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Comparative analysis of metric changes in the sections of hemo microcirculatory stream of rat mucous membrane of gums and hard palate after exposure to ethanol and methacrylate

Introduction.

Currently, the problem of the salivary glands' dysfunction is becoming topical considering the common tendency to population aging worldwide. Hyposalivation is caused by dental diseases [3, 4], systemic diseases, transplantation, consumption of medications (hypotensive drugs, antidepressants, and antibiotics), radiation therapy, application of dentures [5], and other exogenous factors [7, 13].

It has been found that morphological changes in oral mucosa, occurred in the abovementioned conditions, are accompanied by changes in the sections of hemomicrocirculatory stream [14, 15]. Use of morphometric methods ensures objective estimation of the structural changes in organs and tissues [1, 2].

Purpose.

The paper was aimed at comparison of changes in the sections of hemomicrocirculatory stream of gingival mucosa after exposure to ethanol and hard palate mucosa after exposure to methacrylate.

Material and Methods.

30 white outbred rats were involved into investigation. 5 outbred white male rats were involved into experiment and assigned into control group (5 animals) and experimental group (10 animals). Xerostomia was simulated by preparation of rat oral mucosa with 1% methacrylic acid methyl ether solution during 30 days [11].

5 animals were assigned into control group who were ventricle administered with NaCl isotonic solution QID; 10 animals were assigned to experimental group who were ventricle administered with 12 mg/kg 40% ethanol (in recalculation for pure alcohol) [6].

The animals were killed under 25 mg/kg thiopental anesthesia overdose in compliance with the scheduled time periods (on days 12 and 30). Pieces of gingiva and palatal mucosa were put into epon- 812 according to standard procedure [9]. Semi-thin sections were stained with polychrome stain.

The following parameters have been measured: diameter of lumens of arterioles, capillaries and venules using the microscope with digital Biorex - 3 VM - 500 microphotohead DCM 900 with software, adapted to these studies. Statistical

processing of morphometric data has been carried out using the Microsoft Excel [8]. Animal housing and experiments on them have been carried out in compliance with the "General Ethic Rules for Conducting Experiments on Animals", adopted by the I National Congress on Bioethics [10] and the requirements of international principles of the "European Convention for the Protection of Vertebrate Animals Used for Experimental and Other Scientific Purposes" [12].

Results and Discussion.

On day 12 of the experiment the effect of 1% solution of meth acrylic acid methyl ether on the sections of hem microcirculatory stream of the rat palatine glands became apparent by the significant narrowing of the average diameter of the arterioles' lumen by 44% (from 19,75 ± 0,13 mcm to 13,07 ± 0,098 mcm ($p<0,05$). The significant enlargement of the average diameter of the venules by 71% has been detected. Lumens of the capillaries increased the average values by 40% (from 5,91 ± 0,12 mcm to 8,28 ± 0.07 mcm ($p < 0.05$)).

Up to day 30 the rate of the average diameter of the arterioles' lumen after administration of 1% solution of methacrylic acid methyl ether increased to 23,99 ± 0,15 mcm and by 21% was significantly higher the rate in the control group of animals and by 83.5% was higher the value of the previous period of observation. The average diameter of the venules' lumen was significantly enlarged by 7.5% as compared with the previous period of observation and by 84% was higher the rate in the control group ($p < 0.05$). The average values of the capillaries' lumen significantly decreased by 6%, as compared with the values on day 12, but were 31,8% higher than the value in the control group of animals.

Following 12 days after the beginning of the experiment, the average values of the arterioles' diameter were (12,98 ± 1,17) mcm and no significant difference in values of the previous time period of the observation and of the control group of rats was noted. The rate of the average diameter of the capillaries decreased by 20,4% and constituted 7,32 ± 0,14 mcm and 5,83 ± 0,09 mcm, respectively ($p < 0.05$), and was 20,14% less than the rate in the control group of animals. The increase in values of the venules' average diameter to 18,54±1,42 mcm was

detected, that was 25,6% higher ($p < 0,05$) than the average diameter of the capacitive section of the hemo micro-circulatory stream in the control group of animals.

No significant difference in the average diameter of arterioles was noted on day 30 of the experiment, as compared with the rate of the previous time period of the experiment and the control group of rats. The rate of the average diameter of the capillaries increased insignificantly as compared with the rate of the previous time period of the experiment (5,92 ± 0,06) mcm, but still was 19,2% less than the value in the control group of animals. Rates of the average diameter of venules were tending to restore to the rates in the control group, though the rate was 11,7% significantly higher.

Conclusions.

Administration of ethanol and 1% solution of methacrylic acid methyl ether causes changes in the sections of hemo microcirculatory stream of the rat mucous membrane of hard palate and gums throughout the experiment. It has been found that methacrylate caused spasm of arterioles on day 12 of the experiment and dilatation on day 30. No effect of ethanol on the rate of average diameter of arterioles was noted. After administration of methacrylate the value of the venules' average diameter progressively increased throughout the experiment. Experimentally, when using ethanol after enlargement of venules' diameter on day 12 of the observation, the tendency to recovery was noted on day 30. Study of the dynamics of changes in the average diameter of capillaries has established the multidirectional changes, i.e., 1% solution of methacrylic acid methyl ether causes dilatation of lumens of metaboloc section of hemomicrocirculatory stream, whereas ethanol leads to persistent narrowing.

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