

An evidence-based decision analysis approach on tooth discoloration

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ABSTRACT

The present study is aimed at providing a summary regarding the causes, diagnosis, and various dental treatments for tooth discoloration. In accordance with the available literature, the study also investigates if the mechanism behind discolorations affects the outcome of a treatment, or influences the treatment options, also about the esthetic outcome of a bleaching treatment on the different classified discolorations. In case, a change is occurred in the tooth structure, it will probably cause modification in the outward appearance of the tooth based on the changes of its light transmitting and reflecting properties. Tooth discolorations which are related to clinical and esthetical challenges, have an impact on a person's self-image and self-confidence in today's society, where most people place tooth color high. Most of the discolorations if mild are treated by bleaching, if moderate or extensive is managed by veneers - Lumineers being the newly introduced system. As dentists, the appropriate knowledge can help the patients with a correct diagnosis and the choice of the most conservative treatment plan with an esthetic outcome that is acceptable to the patient and the dental practitioner.

Keywords: Discoloration, esthetics, genetics, developmental, stains

Introduction

The tooth consists of three distinct layers; the enamel which covers the crown, the root cementum on the root surface, and an inner layer of dentin in the crown and the root. The pulp contains microvascular structure forming the inner part of the tooth. In case, a change is occurred in the tooth structure, it will probably cause modification in the outward appearance of the tooth based on the changes of its light transmitting and reflecting properties. Tooth discolorations are related to many clinical and esthetical challenges which can affect a person's self-image and self-confidence where most people place tooth color high. Some discolorations are resulted from stain that is taken up by dentin or enamel, some are placed on the exterior surface of the tooth structure, and others result during tooth development. Tooth discolorations are caused by multiple

factors; medications, genetic defects, diseases, trauma, caries, and normal aging processes are some examples^[1]. This information is also important to explain the nature of the condition to the patient and to give him/her help to prevent the existing tooth discolorations, and when to consider whether to treat the condition. Finding out the etiology and different kinds of tooth staining are important factors for ensuring a correct diagnosis when examining a stained dentition.

Classification

Intrinsic discoloration

Systemic causes

Genetic defects

Alkaptonuria, congenital erythropoietic porphyria, congenital hyperbilirubinemia, and amelogenesis imperfecta (AI).

Syndromes associated with AI

Trichodontoosseous syndrome, cone-rod dystrophy, KohlschütterTönz syndrome, McGibbon syndrome, Vitamin D -dependent rickets, and Vitamin D-resistant rickets.

Dentinogenesis imperfecta (DI)

Syndromes associated with osteogenesis imperfect Ehlers-Danlos syndrome, Goldblatt syndrome, and Schimke immunoosseous dysplasia.

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Drug induced

Tetracycline staining, ciprofloxacin, and fluorosis.

Local causes

Acquired, pulpal hemorrhagic products, root resorption, and ageing.

Internalized discoloration

Developmental defects Enamel hypoplasia.

Acquired defects

Tooth wear and gingival recession.

Review Results**Treatment options****Alkaptonuria – management**

There are no reports describing how to treat the stained teeth caused by Alkaptonuria. Bleaching should be done first, but the blue or gray stains are difficult to be eliminated.^[2] When the stains do not respond to bleaching, either abrasion or restorative treatment can be carried out.

Congenital erythropoietic porphyria – management

To improve the esthetics in teeth with red-brown porphyrin pigments deposited. The dental treatment options are crowns, facings, and/or laminated veneers.^[3]

Congenital hyperbilirubinemia – management

The treatment for the condition is bleaching or placement of esthetic crowns.

AI – management

The most common clinical problems include poor esthetics, tooth sensitivity, and extensive tooth wear. Management in cases of affected children and adolescents have to be focused on improving esthetics, reducing sensitivity, correcting or maintaining vertical dimension, and restoring the masticatory function.^[4]

AI may have psychosocial impact on young patients. Early diagnosis is important for proper preventive and restorative treatments over several phases. The temporary phase commences soon after diagnosis in the primary or mixed dentition and is followed with a transitional phase providing the patient with a functional and esthetic permanent teeth before the permanent treatment phase.^[5] The treatment of AI types depends on the phenotype of the affected enamel. The treatment can range from preventive care and bonded technique for esthetic improvements.^[6]

DI – management**Bleaching and prosthetic crowns**

Croll et al. reported a case with successful bleaching of teeth with DI discoloration. They used application of 10% carbamide peroxide in a custom tray for home bleaching. The patient wore this several hours a day in 2 weeks. Some lightening had occurred. After 5 ½ weeks, the teeth were lighter and the bleaching was ended. After 6 weeks, it was found that the teeth were lighter before bleaching. The number of days and hours per day of exposure to bleach required to effectively improve appearance of teeth discolored by DI is not known.

