfactory aesthetic results as well as good gingival response to the treatment. There were no caries involvement and no breakage or discoloration of veneers during the six-year evaluation. Figures 8 a-b show the pre-and post-operative results. One could easily compare the pre-and-post-treatment photographs to note the significant aesthetic difference.

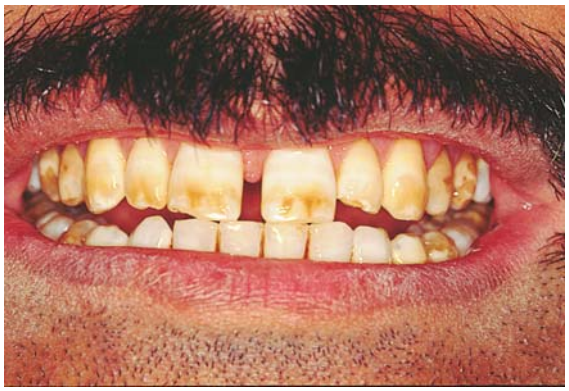

Fig. 8a. Pre-operative smile of the patient.

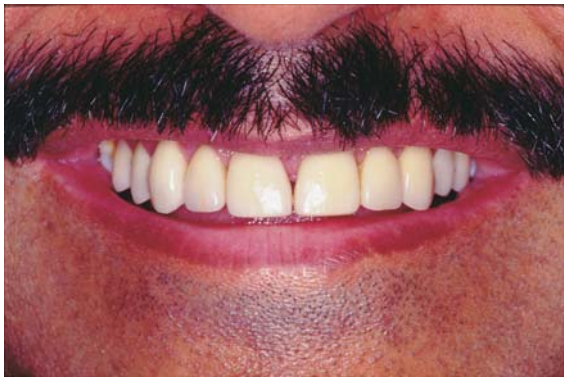

Fig. 8b. Post-operative smile of the patient.

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. Veneering the affected teeth with porcelain laminates is one possible management option. Christensen and Christensen[17] found that Cerinate veneers provided excellent patient service over the three-year evaluation period. Karlsson et al[18] reported satisfactory results with PLV restorations for an 18-months period regarding surface, color, margin integrity, fracture rate and gingival tissues response. Shaine et al[19] observed higher rates of failure with PLV restorations when fitted by inexperienced operators. Following the recommended treatment plan, ten PLV restorations were placed for the upper anterior and premolar teeth.

Preparation for PLV restoration

Tooth preparation

Tooth preparation for porcelain veneers requires the removal of tooth structure for adequate porcelain thickness[15,16] (Figs. 2, 3). Approximately 0.5-0.8 mm of labial enamel was removed, creating a chamfer-finish line[20] at the free gingival margin. This finish line extends one-half the thickness of the proximal contacts including the sub-contact areas to hide any discoloured enamel. A well-defined and smoothened chamfer-finish line allows accurate veneers with definite margins to be produced by laboratory technician. The proximal contacts were slightly stripped using thin metal strips to ease of interproximal finishing. The proximal extension of diastema was ended with feather-edge finish line to be able to build the porcelain and close the spaces sufficiently. The incisal edges were reduced approximately 1 mm to allow for adequate bulk of restorative material. For anterior teeth, the reduction was carried palatally, incisal wrap, with a chamfer finish line that is continuous with the labial-proximal outline. The advantages of incisal wrapping are; to hide the tooth-porcelain interface, aid in proper placement of laminates and minimize the effects of shear forces on the restoration and its composite lute. All the incisal line angles were rounded to prevent internal stresses within the porcelain veneer. For premolar teeth, there was no palatal wrap and ended with window shape to preserve the occlusal contacts.

Impression procedure

Following tooth preparation, gingival retraction cord was inserted gently into the sulcus and multiple final impressions were taken with polyvinyl-siloxane material.

Shade selection

Final shade selection was made with chromascopic shade guide. All prepared teeth were desensitised using primer A & B, included in All-Bond 2 universal dental adhesive system (Bisco, Inc. 1100W. Irving Park Rd. Schaumburg, IL, USA), following manufacturers' instructions. Since only 0.5-0.8 mm was removed from the enamel surfaces no temporization procedure was required.

Laboratory fabrication

The laminate veneers were made from IPS-Empress using the lost wax technique. The flexural strength of this type of ceramics is well documented.[21] The fitting surfaces of the veneers were etched with 2% hydrofluoric acid for two

minutes as per the manufacturers' instructions.

Try in PLV restorations

The laminates' fit, form and colour were checked on the master cast both individually and collectively. The teeth were cleaned with slurry of pumice and laminates were checked again using try-in paste, included in PLV cementing kit (Choice/Bisco Dental Products). Once everything was approved, the etched veneers were cleaned with 37% phosphoric acid for 15 seconds to remove any salivary contamination and then treated with two layers of silane coupling agent.[22]

Final cementation of PLV

The teeth were re-cleaned with slurry of oil-free pumice and the proximal surfaces with fine abrasive strips. Thin matrix strips were placed between the central incisors, first teeth to be restored, and adjacent teeth. The teeth were etched with 37% phosphoric acid for 30 seconds,[23] rinsed and blot dried without desiccation using oil-free air. Primer A & B, was applied and light cured, followed by a thin layer of adhesive bonding on both the silane treated veneers and etched teeth without light curing, as per manufacturers' instructions. Pre-selected shade of luting cement was applied to the internal surface of the PLV and was carefully placed onto the tooth until fully seated. Using a sable brush moistened with bonding agent, excess cement was removed from the margins to facilitate the finishing process. Holding PLV in its place the incisal tip was light cured for 5 seconds for better removal of excess cement and less stress concentration and cracks,[24] followed by a complete polymerization from all the surfaces. The same steps were taken for cementation of the remaining veneers.

Finishing and polishing PLV

Gross finishing was made with ultra fine diamond burs and a 30-fluted carbide bur to remove any remaining excess of luting material on both gingival and incisal margins. For the proximal surfaces, finishing abrasive strips were used then checked with un-waxed dental floss. Occlusion was checked in both centric and eccentric excursions and any needed adjustments were made. Final polishing was delayed 24-hours and performed with a diamond polishing paste on a felt-cloth-mounted wheel for optimum gingival tissues response. Final photographs were taken (Figs. 4, 5) and patient was instructed to brush and floss regularly and biting on any hard food should not be attempted. After six years follow-up (Figs. 6, 7) the patient showed great satisfaction with this type of treatment and had no complaints except that he was so curious to know how can he could preserve these veneers.

Conclusion

Porcelain veneers are becoming a popular method of solving many aesthetical and functional problems that occur in dentistry. This case demonstrated the use of porcelain laminate veneers as a treatment of choice to solve a combination of two or more aesthetical problems that might previously have been treated with full coverage or direct bonding. Porcelain veneer, if properly constructed and placed, has the potential to survive at least as long as any other dental restoration, if not longer.

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