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1. DEFINITION OF THE DISEASE, ETIOLOGY, PATHOMORPHOLOGY, PATHOGENESIS OF TUBERCULOSIS, GOALS AND TASKS OF THE GENERAL PRACTITIONER IN DIAGNOSTICS AND PREVENTION OF TUBERCULOSIS

Tuberculosis is a chronic infectious disease caused by MBT. It is characterized by a primary chronic undulating course, multiple organ damage and a variety of clinical manifestations. The most frequently affected organs are the respiratory organs. Tuberculosis is the most widespread infectious disease in the world and in Russia.

The causative agents of TB are mycobacteria of the human species (*M. tuberculosis*), bovine species (*M. bovis*) and intermediate species (*M. africanum*). Mycobacteria of the human species most often (in 92% of cases) are the causative agents of tuberculosis in humans, while mycobacteria of the bovine species and intermediate species are responsible for 5% and 3% of cases, respectively.

The source of causative agents of infection is a person with tuberculosis, as well as diseased animals (especially cattle).

The most common route of infection through the upper respiratory tract is aerogenic — 93% (airborne, dust). Mycobacteria can enter the body through the alimentary route (with milk, sour cream, cottage cheese, etc.), by contact — through the damaged surface of the skin and mucous membranes.

Pathomorphological changes. Inflammation develops on an immune basis due to delayed-type hypersensitivity (DST) and is productive. Mycobacteria typically induce specific changes in conjunction with non-specific ones in most forms.

At the heart of a specific lesion is a granuloma (tuberculous tubercle). Morphologically, it is an epithelioid-giant-cell granuloma with an area of caseous necrosis. MBT is an intracellular infection. A specific granuloma forms in 6–8 weeks.

TB pathogenesis is complex and depends on many conditions, in which the infectious agent (mycobacterium) and the macroorganism interact.

There are 2 stages of tuberculosis infection: primary and secondary.

The primary period is marked by the development of tuberculosis in an organism that is still intact. The most important are massiveness and virulence of the infection. The fact of infection is established, as a rule, by the «conversion» of the Mantoux tuberculin test, i.e., the appearance of a positive infectious test for the first time and corresponds to the appearance of a specific immune response. Before the appearance of an immune response, the stage of bacteremia

is observed from 4 to 8 weeks. The primary period has a tendency to spontaneous healing with varying degrees of severity of residual changes.

Characteristics of tuberculosis during the primary stage:

- 1) infection of an intact organism (contact with a bacterial excretor is required);
- 2) hypersensitivity to mycobacteria and tuberculin;
- 3) «conversion» of the tuberculin test;
- 4) lymphotropism;
- 5) the presence of paraspecific changes (enlarged lymph nodes, erythema, conjunctivitis, etc.);
- 6) young age (mainly children and adolescents);
- 7) the disease manifests as a condition affecting the entire body (functional disorders);
- 8) a tendency to spontaneous recovery, the formation of specific immunity.

After infection, the primary period may end in infection or disease (local or non-local forms). The primary period includes 3 forms — intoxication (11%), primary tuberculosis complex (10%), tuberculosis of the intrathoracic lymph nodes (60–80%). The remaining pulmonary forms belong to the secondary period.

Extrapulmonary forms have a secondary origin. In the structure of forms, they make up to 17%. The most common extrapulmonary forms are kidney tuberculosis, osteoarticular tuberculosis, tuberculosis of the peripheral lymph nodes.

The secondary period of tuberculosis develops against the background of a previous infection at a more mature age, as a result of the reactivation of post-primary residual changes in the intrathoracic lymph nodes, lungs and other organs. Various debilitating factors play a decisive role in the pathogenesis of secondary forms. There may be exogenous re-infection. The disease takes on the character of a local lesion.

The role of the general practitioner is to prevent TB in the family members under their care and to prevent the spread of the infection within the family.

The goal is solved by the following TASKS:

- ▶ preventing the entry of TB patients into the family;
- ▶ active early and timely detection of tuberculosis in family members;
- ▶ identification and monitoring of high-risk groups for tuberculosis in the family;
- ▶ creating immunity to tuberculosis in uninfected family members;
- ▶ carrying out preventive measures for tuberculosis (together with a phthisiatrician);
- ▶ sanitary and educational work on the prevention of tuberculosis;
- ▶ timely and full implementation of anti-epidemic measures in the family when a patient with active tuberculosis is detected.

