

Tooth-whitening activity of a novel home-bleaching system

A multifunctional evaluation of efficacy at cervical body and incisal tooth sites

At a glance

The determination of tooth shades represents a significant challenge to dental professionals. The efficacies of teeth-whitening processes are critically dependent on the diffusion of active bleaching agents to teeth stain sources (coloured molecules) present within enamel and dentine, a process correlated to the active bleaching agent-surface temperature gradient.

Previous investigations of this nature have involved measurement of the shades of the teeth by a visual inspection method. This is highly subjective and dependent on many factors, such as the assessor involved, surgery lighting and clinical evaluator fatigue.

A newly-developed objective digital spectrophotometric facility was employed for the first time to monitor tooth stain intensities. The novel thermal diffusion system was extremely effective in promoting the removal of tooth stains.

Challenge

To investigate the capacity of a newly-established tooth-whitening product (containing hydrogen peroxide and manufactured by Smile Studio UK Ltd.), with a linked thermal diffusion system to remove tooth stains.

To determine and monitor tooth stains, and the tooth-whitening actions of the product, for three shade parameters (red-green, yellow-blue and black-white) at three different tooth regions simultaneously (the cervical, body and incisal areas).

Approach

50 teeth in 15 volunteers were investigated. Tooth shade parameters were monitored both prior and subsequent to completion of a 10-day trial period involving: (1) the application of the bleaching gel to tooth surface enamel and (2) a thermal diffusion system; participants applied the treatment at home twice-daily.

The experimental design for the study was classified as a mixed-model, 4-factor analysis-of-variance system.

Solution

We employed, for the first time, a newly-developed objective digital spectrophotometric facility to monitor tooth stain intensities (and also the bleaching effects of the tooth-whitening product involved) for each of the three parameters at the three specified regions of each tooth simultaneously.

Evaluations of 'smile-zone' tooth shades before and after treatment with the tooth-whitening system revealed that this product exerted extremely powerful bleaching actions in all tooth areas investigated for each shade parameter.

The novel thermal diffusion system was extremely effective in promoting the removal of tooth stains.

Benefits

The above spectrophotometric system provided major advantages over the alternative subjective (visual) determination of tooth stains.

The experimental design of the study permitted the simultaneous study of five sources of variation: 'Between-Treatments' and 'Between-Tooth Regions', Treatments x Tooth-Area Interaction, and 'Between-Participants' and 'Between-Teeth-within-Participants'. Almost all of these were found to be highly significant for each of the tooth shade parameters monitored. Interestingly, the cervical area of teeth was bleached less effectively than the body and incisal areas.

The nature of tooth-whitening effectiveness observed reflected the ability of the tooth-whitening agent's thermal diffusion system to promote penetration of the bleaching agent to 'difficult-to-bleach' stain sites.