

Decision Analysis On Discolored Tooth Management

Research Article

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Abstract

In the present modern society, There is a growing consciousness about the appearance among both men and women. The importance towards the esthetics has tremendously increased. Due to the recent advancements and growing awareness about esthetics, people are eager to know how dentistry would help in enhancing their smiles. The overall feeling of appearance is influenced by their appearance of the dentition. The appearance of the dentition is of concern to a large number of people seeking dental treatment and the colour of the teeth is of particular cosmetic importance. Tooth discoloration presents two major challenges to a dentist. The first challenge is to ascertain the cause of the stain and the second is its management. Discoloration may be limited to a single tooth or several teeth in a single arch or it may be generalized and evident on all of the teeth. Main key for the treatment lies in recognition of actual cause for the discoloration. In some cases, scaling and polishing the teeth will improve the situation; however, more extensive treatment often is needed to achieve a satisfying result.

Keywords: Decision Analysis; Discolored Teeth; Veneer; Bleaching.

Introduction

In the present modern society, there is a growing consciousness about the appearance of both men and women. The importance of esthetics has tremendously increased. The recent advancements and the increasing awareness about esthetics has made people curious in knowing the newer methods which can enhance their smiles. The overall feeling of appearance is influenced by their appearance of the dentition [1]. Smile has been the most important interactive communication skill. The dental appearance is of major concern to the majority of the people. The cases reporting for esthetic reasons like discoloration has tremendously increased in recent years [2]. This can be attributed to the awareness and education which has an influence in young individuals.

Tooth discoloration is an esthetic problem [3]. It is defined as any change in hue, color, or translucency of the teeth due to any cause, restorative materials, drugs, pulpal necrosis, or hemorrhage may be responsible [4].

Teeth are not uniform with respect to appearance because of the varied form, color, texture in different dentitions and conditions. It is composed of a number of colors and there are variations in the shades from the gingival to the incisal edge. The gingival third is the darkest portion of the teeth because of its close approximation of the dentine with enamel. In some people canine teeth appear darker than the incisors, younger individuals have lighter shades of teeth than older individuals. Tooth color changes with age, it becomes darker due to the physiologic deposition of secondary dentine, accumulation of stains, and general wear of the teeth [5]. Apart from these, there are other factors like the condition, light source, the time of the day, surrounding conditions like the color of the skin, clothing, lipstick, makeup, and the angle at which the tooth. These factors should be neutralized before planning for aesthetic treatment [6].

In such situations, the primary goal of a restorative dentist is to restore function and appearance. The matching of the restora-

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tive material with the remaining tooth structure to recreate the esthetic smile has been a major challenge to the dentist [7]. Cosmetic dentistry has imposed several demands on the artistic abilities of the clinician, and the technician. Understanding the basic principles of color and its practical application is also challenging [8]. Dental practitioners should have a good understanding of the etiology and clinical presentation of tooth discoloration to make the right diagnosis and select the most appropriate treatment for each case [9].

Previously our team has a rich experience in working on various research projects across multiple disciplines [10-24]. Now the growing trend in this area motivated us to pursue this project.

Classification Of Tooth Discoloration

Tooth discoloration is historically classified into three categories based on etiology [25].

1. Intrinsic discoloration
2. Extrinsic discoloration
3. Internalized discoloration

Intrinsic discoloration

This kind of discoloration arises when the structural composition or thickness of the tooth is altered. This can be altered by many conditions like alkaptonuria, Congenital erythropoietic porphyria, Amelogenesis imperfecta, Dentinogenesis imperfecta, Hyperbilirubinemia, etc.

Extrinsic discoloration

It occurs on the external surface of the tooth or in the acquired pellicle. This can be further divided into metallic and non-metallic extrinsic discoloration.

Internalized discoloration

Occurs due to incorporation of extrinsic stain within the tooth substance following tooth development. The pathways by which the coloring pigments get internalized are developmental defects, tooth wear, dental caries, and restorative materials.

Another new classification is given based on the type of color [9] Black: Black discoloration has also been found in people using iron supplements, containing high amounts of iodine, and iron foundry workers as well. This pigmentation usually occurs in people with poor oral hygiene.

Blue, Blue- Brown, Blue-Grey, Dark Blue chromogenic bacteria- *Pseudomonas aeruginosa*, *dentinogenesis imperfecta*, Parkinson's disease [26], tetracycline users [27, 28].

Dentinogenesis imperfecta is a hereditary disorder of dentine as a result of abnormal dentinogenesis in primary and permanent dentition. The severity depends on the stage of tooth development. Primary dentitions are affected more than the permanent dentition.