2. ANTI-TUBERCULOSIS MEASURES IN THE FAMILY BEFORE THE CHILD'S BIRTH

Prevention of tuberculosis in a child begins even before its birth. Pregnancy has a suppressive effect on the cellular immune response and reactivation of old tuberculous foci can occur — therefore, this period is a period of risk of tuberculosis in women. To prevent the penetration of tuberculosis into the family, it is necessary to conduct LFF for the first 6 months of pregnancy for all persons who will live in the same apartment with the child and those in contact with it.

When a patient is identified, together with a phthisiatrician, the issue of hospitalization in a hospital, the final disinfection before the child is discharged from the hospital is decided. If hospitalization of the patient is impossible, then the issue of delaying a healthy woman and a vaccinated child for 45 days in the maternity hospital (until immunity is developed) is resolved. If it is impossible to separate contact with a diseased person discharging bacteria, then a newborn child is prescribed chemoprophylaxis from the beginning of contact. After giving birth, the mother must undergo a fluorography within a month.

Tuberculosis and motherhood. Children born to mothers with tuberculosis are usually healthy. Most babies become infected after birth through contact with their mother.

The maternity ward must be notified in advance that a woman has tuberculosis, she is placed in a separate block. After discharge, the final disinfection is carried out.

A newborn child from a mother with an active form of tuberculosis, regardless of the allocation of MBT, is vaccinated with BCG at birth in the maternity hospital. The child is completely isolated from the diseased mother for at least 8 weeks, for which the newborn is placed in a specialized department or (according to indications) the child is discharged home to relatives. If the newborn was in close contact with a diseased mother before the introduction of the BCG vaccine (birth of a child outside a medical facility, etc.), vaccination against tuberculosis is not carried out. The child is prescribed a course of chemoprophylaxis for 3 months, and only after that, with a negative reaction to the Mantoux tuberculin test with 2 TU PPD-L, they are vaccinated with the BCG-M vaccine. If the mother of a newborn is diagnosed with tuberculosis after the BCG vaccine has been administered and this was not known to the tuberculosis dispensary, prophylactic treatment for the child is carried out regardless of when the BCG vaccine was administered. Such children are under close observation by the district health department as the group most at risk for tuberculosis.

If a mother with tuberculosis does not excrete mycobacteria and receives antibacterial drugs, contact with the child is not separated, the child is vaccinated,

chemoprophylaxis is not prescribed (because the child receives antibacterial drugs with milk).

For newborns vaccinated in the maternity hospital with the BCG vaccine from mothers with tuberculosis, in whom it was not detected in a timely manner, and who fed the child with milk, it is necessary to observe together with a phthisiatrician and prescribe chemoprophylaxis.

When feeding with milk, it is important to prevent its contamination from infected cattle. If a nanny is hired, she needs to undergo a broad-format fluorography, especially for elderly people.

3. ANTI-TUBERCULOSIS MEASURES AFTER THE BIRTH OF A CHILD AND UNTIL THE AGE OF 1 YEAR

Anti-tuberculosis measures in children under one year of age consist of prevention and early detection in unvaccinated children.

BCG vaccination is used for specific prevention of tuberculosis. BCG vaccination prevents the development of severe, generalized forms of tuberculosis.

3.1. Specific prophylaxis (BCG vaccination, indications, contraindications, consideration of vaccination reaction, complications)

Live mycobacteria of the BCG strain, multiplying in the body, lead to the development of long-term (5–7 years) specific immunity to tuberculosis. Immunity lasts up to 5–7 years, gradually fading, which creates the need for revaccination. The emergence of immunity can be judged by the appearance of a scar at the site of vaccine administration and post-vaccination allergies.

For gentle primary immunization, they use the anti-tuberculosis vaccine (BCG) in dried form for intradermal administration (in a dose of 0.05 mg in 0.1 ml) and the anti-tuberculosis vaccine (BCG-M) in dried form (0.025 mg in 0.1 ml). BCG-M is used for premature newborns weighing 2000 g or more, as well as children who have not received vaccination at the maternity hospital for medical reasons and are subject to vaccination in children's clinics.

Vaccinations are administered out by a specially trained nurse.

In connection with early discharge from obstetric hospitals, in the absence of contraindications, vaccination of newborns against tuberculosis can be carried out from the third day of life, discharge is possible one hour after vaccination if there is no reaction to it. Primary vaccination is carried out in the maternity hospital in the morning in a specially designated room after examining children by a pediatrician. On the day of vaccination, in order to avoid contamination, no other parenteral manipulations

are performed on the child, including examination for phenylketonuria and congenital hypothyroidism. The vaccine is diluted immediately before use (it is allowed to store for 2–3 hours in a place protected from light, then the unused vaccine must be destroyed). The vaccine is administered strictly intradermally at a dose of 0.1 ml at the border of the upper and middle thirds of the outer surface of the left shoulder. With the right technique, a white papule is formed at the injection site, 5–8 mm in diameter. After 15–20 minutes, the papule disappears, and the skin becomes normal. Bandages and disinfectants should not be applied to the injection site.

