"JOURNAL OF SCIENCE-INNOVATIVE RESEARCH IN UZBEKISTAN" JURNALI
VOLUME 1, ISSUE 9, 2023. DECEMBER
ResearchBib Impact Factor: 8.654/2023 ISSN 2992-8869

MORPHOMETRY OF THE VISCERAL LYMPH NODES OF DIFFERENT LOCALIZATION DURING PRE-ECLAMPSIA

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Summary

A comparative analysis of the structural organization of lymph nodes of different localization with an assessment of the effect of pre-eclampsia was performed. The lymph nodes of different localizations were studied in two groups of deceased women who died during pregnancy: there were the control group or the comparison group – where deceased women from other diseases were examined in comparison to those who died from preeclampsia. It was noted that the morphometric indicators of the morpho functional zones of the lymph nodes of all localizations underwent changes in pre-eclampsia. In paratracheal lymph nodes, the area of lymphoid follicles, paracortex, and soft tissues were expanded and the occupied area of other zones was decreased. In the mesenteric and subhepatic lymph nodes, a more significant increase in the area of lymphoid follicles and pulp cords was noted. A significant expansion of the area of paracortex was noted in the sub-splenic lymph nodes and was almost twice as much as the control of the same group. In these lymph nodes, there was also a significant decrease in the area of cortex area and sinuses of the medullary layer.

The relevance of the problem. The relevance of studying of lymphoid organs in pre-eclampsia of pregnant women is that this pathology is a manifestation of an immunological conflict that arises on the basis of genetically determined antigenic heterogeneity of mother and fetus body. With the normal development of the pregnancy, antigenic heterogeneity does not occur due to the complex immunobiological relationships between the mother, fetus and placenta. By studying the organs of the mother's immune system during the complicated pregnancy could help to reveal the mechanisms of preeclampsia.

The immunocompetent cells of reproductive system and regional lymph nodes which respond to embryo, provide local immunity of the uterus during the pregnancy. At the same time, the general and systemic immune responses develop. According to this, during the pregnancy lymphadenitis can be a complication after infectious diseases and with preeclampsia due to the immune

conflict that arises between the mother and fetus. During physiological pregnancy, a regional lymph node is distinguished by the absence of secondary lymphoid nodules, which may indicate the immaturity of the humoral link in the immune response (2,5,7,10) .

It is known that the lymph nodes perform an important and universal functions of hematopoietic, immunopoietic, protective-filtration, exchange and reservoir nature. In this regard, it is necessary to study the morphological features of these functions of the lymph nodes in pre-eclampsia, which allows us to elucidate the pathogenetic and morphogenetic mechanisms of the development of this pathology. Also, there is no exact data on which localization groups, which morpho functional zone of the lymph nodes suffers the most during preeclampsia. Therefore, the study of the morphological state of all of the morpho-functional zones of the lymph node during the pre-eclampsia intoxication period is important, which allows to understand the immune pathogenetic mechanism of such pathology (1,3,6,9) .

The structural organization of lymph nodes undergoes significant transformations under the influence of exo- and endoecological factors, which is seen during endogenous intoxication period in preeclampsia and depends on the specifics of drained areas of organs and tissues [3, 4, 6–8]. The existing functional connection between the lymph nodes dictates the need to study the features of their structural organization, depending on their belonging to the topographic and anatomical group.

The purpose of the study was to conduct a comparative analysis of the structural organization of lymph nodes of different localization with an assessment of the preeclampsia effect on it.

Materials and research methods. The lymph nodes of different locations of deceased women during the pregnancy were studied in two groups: the control group, or the comparison group — where it includes the deceased women from accidental diseases, and experimental group — where there are the deceased women died from preeclampsia. For the histological examination , as an object the visceral - mesenteric, paratracheal , subhepatic and subplenic lymph nodes of different topographic groups were chosen. Lymph nodes were fixed in 10% neutral formalin. This was followed by the classical scheme of wiring and pouring of the material into the paraffin, followed by the preparation of histological sections. Histological sections were made longitudinally and always strictly through

the gates of the lymph nodes, then stained with hematoxylin and eosin, azure and eosin. Morphometric analysis of the structural components of the lymph node was carried out in Image-Pro Plus 4.1. using a morphometric grid [1], which was superimposed on a section of the lymph node. We counted the number of intersections of the network that occurred over the entire section as a whole and separately for each of the structural components of the lymph node (capsule, cortical plateau, lymphoid nodules, paracortex , pulp cords, sinuses) with recalculation in percent. To compare the structural organization of lymph nodes of different topographic groups, a methodical technique was applied, which were done by standardization of the total cross-sectional area of the lymph node, when its size was taken as 100% in total. In this case, it becomes possible to compare the degree of development of structural-functional zones with each other in the lymph nodes of different topographic groups. The statistical method was used in the work with the determination of the arithmetic mean, standard error and the significance of differences at $p < 0.05$ using the Stat Plus Pro 2009 program.

