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Review Article

NARRATIVE REVIEW: TEETH WHITENING FOR DIFFERENT DISCOLOURATION CHALLENGES

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ABSTRACT

Nowadays, there are countless latest comprehensive studies done on the subject of tooth whitening for different discolouration challenges available coming out each year. The objective of this study is to provide an insight and guide to different tooth whitening modalities, their indications and potential side effects to ensure optimum treatment planning. The Scale for the Assessment of Narrative Review Articles (SANRA) is used as a guide for the articles chosen. Articles were searched in PubMed/Medline to identify relevant articles using the combination of search terms: teeth whitening, whitening toothpaste, tooth discolouration with a combination of each discolouration challenge. The literature retrieved was then narrowed down only for teeth whitening that corresponds to causative factors and the repeated and similar types of treatment were eliminated. A comprehensive literature search was conducted on PubMed and Scopus databases. A separate search was made on a Google search engine. The references from the reviewed material were used to locate other relevant publications. Different discolouration challenges will affect the final outcome of the treatment. It is vital for dentists to have knowledge of tooth whitening modalities available and their specific indications and limitations. Tooth whitening procedures are a minimally invasive way to improve dental aesthetic, conservatively.

Keywords: Teeth/tooth whitening, Tooth discolouration, Tooth whitening treatment

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INTRODUCTION

Aesthetic treatment and tooth whitening procedures are among the most requested treatments in the dental clinic. Our modern society is exposed to various types of dental treatment available through social media and online discourse. Often, a patient comes to the dentist requesting veneer to improve their tooth shade, with some even referencing a celebrity as their aesthetic goal. Therefore, dentists should play their role in educating and discussing suitable treatment options personalised for a patient.

The shade of a tooth is influenced by a combination of dentine and enamel. Naturally, dentine is more yellowish, while enamel is white with slight translucency, allowing the shade of the dentine to shine through it. Over time, a tooth will undergo physiological changes due to function and chemical wear which will cause the enamel to become thinner, resulting in increased translucency over the year [1]. This will cause the shade of dentine to become more visible and the tooth will appear visibly yellow. In addition to their fairly uniform overall shade, sometimes there is a presence of localised or generalized discolouration on a tooth caused by colourant or stains, as shown in table 1.

Tooth discolouration is caused by chromogens that come as an organic compound with double bonds or metallic compounds [2]. It may occur due to intrinsic, extrinsic or even internalized stains as shown in table 1. Intrinsic stain occurs when there is a systemic disturbance during the development of the tooth or it can also come from a material used in restorative treatment. On the other hand, extrinsic stains, which may form in the acquired enamel pellicle attaches itself to the tooth through various chromogenic diets, tobacco or by chemical interaction [3]. Extrinsic stains will usually form on those areas of the teeth that are less accessible for tooth brushing. Internalized staining occurs when a tooth is exposed to chromogens and becomes embedded in the tooth structure. It is important to make the correct diagnosis for tooth discolouration as it will invariably affect the type of treatment and, eventually the treatment outcome [4]. This article will discuss the treatment options for commonly encountered tooth discolouration.

Table 1: Source of discolouration

Source	Type of discolouration	Reference
Intrinsic	Tetracycline	[5]
	Fluorosis	
	Tooth necrosis	
	Dentinogenesis imperfecta	
	Root canal-related treatment	
	• Remaining pulp tissue	
	• Root canal sealers	
	• Endodontic materials	
Extrinsic	Food such as tea, coffee, curry, etc	
	Tobacco smoking	
	Poor oral hygiene	
	Chlorhexidine mouthwash	
Internalized	Amalgam restoration	
	Root canal treatment	

Method

For this literature review, searches were done on Pubmed and Scopus using a combination of keywords. SANRA is used as a guide for the articles chosen in this narrative review [5]. Relevant articles were searched in PubMed and Medline using the combination of search terms: 'teeth whitening', 'tooth discolouration', 'non-vital tooth', 'pulp necrosis', 'intrinsic discolouration', 'extrinsic

discoloration', 'smoking', 'tetracycline', 'amalgam', 'fluorosis' and 'management'. The literature was then narrowed down only for tooth discolouration treatment and out of those identified; we eliminated repeated and similar types of treatment.

