Evaluation of the effectiveness of the professional home whitening with the new ENA White 2.0

Analysis of results measured with spectrometer 6 months after treatment

Author: Dr Irene Franchi, Italy

Introduction

The ideal smile has always been considered as an expression of health and beauty. The Romans conscripted the tradition of having teeth that were white in colour and perfect in shape; Patrician women used to try to bleach their teeth by rubbing them with tissues soaked in urea-based natural mixtures.

According to some recent statistics, about 50 per cent of the world population are not satisfied with the colour of their own teeth, and adopt all the possible methods to make them whiter and brighter, just like all advertising models suggest.

Table 1: Arithmetic mean of chroma, hue and value of the treated elements of the selected study group.

Discolouration is a very important aesthetic problem: extrinsic discolouration affects the external surface of the tooth and is of exogenous nature as it is caused by external agents (e.g. food, drinks, plaque, tartar, smoke, products with chlorhexidine) and can be easily eliminated by using a specific toothpaste and professional abrasive techniques.

Intrinsic discolouration is caused by a deposit of pigments in the organic or mineral structure of the tooth, accumulated during the development and/or the mineralisation of dental germs; specific products or appropriate techniques are required to solve them. From a chemical point of view, bleaching means the destruction of the chromophore groups in the organic and inorganic compounds.

Through a chemical reaction of oxide reduction, the bleaching agent can discolor a substratum

PATIENT N. 1

<table>
<thead>
<tr>
<th>Tooth Element</th>
<th>Before L</th>
<th>After L</th>
<th>6 m. later L</th>
<th>Before c</th>
<th>After c</th>
<th>6 m. later c</th>
<th>Before h</th>
<th>After h</th>
<th>6 m. later h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incisal third</td>
<td>66.66</td>
<td>66.84</td>
<td>66.88</td>
<td>71.51</td>
<td>70.02</td>
<td>70.07</td>
<td>76.01</td>
<td>75.54</td>
<td>75.54</td>
</tr>
<tr>
<td>Middle third</td>
<td>66.81</td>
<td>67.09</td>
<td>67.11</td>
<td>71.83</td>
<td>70.01</td>
<td>70.04</td>
<td>76.15</td>
<td>75.79</td>
<td>75.79</td>
</tr>
<tr>
<td>Cervical third</td>
<td>66.24</td>
<td>66.43</td>
<td>66.45</td>
<td>71.69</td>
<td>70.21</td>
<td>70.25</td>
<td>76.08</td>
<td>75.74</td>
<td>75.74</td>
</tr>
</tbody>
</table>