There are three types of dentinogenesis imperfecta.

Type I: Opalescent teeth with Osteogenesis imperfecta.

Type II: Opalescent primary dentine

Type III: Opalescent dentine with radiographic changes, Normal enamel thickness with extremely thin dentine and enlarged pulp, giving shell teeth appearance.

Brown, brown-black and golden brown pigmentation -iron, iodine, and stannous fluoride, respectively, Chromogenic bacteria, Chlorhexidine, [29, 30] Brown stain forms as a thin, pellicle usually observed on the buccal surface of maxillary molars and lingual surface of lower incisors.

Overuse of tea, coffee based products or beverages will also lead to extensive brown pigmentation of the enamel. The anionic polyphenols interact with the cationic salivary pellicle to form a thick layer of brownish stain. It can also result from physical and chemical interactions.

Smokers have brown tobacco stains which results from penetration of coal tar products on the tooth surface.

The degree of staining in such cases is not dependent on the amount of tobacco consumption rather it depends on the defects and the thickness of enamel. Another major reason for brownish discoloration is usage of chlorhexidine based antiseptic mouthwashes. The side effects of chronic chlorhexidine usage were first described by Flora in 1971. This type of pigmentation develops in a week's time and it frequently involves the interproximal surface near the gingival margins. Chlorhexidine molecules being positively charged molecules get attached to the negatively charged tooth surface.

Tetracycline also causes brown discoloration. It was first described in the mid 1950s. Tetracycline can cause brown or brown grey tooth pigmentation. Tetracycline staining was first described in the mid-1950s. After a decade in 1963, United States. Tetracycline molecules form complexes with calcium molecules of enamel. Tetracycline is avoided during the pregnancy time from 29 weeks till delivery to prevent incorporation into the dental tissue as these molecules have the potential to cross placenta. Permanent dentition is usually affected when the drug is taken from 4 months of infancy to seven years of age. Hence this period of pregnancy is usually referred to as the critical time period.

Dental fluorosis is another cause of major concern with respect to discoloration. The negative effects of excessive usage of fluoride was first explained by Dean in 1932.

Dental fluorosis can arise from natural water supplies or fluoride containing products. When the fluoride concentration exceeds the safe limit which is 1 ppm, it results in brownish spots to pitting of dental surfaces.

The brownish staining in alkaptonuria is due to homogentisic acid. It is a metabolic disorder resulting from incomplete metabolism of phenylalanine and tyrosine.

Sodium hypochlorite also results in brown stains in some cases when it is combined with Chlorhexidine.

Green, Green to Blue-Green - Chromogenic bacteria, copper and

nickel, erythroblastosis fetalis [31].

Grey pigmentation - amalgam restorations, endodontic treatments [32].

Pink discoloration-internal resorption [33, 34].

Pink teeth usually result from 3 to 4 weeks after discoloration because of localised vascular damage. Pink teeth is a common clinical finding. It's an asymptomatic condition, often accidentally noticed on radiographic examination. Resorption causes thinning of enamel allowing the granulation tissues to be shown through it. Pinkish discoloration also occurs as a result of usage of endodontic materials like Tubli-seal, Diaket and Roths sealer.

Red, Red-Purple, Red-Brown -congenital erythropoietic porphyria (CEP), lepromatous leprosy [35].

Congenital erythropoietic porphyria is a metabolic disorder. It is also referred to as Gunther's disease as it was first described by Dr.Gunther in 1911. It results from mutation in genes which codes uroporphyrinogen-III synthetase, leading to accumulation of porphyrin in skin, urine and dentine. As a result, the teeth in such cases have red- purple or red brown color-Erythrodonia.

Yellow-green discoloration - Amelogenesis imperfecta, erythroblastosis fetalis, intracanal medicaments.

Amelogenesis imperfecta is a hereditary condition characterized by enamel defects such as inadequate deposition of enamel matrix, inadequate mineralization of matrix, incomplete maturation of enamel matrix. The incidence of this condition ranges from 1:718 to 1:14000.

Yellowish discoloration also can result from calcific response of teeth to trauma or infection due to excessive deposition of dentine in the pulp chamber. This condition is called dentine hypercalcification or calcific metamorphosis.

Management Of Discolored Teeth

The treatment protocol depends on the condition which has caused discoloration

Alkaptonuria

There is no literature evidence or any case reports describing the protocol for the management of dark teeth in alkaptonuria. Bleaching can be attempted first. If the stains don't respond, microabrasion and restorative treatment can be performed [36].

