A Review: Internal Bleaching of Non-Vital Teeth  
By Bobby Baig

Introduction:

1. In recent years, tooth discolouration has become a common esthetic complaint. A growing number of patients request dental treatment for tooth whitening procedures.
2. Intracoronar bleaching is a conservative alternative to the more invasive esthetic treatment of non-vital discoloured teeth. Careful examination is necessary, since the method requires healthy periodontal tissues and a root canal that is properly obturated to prevent the bleaching agent from reaching the periapical tissues.
3. Bleaching action is described as an oxi-reduction reaction between the whitening agent and the darkened substrate.
4. A combination of sodium perborate and water or hydrogen peroxide has been used in the “walking bleach” technique.

Walking Bleach technique:

1. The medicament is placed in the pulp chamber, sealed, left for 3-7 days, and is thereafter replaced regularly until acceptable lightening is achieved. If the tooth has not responded satisfactorily after 2-3 treatments,
2. Access to the pulp chamber is gained by removal of the coronal restoration and the coronal part of the root filling. The remaining root filling is sealed off with glass-ionomer cement.
3. The bleaching agent, usually 10% carbamide peroxide, intracoronally at regular intervals and covers the lingual aspect of the tooth with a plastic splint.
4. In this method, the pulp chamber is left unsealed during the weeks of treatment.
5. One of the most important properties of a bleaching material is its ability to allow penetration of the bleaching agent into the dentinal tubules and reach the discolored molecule.
6. The deeper the penetration, the more that causes chromatic alteration of the dental tissues can be reversed by the oxidation reaction.
7. The important property of a bleaching agent is its ability to affect the dentinal permeability but increase in permeability also leads to increased external resorption.
8. The ”walking bleach” technique can be supplemented with an in-office bleaching procedure. The treatment may continue until an acceptable result is obtained.
Non-vital bleaching agents:

Sodium Perborate Paste:

1. Improved esthetic results when prepared with either hydrogen peroxide of distill water as the liquid vehicle. When mixed with hydrogen peroxide concentration 3-35% it has been reported to produce improved results in tooth bleaching. (Carrasco et al. 2003).
2. Less potential to harm dentinal tissues and root resorption when used with water based paste.
3. Different types of sodium perborate (mono-tri or tetra-hydrated) may be with similar results.

Carbamide Peroxide:

1. 10% carbamide peroxide gel has been used for internal bleaching of non-vital teeth simultaneously with external bleaching.
2. Similar performance to sodium perborate for internal bleaching. (Vachon et al 1998).
3. 37% provides highest increase in dentinal permeability as compared to 27% concentration.
4. Carbamide peroxide also yields urea (Budavari et al., 1989) that theoretically can be further decomposed to carbon dioxide and ammonia. It is unclear, however, how much ammonia is formed during tooth bleaching with carbamide peroxide.

Esthetic Result and Long Term Success:

1. The failure rate is "teeth that need to be re-treated". The need for re-treatment increased with the observation time,
   1) 10% after 1 to 2 years (Friedman et al., 1988),
   2) 20-25% after 3 to 5 years (Brown, 1965; Holmstrup et al., 1988),
   3) 40% failure in teeth observed up to 8 years (Friedman et al., 1988).
   4) In a more recent study, a 7% failure rate was reported after 5 years.

Advantages of Non vital Bleaching:

1. There is no significant difference in the success rate achieved between anterior non-vital teeth with and without crowns. Thus, supporting this view that endodontically treated anterior teeth do not require crowns.
2. (Trabert et al.) Also concluded no appreciable difference in the resistance to fracture between untreated anterior teeth and endodontically treated anterior teeth.
3. Further despite small proximal restorations, most pulp less anterior teeth with sound coronal tooth structure can be conservatively restored with the lingual composite restoration.
4. Interestingly, there was no advantage in reinforcement by cementing posts in endodontically treated anterior teeth.
5. In contrast placement of a dowel and crown in such a tooth is likely to weaken rather than strengthening it. For instance, intact endodontically treated anterior teeth with natural crowns demonstrate greater strength against fracture than teeth built-up with pin retained amalgam cores or cast gold dowel cores. Further central incisors were three times more resistant to fracture than the teeth, which were restored with dowel core and crowns.

