Acute Appendicitis in Pregnancy: a Diagnostic and Management Challenge

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ABSTRACT

Acute appendicitis is the most common extra-uterine surgical emergency encountered during pregnancy, but an accurate diagnosis is still an enigma. Anatomical shifting of the appendix by the enlarging uterus makes the clinical and sonographic diagnosis difficult. Prompt diagnosis and treatment are essential to prevent perforation, which increases the risk of fetal and maternal death. Surgical intervention, either by an open laparotomy or laparoscopy is the most appropriate treatment for appendicitis. This article reviews the epidemiology, clinical diagnosis, investigation, complications and treatment of acute appendicitis in pregnancy.

KEYWORDS: Appendicitis, pregnancy, epidemiology, diagnosis, investigation, treatment

INTRODUCTION

Acute appendicitis was first diagnosed in 1886,[1] and it is by far the most common extra-uterine surgical emergency encountered during pregnancy.[2] The aetiology and pathogenesis of it is not known although many theories have been proposed; including mechanical obstruction of the appendiciel lumen, breakdown of the mucosal barrier of the appendix due to direct invasion of a pathogen, and the inflammatory response triggered by pathogens or other stimuli.[3] The diagnosis and management of acute appendicitis in pregnancy can be a challenge because of the non-classical clinical presentation and the complications of a perforated appendicitis which carries a high rate of maternal and fetal death. Thus, achieving an accurate diagnosis and starting early treatment are crucial to prevent complications. This article reviews the epidemiology, clinical diagnosis, investigations, complications and treatment of acute appendicitis in pregnancy.

EPIDEMIOLOGY

Acute appendicitis can occur at any time during pregnancy, although it occurs most often during the second trimester (45%) and 30% during the first trimester and the remaining 25% in the third trimester[4]. The overall incidence being 0.15 to 2.10 per 1000 pregnancies.[4,5] A study done in Sweden showed that there is an inverse relation between pregnancy and appendicitis, suggesting that pregnancy protects against appendicitis, especially during the last trimester[3]. Maternal deaths are rare in cases of simple appendicitis but increases to 2% with advanced pregnancy and perforated appendicitis while fetal mortality ranges from 0-1.5% in cases of simple appendicitis to 20-35% in perforated appendicitis.[5]

CLINICAL DIAGNOSIS

Generally, the diagnosis of acute appendicitis is a clinical one based on a thorough history and clinical examination. However, it may be difficult to diagnose in pregnant women due to the physiological and anatomical changes that occur during pregnancy. This is because the symptoms such as nausea, vomiting, anorexia, and abdominal discomfort are similar to those of pregnancy itself.[1,2,4,6] Also, the appendix is superiorly and laterally displaced by the enlarging uterus, thus, pushing it away from Mc Burney's point. Clinical studies have shown that 84% of pregnant women presenting with appendicitis have pain at the right lower quadrant though it is reported that the appendix can also be displaced into the right upper quadrant.[4]

In addition to this, rebound tenderness and guarding of the abdominal wall are less commonly elicited during examination due to the laxity of the abdominal wall muscles during pregnancy; whereas a positive classical obturator, psoas and Rovsing signs are y encountered in less than one-third of patients.[1] Fever, hypotension, and tachycardia are also unreliable and may not be present during pregnancy.[1,2,4]

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DIFFERENTIAL DIAGNOSIS

Both obstetrical or gynaecological conditions and non-obstetrical or non-gynaecological conditions may present with abdominal pain and can mimic appendicitis. The following are possible differential diagnoses:

Obstetrical and Gynaeological	Non-Obstetrical & Gynaecological
• Ectopic pregnancy	• Urinary tract infection
• Miscarriage (early gestation)	• Acute cholecystitis
• Twisted or ruptured ovarian cyst	• Gastroenteritis
• Pelvic inflammatory disease	• Right ureteric colic
• Preterm labour (advanced gestation)	• Right pyelonephritis
• Placental abruption	• Perforated peptic ulcer
• Degenerating uterine leiomyoma	• Mesenteric adenitis

INVESTIGATION

Blood tests, particularly the white blood cell count (WBC) is usually done to confirm or exclude the suspected appendicitis in patients with right lower quadrant pain. However, it may not be helpful and reliable in pregnant women as leukocytosis (WBC count as high as 16000/μL) and bandemia (immature WBC) are normal physiological alterations during pregnancy. Furthermore, not all pregnant women with appendicitis have leukocytosis.[6] C-reactive protein (CRP) can also be used but is unreliable.[1,2] Diagnostic imaging may be considered in doubtful cases. Ultrasonography (USG) has been used for investigation of right lower quadrant pain in gynaecological patients for many decades. It can also visualize the inflamed appendix. Some of the features noted during ultrasonography are: appendix measures more than six mm or more in diameter, thickening of the appendiceal wall, and presence of peri-appendiceal fluid or faecolith. The USG is therefore a very useful tool to diagnose appendicitis in pregnancy due to its high sensitivity (75-90%) and specificity (75-100%),[7] is relatively cheap, fast and noninvasive.[8] However, as the pregnancy advances, the diagnosis becomes more difficult because of the shift in the position of the appendix.

