

# Appendicitis During Pregnancy with a Normal MRI

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Abdominal pain frequently represents a diagnostic challenge in the acute setting. In pregnant patients, the gravid abdomen and concern for ionizing radiation exposure further limit evaluation. If undiagnosed, appendicitis may cause disastrous consequences for the mother and fetus. We present the case of a pregnant female who was admitted for right lower quadrant abdominal pain. Advanced imaging of the abdomen and pelvis was interpreted to be either indeterminate or normal and a diagnosis of acute appendicitis was made on purely clinical grounds. This patient's management and a literature review of diagnostic techniques for acute appendicitis during pregnancy are discussed. [West J Emerg Med. 2014;15(6):652-654]

## CASE REPORT

A 22-year-old G2P0 pregnant female at 10+6 weeks estimated gestational age presented to the Emergency Department (ED) with a chief complaint of right lower quadrant abdominal pain. The patient's past medical history included a right hemorrhagic ovarian cyst resulting in laparoscopy and a missed abortion requiring dilation and curettage. Forty-five minutes prior to ED presentation, the patient reported acute onset abdominal pain and nausea. The pain was non-radiating, constant, sharp, cramping, rated 6 out of 10 on a pain scale, and was unrelated to oral intake or movement. The patient denied vomiting, fevers, chills, diarrhea, melena, hematochezia, dysuria, vaginal discharge, or vaginal bleeding. She endorsed having similar symptoms during her previous miscarriage and ovarian cyst rupture.

Initial physical examination revealed an anxious appearing woman with the following vital signs: temperature, 99.2°F (37.3°C); blood pressure, 135/84 mm Hg; pulse, 92 beats/min; respiratory rate, 18 breaths/min; and oxygen saturation, 99% on room air. Notable physical exam findings included tenderness to palpation in the right lower quadrant with voluntary guarding. No rebound tenderness, peritoneal signs, or palpable masses were elicited. The remaining physical exam was unremarkable. Laboratory testing revealed: a bicarbonate level of 20 mmol/L but an otherwise normal basic chemistry and hepatic panel; white cell count, 9.9 K/ $\mu$ L; hemoglobin, 11.7 G/dL; and platelets, 218 K/ $\mu$ L. Urinalysis

showed no signs of infection.

Initial pelvic and abdominal ultrasounds were unable to visualize the appendix and were otherwise unremarkable. Due to her pregnancy and the risk of radiation exposure, magnetic resonance imaging (MRI) was selected over computed tomography (CT) as the next imaging modality. The MRI revealed a normal appendix without inflammation and a 3.7cm cyst on the left kidney. Over the course of the patient's ED stay she received 1.5L of 0.9% normal saline, IV morphine, and ondansetron. She tolerated a trial of oral intake and her pain greatly improved. Given her negative workup, she was discharged home with the diagnosis of abdominal pain and nausea with vomiting. She was instructed to return to the ED if her abdominal pain or symptoms worsened.

Twenty-four hours after discharge the patient returned to the ED with right lower quadrant abdominal pain worse than the previous day's pain that radiated to the umbilicus and was associated with continued nausea. The physical examination was notable for right lower quadrant tenderness with voluntary guarding but no rebound tenderness or peritoneal signs. As before, the remainder of the physical exam was unremarkable. On readmission, laboratory testing revealed: a basic chemistry panel within normal limits except for a bicarbonate level of 21 mmol/L; white cell count, 9.2 K/ $\mu$ L; hemoglobin, 12 G/dL; and platelets 209 K/ $\mu$ L.

Repeat transabdominal pelvic ultrasound demonstrated an intrauterine pregnancy without pathology. Considering her

atypical presentation coupled with unremarkable laboratory and imaging studies, the general surgery and gynecology services were consulted, and a diagnostic laparoscopy was planned to rule out appendicitis versus ovarian torsion.

