MANGEMENT OF FLUOROSED TEETH USING CERAMIC VENEERS - A CASE REPORT

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Abstract:

A young male patient reported with a chief complain of discoloration in upper and lower front teeth region which were present since childhood. After recording essential demographic details and appropriate clinical examination the final diagnosis of dental fluorosis was given and hence, ceramic Veneers was considered to be the treatment of choice for the case. After the necessary steps of tooth preparation and cementation of the veneer the final outcome of the case was satisfactory and pleasant that facilitated to uplift the morale of the patient and also improved his self-confidence.

Key words:- *Ceramic veneers, Discoloration, Dental Fluorosis, Resin cement*

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INTRODUCTION

Dental fluorosis refers to a developmental disorder that affects the morphology of the dentition resulting into unesthetic appearance and is most commonly seen in areas where fluoride levels in drinking water is >1.5 mg/l.[1,2] Increased intake of fluoride at the time of enamel maturation unfavourably disturbs the cleavage and elimination of enamel proteins like amelogenins.[3,4] The retention of proteins and water inhibits the crystal growth of the enamel leading to different sub-surface porosities, the pore volume and depth of which increases with the increased amount of fluorides thus, causing severe discoloration of the teeth that is esthetically unpleasant and psychologically disturbing.[5,6] Therefore, minimally invasive therapeutic intercession, is frequently required to manage and correct such cases of dental fluorosis. There are numerous management approaches that have been adapted for fluorosed teeth.[7,8]

Dental fluorosis being endemic globally (32.1%), including India, reports >20% of children affected.[9] There is very little evidence available regarding the management of dental fluorosis which

changes the esthetic appearance of the dentition and becomes the biggest concern of the patients. It has been documented that moderate to severe types of fluorosis require decisive dental treatment. There are certain treatment options like bleaching or microabrasion that shows less efficiency quite frequently or delivers a temporary result, whereas, composite restorations tend to discolor the teeth and also can wear-out over time or may chip or debond.[10,11,12] Hence, porcelain veneers have emerged as the ultimate choice of treatment to be used as the restoration for severely fluorosed teeth, as they have the capability to retain their color, wear resistance, and biocompatibility.[13] Dental veneer refers to a thin layer of composite material or dental porcelain that is bonded to the tooth surface, which can be either composite or ceramic. The thin porcelain shield covering the front surface of the tooth are the Ceramic Veneers that epitomize an everlasting resolution to the alterations of the dentition or enhance the appearance of un-aesthetic teeth that might be stained, chipped, broken. These veneers have been indicated and contraindicated in certain cases as described in Table 1. However, ceramic veneers have gradually acquired acceptance, admiration and approval among the clinician and the patients, as a common aesthetic management option for fluorosed teeth and is being widely used globally.[14] This case report documented the result of porcelain veneer as a restoration in a patient with dental fluorosis.

Table 1:- Indications and contraindications for ceramic veneers by Magne & Belser[14]

INDICATIONS	CONTRAINDICATIONS
▪ Type-1 - Teeth resistant to bleaching ▪ Type 1A - Tetracycline discoloration ▪ Type 1B - Teeth unresponsive to bleaching ▪ Type-2- Major morphological modification ▪ Type 2A - Conoid teeth ▪ Type 2B - Diastema or interdental triangles to be closed ▪ Type 2C - Augmentation of incisal length or facial ▪ prominence ▪ Type 3 - Extensive restoration ▪ Type 3A - Extensive coronal fracture ▪ Type 3B - Extensive loss of enamel by erosion or wear ▪ Type 3C - Generalized congenital malformation	▪ Young permanent teeth ▪ Presence of little or no enamel (full crown should be considered here) ▪ In patients with habits like bruxing or clenching, parafunctional habits like pencil chewing/ice crushing. (veneers would not be long-lasting in such cases) ▪ Severe periodontal involvement ▪ Presence of severe crowding of teeth ▪ Occlusal problems in dentition like Class III malocclusion and end-to-end bites. ▪ Poor oral hygiene

CASE REPORT

An 18-year-old male patient reported to the department of Conservative Dentistry and Endodontics of Hazaribag College of Dental Science and Hospital, with a chief complain of discoloration in upper and lower front teeth region. He complained of discoloration of teeth and chipping of enamel from the upper and lower front tooth region since childhood. On asking about the residing location of the patient, he informed that he stayed in a fluoride rich area or Fluoride Belt in the state of Jharkhand.He also gave history of his family suffering from the same problem.

