**Clinical evaluation of two novel self-directed bleaching agents for the treatment of teeth affected by fluorosis: In-vivo study**

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**Abstract:**

**Introduction:** The purpose of the present study was to compare the efficiency and efficacy of two dentist prescribed, patient administered at-home bleaching gels including Vivastyle Paint on from IvoclarVivadent containing 6% carbamide peroxide and Enamel White from Perfect Smile containing 6% hydrogen peroxide.

**Methodology:** The methodologies used to evaluate efficiency and efficacy of these products included use of Vitapan Shade Guide to determine the shade change, measuring teeth sensitivity by tactile and thermal methods, evaluating gingival conditions using Silness and Loe Gingival Index and comparing preoperative and post operative photographs.

**Results and Conclusion:** Considering the results both products are found to be effective with Enamel White Click and brush on pen containing 6% hydrogen peroxide more effective in bleaching as it contains higher concentration of hydrogen peroxide. However, the patient groups are too small to lead to a conclusive result.

**Keywords:** Bleaching, Fluorosis, Carbamide peroxide

**INTRODUCTION**

The present work was planned compare the efficiency and efficacy of two dentist prescribed, patient administered at-home bleaching gels including Vivastyle Paint on from IvoclarVivadent containing 6% carbamide peroxide and Enamel White from Perfect Smile containing 6% hydrogen peroxide.

The methodologies used to evaluate efficiency and efficacy of these products included use of Vitapan Shade Guide to determine the shade change, measuring teeth sensitivity by tactile and thermal methods, evaluating gingival conditions using Silness and Loe Gingival Index and comparing preoperative and post operative photographs.

Smile is a gateway to a good personality. Good smile with healthy, white teeth makes a person look more young, attractive and confident. Dental fluorosis is a form of enamel hypoplasia characterized by moderate to severe staining of the tooth surface.

Several treatment methods are available to improve the esthetic appearance of the dentition affected with fluorosis, which includes laminates or porcelain veneers, full coverage crowns, bonding, mechanical abrasion and chemical stain removal (bleaching).

The determination of which clinical procedure is best used to optimize tooth color depends on variables such as the nature and intensity of stain. Vital tooth bleaching refers to the clinical application of a chemical solution on the tooth surface in order to
achieve a lightening effect. Vital tooth bleaching is considered to be the treatment of choice if the patient has realistic expectations and the teeth are acceptably shaped, intact and moderately stained. One novel tooth bleaching approach\textsuperscript{17} includes a direct-to-consumer bleaching gel/varnish using a paint-on delivery. The paint-on polish application is reported to offer some specific advantages over other delivery systems, particularly in the area of convenience. After application, this gel is reported to dissolve over time in saliva without any tray or other external barrier. The advantages of paint on delivery systems are more convenience, more predictable results, lesser gingival irritation, no tray fabrication, less time consuming and less interfering with the daily routine schedule of the patient\textsuperscript{18}.

**MATERIALS AND METHODS**

The pursuit for better esthetics has led to introduction of many new bleaching systems with different peroxide concentrations, different consistencies and different formulations. This study was carried out to see the effect of two newly introduced self directed bleaching systems\textsuperscript{19,20} for removal of fluorosis stains which includes: VivaStyle Paint On from IvoclarVivadent and Enamel White – a click and brush on bleaching penPerfect Smile Corporation.

**METHODOLOGY:**

Twenty subjects were selected to take part in this clinical study. They were divided into two groups each with ten subjects. Group I patients received treatment using VivaStyle Paint On from IvoclarVivadent, while group II patients received treatment using Enamel White from Perfect Smile Corporation. Six maxillary anterior teeth with minor fluorosis stains were selected per patient. The six mandibular anterior teeth in each patient were used as a control group. The subjects selected had tooth shade darker or same as A3.

**Step by step application method for VivaStyle Paint On\textsuperscript{21}:**

1. Clean the teeth thoroughly using prophylaxis paste. Use dental floss to clean between the teeth. Rinse well.
2. Fill the dispensing cup up to the brim with VivaStyle Paint On. The dispensed amount is usually enough for treating maxillary anterior teeth.
3. Pull the lips up and to the side so that the teeth are clearly visible. Place a cheek retractor if deemed necessary for better retraction and convenience.
4. Use a soft absorbent paper towel to blot dry the maxillary anterior teeth.
5. Apply a thin even layer of VivaStyle Paint On to the front teeth with the brush. Paint along the sides of the teeth as well as along the gumline. Make sure that the varnish does not get on the gums.
6. Allow the varnish to dry for about 30 seconds. The varnish will exhibit matt white appearance. Once this is achieved, cheek retractor can be removed.
7. Subject is allowed to close the mouth. The varnish is left on the teeth for 20 minutes.
8. After 20 minutes, remove varnish by brushing teeth with a tooth brush without use of a toothpaste. Rinse thoroughly. Spit everything out – do not swallow.
9. Use VivaStyle Paint On daily without skipping a day until the treatment is finished. The varnish
may be applied once or twice a day, depending on how the treatment fits into the daily schedule and how fast the results are to be achieved. A new dispensing cup and brush should be used for every application.

