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CHANGES IN NEUROGLIAL INTERRELATION OF MUSCLE-INTESTINAL NERVE PLEXUS OF ESOPHAGUS AFTER ONE-SIDED CROSSING OF VAGOSYMPATHETIC TRUNK

Abstract. *Experimental examination was performed on 43 adult cat. Neurono-glial complex was studded using Bilshovsky-Gross silver impregnation method and morphometry in normal cases and in animals with unilateral vagotomy. Reactive-degenerative processes were shown before 30 days. Regeneration-hypertrophic processes was found out in later term. Them morphometric value was non-nonnal. Conclusion: during thoracal, esophageal and gastric surgery is very important to preserve branches of nervus vagus which innervate esophagus.*
Key words: *esophagus, musculo-intestinal nervous interlacement, vagotomy, neuron, glia.*

Introduction. In medical practice, you often have to deal with various diseases of the esophagus. Pathological changes in the esophagus can be found in 37, 5 – 93, 0% of cases during the examination of the sectional material for different somatic diseases which was taken from the body of dead patients, and in 12, 7 – 68, 7% of cases during endoscopic examination of the digestive tract in patients which were cured for various diseases or damage of the esophagus [2, 3, 4]. n addition, the frequency of various diseases of the esophagus is constantly increasing [1]. That's why morphological examination of the esophagus during the above-mentioned pathological states have a significant applied value.

It is known that the esophagus belongs to those organs which are under the significant influence of the nervus vagus. Mechanical compression of this nerve, its traumatism during surgery or some inflammation can be observed during many diseases of the chest and this can be the cause of changes in the esophagus [9, 12].

Exemening the nervous elements of the organs of the digestive system, the researchers have found that most neurons of the esophagus are concentrated in its muscular-intestinal nerve plexus [10]. The variability of the structure of the ganglion data is observed in different parts of the body (cranial, middle, caudal), and in each individual [5].

Neurology which provides the processes of metabolism in the nerve cells is in the close connection with neurons in the nervous system. This relates also to intramural plexus of the digestive tract [11]. But too little attention of the studying of this important structural formation in the autonomic nervous system, and especially the neuron-glial complex of the esophagus is given.

The aim of the research. Determination of the nature of changes in the structure of the neuronal-glial complex of the muscular-intestinal nerve plexus of the esophagus after the defection of its parasympathetic innervation.

Materials and methods. Experimental examination was performed on 43 adult cat (Felis domestica) almost of the same age and weight. 20 animals were in the group of control, and 23 were in the group of examination. The ganglia of the muscular-intestinal nerve plexus of the esophagus and their nerve elements were found with impregnation of nitrous oxide silver using the method of Bilshovsky-Gross. Morphometric, variational and correlation analyzes were performed.

We chose the intersection of only the right (one side) vagotomy trunk since bilateral intersection (trunci vagales) in this experiment on cats leads to dysfunction of cardiopulmonary complex, which incompatible with life of animals.

All operations were carried out under the anesthesia using the rules of asepsis and antiseptics. Animals were put to death with overdosing of ether anesthesia. The terms of the experoments: 1, 3, 7, 15, 30, 60, 90 days after surgery.

Results of the research and their discussion. During the first and the third day after the vagotomy the neurons of the muscular-intestinal nerve plexus of the esophagus showed various tenctorial properties, which were manifested by their various coloring. Moreover, the histology of the neurons in the distal part of the esophagus, indicated their acute edema, chromatolysis and cariolysis. Ganglia area (for one neurocyte) of muscular-intestinal nerve plexus increased in the cranial and medial parts of esophagus during these periods. This indicated decreasion the number of neurons in the area of the ganglia. Anything did not change in the caudal part of the organ.

The number of glial cells did not significantly change around each of the neurocytes in period of experiment .

We observed in all sections of the esophagus a significant number of neurons 7-15 days after vagotomy histological changes of which show the deployment of the degenerative process. Morphometric examinations confirm the degenerative process. Thus, the "living space" of the neurocyte increases in comparison with the norm in the cranial part of esophagus in 2, 48 ($P < 0.001$), in the medial – 1,37 ($P < 0.05$) and caudal – 1,75 times ($P < 0.01$).

