# Renal Changes in Pregnancy

## Topic- based Uworld Questions

Block 1, 2, 7, 8

A 28-year-old woman, gravida 1 para 0, at 34 weeks gestation comes to the emergency department due to sudden-onset lower abdominal pain. The patient initially had intermittent flank pain over the past 4 days that improved with acetaminophen. For the last 2 hours, she has had excruciating pain in the right flank that radiates to her groin. She has had some irregular contractions but no vaginal bleeding or leakage of fluid. Fetal movement is normal. Her pregnancy has been uncomplicated, and she has no chronic medical conditions. Temperature is 37.5 C (99.5 F), blood pressure is 130/86 mm Hg, and pulse is 98/min. Fetal heart rate tracing shows a baseline of 155/min, moderate variability, multiple accelerations, and no decelerations. Tocodynamometer reveals irregular contractions every 7-15 minutes. There is tenderness to palpation over the right flank and right inguinal region. The uterus is nontender and the cervix is closed. Urinalysis shows moderate blood but is negative for white blood cells, leukocyte esterase, and nitrites. Which of the following is the best next step in management of this patient?

A. 24-hour urine collection for protein
B. Betamethasone and indomethacin
C. CT scan of the abdomen and pelvis
D. Laparotomy and cesarean delivery
E. Ultrasound of the kidneys and ureters

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- A. 24-hour urine collection for protein (0%)
- B. Betamethasone and indomethacin (2%)
- C. CT scan of the abdomen and pelvis (2%)
- D. Laparotomy and cesarean delivery (1%)
- ✓ E. Ultrasound of the kidneys and ureters (92%)