RESULTS

Management of different tooth discolouration challenges

Tooth bleaching is an integral part of the treatment of tooth discolouration, where it can be the sole solution or a precursor to the next treatment. In order to prescribe a treatment for the patient, it is necessary to determine the cause of the tooth discolouration. The diagnostic criteria include the number of discoloured tooth/teeth, distribution of discoloured tooth/teeth (generalized or localized staining), diet and smoking habits, history of treatment on the affected tooth, duration of how long the tooth has been stained, trauma history and also associated medical and familial history [6]. Conservation of tooth structure is the main aim in restorative dentistry, hence, tooth bleaching should always be considered as the first line of treatment even when full or partial coverage is planned in the future. Treatment options that are available for tooth discolouration include:

1. Scaling and polishing

2. Tooth bleaching: Internal bleaching, external bleaching, inside-out bleaching, at-home bleaching.

3. Restorative treatment: Composite restoration

4. Prosthodontics treatment: Veneer, onlay, crown.

Diet and smoking

A diet that is rich in pigments such as tea, coffee and has the potential to cause tooth discolouration when combined with a low potential of hydrogen (pH) of the food. Lower pH food can induce enamel surface porosity which encourages the deposition of chromogens into the enamel surface, causing external discolouration [7]. From my research for this paper, there is very little evidence that relates the smoke of a conventional cigaratte to tooth discolouration. However, a paper by Wasilewski *et al.* stated that cigarettes burn, components such as tarare responsible for the discoloration because of their dark color and ability to stick to the tooth surfaces [8]. These are easily removed by the manner of toothbrushing and bleaching, such as in-office teeth bleaching procedure or at-home tray bleaching, as stated in a study by Bazzi *et al.* [9]. In a simple case of plaque and calculus deposition on the tooth surface, these colour changes can be easily rectified by scaling and polishing. However, in a more complex case where the chromogen has attached itself to the tooth structure, in-office bleaching is necessary.

In-office bleaching was done under dentist supervision using high concentrations of 35-40% hydrogen peroxide or carbamide peroxides. This procedure can be repeated multiple times until the desired shade is achieved [10]. Due to the high concentration of bleaching agents used, this technique produces faster results. However, due to the high concentration of bleaching agents, special care should be taken to avoid contact between the bleaching agents and the gingival margin. Peroxides in high concentrations are known to be a cause of gingival irritations and, therefore, should be used with caution. Due to this concern, some countries have imposed a strict law where the maximum concentration used in patients is 5% although there are countries that allow the usage of carbamide peroxides up to 35% concentration.

Bleaching agents whiten the tooth through the oxygen radicals released by hydrogen peroxide. The oxygen radicals, through oxidising process, will break the double bonds and consequently reduce tooth discolouration [11]. Peroxides are the most common ingredients used for tooth bleaching either in office or over-the-counter products. The procedure for in-office bleaching is shown in table 2.

Table 2: In-office bleaching protocol

Step	Process	Consideration
1	Patient discussion	Discussion of treatment options and managing expectation. Patient are presented with their current tooth shade before bleaching and documented.
2	Pre-op bleaching and gum protection	Teeth need to be cleaned and pumice before the start of the treatment. Teeth also need to be isolated using a gingiva dam as close to the tooth as possible and to cover all gingiva margin areas.
3	Bleaching	Bleaching materials such as carbamide peroxide or hydrogen peroxide (35%) need to be painted on the tooth surfaces, carefully avoiding the gingiva area. The steps can be repeated three times or according to manufacturer instructions.
4	Review	During the review visit re-bleaching can be done.

