Review Article

ALL ABOUT DENTAL STAINS: A REVIEW (PART II)

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Abstract

Dental stains is a significant problems faced by people in the present showbiz society. There has been a rapid rise in people demanding the treatment for tooth discoloration. Thus it becomes a duty for every clinician to possess the knowledge and skill to manage dental stains according to the patient's demands. In order to treat the stains, a correct diagnosis is necessary to differentiate between an intrinsic stain and extrinsic stain that will dictate the management procedure. Extrinsic stains are easier to remove from the tooth surface, can be managed by prophylaxis and polishing whilst intrinsic stains are more difficult to manage. Usually bleaching is the most common method to manage intrinsic stains. This article aims to discuss in detail, the methods to clinically diagnose and manage dental stains.

Key words – Bleaching, Discoloration, Esthetics, Whitening, Stains,

Introduction

Tooth staining is associated with many clinical and esthetical challenges. They can have an impact on a people's image and self-confidence in this society, where most people place tooth colour as a priority. As a dentist we must possess the ability to help these patients with a correct diagnosis and the choice of the most effective treatment plan so that the aesthetic outcome is acceptable to the patient as well as the clinician.[1] The previous part of this article was a review about the different types of dental stains and their etiopathogenesis. This article is a review about the diagnosis and management of dental stains.

There are broadly two kinds of dental stains, intrinsic and extrinsic stains that have different methods of management. To differentiate one from another a proper diagnosis and clinical examination is required.[2]

Diagnosis of Stains

In order to understand the type and etiopathogenesis of the stain a through history should be taken from the patient that should include: -[3,4,5]

1) *Dental history* – History of previous restorations, root canal treatment, trauma, use of mouthwashes including supplementation, residence in natural water fluoridation areas.
2) *Medical history* – Neo-natal or early childhood illness, any drugs taken, maternal disease.
3) *Family history* – Presence of genetic disorder.
4) *Personal history* – Quality of their diet, consumption of beverages between meals, history of malnutrition.
5) *Social history* – A proper history of the nature of the work and exposure to metal, history of tobacco or betel leaf chewing habit, smoking.

Clinical Examination

It involves extra-oral and intra-oral examination, with evaluation about the type of dentition present. The distribution of the stains or hypoplasia should be clearly established regarding type of dentitions affected, number of teeth affected, and symmetry of staining present that have developed subsequently and become either more or less severe with time. The extent of stains should be identified with respect to the depth of affected enamel or dentine.[6]

Scratch Test: - This test differentiates between extrinsic and intrinsic stains. Armamentarium used is dental explorer, scalars, or any other sharp instruments. An extrinsic stain can be removed by use of these instruments while intrinsic cannot be removed. Usually, if the removal is difficult the stain is considered tenacious.[3,5]

The extrinsic stains is generalised in distribution on teeth surface while intrinsic can affect from a single tooth to whole dentition. Tooth having extrinsic stains usually have no pulpal involvement.[3]

Radiographic Examination

A radiograph is used to determine the abnormalities in structures and morphology of enamel and dentin, and the adequacy of root canal fillings in non-vital teeth. Vitality test will suggest the presence or absence of a nerve supply and vasculature.[6]

Histological Examination

Histological sectioning of extracted teeth may identify hereditary and environmental abnormalities.[6]

Management of Stains

Extrinsic Stains

The most commonly used procedure to treat extrinsic stains is by a professional hygiene treatment and by polishing tooth surfaces with polishing cups and more or less aggressive abrasive pastes.

Personal Management

a) *Diet and habit*: The patient should Control the amount and type of beverages causing extrinsic stains, brush their teeth immediately after consumption of stain producing food. They must restrict their use of tobacco products that will significantly reduce the amount of extrinsic staining.[7]

b) *Tooth brushing*: - Patients must be advised on correct tooth brushing technique with dentifrice containing sufficient cleaning and polishing power, or dentifrices, containing chelating agents, such as sodium citrate and citric acid, and proteolytic enzyme. Effective tooth brushing twice daily with a dentifrice helps to remove and prevent the formation of extrinsic staining. Most dentifrices contain an abrasive, a detergent, and an anti-tartar agent. Apart from that, some dentifrices now contain tooth-whitening agents. Meswak (*salvadora persica*), a chewing stick used by some Afro-Asian and muslim communities, is an efficient tool for the cleaning of teeth because it contains a high amount of abrasive silica and calcium phosphate salts.[4,7]