Omitted
Correct answer
E

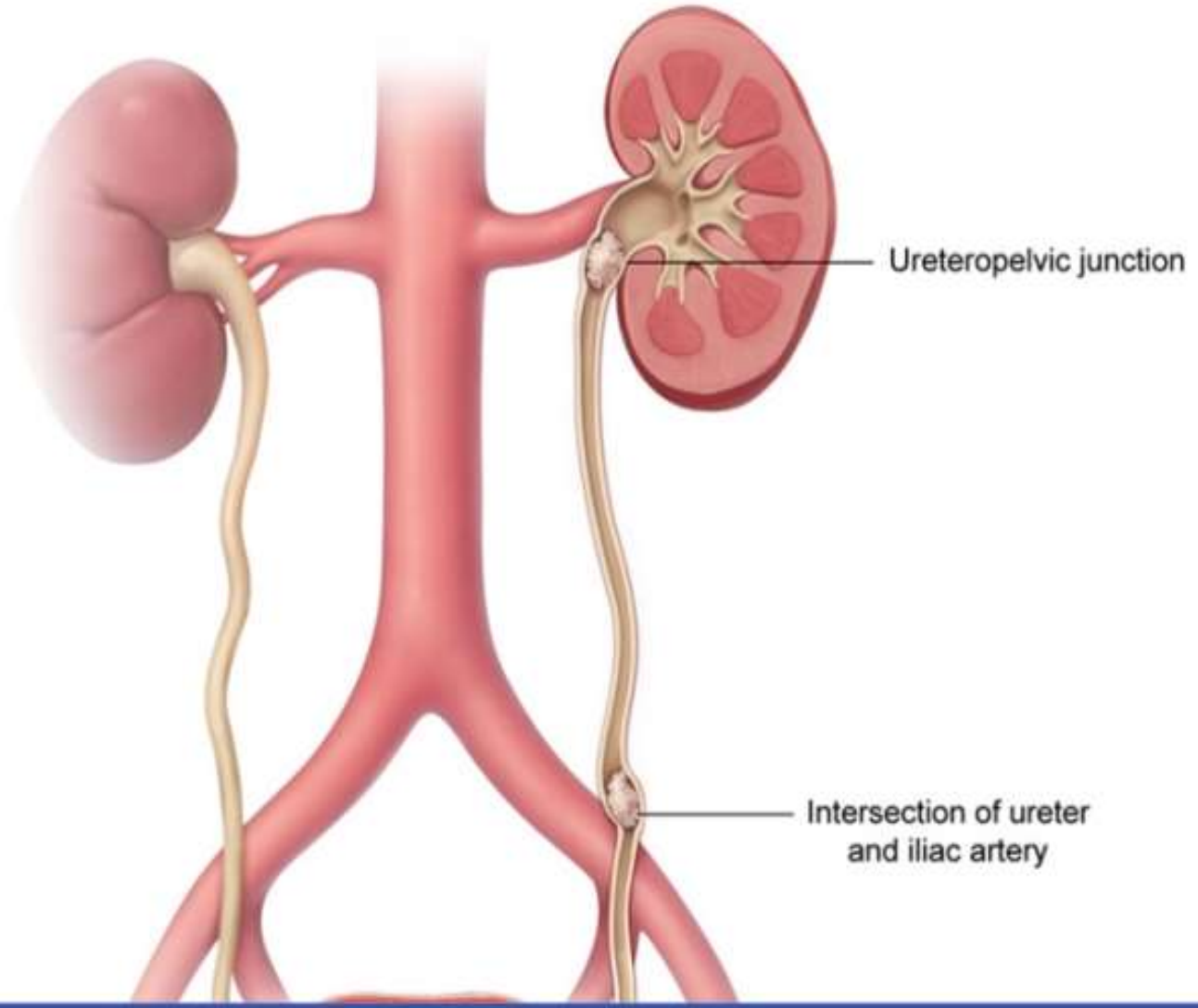
92%
Answered correctly

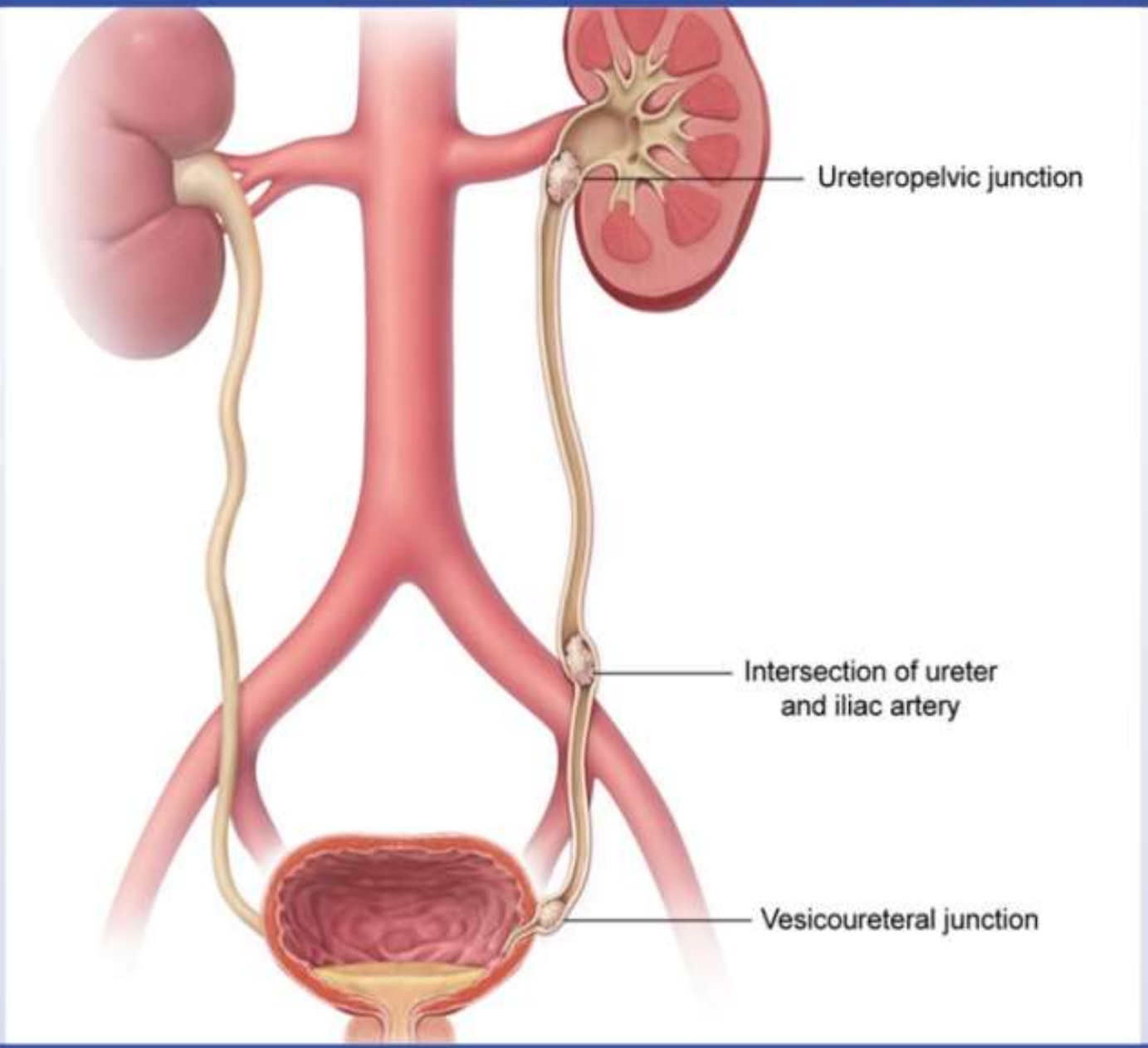
02 secs
Time Spent

04/04/2020
Last Updated

Explanation

## Likely locations of ureteral obstruction




Ureteropelvic junction
Intersection of ureter and iliac artery
Vesicoureteral junction

