

TISSUE CHANGES IN ACUTE AND CHRONIC INFLAMMATION

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Abstract: This article is devoted to an in-depth analysis of morphological and histological changes occurring in tissues during acute and chronic inflammatory processes. The biological essence of inflammation, its importance as a protective-adaptive reaction, and the stages of pathogenesis are covered on the basis of scientific sources. The article pays special attention to the histological signs of microcirculatory vascular reaction, increased vascular permeability, exudation, and neutrophil leukocyte infiltration characteristic of acute inflammation.

Also, the mechanisms of mononuclear cell infiltration, the leading role of macrophages, fibroblast proliferation, and fibrosis, which predominate in chronic inflammation, are described in detail. The transition of acute inflammation to a chronic form in cases of incomplete recovery and the occurrence of irreversible structural changes in tissues as a result are scientifically substantiated.

The article provides a comparative analysis of the histological differences between acute and chronic inflammation and shows their clinical significance. This work helps to understand pathological processes at the microscopic level and serves as an important theoretical basis for future doctors in choosing diagnostic and treatment tactics.

Keywords: Inflammation, acute inflammation, chronic inflammation, exudation, proliferation, infiltration, fibrosis, necrosis, granulation tissue.

Relevance of the topic: Inflammation is an evolutionarily formed universal protective reaction of the body, which develops under the influence of various infectious agents, physical and chemical factors, immunological disorders and metabolic processes. The vast majority of diseases encountered in modern medical practice - infectious diseases, autoimmune pathologies, allergic reactions, diseases of the cardiovascular system and many tumor processes - are directly or indirectly associated with inflammation.

Acute inflammation often develops rapidly and is clinically manifested by bright symptoms, but if not treated in a timely and proper manner, it can become chronic. Chronic inflammation, on the other hand, lasts a long time and leads to irreversible changes in tissues, such as structural remodeling, fibrosis and sclerosis. These processes lead to a decrease in organ function, disability, and in some cases, life-threatening complications. Histological examination methods can determine the stage, type and severity of inflammation. In particular, the correct interpretation of microscopic signs in pathological anatomy is of great importance in assessing the course of the disease and determining the prognosis. Therefore, an in-depth study of tissue changes in acute and chronic inflammation is relevant not only theoretically, but also practically.

Purpose of the topic: The main purpose of this work is to systematically analyze the morphological and histological changes that occur in tissues in acute and chronic inflammatory processes.

The following tasks are also set:

- ✓ to scientifically describe the etiological factors and stages of pathogenesis of inflammation;
- ✓ to characterize the vascular reactions, exudation and cellular infiltration processes characteristic of acute inflammation at the microscopic level;
- ✓ to analyze the mechanisms of mononuclear cell participation, proliferation and fibrosis in chronic inflammation;
- ✓ to comparatively demonstrate the differences and common aspects of acute and chronic inflammation;

To justify the importance of the data obtained in choosing clinical diagnosis and treatment tactics.

The implementation of these goals and tasks will serve to deepen the understanding of the histological nature of the inflammatory process and make the right clinical decisions in future practical activities.

Main part: Inflammation is a complex protective-adaptive reaction of the body to various harmful factors. It develops in living tissues with the participation of blood vessels, blood cells and connective tissue elements. The inflammatory process is classically considered to consist of the stages of alteration, exudation and proliferation. The scientific foundations of this theory are widely covered in the doctrine of cell pathology and were deeply developed by the German scientist Rudolf Virchow.

Acute inflammation usually begins suddenly and lasts for a short time. At the initial stage of the process, alterative changes are observed in cells under the influence of a damaging factor. Granulation and vacuolation appear in the cytoplasm, mitochondria swell, and changes such as pyknosis, karyorrhexis and karyolysis occur in the nucleus. In severe damage, necrosis develops and the structural integrity of the tissue is disrupted.

The reaction of microcirculatory vessels is important in acute inflammation. First, a short-term spasm occurs in the arterioles, then they expand and hyperemia develops. As a result of increased permeability of the vascular wall, plasma proteins and fluid leak into the interstitial space. This is called the process of exudation. Swelling occurs in the tissue, fibrin fibers are deposited, and neutrophil leukocytes accumulate in the focus of inflammation. Neutrophils reach the damaged area by chemotaxis and carry out the process of phagocytosis. As a result of their disintegration, enzymes are released, which sometimes leads to secondary tissue damage. In purulent inflammation, a large number of dead neutrophils and tissue detritus accumulate, forming pus. If acute inflammation is completely eliminated in a timely manner, the regeneration process in the tissue prevails and damaged structures are restored. However, if the damaging factor persists or the body's reactivity decreases, the process can become chronic. Chronic inflammation is a long-term process in which destruction and proliferation occur simultaneously. In this form, lymphocytes, plasma cells, and macrophages, rather than neutrophils, predominate. Macrophages play a central role, secreting biologically active substances and cytokines. These substances activate fibroblasts and enhance collagen synthesis. As a result, connective tissue elements increase and fibrosis develops.

Histological examination reveals dense collagen fibers, newly formed capillaries, and infiltration of mononuclear cells in chronic inflammation. The normal tissue architecture is

disrupted, and organ function gradually decreases. In some cases, granulomatous inflammation develops, forming a granuloma consisting of epithelioid cells and multinucleated giant cells. This is a protective reaction of the body against long-lasting antigens.

Thus, in acute inflammation, vascular reaction, exudation and neutrophil infiltration predominate, while in chronic inflammation, proliferation and fibrosis processes take a leading role. The acute process is often rapid and severe, while the chronic process is prolonged, leading to deep and often irreversible structural changes in tissues.

Conclusion: Although inflammation, as a protective-adaptive reaction of the body, is aimed at limiting and eliminating pathogenic factors, its course characteristics cause various morphological changes in tissues. In acute inflammation, vascular reaction, exudation and neutrophil infiltration predominate, and the process often develops rapidly and lasts for a short time. If the damaging factor is eliminated, the tissue undergoes regeneration processes and structural integrity is restored. However, severe or uncontrolled acute inflammation can end with necrosis, purulent processes and complications.

Chronic inflammation is a long-term process in which destructive and proliferative changes occur simultaneously. As a result of mononuclear cell infiltration, macrophage activity, fibroblast proliferation and increased collagen synthesis, fibrosis and sclerosis develop. This disrupts the normal architecture of organs and leads to their functional insufficiency. In some cases, granulomatous inflammation is formed, which manifests itself as a morphological expression of a prolonged immune response. Thus, the main difference between acute and chronic inflammation is determined by the duration of the process, the cellular composition and structural changes occurring in the tissue. While acute inflammation is more exudative and rapid in response, chronic inflammation is characterized by proliferative and remodeling processes. A thorough study of the histological characteristics of inflammation allows us to determine the stage of the disease, assess its prognosis and is important in choosing the right treatment tactics. Therefore, knowledge of tissue changes in acute and chronic inflammation is a necessary theoretical and practical knowledge for every future doctor.

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