In the West, helical computed tomography scanning (CT scan) is becoming popular as a tool to diagnose appendicitis because of its accuracy, but it is definitely contraindicated in pregnancy especially in the first trimester because of the radiation exposure.[1,7] Another imaging tool that is useful to diagnose appendicitis is the magnetic resonance (MRI). A report in the United States proved a definitive diagnosis of perforated appendicitis in a second-trimester pregnant woman but the long-term effects of the static magnetic field to the fetus is still not known.[7]

COMPLICATION

In acute appendicitis, the most severe complication is perforation of the appendix. In pregnancy, the percentage of perforated appendix can be as high as 43%, compared to 19% in the general population.[9,10] The risk of perforation also increases with gestational age,[11,12] in which the incidence of perforated appendix is highest during third trimester.[13]

Perforation of the appendix causes escape of its contents into the abdominal cavity. This can lead to peritonitis, miscarriage, preterm labor and fetal or maternal death.[10,13,14,15,16] According to various studies, perforated appendix increases the rate of preterm contraction and preterm labor.[16,17] However, the risk of preterm labor is highest in the first week after surgery5 and suggests that preterm contraction can be a result of both the appendicitis itself and the complications of surgery.

For the fetus, appendicitis is associated with a fetal loss risk of 1.5% to 9%, however the risk increases up to 35% after perforation.[15,18,19]

Maternal mortality has also been reported; however, the rates are much lower, ranging from 0 to 2%.[11,15,18,20]

TREATMENT

As soon as acute appendicitis is diagnosed, early surgical intervention is recommended. Studies have shown that surgery within 24 hours has a relatively lower rate of appendix perforation.[5,6] After 36 hours of onset of symptoms the rate of perforation is between 16% and 36%. It was also noticed that the risk of perforation increases 5% for every subsequent 12-hour period.[21] Therefore, once the diagnosis of acute appendicitis is made, appendectomy should be carried out immediately.[6]

Most patients are given broad-spectrum antibiotics preoperatively, which are proven to decrease post-operative wound infection and abscess formation.[22] Due to the potential risk of teratogenesis, the second

generation cephalosporins are normally used before operation.[23] Besides being used as prophylaxis, it is also used in treatment of perforation, peritonitis and gangrenous appendix.[24] Cephalosporins are used in combination with metronidazole in complicated perforated appendicitis.[15]

To relieve the symptoms, analgesics and tocolytic agents are used occasionally.[6] Like antibiotic, the concern of analgesic usage is a risk of teratogenesis. Furthermore, it may also cloud the clinical picture and lead to a wrong diagnosis.[25] Tocolytic agents are used to prevent uterine irritation.[15,18] However, its effectiveness has not been proven.[15,18]

SURGERY

Open surgery and laparoscopy are surgical techniques used in treating appendicitis. The appendix is accessed through an open Lanz incision, which is typically made through McBurney's point.26 This method has the main advantage of better visualization of the peritoneum, shorter operating time, less exposure of the fetus to carbon dioxide, less risk of a pneumoperitoneum and lower costs.4,6 As the exposure of carbon dioxide is less in open surgery than in laparoscopy and the long-term effects of the exposure to the gas are not certain, open surgery is believed to be better and generally preferred over the laparoscopic method in the late second and third trimester.[27]

Although laparoscopy was initially contraindicated in pregnancy,[14] recent studies have shown that it is well tolerated by mother and fetus throughout the period of pregnancy.[28,29,30] The main concern of the laparoscopic method is the use of carbon dioxide to create a pneumoperitoneum. This exposes the fetus to carbon dioxide, increases intra abdominal pressure, which can lead to preterm labor, decrease uterine blood flow and cause fetal acidosis.[14,31] The placing of a primary port or Veress needle can also injure the fetus and cause a pneumoamnion.[4] However, due to recent advances in laparoscopic technique, there are a few advantages of laparoscopy over open surgery. Among them are a decrease incidence of wound infection, less postoperative pain, less narcotic use and a lower risk of ileus.[3] Studies have also shown that it is associated with a reduced hospital stay, early mobilization, reduced risk of thromboembolism, reduce the risk of an incisional hernia and less fetal depression secondary to pain and narcotic use.[6]

CONCLUSION

Acute appendicitis is a common cause of an acute abdomen in a pregnant patient. Due to the potential harm to the fetus and mother, appendicitis must be ruled out in any pregnant women presenting with an episode of abdominal pain. The diagnosis of appendicitis in pregnancy is mainly clinical. Therefore, it requires high level of suspicion, skills and experience. Several investigations can assist in diagnosis. Early diagnosis and management must be made to avoid complications. Surgery remains the mainstay of treatment in acute appendicitis regardless of the choice of surgical techniques.

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