

Twinkling stars: Literature review on dental whitening in children

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ABSTRACT

An attractive smile plays a major role in the overall perception of physical attractiveness. This public demand for whiter smile and improved esthetics has made tooth whitening popular. Consequently parents and news media request information on dental whitening for children and adolescent. This review takes into account about the different methods available in market for tooth whitening, health implications of using these procedures in younger age group with emphasis on safety and efficiency of the agents used.

Introduction

Esthetic problems in childhood and adolescence can have a significant effect on psychosocial development and interaction with peers.[1] In a 2004 study, 32% of group of 2495 children were dissatisfied with their tooth color, 19% of parents were dissatisfied with their child's tooth color.[2] Children as well as their parents become worried as esthetics is impaired and demand for non invasive procedure to improve the tooth color. The trend for non invasive dental treatment have led to development of different material and whitening technique that are capable of reestablishing patient's smile.[3] Most reports involve adult population, while little controlled research has been conducted and / or reported in younger population.[4]

History

In 1966 Schneider et al [5] documented the use of peroxide gingival strip to healing periodontal tissue. Tooth whitening was later observed as an unintentional side effect. In the late 1960's Klusmier noticed whitening effect when using gly-oxide in orthodontic positioners.[6]

In 1989, Heyman and Haywood [7] introduced night guard vital bleaching. In 1989 Fischer created opalescence carbamide peroxide. This whitening gel formulation is still the basis for most night-time gels in use today and was the first ADA approved system of whitening.[8] The first description of walking bleach technique with mixture of sodium perborate and distilled water was mentioned in a congress report by Marsh and published by Salvas.[9]

Bleaching in Children and Adolescents

Generally patients are candidates for bleaching when they are 10 years old or older, as that is when permanent teeth erupt. However if a young person has a problem with discoloration it is better to bleach the teeth than wait and have them deal with embarrassment of discoloration. Although teeth bleaching have been performed in children as young as age four, it is rarely done in children younger than six.[10] The only indication for primary tooth bleaching is trauma darkening without pathology.[11] Dony KJ et al reported 48 teens in age group of 13-17 years where bleaching was done with success.[12] Sodium perborate is found to be successful in whitening primary teeth and can be recommended as a safe alternative for the bleaching of devital primary teeth with intrinsic discoloration.[13]. Nagaveni NB has successfully bleached non vital tooth in a 12 years old girl using walking bleach method.[3] Sharma DS et al have also presented two successful cases of intra coronal bleaching in children.[14] Brantley DH et al have reported a 4 year old girl with discolored primary anterior teeth. The case was bleached with 10% carbamide peroxide with good results.[11]

Psychological Aspects Associated with Dental Esthetics

The odd attracts society in odd manner, as is the case when a patient with discolored teeth smiles. Because of that pediatric patients have psychological impact.[14] The effect of a smile is so significant that advertising experts refer to this phenomenon as smile power.[15] A negative self image due to discolored tooth or teeth can have serious consequences on adolescents and could be considered as an appropriate indication for bleaching.[16] Brantley reported a 4 year

old child with tooth discolouration. The child reported that other children and adults were now commenting about her dark teeth. Before pursuing whitening treatment, parents should be made aware that their child (especially teenagers) may expect an unrealistically fast occurring and whiter shade change.[10]

Causes of Tooth Discolouration

Trauma or infection of primary tooth may cause discolouration of related permanent tooth. Chronic ingestion of fluoride during childhood or treatment with tetracycline can cause intrinsic staining. Tooth discolouration has also been reported when minocycline was used as an intracanal medicament in immature permanent incisor.[17]

Science Behind Tooth Whitening

Bleaching agents produce oxidizers as part of chemical reaction and these are able to diffuse along a gradient within enamel micropores, gaining direct access to the underlying dentine. Oxidizers cleave double bonds with pigmented molecules which result in their breakdown and diffusion into external environment.[18] Enamel permeability in children's teeth is more, hence they are easier to bleach than adult teeth.[10]

Pre Treatment Assessment and Planning

In 2004, The American Academy of Pediatric Dentistry (AAPD) [10] adopted a policy on dental bleaching for children and adolescents. The AAPD encourages the judicious use of bleaching for these patients and discourages full arch bleaching for the patient in mixed dentition.