Professional Management

a) *Oral Prophylaxis*: Most of the extrinsic stains are removed by professional scaling i.e.; hand, sonic or ultrasonic scaling. Sonic and ultrasonic scalers are more efficient in removal of stains and calculus from the tooth surface.[7]

b) *Polishing*: It involves the use of hand piece with a rubber cup or disc insert and abrasive fine polishing paste. Experiments indicate that application of pumice and water slurry with a rotating rubber cup for 30 seconds removes about a 3-micron thick enamel layer.[8] For more tenacious stains, enamel microabrasion (hydrochloric acid and pumice abrasion) or home bleaching technique should be attempted.[4,7]

c) *Air jet Polishing*: Air polishing was first introduced to in the late 1970s that aids in easily removing extrinsic stain and soft deposits. It also reduces the fatigue in hand, wrist, neck and eye because of quicker action. It uses a water soluble sodium bicarbonate mixture to help in the removal of stain and plaque. Air polishing is effective in the removal of stain due to smoking, coffee, tea, chlorhexidine and other extrinsic factors. Aluminum trihydroxide can be used instead of sodium bicarbonate for patients with sodium restrictio. Avoid its use on dentin, cementum and restorative resins. Universal precautions including protective apparel, a face shield or safety glasses must be used by the operator with side shields, gloves, and a well-fitting mask with good filtration capacity.[7]

Intrinsic Staining

Intrinsic stains are formed by incorporation of chromogenic materials into enamel and dentin. Staining could occur before eruption (during odontogenesis) or after eruption. They are more difficult to treat as compared to external stains, which occur on the tooth surface. Different kinds of intrinsic stains require different approach for treatment, according to location and etiology of the stain. Generally surface enamel stains can be treated using enamel microabrasion whereas deeper internal stains can be managed by bleaching technique.[4]

Micro Abrasion

This technique is done by removal of a layer of enamel surface. It involves 'abrasion' with dental instruments and 'erosion' with acidic agents. This method is also sometimes referred as 'abrosion'.

Mostly two main techniques for microabrasion are used. Either Hydrochloric acid or phosphoric acid with pumice can be used, which requires careful isolation of the teeth. Microabrasion is a simple, quick, and safe technique indicated for fluorosis, post-orthodontic demineralisation, localised hypoplasia due to infection or trauma, and idiopathic hypoplasia when the stains is limited to the outer layer of enamel. The evaluation of effectiveness of microabrasion should be done after one month post-treatment, as the teeth appearance will continue to improve during this time.[6]

Bleaching

Bleaching refers to lightening and whitening of discoloured vital or nonvital teeth by using oxidizing materials like hydrogen peroxide, carbamide peroxide, and sodium perborate. These materials have the ability to penetrate the enamel and dentin, emitting reactive oxygen, which dissolves and release stain producing chromogens. Bleaching may be done for vital or non-vital teeth and it can be done in the dental office or at home.[4,9]

The commonly used techniques of bleaching vital teeth are:

1. Over the counter preparations (OTC)
2. Dentist prescribed home bleaching,
3. In-office bleaching,

Over The Counter Preparation (OTC)

There has been increase in popularity for over the counter (OTC) bleaching products in recent years. They are composed of a low concentration of whitening agent like 3–6% hydrogen peroxide and are applied to the teeth via gum shields, strips or paint-on form.[10] It is also available as whitening toothpastes, pre-fabricated trays and whitening strips.[11] They should be applied twice per day for up to 2 weeks. The use of these bleaching agents has high safety concerns because they are not regulated by the Food and Drug Administration.[10]

Patients using over-the counter bleach should be educated that going for professionally applied bleach is safer. Using OTC bleaching products without the supervision of a dentist is a matter of concern in terms of safety and efficacy and are not recommended, because it can be a potential for long-term over use and abuse by uninformed patients.[12]

Dentist Prescribed Home Bleaching

Klusmier in 1968 noticed whiter teeth after treatment of mouth injury using *Gly-oxide, a* hydrogen peroxide mouthwash in an orthodontic retainer. Haywood and Heman published their first report of dentist prescribed home bleaching in 1989. This technique is indicated in case of staining due to aging, smoking, chromogenic materials,

tetracycline, or mild fluorosis. It is also called dentist-home bleaching, Nightguard vital bleaching (NGVB), and matrix bleaching. [2,13]

This technique involves the use of a low concentration of bleaching agent (carbamide peroxide 10–20% which is equal to 3.5–6.5% of hydrogen peroxide) that is almost one tenth of the concentration used by dentist in his clinics. If carbamide peroxide is being used as a whitening agent, 10% of it should be used for 8 hours per day, and if 15–20% concentration is used, it must be used for 3-4 hours by the patients themselves and the procedure should be supervised by dentists during recalls. The bleaching gel is dispensed in a custom-fabricated mouth guard that is worn over the teeth at night for 2 weeks at least. Dentist prescribed home bleaching at present is probably the most widely used technique of tooth whitening.[2,10,13]

Dentist prescribed Home bleaching is simpler, less expensive, less complicated, and requires less in-office time but active patient compliance is mandatory and the technique suffers from high dropout rates and the excessive use by overzealous patients is also possible, which frequently causes thermal sensitivity.[10,14,15]