**Step by step application method for ENAMEL WHITE bleaching pen**:

1. Clean the teeth thoroughly using prophylaxis paste. Use dental floss to clean proximally. Rinse well.
2. Pull the lips up and to the side so that the teeth are clearly visible. Place a cheek retractor if deemed necessary for better retraction and convenience.
3. Unlike VivaStyle Paint On, there is no need to dry the teeth because Enamel White is a water-based formula.
4. Click the Enamel White – click and brush on bleaching pen several times before the first use. Apply a thin layer of Enamel White on one tooth at a time using an up and down motion. Periodically, click the pen to extrude more gel.
5. The gel dries in seconds and forms an invisible shield on the surface of the teeth. Tiny bubbles will begin to appear in the film applied on the teeth. That means that the gel is working – do not wipe off.
6. Lips or tongue should not touch the teeth for about 15 seconds. Instruct patient to refrain from eating or drinking for about 30 minutes to allow Enamel White to work.
7. There is no need to brush Enamel White off, it slowly dissolves as it bleaches.
8. Use Enamel White bleaching pen daily without skipping during the treatment. The gel may be applied once or twice a day, depending on how the treatment fits into the daily schedule and how fast the results are to be achieved.

**OBSERVATIONS AND RESULTS**:

Among all the 20 subjects, not a single patient had dropped out from the study and all of them had followed the treatment regime strictly as per the instructions.

**RESULTS OF TOOTH SHADE CHANGE**: For shade assessment with the Vita Shade Guide, the shade guide was arranged in the value from lightest to darkest according to the following order: B1, A1, B2, D2, A2, C1, C2, D4, A3, D3, B3, A3.5, B4, C3, A4, C4 as recommended by the manufacturer.

| Table 1: |
|-----------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Vita Shade** | B1 | A1 | B2 | D2 | A2 | C1 | C2 | D4 | A3 | D3 | B3 | A3.5 | B4 | C3 | A4 | C4 |
| **Value order** | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12  | 13 | 14 | 15 | 16 |
Table 2: Vita shade change using VivaStyle Paint On bleaching varnish.
The following table shows the data of the subjects in respect to their initial tooth shade, final tooth shade, unit change (calculated by subtracting the value order of initial tooth shade score from final tooth shade score) and the number of applications needed to achieve effective bleaching.

<table>
<thead>
<tr>
<th>Subject Serial No</th>
<th>Initial shade</th>
<th>Final Shade</th>
<th>Unit Change</th>
<th>Number of applications needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>A3</td>
<td>B2</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>2.</td>
<td>B3</td>
<td>C1</td>
<td>5</td>
<td>16</td>
</tr>
<tr>
<td>3.</td>
<td>A3.5</td>
<td>C2</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>4.</td>
<td>D3</td>
<td>D3</td>
<td>0*</td>
<td>14</td>
</tr>
<tr>
<td>5.</td>
<td>A3</td>
<td>A2</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>6.</td>
<td>B4</td>
<td>C2</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>7.</td>
<td>D3</td>
<td>C2</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>8.</td>
<td>A3</td>
<td>B2</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>9.</td>
<td>B3</td>
<td>C2</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>10.</td>
<td>C3</td>
<td>D3</td>
<td>4</td>
<td>14</td>
</tr>
</tbody>
</table>

In this case negative change was also evident. This may be the result of subjective assessment of tooth colour. Mean Shade Change = 4.4 Vita tabs. Tooth shade comparisons were made at the initiation and the termination of the study. An average shade change of 4.4Vita tabs was observed.

Table 3: Vita shade change using Enamel White click and brush on bleaching pen.

