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"Vital and Non Vital Bleaching- A Conservative Viable Approach in Aesthetic Dentistry"

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ABSTRACT

Discoloration of teeth is a common aesthetic problem that can greatly affect the appearance and self-confidence of the patient and reason to seek dental treatment. Although numerous treatment options like direct and indirect veneering, full coverage crown exist, bleaching of such teeth is a minimally invasive and aesthetically pleasing solution. The effectiveness and reliability of bleaching in such cases arise from accurate diagnosis, comprehensive treatment planning, and the implementation of suitable techniques. The present article deals with case reports of vital as well as non-vital bleaching cases and discusses the aetiology of discoloration, delves into the theory, safety, and available bleaching methods by reviewing relevant literature and clinically applying it in the reported cases.

KEYWORDS: vital bleaching, non-vital bleaching, tooth discoloration, Hydrogen Peroxide, Sodium Perborate, Walking bleaching

I. INTRODUCTION

There are several different materials and techniques for bleaching of vital and non-vitalteeth, each with their own mechanism of action. Their selection is dependent upon the particular tooth discoloration that is being treated. Causes of tooth discoloration can be categorized into two main groups: intrinsic and extrinsic staining.[1] Intrinsic staining, sometimes called internal staining, can be attributed to factors such as genetics, age (from enamel wear over time exposing yellower dentin), intake of antibiotics, high levels of fluoride during tooth development as well as developmental disorders like amelogenesis imperfecta, dentinogenesis imperfecta, hereditary enamel hypoplasia etc. Localized intrinsic staining includes discolorations due to some dental restorations like amalgam, MTA and use of minocycline in TAP for canal disinfection. Extrinsic staining or external staining, is largely due to environmental factors including smoking, certain beverages and foods, mouthwashes, syrups etc. Coloured compounds from these sources are adsorbed into acquired dental pellicle or directly onto the surface of the tooth causing a stain to appear.[2-3]

Tooth stains consist of compounds called chromogens that have darker shades and are accumulated in the tooth (intrinsic) or on the tooth (extrinsic). Chromogens fall into two categories: large organic compounds that have conjugated double bonds in their chemical structure and metal containing compounds. Tooth whitening is any process that lightens the colour of a tooth accomplished by physical removal of the stain or a chemical reaction to lighten the tooth colour. Bleaching is defined as the chemical degradation of the chromogens to attain the natural tooth colour.

The active ingredient in most whitening products is hydrogen peroxide (H_2O_2) which is delivered as plain active hydrogen peroxide (3-35%) or stable source of H_2O_2 as carbamide peroxide (10-35%). Carbamide peroxide is a stable complex ($CH_6N_2O_3$) that breaks down in contact with water to release hydrogen peroxide. Because carbamide peroxide releases hydrogen peroxide the chemistry of most tooth whitening is that of

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hydrogen peroxide. Bleaching of the organic compounds by hydrogen peroxide involves reacting with the double bonds to oxidize the double bond. This causes the chromogen to become a lighter colored compound.[4] Bleaching of the discoloration due to metallic compounds is much more difficult; so better esthetic options may be direct or indirect veneers or full coverage crowns.

II. CASE REPORT 1 (VITAL BLEACHING) –

A 28-year-old male patient reported to the Department of Conservative Dentistry and Endodontics with the chief complaint of tooth discoloration. On clinical examination, there was mild discoloration in anterior teeth. Patient had good oral hygiene with no caries, good periodontal health with no gingival recession. There was no history of tooth sensitivity. Patient was conscious about the mild discoloration and wanted tooth whitening. Vital tooth bleaching procedure utilizing whiteness HP Maxx was planned and patient was explained accordingly.

Treatment procedure

Pre-operative photographs were taken with the shade guide to ascertain the pre bleaching shade. The patient's initial shade was 3M1, which was verified by Vita 3D Shade guide(Vita Toothguide 3D Master).

