Effect and Clinical Results of 3.5% Hydrogen Peroxide TiO₂ Bleaching Agent

HOASHI Ryotaro, TOKO Teruo and HISAMITSU Hisashi

Department of Clinical Cariology and Endodontology, Showa University School of Dentistry

Abstract: Low concentration hydrogen peroxide (HP) bleaching agent containing titanium dioxide (TiO₂) as a photocatalyst is considered to be a new office bleaching agent that is safe and has good bleaching performance. In this study, Pyrenees®, a 3.5% HP bleaching agent containing TiO₂ photo-catalyst (Mitsubishi Gas Chemical, "PY") and Shofu HiLite™ (Shofu, "HL"), a conventional 35% HP office bleaching agent, were applied to extracted human teeth or vital teeth to compare the changes in tooth color.

PY and HL were used as bleaching agents. Of 69 extracted human teeth, 40 were used to measure tooth color. The micro-Vickers hardness of each of 10 teeth, bleached with PY and HL, was measured before and after bleaching. Nine teeth were divided into three groups (control, PY and HL group) for SEM examination, and the surface properties were compared at the magnification of 5,000. The wavelengths of 11 curing units (three halogen curing units, three xenon, three LED, and two multi arch irradiation units) were measured. The curing units used for measuring wavelength were also used for measuring temperature elevation during irradiation. To examine the bleaching effect of PY on vital teeth in a clinic, the maxillary anterior teeth of 15 volunteers were treated with PY and ZOOM! (Discus Dental, USA).

Color changes of extracted human teeth, the highest result being ΔE*ab of 13.1, were obtained from PY with a high intensity halogen unit and irradiation from a distance of approximately 1 mm.

No differences were found between PY and HL in micro-Vickers hardness and SEM observations before and after bleaching. The wavelength of Hyper-Lightel (Morita) and ZOOM! generated visible light at around 400 nm. The pH values were 6.13 with PY and 3.91 with HL. No temperature elevation higher than 40°C was caused during irradiation. Color changes of the vital teeth were ΔE*ab = 4.9 at the third visit of bleaching treatment, and after 1 year the ΔE*ab value was 4.0.

PY was less invasive to tooth enamel and soft tissue and more effective than HL at the specific conditions used, i.e., wavelength irradiation of approximately 400 nm. These findings suggest that PY is a safe and effective office bleaching agent.

Key words: Titanium dioxide, Tooth bleaching, Hydrogen peroxide, Wavelength of irradiators