

ANALYSIS OF ENAMEL PERMEABILITY BEFORE AND AFTER COMBINED BLEACHING OF EXTRACTED DEVITAL TEETH

Ruzimuradova Zilola Shukhratovna

Samarkand State Medical University

ANNOTATION

In recent years, in the world dental practice, in order to achieve the maximum aesthetic result in the correction of discolored teeth, preference is given to conservative methods of treatment, which include various types of whitening [1—3]. However, this method of treatment should be carried out in patients with discoloration strictly according to the indications [4]. Dental discoloration (the term was introduced into Russian literature [5]) is understood as a change in the color of tooth crowns.

Many domestic and foreign authors point to the safety and availability of hydrogen peroxide and carbamide preparations for whitening devital teeth [6, 7]. Whereas, according to G. Lee et al. [8], when using the method of internal teeth whitening, there is a risk of developing external root resorption.

L. Macey-Dare et al. [9] noted the possibility of tooth root resorption in the treatment of discolored devital teeth by whitening. The most pronounced radicular resorption was noted in the group of teeth treated with sodium perborate tetrahydrate mixed with 30% hydrogen peroxide. In order to reduce the risk of root resorption of teeth, it was proposed to mix sodium perborate not with hydrogen peroxide, but with water [8].

The purpose of the study was to evaluate the enamel permeability before and after combined bleaching of extracted devital teeth using 30% carbamide peroxide and 38% hydrogen peroxide with and without ozone activation, as well as after the use of prophylactic agents (calcium gluconate and hydroxyapatite) in vitro.

Material and methods. To study changes in enamel permeability before and after combined bleaching of devital teeth, as well as after a course of remineralizing therapy, an intravital acid biopsy of the enamel was performed (V.K. Leontiev, V.A. Distel 1973) modified by N.I. Krikheli (2008), followed by biochemical

analysis of biopsy specimens in vitro. In the obtained biopsy specimens, the concentration of total calcium, phosphate, magnesium, and iron was determined. To conduct a laboratory study, 60 teeth removed according to periodontal indications were selected, which were previously cleaned of dental deposits, depulped and sealed with gutta-percha using the lateral condensation method. The orifices of the root canals were sealed with glass ionomer cement.

Group 1 included 20 intact extracted teeth. Professional teeth whitening was carried out using the Opalescence professional whitening system. Xtra boost. The 2nd group included 20 extracted teeth. Professional whitening of these teeth was carried out using a professional whitening system Belagel O, which includes 30% carbamide peroxide. The 3rd group included 20 extracted teeth, which were professionally whitened using the Opalescence professional whitening system. Xtra Boost containing 38% hydrogen peroxide, which was activated using the HealOzon apparatus for 60 seconds. The bleaching material was applied three times and activated for 20 s with an interval of 5 min. The 4th group included 20 extracted intact teeth. Professional whitening of these teeth was carried out using the Belagel O professional whitening system with 30% carbamide peroxide, which was activated using the HealOzon apparatus for 60 seconds. The whitening material was applied three times and activated for 20 s at 5 min intervals.

Before the enamel biopsy, the tooth surface was treated with a 3% hydrogen peroxide solution and dried. A biopsy was taken from the vestibular surface of the tooth. A piece of sticky polyethylene film with a round window 5 mm in diameter was glued onto the enamel area under study. Subsequently, a drop of the demineralizing mixture (pH 0.37) was applied to this “window” with a dosing pipette, which, after 30 s, was collected with a wedge-shaped piece of filter paper. After that, 1 ml of distilled water was added, infused for two days, and the concentration of macro- and microelements in the obtained sample was determined.

Results. The results of biochemical studies showed a significant ($p < 0.01$) increase in the output of total calcium in the 1st, 3rd and 4th groups by 1.3 times,

in the 2nd group by 1.5 times. The existence of phosphate in the 1st and 3rd groups significantly ($p < 0.02$) increased by 1.5, in the 2nd group — by 1.9, in the 4th group — by 1.4 times. The output of magnesium in the 1st, 2nd and 4th groups significantly ($p < 0.001$) increased by 1.9 times, and in the 4th - by 1.8 times. The existence of iron significantly ($p < 0.001$) decreased in the 1st and 4th groups by 1.5, in the 2nd group — by 1.2, and in the 3rd group — by 1.4 times.

The use of a complex of prophylactic agents (calcium gluconate and hydroxyapatite) led to a significant ($p < 0.01$) decrease in the existence of total calcium in biopsy specimens by 1.2 times, in the 2nd group by 2 times, in the 3rd group by 1.7 times, and in the 4th - 1.6 times. The existence of phosphate in the 1st group significantly ($p < 0.001$) decreased by 1.7 times, in the 2nd group - by 2.1 times, in the 3rd group - by 1.8 times, and in the 4th group - 2.2 times. The output of magnesium in the 1st and 2nd groups significantly ($p < 0.001$) decreased by 4.3 times, in the 3rd group there was also a decrease in the output of magnesium in biopsy specimens by 2.6 times, and in the 4th group - in 3.8. The existence of iron in the 1st group significantly ($p < 0.02$) decreased by 1.9 times, in the 2nd group - by 2.6 times, in the 3rd group - by 4.8 times, and in 4- group - 2.3 times.

Conclusion. After combined bleaching of pulpless teeth using 38% hydrogen peroxide and 30% carbamide peroxide activated by ozone and without activation, an increase in enamel permeability was found (in vitro). The use of prophylactic agents with calcium and phosphates led to a significant ($p < 0.01$) decrease in enamel permeability (in vitro).

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