The teeth were cleaned with pumice slurry. Isolation was done with Top dam-light-curing gingival protector (FGM), which was cured for 20-30 seconds. The kit contained the peroxide phase and the thickener phase. The Peroxide phase was mixed with the Thickener phase in a proportion of 3 drops peroxide to 1 drop thickener for one tooth application. The process involved covering the vestibular surface of teeth with a gel layer between 0.5 mm and 1 mm thickness. The gel was applied to teeth using a brush or micro-applicator to remove oxygen bubbles. The gel was washed away and another layer of the gel was applied. This process was repeated twice for each gel application. During this procedure, the gel remained on the teeth surface for 15 minutes both the times. After treatment, the gel was cleaned, teeth were thoroughly washed, and the gingival protector was removed. Desensitizing paste {Desensibilize KF 2% (FGM)} was applied for 10 minutes, followed by polishing of the teeth. The tooth shade was checked again and post bleaching photographs were taken. Using standard visual examination and confirmation with Vita toothguide 3D master, a noticeable shade change occurred. The shade achieved was 2M1 and patient was pleased with the final outcome, indicating a significant improvement in his smile. The patient was recalled after 2 weeks and the shade was checked again to see any reversal in the achieved results. There was no change in the shade achieved with the in-office bleaching technique.

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Figures of vital bleaching – A, Initial preoperative shade 3M1; B, Application of FGM Top Dam; C, Application of Whiteness HP Maxx according to manufacturer's instruction; D, Polishing with polishing paste; E, Significant changes in the shade of teeth seen Postoperatively; F, Postoperative shade 2M1 according to Vita tooth guide 3D master

III. CASE REPORT 2 (NON-VITAL BLEACHING) –

A 26-year-old female patient reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of discoloured upper left anterior tooth. Patient had a history of trauma 10 years back in the front teeth region. There was no fracture of any toothbut the tooth discoloured over time. There was no history of any sensitivity, swelling or pus discharge till date. Intraoral examination revealed brownish discoloured maxillary left central incisor. There was no sinus/fistula in relation to 21. The tooth's vitality was tested using an electric pulp tester and the tooth was non vital. An intraoral radiograph showed mild periapical radiolucency with 21.Root canal treatment followed by non-vital bleaching utilizing walking bleach was planned for the patient. The patient was explained about the treatment plan and consent was taken.

Treatment Procedure

Access opening was done followed by determination of working length and cleaning and shaping was performed using protaper gold. The canal was prepared upto F3 along with constant irrigation using sodium hypochlorite and normal saline. Closed Calcium hydroxide dressing was placed in the canal and patient was recalled after 1 week. After 1 week, since patient was

