

Case Based Learning Program

**The Department of Urology
Glickman Urological & Kidney Institute
Cleveland Clinic**

Case Number 7

Case Based Urology Learning Program

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A 32-year-old pregnant woman presents to the ER with right sided flank pain. Renal US shows right hydronephrosis.

What is the differential diagnosis?

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Although the same differential for hydronephrosis and flank pain exist for pregnant versus non-pregnant women (intrinsic or extrinsic obstruction, reflux, congenital, etc.), physiologic hydronephrosis is another common consideration during pregnancy. One of the most significant genitourinary tract changes in pregnancy is dilation of the upper urinary tracts, which occurs by the 7th week of gestation in up to 90% of pregnant women and may persist for 6 weeks postpartum. This physiologic hydronephrosis is thought to result from both hormonal and mechanical factors. The expanding uterus directly compresses the ureters, whereas progesterone inhibits ureteral smooth muscle contraction, causing further ureterectasis. Ureteral dilation is more pronounced on the right side because of dextrorotation of the uterus, whereas the left ureter is more protected from compression by the gas filled sigmoid colon.

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Physiological hydronephrosis typically is more impressive on the right side and generally terminates at the pelvic brim. If the hydroureteronephrosis extends below the pelvic brim, distal ureteral obstruction should be considered. Of course, other findings such as an echogenic density with associated shadowing can also be very helpful.

Imaging suggests physiologic hydronephrosis.

How is this managed?

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Occasionally, physiologic hydronephrosis may be painful requiring analgesia, or may be relieved by positioning the patient on her left side. Ureteral stent or nephrostomy tube placement may be necessary if symptoms persist; however, hydronephrosis is a normal physiological finding during pregnancy and if asymptomatic or only minimally symptomatic, intervention is not warranted.

The patient is found to have a SCr level of 0.4 mg/dL (her baseline SCr is 0.8 mg/dL).

What is causing this change and is there clinical relevance?

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Pregnancy is associated with increased cardiac output and decreased systemic vascular resistance. This leads to a concomitant increase in renal plasma flow and enhanced glomerular filtration rate (GFR). In some studies, GFR has been shown to increase 40%-65% in comparison with pre-pregnancy values. The increased GFR results in a decrease in average SCr levels from 0.8 to 0.5 mg/dL during pregnancy. Therefore, the renal excretion of certain medications may be affected and SCr values that would otherwise be considered normal, such as SCr = 1.0 mg/dL, may indicate renal dysfunction during pregnancy.

The flank pain resolves with conservative measures and you see the patient in clinic 2 weeks later. Her urinalysis (UA) shows bacteriuria, but she is asymptomatic.

Should this be treated?

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Because of the risk of acute pyelonephritis with associated complications for the mother and fetus, current guidelines recommend that all pregnant women be screened at approximately 16 weeks of gestation for bacteriuria. Asymptomatic bacteriuria is defined as the presence of $>10^5$ colony forming units (CFU) of a single pathogen per milliliter of urine in a properly collected specimen without concomitant symptoms. However, bacterial counts as low as 10^2 CFU should also be considered significant in pregnant women and treated appropriately.

The rate of progression of asymptomatic bacteriuria to symptomatic infection is 3-4 times higher during pregnancy, which is thought to result from the various anatomic and physiological genitourinary changes associated with pregnancy. Acute pyelonephritis occurs in 1%-4% of pregnant women, and up to 20%-40% of women with untreated asymptomatic bacteriuria will develop pyelonephritis.

Which antibiotics can be used during pregnancy and which are contraindicated?

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Contraindicated: flouoroquinolones, erythromycin, chloramphenicol, tetracycline

Use with caution:

Nitrofurantoin: risk of fetal anemia in the 3rd trimester in G6PD deficient mothers

Aminoglycosides: risk of fetal ototoxicity or nephrotoxicity, but often used for serious infections such as acute pyelonephritis

Sulfonamides: risk of neural tube defects related to anti-folate metabolism in 1st trimester, risk of fetal anemia in G6PD deficient mothers

Trimethoprim: risk of neural tube defects related to anti-folate metabolism in 1st trimester

Safe in pregnancy: penicillins and cephalosporins

Are pregnant women at increased risk
of stone disease?

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No, their risk of stone disease does not change appreciably. On the one hand, hypercalciuria occurs commonly in pregnancy, primarily due to increased intestinal calcium absorption as well as increased renal calcium filtration. However, rates of stone formation remain unchanged, because levels of inhibitory factors for stone production such as citrate, magnesium, and glycoproteins are also increased.

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Imaging pregnant women presents significant diagnostic challenges because of the potential risks of ionizing radiation to the developing fetus. Radiation exposure to the fetus is more damaging during the first trimester, during rapid cell division and organogenesis; however intrauterine exposure during the second and third trimesters may also produce adverse effects.

Generally, abdominal ultrasonography (US) is the preferred first-line imaging modality for pregnant women for the evaluation of hydronephrosis or nephrolithiasis. Unfortunately, US in pregnancy is limited by physiological hydronephrosis and poor visualization of the ureters, and its success is highly operator dependent. US has a limited sensitivity of 34%-95% to detect stones in pregnant women. Computed tomographic imaging is generally avoided in pregnancy because of the high radiation exposure involved. However, low-dose or ultra-low-dose CT renal stone protocols have recently been developed with radiation doses comparable to the “3-shot” IVP. If results from US are inconclusive and further imaging is necessary, adjunctive imaging with a 3-shot IVP, MR urogram, or a low-dose CT protocol can be considered in select cases.

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In several series, up to 64%-70% of patients studied passed stones spontaneously during pregnancy, and 50% of remaining patients passed their stones in the postpartum period. As most pregnant patients with acute stone episodes do not require intervention, conservative therapy with analgesia and hydration is often the preferred first-line management. However, the safety of medical expulsive therapies during pregnancy such as calcium channel blockers or alpha blockers has not been established.

Temporary urinary drainage in pregnant patients with ureteral obstruction can be achieved with ureteral stent or percutaneous nephrostomy placement, often requiring inpatient admission to allow for intravenous hydration and fetal monitoring. Retrograde ureteral stent placement may be performed under local anesthesia using ultrasound guidance, or under general anesthesia along with limited fluoroscopy. However, indwelling ureteral stents may worsen irritative lower urinary tract symptoms and rapid stent encrustation is common in pregnancy. Therefore, ureteral stents should be changed every 4-8 weeks in pregnant patients.

What definitive therapies are there for symptomatic stone disease during pregnancy?

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Absolute and relative indications for surgical intervention in pregnancy are similar to those in non-pregnant women, including intractable pain, nausea, vomiting, febrile urinary tract infections, obstructive uropathy, acute renal failure, sepsis, and obstruction of a solitary kidney.

Definitive therapies for the management of stone disease during pregnancy are somewhat limited. Shock wave lithotripsy is contraindicated, and percutaneous stone extraction is not advised because of the need for extended fluoroscopy times and patient positioning. However, ureteroscopy has been shown to be safe and effective in the treatment of nephrolithiasis in all trimesters of pregnancy, with stone-free rates of 70%-100%. Therefore, ureteroscopy is considered one of the first-line approaches in the management of symptomatic stone disease in pregnancy. Physiological hydroureteronephrosis facilitates passage of the ureteroscope within the ureter and lithotripsy can then be performed.

Selected Reading

Thomas AA, Thomas AZ, Campbell SC: Urologic Emergencies in Pregnancy. *Urology* 2010;76:453-60.

Topic:

Miscellaneous

Subtopics:

Urologic Problems During Pregnancy:
Hydronephrosis, Nephrolithiasis, UTI