

MODERN DIAGNOSTIC METHODS FOR PYELONEPHRITIS IN CHILDREN

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Abstract

Pyelonephritis is an inflammatory process in the pelvic part of the kidneys, often caused by infections. The article reviews the process in detail, from clinical signs to laboratory tests and imaging methods. Laboratory methods such as urinalysis, blood tests, and urine culture are used to detect infection. Imaging methods such as ultrasound and computed tomography (CT) are used to more accurately determine the inflammatory processes in the kidneys

Keywords

pyelonephritis, diagnostics, laboratory analyses, ultrasonography, computed tomography (CT), infection, inflammation, differential diagnosis.

Introduction:: Pyelonephritis is an inflammation of the kidneys, usually caused by bacterial infections. This disease damages the kidney tissue, mainly through inflammatory processes, and can reduce kidney function.

Reasons

Pyelonephritis develops mainly for the following reasons:

- Bacterial infection: The most common cause is the bacteria *E. coli* (*Escherichia coli*). Other bacteria (e.g. *Klebsiella*, *Proteus*) can also cause infection.
- Urinary tract blockage: Obstructions in the urinary tract (such as stones or tumors) can lead to infection.

Signs

Symptoms of pyelonephritis include:

- High fever (above 39 °C)
- Severe back pain
- Stomach ache
- Blood or pus in the urine
- Pain or difficulty urinating
- Fatigue and general weakness

There are two main types of pyelonephritis:

- Acute pyelonephritis is an inflammation of the kidney tissue, usually caused by a bacterial infection. This condition mainly affects the renal tissue and pelvis (the inner part of the kidney). Symptoms of acute pyelonephritis may include:

1. Very severe abdominal pain: Usually in the lower back and lower abdomen.
2. High temperature: can be above 38°C.
3. Esophagus: Headache, muscle pain, and general discomfort.
4. Bleeding or spotting from the hole: Sometimes there is blood in the urine or pain when urinating.

Acute pyelonephritis usually requires prompt treatment because it can lead to serious complications, such as kidney abscesses or sepsis. Treatment options usually include antibiotics and sometimes other medications.

- Chronic pyelonephritis is an inflammation of the kidneys, usually caused by long-term or recurring infections. This condition mainly causes persistent inflammation and damage to the kidney tissue, which can lead to a decrease in kidney function. The main causes of chronic pyelonephritis are:

1. Recurrent infections: Urinary tract infections that persist or recur over a long period of time.
2. Anatomical abnormalities: Structural problems in the urinary tract (e.g., obstruction of urine flow).
3. Diabetes: Diabetes can weaken the kidneys.
4. Other diseases: Autoimmune diseases or other inflammatory diseases.

Signs:

Symptoms of chronic pyelonephritis can be variable and sometimes very vague. They may include:

- Lower back pain
- Pain or discomfort when urinating
- Frequent urination
- Blood in the urine or nausea
- General fatigue and malaise

Treatment:

To treat chronic pyelonephritis, doctors usually recommend antibiotics, anti-inflammatory medications, and other methods to address the problem. If there are anatomical problems, surgery may be necessary.

Modern diagnostics of pyelonephritis in children includes many important stages. Each method has its own significance, and together they help to diagnose the disease and develop a treatment plan. Let's take a closer look at each diagnostic method:

1. Medical history and symptom assessment

The doctor will carefully review the child's medical history, including any previous illnesses, family history, and current symptoms (such as fever, back pain, changes in urination). At this stage, the doctor will determine if the child has any signs that are typical of pyelonephritis.

2. Physical examination

During a physical examination, the doctor will perform a thorough physical examination of the child, pressing on the abdomen and lower back to detect any back pain or other discomfort. At this stage, the doctor will try to rule out other conditions.

3. Urinalysis

A urinalysis is performed to determine if your child has signs of infection (e.g., bacteria, inflammatory cells, blood). The urinalysis also evaluates the pH, specific gravity, and other parameters of the urine.