Pulp necrosis and root canal treatment

Discoloured non-vital tooth or endodontically treated tooth is usually caused by trauma to the tooth, remnants of the pulp tissue or root-filling materials. Trauma to the tooth produces irons, a byproduct of blood degradation. The irons in turn, are converted into ferric sulphate that causes the dark staining of a tooth. For these types of cases, treatment such as internal bleaching can be done with or without the combination of onlays or crowns. Bleaching is a minimally invasive treatment for non-vital tooth discolouration in comparison to the alternative treatment such as onlay or crown. In some cases where coronal coverage is required, bleaching should also be the first line of treatment for a lighter shade core before the material for fixed prosthesis is chosen.

Internal bleaching also known as walking bleach, is done by inserting the bleaching material into the pulp chamber. The efficacy of the bleaching materials will deteriorate after two weeks hence, it is imperative that the bleaching material be changed by then. The bleaching agents that are available are carbamide peroxide, hydrogen peroxide, and hydrogen peroxide [12]. This technique utilizes hydrogen peroxide or carbamide peroxides in different concentrations in order to achieve tooth whitening and the procedures are shown in table 3.

Table 3: Internal bleaching procedures

Step	Process	Consideration	Reference
1	Patient discussion	Discussion of treatment and managing expectation. Patient are presented with their current tooth shade prior to bleaching and documented.	[12]
2	Tooth access and barrier placement	Before application of internal bleaching, the cavity needs to be access and barrier (GIC, Cavit or IRM) placed above the gutta percha below CEJ or further if the root also needs to be bleached.	
3	Bleaching	The area of the cavity access can be refined before the placement of bleaching material. Inject/place the bleaching material into the pulp chamber. The pulp chamber cavity will be covered with Cavit or IRM.	
4	Review	Patient should return for review every three to seven days up to two weeks. The bleaching process can be repeated up to four times.	
5	Final restoration	Once the tooth has been bleached to the desired shade, composite restoration can be done to restore the tooth. However, if the desired colour has not been achieved veneer or crown might be indicated.	

Fluorosis and white spot lesions

Fluorosis is a disease characterised by the deposition of fluoride onto tooth surfaces during tooth development, which affects the formation of tooth structure. The severity of fluorosis depends on the amount of fluoride exposure during the important tooth development process for both deciduous and permanent tooth structures. Fluorosis can be classified from minor fluorosis to a heavy stain. Fluorosis ranges from mild fluorosis, which presents itself as white opaque areas to severe fluorosis, which presents as brownish with pitting tooth surfaces [13]. Current treatment options that are available to reduce the appearance of fluorosis include microabrasion, bleaching, resin infiltration or combinations of those treatments. Although veneers and crowns are able to completely change the appearance of a tooth, a study shows a more conservative treatment using resin infiltration is fully able to provide aesthetic results that fulfill patients' demands [14].

For the treatment of mild to moderate fluorosis or white spot lesions, resin infiltration provides the best conservative treatment without the removal of tooth structure as shown in table 4. However, in cases of severe fluorosis a combination of resin infiltration and composite restoration is needed. Case selection remains crucial in terms of the success of the treatment. This treatment consists of acid etching, air drying and infiltration using small molecule resin. It works by creating porosity in the enamel layer through etching of enamel in order for the resin to infiltrate through and fill in the gaps between the porosity; the technique is shown in table 4 [15]. For a deeper lesion (more than 0.2 mm-0.3 mm) the porosity needs to be created by preparing the enamel portion until the lesion can be reached. However, due to the minimal tooth preparation, this will require composite restoration. The same goes for pitting enamel in a severe case of fluorosis. Resin infiltration uses the concept of infiltrating the porosities of enamel with a low-viscosity resin, making it suitable for similar types of lesion, namely early caries lesions and molar incisor hypomineralisation (MIH) [16, 17].

