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## PREGNANT PYELONEPHRITIS

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**Resume:**Data on the etiology, pathogenesis, clinic, diagnosis and treatment of acute pyelonephritis in pregnant women are presented. The role of restoring urine outflow from the kidney in the treatment of pregnant women with acute obstructive pyelonephritis is emphasized. The tactics of managing pregnant women with acute pyelonephritis are proposed.

**Резюме :**Приведены данные об этиологии, патогенезе, клинике, диагностике и лечению острого пиелонефрита у беременных. Подчеркивается роль восстановления оттока мочи из почки при лечении беременных с острым обструктивным пиелонефритом. Предлагается тактика ведения беременных с острым пиелонефритом.

**Rezyume:**Ushbu maqolada homilador ayollarda o'tkir pielonenfritning etiologiyasi, patogenezi, klinikasi, diagnostikasi va davolash bo'yicha ma'lumotlar keltirilgan . Obstruktiv pielonefrit bilan homilador ayollarni davolashda buyrakdan siydik oqimini tiklashning roli ta'kidlangan obstruktiv pielonefrit bilan. O'tkir pielonefrit bilan homilador ayollarni boshqarish taktikasi taklif etiladi.

**Key words:**pyelonephritis ,pregnancy, kidneys, antibiotics, intrauretral infections , urodynamics, dysuria.

**Relevance:**Pyelonephritis is the most common kidney disease in pregnant women. Acute pyelonephritis occurs in 12% of pregnant women, more often during the first pregnancy, usually in the second half of it (in most cases at 20-26 weeks). Pyelonephritis adversely affects the course of pregnancy and the condition of the fetus. Late gestosis is associated with at least 40% of patients with pyelonephritis, especially chronic ones. Miscarriage in this category is 30% due to premature birth. Perinatal mortality is 25-50%. Newborns are more susceptible to postpartum purulent-septic diseases. Exacerbation of chronic pyelonephritis should be considered as acute inflammation. In pregnant women and women who give birth, pyelonephritis with a chronic course should be regarded as gestational, regardless of when it is detected.

**Physiological changes in the genito-urinary tract during pregnancy**

Any pregnancy is accompanied by functional changes in the urinary system. Due to increased filtration and reduced reabsorption of water and sodium, polyuria appears, and diuresis returns to normal between 13 and 28 weeks of pregnancy, followed by oliguria. The retention of sodium and water in the body is associated not only with a decrease in glomerular filtration, but also with an increase in renal tubular reabsorption. A significant expansion of the pelvic system and ureters is characteristic of pregnancy, which begins in the first trimester, reaches a maximum in the fifth to eighth months and remains for 12-14 weeks after delivery. Urodynamic changes are more pronounced in primiparous women due to the greater elasticity of the abdominal wall. In the expanded cup-pelvis system, instead of 3-5 ml of urine, up to 150 ml or more of the so-called "residual urine" accumulates.

The ureters bend in a loop in the upper third, reaching a diameter of 20-30 mm, and in the lower sections deviate from the midline outwards, forming an "arc". The mechanism of its formation is quite simple: the pelvic sections of the ureters shift along with the peritoneum, with which they are closely connected. The distal ends of the ureters are inactive due to the development of connective tissue in the vesicovaginal septum, which fixes them with the cervix. The changes are more often pronounced on the right side, as the uterus tends to deviate in this direction during pregnancy.

The asymmetry of the lesion is to some extent related to the unequal bending of the ureters through the iliac vessels. The right ureter crosses the arteries and veins at an almost right angle, and the left one first crosses the artery and then the vein. The reason for the more frequent changes in the urinary tract on the right is explained by the varicose veins of the ovarian veins crossing and compressing the ureter at the level of the I sacral vertebra and the great mobility of the right kidney and a short renal vein, which makes it difficult to pass urine. You should also pay attention to the fact that the upper urinary tract on the left is protected from pressure enlarged uterus with sigmoid colon.

### Pathogenesis

Cavernous vascular formations located in the intramural part of the ureters also play a role in the pathogenesis of ureterohydronephrosis. During pregnancy, they swell, which causes compression of the ureters and impaired tone. The mucous membrane of the ureters becomes edematous, the muscular membrane becomes hypertrophied, and the process extends to the parochial space. These changes are approximately the same as in the muscles of the uterus and vagina, but in this case hypertrophy is combined with dilation of the ureters. And, Finally, an overflowing bladder as a result of the formation of an acute angle at the confluence of the ureters makes it difficult for urine to flow out of the upper urinary tract and thus contributes to their expansion. Pregnant women experience rarer contractions of the ureters (every 5-15 seconds, and normally after 3-5 seconds), which is clearly visible during cystoscopy. Hormonal factors are also important in the violation of the urodynamics of the upper urinary tract. As the amount of hormones increases, especially follicular hormones, the renal pelvis and ureters expand. Hormones have an inhibitory effect. the effect on the ureters reduces the amplitude and frequency of contractions, as well as weakens muscle tone.