Tetracycline – management

Haywood had shown that tetracycline-stained teeth may respond to longer bleaching treatments, some can require from 1 to 12 months of treatment every night. Extended treatment time can give sensitivity episodes.^[7]

Leonard et al. (2003) stated in their study that nightguard vital bleaching indicates that tetracycline-stained teeth can be whitened successfully using a 6-month active treatment with 10% carbamide peroxide, and that shade stability may last at least 90-month posttreatment.^[8-10]

The prognosis of vital bleaching is good for Degree I. Degree II is more variable to localize the amount and location of the discoloration. The prognosis is therefore variable depending on the specific degree and intensity of staining.

Degree III is usually marked with banding. The most difficult tetracycline discolorations to treat involve banding caused by sporadic repetitive ingestion of the drug. These bands become more evident as the lighter stains respond effectively to bleaching. Degree III and IV are severe stains and the prognosis is usually not good. In cases where the teeth are severely stained in the gingival region, and bleaching treatment has no effect, veneers, or placement of a crown will be the ideal options to restore esthetics and function. According to Haywood, it is best to try bleaching first, and then abrasion, or bonded technique, because one of the treatment options may have a satisfactory effect and eliminate the need for more conventional treatments.^[11]

Fluorosis – management

The choice between different treatment modalities depends on the severity of the fluorosis and may be determined by the Thylstrup and Fejerskov index^[12-14]. The esthetic of mild fluorosis can be improved successfully with bleaching. Moderate fluorosis can be corrected with bleaching or in combination with microabrasion. Severe fluorosis may require laminate veneers, restorations, or crowns.

Pulpal hemorrhagic product – management

It has shown that the pinkish hue seen initially after trauma might disappear in 2-3 months if the tooth becomes revascularized. It is therefore advised to wait for 3 months before bleaching treatment.^[15,16]

Pulp necrosis

Intracoronally, bleaching is the treatment of choice. According to Plotino, trauma or necrosis-induced discoloration can be successfully bleached in about 95% of the cases. The treatment procedure involves first the removal of all the filling materials to a level just below the bone.^[17,18] Then, clean the chamber with burs. Moreover, finally, treat the tooth with intracoronary bleaching. The duration of discoloration and type of sealer may affect the prognosis.

Enamel hypoplasia - management

Treatment options depend on the severity of EH and the symptoms associated with it.

Tooth wear and gingival recession – management

To improve the appearance of discolored roots of teeth, the exposure to bleaching material requires usually treatments of long periods, longer than what is common for the bleaching of the enamel.^[19]

Discussion

It is important that patients are aware of the treatment options available for tooth discolorations and also the consequences of these. An adequate and appropriate communication between the dental practitioner and the patient may prevent many disappointments in the final result. In the management of patients with stained teeth, it is important to know and understand the mechanisms behind the tooth discoloration, and the clinical features of different types of tooth staining to ensure a correct diagnosis. The reasons for discolorations can be of medical, genetic, or odontological origin.^[20,21] A number of metabolic diseases Alkaptonuria, congenital erythropoietic porphyria, and congenital hyperbilirubinemia can also contribute to severe tooth discolorations. AI and DI are caused by genetic disorders, while tetracycline staining and fluorosis can occur during tooth formation. Both environmental and genetic factors that interfere with odontogenesis may be responsible for enamel hypoplasia.^[22] Despite the fact that people have severe tooth discolorations, we must also be aware that this can be experienced as normal for some people in a community. The prevalence of dental fluorosis as a side effect of the fluorinated water will be high among the people living in these areas.^[23] Moreover, they will not necessarily feel that fluorosis is an esthetic problem because they do not differ compared to other members of the community. Patient's perception of their teeth is a valuable information, and the

dentist should not cause treatment needs that are not present in patients^[24]. The teeth are an integrated part of facial esthetics and are involved in a complex social, cultural, and psychological interaction. People having severe discolorations, bleaching can be an important and valuable treatment. Croll had reported in 1995, on the successful use of carbamide peroxide bleaching in a teenager, who had spent his childhood with brown teeth, and thus could have more normal teeth for his high school years, brown and yellow stains are easier to change, while gray and blue stains are mostly resistant to bleaching, and the discolorations located in the gingival area have a poor prognosis. However, recent researchers have shown that tetracycline-stained teeth that often have a gray-blue staining may demand longer bleaching treatments, from 1 to 12 months, but it is almost impossible to predict its results. Haywood had stated that it is best to try bleaching first, because the patient may be pleased with the effect of the treatment and eliminate the need for veneers or replacement with full crown. With minocycline, a staining might occur post-eruption in previously normal fully mineralized teeth on an adult patient. Some of these patients might then experience increasing gray discoloration of their permanent teeth following the minocycline therapy. Moreover, the discolorations can be experienced as an extra burden on these patients. Bleaching is the most preferred treatment option, but we also know that it works best for more uniform gray/brown stains. In some cases, removal of sound tooth substance cannot be avoided to mask the discoloration. Although the effect of this treatment is not the most desirable one and other conventional treatments are required, the patient is at least sure that the most conservative treatment has been tried first.

Conclusion

As dentists, the appropriate knowledge can help the patients with a correct diagnosis and the choice of the most conservative treatment plan with an esthetic outcome that is acceptable to the patient and the dental practitioner.

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