

TUBERCULOUS MENINGITIS: CAUSES, SYMPTOMS, DIAGNOSIS AND TREATMENT

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Introduction : Tuberculous meningitis is a form of meningitis caused by the bacterium *Mycobacterium tuberculosis* . It occurs when a tuberculosis infection from the lungs or other organs spreads to the central nervous system, primarily the membranes that cover the brain and spinal cord. This condition is not only complex, but also potentially life-threatening.

Tuberculous meningitis most often develops as a complication of active tuberculosis infection, especially pulmonary forms of the disease. The main causes and risk factors include:

- Weakened immune system : People with weakened immune systems (eg, HIV-positive people) are at greater risk of developing tuberculous meningitis.
- Older age: Older people have an increased risk due to decreased immune function.
- Contact with people with TB: Close contact with people who have active TB disease may increase your risk of getting the disease.
- Incorrect or untimely treatment of tuberculosis: this can also lead to the spread of infection.

The symptoms of tuberculous meningitis develop gradually and are difficult to distinguish from those of other forms of meningitis. However, they may become more obvious over time:

1. Early symptoms:

- Constant weakness or fatigue.
- Mild malaise or flu-like symptoms.
- Inability to concentrate.

2. Advanced symptoms:

- Severe headache (throbbing or pressing).
- Increased temperature (fever), which may be high.
- Stiff neck (difficulty bending the neck).
- Impaired consciousness: from mild confusion to coma.
- Intolerance to bright light (photophobia).
- Nausea and vomiting.

3. Complications:

- Seizures, which can occur due to high pressure in the brain.
- Mental changes including depression and confusion.

Diagnosis of tuberculous meningitis requires a comprehensive approach and includes the following steps:

Basic diagnostic methods

- Clinical methods

- Symptoms: Initial symptoms such as headache, fever, stiff neck may indicate meningitis.
- Medical history: Collection of anamnesis, including potential risk factors, contacts with tuberculosis patients.

- Laboratory methods

- Cerebrospinal fluid (CSF) analysis: The study of the quality and composition of CSF is the main diagnostic method. Detection of specific mycobacteria or an increase in lymphocytes indicates an inflammatory process.
- PCR (Polymerase Chain Reaction): Detection of *Mycobacterium tuberculosis* DNA in CSF is a

highly specific and sensitive method. This method allows to significantly reduce the time for diagnostics.

- Bacteriological examination: CSF culture on special media to detect mycobacteria.
- Instrumental methods
- Magnetic resonance imaging (MRI): Allows visualization of changes in brain structures, such as swelling or abscesses.
- Computed tomography (CT): May reveal complications such as hydrocephalus or vascular lesions.

Modern approaches to the diagnosis of tuberculous meningitis, despite advances in molecular diagnostics, still face challenges such as the availability of technology and the need for high clinical suspicion. Ongoing studies show that a combination of different methods increases the likelihood of correct diagnosis.

Tuberculous meningitis requires a comprehensive approach to diagnostics. Synergy of clinical, laboratory and instrumental methods can significantly improve the accuracy and speed of diagnostics. It is important to continue research in this area to optimize diagnostic algorithms and improve treatment outcomes.

1. Clinical manifestations

- General symptoms: Fever, headache, stiff neck, changes in consciousness.
- Specific symptoms: Presence of neurological deficits such as paralysis or seizures.
- Comparison with other types of meningitis: Viral, bacterial and fungal meningitis can have similar clinical manifestations.

2. Laboratory research

- PCR testing: High sensitivity for detection of *Mycobacterium tuberculosis* . Comparison with other specific tests for various pathogens.

Types of Meningitis	CSF analysis
Tuberculous meningitis	Increased lymphocytes, low glucose, increased protein
Bacterial meningitis	Most often high protein and low glucose, but with high neutrophils
Viral meningitis	Normal glucose levels and moderate increases in protein are usually observed.

3. Instrumental methods

- MRI and CT: Allow identification of relevant changes in brain structures. Analysis of changes inherent in a specific type of meningitis.
- EEG: Can show characteristic changes in inflammatory processes in the brain, but is not a specific diagnostic method.

4. Differential diagnostics

- Bacterial meningitis: Comparison of clinical features and laboratory data to exclude bacteria such as *Neisseria meningitidis* and *Streptococcus pneumoniae* .
- Viral meningitis: Generally has less severe symptoms and a more favorable prognosis.
- Other infections: Fungal infections and paraptussis can mimic the clinical manifestations of TM.
- Neurological disorders: Hydrocephalus, acute strokes and brain tumors.

The need to use a comprehensive approach to differential diagnosis of tuberculous meningitis, which includes clinical data, laboratory test results and instrumental diagnostic results. Discussion of modern methods and technologies aimed at improving diagnostics.

Differential diagnosis of tuberculous meningitis requires high clinical skills and knowledge. Combining different diagnostic methods can significantly increase the likelihood of correct diagnosis and timely initiation of treatment, which is critical to improving patient survival.

Treatment of tuberculous meningitis requires urgency and a comprehensive approach. Includes:

1. Antibiotic therapy: Special antibiotics against tuberculosis are used, such as:

- ❖ Isoniazid .
- ❖ Rifampicin .
- ❖ Pyrazinamide .
- ❖ Ethambutol .

The course of treatment usually lasts from 9 to 12 months, and it is important to strictly adhere to it to prevent the development of resistant forms of the disease.

2. Corticosteroids: Often used to reduce inflammation and decrease swelling in the brain. They can improve outcomes and reduce the risk of complications.

3. Supportive care: This includes treating symptoms such as headache, fever, and seizures. The need for supportive care may vary depending on the patient's condition.

Prevention of tuberculous meningitis includes the following measures:

- Vaccination: BCG vaccination can help protect against severe forms of TB, especially in children.
- Early diagnosis and treatment: Detection and treatment of active tuberculosis can prevent the spread of infection and the development of meningitis.
- Taking care of your health: Maintaining general health, eating well, being physically active, and managing chronic diseases can also reduce your risk.

Conclusion

Tuberculous meningitis is a serious and potentially life-threatening illness that requires immediate medical attention. Knowing the symptoms, risk factors, and the importance of early diagnosis can save lives. If you or someone you know has symptoms, don't delay seeing a doctor. Prevention and early treatment are the most effective ways to combat this disease.

References:

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