

NOVEL THOOTH BLEACHING TECHNIQUE USING NON-THERMAL ATMOSPHERIC-PRESSURE PLASMAS

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Hydrogen peroxide (H_2O_2) is a widely used tooth bleaching material that is effective and safe. However, the exact mechanism of bleaching action by H_2O_2 is not completely understood. One possible mechanism is that H_2O_2 breaks down to produce oxygen radicals, which attack organic pigment molecules, and causes bleaching. In-office bleaching systems use from 30 to 44% H_2O_2 bleaching gel and a high-intensity light source. The light source may enhance bleaching by heating the H_2O_2 and consequently accelerating bleaching, but this mechanism has not been confirmed yet. In this study, we demonstrate a tooth bleaching procedure that uses room-temperature plasma, instead of a light source in an in-office H_2O_2 bleaching system. Extracted human teeth were used in these *in vivo* experiments. All the teeth were sectioned into two species to be used in two groups; experimental group and control group. The experimental group was treated by 28% of a H_2O_2 with a plasma jet for 10 minutes, while control group was treated by H_2O_2 alone for the same time. Removal of the tooth surface protein was proved through scanning electron microscope images and Ponceau staining method. We had analyzed the bleaching results by comparing the overall color changes of the teeth photos which were taken before and after these treatments. Combining plasma and H_2O_2 improved the bleaching efficacy by a factor of three compared to using H_2O_2 alone. Tooth surface proteins were noticeably removed by plasma treatment. When a piece of tooth was added to a solution of H_2O_2 as a catalyst, the production of $\cdot OH$ after plasma treatment was 1.9 times greater than when using H_2O_2 alone. In conclusion, the plasma irradiation enhanced the tooth bleaching effect through the removal of tooth surface proteins and prominently enhanced $\cdot OH$ generation reaction from H_2O_2 .