Tetracycline discolouration

Tetracycline is a broad-spectrum antibiotic introduced in the 40s. Soon after, it was realised that tetracyclines had the ability to chelate calcium ions and then incorporate them into developing teeth during odontogenesis causing teeth staining [18]. Tetracycline staining on a tooth can be classified into four classes, ranging from mild to severe staining. The first-degree of tetracycline staining formed an even distribution of light yellow, brown or gray staining throughout the crown with no evidence of banding or localized concentration. Second-degree tetracycline staining consists of golden brownish or gray stains with no banding. Third-degree tetracycline is in the form of dark banding with dark gray or blue stains, while fourth-degree tetracycline staining is severely darkened tooth stains. The first three degrees of staining can be treated with tooth bleaching, while the fourth degree cannot be treated with vital bleaching and fixed prosthesis should be included in the treatment plan [19].

At-home tray bleaching using carbamide peroxide 10% as shown in table 5 can be the first-line treatment of choice for the treatment of mild to moderate tetracycline staining. In the case of severe tetracycline staining, carbamide peroxide can be an adjunct to the future indirect prosthesis that allows better natural crown shade selection without the need to remove excessive tooth structure in order to mask the darker shade of the tooth. In the case of severe tetracycline staining a choice of metal-ceramic or zirconia crown can be used to mask the discolouration.

The attempt to bleach tetracycline-stained teeth has been done since the 1970s. Although there have been some unsuccessful cases in the past, recent case studies show successful attempt where 10% carbamide peroxide was used continuously every night using a clear non-reservoir tray. The tray will need to be used continuously at night, which is the same amount of time carbamide peroxide remains in its active form. Due to the nature of the staining, the time required for improvement of tooth shade will take a longer time than normal vital bleaching. Several studies also show marked improvement in the tooth shade post-treatment and great patient acceptance [18, 20].

The period of time needed for the teeth to lighten will depend on the severity of the staining. A study done by Bloomquist *et al.* stated that the treatment will take up to a year with one month, third month and every six-month recall [18]. Another study, which was conducted for nine months with two-year and five-year review, reported a similar lightened tooth shade; however, after 5 years periods in some cases, patient will need to undergo re-bleaching [20]. Most studies stated that the most difficult area to bleach was the cervical area where in some cases a fixed option might be used as the definitive treatment.

Table 4: Resin infiltration procedure

Step	Process	Consideration	Reference
1	Patient discussion	Discussion of treatment options examples: the potential of failure. Case selection and suitability with the type of treatment. The possibility of removing of tooth structure in order to reach a deeper lesion. In order to improve the overall colour of the patient's dentition, it might be possible for the patient to undergo full mouth tooth bleaching prior to the resin infiltration.	[15]
2	Pumice	After placement of isolation, the tooth was pumiced in order to clean the area. The tooth is then cleaned and dried with non-oil air.	
3	Etch	Etchant is applied on the lesion, extending about 1 mm outside the lesion perimeter. This is done for about two minutes with agitation of the syringe. Repeat the etching procedure for long-standing lesions.	
4	Rinse and dry	Rinse the etchant for 30 seconds and apply a drying agent (ethanol) on the surface. A drying agent can mimic the final result and can be a good indication of the final outcome. If the lesion appears the same colour as the tooth after application this is an indication success.	
5	Infiltration	Once the area is dry, apply the infiltrant (remove light prior) to the lesion for 3 min and light cure. Repeat the infiltration once more and light cure. Finishing can be done afterward.	

Table 5: Vital bleaching for tetracycline staining case procedure

Step	Process	Consideration	Reference
1	Patient discussion	Discussion of treatment options examples: The potential of failure. Case selection and suitability with the type of treatment with the possibility of combining fixed options. Impression taking using alginate to form a vacuum form non-scalloped and no reservoir tray that covers up to 1-2 mm into the gingivae.	[18]
2	Patients advice	Patients are advised to wear the tray with carbamide peroxide 10% at night. The patient is provided with a desensitising agent applied pre-brushing or in the tray for 10-30 min.	
3	Review	Patients are required to come to review every month or as needed according to the practitioner.	

