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TRANSMISSION OF MENINGOCOCCAL INFECTION INTO THE HUMAN ORGANISM AND ITS CLINICAL PROCESSES

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Abstract

This article provides an in-depth analysis of the routes of meningococcal infection into the human body, the biological characteristics of the pathogen, and the pathophysiological processes in the development of the disease. Meningococcal infection is one of the severe infectious diseases characterized by high mortality and acute onset, and is most common among children and adolescents. The disease is spread by airborne droplets, and short-term close contact with a patient may be sufficient for infection.

The abstract describes in detail the mechanisms of meningococcal adhesion to the nasopharyngeal mucosa, overcoming epithelial barriers, entering the bloodstream, and the development of bacteremia and sepsis. The mechanism of the development of severe complications such as septic shock, coagulopathy, and acute renal failure by inducing severe immune inflammatory reactions in the body is also analyzed.

The article describes the clinical stages of meningitis - initial signs, meningeal symptoms, nervous system damage, hemorrhagic rashes, the formation of intoxication syndromes on a scientific basis. The importance of early diagnosis of meningococcal infection is emphasized, and in late cases, the development of extremely severe complications - Waterhouse-Friderichsen syndrome, fulminant sepsis and brain edema.

One of the important aspects of the article is to highlight the issues of prevention and epidemiological control. It is noted that measures such as the level of immunization among the population, seasonality of the disease, identification of carriers, early laboratory diagnosis, prophylactic antibiotic therapy play a special role in reducing the spread of infection. At the end of the study, the need for an integrated approach of epidemiologists, pediatricians, therapists and resuscitators to effectively combat meningococcal infection is emphasized.

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Relevance of the topic: Meningococcal infection remains one of the global health problems today. It is particularly dangerous due to its epidemic spread, rapid severity, and short-term mortality. It is especially common among children under 5 years of age, adolescents, students, military personnel, and groups living in closed communities.

In addition, the increasing resistance of meningococci to antibiotics, high mortality rates due to delayed diagnosis, and the high incidence of severe complications such as meningitis, septic shock, and disseminated intravascular coagulation (DIC) increase the relevance of this topic.

At the same time, the difficulty of early detection and the indistinguishable initial symptoms from a common cold further increase the risk of the disease. Therefore, a thorough study of the clinic of meningococcal infection is necessary for every medical worker.

Purpose of the topic: The purpose of the article is to systematically cover the pathogenesis, transmission mechanism, clinical processes and complications of meningococcal infection, as well as to improve the knowledge necessary for medical personnel to diagnose the disease early and treat it properly.

Keywords: Meningococcus, Neisseria meningitidis, pathogenesis, meningococcemia, meningitis, septic shock, nasopharyngitis, DIC, petechial rash, endotoxin.

Main part: Meningococcal infection is a highly dangerous bacterial disease caused by Neisseria meningitidis, which is transmitted mainly by airborne droplets. The portal of infection is the nasopharyngeal mucosa, where the bacteria settle. During the colonization phase, the bacterium uses its pili and capsule to adhere to epithelial cells. When the mucosa is damaged, meningococci penetrate through the tissues and initiate a local inflammatory process. This stage is most often manifested in the form of acute nasopharyngitis.

The main stage of pathogenesis is the entry of bacteria into the bloodstream and the development of bacteremia. Meningococci that enter the bloodstream secrete a very potent endotoxin (lipooligosaccharide). This toxin causes severe intoxication in the body, increased vascular permeability, capillary damage, and hemostasis disorders leading to DIC syndrome.

The clinical course of meningococcal disease usually proceeds in three directions:

Nasopharyngeal form

This is the mildest form, characterized by sore throat, mild fever, redness, and headache. However, this stage is dangerous because the bacteria can enter the bloodstream in a latent manner.

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Meningococcemia (spread into the blood)

This is the most severe form of infection. The disease begins suddenly, is accompanied by a temperature of 39–40°C, loss of consciousness, vomiting, severe intoxication. A characteristic sign of the disease is petechial-dark red hemorrhagic rashes (star-shaped), which appear on the legs, thighs, buttocks, and body.

Under the influence of the toxin, the blood coagulation system is disrupted, DIC syndrome, peripheral vascular collapse, and septic shock develop, which can lead to death within a few hours

Meningitis form

Meningococci reach the meninges through the bloodstream and serous-purulent meningitis develops. Its main symptoms include:

- severe headache;
- stiff neck;
- photophobia;
- vomiting;
- Kernig and Brudzinski signs;
- impaired consciousness, convulsions.

If meningitis is not treated in a timely manner, complications such as brain edema, hydrocephalus, neurological defects, deafness, and intellectual disability may develop.

Complications

The main complications of meningococcal infection are:

- meningococcal septic shock;
- hemorrhagic necrosis of the adrenal gland (Waterhouse–Friderichsen syndrome);
- DIC syndrome;
- brain edema;
- loss of vision or hearing;
- neurological disorders.

Due to the rapid development of the disease, immediate emergency medical care is required in any suspected case.

Conclusion: Meningococcal infection is one of the infectious diseases characterized by the rapid development of severe clinical manifestations, high mortality, and rapid spread. Studies show that the main danger of the disease lies in its latent onset and the possibility of its transition to a fulminant form within a few hours. In particular, severe complications such as sepsis and Waterhouse–Friderichsen syndrome often occur in cases of delayed diagnosis and pose an immediate threat to the patient's life.

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As a result of the penetration of meningococcus into the body, its penetration through the nasopharyngeal epithelium into the bloodstream, and the release of endotoxin, a cascade of inflammatory reactions is activated. This leads to disruption of the coagulation system, the formation of microthrombi, hemodynamic failure, and multiple organ failure. Therefore, attention to early clinical signs, timely detection of rashes, and timely physical examinations reflecting meningeal symptoms are crucial in saving the patient's life.

The epidemiological data analyzed in the article show that preventive measures against meningococcal infection, especially immunization, carrier detection, timely antibiotic therapy, and public education, significantly reduce the spread of infection. Also, increased monitoring in crowded places such as educational institutions, dormitories, and military units is important in preventing group spread of infection.

In conclusion, effective control of meningococcal infection requires close cooperation between medical workers, epidemiologists, parents, teachers, and the public health system. Early diagnosis, timely initiation of an aggressive treatment regimen, preventive vaccination, and regular epidemiological surveillance are the most effective ways to reduce mortality from this disease. A comprehensive approach to limiting meningococcal infection is strategically important in strengthening public health.

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