Clinical examination:-

On clinical examination, it was found that there was discoloration of teeth and stains in the teeth with respect to 13,12,11,21,22,23,31,32,33,41,42 and 43 regions (Fig 1) that was classified as Moderate (according to Deans Index of fluorosis).

Fig 1 showing dental fluorosis in relation to 13, 12, 11, 21, 22, 23, 31, 32, 33, 41, 42 and 43

Diagnostic and Treatment approach:-

Considering the patient's personal history and with the findings of the clinical examination, differential diagnosis of *Dental Fluorosis, Amelogenesis Imperfecta and Enamel Hypoplasia* were given. However, the final diagnosis that was established was of Dental fluorosis owing to the history of residence since childhood (Fig 2). Secondly, in cases of dental fluorosis there remains a horizontal white band which usually corresponds to periods of fluoride intake, that was quite obvious on the tooth surface of the patient and thirdly, the dentition does not show chronological distribution and disturbances that is usually present in amelogenesis imperfecta and hence, it was ruled out. Thus, to attain the proper esthetic value and appeal of the patient, Ceramic Veneers was well-thought of for the management of the fluorosed dentition (in relation to- 13,12,11,21,22 and 23) A2 shade selection was done.

Fig 2 showing dental fluorosis of the dentition

Tooth preparation was performed which was minimal and limited only to the enamel with chamfer finish lines placed within the enamel at the level of gingival crest. This was followed by facial, proximal and incisal reduction. Facial reduction was carried out using a diamond bur (depth cutter) to provide a depth of 0.3mm gingivally and 0.5mm at the incisal half. Proximal reduction was done using a round end tapered diamond bur and the internal line angles were rounded up. Overlapped incisal edges were attained with the incisal reduction (Fig 3, 4). Impression was made using polyvinylsiloxane by putty wash technique.

Fig 3,4 showing tooth preparation done in the upper anterior region

Mock-up: Golden Proportion of 1.6:1:O.6 was used for analysis wherein the width of the anterior tooth is 60% of the width of the adjacent tooth. Etching of the prepared tooth surface was done using 9% Hydrofluoric acid (Ultradent) for 90 seconds. Silane coupling agent Ultradent porcelain silane was applied for 60 seconds on the on the etched surface of the tooth. The teeth surfaces were then cleaned and rinsed thoroughly and air dried. Bonding agent was applied and then the Dual cure resin cement (RelyX) was applied, followed by curing and removal of excess cement (Fig 5). After the final restoration was done, occlusion was checked in maximum intercuspation and eccentric positions, followed by necessary adjustments and polishing. The final outcome showed satisfactory results (Fig 6).

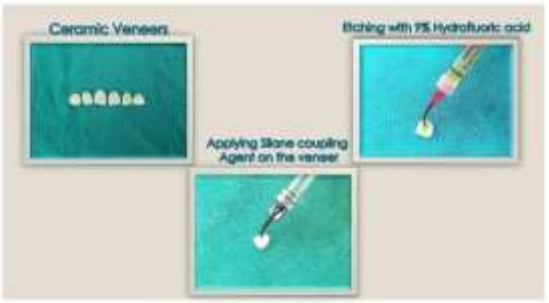

Fig 5 showing the etching process and the application of Silane coupling agent

Fig 6 showing the final aesthetically restored dentition with Ceramic veneers

DISCUSSION

Dental fluorosis leads to discolouration of teeth due to intrinsic staining propensity and there are several treatment options that have been adopted to restore the esthetics of the patient. The usage of composite veneers was considered in most of the cases owing to its easy applicability, cost-effectiveness and less operative time, however, they have poor wear resistance and low colour stability and thus, ceramic veneers are preferred over these.[15] Porcelain laminate veneers deliver brilliant esthetics, require minimal tooth preparation as they require minimally invasive design preparation, less plaque retention and are easy to clean.[16] Ceramic veneers were initially introduced in 1938 and since then their acceptance and fame has amplified owing to their biocompatibility and esthetic value.[17] These restorations have certain beneficial properties like opalescence, fluorescence, reflection (similar to natural teeth), thus providing the teeth life-like appearance depending on the restoration thickness and shade of the resin cement.[16,18,19]