Research results and discussions. The study of lymph nodes of different localization of the dead women in a control group showed that by morphometric indices different morpho-functional areas differ from each other. The area of the cortical slice of the paratracheal lymph nodes is wider than the analogous zone of the lymph nodes of other locations. Lymphoid follicles of lymph nodes of all types of localization almost occupy the same area and consists in an average of 23.1 ± 2.7%, this indicator is relatively greater in mesenteric lymph nodes than other localization lymph nodes (table). The area of the paracortex of the sub-splenic lymph nodes had the highest rate and averaged 24.6 ± 3.2%, the lymph nodes of other locations had a smaller index, especially the mesenteric lymph nodes (16.4 ± 1.4). Lymph nodes experience both functional and morphological tensions in particular their individual morpho-functional zones during preeclampsia period. Significant changes in the percentage ratios of all the morpho functional zones of the paratracheal, mesenteric, subhepatic and sub-splenic lymph nodes are noted.

It was noted that during the preeclampsia, the morphometric indicators of the morpho functional zones of the lymph nodes of all localizations underwent changes. In the paratracheal lymph nodes, the area of the lymphoid follicles, paracortex, and pulp cords were expanded and the occupied area of the other zones

were decreased. In the mesenteric and subhepatic lymph nodes, there was a more significant increase in the area of lymphoid follicles and the pulp strands (table). A significant expansion of the area of paracortex was noted in the sub-splenic lymph nodes and was almost twice as much as the control of the same group. In these lymph nodes, there was also a significant decrease in the area of cortical plateau and sinuses of the medullary layer.

Morphometric indicators of morpho-functional zones of lymph nodes of different localization in pre-eclampsia, indicated in percentages.

		Capsule	Cortical plateau	Lymphoid follicles	Paracortex	Pulp	Sinuses
Paratracheal	C	4.8 ± 0.4	23.6 ± 3.2	20.6 ± 2.5	19.5 ± 1.8	17.7 ± 1.4	13.8 ± 1.2
	PE	***5.4 ± 0.6 ****	***17.5 ± 2.6 #***	***27.4 ± 3.3 [a]***	***21.6 ± 2.8 [a]***	***19.3 ± 1.9 #***	***8.8 ± 0.6 ****
Mesenteric	C	3.7 ± 0.5	16.7 ± 2.4	28.5 ± 3.5	16.4 ± 1.4	21.3 ± 2.1	13.4 ± 1.6
	PE	***5.2 ± 0.7 ****	***14.4 ± 1.5 #***	***31.4 ± 3.6 [a]***	***18.8 ± 2.4 [a]***	***24.2 ± 2.8 #***	***6.0 ± 0.5 ****
Subhepatic	C	4.2 ± 0.7	19.2 ± 1.8	23.1 ± 2.7	22.4 ± 2.6	16.5 ± 1.5	14.6 ± 1.3
	PE	***4.7 ± 0.8 ****	***16.5 ± 1.4 #***	***26.3 ± 2.5 [a]***	***18.6 ± 1.7 [a]***	***20.6 ± 2.1 #***	***13.3 ± 0.8 ****
Sub-splenic	C	4.1 ± 0.6	17.3 ± 1.6	25.4 ± 2.2	24.6 ± 3.2	13.0 ± 1.5	15.6 ± 1.7
	PE	***5.1 ± 0.8 ****	***12.4 ± 1.3 #***	***22.5 ± 2.1 [a]***	***41.3 ± 4.2 [a]***	***12.6 ± 1.3 #***	***6.1 ± 0.8 ****
		* P≤0.05	# P≤0.01	[a]P≤0.001			

Identified in the lymph nodes of different localization of the control group in preeclampsia, apparently reflect the stages of the "disturbing" general adaptation syndrome. This opinion is consistent with the conclusions of Yu.I. Borodin (2011), who believes that one of the first reactions to endointoxication is the migration of lymphoid cells from peripheral to central organs and immunogenesis which increases the immune competence of the bone marrow and the body's resistance to damaging factors. At the same time, the fraction of the cross-sectional areas of structural components at the section of paratracheal and mesenteric lymph nodes almost does not differ from the parameters of the control group. A

marked change in the structure parenchyma mesenteric groups of lymph nodes is observed in medullary strands substantially increasing of the area of medullary substance (1.7-fold; $p < 0.01$). The cortex area of shown lymph nodes is increased by 1.8 times compared with control group ($p < 0.05$).

The structural organization of lymph nodes subjected to significant transformations during endogenous intoxication as pre-eclampsia depends on the specifics of the drained areas of organs and tissues [3, 4, 6–8]. The functional relationship between the lymph nodes necessitates studying the features of their structural organization, depending on their belonging to the topographic and anatomical group.

Conclusions:

1. The morphometric parameters of different morpho-functional zones of lymph nodes with different localization died women in a control group differ from each other.
2. It is noted that during the pre-eclampsia, the morphometric indicators of morpho-functional zones of the lymph nodes with all kind of localizations underwent changes.
3. In the paratracheal lymph nodes, the area of the lymphoid follicles, paracortex and pulp cords expanded and the occupied area of other zones decreased.
4. In the mesenteric and subhepatic lymph nodes, a more significant increase in the area of the lymphoid follicles and pulp cords was noted.
5. In the sub-splenic lymph nodes, a significant expansion of the area of paracortex was noted and amounted to almost twice as much as the control of the same group. In these lymph nodes, there was also a significant decrease in the area of cortical plateau and sinuses of the medullary layer.

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