This patient most likely has **symptomatic nephrolithiasis** (ie, kidney stones). Nephrolithiasis typically occurs during the second and third trimesters because pregnancy causes progesterone-induced urinary stasis and increases urinary calcium excretion. As the stone travels the course of the ureter, it causes intermittent obstruction (eg, **intermittent flank pain that radiates to the groin**) and epithelial damage (eg, **hematuria**). Some patients develop irregular contractions due to the proximity of the uterus to the inflamed ureter.

Most patients with suspected nephrolithiasis undergo CT scan of the abdomen and pelvis; however, during pregnancy, this imaging may expose the fetus to radiation. Although the highest risk of fetal injury is in the first trimester, radiation should be limited throughout pregnancy to avoid fetal complications (eg, microcephaly, growth restriction). Therefore, pregnant women with suspected nephrolithiasis undergo **ultrasound of the kidney and ureters** because of the **low risk of fetal radiation exposure**.

Treatment is supportive (eg, pain control, hydration) because most stones pass spontaneously. Patients with complicated nephrolithiasis (eg, sepsis, obstruction) may require additional management with cystoscopy and possible stent placement.

**(Choice A)** A 24-hour urine collection for protein is used to evaluate for preeclampsia as a measure of end-organ damage. This patient does not have preeclampsia because her blood pressure is normal for pregnancy (ie, <140/90 mm Hg).

**(Choice B)** Betamethasone, a corticosteroid used to promote fetal lung maturity, and indomethacin, a tocolytic, are administered to patients in preterm labor (ie, regular, painful contractions that cause cervical dilation). Although nephrolithiasis can cause preterm labor, this patient has irregular contractions and a closed cervix. In addition, indomethacin is contraindicated after 32 weeks gestation due to the risk of premature closure of the fetal ductus arteriosus.

**(Choice C)** CT scans are relatively contraindicated in pregnancy because of the risk of fetal radiation exposure. Limited low-dose CT scans may be considered in the second and third trimesters if safer imaging modalities (eg, ultrasound, MRI) are nondiagnostic.

**(Choice D)** Laparotomy and cesarean delivery are performed in patients with possible abruptio placentae or uterine rupture (ie, uterine tenderness, fetal distress). This patient has a nontender uterus and a reassuring fetal heart rate tracing (eg, moderate variability, accelerations).

**Educational objective:**
Nephrolithiasis typically presents with flank pain that radiates to the groin and hematuria. Ultrasound of the kidneys and ureters is used for diagnosis during pregnancy because of this modality's low risk of fetal radiation exposure.

A 38-year-old woman, gravida 5 para 4, at 10 weeks gestation comes to the office for an initial prenatal visit. She feels well and has no concerns. The patient takes prenatal vitamins and has a history of type 2 diabetes mellitus that is currently managed with insulin. She has no vaginal bleeding or pelvic pain. The patient reports no urinary urgency, hematuria, or dysuria. She does not use tobacco, alcohol, or illicit drugs. Temperature is 36.7 C (98.1 F) and blood pressure is 130/80 mm Hg. BMI is 29 kg/m$^2$. The fetal heart rate is 155/min on Doppler ultrasound. Physical examination shows no abnormalities. A clean-catch urine culture from today's visit grows >100,000 colony-forming units/mL of *Escherichia coli*. Which of the following is the best next step in management?

