

PHILIPS

ZOOM!

Tooth whitening

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In vitro study

In vitro evaluation of effects of tooth bleaching gel treatment on human enamel — Microhardness and scanning electron microscopy studies

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Objective

To evaluate the effects of Philips Zoom! NiteWhite [16% carbamide peroxide (CP)] on enamel using microhardness and scanning electron microscopy (SEM).

Methodology

Extracted sound human incisors (n=30) were collected and stored in 10% buffered formalin solution at 4°C prior to experimentation. The enamel specimens were trimmed and mounted on plastic rods. In preparation for testing, the enamel surfaces were ground and polished.

All specimens were randomly assigned to a treatment group according to the test requirements.

Treatments included:

1. Human Saliva (HS group, n=10); Negative Control: 1 treatment = 30 minutes in human saliva with gentle stirring; 9 daily treatments with fresh saliva,
2. Philips Zoom! NiteWhite 16% CP Whitening Gel (16% CP group, n=10); Bleaching Treatment: 1 treatment = 30 minutes in human saliva followed by a deionized water rinse, an air dry, coverage of the enamel surface with gel for 4 hours and finally a rinse with deionized water; 7 daily treatments, or
3. Orange Juice, pH=3.7 (OJ group, n=10); Positive Control: 1 treatment = 30 minute in human saliva followed by 30 exposure cycles (5 seconds in orange juice and 5 seconds in saliva); 8 daily treatments with fresh orange juice and saliva.

The NiteWhite 16% CP Whitening Gel treatment followed the manufacturer's Directions for Use.

For microhardness testing, 3 Knoop Hardness Number (KHN) measurements were taken at pre-treatment, and three KHN measurements were taken post-treatment. For both the pre- and post-treatment KHN measurements, the 3 readings per specimen were averaged. Subsequently, for each treatment the mean and standard deviation (SD) were calculated.

For SEM evaluation, enamel specimens as treated above were prepared using standard procedures and examined at 200X and 2000X magnifications for surface morphology.

Results

Microhardness: Thirty enamel specimens were equally divided between the 3 treatment groups for the evaluation of changes in microhardness (Table 1).

There were statistically significant between-treatment differences among the 3 groups. Pairwise comparisons were subsequently conducted. The reduction in KHN for the bleaching treatment group was similar to the negative control HS group (0.5% and 2.0%, respectively) and statistically significantly less than the positive control OJ group (0.5% and 17.5%, respectively).

SEM: Examination of the SEM photomicrographs of the enamel surfaces indicated that there was no surface erosion or exposed enamel prisms with the negative control HS group or the 16% CP bleaching treatment group specimens. In contrast, significant surface erosion and exposed enamel prisms were observed in the positive control OJ group specimens.

Table 1

Knoop Hardness Number: mean (standard deviation)						
Group ^a	N	Pre-Treatment	Post-Treatment	Reduction ^c	% Reduction	p-value ^d
HS	10	309.0 (16.8)	302.9 (12.1)	6.1 (11.2) A	2.0%	0.365
16% CP	10	309.2 (14.1)	307.6 (14.4)	1.5 (13.3) A	0.5%	0.816
OJ	10	307.9 (18.5)	254.0 (28.9)	53.9 (29.9) B	17.5%	<0.001
p-value ^b		0.983	<0.001	<0.001		

^a HS = human saliva (negative control), 16% CP = Philips Zoom! NiteWhite 16% carbamide peroxide whitening gel, OJ = orange juice (positive control)

^b Comparison of the between-treatment effect using analysis of variance (ANOVA).

^c Means followed by different letters are statistically significantly different.

^d Comparison of the within-treatment effect using the t-test.

Conclusions

The Philips Zoom! NiteWhite 16% CP Whitening Gel did not have significant adverse effects on enamel microhardness and morphology and was found to result in a statistically significantly smaller decrease in microhardness than orange juice (positive control).