The porcelain veneers are not appropriate to be applied in all cases of dental fluorosis. For instance, in cases of minor fluorosis the invasive removal of tooth structure might not be warranted. Thus, all the necessary indicative parameters should be precisely judged and the tissue structure of the dentition should be well-preserved to produce appeasing results in very less time.[20,21]

The long-standing success of these veneers relies upon appropriate case selection and treatment protocol including shade selection, tooth preparation, cementation, oral hygiene maintenance and follow-up.[22] Hence, ceramic veneer was the ultimate choice of treatment for the patient in the present case. The primary aim of the treatment in the present case was to enhance the patient's smile and reintegrate the esthetic appearance. In a similar previous case, it was reported that ceramic veneers produced satisfactory results in fluorosed teeth that were restored with porcelain laminate veneers over a period of 6-year follow-up.[23] There are other studies also that have demonstrated adequate aesthetic results in cases of moderate to severe fluorosis with the application of ceramic veneers.[24]

The ceramic veneer restorations are predictably long-lasting with good durability and an approximated survival probability of 93.5% over a period of 10 years as was previously reported in few studies.[12,25,26] In another study by Smales RJ *et al*.(2004),[27] the clinical success rate of 110 ceramic veneers was determined for a time-period of 7 years and a 96% success rate was observed for the incisal overlap design as compared to the 86% success rate for those veneers without incisal coverage. There are certain drawbacks of these veneers as they can often fracture, acquire marginal discolouration and there can be loss of marginal integrity and post-operative sensitivity in some cases.[28,29] A procedural worry with the use of such restorations is the bonding procedure of the adhesive cement. This is because, in severe dental fluorosis the hypermineralized surface layer along with the organic network must be grinded and removed prior to subsurface etching of the enamel that leads to the micromechanical tags. Therefore, the etching time needs to be

augmented fourfold (60 seconds) with 37% phosphoric acid.[30] Therefore, it is imperative for the patients to continue regular dental check-up visits and adapt appropriate oral hygiene habits for the proper care of the veneers that could help to prolong their life without any further complications.

CONCLUSION

The major goal of esthetic or cosmetic dentistry is to deliver maximum satisfaction to the patients in terms of looks and appearance with minimal invasion or trauma to the dentition and surrounding structures. Thus, the use of ceramic veneers being an extremely adaptable clinical technique that restores the esthetic value of the patient, has conservative tooth preparation and is fracture resistant along with tissue acceptance, patient gratification, approval and insignificant caries incidence. Hence, the present case showed great esthetic results and helped to enhance the psychological morale of the young patient along with enhanced self-esteem.

REFERENCES

1. Møller IJ. Fluorides and dental fluorosis. Int Dent J. 1982 Jun;32(2):135-47.
2. Chowdhury AR, Debnath A. Esthetic restoration of dental fluorosis with ceramic veneers: a case report. J Orofac Rehab. 2021;1(1):67-71.
3. DenBesten PK, Heffernan LM. Enamel proteases in secretory and maturation enamel of rats ingesting 0 and 100 PPM fluoride in drinking water. Adv Dent Res. 1989 Sep;3(2):199-202.
4. Aoba T, Fejerskov O. Dental fluorosis: chemistry and biology. Crit Rev Oral Biol Med. 2002;13(2):155-70.
5. DenBesten PK, Thariani H. Biological mechanisms of fluorosis and level and timing of systemic exposure to fluoride with respect to fluorosis. J Dent Res. 1992 May;71(5):1238-43.
6. Thylstrup A, Fejerskov O. Clinical appearance of dental fluorosis in permanent teeth in relation to histologic changes. Community Dent Oral Epidemiol. 1978 Nov;6(6):315-28.
7. Ermis RB, Van Landuyt K, Van Meerbeek B, Swift EJ Jr. Bonding to fluorosed teeth. J Esthet Restor Dent. 2009;21(4):213-4.
8. Akpata ES. Therapeutic management of dental fluorosis: a critical review of literature. S J Oral Sci. 2014;1(1):3-13.
9. Alothman Y, Bamasoud MS. The Success of Dental Veneers According To Preparation Design and Material Type. Open Access Maced J Med Sci. 2018 Dec 14;6(12):2402-2408.
10. Brunton PA, Wilson NH. Preparations for porcelain laminate veneers in general dental practice. Br Dent J. 1998 Jun 13;184(11):553-6.
11. Peumans M, Van Meerbeek B, Lambrechts P, Vanherle G. Porcelain veneers: a review of the literature. J Dent. 2000 Mar;28(3):163-77.
12. Beier US, Kapferer I, Burtscher D, Dumfahrt H. Clinical performance of porcelain laminate veneers for up to 20 years. Int J Prosthodont. 2012 Jan-Feb;25(1):79-85.
13. Petridis HP, Zekeridou A, Malliari M, Tortopidis D, Koidis P. Survival of ceramic veneers made of different