Children who were born at home should be vaccinated at the same time as other newborns. In this case, the pediatrician of the polyclinic is responsible for organizing the vaccination.

Observation of the vaccinated is carried out by doctors and nurses of the general medical network.

Contraindications for vaccination of newborns with BCG vaccine:

- 1) prematurity grade 2–4 (with birth weight less than 2500 g);
- 2) acute diseases (intrauterine infection, purulent-septic diseases, hemolytic disease of the newborn of moderate and severe form, severe lesions of the nervous system with severe neurological symptoms, generalized skin lesions, etc.). Vaccination is postponed until the disappearance of the clinical manifestations of the disease;
- 3) immunodeficiency state (primary);
- 4) generalized BCG infection detected in other children in the family;
- 5) HIV infection in a child.

For children who are not vaccinated during the neonatal period, after the exclusion of contraindications, the BCG-M vaccine is prescribed.

When in contact with infectious patients in the family, children's institution, etc., vaccinations are carried out at the end of the quarantine period or the maximum incubation period for this disease.

Individuals temporarily exempted from vaccinations should be carefully monitored and documented. They should receive the vaccination once they have fully recovered or once any contraindications have been resolved. Children not vaccinated during the neonatal period receive the BCG-M vaccine, children aged 2 months and older are pre-tested with a Mantoux test 2TU PPD-L and only tuberculin-negative are vaccinated.

Other prophylactic vaccinations can be carried out at intervals of at least 1 month between BCG revaccinations.

Release form. In ampoules containing 0.5 mg (10 doses) or 1.0 mg of the drug (20 doses) packaged with a solvent — 0.9% sodium chloride solution — 1 or 2 ml per ampoule, respectively.

One pack contains 5 ampoules of BCG vaccine and 5 ampoules of 0.9% sodium chloride solution (5 sets). The shelf life of the BCG vaccine is 2 years.

Conditions of storage and transportation. Store the drug at a temperature of 5–8 °C.

Transportation by all means of transport at a temperature of 5–8 °C.

Children weighing 2000 g and above are vaccinated with the BCG-M vaccine.

Contraindications for vaccination of newborns with the BCG-M vaccine include birth weight less than 2000 g (for other contraindications, refer to the BCG guidelines).

Children not vaccinated in the maternity hospital are vaccinated with BCG-M in the clinic for 1–6 months, after recovery. Up to 2 months without a Mantoux test with 2TU, after 2 months the child is vaccinated if the Mantoux test with 2TU is negative (after consulting a phthisiatrician). The interval between the Mantoux test and vaccination is at least 3 days, not more than 2 weeks.

If within 2 weeks the child is not vaccinated, then the test is repeated.

Other vaccinations for a newborn child begin after 1 month after vaccination with BCG (BCG-M), if there is no pustule at the injection site and a crust has formed. In the presence of a pustule, a temporary suspension of vaccinations is prescribed. At a later date, other vaccinations can be carried out at intervals of at least 2 months before and after BCG vaccination. If there are complications from the BCG vaccination, other vaccinations should be temporarily postponed.

Information about vaccination is recorded in the history of the child's development — date, type of vaccination, series, dose and vaccination reactions at 1, 3, 6, 12 months. The same information is duplicated in the «Card of preventive vaccinations» (form 063/y, 026y).

Vaccination reaction. After 4–6 weeks, hyperemia appears at the injection site with a small nodule in the center, sometimes with a pustule, there may be slight necrosis with a slight discharge, then a crust forms.

Healing occurs in the majority of those vaccinated by 4 months, in some — by 6–8 months from the introduction of BCG. At the injection site of the BCG vaccine, most vaccinated people develop a superficial scar 2–10 mm in diameter, while the rest develop a pigmented spot. Mechanical influences during water procedures should be avoided. At the site of intradermal injection of the BCG vaccine, a specific reaction develops in the form of a papule 5–10 mm in diameter.

A normal vaccination reaction is characterized by changes at the BCG vaccine injection site not exceeding 10 mm in diameter and healing within 6–12 months. In some cases, consultation with a phthisiatrician is necessary.

Complications of BCG. Complications after BCG vaccination (BCG-M) are usually local in nature and are relatively rare.