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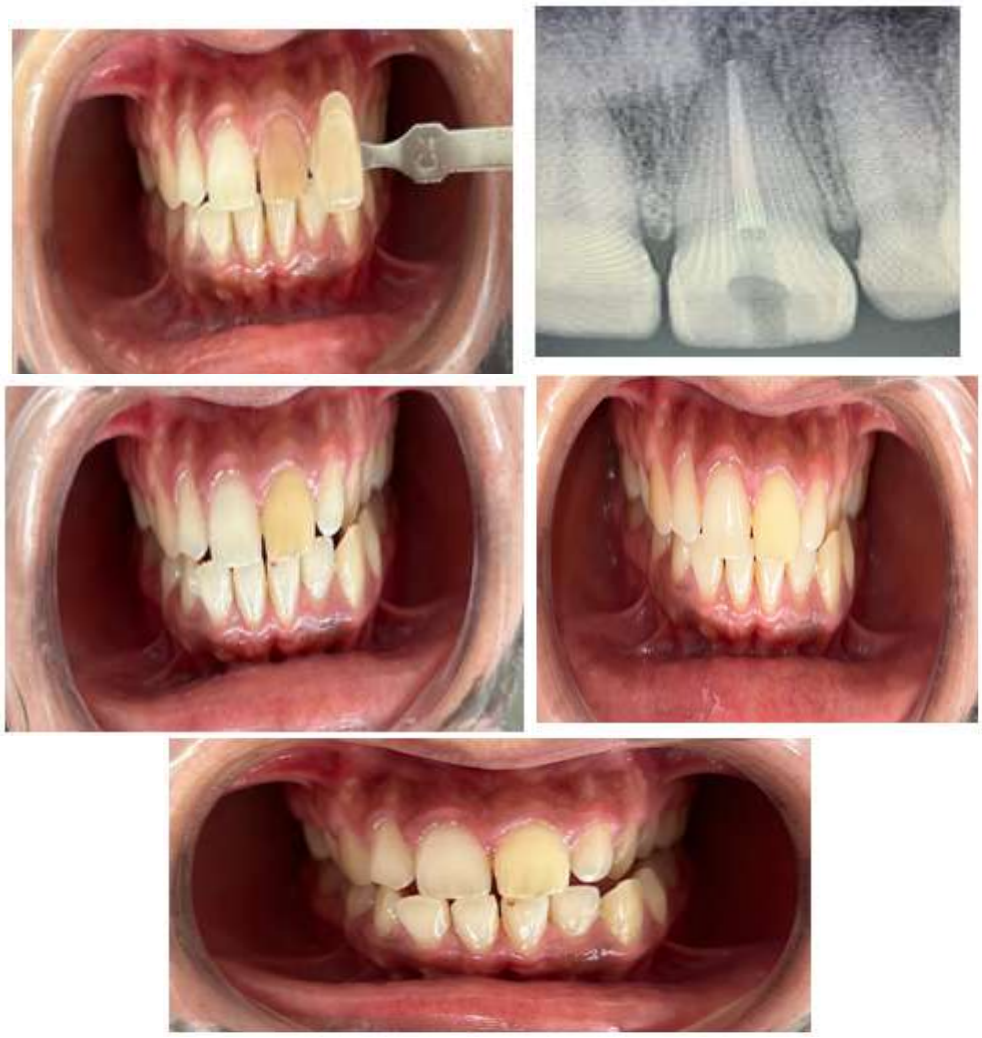
asymptomatic and the canal was clean and dry, root canal obturation was done using lateral compaction technique with master cone F3 and zinc oxide eugenol sealer. Patient was recalled after 1 week for the bleaching procedure.

Pre bleaching photograph of the tooth with Vitapan classical shade guide was taken under normal daylight. The shade was darker than the darkest shade available in the shade guide which was C4. The pulp chamber was re-accessed, cleaned by removing 2 mm of gutta-percha cervical to the orifice. Glass ionomer cement (GIC) in thickness of 2 mm was placed over the gutta-percha, conforming to the cervical line to create a mechanical barrier between the sealed root canal and bleaching agent to be used in pulp chamber.[7]Nonvital bleaching using a solution of 3% hydrogen peroxide and sodium perborate [sodium perborate and 3% H2O2 in a 2:1 (gm/mL) ratio] was mixed and placed in the pulp chamber and sealed with glass ionomer cement. In order to get the intended outcomes, the patient was recalled back after a week to evaluate the effect of bleaching. The shade was lighter than the preoperative shade. The bleaching procedure was repeated in the similar manner and patient was recalled again till the desired shade was achieved. Before proceeding ahead, in each visit, the result was clinically evaluated comparing the teeth shade with the previous one using Vitapan classical Shade guide and photographs taken. After 3 visits, the shade of the teeth got lightened to a superior esthetic shade with accepted clinical success.



Figures of non vital bleaching – A, Initial preoperative shade wrt 21 is C4; B, radiograph showing 2-3 mm of gutta percha below CEJ level; C, results after 1st sitting, notice the significant change in tooth color; D, results after 2nd sitting; E, Significant changes in the shade of tooth seen after final sitting. Patient was satisfied with the result and did not want any further treatment.

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IV. DISCUSSION

Bleaching is the process of lightening tooth discolorations by oxidizing the dark pigments (chromogens) by a strong oxidizing agent, such as hydrogen peroxide, which breaks the bonds in chromogens, converting them into smaller lighter-coloured compounds. In-office bleaching method uses a light source and 35% hydrogen peroxide for extrinsic stains.[5] To achieve a desired colour change, the patient must be exposed to the peroxide application for 15 to 20 minutes each session. Since H_2O_2 35% is caustic and may cause burn in the surrounding soft tissue, itrequires proper mucosal tissue isolation and protection.So, a proper gingival barrier should be placed preferably with rubber dam isolation. NSAID can be prescribed before the bleaching procedure by dentists to prevent any post bleaching sensitivity caused byinflammation of the pulp with 35% hydrogen peroxide.