2) Congenital erythropoietic porphyria

Reddish discoloration should be restored with full veneer crowns. Dental restorations with heavy metals such as copper and mercury should be avoided in these patients. Any exposure to strong lights should also be avoided while undergoing dental treatment. Rand et al suggested to use lights with filters to prevent radiosensitivity [37, 38].

Hyperbilirubinemia

Green teeth resulting from the accumulation of bilirubin pig-

ments can be managed by bleaching, laminates, veneers, or full veneer crowns [39].

Amelogenesis imperfecta

The hypomineralized enamel in amelogenesis imperfecta can be masked by direct and indirect composite restorations. Some authors suggest complete etching of enamel with 5% sodium hypochlorite to remove the residual enamel proteins. But the longevity of restoration in such cases remains questionable owing to the decreased bonding of the restoration with the underlying defective structure. Another option can be full veneer crowns and veneers. Veneers are often preferred in anteriors since it requires minimal tooth preparation than full veneer crown [40].

Fluorosis

It's a complex and more common condition case that often requires combination therapy of bleaching, microabrasion, veneers, and crown. Leaching would help in breaking down the chromogens to make the teeth look less dark than before. Microabrasion removes the superficial microporous zone together with the entrapped extrinsic stains, while laminate veneers and crowns provide esthetic masking of the discolored fluorosed enamel. Mild-to-moderate fluorosis cases can be treated with microabrasion followed by bleaching, But severe cases of fluorosis, with structural loss, are managed by veneering and full veneer crown depending on the extent of surface enamel loss [41].

Dental fluorosis may also be managed with Wright's protocol. [42]. The fluorosed tooth is cleaned, using prophylaxis paste. The enamel surface is then etched with 35% phosphoric acid to facilitate penetration of sodium hypochlorite that acts as the bleaching agent. The bleaching session may be repeated until the desired shade is attained. Following bleaching, the enamel pores can be permanently sealed with low viscosity resin.

Tetracycline discoloration

Tetracycline stains have been classified into three types. Degree I, II, III, and IV [43].

Degree I: Mild tetracycline staining. This staining is a minimal expression of tetracycline. Varies from yellow to grey with no banding.

Degree II: Moderate tetracycline staining. Yellow-brown to dark grey banded staining.

Degree III: Severe tetracycline staining. Blue-grey or black with significant banding across the tooth.

Degree IV: Extended and more severe staining.

Degree I discoloration are milder forms that can be managed by vital bleaching. Degree II can be managed by bleaching. If this doesn't fetch good results, then ceramic veneers or crowns can be given. Severe stains in Degree III and IV, bleaching cannot produce good results. Veneers or full veneer crown are 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 satisfac-

tory effect and eliminate the need for more conventional treatments [44].

Enamel hypoplasia

Enamel hypoplasia can usually be managed by restoring the affected enamel, following proper oral hygiene methods. Topical fluoride application is effective in reducing dentin sensitivity and caries attack. In most cases, interim therapeutic restorations are necessary until definitive rehabilitation is possible [45].

Discussion

Dental bleaching can be performed externally or intracoronally. The bleaching of nonvital teeth is relatively less invasive treatment. However, teeth whitening can be expensive and doesn't work in all kinds of discoloration. Also the bleaching agents are not effective on veneers, crowns and it has not shown good results in discoloration which are caused due to injury or medication. It is also proved that the residual peroxide components can interfere with the polymerization of the permanent restoration resulting in reduced bond strength.

Other treatment alternatives for discoloration management includes dental veneers and full veneer crowns. The indications of dental veneers include discolored teeth due to tetracycline staining, fluorosis, amelogenesis imperfecta, fractured discolored teeth, malalignment etc. Contraindications of veneers include patient site parafunctional habits, edge edge relation, poor oral hygiene, insufficient enamel. But veneers are expensive, technique sensitive, time consuming, veneers might also fall off and can cause postoperative sensitivity. Veneers are not a good choice for people with unhealthy teeth, weakened teeth, those who don't have enough existing enamel on the tooth surface.

Our institution is passionate about high quality evidence based research and has excelled in various fields [14, 46-55].

Conclusion

All the above-mentioned treatment modalities are an effective way for the management of tooth discoloration. During the management of these case scenarios, the clinician should take prior precautions and should consider various factors such as the amount of tooth structure as well as pulpal response which could influence the treatment diagnosis. The above flowchart would effectively help clinicians to manage these case scenarios in their regular clinical practice.

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