<table>
<thead>
<tr>
<th>Subject Serial No</th>
<th>Initial shade</th>
<th>Final Shade</th>
<th>Unit Changes</th>
<th>Number of applications needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>B3</td>
<td>C1</td>
<td>5</td>
<td>16</td>
</tr>
<tr>
<td>2.</td>
<td>A3</td>
<td>A2</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>3.</td>
<td>D3</td>
<td>C1</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>4.</td>
<td>B4</td>
<td>D4</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>5.</td>
<td>A3.5</td>
<td>C2</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>6.</td>
<td>B4</td>
<td>C2</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>7.</td>
<td>B4</td>
<td>D4</td>
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</tr>
<tr>
<td>9.</td>
<td>A3</td>
<td>A3</td>
<td>0*</td>
<td>14</td>
</tr>
<tr>
<td>10.</td>
<td>B3</td>
<td>A2</td>
<td>6</td>
<td>16</td>
</tr>
</tbody>
</table>
With this product also negative changes were evident, as with VivaStyle Paint On. This may be the result of subjective assessment of tooth colour.

In group II, two subjects reported of gingival irritation with Gingival Index score of 1, while the rest of the subjects did not complain of any gingival irritation and the Gingival Index scores remained the same as like the preoperative score. The severity of sensitivity decreased with time. The within-treatment analysis indicated a significant increase in sensitivity after 4 and 7 days of treatment; however, these results appear to be typical for peroxide bleaching systems. All the sensitivity was transient and resolved within a few days after completion of the bleaching application. The results showed no clinical evidence of significant adverse effects from using VivaStyle Paint On or Enamel White on oral tissues. Evidence of mild gingival inflammation was found in one subject in group I and two subjects in group II. Angular cheilitis and an ulcer at the tip of the tongue was observed in one subject in group II. Both the lesions resolved during the course of the study. No changes in hard tissues were observed.
DISCUSSION

Significant effort has been directed towards understanding the nature of tooth discolouration and devising methods to improve dental esthetics. Currently, several methods are available to restore discoloured dentitions. The paint-on polish application is reported to offer some specific advantages over other delivery systems, particularly in the area of convenience. Comparing the paint on gel bleaching agents with other modes of treating discoloured dentition provides inset view of the advantages of this method over other popular treatment options. Use of abrasives, such as prophyl pastes, is a common and accepted procedure to remove superficial stains by an abrasing action. Abrasion of tooth surfaces removes extrinsic stains, but does not satisfactorily remove gross discolourations. Another accepted method to whiten the teeth is by the use of chemical agents, such as peroxides. This method is considered to be the safest means to restore discoloured dentition because it does not entail removal of sound tooth structure, it is the least invasive and the agents used in this procedure have a safety record. However, they do cause gingival irritation and tooth sensitivity following the treatment, which is much reduced using the paint on delivery system. Use of laminates and porcelain veneers as a treatment option to cover the stains is most invasive because sound tooth structure is removed to achieve an acceptable level of esthetics.

Thus, considering the above facts, the direct-to-consumer paint on bleaching gels are considered to be the safest with least gingival irritation and teeth sensitivity, least invasive, least time consuming, patient friendly, convenient and effective. The two novel paint on bleaching gels used in this study includes VivaStyle Paint On from IvoclarVividant and Enamel White – a click and brush on bleaching pen from Perfect Smile Corporation.

Carbamide peroxide is the active ingredient used in bleaching procedures. Chemically, carbamide peroxide contains approximately 35% by volume hydrogen peroxide and it decomposes to form hydrogen peroxide and urea in aqueous solution. Thus, the pigments in enamel and dentin are altered and a lightening effect is achieved. At the end of the study, (i.e. after 7 days if treatment was carried out twice a day and after 14 days if treatment was carried out once a day) the subjects were evaluated for baseline examinations.

Thus, considering the results both products are found to be effective with Enamel White Click and brush on pen more effective in bleaching as it contains higher concentration of hydrogen peroxide. However, the patient groups are too small to lead to a conclusive result. One important outcome of this trial is the evidence that concentration and duration alone may not sufficiently predict clinical response to peroxide use. While both of the peroxide containing products in this trial used a similar regimen, these two products differed with respect to starting peroxide concentration. The Enamel white click and brush on pen containing 6% hydrogen peroxide started at a measurably higher concentration that VivaStyle Paint On with 6% carbamide peroxide. But with patient sample size these small, results can be considered inconclusive.

CONCLUSION

Considering the results both products are found to be effective with Enamel White Click and brush on pen containing 6% hydrogen peroxide more effective in bleaching as it contains higher concentration of hydrogen peroxide. However, the patient groups are
too small to lead to a conclusive result. The direct-to-
consumer paint on bleaching gels are considered to
be the safest with least gingival irritation and teeth
sensitivity, least invasive, least time consuming, 
patient friendly, convenient and effective in
comparison with other methods of treating
discoloured dentition

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REFERENCES

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