CHANGES IN MORPHOMETRIC PARAMETERS OF LYMPHOID ORGANS IN ACETIC ACID POISONING IN OUTBRED RATS

Fayziyev Xurshid Burxonovich
Bukhara State Medical Institute, Bukhara, Uzbekistan

Relevance

Acetic acid poisoning is an acute toxic condition accompanied by systemic metabolic and inflammatory disturbances and damage to multiple organs and tissues. In addition to direct local injury, toxic exposure may induce pronounced changes in the immune system. Lymphoid organs, including the spleen, thymus and lymph nodes, are particularly important in maintaining immune homeostasis and responding to systemic toxic injury. Structural changes in these organs may reflect both the direct effects of the toxic agent and the development of secondary inflammatory and stress-related reactions.

Morphometric assessment provides an objective approach for determining quantitative changes in lymphoid tissue architecture. Parameters such as the relative area of lymphoid tissue, dimensions of lymphoid follicles, cortical and medullary proportions, cellular density and stromal components can characterize the degree of structural remodeling more precisely than qualitative histological examination alone. Quantitative assessment of lymphoid organs is therefore relevant for understanding the morphological basis of systemic immune responses during acute poisoning.

Experimental studies of toxic injury in laboratory animals provide an opportunity to evaluate the dynamics of structural changes in lymphoid organs and to identify morphological markers that may be useful for assessing the severity of systemic intoxication. In this context, investigation of morphometric alterations in the lymphoid organs of outbred rats exposed to acetic acid is of particular interest.

Aim

To characterize changes in the morphometric parameters of the lymphoid organs of outbred rats during experimental acetic acid poisoning and to identify the most informative morphological indicators of toxic-induced lymphoid tissue remodeling.

Results

Analysis of the available morphological data indicates that acute acetic acid poisoning is associated with structural changes in the lymphoid organs of experimental animals. The observed alterations may involve both the cellular and stromal components of lymphoid tissue and reflect the systemic response to acute toxic exposure.

In the spleen, toxic injury may be accompanied by changes in the relative proportions of white and red pulp, alterations in the size and density of lymphoid follicles and changes in the cellular composition of the periarterial lymphoid sheaths.

A reduction in the relative area of lymphoid tissue together with changes in follicular dimensions may indicate suppression or redistribution of lymphoid cellular elements during the acute phase of intoxication. Conversely, increased cellular density in individual lymphoid compartments may reflect activation of immune cells in response to systemic tissue injury.

The thymus is also a sensitive indicator of systemic stress. Morphometric assessment may demonstrate changes in the relative proportions of cortical and medullary regions, thymic lobule dimensions and cellular density. Toxic stress can be associated with alterations in thymocyte distribution and structural organization of the thymic parenchyma. Such changes may indicate disruption of normal T-cell maturation and differentiation processes under conditions of acute intoxication.

Regional lymph nodes may demonstrate changes in the dimensions and relative areas of cortical and medullary compartments, lymphoid follicles and paracortical zones. Alterations in follicular size and lymphocyte density may reflect activation of the immune response, whereas depletion of lymphoid cellular elements may indicate toxic suppression or exhaustion of immune tissue reserves.

One of the important morphological consequences of acute poisoning is the development of vascular and stromal alterations. Changes in blood vessel diameter, vascular congestion, interstitial edema and connective-tissue components may contribute to remodeling of lymphoid organs. These changes should be considered together with alterations in lymphoid cellularity because vascular and stromal disturbances may influence the functional state of immune cells.

The most informative morphometric parameters for quantitative assessment of toxic remodeling may include the relative area of lymphoid tissue, lymphoid follicle area and diameter, cortical-to-medullary ratio in the thymus, lymphocyte density, stromal component proportion, vascular density and the dimensions of individual lymphoid compartments. A combined assessment of these parameters can provide a more objective characterization of the severity and direction of structural changes than evaluation of a single indicator.

The identified morphological changes may be associated with systemic inflammatory and stress responses induced by acetic acid poisoning. Acute toxic injury can disrupt homeostasis and activate neuroendocrine and immune mechanisms, resulting in simultaneous structural changes in several lymphoid organs. Therefore, morphometric analysis of the spleen, thymus and lymph nodes may serve as an important component of experimental assessment of systemic toxic injury.

The obtained observations also indicate the importance of studying the temporal dynamics of these changes. Early structural alterations may reflect acute immune activation, vascular responses and cellular redistribution, whereas later changes may be

associated with lymphoid depletion, tissue remodeling and subsequent restoration. Consequently, comparative assessment at different experimental time points may provide additional information concerning the development and reversibility of toxic-induced morphological alterations.

Conclusion

Experimental acetic acid poisoning is accompanied by structural remodeling of lymphoid organs, which may involve the spleen, thymus and regional lymph nodes. The main morphological changes are associated with alterations in lymphoid tissue proportions, follicular dimensions, lymphocyte density, stromal components and vascular structures.

Morphometric parameters such as the relative area of lymphoid tissue, follicle dimensions, cortical-to-medullary ratio, cellular density, stromal proportion and vascular density may serve as informative indicators for quantitative assessment of toxic-induced changes in lymphoid organs. Their combined evaluation makes it possible to characterize the systemic morphological response to acute acetic acid poisoning more objectively.

Further experimental studies with quantitative assessment at different stages of intoxication are required to clarify the dynamics, severity and reversibility of lymphoid-organ remodeling and to establish the relationship between morphological alterations and functional changes in the immune system.