LESSON № 6

Topic: IMMUNOLOGICAL DISORDERS. AIDS

Aim of the lesson: to get knowledge on the reactivity and resistance, to study mechanisms of nonspecific reactivity and resistance, implored factors on the human reactivity, etiopathogenesis of immunologycal disorders and mechanisms of clinical symptoms of AIDS.

QUESTIONS:

1. Reactivity. Types of reactivity (typical, group, individual).
2. Physiological and pathophysiological reactivity.
3. Specific and nonspecific mechanisms of reactivity.
4. Degree of reactivity (normergic, hyperergic and hypergic).
5. Resistance. Local and common resistance, hereditary and aquired.
6. Factors, which determine the reactivity and resistance (heredity, constitution, sex, environmental and social factors).
7. Immunologycal disorders. Categorization.
8. Primary immunodeficiencies: classification and clinical manifestations, forms of primary immunodeficiency (causes, mechanisms, clinical manifestations):
   - B-system-dependent;
   - T-system-dependent;
   - defects in leukocyte function. Defects in leukocyte adhesion and intracellular digestion.
   - complement-dependent;
   - combined.
9. Secondary (acquired) immunodeficiency states. AIDS. Etiology. Clinical symptoms and mechanisms of their development.
10. Graft-versus-host disease.

LABORATORY WORKS

Laboratory work 1. ***Estimation of vascular resistance by Nesterov test***

Description of the work: The pot of Nesterov apparatus should be applied on the middle one third of internal part of forearm. Experimenter maintains the pressure in the pot about 0,4 atm. during 3 minutes. After pot removing students calculate amount of petechias (small red points which develop due to hemorrhage) on the forearm. The vascular resistance is estimated in 4 degrees:

0 degree – less than 20 petechias

1 degree – 20-40 petechias

2 degree – more than 40 petechias

3 degree – total hemorrhage bruise

The first two degree (0-1) suggest about normal vascular resistance, but next degree (2-3) show decreasing vascular resistance and increasing permeability of vessels. It can be during different pathological conditions like thrombocytopenia, deficiency of vitamin C, vasculitis and other.

Tasks

1

Patient M., male, 21 years old, suffers from hereditary form of hypogammaglobulinemia. His father also suffers from this disease; mother is healthy. An examination showed a significant decrease of IgM and IgG levels in the patient's blood.

• What are the etiology, basic mechanisms and clinical manifestations of hypogammaglobuliemia?

• Does the pattern of immune and allergic reactions change in hypogammaglobulinemia? Substantiate your opinion.

2

A patient who had undergone a surgical intervention for gallstones presented with a slow healing of the postoperative wound, its infection, and fever. The use of antibiotics (after sensitivity tests) had positive effect. Investigation of the patient's blood showed leukopenia due to a decreased neutrophils and monocytes, a decreased mobility of leukocytes and a low activity of leukocytic myeloperoxidase.

Similar abnormalities were found in the patient's sister and brother.

Taking into account the observed changes in the leukocyte counts, name the syndrome (s) which the patient suffers from. Substantiate your answer.

What are the possible causes, manifestations, and mechanisms of this syndrome? Are there grounds for its hereditary or congenital origin?

- What are the mechanisms of the decreased neutrophil mobility and low activity of the neutrophil myeloperoxidase?

3

A 20-year-old patient who suffered from diabetes mellitus presented with slow healing of a surgical wound, purulence, and an increase in the body temperature up to 37.2°C after he had undergone the appendectomy. Treatment with antiobiotics for 6 days (after the appropriate sensitivity tests) had no effect. With an aim to find the reason for treatment failure blood glucose determination and special neutrophil tests were performed. The results of the tests are the following: hyperglycemia (320 mg/dl) is accompanied by a decrease in the number, mobility, and microbicidal activity of neutrophils.

What parameters, in your opinion, should be investigated to elucidate mechanisms of the decreased mobility and microbicidal activity of neutrophils?

What are the most likely causes and mechanisms of impairment of the neutrophils' function in this patient?

Is there any association between the abnormal phagocytosis, the infection of wound and its slow healing? If you think there is, name and characterize possible mechanisms of such an association.

Why is the body temperature in the patient with a purulent wound increased only moderately?

4

A 30-year-old patient P. visited his physician with complaints of recurrent stomatitis, tonsillitis, tracheitis, otitis, and repeated pneumonia even in the summer time. Procedures aimed at enhancing the nonspecific body resistance to infection, such as an increase of cold endurance, had no effect. The results of the laboratory tests are the following: lymphocytes reactivity toward phytohemagglutinine (PHA) and tuberculin is normal; activity of the complement factors and levels

of IgM, IgG, and IgA in the blood serum are within the normal range. The complete blood count test with differential showed no changes in erythrocytes count or Hb concentration; leukocytes count is low due to a decrease in monocytes, but the content of granulocytes is normal. The phagocytic activity of macrophages is decreased by 45%.

• Define the type of pathology found in the patient.

• What part of the immune surveillance system is impaired in the given patient: the specific immune response or the nonspecific host defence?

• If the specific immunity is abnormal, what part of it is defective: A, B, or T? Explain the origin of symptoms presented by the patient.

• If the hostdefence system is deficient, what subsystem is responsible for the defect? Explain the mechanisms of symptoms seen in the patient.

5

An 10-year-old patient was admitted to the pediatrics department. His parents were concerned about the frequent occurrence of otitis, quinsy, rhinitis, conjunctivitis, bronchitis, pneumonia, and enterocolitis in their child. The current admission was associated with a high risk of bacterial endocarditis and sepsis in the young patient.

A test performed in the hospital showed the presence of leukopenia due to a decrease in lymphocytes, especially in T-cells, and, to a lesser degree, in B-cells, a decrease in the blood levels of IgA and IgE (by 40 and 50% respectively, compared to normal values); concentration of IgG is at the lowest normal value; proliferation of lymphocytes in the presence of phytohemagglutinine is decreased.

• Define the type of pathology developed in the patient. Substantiate your answer.

• What are the possible causes of this pathological state?

• Taking into account the results of the laboratory tests, explain the mechanism of the development and consequences of this type of pathology.

• How can you explain a decrease in the lymphocytes' reaction to phytohemagglutinine and a considerable reduction in the blood content of IgA and IgE when the levels of IgG are in the normal range?

• What symptoms in this child could be a direct result of the IgA

and IgE depletion?

LITERATURE:

1. General and clinical pathophysiology / ed. by A.V. Kubyshkin. – Vinnytsa: Nova Knyha Publishers. – 2011. – P. 209-233.

2. General and systematic pathology / ed. by J.C.E. Underwood. 2nd ed. – 1996. – P. 181-220.

3. Pathology / ed. by E. Rubin and J.L. Farber, 2nd ed. – 1994. – P. 96-140.

4. Pathophysiology / ed. by C. Paradiso (Lippincott's review series). – 1995. – P. 403-413.

5. Pathophysiology of disease: an introduction to clinical medicine / ed. by S.J. McPhee, W.F. Ganong. – 2006. – P. 48-58.