

ETIOPATHOGENETIC FOUNDATIONS OF SEPSIS, ITS CLINICAL FEATURES, AND PRINCIPLES OF MODERN THERAPY

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Abstract: This article discusses the role of sepsis in modern medicine, its causes of development, pathogenesis mechanisms, types of clinical signs, and its significance as an emergency condition. Sepsis is a severe systemic inflammatory response of the body to infectious agents. If not detected in a timely manner and treated correctly, it can lead to multiple organ failure and death. The article provides information on modern laboratory and instrumental methods used in the diagnosis of sepsis, as well as contemporary approaches to treatment, such as antibiotic therapy, infusion therapy, and organ support.

Keywords: Sepsis, infection, pathogenesis, clinical signs, antibiotic therapy, inflammation, systemic bloodstream infection, multiple organ failure, emergency medical care.

ЭТИОПАТОГЕНЕТИЧЕСКИЕ ОСНОВЫ СЕПСИСА, ЕГО КЛИНИЧЕСКИЕ ОСОБЕННОСТИ И ПРИНЦИПЫ СОВРЕМЕННОЙ ТЕРАПИИ

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Аннотация: В данной статье рассматривается роль сепсиса в современной медицине, причины его развития, механизмы патогенеза, виды клинических проявлений и его значение как неотложного состояния. Сепсис — это тяжелая системная воспалительная реакция организма на инфекционные агенты. Если его не выявить своевременно и не лечить должным образом, это может привести к полиорганной недостаточности и летальному исходу. В статье представлена информация о современных лабораторных и инструментальных методах, используемых при диагностике сепсиса, а также о современных подходах к лечению, таких как антибиотикотерапия, инфузионная терапия и поддержка функции органов.

Ключевые слова: Сепсис, инфекция, патогенез, клинические признаки, антибиотикотерапия, воспаление, системная инфекция кровотока, полиорганная недостаточность, неотложная медицинская помощь.

Relevance: Sepsis is an emergency condition that develops in response to infection, characterized by a dysregulated immune response of the body, leading to multiple organ failure and a high risk of death. It poses a serious threat to human life through systemic inflammatory processes. According to WHO data, approximately 49 million people worldwide suffer from sepsis each year, with 11 million deaths. Due to the high mortality rate and rapid progression, early detection of sepsis, a deep understanding of its pathogenesis, and prompt treatment are of vital importance. If early antibiotic therapy, infusion resuscitation, vasopressors,

and source control of infection are applied based on standard algorithms, clinical outcomes can be significantly improved.

Etiology and Pathogenesis. Sepsis develops under the influence of the following microorganisms:

- Gram-negative bacteria: *Escherichia coli*, *Klebsiella pneumoniae*
- Gram-positive bacteria: *Staphylococcus aureus*, *Streptococcus pneumoniae*
- Fungi: *Candida albicans* (especially in immunocompromised patients)

In the pathogenesis process, shock-inducing cytokines (TNF- α , IL-1, IL-6) are actively released. This condition leads to endothelial damage, increased capillary permeability, microcirculatory disturbances, and hypotension. The main causes of multiple organ failure are coagulopathy and disruption of oxygen delivery.

Clinical features and diagnosis. Sepsis clinically presents in a polymorphic manner, and in some cases, classic signs may not be evident. Therefore, each symptom complex must be evaluated.

Changes in body temperature: High fever ($\geq 38^{\circ}\text{C}$) is common but not always observed and is not directly correlated with the severity of sepsis. Normal temperature does not rule out sepsis. In some cases, hypothermia ($< 36^{\circ}\text{C}$) is observed, which is also considered a sign of severe infection. Antipyretics and analgesics can mask the clinical picture.

Hematological changes: Leukocytosis ($> 12 \times 10^9/\text{L}$) or leukopenia ($< 4 \times 10^9/\text{L}$) are laboratory signs characteristic of severe infection.

Respiratory and circulatory system disturbances: Tachypnea (respiratory rate $\geq 22/\text{min}$) indicates the need to rule out sepsis and life-threatening conditions. Tachycardia (heart rate $\geq 90/\text{min}$), arterial hypotension, hypoxia (cyanosis), delayed capillary refill, and a "marbled" skin appearance reflect microcirculatory disturbances.

Renal and fluid balance disturbances: Oliguria (less than 0.5 ml/kg/hour for ≥ 2 hours) and positive fluid balance (≥ 20 ml/kg/24 hours) indicate organ failure.

Gastrointestinal symptoms: Diarrhea, vomiting, and intestinal paresis are important signs of pelvic (genital) sepsis. Severe pain in the lower abdomen that does not respond to analgesics, as well as intense postpartum contractions, are also characteristic of sepsis.