**The hormonal effect** on the body is exerted by the maternal surface of the placenta. After removal of the placenta, dilation of the urinary tract disappears. The excess of hormones in the blood serum in pregnant women coincides with the occurrence of urodynamic disorders of the upper urinary tract and the development of pyelonephritis. In the third trimester of pregnancy, the placenta begins to secrete large amounts of estrogens, progesterone, and glucocorticoids. Estrogens promote the growth of bacteria pathogenic to the urinary organs, such as E. coli. The influence of the mechanical factor prevails at the sixth to seventh month of pregnancy, when the uterus extends beyond the small pelvis, and stops by the 5th to 7th day after delivery, when it returns to its usual place. However, it should be noted that, despite the pronounced bilateral ureterohydronephrosis, most pregnant women have no subjective symptoms. In extremely rare cases, complete ureteral obstruction occurs during pregnancy. Hormonal and toxic factors are the main cause of changes in the ureters in pregnant women, and mechanical moments only exacerbate this condition.

As a result, the urodynamics of the ureter is disrupted and conditions for the development of reflux are created. These same factors affect the function of the bladder. At the same time, dysuric phenomena occur in 20-25% pregnant women appear in the first weeks of pregnancy, i.e. when the uterus does not exert mechanical pressure on the bladder. Urination can be difficult, and sometimes incontinence and even urinary retention occur. Women almost always have an indentation of the

posterior wall of the bladder caused by the uterus, even unchanged in size, which can be seen during cystoscopy. During pregnancy, the depression increases, bringing the bladder closer to the pubic symphysis. The cystoscopic picture varies depending on the duration of pregnancy. Changes in the bladder are noticeable already in the first 3-4 weeks of pregnancy, but they are especially pronounced by 10-12 weeks. As a result of venous congestion, swelling of the mucous membrane of the urethra develops, spreading to the bladder. During the entire period of pregnancy, the mucous membrane of the bladder is swollen. It loses its usual luster, which is associated with hyperemia of the abdominal and pelvic organs, and separate areas of hemorrhage are visible. In the last months of pregnancy, there is an abundance of veins in the form of sinuous varicose veins, especially in the area of the urinary triangle. The intervertebral fold is hypertrophied, and the mouths of the ureters are swollen and gaping.

Sometimes a rupture of the dilated veins of the bladder is possible, and then hematuria occurs, and it can be so intense that it poses a danger to the life of a pregnant woman. The volume of the bladder increases from the fourth month, reaching a maximum by the eighth month of pregnancy (500-800 ml), and its tone decreases. Sometimes up to 2000 ml of urine accumulates in the bladder. An overflowing bladder moves the uterus upward, preventing it from contracting after childbirth, which may be the cause of atonic bleeding. Women in labor and childbirth often have residual urine. Urinary stasis increases the susceptibility of the urinary tract to infection, and spontaneous ruptures of the bladder are extremely rare.

Changes during pregnancy also occur in the urethra. Already in the first half of pregnancy, the urethra, especially its external opening, becomes swollen, with a cyanotic tinge. Venous congestion spreads to the bladder, ureters, and even to the calyx-pelvis system. The uterus, performing the pelvic cavity, presses the bladder sphincter against the pubic symphysis, and the urethra lengthens and changes its shape. direction. At the same time, its diameter increases by 1 1/2-2 times, the angle of the vesicourethral segment is smoothed, and symptoms of urinary incontinence appear, which are especially common in those who have risen in price.

During childbirth, urination is difficult because the urethra is elongated and narrowed. The above-mentioned changes in a normally developing pregnancy are functional in nature. The onset of pregnancy is accompanied by changes in a woman's immune status. An immunodeficiency develops, which worsens with the threat of termination and miscarriage. Therefore, the susceptibility of a pregnant woman to infectious diseases is very high. In addition, latent diseases (including pyelonephritis) often worsen during pregnancy. This increases the frequency of complications of pregnancy and childbirth, and adverse outcomes for the fetus and newborn.

