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Regional principle of aging dynamics of visceral lymph nodes of different lymphatic region

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Motivation and Aim: Lymph nodes are grouped into areas belonging to different organs according to the concept of lymph region [1]. Lymphatic regions of organs of respiratory and digestive system change unequaly when aging, as regions have features of contact with the external environment. Lymph node is considered as marker of state of drained lymph region [1] and lymph node can be used to estimate rates of changes of morphophysiological parameters of lymph node in aging. The lymph node is a triedic homeostatic system including structural (lymphoid), hydration, and trace elements parts. These components allow to maintain lymph node workability in different periods of life [2]. The purpose of the study is to determine the intensity of age-induced changes of visceral lymph nodes including the structure, hydration and concentration of trace elements.

Methods and Algorithms: The experiment was performed on 160 white rats of Wistar with division into an experimental group (rat age is 18–20 months) and a control group (rat age is 3–5 months). Age of rat groups is taken for the final and base period for comparative dynamic estimation of lymph nodes. Mesenteric and tracheobronchial lymph nodes were selected as the subject of the study. We used the following a histological method, thermogravimetric method [3], X-ray fluorescence analysis using synchrotron radiation (RFA SI) [4] and statistical method using the StatPlus Pro 2009 program with determination of basic indicators.

Results: The emergence of lymph theory of aging and concept of lymph region [1, 2] poses the need to take into account changes in regional lymph node in aging. Not knowing what happens in organs and regional lymph nodes, we cannot consider age-dependent changes (aging) in isolation. Control at the exit from the lymph region is carried out by the lymph node [1]. Lymphatic regions of the respiratory system and gastrointestinal tract differ from each other in their morphophysiological parameters. The age intensity of changes occurs asynchronously in the mesenteric and tracheobronchial lymph nodes. The mesenteric lymph node undergoes aging to a greater extent. Evidence is the sprawl of connective tissue inside the lymph node and the coarsening of the capsule. There is an intense decrease in cortical plateau, lymphoid follicles and lymphatic sinuses. There is expansion of the medullary substance due to medullary cords with exposure of the reticular stroma of the lymph node. The rate of change indicates the regional specificity of the mesenteric lymph node aging in the intestinal lymphatic region. In aging, the tracheobronchial lymph node is characterized

by less intense changes, demonstrating a significant difference with the mesenteric lymph node. The largest rate of change is noted by lymphoid follicles with a herminative center, medullary cords. Paracortex decreases equally in mesenteric and tracheobronchial lymph nodes. We assume that the difference in structural response to aging depends in large part on the original morphotype of a lymph node. The lymph region with different antigenic load when in contact with the external environment causes accelerated aging of the mesenteric lymph node compared to the tracheobronchial lymph node.

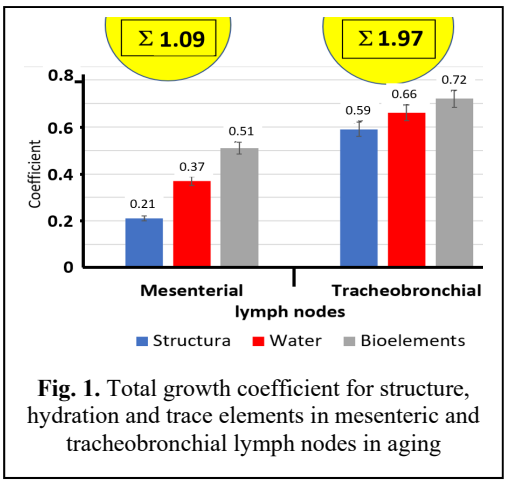

Fig. 1. Total growth coefficient for structure, hydration and trace elements in mesenteric and tracheobronchial lymph nodes in aging

We used to estimate the total growth coefficient, which takes into account the three components of the lymph node – structure (compartments), aqueous saturation and trace element concentration. These three components allow an assessment of the overall operability of a lymph node (Fig. 1). The dynamics of aging of regional lymph nodes are different and are associated with the identity of the drained lymph region. The largest value of the total coefficient is in the tracheobronchial lymph node and a smaller value is typical of the mesenteric lymph node (see Fig. 1). Lymph nodes of different lymphatic regions are subject to age-dependent changes to varying degrees. The mesenteric lymph node is more susceptible to senile changes, as its parameters regarding structure, hydration, and trace elements differ significantly from the base level. Senile changes are explained by the peculiarity of the lymphatic region, which includes the "organ –lymph node" system, where the organ is dominant, as it directly contacts the external environment [1, 2].

Conclusion: Age changes in mesenteric and tracheobronchial lymph nodes occur at different rates. This proves the regional principle of aging depending on the morphophysiological features of the lymphatic region. The mesenteric lymph node is subject to age-dependent changes to a greater extent than the tracheobronchial lymph node, judging by the basic indicators for structure (lymphoid tissue), hydration and trace element concentration. Belonging to different lymph regions determines the morphophysiological response of lymph nodes at different periods of life.

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