Table 1: Arithmetic mean of chroma, hue and value of the selected study group.
<table>
<thead>
<tr>
<th>Tooth Element</th>
<th>L before</th>
<th>L after</th>
<th>L 6 m. later c before</th>
<th>c after</th>
<th>c 6 m. later h before</th>
<th>h after</th>
<th>c 6 m. later</th>
</tr>
</thead>
<tbody>
<tr>
<td>11th Element</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>73,08</td>
<td>73,47</td>
<td>73,87</td>
<td>23,97</td>
<td>24,76</td>
<td>25,67</td>
<td>83,12</td>
</tr>
<tr>
<td>2016</td>
<td>73,08</td>
<td>73,47</td>
<td>73,87</td>
<td>23,97</td>
<td>24,76</td>
<td>25,67</td>
<td>83,12</td>
</tr>
<tr>
<td>2015</td>
<td>73,08</td>
<td>73,47</td>
<td>73,87</td>
<td>23,97</td>
<td>24,76</td>
<td>25,67</td>
<td>83,12</td>
</tr>
<tr>
<td>2014</td>
<td>73,08</td>
<td>73,47</td>
<td>73,87</td>
<td>23,97</td>
<td>24,76</td>
<td>25,67</td>
<td>83,12</td>
</tr>
<tr>
<td>2013</td>
<td>73,08</td>
<td>73,47</td>
<td>73,87</td>
<td>23,97</td>
<td>24,76</td>
<td>25,67</td>
<td>83,12</td>
</tr>
<tr>
<td>2012</td>
<td>73,08</td>
<td>73,47</td>
<td>73,87</td>
<td>23,97</td>
<td>24,76</td>
<td>25,67</td>
<td>83,12</td>
</tr>
<tr>
<td>2011</td>
<td>73,08</td>
<td>73,47</td>
<td>73,87</td>
<td>23,97</td>
<td>24,76</td>
<td>25,67</td>
<td>83,12</td>
</tr>
<tr>
<td>2010</td>
<td>73,08</td>
<td>73,47</td>
<td>73,87</td>
<td>23,97</td>
<td>24,76</td>
<td>25,67</td>
<td>83,12</td>
</tr>
<tr>
<td>2009</td>
<td>73,08</td>
<td>73,47</td>
<td>73,87</td>
<td>23,97</td>
<td>24,76</td>
<td>25,67</td>
<td>83,12</td>
</tr>
<tr>
<td>2008</td>
<td>73,08</td>
<td>73,47</td>
<td>73,87</td>
<td>23,97</td>
<td>24,76</td>
<td>25,67</td>
<td>83,12</td>
</tr>
<tr>
<td>2007</td>
<td>73,08</td>
<td>73,47</td>
<td>73,87</td>
<td>23,97</td>
<td>24,76</td>
<td>25,67</td>
<td>83,12</td>
</tr>
</tbody>
</table>

**Note:** The document contains data on dental measurements and comparisons over time, specifically focusing on the effectiveness of home whitening treatment over 6 months.
containing double conjugated links, aromatic systems and quinolonic systems.1, 3

Many bleaching products for outpatient or home bleaching that are currently on the market are based on hydrogen peroxide and carbamide peroxide at different concentrations.1, 4

For outpatient bleaching, the professional applies the mixture on the teeth to be treated, while for at home bleaching, a special resin tray is made to be worn by the patient with the product inside during the night.

The new bleaching product ENA White 2.0 (Micerium S.p.A., Italy; Fig. 2) is an innovation in this field as the bleaching product is not applied with a tray or in-office but supplied by a toothbrush with a dispenser.

The aim of this study is to verify the efficacy of the bleaching treatment ENA White 2.0 through spectrophotometer analysis, on a group of 10 patients 6 months after the clinical results, excluding possible side effects such as sensitivity.

Materials and methods

Eight patients who required the cosmetic treatment of outpatient bleaching were selected. The criteria to be included in the group of the study were: to be non-smokers, aged between 18 and 50 years old, not periodontally compromised and without any prosthetic element or aesthetic restoration on anterior teeth. Some pregnant women were excluded, as it is advisable to postpone treatment until after the birth as it is a cosmetic treatment, despite no side effects being documented for the foetus nor the mother.

Before starting the clinical bleaching session, all patients were submitted to an accurate treatment of oral hygiene and spectrophotometer analysis of the six frontal superior elements (from canine to canine).

For each dental element (from 1.3 to 2.3), the variables L (value), C (chroma) and h (hue) in the cervical, medium and incisal sections were observed (Fig. 1 and Table 1).

The three above-described parameters were observed before the treatment and after 6 months, with the aim of evaluating the maintenance of the colour.

All patients used the toothbrush twice a day: once in the morning and once in the evening. The patients were given instructions on how to use the device as follows:
- First remove the cap, unscrew the head of the brush from the dispenser and remove the seal at the base of the toothbrush.
- Then screw the head on the dispenser again, rotate the ring on the lower part anti-clockwise towards the direction ‘UP’ until the gel comes out.
- The first time you perform this operation, a couple of rotations of the ring are required as the tube that takes the gel to the bristles must be filled. (The patient must be informed that a rotation of a couple of marks is enough to make the right quantity of product come out.)
- The brushing must be performed with a horizontal movement, for about 30 seconds, avoiding the gums as much as possible; then rinse the toothbrush with water and brush again for another 30 seconds.
The patients were asked to evaluate the post-operative sensitivity, indicating its extent with a number (from 5, maximum intensity, to zero) immediately after the session and 10 days after (Table 2).