Post-surgical pathology revealed an acutely inflamed appendix. The patient tolerated the procedure well and was discharged from the hospital on post-surgical day two. The patient recovered from appendectomy without complications and had an otherwise unremarkable pregnancy that resulted in the birth of a healthy girl via spontaneous vaginal delivery at 38+4 weeks of gestation.

## DISCUSSION

Acute abdominal and pelvic pain in pregnant patients can be caused by a wide range of conditions, of which appendicitis is the most common nonobstetric surgical emergency.<sup>1-5</sup> Fetal mortality is as high as 37% if the maternal appendix perforates,<sup>4,6</sup> and surgical delay of greater than 24 hours results in a 66% increase in the rate of appendiceal perforations.<sup>5,7</sup> Thus, early and accurate diagnosis of appendicitis in pregnant patients is critical to prevent adverse outcomes to both mother and fetus.

Diagnosing appendicitis in pregnant patients is often complicated by atypical clinical presentations. The most common presenting symptom of appendicitis during pregnancy is right lower quadrant pain.<sup>3,4,8</sup> Fever and leukocytosis are less reliable markers of acute pathology than in patients who are not pregnant.<sup>2,3,6</sup> Additionally, while controversial, the repositioning of the appendix during pregnancy may thwart visualization and identification in imaging studies.<sup>2,3,5,6</sup>

Ultrasound is widely used as the initial imaging modality in the evaluation of right lower quadrant pain during pregnancy due to its availability, rapidity, and lack of ionizing radiation.<sup>5,6</sup> Limitations include dependency on operator experience and a finite field of view that may be restricted further by obesity or gravid anatomy.<sup>5,6,9</sup> For example, in several studies among pregnant patients, the appendix could not be identified even when appendicitis was proven on pathology.<sup>10,11</sup> Overall among pregnant patients, sensitivities range from 36% to 100% and specificities range from 33% to 99% when compared to the gold standard of surgical pathology in the diagnosis of appendicitis.<sup>2,5,8,11</sup>

MRI represents another radiographic technique without ionizing radiation that is considered safe during pregnancy.<sup>5,6,10</sup> In pregnant patients suspected to have acute appendicitis, most studies find MRI sensitivities and specificities to be 80-100% and 93-98%, respectively, when compared to surgical pathology.<sup>2,4,6,10</sup> One smaller study with 19 patients demonstrated lower MRI sensitivity of 50%, although it had a specificity of 100%.<sup>12</sup> The use of MRI in this population has been shown to reduce rates of both negative laparotomy and perforation.<sup>10</sup> Additionally, MRI frequently identifies an alternative diagnosis for abdominal

pain when appendicitis is not present.<sup>8-10</sup>

In the ED setting, MRI is particularly effective in ruling out appendicitis. Several studies suggest that MRI has a 100% negative predictive value when the appendix is visualized.<sup>2,6,10</sup> Nikolaidis et al. studied cases with a nonvisualized appendix on CT and found that even without visualizing the appendix, other findings consistent with acute appendicitis such as abscess formation and fat stranding often existed.<sup>13</sup> Although comparable studies of nonvisualized appendix on MRI have not been performed, the diagnostic performance of CT and MRI in the evaluation of appendicitis during pregnancy have yielded similar results.<sup>5,14</sup>

## CONCLUSION

Appendicitis during pregnancy increases morbidity and mortality of both the mother and fetus. Due to the physical and physiological changes of pregnancy, the presentation of appendicitis can be highly variable. Ultrasound is often the initial diagnostic imaging technique due to its accessibility, although it has demonstrated less than ideal sensitivities and specificities in pregnant patients. MRI can be effectively used to assist in the evaluation of abdominal pain during pregnancy and has nearly 100% negative predictive value for appendicitis. However, as this patient demonstrated, a detailed history, physical examination, proper discharge instructions, and a recognition that no imaging modalities are perfect remain essential in the diagnosis of acute appendicitis in pregnancy.

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