materials after a minimum follow-up period of five years: a systematic review and meta-analysis. Eur J Esthet Dent. 2012 Summer;7(2):138-52.

14. Verma SA, Milani N. Ceramic veneers – case report. IJAMSR. 2020;3(3):16-26.
15. Singh R, Prakash P, Kumar RV, Awasthi P. Esthetic rehabilitation of a patient with dental fluorosis using porcelain laminate veneers - a case report. International Journal of Contemporary Medical Research 2018;5(11):K8-K11
16. El Mourad AM. Aesthetic Rehabilitation of a Severe Dental Fluorosis Case with Ceramic Veneers: A Step-by-Step Guide. Case Rep Dent. 2018 Jun 6;2018:4063165.
17. Ouada D, Adli A, Dakhli R, Daouahi N, Riahi Z, NouiraZ, Harzallah B, Cherif M. Aesthetic management of dental fluororis with ceramic veneers: a case report. Int J Dent Med Sci Res. 2020;4(11):26-31.
18. Cho MS, Yu B, Lee YK. Opalescence of all-ceramic core and veneer materials. Dent Mater. 2009 Jun;25(6):695-702.
19. Bhagat A, Marwaha S,Dev K, Mogla S. Making severely fluorosed teeth with ceramic veneers. Int J Prev Clin Dent Res. 2016;3(2):155-7.
20. Du Toit J, Patel N, Montalli V, Jain S. Aesthetic treatment of severely fluorosed teeth with prefabricated composite veneers: a case report. Int Dent (African Edition). 2012;2(6):44-50.
21. Jagadeesh K, Hombesh MN, Shashidar HS, Kumar GV, Sharma A, Vijayalakshmi CR. Esthetic Management of Dental Fluorosis with Ceramic Veneers. J Health Sci Res. 2018;9(1):27-30.
22. Dahiya S, Ahlawat M, Gandhi A, Khetarpal A, Gill M, Singhal N. Aesthetic correction of discolored fluorosed anteriors with porcelain laminate veneers: Case report. Int J Oral Care Res. 2020;8:14-6.
23. Aljazairy YH, Management of fluorosed teeth using porcelain veneers: a six-year recall case report, Saudi Dent J. 2001;13:106–13.
24. Sherwood IA. Fluorosis varied treatment options. J Conserv Dent. 2010 Jan;13(1):47-53.
25. Shetty N, Dandakeri S, Dandekeri S. Porcelain Veneers, a Smile Make Over: A Short Review. J Orofac Res. 2013;3(3):186-90.
26. Magne P, Douglas WH. Porcelain veneers: dentin bonding optimization and biomimetic recovery of the crown. Int J Prosthodont. 1999 Mar-Apr;12(2):111-21.
27. Smales RJ, Etemadi S. Long-term survival of porcelain laminate veneers using two preparation designs: a retrospective study. Int J Prosthodont. 2004 May-Jun;17(3):323-6.
28. Robinson C, Connell S, Kirkham J, Brookes SJ, Shore RC, Smith AM. The effect of fluoride on the developing tooth. Caries Res. 2004 May-Jun;38(3):268-76.
29. Jhajharia K, Shah HH, Paliwal A, Parikh V, Patel S. Aesthetic Management of Fluoresced Teeth with Ceramic Veneers and Direct Composite Bonding - An Overview

and A Case Presentation. J Clin Diagn Res. 2015 Jun;9(6):ZD28-30.

30. Al-Sugair MH, Akpata ES. Effect of fluorosis on etching of human enamel. J Oral Rehabil. 1999 Jun;26(6):521-8.