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Review Article

Clinical indications, complications, and outcomes of internal bleaching

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ABSTRACT

Different bleaching treatments may be used to try to remove intrinsic stains and more tenacious extrinsic discoloration. Intracoronal tooth whitening, sometimes known as non-vital tooth whitening can be used to whiten teeth. By oxidizing the organic discoloration in the tooth, the bleaching treatment lightens the color of the teeth. The underlying etiology of the discoloration affects the effectiveness and efficacy of tooth bleaching. Internal bleaching is a minimally invasive and cost-effective dental technique that doesn't alter the tooth's size or position on the dental arch. Trauma can cause a tooth to become nonvital and lose its natural color without ever requiring endodontic treatment. In these situations, the first course of treatment should be a root canal. We can move forward with the internal bleaching technique if the tooth has had endodontic treatment. Before placing all ceramic restorations, an interior bleaching may occasionally be required too. Pulp chamber origin discoloration is an indication for internal bleaching. Inflammation-mediated external root resorption known as cervical root resorption can occur after trauma and after intracoronal bleaching. Another internal bleaching issue was the coronal fracture, which is thought to have been brought on by desiccation or changes to the physicochemical properties of the dentin and enamel. The absence or minimal color difference between the treated and untreated teeth has traditionally been considered a sign of immediate treatment efficacy.

Keywords: Non-vital tooth, Bleaching, Discoloration

INTRODUCTION

The profession of dentistry today combines treatment with esthetics maintenance. People believe that having white teeth is crucial for developing self-esteem and confidence; having teeth that are discolored negatively affects people's quality of life on the physical, mental, and social levels. A tooth can become discolored when its hue, color, or translucency changes. Age, environmental conditions, underlying diseases, or inherited factors may all contribute to tooth discolorations. The origin, presentation, location, severity, and adhesiveness to dental structure of tooth discoloration vary. It can be divided into intrinsic, extrinsic, and both categories.[1] When chromatogenic material is incorporated into dentin and enamel during odontogenesis or after eruption, intrinsic coloring results. Pre-eruptive discoloration may be brought on by high fluoride exposure, tetracycline use, hereditary developmental abnormalities, and damage to the developing tooth. The main reasons of intrinsic discoloration after tooth eruption include aging, pulp necrosis, and iatrogenic discoloration. Extrinsic stains are caused by coffee, tea, red wine, carrots, oranges, and tobacco.[1,2] The light-transmitting qualities of teeth are

impacted by dental wear, secondary dentin deposition brought on by age, pulp inflammation, and dentin sclerosis, which causes a gradual darkening of the teeth.[2] Due to their integration into the dental structure, intrinsic discolorations are concerning, whereas extrinsic discolorations are only superficially absorbed into the tooth surface. Many extrinsic stains are removed from teeth by scaling and polishing. Different bleaching treatments may be used to try to remove intrinsic stains and more tenacious extrinsic discoloration. External tooth whitening, also known as night guard vital bleaching or vital tooth whitening, and intracoronal tooth whitening, sometimes known as non-vital tooth whitening, are two ways to whiten teeth. Using bleach on the teeth is a common method for treating discoloration. By oxidizing the organic discoloration in the tooth, the bleaching treatment lightens the color of the teeth. It does this by restoring the tooth's natural color and tint while also effectively removing the stain with a bleaching chemical.[3] The underlying etiology of the discoloration affects the effectiveness and efficacy of tooth bleaching. The final treatment plan should incorporate the indication of the bleaching technique.[4] Teeth that have undergone endodontic treatment require to be bleached, as the shade of the teeth is affected, which raises the cost of treatment for patients by requiring more severe, expensive full crown treatments. With the access cavity sealed with temporary cement, the procedure involves leaving a bleaching substance (a sodium perborate mixture) in the pulpal space for a number of days.[5,6] The intrinsic bleaching process includes multiple components, including: determining the cause and source of the stain; evaluating the root canal treatment; coronal restoration investigation; clinical photography; removing the rubber dam; and preparing the access cavity for restorative filling materials and root-filling material; cleaning the cavity with sodium hypochlorite to lower surface tension; and removing the sealer and necrotic pulp tissue remnants.[7] In order to create the consistency of wet sand, sodium perborate must be combined with an inert liquid before being applied as a protective layer over the root filling substance. All tissues are examined when the rubber dam is removed, and the patient should be told of how the stain will respond to the treatment and how long it will take to see results.