Amalgam discolouration

Tooth discolouration from amalgam restoration is a result of amalgam corrosion and deposition of the corroded amalgam constituents into dentine. The topic came upon the author after a failed amalgam discolouration bleaching that turns a tooth green after a walking bleach (fig. 1). Haywood raised the greening effect of oxidated amalgam in his case reports [21]. Since then, not much has been reported and after the introduction of adhesive dentistry combined with the current decline of amalgam restoration usage. However, with a high survival rate of amalgam restoration, the effect of amalgam discoloration is still seen today. The effect of amalgam staining on aesthetic is less severe for posterior teeth while on anterior teeth, it can negatively impact for patients' aesthetics [22].

Fig. 1: Greening of the tooth after bleaching

Amalgam discolouration is notoriously difficult to treat. Since the colour pigment of amalgam is embedded inside the tooth structure, it cannot be removed by external mechanical procedures. A recorded case for the treatment of amalgam dicolouration includes walking bleach using a customised tray of 10% carbamide peroxide. This, however did not improve the tooth discolouration caused by amalgam. In this case, a walking bleach/internal was prescribed to the patient and did not successfully improve the tooth shade. The patient was then advised for an indirect prosthesis option.

Indirect prostheses

For the more challenging case where tooth bleaching failed to lighten the colour of the tooth a fixed option was given to the patient. Treatment options include direct or indirect veneer, partial or full coverage crown and this is based on a thorough assessment that will determine the types of indirect restorations. The types of fixed treatment and material chosen for the veneer or crown will eventually determine the aesthetic of the final outcome. There are some consideration that needs to be taken into account when choosing the material to mask the dark core, such as the type of restoration (ie; full coverage or partial coverage) and material of choice (ie; porcelain fused to metal or ceramic).

Porcelain fused to metal has been a gold standard for fixed restoration for a very long time until the advancement of bonding. Bonding allows the crown and tooth to become a monobloc, thus making the restoration stronger. There are two ceramics broadly classified into two categories which are etchable and non-etchable ceramic. Etchable ceramic (ie; etchable ceramics are feldspathic porcelain, IPS Emax and IPS empress) has the advantages of being able to be bonded to the tooth structure namely enamel and also possess high translucency making it an aesthetically pleasing choice. On the other hand, we have non-etchable ceramic (ie; alumina or zirconia-based ceramics like Zircon, In-Ceram, Lava and Procera), which cannot be bonded to the tooth structure, however, possess high opacity which allows for masking of discolouration. The disadvantage of being opaque is, that will lose the translucency which makes the tooth less life-like. In order to overcome this, another option is introduced where the zirconia core is layered with feldspathic ceramic making it more aesthetic [23].

Miscellaneous

First and foremost, before going through any teeth whitening treatment, dentists should consider patients' oral hygiene status and the state of oral disease such as caries and periodontitis to ensure a good baseline [24]. In order to maintain a white tooth there are maintenance regime that needs to be adhere to. After a teeth whitening procedure, it is important to avoid certain types of diet to maintain the tooth shade post-operative. High intake of food that causes staining, such as coffee, curry and so on will reduce the period during the tooth remains white for longer. The usage of straw might reduce the staining on the buccal area however the swirling of drinks might stain the palatal aspects of the teeth.

In general, abrasives have been designed to give effective removal of extrinsic stains and help prevent tooth stains from reforming without excessive abrasivity towards the dental hard tissues. Whitening toothpaste may contain additional agents that augment the abrasive cleaning by aiding the removal and/or prevention of extrinsic stains, for example, peroxide, enzymes, citrate, pyrophosphate and hexametaphosphate, or optical agents such as blue covarine, which can improve tooth whiteness following tooth brushing [25]. Colorants such as blue covarine are added to toothpaste and act by shifting the optics of a tooth colour from yellow to whitish through the deposition of the semitransparent bluish film onto the tooth surface [26]. Toothpaste containing blue covarine has been shown by studies as the most clinically significant tooth whitening effect in comparison to other conventionally marketed products containing silica, activated charcoal and peroxides [26, 27]. In terms of whitening efficiency, it is mainly used for prevention and maintenance rather than whitening, only suitable for mechanically removing extrinsic stains attached to the tooth pellicle. Over-the-counter products such as whitening strips and whitening mouthrinses are also available for maintenance purposes. Although these products are shown to be significantly less effective in bleaching, it is still beneficial to the purpose of the post-bleaching maintenance regime [28].