- A. Amoxicillin-clavulanate
- B. Ciprofloxacin
- C. Doxycycline
- D. No additional treatment or workup indicated
- E. Trimethoprim-sulfamethoxazole

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- ✓ A. Amoxicillin-clavulanate (64%)
- B. Ciprofloxacin (10%)
- C. Doxycycline (1%)
- D. No additional treatment or workup indicated (5%)
- E. Trimethoprim-sulfamethoxazole (17%)

Omitted
Correct answer
A

64%
Answered correctly

02 secs
Time Spent

01/06/2020
Last Updated

Explanation

| Asymptomatic bacteriuria | |
|---|---|
| **Definition** | • ≥100,000 CFU/mL bacteria |

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|---|---|
| **Definition** | • ≥100,000 CFU/mL bacteria |
| **Risk factors** | • Pregestational diabetes mellitus<br>• History of urinary tract infection<br>• Multiparity |
| **Common pathogens** | • *Escherichia coli* (most common)<br>• *Klebsiella*<br>• *Enterobacter*<br>• Group B *Streptococcus* |
| **First-line treatment** | • Cephalexin<br>• Amoxicillin-clavulanate<br>• Nitrofurantoin<br>• Fosfomycin |

CFU = colony-forming units.

**Asymptomatic bacteriuria** (ASB) is the growth of ≥100,000 ($10^5$) colony-forming units/mL of a single bacteria from a clean-catch urine specimen in the absence of urinary tract infection symptoms. Prepregnancy diabetes mellitus, as in this patient, is a risk factor. Screening and treatment for ASB is typically not performed in the general population because it does not decrease the rates of symptomatic infection or adverse outcomes. In contrast, **pregnant women** have an **increased risk of pyelonephritis** and complications (eg, **preterm delivery**, low birth weight) associated with ASB. This is likely related to progesterone-induced smooth muscle relaxation (ie, ureteral dilation, valve laxity) that allows bacteria to ascend to the upper urinary tract.

Therefore, all pregnant patients are screened for ASB at the initial prenatal visit. Patients whose screening urine cultures are positive require antibiotic therapy **(Choice D)**. The most common pathogen is *Escherichia coli*, as in this patient. First-line antibiotic therapy includes **cephalexin**,

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Therefore, all pregnant patients are screened for ASB at the initial prenatal visit. Patients whose screening urine cultures are positive require antibiotic therapy **(Choice D)**. The most common pathogen is *Escherichia coli*, as in this patient. First-line antibiotic therapy includes **cephalexin**, **amoxicillin-clavulanate**, or **nitrofurantoin**. A repeat urine culture (ie, test of cure) is performed after antibiotic completion to ensure clearance of the bacteriuria.

**(Choice B)** Fluoroquinolones (eg, ciprofloxacin) are contraindicated in pregnancy due to the potential association with fetal bone deformities and arthropathy.

**(Choice C)** Doxycycline and other tetracycline antibiotics are contraindicated in pregnancy because they interfere with fetal bone and tooth development. Children exposed to tetracycline in utero can also develop gray discoloration of the teeth.

**(Choice E)** Trimethoprim-sulfamethoxazole is safe in the second trimester but contraindicated in the first (eg, 10 weeks) because it interferes with folic acid metabolism, which is critical to early fetal development. It is also contraindicated in the third trimester due to the risk of neonatal kernicterus.

**Educational objective:**
All pregnant patients are screened and treated for asymptomatic bacteriuria at the initial prenatal visit due to the risk of acute pyelonephritis and complications (eg, preterm delivery, low birth weight) associated with untreated asymptomatic bacteriuria. The most common pathogen is *Escherichia coli*. First-line antibiotics include cephalexin, amoxicillin-clavulanate, or nitrofurantoin.

**References**

- Asymptomatic bacteriuria in pregnancy.

A 30-year-old woman, gravida 3 para 1 aborta 1, at 26 weeks gestation comes to the office for evaluation of increased vaginal discharge that started yesterday. She now changes her pad every hour and has noticed some spotting. Her initial prenatal visit was 2 weeks ago, and laboratory evaluation revealed a positive urine culture. The patient has not started her antibiotics because she has no symptoms. Her last delivery was 2 years ago via term cesarean delivery for recurrent late fetal decelerations. Vital signs are normal. The abdomen is soft, and the uterus is nontender. On speculum examination, there is pooling of clear, nitrazine-positive fluid in the vagina; the cervix is visibly closed. Fetal heart rate tracing shows a baseline of 150/min, accelerations, and no decelerations. There are irregular contractions on tocodynamometry. Transabdominal ultrasound shows an anterior placenta and an amniotic fluid index of 3 cm. Which of the following most likely contributed to this patient's presentation?