Adverse Effects:

1. Tooth crown fracture has also been observed after intracoronar bleaching most probably due to extensive removal of the intracoronar dentin. In addition, intracoronar bleaching with 30% hydrogen peroxide has been found to reduce the micro-hardness of dentin and enamel and weaken the mechanical properties of the dentin.
2. Cervical root resorption:


<table>
<thead>
<tr>
<th>Type of Study</th>
<th>Bleaching Procedure</th>
<th>Observation Time</th>
<th>No. of Patients</th>
<th>No. of Teeth</th>
<th>Trauma</th>
<th>Cervical Resorption</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case report</td>
<td>WB</td>
<td>2 teeth</td>
<td>2 teeth</td>
<td>2 teeth</td>
<td>all teeth</td>
<td>Latcham, 1986, 1991</td>
<td></td>
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<tr>
<td>Case report</td>
<td>WB</td>
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<td>1 tooth</td>
<td>1 tooth</td>
<td>all teeth</td>
<td>Goon et al., 1986</td>
<td></td>
</tr>
<tr>
<td>Case report</td>
<td>WB+TC</td>
<td>18 teeth</td>
<td>15 teeth</td>
<td>15 teeth</td>
<td>all teeth</td>
<td>Harrington and Nafkin, 1979; Lado et al., 1983; Creek and Lindvall, 1985; Gimlin and Schindler, 1990; Al-Nashan, 1991</td>
<td></td>
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<tr>
<td>Follow-up</td>
<td>WB</td>
<td>3-15 yrs</td>
<td>20</td>
<td>112</td>
<td>No</td>
<td>0%</td>
<td>Abou-Rass, 1998</td>
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<tr>
<td>Follow-up</td>
<td>WB</td>
<td>4 yrs</td>
<td>31</td>
<td>248</td>
<td>No</td>
<td>0%</td>
<td>Anitua et al., 1990</td>
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<tr>
<td>Follow-up</td>
<td>WB</td>
<td>3 yrs</td>
<td>86</td>
<td>95</td>
<td>96%</td>
<td>0%</td>
<td>Holmstrup et al., 1988</td>
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<tr>
<td>Follow-up</td>
<td>WB, TC, WB+TC</td>
<td>1-8 yrs</td>
<td>46</td>
<td>58</td>
<td>38%</td>
<td>6.9%</td>
<td>Friedman et al., 1988</td>
</tr>
</tbody>
</table>

a. WB = “walking bleach” technique with H$_2$O$_2$.
b. WB = “walking bleach” technique with NaBO$_3$ + 30% H$_2$O$_2$.
c. WB+TC = “walking bleach” technique (NaBO$_3$ + 30% H$_2$O$_2$) combined with thermo catalytic treatment.
d. Tetracycline-discolored, intentionally endodontically treated teeth.
e. WB = “walking bleach” technique with NaBO$_3$ + 30% H$_2$O$_2$ replaced once a week.
f. WB = “walking bleach” technique with NaBO$_3$ + oxygen-water (conc. not given).
g. WB = “walking bleach” technique with NaBO$_3$ replaced every 10-15 days.
h. WB = “walking bleach” technique with 30% H$_2$O$_2$ (cervical resorption, 5.0%); TC = thermo catalytic treatment with 30% H$_2$O$_2$ and heat (cervical resorption, 7.6%); WB+TC = combination of the two previously mentioned techniques (cervical resorption, 8.0%).
i. No history of trauma in teeth with cervical resorption.

**Case Report:** Non-vital tooth bleaching of a discolored tooth in a 24-year-old woman. The tooth 21 had been endodontically treated 3 yrs earlier due to trauma. A slight discoloration, which subsequently became more intense, was visible immediately after the endodontic treatment. And also patient has congenitally missing lateral incisors and ideal implant site space is created by orthodontic treatment. (A) Endodontic access for tooth # 21 with lingual arch wire (Lingual view). B) Tooth #21 with a dark brown discoloration, and patient with interim restorations. (C) The result after 3 wks of internal bleaching with sodium perborate suspended in water and a weekly change of bleaching agent. (D) Side view with Clinically acceptable shade and optical properties compared with tooth #23. Tooth # 12 and 22 are single implant restorations.

(By Dr. Bobby Baig and Dr. Caroline Inaba).
Patient Satisfaction:
High level of patient satisfaction after non-vital tooth bleach treatment strongly supports this treatment modality to be a conservative treatment alternative for traumatized discolored anterior tooth. (Gupta et al 2014).

Conclusion:
- Sodium perborate in water, sodium perborate in 3 and 30% hydrogen peroxide, and 10% carbamide peroxide were efficient for internal bleaching of non-vital teeth.
- Whenever non-vital tooth bleaching is performed, there is always a concern that relapse occurs and tooth discoloration returns.
- This was one of the factors perplexing to the patients as been told beforehand. Presently, no ideal protocol can be proposed to overcome tooth relapse of non-vital bleaching.
- High level of patient satisfaction after non-vital tooth bleach treatment strongly supports this treatment modality to be a conservative treatment alternative for discolored anterior tooth.

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Reference:
8. Effect of internal bleaching agents on dentinal permeability of non-vital teeth: quantitative assessment; Carrasco LD et al; Dental Traumatology 2003; 19: 85±89.