STUDYING THE STRUCTURE OF TEETH IN CARIES BY ELECTRONIC MICROSCOPY IN HYPERPARATHYROISIS

Navruzova L.Kh.[1]

[1]Bukhara State Medical Institute, Uzbekistan

Abstract: It is generally accepted that the barrier-protective function of the tooth as a whole is composed of three levels. Of primary importance is the condition of the surface of the enamel with its organic shells cuticle, pellicle, microbial plaques, etc. Enamel prisms, approaching the tooth surface thickening and forming a smooth and even surface, without any defects. Violation of the integrity of the enamel, the appearance of ultramicroscopic cracks, fractures leads to a significant deterioration of the barrier-protective mechanisms already in the deeper layers, in particular in the dentin. Dentinal tubules, on the enamel-dentinal border and on the side of the predentine and odontoblasts. Defects of the enamel surface serve as a kind of entrance gate and trigger a chain of destructive changes. The 3-level defense mechanism includes the pulp, which fights against penetrating microorganisms by cellular and humoral mechanisms [1].

Keywords: enamel surface, odontoblasts, hard tissues, dentinal tubules, ultramicroscopic cracks, microbial plaques

A tooth, being a living organism, constantly metabolizes in it, therefore tooth tissues clearly react to metabolic changes, in particular, the state of the tooth tissue is affected by the parathyroid hormone, which is actively involved in the metabolism of calcium and phosphates in the body. In the literature there are almost no data on the morphological features of dental tissues with hyperparathyroidism obtained using scanning electron microscopy of native teeth without decalcification.

The goal is to study the morphological features of hard tooth tissues in the control of hyperparathyroidism using scanning electron microscopy of chipped teeth.

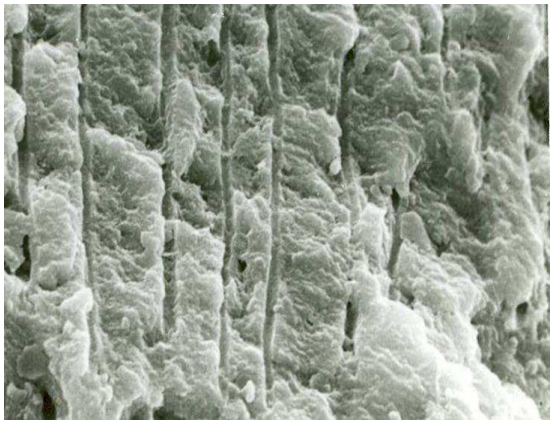
Material and research methods. To study with the help of scanning electron microscopy (SEM) the structure of the more or less normal state of hard tissues, we used intact teeth, removed for medical reasons during orthodontic interventions, as well as the teeth of healthy people who died from injuries and other reasons not related from the pathology of the digestive tract (according to relatives). The extracted teeth after washing in a solution of phosphate buffer or physiological solution and removing soft tissues and blood are fixed wali in 2.5% glutaraldehyde in phosphate buffer solution and subjected to dehydration in an alcohol-acetone ascending concentrations (as usual for scanning electron microscopy). Dehydrated teeth were placed for a short time, 2-3 minutes, in liquid nitrogen, and then the frozen teeth were split longitudinally along their long axis. The enamel surface was also examined without cryogenic impact on the tooth. After the above treatment, the samples were subjected to dehydration in alcohol-acetone. then dried by the critical point method in the apparatus NSR-2. The studied objects were sprayed with gold in the apparatus IB-3, pre-mounted on foil substrates using special conductive glue. (Hitachi). using a Hitachi S-405 A electron microscope at an angle of inclination of the electron beam of 35 and an accelerating voltage of 20 kV. Photographing was performed using a digital SLR computer on a Computek Pentium IY computer using the Windovs XP-Professional application programs.

Results and discussion: On the slopes of the control teeth, the enamel surfaces are even and no defects were detected (Fig. 1).

Enamel prisms retain their S-shaped direction, have the same dimensions. The ends of enamel prisms facing the surface are thickened, as a result of which any gaps between them are not detected. The enamel-dentin border is not even, in some areas the electron-dense substance

