



IMMUNOMORPHOLOGICAL STATES OF THE SPLEEN UNDER THE INFLUENCE OF PATHOLOGICAL FACTORS AND THEIR ADAPTIVE MECHANISMS

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Annotation

The spleen plays a key role in immune regulation and homeostasis, participating in blood filtration, antigen presentation and formation of an adaptive immune response. The influence of pathological factors, such as infections, autoimmune diseases, hypoxia and toxic lesions, causes complex immunomorphological changes affecting lymphoid structures, vascular bed and stromal elements of the organ. The article discusses the key mechanisms of morphofunctional changes in the spleen, as well as adaptive reactions aimed at compensating for damage and maintaining the immune response.

Keywords: spleen, immunomorphology, pathological factors, adaptation, lymphoid structures, cytokines.

Introduction

The spleen is a central peripheral immune organ involved in the control of humoral and cellular immunity. Under pathological conditions, the morphofunctional state of the organ undergoes significant changes, which affects its lymphoid apparatus, vascular system, and phagocytic activity. The study of immunomorphological reorganizations of the spleen under the influence of pathological factors is an important task for understanding the mechanisms of adaptation and developing new therapeutic approaches.

Materials and methods

To analyze morphological changes, we used spleen tissue samples obtained from patients with various pathological conditions, as well as experimental models on laboratory animals. Histological staining methods (hematoxylin-eosin, immunohistochemistry), light and electron microscopy, as well as quantitative methods for analyzing cellular composition (flow cytometry) were used. The levels of proinflammatory and anti-inflammatory cytokines were assessed using enzyme immunoassay.

Results and discussion

1. Morphological changes in the spleen under the influence of pathological factors

In infectious conditions, there is pronounced hyperplasia of lymphoid follicles with activation of germinal centers and an increase in the number of immunoblasts. Viral infections are accompanied by destructive changes in the periarterial lymphoid sheaths (PALS) and the development of apoptosis in lymphocyte populations. In autoimmune diseases (for example,

systemic lupus erythematosus, rheumatoid arthritis), there is a violation of the architectonics of the splenic structures with involution of the white pulp, infiltration by tissue macrophages and pronounced vascular dysfunction. Hypoxic conditions (shock, ischemia) lead to necrotic changes in the red pulp, a decrease in the phagocytic activity of macrophages and an increase in the level of proinflammatory cytokines (IL-1 β , TNF- α).

2. Adaptive mechanisms of the spleen in response to pathological influences

Compensatory reactions include:

- Hyperplasia of lymphoid tissue – increased proliferation of B- and T-lymphocytes in response to antigenic stimulation.
- Activation of the macrophage-phagocytic system – an increase in the number of phagocytes in the red pulp during infections.
- Angiogenesis and restructuring of microcirculation – expansion of the vascular bed during chronic hypoxia to ensure blood supply to lymphoid elements.

In conditions of a chronic pathological process, dystrophic changes are possible, leading to the depletion of lymphoid reserves and the formation of immune deficiency.

Conclusion

The spleen is a key organ of the immune system, providing blood filtration, antigen presentation and coordination of the immune response. Under the influence of pathological factors, such as infections, autoimmune diseases, hypoxia and toxic lesions, significant morphofunctional changes occur in the organ, affecting the lymphoid structures, vascular network and stromal elements. Immunomorphological changes in the spleen include hyperplasia of lymphoid follicles in infections, destructive changes in the white and red pulp in autoimmune processes, as well as necrotic and inflammatory changes in hypoxia. In response to damaging factors, the organ activates adaptive mechanisms, such as lymphoid tissue hyperplasia, increased phagocytic activity and angiogenesis, aimed at compensating for disorders and maintaining homeostasis. However, with prolonged exposure to pathological factors, the compensatory capabilities of the spleen can be depleted, which leads to a disruption of its immunological functions and the formation of immune deficiency. A deep understanding of the morphofunctional changes and adaptive reactions of the spleen opens up prospects for the development of new therapeutic strategies aimed at maintaining its immunoregulatory role in the context of pathological processes

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