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Response of electric pulp testing towards dental fluorosis - A review

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Abstract

Dental fluorosis is a developmental disturbance caused by exposure to high conc of fluoride during tooth development which leads to less mineral content in enamel. Severity of dental fluorosis depends upon duration of exposure to fluoride. The effect can be seen in permanent teeth at a age of 20-30 years. Fluoride at a recommended level i.e 0.05-0.07 mg F/Kg/day helps in remineralization but above this range it can lead to mild to severe fluorosis. At times fluorosis can lead to misdiagnosis if the tooth has to undergo vitality test. Dental fluorosis leads to structural changes in enamel which at times gives delayed response. The clinician should have thorough knowledge about fluorosis, its sources and the possible complications it can lead from diagnosis to treatment.

Keywords: Dental Fluorosis, Enamel, Pulp Sensibility **Introduction**

Dental fluorosis is a developmental disturbance of enamel occurring due to high exposure of fluoride at the time of tooth development leading to enamel of low mineral content and porosity. The severity of dental fluorosis depends upon many factors like duration of exposure of fluoride and individual response, weight, degree of physical activity, nutritional factors and bone growth. Esthetic changes in permanent dentition are greatest concern in dental fluorosis especially in children who are more exposed to fluoride in 20 - 30 months of age.⁽¹⁾ The safe level for daily fluoride intake is 0.05 to 0.07 mg F/Kg/day. Above this level, the risk of developing fluorosis due to chronic fluoride consumption will be evident.⁽²⁾

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Fluorides are considered as an important factor in prevention and management of dental caries, inhibiting demineralization and promoting remineralization.^(3,4) The prevalence of fluorosis in permanent incisors of 8-9 years-old-children, living in communities supplied with fluoridated and non-fluoridated water was 54% and 23%, respectively. Catani et al. described that the prevalence of fluorosis in areas with oscillating and homogenous fluoride content in water was 31.4%, and 79.9%, respectively. These values are within the variation from 35% to 60% reported from fluoridated communities in the United States.^(5,6,7)

In clinical practice pulp sensibility test assess the integrity of nerve fibers by applying stimulus to the outer surface of the tooth whereas pulp vitality assess the blood supply. Electric pulp testing is a technique sensitive procedure and more reliable than thermal test. It is based on stimulation of intact A delta fibers in pup dentine complex by applying electric current on tooth surface. The various factors that influence EPT result for false positive or false negative response include the thickness of enamel and dentine, concentration of pulpal neural elements, direction of dentinal tubules, amount of dentinal fluid, and the distance between the electrode tip and the pulp. Similarly fluorosed teeth are different from normal teeth and poses many challenges during diagnosis and treatment planing.^(8,9,10)

Changes in structure of enamel

Fluorosis is hypomineraization of tooth enamel caused by delayed removal of amelogenins in maturation stage and leading to high organic content. Fluorosis leads to altered composition of the enamel matrix with resultant altered crystal growth, increased inter-crystalline spaces causing pores and prism-less enamel in severe cases. Morphologically two types of lesion can be seen in enamel firstly, infoldings of the enamel surface, sometimes aligned in horizontal rows and second ones are sharply demarcated against the surrounding enamel.⁽¹¹⁾

Challenges in Diagnosis and Treatment Planning

Dental fluorosis is a developmental disturbance which poses many challenges in diagnosis and treatment planning starting from pulp sensibility tests, shade selection, shade matching, etching and bonding procedures during composite restorations.^(12,13) The hypermineralized enamel in fluorosed teeth may affects the fluid concentration in the dentinal tubules, which plays an important role in the conduction of electric impulses. In fluorosed enamel, hydroxyapatite crystals are substituted by fluorapatite crystals, which may result in ionic shift in the dentinal fluid.^(14,15) Clinically, mild fluorosis appears as bilateral, diffuse, opaque and white striations running across the enamel. Then these opacities coalesce to form white patches. In severe forms enamel becomes discoloured and pitted. At the time of eruption fluorosed teeth is not discoloured, the stains develop due to exogenous ions which get absorbed into porous enamel. Difficulty in diagnosis occurs with mild form of fluorosis which is very less evident. It is important to differentiate enamel opacities which can be because of dental hypoplasia or discoloured opacities affecting single or multiple teeth.⁽¹⁶⁾

Threshold response of fluorosed teeth

Acc to various studies electrode placement site and threshold level of Electric pulp testing have different opinions. Bender⁽¹⁷⁾ et al stated that placing a electrode at incisal edged anterior teeth evoked a response with least amount of electric current whereas Lin et all suggested that optimum site for placement of electrode in molar is at the mesiobuccal cusp.⁽¹⁸⁾ Acc to a study in which both fluorosed and non fluorosed teeth at the incisal edge showed lowest threshold level for electric

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pulp testing when it was compared with incisal, middle and cervical third because enamel is thinnest in this area and course of dentinal tubules is also straighter in this area. So the straighter dentinal tubules offer faster flow rate to electric current.^(19,20)whereas according to a study by Vemishetty et al high threshold value for fluorotic incisor was because of increased resistivity of the enamel as the current has to pass along the enamel prism lines.⁽²¹⁾

Therefore, it can be concluded that incisal edge is the optimal site for probe placement and Non fluorotic teeth respond to low electric pulp testing threshold than fluorotic teeth. The difference in threshold value is because of changes in enamel structure.

Fluorides are a safe and effective method in reducing caries as it helps in remineralization and it is needed throughout the life. But in excess in can be mentally traumatizing for the patient as well the clinician.

So, the clinician should have promt knowledge about the possible causes, diagnostic difficulties and its management.

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