

SEPSIS – A GLOBAL MEDICAL PROBLEM IN MODERN INTENSIVE CARE

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Abstract: *Sepsis is a severe pathological condition that develops as a result of an unbalanced response of the body to infection, accompanied by life-threatening multi-organ failure. In modern medicine, sepsis is one of the most urgent problems in intensive care and resuscitation practice. According to the World Health Organization, millions of patients die from sepsis every year worldwide. The pathogenesis of sepsis is based on the cytokine cascade, endothelial dysfunction, microcirculation disorders and tissue hypoxia. Early diagnosis (SOFA, qSOFA criteria) and intensive care initiated within the “first hour” significantly reduce mortality. This article discusses the etiology, pathogenesis, clinical signs and principles of modern treatment of sepsis on a scientific basis.*

Keywords: *Sepsis, septic shock, multi-organ failure, cytokine storm, SOFA, intensive care, vasopressors.*

Introduction

Sepsis is one of the most severe and highly lethal pathological conditions of the 21st century. According to the modern definition, sepsis is a multi-organ dysfunction that develops as a result of an uncontrolled and unbalanced response of the body to infection.

According to statistics from the World Health Organization, more than 40 million cases of sepsis are recorded worldwide every year, and most of them end in death. Newborns, the elderly, and patients with reduced immunity are especially at high risk.

Pathogenesis

The main mechanism in the pathogenesis of sepsis is excessive activation of the immune system. Under the influence of endotoxins and microbial components, proinflammatory cytokines such as IL-1, IL-6, TNF- α are massively released. As a result:

- Endothelium is damaged
- Capillary permeability increases
- Microthrombosis develops
- Hypoxia occurs in tissues

This process ultimately leads to multi-organ failure. In severe cases, septic shock develops, with a sharp decrease in arterial pressure and impaired tissue perfusion.

- Clinical signs and diagnosis
- Hyperthermia or hypothermia
- Tachycardia

- Tachypnea
- Arterial hypotension
- Oliguria
- Impaired consciousness

The SOFA and qSOFA scales are important in diagnostics. An increase in the level of lactate in the blood is an important indicator of tissue hypoxia.

Treatment principles

- The golden hour principle is fundamental in the treatment of sepsis:
- Start broad-spectrum antibiotics within 1 hour
- Fluid therapy (crystalloids)
- Vasopressors (noradrenaline)
- Oxygen therapy
- Artificial respiration if necessary

Current treatment algorithms are based on the recommendations of the Surviving Sepsis Campaign.

What are the first signs and common symptoms of sepsis?

The symptoms of septicemia depend on the primary site of infection. Early detection of the disease is essential, and immediate medical intervention is required for effective treatment of blood infections. Early recognition of these warning signs also reduces the risk of developing life-threatening septicemia. Sepsis, if not treated properly in the early stages, can become severe, characterized by a decrease in the function of various vital organs, such as the lungs, kidneys, and liver.

Early signs and symptoms of sepsis include: diarrhea, pale skin due to decreased blood perfusion, disorientation, rapid pulse, very low temperature or fever and chills, urinating less than usual, mental decline, muscle pain, vomiting, rashes, shallow and rapid breathing.

What are the complications of sepsis?

Septicemia and sepsis are progressive diseases that can be effectively treated with antibiotics and intravenous fluids. However, untreated sepsis can cause a variety of complications, such as:

Circulatory collapse: Reduced blood flow, affecting the function of various vital organs. Organ dysfunction: During sepsis, the permeability of blood vessels increases, which reduces blood supply and increases the risk of clots. This leads to organ failure and failure.

Septic shock: Uncontrolled sepsis leads to septic shock, which is characterized by dangerously low blood pressure. Reduced blood flow and low blood pressure can lead to organ or tissue damage.

Inflammation: An overly aggressive immune response to bacteria causes inflammation throughout the body and can damage organs. Severe inflammation, which can lead to organ damage, is especially common in patients with chronic illnesses, as their immune systems are weakened. Acute respiratory distress syndrome: This is also a serious side effect of a blood

infection, as oxygen delivery to the lungs and brain is reduced. The patient may develop neurological symptoms due to the reduced oxygen levels.