METHODOLOGY

This study is based on a comprehensive literature search conducted on 19 October 2022, in the Medline and Cochrane databases, utilizing the medical topic headings (MeSH) and a combination of all available related terms, according to the database. To prevent missing any possible research, a manual search for publications was conducted through Google scholar, using the reference lists of the previously listed papers as a starting point. We looked for valuable information in papers that discussed the information about clinical indications, complications, and outcomes of internal bleaching. There were no restrictions on date, language, participant age, or type of publication.

DISCUSSION

Internal bleaching involves minimal chair time and tooth alteration and is a cost-effective dental technique that doesn't alter the tooth's size or position on the dental arch.[8] Before placing all ceramic restorations, an interior bleaching may occasionally be required. By allowing light to pass through it, it helps to preserve the original color of the tooth abutment, enhancing the aesthetic, physical, and social facets of people's quality of life.[8] Dental professionals should determine whether the tooth to be bleached has received proper endodontic treatment with an adequate obturation before performing internal bleaching, which is typically performed using the appropriate radiograph. Trauma can cause a tooth to become nonvital and lose its natural color without ever requiring endodontic treatment. In these situations, the first course of treatment should be a root canal. Intrinsic bleaching technique can be performed if the tooth has had endodontic treatment. Sodium perborate is considered to be easier to use and safer than concentrated peroxide.[9-11] As a result, it is considered to be the first choice for intrinsic bleaching in the majority of situations. As opposed to superficial enamel discolorations and poor enamel formation, which have been described as contraindications for internal bleaching due to the internal and external causes of the respective stains, pulp chamber origin discoloration is an indication for internal bleaching. Before applying the bleaching solution in the pulp chamber, it is crucial to cover the root-filling material with a protective dental layer with a minimum 2-mm thickness. Without this layer, bleaching agents could enter the apical foramen through the root filling and irritate the periapical area.[4,12] In situations of severe discoloration, some dentists believe that including 3% hydrogen peroxide to a paste of sodium perborate benefits, which may be attributed to the risk of root resorption being increased. By replacing the water in sodium perborate with higher quantities of hydrogen peroxide, a walking bleach paste is enhanced.[13,14] It is advised that a patient return 3–10 days after bleaching to review the results and, if required, replace or refresh the walking bleach.[7,15] Internal bleaching complications include external root resorption as well. In their clinical trial, Anderson et al provided an explanation for this.[16] According to Spasser et al study's the chemical makeup of sodium perborate varies depending on the medium.[5] While sodium perborate has stability when dry, it will change to sodium metaborate, hydrogen peroxide, or nascent oxygen when it comes into contact with water, acid, or warm air.[5] There are many types of sodium perborate, which include monohydrate, trihydrate, and tetrahydrate, according to Weiger et al.[17] These kinds of sodium perborates have a distinct oxygen concentration, which has an impact on how effectively they bleach.[17] Sometimes it's preferable to overbleach in connection with internal bleaching. The definition of "overbleaching" by Howell et al said that it was acceptable due to the anticipated return of discoloration.[18] The practitioner needs to be note that bleaching a tooth to make it appear lighter in comparison to an adjacent tooth is typically done carefully so the