Complications fall into four categories:

- ▶ category 1: inflammatory lesions developed at the site of vaccine administration or in the corresponding regional lymph nodes — infiltrates, abscesses, fistulas, ulcers and regional lymphadenitis;

- ▶ category 2: inflammatory lesions resulting from hematogenous spread of bacteria of the vaccine strain outside the area of vaccine administration:
 - 2-A: local (monofocal) lesions — osteitis and isolated soft tissue abscesses;
 - 2-B: generalized (multiple) lesions with two or more localizations that developed in children without congenital immunodeficiency syndrome:
- ▶ category 3: disseminated BCG infection with multiple organ damage in congenital immunodeficiency;
- ▶ category 4: post-BCG syndrome — allergic diseases that arose after vaccination as a result of specific sensitization: erythema nodosum, granuloma annulare, rash, keloid, uveitis, etc.

Ulceration at the injection site of more than 10 mm, an increase of more than 10 mm in one of the peripheral lymph nodes, or prolonged non-healing of the local vaccination reaction over 6 months are indications for referring the child to a pediatric phthisiatrician for consultation. An additional examination by a pediatric phthisiatrician is also indicated for children with axillary, supraclavicular, subclavian lymphadenitis, detected by chance during an X-ray examination of the chest organs due to a slight enlargement of the lymph node, a «conversion» of tuberculin reactions, hypersensitivity to tuberculin, symptoms of tuberculosis intoxication, frequent colds, the presence of a bone focus, regarded as osteomyelitis, chronic synovitis and arthritis.

Clinical criteria for post-vaccination complications to distinguish them from non-specific lesions are given below.

Lymphadenitis (regional, often axillary, sometimes over- or subclavian, occurs mainly in young children):

- ▶ an increase in lymph nodes to IV («bean»), V («hazelnut») and later — VI («walnut») sizes;
- ▶ consistency of the lymph nodes at first — soft, elastic, later — dense;
- ▶ palpation of the lymph nodes is painless;
- ▶ the skin above them is not changed or pinkish in color;
- ▶ may be accompanied by caseification with a breakthrough of caseous masses outward and the formation of a fistula with moderate or profuse purulent discharge.

The infiltrate develops at the injection site:

- ▶ in the center there may be ulceration, size from 15 to 30 mm — or more;
- ▶ accompanied by an increase in regional lymph nodes.

Cold abscess (scrofuloderma):

- ▶ tumor-like formation without changes in the skin over it;
- ▶ palpation is painless, fluctuation is determined in the center;
- ▶ often accompanied by a reactive enlargement of axillary lymph nodes;
- ▶ ulceration (in case of untimely diagnosis of a cold abscess and its spontaneous opening).

Ulcer (defect of the skin and subcutaneous fat at the injection site):

- ▶ the size of the ulcer is from 10 to 20–30 mm in diameter (its edges are undermined, the infiltration around is weakly expressed, the bottom is covered with abundant purulent discharge).

Keloid scar (a tumor-like formation at the injection site of various sizes, rising above the level of the skin). Unlike a scar that forms during the normal course of the vaccine process, a keloid has:

- ▶ dense, sometimes cartilaginous texture;
- ▶ in the thickness of the keloid there are capillaries that are clearly visible during examination;
- ▶ the shape of the scar is round, elliptical, sometimes stellate;
- ▶ the surface is smooth, glossy;
- ▶ color from pale pink, intense pink with a bluish tinge to brownish;
- ▶ accompanied by a feeling of itching in its area, pain is added to the itching.

Osteitis is a disease of the bone system (the clinical picture corresponds to the disease). The criteria for assuming a post-vaccination etiology of the process are the child's age from 6 months to 1 year and the localization of the disease focus.

The presence of complications of BCG vaccination is a contraindication for the following revaccinations.

Children who are not vaccinated with BCG in the maternity hospital are given a Mantoux test with 2TU once every 6 months.

3.2. Features of the diagnosis of tuberculosis in young children

In young children, tuberculosis is more likely to occur:

- ▶ in contact with a person discharging bacteria (familial);
- ▶ unvaccinated children;
- ▶ in debilitated children;
- ▶ in children from families with poor material and living conditions.

When identifying symptoms similar to tuberculosis, with «masks» of tuberculosis (protracted and recurrent respiratory diseases, frequent acute respiratory viral infections, fever of unclear etiology, etc.), they are sent for an extraordinary examination to a phthisiatrician.

4. ANTI-TUBERCULOSIS MEASURES IN CHILDREN FROM 1 YEAR TO 14 YEARS OLD

Anti-tuberculosis measures consist of:

- a) early detection of tuberculosis;
- b) prevention-revaccination and chemoprophylaxis;
- c) identification of risk groups for tuberculosis.