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## Efficacy of foam liner in 10% carbamide peroxide bleaching technique

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*The purpose of this study was to determine if the use of a foam liner in a tray during the nightguard vital bleaching technique would cause a difference in the rate of bleaching or the final shade of the bleached teeth. Ten subjects were selected who had previously successfully bleached their maxillary arch by using a 10% carbamide peroxide solution. Vacuum-formed guards were fabricated for the mandibular arch so that one quadrant was covered with a conventional-style guard, and the other quadrant was covered with a foam-lined guard. All patients were successful in bleaching their mandibular arch. No patient reported any difference between the two quadrants in the rate of bleaching or in the final shade, nor was any difference apparent to the operators clinically or in photographic evaluation. It appears that the addition of a foam insert does not noticeably alter the clinical result of home bleaching. If bleaching is successful in one arch, it can be expected to be effective in the other arch.*  
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### Introduction

Nightguard vital bleaching, or dentist prescribed, home-applied bleaching, has become increasingly popular since its introduction to the profession in 1989.<sup>1</sup> The original technique involved the use of a 10% carbamide peroxide solution containing Carbopol (Goodrich), placed into a custom-fitted mouthguard or tray. The tray was worn 2 to 8 hours per day or at night for approximately 4 to 6 weeks.

Since the original design was published, a number of different types and concentrations of solutions have been introduced, as well as several variations on the technique.<sup>2-11</sup> These variations include different concentrations of tray material, different amounts of tissue coverage by the tray, reservoirs in the tray, and

the addition of foam liners to the tray. The foam liners have been advertised by one manufacturer to provide a 50% reduction in bleaching time,<sup>12</sup> while another manufacturer has obtained a patent for the foam-lined technique that claims to produce results that are superior to the results heretofore known to the art.<sup>13</sup> The purpose of this study was to determine if the use of a foam liner in a tray during the nightguard vital bleaching technique would cause a difference in the rate of bleaching or in the final shade.

### Method and materials

Ten subjects were selected from bleaching patients in the University of North Carolina Clinical Nightguard Vital Bleaching Research Program. These patients had previously successfully bleached their maxillary arch by using either a 10% carbamide peroxide solution with Carbopol (Proxigel, Reed & Carnrick) or a solution without Carbopol (Gly-Oxide, Marion Merrill Dow).<sup>14</sup> The 10 patients consisted of three patients using Gly-Oxide and seven patients using Proxigel. In these successful bleaching treatments, the maxillary arch had been treated, and the mandibular arch served as a control.

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An alginate impression (Jeltrate Plus, Caulk) was made of the mandibular arch. The impression was sprayed with glutaraldehyde (OMNI II, Omni-Tech Medical) for infection control. After at least 3 minutes dwell time in the glutaraldehyde, the impression could be handled with ungloved hands. The impression was then washed vigorously under running water to prevent the disinfectant from inhibiting the setting of the dental stone. Failure to rinse the impression adequately will result in a cast with a softened surface that is easily abraded. This softened surface can result in the fabrication a guard that is too small in certain areas. Use of a slightly small guard can account for some of the two common side effects of at-home bleaching, gingival irritation and tooth sensitivity.

The disinfected, rinsed impression was poured with non-vacuum-mixed dental stone. The stone cast was trimmed on a model trimmer with the base parallel to the occlusal plane of the posterior teeth, and no land area beyond the depth of the vestibule. The cast was allowed to dry at least 24 hours prior to tray fabrication.

A heat and vacuum tray-forming machine (Sta-Vac, Buffalo Mfg) was used to fabricate the trays. The machine was allowed to warm up for 10 minutes prior to fabrication to ensure uniform heating of the material. Trays were fabricated with a 0.020-inch material so that one quadrant was covered with a conventional-style tray and the other quadrant was covered with a foam-lined tray. On softening, the heated tray material was lowered onto the casts slowly to prevent the appearance of wrinkles or folds in the tray material. The junction of the plain and foam-lined portions of the tray was at the mandibular midline (Fig 1). The tray was trimmed on the cast, then fitted in the mouth to completely cover the teeth.

Preoperative photographs were taken with a shade tab. The shade tab and the maxillary arch served as the color standards. Patients were given the same solution as they had previously used in the successful bleaching of the maxillary arch. The application technique and instructions were also identical to the technique in the maxillary arch. Patients were instructed to place 2 to 3 drops of the material into each tooth area on the guard, then insert the guard and expectorate the excess. They could wear the tray at night or during the day, depending on what they had found to be most convenient in the successful color change of their maxillary arch. If the tray was worn during the day, the solution was changed every 2 hours.

Patients were instructed to report if one quadrant

ever appeared any lighter than or different from the other quadrant and if the final result showed any difference between the two quadrants or between the mandibular and maxillary arches. Log forms were maintained to record the number of hours for completion of the bleaching. Postoperative photographs were taken on completion of the treatment.

## Results

All patients successfully bleached their mandibular arch. No patient reported any difference in rate of bleaching or in the final shade between the quadrants, nor was any difference apparent to the operators clinically or in the evaluation of slides (Figs 2a and 2b). This held true for both conventionally stained and tetracycline-stained teeth (Figs 3a and 3b). Not all of the patients returned the log forms with the hours of treatment recorded. However, among those patients who did record and return the hours, it was noted that the mandibular arch was treated with the same or fewer hours than the maxillary arch. Comparison of the maxillary and mandibular arches also revealed that the mandibular arch was not perceived to get as light as the maxillary arch in some patients.

