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INFLAMMATORY MARKERS AND THEIR DIAGNOSTIC SIGNIFICANCE IN ACUTE INFLAMMATION

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Abstract: This article covers the topic "Inflammatory markers and their diagnostic significance in acute inflammation". The article analyzes in detail the physiological basis of inflammatory processes, clinical manifestations of acute inflammation and the role of diagnostic markers. In particular, information is provided about inflammatory markers such as C-reactive protein, procalcitonin, pentraxin 3 and serum amyloid A. These markers are important in determining the intensity, cause and prognosis of inflammation. The article highlights the clinical significance of these markers in the effective management and treatment of inflammatory processes.

Keywords: Inflammation, Inflammatory markers, C-reactive protein, Procalcitonin, Systemic effects of inflammation, Stages of inflammation, Procalcitonin, Interleukins.

Аннотация:В статье рассматривается тема «Маркеры воспаления и их диагностическое значение при остром воспалении». В статье подробно анализируются физиологические основы воспалительных процессов, клинические проявления острого воспаления, роль диагностических маркеров. В частности, представлена информация о маркерах воспаления, таких как С-реактивный белок, прокальцитонин, пентраксин 3 и сывороточный амилоид А. Эти маркеры важны для определения интенсивности, причины и прогноза воспаления. В статье подчеркивается клиническая значимость этих маркеров в эффективном контроле и лечении воспалительных процессов.

Ключевые слова:Воспаление, Маркеры воспаления, С-реактивный белок, Прокальцитонин, Системные эффекты воспаления, Стадии воспаления, Прокальцитонин, Интерлейкины.

Introduction

Inflammation is one of the main protective reactions of the body against external and internal harmful factors. The inflammatory process occurs as a result of infectious agents (bacteria, viruses, fungi), mechanical damage, chemicals, toxins, and even an incorrect response of the immune system to its own tissues. The main function of inflammation is to protect damaged or infected tissues, eliminate harmful factors, and initiate tissue regeneration. Inflammation is clinically manifested as a central pathogenetic element of many diseases. In particular, acute inflammatory conditions - diseases such as pneumonia, appendicitis, pancreatitis, sepsis - require early and accurate diagnosis. In such cases, it is important to

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identify and control the inflammatory process using laboratory indicators, not limited to clinical symptoms (fever, pain, swelling).

Inflammatory markers are a set of substances that change in the blood and other biological fluids when an inflammatory process develops in the body. These include, first of all, C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), procalcitonin (PCT), interleukins, tumor necrosis factor (TNF-α), fibrinogen, ferritin and many other markers. These indicators make it possible to determine the presence, severity, stage, and sometimes the etiological factor of inflammation. Currently, in medical practice, the determination of inflammatory markers has become an integral part of the diagnostic process. For example, an increase in the level of C-reactive protein is characteristic of bacterial infections, and an increase in procalcitonin is characteristic of sepsis and severe infectious conditions. At the same time, each marker has its own characteristics, level of accuracy and clinical limitations, and their correct interpretation requires deep knowledge and experience from the doctor. The diagnostic value of inflammatory markers plays a major role not only in diagnosing the disease, but also in assessing and predicting the effectiveness of treatment. By monitoring their dynamics, doctors can assess the development of the disease or the recovery process, and change treatment methods in a timely manner.

Literature review and method

Inflammation is a complex biological process that develops as a protective reaction of the body, aimed at combating external and internal harmful factors and restoring damaged tissues. Inflammation plays a key role in protecting the body from factors such as infectious agents, mechanical damage, chemicals and toxins.

Inflammation is manifested in clinical practice as the main pathogenetic mechanism of many diseases. In particular, acute inflammatory conditions - diseases such as acute pneumonia, acute appendicitis, acute pancreatitis, sepsis - require early and accurate diagnosis. In such cases, it is necessary to identify and control the inflammatory process using laboratory indicators, not limited only to clinical signs.

Inflammatory markers are biological substances that change in quantity in the blood and other biological fluids when an inflammatory process develops in the body. These markers make it possible to determine the presence of the inflammatory process, its intensity, duration, and sometimes the cause of the inflammation.

The main types of inflammatory markers are:

C-reactive protein is a protein produced in the liver and increases rapidly in the blood during the early stages of the inflammatory reaction. Increased levels of C-reactive protein are often associated with bacterial infections, autoimmune diseases, and tissue necrosis. C-reactive protein is a very sensitive and variable marker for assessing the intensity of inflammation.

Erythrocyte sedimentation rate - this method measures the rate at which erythrocytes settle in plasma. The erythrocyte sedimentation rate increases in inflammation and other pathological processes. Although this indicator is not an accurate diagnostic tool, it is useful in monitoring chronic and acute inflammatory conditions.

Procalcitonin is a protein that is normally present in very low levels in the blood, but its levels increase dramatically in bacterial infections and sepsis. Elevated levels of procalcitonin are important in differentiating bacterial from viral infections.

Interleukins are cytokines produced by immune system cells that are involved in regulating the immune response and promoting inflammation. Interleukin-6 levels in

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particular are considered important markers for assessing the severity of the inflammatory process. Tumor necrosis factor alpha is a cytokine that plays an important role in the initiation and progression of inflammation. Tumor necrosis factor alpha levels are particularly elevated in severe infections and sepsis. Ferritin is a protein that stores iron in the body, and its levels increase during inflammation. Ferritin helps assess the intensity of inflammation and the severity of the disease. Fibrinogen is a protein present in plasma that is involved in blood clotting, and its levels increase during inflammatory reactions. Fibrinogen is also considered a risk factor for cardiovascular disease.