Discussion
At the end of the 1980s, some home bleaching techniques were conceived, with the use of customised or not-customised trays, adequately filled with hydrogen peroxide at a low rate, worn for some hours per day, or even all night long. The active ingredient had a concentration from 10 to 30 per cent and the time of contact (from a couple of hours to the whole night) varied accordingly.

The aesthetic result obtained is based on the variation of the colour; to define the colour from the psychosensorial point of view three parameters1-23 were used:

- Hue (h) is the base colour of the tooth, the most difficult parameter to identify, which comes from the dentine and is defined with four gradients: A (red-brown), B (orange-yellow), C (green-grey), and D (pink-grey).
- Chroma (c) represents the level of saturation, the pigmented portion of a shade. Vita Shade Guide has 4 levels of chroma: 1, 2, 3 and 4.
- Value (L) represents the level of brightness, it separates light and dark colours. Black is the minimum value, white is the maximum value.

Through the SpectroShade colorimeter, the value, hue and chroma of the upper frontal elements were measured; the main feature of this device is that it shows the value of the sample of the required shade guide, which is more similar to the colour of the examined tooth, thanks to a comparison of the delta E of the samples.

The delta E of the data is the square root of the sum of the squares of the colorimetric data of the obtained evaluation points:

$$\Delta E = \left( (L_{\text{fin}} - L_{\text{init}})^2 + (c_{\text{fin}} - c_{\text{init}})^2 + (h_{\text{fin}} - h_{\text{init}})^2 \right)^{1/2}$$

After the analysis of 10 clinical cases, it was shown that the value (L) of the treated elements increased, so that the dental element acquired a lighter aspect. Analysing the literature1-23, we can deduce that in order to have a visual perception of the difference of brightness between the two treated elements \(\Delta L\) must be at least identical or higher than 1.

The results obtained for the parameter of chroma (C) were excellent, with values that were lower than at the start of the study, meaning that a lower level of saturation was attained.

Six months after the end of the treatment, the analysis with the spectrophotometer was repeated and it was noticed that the studied parameters remained unvaried, without any significant change.

The excellent aesthetic result achieved with ENA White 2.0 bleaching is visually admirable and confirmed also by the analysis with the colorimeter.

The balance of chroma, hue and value was also maintained after 6 months.

Concerning post-operative progress, this study confirms what has been stated by the literature:17-22 sensitivity is particularly marked during the first hour after the treatment, but it disappears in 24 hours. After 3 days, only four people reported some problems of sensitivity (described as very bearable), which persisted in only one case even after 7 days. On the 10th day no problem was reported.

Conclusion
The new method with ENA White 2.0 allows excellent aesthetic results to be obtained with only 2 minutes a day of application of the bleaching product for about 20 to 30 days, a time period corresponding to less than 1/5 of the time necessary using the classic tray; the toothbrush with dispenser is easy to use, handy, it can be brought and used anywhere for 1 minute in the morning and 1 minute in the evening.

If the aesthetic result is not achieved at the end of this treatment, a second cycle can be performed without any negative effect on the dental structure.

The described treatment respects the EU regulation for the use of 6% hydrogen peroxide, clarifying that the bleaching kits can be directly delivered to the user by the dentist as a professional treatment after an accurate visit and evaluation of every single case.

The accelerator XS 151 is contained into the bleaching, it activates with brushing and allows the patient to use it easily and everywhere.

Editorial note: A complete list of references is available from the publisher.

Contact
Dr Irene Franchi is working as a dentist in Levizzano Rangone in Italy. She can be contacted at franchiirene@virgilio.it.