CONCLUSION

It is imperative that a thorough examination and diagnosis are done before treatment options are laid out for the patient. This is to ensure that a conservative route is routinely done as the first line of treatment beforea more invasive treatment is introduced to the patient. It is vital for dentists to have a knowledge of the available tooth whitening modalities and their specific indications and limitations.

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CONFLICT OF INTERESTS

Declared none

REFERENCES

1. Algarni AA, Ungar PS, Lippert F, Martinez Mier EA, Eckert GJ, Gonzalez Cabezas C. Trend analysis of dental hard tissue conditions as function of tooth age. J Dent. 2018;74:107-12. doi: 10.1016/j.jdent.2018.05.011, PMID 29800639.
2. Alkahtani R, Stone S, German M, Waterhouse P. A review on dental whitening. J Dent. 2020;100:103423. doi: 10.1016/j.jdent.2020.103423, PMID 32615235.
3. Rodriguez Martinez J, Valiente M, Sanchez Martin MJ. Tooth whitening: from the established treatments to novel approaches to prevent side effects. J Esthet Restor Dent. 2019;31(5):431-40. doi: 10.1111/jerd.12519, PMID 31448534.
4. Watts AM, Addy M. Tooth discolouration and staining: a review of the literature. Br Dent J. 2001;190(6):309-16. doi: 10.1038/sj.bdj.4800959, PMID 11325156.
5. Baethge C, Goldbeck Wood S, Mertens S. Sanra a scale for the quality assessment of narrative review articles. Res Integr Peer Rev. 2019;4:5. doi: 10.1186/s41073-019-0064-8, PMID 30962953.