Markers of inflammation are important laboratory indicators for determining the presence of an inflammatory process in the body, assessing its level and activity. These markers can be used to detect the disease at an early stage, determine its severity, monitor the effectiveness of treatment, and assess the prognosis.

The diagnostic value of markers of inflammation primarily allows for early diagnosis of the disease. Markers such as C-reactive protein and procalcitonin increase their levels in the first hours of the inflammatory reaction. This makes it possible to diagnose the disease and take prompt medical measures before the patient has fully developed clinical symptoms.

The second aspect is that inflammatory markers help assess the severity of the inflammatory process. High levels of C-reactive protein, Interleukin-6, and procalcitonin indicate a strong course of inflammation in the body. This, in turn, signals the doctor to assess the patient's general condition and the need for intensive treatment.

The third important aspect is that inflammatory markers are used to monitor the effectiveness of the treatment process. If the level of inflammatory markers decreases as a result of the prescribed treatment, this indicates that the treatment method has been chosen correctly. On the contrary, if the level of markers does not decrease or increases again, it is necessary to reconsider the treatment strategy.

The fourth importance is that inflammatory markers can be used to determine the nature of infectious agents. For example, procalcitonin levels are elevated in bacterial infections, while no significant changes are observed in viral infections. This plays an important role in determining the need for antibiotic therapy.

Fifth, inflammatory markers allow us to assess the prognosis of the disease. If the level of inflammatory markers is very high, this may indicate a severe course of the disease or the development of complications. To correctly interpret inflammatory markers in clinical practice, their level must be evaluated in conjunction with the patient's clinical symptoms, instrumental examination results, and other laboratory indicators. Because inflammatory markers only indicate the existing inflammatory state, but cannot determine its exact cause or location.

Discussion

Although inflammation is a natural biological process that occurs as a protective reaction of the body, its untimely detection or incorrect assessment can lead to many serious complications. Therefore, the detection of inflammatory markers and making clinical decisions based on their results play an important role in modern medicine.

Inflammatory markers, in particular, such as C-reactive protein, procalcitonin, and Interleukin-6, allow not only to determine the presence of inflammation, but also to assess its level and dynamics of development. In acute inflammatory conditions, such as acute pneumonia, appendicitis, or sepsis, these markers are an integral part of diagnostics. Studies and clinical experiences show that increased levels of C-reactive protein and procalcitonin

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allow for the early detection of acute bacterial infections. In particular, procalcitonin is used as an accurate and reliable marker in the differential diagnosis of bacterial and viral infections. Also, the levels of cytokines such as Interleukin-6 and Tumor necrosis factor alpha increase significantly during severe infection and inflammation.

However, it is necessary to take into account some of their limitations when assessing inflammatory markers. For example, C-reactive protein can be increased in many different conditions, including autoimmune diseases, injuries, and even some non-inflammatory conditions. This requires that markers be interpreted not only as laboratory indicators, but also taking into account the clinical picture.

Another important point in the discussion is that inflammatory markers can greatly help in monitoring the treatment process. A decrease in the level of C-reactive protein or procalcitonin indicates that the inflammatory process in the patient has subsided and the treatment is effective. Conversely, persistently high or increasing levels of markers indicate disease progression or non-response to treatment.

Inflammatory markers can also be used to assess the prognosis of the disease. For example, high levels of procalcitonin and Interleukin-6 indicate a high risk of developing severe sepsis or septic shock. This indicates to the doctor the need to monitor the patient in intensive care or take more aggressive treatment measures. In general, inflammatory markers provide great opportunities in clinical practice for early diagnosis of diseases, assessment of the treatment process and determination of the patient's prognosis. Their correct interpretation and evaluation in combination with other clinical data allows choosing the most optimal and effective treatment strategy for the patient. Therefore, accepting inflammatory markers as an integral part of the diagnostic process and carefully approaching their results is an important requirement of modern medicine.

Results

Inflammatory markers are of great diagnostic importance in identifying acute inflammatory processes, assessing the severity of the disease, monitoring and predicting the effectiveness of treatment. Key markers such as C-reactive protein, procalcitonin, and Interleukin-6 show significant changes in the early stages of the inflammatory process, supporting clinical diagnosis and helping the doctor make quick decisions. By assessing the level of inflammatory markers, the possibility of determining the etiology of the infectious process, controlling the course of the disease, and preventing complications increases. Monitoring based on markers allows you to improve the patient's general condition and apply the necessary treatment measures in a timely manner.

Therefore, inflammatory markers play an invaluable role in clinical practice in the correct and early detection of inflammatory processes, developing an effective treatment strategy, and improving the patient's quality of life. In the future, the introduction of new and more sensitive markers is expected to further expand diagnostic capabilities in this regard.

Conclusion

Inflammatory markers are of fundamental importance in modern laboratory diagnostics for early detection of inflammatory processes, assessment of their severity, and monitoring the effectiveness of treatment. Studies show that the levels of C-reactive protein, procalcitonin, Interleukin-6, and other biomarkers change significantly in acute and chronic inflammatory conditions, which serves as an important diagnostic and prognostic indicator in clinical decision-making. Timely and correct interpretation of inflammatory markers allows for differential diagnosis of infectious and non-infectious inflammatory processes,

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assessment of the course of the disease, and development of an individual treatment strategy. Some markers, such as procalcitonin, show high sensitivity and specificity in distinguishing bacterial infections from viral infections, while C-reactive protein shows high sensitivity and specificity in determining the overall inflammatory activity.

Based on scientific sources and clinical experience, it has been established that inflammatory markers also play an important role in assessing the patient's prognosis. High levels of markers are considered an independent predictor of the development of severe diseases and complications. Therefore, in clinical practice, it is necessary to use inflammatory markers in a comprehensive approach, in combination with other laboratory and instrumental examinations.

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