Blood clots: Blood infections can also cause blood clots to form in various parts of the body. As blood clots block blood flow to tissues, the tissues begin to die. Prolonged interruption of blood flow to an organ can lead to permanent damage and organ death, often requiring amputation. **Post-sepsis symptoms:** It is evident that even if sepsis is completely treated, the patient lives with post-sepsis symptoms for months. Some of the symptoms associated with the condition “post-sepsis symptoms” include

- Cognitive decline,
- Fatigue
- Insomnia
- What are the causes of sepsis?

Bacterial infections are the most common cause of sepsis. Infections can be primarily caused by bacteria, but fungi and viruses can also be causative agents. Infections can mainly occur in one of the following places:

Lungs: Lung infections and pneumonia are said to be the main sources of blood infections. As the blood travels through the pulmonary arteries and veins, the infection spreads throughout the body through the blood. **Gastrointestinal tract:** Gastrointestinal infections also lead to sepsis. The gastrointestinal organs that are prone to infection are the stomach, intestines, and colon. **Urinary tract:** An infection in the kidneys can lead to a blood infection as the blood passes through the urinary tract to be filtered.

Blood infections: Direct blood infections, such as those caused by an insect bite, can also lead to sepsis. **Post-surgical infections:** You can also get a blood infection after surgery for various reasons. **Urinary tract infections** are a common feature after surgery and can lead to sepsis. In addition, cuts in your body and internal tissues are exposed to the environment. If appropriate measures are not taken, this can lead to infection and sepsis.

Meningitis: If you have meningitis, an inflammation of the membranes or coverings of the brain, the risk is high. During sepsis, the coagulation system is also significantly activated. Inflammatory mediators increase thrombin generation and weaken natural anticoagulant mechanisms. This leads to the formation of microthrombi and further deterioration of organ perfusion. This condition can lead to disseminated intravascular coagulation syndrome in severe cases. Multiple organ failure occurs precisely as a result of microcirculatory disorders and disruption of energy metabolism at the cellular level.

In recent years, sepsis has been considered not only as an inflammatory process, but also as an immune imbalance syndrome. Initially, hyperinflammation is observed, and then a stage of immunosuppression develops. During this period, lymphocyte apoptosis increases and the body becomes susceptible to secondary infections. It is this mechanism that causes the development of nosocomial infections in long-term intensive care patients.

Metabolic changes are also important. During sepsis, mitochondrial dysfunction develops and the ability of cells to use oxygen decreases. As a result, lactate levels increase,

which is considered a laboratory sign of tissue hypoxia. High lactate is a negative prognostic indicator. Hemodynamically, septic shock is characterized by peripheral vasodilation. Decreased vascular tone leads to a decrease in arterial pressure and the need for vasopressors. Restoration of adequate perfusion with fluid therapy is one of the main stages of sepsis management. According to modern views, early detection of sepsis requires comprehensive clinical observation and laboratory monitoring. The SOFA criterion is widely used to assess organ dysfunction and is important in determining the prognosis. Also, the principle of an individual approach in intensive care is paramount, and dynamic monitoring based on the patient's hemodynamic parameters and laboratory results is recommended. Preventive measures include early sanitation of the source of infection, strict adherence to the rules of asepsis and antiseptics, and rational use of antibiotics. The introduction of standard protocols in the healthcare system is important in reducing sepsis.

Conclusion

Sepsis is a severe pathological condition with a high mortality rate, requiring rapid diagnosis and aggressive intensive care. Early detection and comprehensive treatment, started within the first hour, significantly improve the patient's prognosis. Prevention and effective management of sepsis are one of the priorities of the modern healthcare system.

The main role in the pathophysiology of sepsis is associated with excessive activation of the innate immune system, where pathogen-associated molecular structures and mediators released from damaged cells sharply activate macrophages and neutrophils. As a result, inflammatory mediators are released on a large scale and a systemic inflammatory response is formed. In this process, a cytokine cascade causes endothelial dysfunction, capillary permeability increases, fluid accumulation in the vessels and relative hypovolemia occurs. Microcirculation disorders increase oxygen deficiency in tissues and lead to the development of metabolic acidosis.

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