Imaging evaluation of pregnant patients with acute non-traumatic abdominal pain: An evidence-based approach

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Purpose

To identify the etiology of the pain and to exclude the possibility of a life-threatening condition in pregnant patients with acute non traumatic abdominal pain.
Study/Project design

A literature search of English-language articles from 1970 to September 2009, using PubMed (National Library of Medicine, Bethesda, Maryland) was performed.

The search strategies employed different combinations of the following terms: acute abdomen, pregnancy, acute non traumatic conditions, pregnant women.

Additional articles were identified by reviewing the reference lists of relevant papers.

The authors performed an initial review of the titles and abstracts of the identified articles followed by review of the full text of articles that were relevant.
Results

In the pregnant patient presenting with acute non traumatic abdominal pain, the appropriate work up is frequently controversial. In an effort to obtain the most diagnostic information, the efficacy of multiple modalities and the corresponding radiation doses to the fetus will be explored. In the abdomen, acute cholecystitis, appendicitis, urinary tract infection, urinary stones, inflammatory bowel disease, HELLP syndrome, ovarian torsion, ovarian vein thrombosis and neoplasm have been recognized (1).

Computed Tomography is usually the imaging technique of choice for patients presenting with acute abdominal pain. Performing CT on pregnant women causes anxiety for all concerned because of the potential harm to the fetus from radiation exposure (2). The risks to the developing fetus are quite small, particularly in the third trimester. The accepted cumulative dose of ionizing radiation during pregnancy is 5 rad (50 mGy), and no single diagnostic study exceeds this maximum (3,4). Radiation-induced teratogenesis is primarily a concern from the tenth to 17th weeks of gestation when the central nervous system is developing. The fetal malformations most commonly caused by high-dose radiation during this time include microcephaly and mental retardation (5).

Radiation-induced malignancies especially leukemia can be caused at any point during gestation requiring exposure as little as 1 or 2 rad to cause a slight increase in incidence (6).

There is a need for a rapid, reliable, safe, and cost-effective test for the evaluation of the acute non traumatic abdomen in pregnancy.

1) What is the accuracy of ultrasonography for diagnosing the etiology of the acute non traumatic abdominal pain in pregnant patients?

Initially, investigation with sonography is preferred, particularly if acute appendicitis or renal colic is clinically suspected. The American College of Radiology has recommended the use of MR over CT in pregnant patients with suspected acute appendicitis, when the US is non-diagnostic or equivocal (7-13). Appendicitis occurs at a rate of 0.07-0.18% during pregnancy (14,15). The accuracy of the ultrasound diagnosis of appendicitis during pregnancy depends on the trimester, with better results earlier in pregnancy (16). Ultrasound is highly user-dependent and in the third trimester is more difficult to perform due to the enlarged uterus and displacement of the appendix. For an obese patient at any gestational age, CT provides the most information (17). MRI may offer another option (18).

In pregnant patients with clinical signs and symptoms of renal obstruction there is no compelling published evidence that intravenous urography, plain film, and sonography or
helical CT is the preferred test. Pregnant patients routinely have right hydronephrosis as the enlarging uterus turns slightly to the right, compressing the ureter. Fast MR urography is a relatively new development, with some limitations in delineating extrinsic vs intrinsic obstruction due to low spatial resolution (19).

Pregnant women have been shown to have higher rates of gallstone formation than non-pregnant women of the same age (20-21). Ultrasound is the study of choice for the pregnant woman with suspected acute cholecystitis. An MR cholangiogram may be of value in the assessment of common bile-duct stones.

Pancreatitis has an incidence range during pregnancy between 1:1,434 and 1:3,333 (22). Ultrasound visualization of the pancreas is limited in patients with a large body habitus and in those with substantial amounts of overlying bowel gas. Therefore, the role of ultrasound is limited to the exclusion of gallstones as the etiology of pancreatitis and to follow pseudocysts (23).

Ovarian torsion is another disease more common in pregnant women than in the general female population (24). Adnexal torsion remains a difficult diagnosis. Sonographic demonstration of the absence or presence of flow cannot be the sole determinant. A small retrospective review over an 8-year period reported a 60% miss rate using Doppler ultrasound. While absence of blood flow suggests torsion (25) and probable nonviability, blood flow can be present in ovarian torsion (26). Assessment of ovarian volume, an associated mass, and pelvic fluid may help establish the diagnosis.

2) What is the accuracy of magnetic resonance imaging for diagnosing the etiology of the acute non traumatic abdominal pain in pregnant patients?

Magnetic Resonance imaging is increasingly used in pregnant patients. It has been shown to be accurate for the diagnosis of acute appendicitis (10,11) and may potentially be of benefit in demonstrating the site of transition in bowel obstruction and identifying areas of inflammation, abscess formation, or hemorrhage within the abdomen and pelvis (27,28). Although no adverse effects of MR imaging on the fetus have been documented, the safety of MR imaging on the fetus have been documented, the safety of MR imaging with respect to the fetus has not been established and should be delayed, when possible, until the second or third trimester (29,30). Current radiology practices and recommendations discourage the use of gadolinium-based contrast agents during pregnancy because their safety for the fetus has not yet been proven. Intravenous gadolinium is teratogenic in animal studies, albeit at high and repeated doses. In line, however, with the European Society of Radiology guidelines and based on the available evidence, gadolinium-based contrast agents appear to be safe in pregnancy. Gadolinium use should be considered when the diagnostic study is important for the health of the mother (31,32).
Discussion

Summary of Evidence:

Although ultrasonography is considered the first imaging study of choice for evaluation of abdominal pain during pregnancy, MRI offers the advantage of multiplanar imaging, excellent soft tissue contrast, no ionizing radiation, and can be used to make a wide variety of diagnoses in the acute setting, including appendicitis, abscess formation, hemorrhage, bowel obstruction and pelvic tumors. In pregnant patients with hydronephrosis MR urography can demonstrate the site of obstruction and the cause.
Conclusions

Acute abdominal pain in pregnant patients presents a difficult diagnostic challenge.

During pregnancy the risk of radiation exposure to the fetus is increased so that more than the usual benefit is necessary to justify the use of Computed Tomography or plain film than in non-pregnant patients.

The first method of choice in the assessment of the acute non traumatic abdominal pain in pregnant patients is ultrasonography.

The intrinsic safety of MRI and its ability to accurately diagnose abdominal and pelvic disease in pregnant patients may it highly useful in the evaluation of these patients.
References


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