The pretreatment professional assessment helps to identify pulp pathology that may be associated with single tooth. This examination also identifies restorations that are faulty and could be affected by bleaching.[16] Pediatric literature has indicated that post concussion 72% of primary teeth failed to develop any radiographic and/or clinical evidence of pathosis but remained asymptomatic and no treatment was required. Hence bleaching can be done in absence of any clinical signs or symptom. Significant tooth yellowing and white spots on anterior teeth are an indication of bleaching in children.[4] Primary teeth with intrinsic discolouration may be treated by facings and abrasion. However, dental bleaching may offer a safer alternative that can be completed with less chair time without harming dental structures.[13] One should avoid bleaching in children with apparent caries, orthodontic appliances, and anterior restorations.[4]

Bleaching Material and Technique Applied

Dental whitening may be accomplished by using either professional or at home bleaching.[16] So far, there is no commonly accepted or agreed upon approach for children tooth whitening. It is imperative to establish proper approach for maximum benefit and minimum side effect. One of the suggested approaches is that tooth bleaching should be done only under strict supervision of the dentist and

parent.[10] Compliance problem in younger children discourages at home whitening.[11] Informed consent should be obtained and a signed document should be kept on file. Each patient health history should be carefully evaluated and possible risk and benefits should be discussed with parents or guardians. Lower concentration of carbamide peroxide should be used and treatment should be frequently repeated.[10]

Brantley DH [11] used Night guard technique for bleaching primary teeth. He used 10% carbamide peroxide. A non scalloped, no reservoir, bleaching tray fabricated from a soft thermoplastic material was used. Walkman bleach has been successfully carried in children.[14,3] Ten percent H_2O_2 gel tray system and 6.5% H_2O_2 gel whitening strips have also be tried in teenagers as bleaching agent.[4]

Efficacy of Bleaching in Children

Vital guard night whitening using 10% carbamide peroxide has been the most extensively researched method for tooth whitening. It has been shown to be effective for lightening primary teeth discolored by trauma.[1] Among teenagers 10% H_2O_2 gel tray system and 6.5% H_2O_2 gel whitening strips have been found to be equally effective.

Fluoride Treatment After Bleaching

Neutral sodium fluoride solution can be applied to the tooth or teeth after completion of a whitening regimen to encourage remineralisation without any side effects.

Bleaching Relapse

To prolong bleaching effects, a whitening tooth paste can be used. This can help sustain improvement and slow the reversion back to its original shade especially for children who eat dye-laden candy. Even colas and fruit sodas can restrain newly lightened teeth in children.[10]

Maintenance and Storage

Children's whitening trays can be cleaned with cold water and a soft tooth brush using the manufacturer's suggested mild soap solution, diluted mouth rinse or a tooth paste. After it is dried, it should be stored in a sturdy container to avoid distortion and contamination.[12]

Children's Whitening and Safety Issues[10]

Recommendations for children whitening safety are based on human research finding from studies utilizing adults. Few studies on minor study subjects (especially those with primary teeth) have been performed partially due to ethical reasons. No studies state that tooth bleaching is unquestionably safe for children. Those that recommend it is "considered safe" haven't performed any direct measurement of systemic effects. Currently while there are dentists dispensed and in office tooth whiteners that have received ADA seal of acceptance, their safety and effectiveness data were collected from adults.

Primary teeth have thinner enamel and relatively larger pulps than permanent teeth; increased sensitivity to peroxide is expected in theory. This however doesn't appear to be consistent with limited clinical finding. Larger pulp can recover from insult more rapidly because apex is also large.[20]

Acute cytotoxic effects appear at doses over 5g/Kg/day for a product containing 10% carbamide peroxide. This corresponds to 0.3 to 1.8 mg/kg /body weight/ day H₂O₂. Donly KJ found in his study that 10% H₂O₂ polyethene strips and tray delivered 10% carbamide peroxide are safe to be used in teenagers.[19]

Side Effects

The most common side effect of bleaching vital teeth is sensitivity and tissue irritation.[16] Bleaching agents can decrease microhardness within sound enamel and both sound and demineralized dentine.[18] One adolescent who improperly used whiteners did suffer permanent enamel disintegration and pitting. Walkman bleach in children and adolescent have been performed in children and adolescent with 81% radiological success.[21]

Effect of Tooth Bleaching on Tooth Restorations [22]

Bleaching may increase the solubility of glass-ionomer and other cements and reduce the bond strength between enamel and resin-based fillings in the first 24 hours, but not later. Following bleaching, H₂O₂ residues in the enamel may inhibit the polymerisation of resin-based materials and reduce bond strength. Thus tooth-bleaching agents should not be used [for 24 hours] prior to treatment with resin-based materials.

Areas of Further Research

More research is needed to definitely establish appropriate use and limitation of use and to investigate toxic implications related to repeated use and dosage in children.[10]

Conclusion

Tooth discolouration results in cosmetic impairment in children. It is the pediatric dentist responsibility to supervise those children who seek to undergo a whitening treatment to ensure maximum cosmetic benefit within the boundaries of oral and systematic health.[3] Informed consent must be obtained.

Much more research is needed on the local and systemic actions and the results of hydrogen and carbamide peroxide in children's tooth bleaching products. Determining the duration and concentration regimen more appropriate for children based on age and dentition type is in the best interest of dentistry.[10]

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