Trauma-induced internal pulp bleeding that spreads blood components into dentinal tubules might result in tooth discolouration. Products of degradation of blood i.e haemosiderin, haemin, haematin, and haematoidin are compounds that release iron during haemolysis. This iron is then transformed into black ferric sulfide with hydrogen sulfide generated by bacteria, which discolours the tooth.[6]

The composition of FGM Whiteness HP Maxx used in present Vital Bleaching procedurecontains 35% hydrogen peroxide, which significantly contributes to whitening process within an hour. It exhibits a two-phase presentation (peroxide phase and thickener phase to be used in a ratio of 3:1). The product also has the characteristics of a heat blocker. This reduces the potential for sensitivity that may arise through the acceleration of sources by heat. It also contains an enzymatic solution (Neutralizer) that is used in the event of unintentional exposure of peroxide to the patient's mucosa. In accordance with the manufacturers' instructions, products were applied in 2-3 mm thickness on the labial surfaces of the teeth to optimise the efficacy of the bleaching procedure. The bleaching process was activated by a bleaching light source. Patient experienced significant reduction in the teeth shade upto his expectations with no post operative sensitivity.

Numerous factors are known to increase sensitivity, including high H_2O_2 concentrations, high enamel permeability, prolonged bleaching agent use, heat generated during accelerator LED light application, and structural morphological differences between enamel and dentin with pores that allow bleaching agents to infiltrate.[5] Due to sensitivity concerns, several manufacturers have introduced bleaching gels with reduced H_2O_2 and desensitizing agent concentrations to reduce the negative effects of peroxide radicals. However, few special scenarios like patients with exposed dentinal tubules, pregnant women, children under 10 years of age, and patients with extreme sensitivity to the same teeth are the main contraindications to the bleaching procedure.

He bang et al in 2021 conducted a meta-analysis to evaluate the influence of light on bleaching efficacy and tooth sensitivity during in-office vital bleaching.The study revealed that light increases the risk of tooth sensitivity during in-office bleaching and light may not improve the bleaching effect when high concentrations of HP (25-35%) are employed. Thereby concluding that dentists should use the light-activated system with great caution or avoid its use altogether.

Nonvital teeth bleaching have been achieved using the thermocatalytic approach because heat accelerates the bleaching procedure and enhances the bleaching characteristics of hydrogen peroxide. Walking bleach is the process of in office non vital bleaching where in the bleaching agent (sodium perborate and hydrogen peroxide) is packed and sealed directly into the pulp chamber after creating an apical barrier to avoid leakage of nascent oxygen into the periapex causing emphysema. The patient is recalled at weekly intervals and bleaching agent is replenished till the desired result is achieved.

Non-vital teeth whitening carries a number of risks, including hydrogen peroxide penetration into the dentinal tubules, alterations in dentin permeability and structure, overall deterioration of the physical characteristics of dental hard tissues, dental fractures during treatment, excessive bleaching, relapse risk, and the most severe external cervical root resorption. Cervical resorption is one of the complications that may occur after bleaching treatment of nonvital teeth if proper care is not taken to create an apical barrier conforming to the cervical line.[8-9,11-15]

This present non vital bleaching case report demonstrates how well the walking bleach method of nonvital bleaching produces a successful and consistent cosmetic result. Therefore, compared to prosthetic treatments, the walking bleaching approach can be employed as the preferred treatment for bleaching discoloured nonvital endodontically treated teeth. It is a very effective, less intrusive way to get the required outcomes quickly and effortlessly.

V. CONCLUSION

Case selection and patient compliance was the key to success in this treatment. Regular clinical evaluation helped us to depict the pronounced difference in the pre and post treatment results. The present case studies suggest vital and nonvital bleaching therapy to be a successful treatment alternative to the prosthetic treatment.

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