Prolonged use of drugs that suppress ovulation is considered predisposing to pathology if the pH of vaginal secretions changes to 5.5-7.0. Biological protection against infections with such pH values is reduced. *Candida albicans*, *E. coli*, *proteus*, and fecal streptococcus grow better in such an environment. After prolonged use of combinations of estrogens and progestogens, severe urinary tract infections and dilated ureters are observed. Secondary pathogenetic factors It can be attributed to the presence of asymptomatic bacteriuria in 5-10% of pregnant women, which is explained by a decrease in the protective properties of urine in relation to pathogenic flora. True bacteriuria is considered to be such a degree when 1 ml of urine contains at least 100,000 microbes. Bacteriuria stops in 30% of women in labor, in another 30% after treatment, and in 40% it remains after childbirth and may eventually cause chronic pyelonephritis.

### **Causative agents of acute gestational pyelonephritis**



The causative agents of pyelonephritis in pregnant women are conditionally pathogenic microorganisms. *E. coli* is seeded in 36-88% of pregnant women and causes sclerosis of the renal pelvis, peri-renal fiber and kidney capsule. *Proteus* (5-20%) breaks down proteins with its enzymes and urea with the formation of ammonia and other substances that damage the cells of the epithelium of the kidneys and ureters. This infection causes the formation of stones and has a recurrent course. *Klebsiella*, *enterococcus*, *streptococcus* groups D and B, *Staphylococcus* and *micrococcus* are also sown from the urine of pregnant women. Inflammation in the kidneys can also be caused by *Candida*, *Mycoplasma hominis*, *Ureaplasma urealyticum*, *Trichomonas vaginalis*, anaerobic bacteria. Monomicrobial urinary infection prevails in the first-time pregnant, and mixed bacterial flora prevails in the second-time pregnant. Pregnant women who were previously hospitalized and treated with antibiotics may develop nosocomial infection. The appearance or exacerbation of pyelonephritis occurs more often in 22-28 weeks of pregnancy, when the levels of sex hormones and corticosteroid hormones increase sharply. This period is critical for pregnant women with a history of pyelonephritis.

### The clinical picture

MON begins with an increase in temperature to 38-40°C, chills, headache, pain in the extremities. Pronounced signs of intoxication are accompanied by lower back pain, which increases with breathing, and radiation along the ureters, into the groin, hip, and labia. Pasternatsky's symptom is positive. Frequent painful urination usually occurs. In some cases, the temperature rises to subfebrile levels without chills. If the disease progresses, intoxication is accompanied by tachycardia (up to 120-140 beats/min), headache, weakness, adynamia, icteric sclera, nausea, vomiting. In 25% of cases, symptoms of bacterial toxic shock are associated with a drop in blood pressure, sudden pallor, acrocyanosis, and confusion. In severe pyelonephritis, signs of renal and hepatic insufficiency with azotemia, severe jaundice appear. When the process spreads to the paranephral tissue, a symptom of tension of the muscles of the anterior abdominal wall appears, soreness in the hypochondrium and tension of the muscles of the lumbar region.

### Diagnostics

Palpation examination of the kidneys is not informative due to the enlarged uterus. X-ray and radionuclide research methods are contraindicated. Ultrasound scanning has the greatest advantages during pregnancy, which makes it possible to simultaneously assess the condition of the mother's kidneys and the condition of the fetus. This method allows you to identify the expansion of the abdominal cavity. kidney systems, urinary tract calculi, as well as changes in the amniotic tissue. Ultrasound scanning of the urinary system should be the first step in the diagnosis of pyelonephritis in pregnant women. Laboratory examination of urine determines bacteriuria and leukocyturia. Proteinuria can be minor, microhematuria and slight cylindruria are possible. Macrohematuria is a poor prognostic sign and often indicates the destruction of the papilla of the kidney- necrotizing papillitis. In general blood tests, leukocytosis with a shift in the leukocyte formula is detected. To the left, the appearance of young forms of neutrophils, their toxic granularity, aneosinophilia, a moderate decrease in hemoglobin levels, and a significant increase in ESR are noted.

In the severe course of the disease, with damage to both kidneys and the development of renal and hepatic insufficiency, azotemia and hyperbilirubinemia appear in the blood. It is mandatory to culture urine for sterility and determine sensitivity to antibiotics before starting antibacterial therapy. Excretory urography is used in extreme situations: bilateral kidney damage, unclear anatomical and functional condition of the opposite kidney, and in cases where a woman's life is in question.