overbleached teeth may not become discolored again. According to the Vachon et al study, carbamide peroxide can be utilized as an intrinsic bleaching agent.[19] Numerous studies have revealed that sodium perborate is superior to carbamide peroxide in terms of features.[20] Long-term success depends on the restoration of bleached teeth, but it's crucial to keep in mind that the peroxides left over from the bleaching treatments may weaken the bonding ability of composite restorative material to the tooth. When sodium perborate and water were combined, the binding strength was far less affected than when concentrated hydrogen peroxide was used.[21] The day of bleaching should be separated by a few days from the day of the last composite restoration. Before installing the final restoration, calcium hydroxide paste should be left in the pulpal space for many weeks. This altered the bleaching agents' acidic environment and stopped further resorption. Rotstein et al claimed that this procedure was needless and ineffective.[11] Inflammation-mediated external root resorption known as cervical root resorption can occur after trauma and after intracoronal bleaching.[22] Following intracoronal bleaching, 22 incidences of cervical root resorption were identified from a review of published case reports. The findings of four follow-up studies are reported. Four cases (7%) of external root resorption were noticed in 58 bleached (30% H_2O_2 and heated) pulpless teeth that were monitored for 1 to 8 years.[22] Cervical resorption was not observed in 95 additional teeth tested three years after treatment with the "walking bleach" technique (sodium perborate in water).[23] No signs of external resorption were discovered in a four-year follow-up of 250 teeth with significant tetracycline discoloration when sodium perborate in oxygen-water was the bleaching solution.[24] No extrinsic root resorption was detected in a similar investigation using 112 teeth bleached with a paste of sodium perborate in 30% hydrogen peroxide over a period of three to fifteen years.[25] According to findings from animal trials, a high concentration of hydrogen peroxide combined with heating seems to increase cervical root resorption.[22,26] Uncertainty surrounds the exact mechanism causing this impact, but it has been proposed that the bleaching agent enters the periodontal tissue via the dentinal tubules and causes an inflammatory response.[13,27-29] Additionally, it has been hypothesized that the peroxide diffuses into the dentinal tubules and denatures the dentin, causing it to change immunologically and be recognized as a foreign body.[30] The resorption was frequently discovered years after the bleaching.[22,30] The dentin was pierced by hydrogen peroxide put in the pulp chamber of extracted teeth in in vitro tests, and the penetration was accelerated by heat.[27,31] In vitro research has shown that teeth with cementum cervical abnormalities had higher levels of penetration.[27] Due to the fact that hydrogen peroxide also increased dentin permeability,[32] its effects may be amplified after repeated exposures. According to the relevant literature, using a thermo-catalytic bleaching treatment on teeth with cervical cementum defects increases the risk of cervical resorption. Additionally, efficacy studies have demonstrated that 30% hydrogen peroxide was not required to provide a satisfactory treatment result. After intracoronal whitening, tooth crown fractures have also been noted, most likely as a result of the significant removal of intracoronal dentin.[33] Additionally, internal bleaching with 30% peroxide has been shown to degrade the mechanical characteristics of the dentin and decrease the micro-hardness of the dentin and enamel.[34,35] Another internal bleaching issue was the coronal fracture, which is thought to have been brought on by desiccation or changes to the physicochemical properties of the dentin and enamel.[36]

The judgment of a bleaching treatment's aesthetic results is subjective, and the patient's and dental surgeon's assessments may diverge.[37] Additionally, it is challenging to compare research because different words and definitions of the results have been used.[22,23,37] The absence or minimal color difference between the treated and untreated teeth has traditionally been considered a sign of immediate treatment efficacy. The thermo-catalytic approach (Howell, 1980) or the traditional "walking bleach" procedure have both been reported to have more than 90% immediate success.[23,38] Assessing the internal bleaching's long-term aesthetic effects may benefit from looking at the failure rate. Yet, in the various long-term studies,[22,23,37,39] failure has not been defined; the implied definition is "tooth that need to be re-treated." A 7% failure rate was recorded after 5 years in a newer analysis, but the bulk of cases were deemed suitable for whitening (just the palatinal endodontic opening was filled).[37] Four out of 20 patients in a study of internally bleached, endodontically treated teeth with tetracycline stains that were monitored for three to fifteen years required re-treatment.[25] No study has yet offered a reliable indicator of how internal bleaching will turn out over the long term. Multiple fillings on a tooth don't seem to make good candidates for the operation.[37,38]

CONCLUSION

When done properly, whitening nonvital teeth is a reasonably low-risk procedure that can enhance the aesthetics of endodontically-treated teeth. The walking bleach technique can be a simple and practical procedure for patients and dentists, depending on the circumstances. Given the facts at hand, it is impossible to precisely calculate the risk of root resorption. However, it is apparent that oral stress promotes cervical resorptions and that this effect is likely more significant than the use of whitening agents. Resorption danger can be reduced with adequate cervical sealing and avoidance of the thermocatalytic technique. In order to reduce the penetration of hydrogen into the periodontal area, further development of the standard bleaching methods by including radical scavengers like thiocarbamide or employing sodium percarbonate is intriguing. It is undoubtedly necessary to conduct further research on the variables that contribute to the return of discoloration following bleaching.

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