## Discussion

In this clinical study, there was no discernible difference between the rate of lightening of the foam-covered side and that of the control side. However, some patients reported that the mandibular arch did not seem to lighten as much as the maxillary arch. They also reported that the mandibular arch often required less treatment time for lightening than the maxillary arch. Because patients were instructed to treat their mandibular arch until it matched the maxillary arch, they terminated treatment when they were ready. One hypothesis for the difference between the color of the maxillary and mandibular arches is that this was the normal variation inherent to the patients' mouths. However, another hypothesis is that, because the mandibular arch was not as visible, patients were not willing to continue treatment for as long a period or would accept a reasonably close shade as successful. This lack of enthusiasm for bleaching the mandibular arch was also noted in some patients' lack of compliance in completing the log form. This lack of motivation on a less noticeable arch may also be a factor in achieving successful results for patients whose teeth are less responsive. After patients see some results,

Fig 1 The tray was constructed so that one half of the mandibular arch was covered with the foam-lined portion and the other half with a conventional design.



Fig 2a The patient has successfully bleached the maxillary arch and is ready to begin the study on the mandibular arch.



Fig 2b The patient has completed the bleaching of the mandibular arch; no difference is apparent in the two sides.



Fig 3a A typical patient with tetracycline-stained teeth after successful bleaching of the maxillary arch.



Fig 3b The mandibular arch has been bleached; no difference was noted during the process, and at the termination of treatment both sides of the mandibular arch appear similar.



they seem to be more compliant. Hence those situations when the teeth are less responsive may warrant some booster treatment in the office to gain the best compliance from the patient.

When trays with foam liners were used, several clinical observations were noted in addition to the lack of change and final shade. Foam liners, although somewhat softer on the patient's gingiva, created more noticeable occlusal discrepancies. The foam trays were also less esthetic, prohibiting the patient from wearing them during times of public contact. Although there was originally a concern about bacterial growth in the foam areas, the bacteriostatic action of the 10% carbamide peroxide kept the foam relatively clean for the duration of the study. It was also noted that when the trays with the foam inserts were constructed, the tray material could not be left in the heated portion of the vacuum-forming machine as long as conventional materials, or the foam would be burned. Whereas the typical Buffalo No. 31720 material is allowed to sag 1 inch, the foam-lined material responded differently to the heat by browning and should only slightly sag before being lowered slowly onto the cast.

It was not determined whether or not the foam absorbed the bleaching solutions clinically. In the laboratory, there was no obvious absorption of the bleaching solution by the foam. Equal drops of the two solutions were placed on both the smooth and foam-covered portions of the tray material while the sheet was in a horizontal position. The sheet of tray material was then rotated to a vertical position to observe the action of the drops. There was no noticeable increase in retention of the bleaching solutions by the foam side. In fact, when the solution used was a non-Carbopol-containing material (Gly-Oxide), the solution on the smooth side was slower to flow down the tray than material on the foam side. When the solution contained Carbopol, the rate of descent was equal. It was also noted that the foam compressed on adaptation to the cast, resulting in less potential for absorption, were that possible.

The design when foam inserts are used is somewhat different from that when reservoirs are used. In the case of reservoirs, a space is created in the tray by placing a spacing material on the cast. The theory is that the space will allow more bleaching solution to be available to the tooth in a continual supply. However, it has not been shown that the bleaching will occur any faster, because all the solution in the reservoir may be assumed to degrade at the same rate.

On the other hand, reservoirs may be quite necessary for the more viscous solutions to mechanically allow seating of the tray. Reservoirs in the absence of viscous solutions may decrease retention of the tray.

## Conclusions

The addition of a foam insert did not noticeably alter the clinical result of dentist prescribed, home-applied bleaching, either in the rate of bleaching or the final outcome. It was found that if bleaching is successful on one arch, it can be expected to be effective on the other arch. However, the mandibular arch may not lighten as much as the maxillary arch.

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## References

1. Haywood VB, Heymann HO. Nightguard vital bleaching. *Quintessence Int* 1989;20:173-176.
2. Haywood VB. Nightguard vital bleaching: Current information and research. *Esthet Dent Update* 1990;1:7-12.
3. Haywood VB. Nightguard vital bleaching: A history and products update. Part 1. *Esthet Dent Update* 1991;2:63-66.
4. Haywood VB. Nightguard vital bleaching: A history and products update. Part 2. *Esthet Dent Update* 1991;2:82-85.
5. Haywood VB. Overview and status of mouthguard bleaching. *J Esthet Dent* 1991;3:157-161.
6. Albers HF. Home bleaching. *ADEPT Report* 1991;2(1):9-17.
7. Goldstein FW. New "at home" bleaching technique introduced. *Cosmetic Dent GP* 1989;June:6-7.
8. Darnell DH, Moore WC. Vital tooth bleaching: The White and Brite technique. *Compend Contin Educ Dent* 1990;11:86-94.
9. Garber DA, Goldstein CE, Goldstein RE, Schwartz CG. Dentist monitored bleaching: A combined approach. *Pract Periodont Aesthet Dent* 1991;3(2):22-26.
10. Christensen GJ. Tooth bleaching, home-use products. *Clin Res Assoc Newsletter* 1989;13(7):1.
11. Christensen GJ. Tooth bleaching, home-use products. *Clin Res Assoc Newsletter* 1989;13(12):1.
12. Dental Products Advertisement. Osage Beach, Mo: Challenge Products Inc.
13. Darnell. U.S. patent No. 4, 968,251, Nov 6, 1990.
14. Haywood VB, Leonard RH, Nelson CF. Effectiveness of night-guard vital bleaching [abstract 591]. *J Dent Res* 1992;71:179.

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