6. Dubal R, Porter RW. An update on discoloured teeth and bleaching part 1: the aetiology and diagnosis of discoloured teeth. Dent Update. 2018;45(7):601-8. doi: 10.12968/denu.2018.45.7.601.
7. Chen YH, Yang S, Hong DW, Attin T, YU H. Short-term effects of stain-causing beverages on tooth bleaching: a randomized controlled clinical trial. J Dent. 2020;95:103318. doi: 10.1016/j.jdent.2020.103318, PMID 32169479.
8. Wasilewski MD, Takahashi MK, Kirsten GA, DE Souza EM. Effect of cigarette smoke and whiskey on the color stability of dental composites. Am J Dent. 2010;23(1):4-8. PMID 20437719.
9. Bazzi JZ, Bindo MJ, Rached RN, Mazur RF, Vieira S, DE Souza EM. The effect of at-home bleaching and toothbrushing on removal of coffee and cigarette smoke stains and color stability of enamel. J Am Dent Assoc. 2012;143(5):e1-7. doi: 10.14219/jada.archive.2012.0188, PMID 22547725.
10. Irusa K, Alrahaem IA, Ngoc CN, Donovan T. Tooth whitening procedures: a narrative review. Dentistry Review. 2022;2(3). doi: 10.1016/j.dentre.2022.100055.
11. Carey CM. Tooth whitening: what we now know. J Evid Based Dent Pract. 2014;14 Suppl:70-6. doi: 10.1016/j.jebdp.2014.02.006, PMID 24929591.
12. Frank AC, Kanzow P, Rodig T, Wiegand A. Comparison of the bleaching efficacy of different agents used for internal bleaching: a systematic review and meta-analysis. J Endod. 2022;48(2):171-8. doi: 10.1016/j.joen.2021.10.011, PMID 34762968.
13. Shahroom NS, Mani G, Ramakrishnan M. Interventions in management of dental fluorosis an endemic disease: a systematic review. J Family Med Prim Care. 2019;8(10):3108-13. doi: 10.4103/jfmpc.jfmpc_648_19, PMID 31742127.
14. Zotti F, Albertini L, Tomizioli N, Capocasale G, Albanese M. Resin infiltration in dental fluorosis treatment 1 year follow up. Medicina (Kaunas). 2020;57(1):22. doi: 10.3390/medicina57010022, PMID 33383755.
15. Tirlet G, Chabouis HF, Attal JP. Infiltration a new therapy for masking enamel white spots: a 19 mo follow up case series. Eur J Esthet Dent. 2013;8(2):180-90. PMID 23712339.
16. Crombie F, Manton D, Palamara J, Reynolds E. Resin infiltration of developmentally hypomineralised enamel. Int J Paediatr Dent. 2014;24(1):51-5. doi: 10.1111/ipd.12025, PMID 23410530.
17. Domejean S, Ducamp R, Leger S, Holmgren C. Resin infiltration of non-cavitated caries lesions: a systematic review. Med Princ Pract. 2015;24(3):216-21. doi: 10.1159/000371709, PMID 25661012.
18. Bloomquist RF, Sword RJ, Londono J, Haywood VB. Bleaching: the initial treatment consideration for tetracycline-stained teeth. Br Dent J. 2021;230(12):807-12. doi: 10.1038/s41415-021-3121-x, PMID 34172864.
19. Al Rawas MZ, Yew Hin B, Johari Y, AB Ghani Z, Husein A. Minimum intervention in managing two cases of tetracycline staining of different severity. Cureus. 2022;14(1):e21289. doi: 10.7759/cureus.21289, PMID 35186551.
20. Matis BA, Wang Y, Eckert GJ, Cochran MA, Jiang T. Extended bleaching of tetracycline-stained teeth: a 5 y study. Oper Dent. 2006;31(6):643-51. doi: 10.2341/06-6, PMID 17153971.
21. Haywood VB. Greening of the tooth amalgam interface during extended 10% carbamide peroxide bleaching of tetracycline-stained teeth: a case report. J Esthet Restor Dent. 2002;14(1):12-7. doi: 10.1111/j.1708-8240.2002.tb00142.x, PMID 11915390.
22. Scholtanus JD, Van Der Hoorn W, Ozcan M, Huysmans MC, Roeters JF, Kleverlaan CJ. Staining of dentin from amalgam corrosion is induced by demineralization. Am J Dent. 2013;26(4):185-90. PMID 24693627.
23. Mizrahi B. The anterior all ceramic crown: a rationale for the choice of ceramic and cement. Br Dent J. 2008;205(5):251-5. doi: 10.1038/sj.bdj.2008.735, PMID 18791580.
24. Usharani P. A study on bacteriological identification of sub-gingival plaques in periodontitis patients. Int J Curr Pharm Sci. 2023;15(1):54-8. doi: 10.22159/ijcpr.2023v15i1.2073.
25. Joiner A. Whitening toothpastes: a review of the literature. J Dent. 2010;38 Suppl 2:e17-24. doi: 10.1016/j.jdent.2010.05.017, PMID 20562012.
26. Vaz VT, Jubilato DP, Oliveira MR, Bortolatto JF, Floros MC, Dantas AA. Whitening toothpaste containing activated charcoal blue covarine hydrogen peroxide or microbeads: which one is the most effective? J Appl Oral Sci. 2019;27:e20180051. doi: 10.1590/1678-7757-2018-0051, PMID 30673027.
27. Shamel M, Al Ankily MM, Bakr MM. Influence of different types of whitening toothpastes on the tooth color enamel surface roughness and enamel morphology of human teeth. F1000Res. 2019 Oct 16;8:1764. doi: 10.12688/f1000research.20811.1, PMID 31839926.
28. Santana Jorge O, Noronha Ferraz DE Arruda C, Tonani Torrieri R, Geng Vivanco R, DE Carvalho Panzeri Pires DE Souza F. Over-the-counter bleaching agents can help with tooth whitening maintenance. J Esthet Restor Dent. 2022;34(2):328-34. doi: 10.1111/jerd.12617.