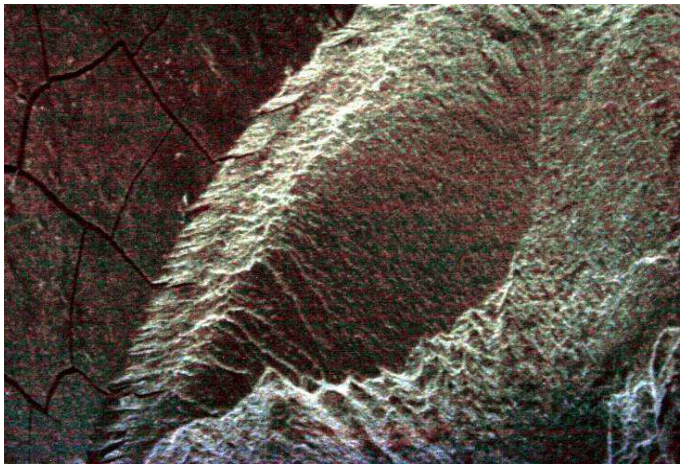
of enamel is pressed into the dentin. In the remaining areas, a relatively low electron-dense substance fills the space between the enamel and dentin. No branching of the ends of the dentinal tubules in the form of arcades was detected, it seems that the dentinal tubules end bluntly. Apparently, these sections of the enamel-dentin border with a low electron density correspond to “Interglobular space” described by light microscopy. Dentin has a lower electron density and the lumen is penetrated by dentinal tubules.

A large number of these canaliculi and their ordered arrangement are clearly visible on the border between the pulp and dentin. This border is also uneven, resembling the relief of the “mountainous terrain." On the slopes, dentin canaliculi are clearly visible throughout. Throughout dentin and located, as a rule. Through even intervals. The dentin substance surrounding the directly dentinal tubule has a higher density, which allows them to clearly contour. The substance located between the dentinal tubules is also heterogeneous, has a globular character, sometimes acquires a scalloped appearance on the chips. Filled or intermittent dentinal tubules, their tubular character is clearly visible, they are evenly distributed and do not differ sharply in size. The diameter of the dentinal tubules is equal to 0.8-1.2 microns, emphasized in all histology textbooks.

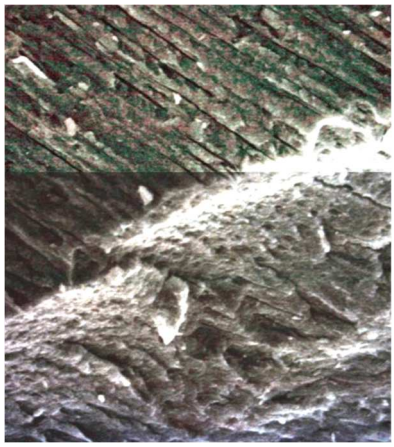


The substance directly surrounding the dentinal tubules (which make up their wall) is characterized by a large electron density and is released on the preparations in the form of a whitish even ring. As the distance from the dentinal tubules, the electron density of the interstitial substance gradually decreases. This picture suggests that directly around the dentinal tubules is the most dense substance. It is characterized by a high level of calcification due to the activity of the processes of odontoblasts located in them. Then and how the level of calcification decreases as it separates from the dentinal tubules. Scanning electron microscopy

of the teeth with hyperparathyroidism reveals significant changes in the morphology of the hard tissues of the tooth. In particular, numerous cracks are revealed on the surface of the enamel. The surface loses its smooth structure. These submicroscopic cracks resemble irregular shapes and look like fractures of dried enamel. On scans of enamel tissue, one can trace how these cracks continue inside it, forming crevices. Upon receipt of a cleavage, faults occur along the indicated enamel cracks. At the same time, thinning of enamel prisms can be noted, in some places they lose their orientation, the sizes of enamel prisms significantly differ from each other, enamel sections are also identified where enamel prisms acquire a mesh arrangement with a sharp difference density in equal sections. Erosed areas are revealed, with pronounced destructive changes (Fig. 3).



With hyperparathyroidism, significant morphological changes are also detected. The dentinal tubules are rarely located, while the intercanalous substance is much larger. Tangential dentin chips are often detected, while completely longitudinal chips are quite rare. It should be noted that the dentinal tubules vary considerably in diameter, along with the wide ones, the tubules with a narrow diameter meet. rings around, i.e. peritubular dentin, some dentinal tubules lose their rectilinear course, acquire a tortuous course, sometimes have varicose enlargements, The substance between the dentinal tubules varies significantly in electron density, its fibrous structure is clearly revealed (Fig. 4).



Conclusions

Raster electron microscopy of hard tooth tissues in control cases reveals the integrity of all echelons of barrier-protective function, the smoothness of the enamel surface, the special structure of enamel prisms, numerous straight dentinal tubules located densely and at a certain interval, the ability to trace the channel along the entire length, to identify the boundary section around the dentinal tubules. All of these structures provide reliable barrier-protective properties of tooth tissues.

With hyperparathyroidism, cracks form on the surface of the enamel, which often extend to the deepest areas, on slopes, the enamel ruptures in these areas. Enamel prisms are heteromorphic, they are often destroyed, forming erosive areas.

Thus, with hyperparathyroidism, a deterioration of all 3 levels of the barrier-protective function of tooth tissues is observed, which can lead to various changes, accompanied by destruction of hard tooth tissues.

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