In Office Vital Bleaching

In-office vital bleaching or power bleaching was the first vital bleaching technique. In this technique, high concentration of tooth-whitening agents (usually 25 to 40% hydrogen peroxide) is used. The advantage of this procedure is that the dentist has absolute control over the procedure and he can stop it whenever the desired shade of tooth is reached. The step involves the isolation of soft tissue with the help of rubber dam and application of whitening gel on the teeth surface. The peroxide gel is then activated by heat or light for around one hour. Various kinds of curing lights are available that can be used to activate the bleaching gel or accelerate the whitening effect such as halogen curing lights, Plasma arc lamp, Xe–halogen light, Diode lasers, or Metal halide light. Usually one appointment is enough to achieve significant result but if not, more sittings are considered to get the optimum whitening.[2,10,16,17]

Other techniques are also available like dual activated system (Hi Lite) that is both chemically and light activated system that can reduce the bleaching time. Waiting room bleaching technique involves heating 35% Carbamide peroxide under running hot water to activate it and then putting it in custom made trays and inserting it in patients mouth and the patient is told to sit in the waiting room for 30 min. Apart from that ultrasonic technology is also being used in the belief that it will create more free oxygen radicals from the bleaching agent to achieve improved whitening effect.[17]

Non Vital Tooth Bleaching

It is also called intracoronal bleaching. The tooth must be endodontically treated prior to starting non-vital bleaching. There are numerous methods used by a dentist to bleach a non-vital tooth. In the middle of the 19th century bleaching of non-vital teeth was introduced. Chemicals like oxalic acid, Chlorinated lime, chlorine compounds, sodium peroxide, sodium hypochlorite, or combination of 25% hydrogen peroxide in 75% ether (pyrozone) were often used. Harlan reportedly used hydrogen peroxide in 1884. Superoxol (30% hydrogen peroxide) was used by Abbot in 1918. Prinz in 1924 recommended the use of heated solutions of sodium perborate and superoxol to clean the pulp cavity. The bleaching agents can be activated by using Light heat or electric currents to accelerate the bleaching reaction.[4,18]

Some of the most commonly used methods of non-vital tooth bleaching is walking bleach and modified walking bleach, thermocatalytic, and inside/outside bleaching.

Walking Bleach: - This procedure was first introduced by Salvas. It involves sealing a mixture of sodium perborate and water inside the pulp chamber of the discoloured tooth. This process is repeated at intervals until the desired bleaching result is obtained. It is effective in managing staining due to tetracycline.[18]

Modified Walking Bleach: - Nutting and Poe used 30% hydrogen peroxide instead of just water as in walking bleach technique to improve the bleaching effectiveness of the mixture. Both walking and modified walking tooth bleaching technique is commonly used for non-vital tooth discoloration because of less destructive effect on dental tissue and minimal chair side time.[4,18]

Thermocatalytic Bleaching: - It is the best technique to bleach non-vital teeth due to effective activation of hydrogen peroxide on heat application. It combines the steps involved in walking bleach along with application of 30%–35% hydrogen peroxide in the pulp chamber followed by heat treatment with electric heating devices or specially designed lamps. A heated metal instrument or other commercial heat applicators can also be used. In some studies hydrogen peroxide is shown to have caustic effect and often associated with a risk of external root resorption.[4,18,19]

Inside Outside Bleach: - It was first described by Settembrini et al in 1997. This is the technique of bleaching non-vital root canal treated teeth with carbamide peroxide gels or hydrogen peroxide at high concentrations (15%–35%). The chemical in the form of gel is applied by means of a bleaching tray on both buccal surface and pulp chamber through the access opening and is placed directly on the tooth, which is isolated with rubber dam. Mainly used in case of failure of walking bleach technique. In this technique, low concentration of bleaching gel is enough to get the optimum shade that adds up to its advantage. The disadvantage of this technique is poor bacterial control that can lead to failure of endodontic treatment.[20]

Restorative techniques

Composite Resin Restorations: - This technique mainly masks the staining of the tooth using resin composites. It is

mostly used in children and adolescents. It can cover either a localised area on the tooth or full veneering can be done that can either be placed directly in clinics or fabricated in labs. It is indicated for localised hypoplasia, fluorosis, tetracycline staining, Amelogenesis imperfecta, Dentinogenesis imperfecta etc.[6]

Porcelain Veneers: This technique is useful in case of severe tooth staining or failure of other techniques. An important requirement of this technique is that, the tooth in question should have a good amount of enamel thickness present to provide good bond strength. Porcelain is contraindicated in tooth with large immature pulp chamber and pulp horns, and presence of immature gingival contour as in case of adolescent patient. In case of severe discoloration of the tooth the clinician must evaluate the masking ability of the veneer that depends upon the thickness and opacity of the material. Various types of porcelains are available like feldspathic porcelain, leucite-reinforced ceramics and high density alumina ceramic core veneer with feldspathic porcelain.[6,21]

Conclusion

Staining can effectively be managed by the above mentioned methods but knowledge about the type of stain will help the clinician to select the method to be used. The use of bleaching products has increased considerably in the past decade. The increasing demand for tooth bleaching has driven many manufacturers and researchers to develop bleaching products to be used either in the dental office or at home. But the risk of its abuse by the patients is a matter of concern and must be regulated.

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