INFLUENCE OF CUTTING THE DIAPHRAGM NERVES ON THE STATE OF THE INTRAORGAN LYMPHATIC SYSTEM OF THE COLON OF A WHITE RAT

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Abstract: The article studies the effect of cutting the phrenic nerves on the state of the intraorgan lymphatic system of the colon of a white rat. The patterns of the polymorphic picture of the intraorgan lymphatic system of the colon and rectum of a white rat that we identified after turning off the diaphragm movements can serve as a basis for its structural adaptations to various degrees of lymphostasis.

Keywords: white rats, lymphatic vessels, diaphragm movements, colon, large lacunae.

ВЛИЯНИЕ ПЕРЕРЕЗКИ ДИАФРАГМАЛЬНЫХ НЕРВОВ НА СОСТОЯНИЕ ВНУТРИОРГАННОЙ ЛИМФАТИЧЕСКОЙ СИСТЕМЫ ТОЛСТОЙ КИШКИ БЕЛОЙ КРЫСЫ

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Резюме: В статье изучены влияние перерезки диафрагмальных нервов на состояние внутриорганной лимфатической системы толстой кишки белой крысы. Выявленные нами закономерности полиморфной картины внутриорганной лимфатической системы ободочной и прямой кишки белой

крысы после выключения движений диафрагмы могут явиться обоснованием ее структурных приспособлений к различным степеням лимфостаза.

Ключевые слова: белой крысы, лимфатические сосуды, движений диафрагмы, толстой кишки, крупные лакуны.

Introduction. In morphology, the evolutionary direction is successfully developing. From this perspective, it appears relevant to examine aspects of lymph circulation and to identify the components of its regulation by the peripheral nervous system indirectly—through the somatic musculature [1,4]. To date, several mechanisms are known by which the respiratory movements of the diaphragm influence the maintenance of lymph flow. Dynamic monitoring of the development of motor-evacuatory dysfunction of the intestine in interconnection with the lymphoid and lymphatic systems requires new approaches to the rehabilitation of such conditions [2,3]. Despite the widespread prevalence of these disorders and the numerous studies devoted to them, the morphological features of impaired motor-evacuatory function of the large intestine that underlie the clinical picture of various disease variants remain largely unstudied [5,8]. The lymphatic system plays a role in maintaining the constancy of the organism's internal environment—that microenvironment which surrounds the cell and ensures its plastic, energetic, and excretory capabilities. In this context, the role of the lymphatic system can be formulated as drainage and detoxification [6,7]. Analysis of the available literature indicates that the anatomical and histological structure of the large intestine and its connections with regional lymph nodes, taking into account changes in peristalsis and the identification of correlative relationships between organometric and histometric parameters, remain insufficiently studied.

Aim of the Study. We investigated the effect of phrenic nerve transection on the state of the intraorgan lymphatic system of the large intestine in white rats.

Materials and Methods. To study the state of the intraorgan lymphatic system of the abdominal and pelvic organs resulting from the cessation of rhythmic diaphragmatic excursions, we performed bilateral excision of segments (1.5–2.0

mm) of the phrenic nerves in the neck region in 20 white rats. The animals were sacrificed 5–20 days after the operation. The lymphatic system of the colon and rectum was injected in both experimental and control animals, and cleared macro-microscopic preparations were prepared.

Results of the Study. Upon analyzing the obtained results, we established that under normal conditions (control group), the lymphatic system of the proximal and distal segments of the large intestine in white rats exhibits a correlative relationship between its morphological characteristics and the structural features of the intestinal wall. Specifically, in the ascending colon, three-dimensional networks of lymphatic capillaries (diameter 0.03–0.045 mm) of the mucosa–submucosa layer are arranged along the course of its palmate folds. In contrast, two-dimensional networks of lymphatic capillaries in the same layer of the descending colon and rectum lack any specific orientation. Transitional-type efferent lymphatic vessels, which form plexuses along their entire length, give rise to collecting lymphatic vessels that drain from the subserous layer at the mesenteric border of the intestine.

In the early postoperative period (5–7 days), destructive changes were observed in all layers of the wall of the colon and rectum in white rats. These changes were characterized by the appearance of numerous segmental constrictions (beading) in lymphatic capillaries, with diameters reaching 0.08–0.1 mm in dilated segments and 0.012–0.015 mm in constricted segments. In the proximal segment of the large intestine, large lacunae were found, concentrated at sites where lymphatic capillaries emptied into submucosal lymphatic vessels. The lymphatic bed of the distal segment of the large intestine showed the emergence of new structural elements on the walls of lymphatic capillaries in the form of blind club-shaped and cone-shaped outgrowths (diameter 0.03–0.045 mm).

In later postoperative periods (10–20 days), sclerotic changes in the lymphatic capillaries and vessels of the large intestine progressed, with the most pronounced alterations occurring in the submucosal layer of its distal segment.

Conclusion. The patterns we identified in the polymorphic morphology of the intraorgan lymphatic system of the colon and rectum in white rats following the cessation of diaphragmatic movements may provide a basis for understanding its structural adaptations to varying degrees of lymphostasis.

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