Neurological and metabolic changes: Decreased level of consciousness, altered mental status, and hyperglycemia (glucose > 7.7 mmol/L) in the absence of diabetes may be observed.

Skin and other signs: Rashes (petechial, maculopapular, purpura), changes in skin color, or signs of fasciitis indicate severe infection. Productive cough and urinary disturbances also have additional diagnostic significance.

Important clinical sign: Lack of improvement in the patient's condition despite ongoing treatment measures indicates severe sepsis and requires immediate reassessment of tactics.

Instrumental Diagnostic Examinations. Ultrasound examination must be performed to detect remnants of placental tissue or blood clots in the uterine cavity

in cases with risk factors for postpartum endometritis. Ultrasound of the uterus should not be used for diagnosing postpartum endometritis, as this method does not have high accuracy.

In cases of spontaneous or, especially, operative delivery, hysteroscopy is performed in all patients when any clinical or echographic signs of endometritis are detected.

In the diagnosis of postpartum and postoperative endometritis, the diagnostic value of hysteroscopy is 91.4%, which is higher than all other examination methods except pathomorphological examination (100%). If a professionally trained and qualified obstetrician-gynecologist is available, hysteroscopy may be performed starting from the 2nd day of the postpartum period.

Computed tomography or magnetic resonance imaging. The choice of instrumental examination methods depends on the presumed location of the infection focus.

Antibacterial Therapy. In sepsis, administering antibiotics within 1 hour is critically important, as each hour of delay increases the risk of death (Kumar et al., 2006). Therapy begins with broad-spectrum antibiotics (carbapenems, cephalosporins, piperacillin-tazobactam), followed by de-escalation based on laboratory results. In cases of suspected MRSA, vancomycin or linezolid is recommended.

Infusion Therapy. Rapid volume resuscitation with 30 ml/kg of crystalloids (0.9% NaCl or Ringer's lactate) is recommended. If lactate levels >4 mmol/L, additional fluid administration is required. Colloids are used only when necessary.

Vasopressors. If arterial pressure is low (MAP <65 mm Hg) and does not respond to fluid administration, vasopressors (norepinephrine as first choice) are used to stabilize blood pressure. Vasopressin or dopamine may be used as adjuncts.

Source Control of Infection. Abscesses, necrotic tissues, or sources of infection must be promptly removed surgically or through interventional procedures. This is a critical component of treatment.

Additional Measures. Glucocorticoids (hydrocortisone) are used in cases unresponsive to vasopressors. Anticoagulant therapy is implemented if DIC develops. Mechanical ventilation is recommended for patients with ARDS.

Discussion. Early clinical recognition of sepsis is often challenging because the signs are nonspecific. Laboratory tests, scales such as SOFA/qSOFA, and rapid treatment are the keys to success. The 2021 Surviving Sepsis Campaign guidelines designate the 1-hour emergency treatment bundle—including antibiotics, infusion, and vasopressors—as first-line care.

Conclusion and Recommendations. Sepsis is a severe emergency condition with a high risk of death, leading to multiple organ failure. Understanding its pathogenesis, early clinical and laboratory detection, and implementation of urgent and rational therapy are the keys to success. It is recommended to introduce special algorithms for early detection of sepsis in healthcare facilities, regularly train all physicians, and act in accordance with standards.

Sepsis is a disease that requires rapid and targeted treatment. Modern therapy is directed toward antibiotics, volume infusion resuscitation, vasopressors, and elimination of the infection source. Clinical outcomes can also be improved with additional therapies. Treatment efficacy can be enhanced through targeted monitoring and evaluation.

References:

1. Singer, M., Deutschman, C. S., Seymour, C. W., et al. (2016). The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). *JAMA*, 315(8), 801–810.
2. Dellinger, R. P., Levy, M. M., Rhodes, A., et al. (2013). Surviving Sepsis Campaign: International guidelines for management. *Critical Care Medicine*, 41(2), 580–637.
3. Shojaei, F., & Rahmani, F. (2020). Biomarkers in Sepsis. *Journal of Clinical Medicine*, 9(1), 114.
4. Kumar, A., Roberts, D., Wood, K. E., et al. (2006). Duration of hypotension before initiation of antibiotics is the critical determinant. *Critical Care Medicine*, 34(6), 1589–1596.
5. Surviving Sepsis Campaign. (2021). *Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock 2021*.
6. Ministry of Health of the Republic of Uzbekistan. (2021). *Protocols for Emergency Medical Care*. Tashkent: Ministry Publishing House.