### Treatment of gestational pyelonephritis

The features of the treatment of pyelonephritis in pregnant women are determined by the fact that it always has urodynamic disorders and the possibility of toxic effects of drugs on the fetus. The impossibility of X-ray examination requires the widespread use of ultrasound diagnostics, which is currently the main method of examination.

Modern treatment approaches include:

- ◆ restoration of urine passage with examination of its microflora and sensitivity to antibiotics
- ◆ intensive antibacterial, infusion and detoxification therapy, taking into account possible adverse effects on the fetus
- ◆ installation of a stent Dynamic monitoring by a urologist and an obstetrician-gynecologist
- ◆ Stent replacement after 1-1.5 months or earlier as indicated

In cases where there is no urodynamic disorder according to ultrasound data, it is sufficient for the patient to stay in a position on her healthy side with the foot end of the bed raised or positional drainage therapy and antibacterial treatment, but most often at the time of admission to the hospital, patients have a pronounced clinical picture of acute pyelonephritis, requiring urgent restoration of urine passage using inserting a ureteral catheter into the renal pelvis and leaving it for 2-3 days, with subsequent replacement with an internal stent. It is possible to install a stent immediately at 38-39 weeks of pregnancy, when there is a risk of labor or delivery is required for medical reasons. Heavy drinking, physical therapy, and immunomodulators are usually contraindicated. Vitamin E reduces the tone of the ureters, so its use in pregnant women with pyelonephritis, if there is no threat of miscarriage, is undesirable.

### Possible complications of kidney stenting

Antegrade introduction:

- ◆ Under the bladder mucosa in the mouth area
- ◆ Perforation of the ureter wall in the area of intersection with the iliac vessels
- ◆ Intraluminal loop bend Retrograde introduction:
- ◆ Perforation of the ureter wall in the middle and upper cystoids
- ◆ Perforation of the pelvis, peritoneum
- ◆ Perforation of the kidney parenchyma
- ◆ Insertion of the stent to the site of obstruction

Prolonged standing of the stent is a factor that provokes stone formation! In cases where intensive conservative treatment for 2-3 days does not lead to a decrease in intoxication and relief of acute pyelonephritis, surgical intervention should be undertaken – drainage of the kidney through cutaneous nephrostomy, and in the absence of necessary equipment and trained specialists – nephro- or pyelostomy with decapsulation of the kidney. Timely surgery can prevent the development of severe purulent process in the kidney, and pregnancy ends with urgent normal delivery in the presence of

nephropyllostoma. Nephrostomy drainage should be maintained after delivery until urinary tract tone is restored (4-6 weeks). Termination of pregnancy at the height of the pyelonephritis attack is impractical.

**Antibacterial therapy** The choice of antibacterial drugs, in addition to general criteria, is determined by the peculiarity of their pharmacokinetics in the body of the mother and fetus, the ability to penetrate the placenta and have a damaging effect on the embryo and fetus, and the duration of pregnancy. It is known that the highest risk of the manifestation of embryotoxic and teratogenic effects of drugs is noted in the first 3-10 weeks of pregnancy. Semi-synthetic penicillin analogues are used for treatment: oxacillin, ampicillin, ampiclox, carbenicillin, amoxicillin clavulanate and others. These drugs are used in large doses of 2 grams 4-6 times a day. In pregnant women with severe forms of pyelonephritis, powerful combined antibacterial therapy is used. The complex of treatment uses drugs of the cephalosporin and aminoglycoside series. Metrogil is applied intravenously by drip. Currently, initial therapy begins with the use of amoxicillin clavulanate. Treatment begins with intramuscular injection, and then the drug is administered orally. Cefuroxime crosses the placenta, but there is no evidence of its embryotoxic or teratogenic effect. Cefotaxime has not been studied in terms of safety in pregnant women, but no teratogenic effects have been found in animals. Ceftriaxone should not be prescribed to pregnant women, especially in the first 3 months of pregnancy, unless there are absolute indications for this, although preclinical studies have not revealed any mutagenic or teratogenic effects of the drug. In the postpartum period, treatment is carried out by the same means as during pregnancy.

Treatment of gestational pyelonephritis should be long-term. If the treatment is carried out for only two weeks, the recurrence rate is up to 60%. For long-term treatment, nitrofurantoin preparations (oral nitrofurantoin) are used, which after the 2nd month of pregnancy in a daily dose of 50-100 mg rarely cause side effects and can be used before the onset of labor.

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