- A. Asymptomatic bacteriuria
- B. Maternal age
- C. Multiparity
- D. Placenta location
- E. Previous spontaneous abortion
- F. Prior cesarean delivery

Submit

A 30-year-old woman, gravida 3 para 1 aborta 1, at 26 weeks gestation comes to the office for evaluation of increased vaginal discharge that started yesterday. She now changes her pad every hour and has noticed some spotting. Her initial prenatal visit was 2 weeks ago, and laboratory evaluation revealed a positive urine culture. The patient has not started her antibiotics because she has no symptoms. Her last delivery was 2 years ago via term cesarean delivery for recurrent late fetal decelerations. Vital signs are normal. The abdomen is soft, and the uterus is nontender. On speculum examination, there is pooling of clear, nitrazine-positive fluid in the vagina; the cervix is visibly closed. Fetal heart rate tracing shows a baseline of 150/min, accelerations, and no decelerations. There are irregular contractions on tocodynamometry. Transabdominal ultrasound shows an anterior placenta and an amniotic fluid index of 3 cm. Which of the following most likely contributed to this patient's presentation?

- ✓ A. Asymptomatic bacteriuria (72%)
- B. Maternal age (0%)
- C. Multiparity (4%)
- D. Placenta location (4%)
- E. Previous spontaneous abortion (10%)
- F. Prior cesarean delivery (7%)

Omitted
Correct answer
A

72%
Answered correctly

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Time Spent

05/29/2020
Last Updated

Explanation

| Preterm prelabor rupture of membranes (PPROM) | |
|---|---|
| **Definition** | • Membrane rupture at <37 weeks prior to labor onset |
| **Risk factors** | • Prior PPROM<br>• Genitourinary infection (eg, ASB, BV)<br>• Antepartum bleeding |
| **Diagnosis** | • Vaginal pooling or fluid from cervix<br>• Nitrazine-positive (blue) fluid<br>• Ferning on microscopy |
| **Management** | • <34 weeks (reassuring): latency antibiotics, corticosteroids<br>• <34 weeks (nonreassuring): delivery<br>• ≥34 weeks: delivery |
| **Complications** | • Preterm labor<br>• Intraamniotic infection<br>• Placental abruption<br>• Umbilical cord prolapse |

**ASB** = asymptomatic bacteriuria; **BV** = bacterial vaginosis; **PPROM** = preterm prelabor rupture of membranes.

This patient at 26 weeks gestation has a pool of nitrazine-positive vaginal fluid and a closed cervix, consistent with **preterm prelabor rupture of membranes (PPROM)**. Risk factors include prior PPROM; conditions that overdistend the membranes (eg, polyhydramnios); and conditions that inflame or weaken the membranes, such as antepartum bleeding, genital tract infection (eg, bacterial vaginosis, gonorrhea), or **asymptomatic bacteriuria**.

Due to the proximity of the bladder, perineum, and rectum, bacteria from one source can migrate readily to another; this is particularly common in

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Due to the proximity of the bladder, perineum, and rectum, bacteria from one source can migrate readily to another; this is particularly common in pregnancy with bladder infections (even if asymptomatic), as the bacteria can spread to the vagina and uterus. As bacteria spreads to the uterus, the **intrauterine bacterial enzymatic activity** may cause **contractions** (by stimulating prostaglandin release) or **increase membrane fragility** (by degrading collagen or activating inflammatory cytokines), resulting in either preterm labor or PPROM.

Due to these risks, all patients require urine culture screening at their initial prenatal visit, and high-risk patients (eg, age <25) undergo sexually transmitted infection screening. Those who screen positive require timely treatment and repeat cultures after treatment (ie, test of cure) to reduce risks of persistent infection.

**(Choice B)** Extremes of maternal age (eg, age <17 or >35) are associated with preterm labor and PPROM; this patient is age 30.

**(Choice C)** Multiparity is associated with precipitous labor and increased risk for postpartum hemorrhage, not PPROM.

**(Choice D)** Patients with placenta previa can have antepartum bleeding with an increased risk of PPROM, likely due to blood causing inflammation and focal weakening of the fetal membranes. This patient has an anterior placenta, which is not a risk factor for PPROM. Her light spotting is likely the result of her rupture of membranes, but such spotting is unlikely to cause PPROM.

**(Choice E)** Previous cervical surgeries or uterine procedures (eg, multiple dilations and evacuations) are associated with preterm delivery. Previous spontaneous abortion is not associated with PPROM or preterm delivery.

**(Choice F)** Prior cesarean delivery increases the risk of abnormal placentation (eg, placenta accreta), not PPROM, in subsequent pregnancies.

**Educational objective:**
Genitourinary tract infection, particularly asymptomatic bacteriuria, is a risk factor for preterm prelabor rupture of membranes. Therefore, universal urine culture screening, timely treatment, and reculturing for test of cure are recommended in pregnancy.

**References**