4. Urine culture

Urine culture is important for identifying the microorganisms causing the infection. This method can determine the sensitivity of the identified microorganisms to antibiotics, which helps in developing the right treatment plan.

5. Blood tests

Blood tests are done to measure markers of inflammation (such as C-reactive protein or white blood cell count) and to assess kidney function. Elevated levels of inflammatory markers may indicate the severity of the infection.

6. Ultrasonography (USG)

Ultrasound can be used to view the structure and condition of the kidneys. This method is useful in detecting obstructions (such as stones) or other abnormalities in the kidneys. USG is a non-invasive method and is considered safe for children.

7. Computed tomography (CT) or magnetic resonance imaging (MRI)

If the ultrasound results are inconclusive or additional information is needed, a CT scan or MRI may be performed. These methods provide high-resolution images and help to see the inflammatory process in the kidneys in more detail.

8. Renalogram

A renogram is used to assess kidney function. This method uses radioisotopes to measure the blood supply and filtration process of the kidneys, which helps determine the effects of inflammation.

These diagnostic methods are important in the detection and treatment of pyelonephritis in children.

Differential diagnosis of pyelonephritis in children is important to exclude other diseases and make a correct diagnosis. When diagnosing pyelonephritis, the following conditions should be considered:

1. Urinalysis (UTR)

- Leukocytes: Indicates an inflammatory process.
- Erythrocytes: To detect the presence of blood in the urine.
- Bacteria: To detect infection.
- Protein: Signs of kidney dysfunction or inflammation.

2. Urine culture

- Urine culture to identify microorganisms. This method identifies bacteria and their sensitivity, which helps in choosing the right antibiotics.

3. Blood tests

- Complete blood count (CBC):
 - Leukocyte count: May indicate the presence of infection.
 - Hemoglobin and hematocrit: To detect anemia or blood loss.
- C-reactive protein (CRP): Indicates the level of inflammation.
- Creatinine and urea: To assess kidney function.

4. Serological tests

- In some cases, serological tests may be performed to rule out autoimmune diseases.

5. Digital ultrasonography (DUS)

- This analysis helps to determine the condition of the kidneys, as well as the presence of stones or other pathologies.

6. Computed tomography (CT) or magnetic resonance imaging (MRI)

- In complex cases, additional imaging modalities may be performed if ultrasonography is not sufficient.

7. Bladder and urethra examination

- Sometimes, a urethroscopy or cystoscopy may be performed to rule out urethritis or other urinary tract pathologies .

These laboratory tests help to identify pyelonephritis and differentiate it from other diseases. In each case, the doctor selects the necessary tests to make an accurate diagnosis.

Treatment of pyelonephritis depends largely on the severity of the disease, its causes, and the patient's general condition. The following main areas of treatment are considered:

1. Antibiotics

- To treat infection: Pyelonephritis is usually caused by a bacterial infection, so antibiotics are the main treatment. The doctor may prescribe broad-spectrum antibiotics, depending on the patient's condition.

- Drug selection: When selecting antibiotics, the sensitivity of the bacteria is taken into account based on the results of urine culture.

2. Pain management

- Analgesics: Analgesics (such as paracetamol or ibuprofen) may be recommended to reduce pain.

3. Fluid intake

- Hydration: It is important to increase the patient's fluid intake, which will stimulate urination and help relieve the infection.

4. Hospital treatment

- Severe cases: If the patient's condition is severe or if antibiotics are not effective, hospitalization may be necessary. In this case, intravenous antibiotics and other additional treatments may be administered.

5. Create convenience

- Rest and relaxation: Proper rest and creating comfortable conditions are important to improve the patient's condition.

6. Additional treatment

- If pyelonephritis is associated with other conditions (such as urinary tract stones), they may also need to be treated.

7. Prevention

- Preventing future infections: Depending on the patient's condition, the doctor may prescribe prophylactic antibiotics.

When treating pyelonephritis, it is important to always follow your doctor's instructions and take the prescribed medications correctly. If the patient's symptoms worsen or new symptoms appear, it is important to consult a doctor immediately.

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