Significant proliferation of neurology can be observed during this term of examination. The number of glial cells which are connected with one neurocyte significantly increases in all sections of the esophagus, and the area of the surface of the neurons, for one gliocyte, decreases.

The degeneration of the structural components of the ganglia of the muscular-intestinal nerve plexus can be detected in all sections of the esophagus after 30 days of the experiment. Neurons are observed at different stages of degeneration, but in most cases – at the last stage. During this period, the area of ganglion for 1 neurocyte increases in comparison with the norm: in the cranial esophagus in 3,16 ($P < 0.001$), in the medial – 2,11 ($P < 0.01$) and caudal – 1,71 times ($P < 0.01$).

The proliferative reaction of neurology is intensified. The number of glial cells around each of the neurocytes is statistically significantly increased in comparison with the norm in all sections of the esophagus.

Degenerative processes in the ganglia of the muscular-intestinal nerve plexus fade out after 60-90 days after vagotomy, but regenerative-hypertrophic (compensatory) reactions develop. There is a hypertrophy of the apophysis and coltablers in neurons. The number of it increases. Often large neurons with the wrong form of the body, sharply thickened initial parts of the dendrites and the axon can be found.

Morphometric examinations show that during this period, the "living space" of neurocyte decreases in the comparison with the previous period, but this indicator does not reach its normal size. The proliferative reaction of neurology fades down. The area of the neuron, for one gliocyte, is slightly different from norm.

It is known that the intersection of the nervus vagus causes transneuronal degeneration in all intramural ganglias of the gastrointestinal tract, especially the muscular-intestinal nerve plexus [6, 8, 13]. This is confirmed by an analysis of the data we have received. The "living space" of the neurocyte, the area of the nerve ganglion, for one neurocyte, is statistically significantly increasing in all sections of the esophagus to 30^{th} day, what shows some increase in the degeneration of neurons.

During 60-90 days of experiment some slight decrease in the "living space" of neurocyte in all sections of the esophagus can be observed if compare it with the previous term (30 days). However, these changes are not statistically reliable. As a contrast, in comparison with the norm, this indicator in all sections of the esophagus remains statistically significantly higher on the 60^{th} and 90^{th} day of the examination. This fact shows that the neurons of the muscular-intestinal plexus of the esophagus, degenerating as a result of vagotomy, they are not subjected to

cellular regeneration by the way of amyotonic or mitotic division and are not quantitatively renewed. However, reparative recovery occurs in the result of intraneuronal (intracellular) hyperplasia, which is the structural basis for restoring the functional capacity of nerve structures. This was stated by the rechearches of neuromorphology [8] and summarized by D.S. Sarkisov in 1977 [7], describing the general principles of regeneration of the nervous tissue.

Conclusion. 1. Reactive reaction of the neurons of the muscular-intestinal nerve plexus can be observed after right-sided vagotomy during the early stages of the experiment (1 –3 days). It is more visible in the distal esophagus, in which degenerative phenomena are observed also. 2. Next, during 7-30th days in the ganglia of the muscular-intestinal nerve plexus throughout the organ, a significant part of the neurons is necrotized, what shows a profound degenerative process. Such changes are particularly pronounced in the proximal and middle sections of the esophagus. They are accompanied by proliferation of glial cells. 3. During the late stages of the experiment (60-90th days), on the background of degenerative phenomena, an active regenerative-hypertrophic process unfolds, which is manifested not by the increase in the number of neurons in the ganglia of the muscular-intestinal nerve plexus, but by the reparative recovery of neurocytes by intraneuronal (intracellular) hyperplasia. 4. Paying attention to the significant changes in the structural organization of the muscular-intestinal nerve plexus of the esophagus, even with oneway intersection of the nervus vagus, in surgical practice during the medical surgery on the organs of the chest, cardial part of the esophagus and stomach it is necessary to save maximally the branches of the nervus vagus, which usually go to the esophagus.

Prospects for further research. Cats have marked connections between the sympathetic trunk and the nervus vagus in the form of anastomosis and the combining of nodes of the sympathetic trunk with cranially located components of the nervus vagus. Such a parasympathetic trunk was crossed. Taking into account that not only parasympathetic, but also sympathetic nerve fibers were crossed, in further researches it would be necessary to examine changes in the sympathetic innervation of the esophageal after oneway vagotomy.

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