

Aeroabrasive Caries Therapy

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Background

Both the 100-percent prevalence rate of caries- the treatment of which is accompanied by pain and the psychological trauma resulting from the vibration and friction caused by rotational appliances- and the problem of relapsing caries inspired our group to assess new methods of odontopreparation. Although aeroabrasion of hard tooth tissue has been available for more than 59 years, few practitioners have elected to employ the technique because of the lack of scientific studies demonstrating its efficacy and safety.

Methods

Two hundred and forty six patients were enrolled in the study. Of these, 146 patients with light, medium, or deep caries were treated with the Air Flow Prep K1 aeroabrasion device. The remaining 100 cases served as controls and underwent traditional caries treatment. Clinical observation of both groups of patients was conducted during the treatment period and continued for one month after treatment. Mineral turnover in enamel was assessed through acid biopsy, and the enamel microstructure was examined with Cam Scan submicroscopy. Enamel-composite junctions were assessed using planar spectrography.

Results

An 1.8 times average increase in calcium emission speed from traumatized enamel surface as compared to that of normal intact enamel was established in the control group and compared to emission rates in patients treated with the Air Flow Prep K1. Aeroabrasion was shown not to affect the rate of either calcium or phosphorus emission. After treating the prepared enamel of the control group with

orthophosphoric acid, a solution to the general problem of enamel-column continuity became evident. Treatment with the Air Flow Prep K1, in contrast to conventional rotational appliances, allowed the receiving microrough surface of the enamel to remain free of contamination from an abrading instrument. Planar spectrography of treated enamel in each group of patients showed complete continuity in enamel-composite junctions.

More strikingly, 99 percent of the patients with light or medium caries in the experimental group reported that tooth preparation was completely painless even without anesthesia, and only 21 percent of patients with deep caries in the experimental group reported hyperesthesia of hard tooth tissues. The pear-shaped structure of cavities formed by deep caries, however, generally required the use of both the Air Flow Prep K1 and a conventional burr during preparation. In contrast to the lack of pain experienced by patients in the experimental group, hyperesthesia of dentin and enamel was reported by all patients in the control group.

Conclusions

The use of aeroabrasive technology to prepare tooth enamel is safe and effective. Aeroabrasion does not induce friction or vibration, thereby avoiding pain and psychological trauma in patients, and does not have psychologically traumatic action. Moreover, use of the Air Flow Prep K1 device does not interrupt mineral turnover in hard tooth tissues nor does not disrupt the microstructure of tooth enamel. These findings support its widespread use in dental practices.



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