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Case Report

Damage Control Laparotomy with Appendectomy and Cesarean Section in the Setting of Perforated Appendicitis

Hossam Abdou*, Lindsay B O'Meara and Jose J Diaz

Department of Surgery, University of Maryland Medical Center, Baltimore, Maryland, USA

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ABSTRACT

Appendicitis is the most common general surgery problem in pregnant patients, but patients can present with vague symptoms making diagnosis difficult. Misdiagnosis and delayed diagnosis can lead to complications such as perforation, which can result in dire outcomes, including fetal and maternal demise. A high level of clinical suspicion should be maintained to identify the diagnosis and progress to operative intervention quickly. Here we present a case highlighting prompt recognition of perforated appendicitis leading to fetal and maternal distress with emergent operative intervention leading to good outcomes for both mother and baby.

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Introduction

Appendicitis is the most frequently encountered general surgery problem in pregnant patients [1]. The overall rate of perforation in appendicitis during pregnancy is not insignificant; Ueberrueck *et al.* reported a rate of 14.9% [2, 3]. Outcomes in perforated appendicitis during pregnancy can be dreadful if not recognized quickly with fetal loss reported to be as high as 36% [4]. Here we present a case highlighting the importance of quick recognition of the diagnosis and emergent operative intervention.

Case Presentation

A 35-week pregnant 39-year-old female with a past medical history of obesity status post sleeve gastrectomy, diabetes, preterm premature rupture of membranes, cholelithiasis and current pregnancy complicated by preeclampsia presented to the emergency room in the middle of the night with 30 minutes of sharp suprapubic pain. Obstetrics admitted her with concern for preterm contractions. She developed a fever and more localized right upper quadrant pain prompting an ultrasound, which demonstrated cholelithiasis without cholecystitis. She became

increasingly tachycardic and tachypneic by morning, so obstetrics ordered a CT chest/abdomen/pelvis with concurrent emergency general surgery (EGS) consultation for concern of an intraabdominal infectious process.

The vitals at the time of evaluation by the EGS service were remarkable for tachycardia to the 140s, a temperature maximum of 100.6°F, the respiratory rate in the 40s on 8 L nasal cannula to maintain oxygen saturations above 92%, and systolic pressures in the 160s. She had progressed to diffuse peritoneal inflammation on exam. Laboratory values were remarkable for leukocytosis (16.5 K/mcL) and low bicarbonate (14 mmol/L). CT images were found to be consistent with ruptured appendicitis (Figure 1). She was intubated due to increasing work of breathing, but during intubation, she had cardiopulmonary collapse with desaturations to 40%. In addition, the tocometer demonstrated severe decelerations with a sustained fetal heart rate in the 50s. She was taken emergently to the operating room.

Upon entering the abdomen, generalized purulent, foul-smelling ascites was encountered. Obstetrics completed a stat cesarean section (C-section). EGS completed the laparotomy and encountered a ruptured

*Correspondence to: Hossam Abdou, M.D., University of Maryland Medical Center, 22 S. Greene Street, S8B02, Baltimore, Maryland 21201, USA; Tel: 4843402859; E-mail: habdou@som.umaryland.edu

appendix. Appendectomy was performed, and the abdomen was briskly irrigated. Due to her hemodynamic instability and pulmonary compromise, her abdomen was packed and left open in a damage control fashion. She was transferred to the intensive care unit (ICU) for further resuscitation.



Figure 1: CT demonstrating right lower quadrant fluid collection with surrounding mesenteric fat stranding and free fluid (white arrow).

She was taken back to the operating room the following day for a second look. Minimal peritoneal fluid was encountered. A pedicled omental flap was created and placed over the base of the cecum. A drain was left in the right lower quadrant, and the abdomen was closed. She was returned to the ICU and extubated later in the day. She was transferred to the floor on postoperative day (POD) 2. Her hospital course was further complicated by an appendiceal stump leak identified on POD 3. She was kept NPO and started on total parenteral nutrition. The drain was kept in place until repeat imaging demonstrated the resolution of the leak. She progressed well and was discharged home on POD 15. She is now 2 months out from surgery and mother and baby are both doing well.

Discussion

Despite being the most common etiology for acute abdomen in pregnancy, appendicitis during pregnancy is still rather uncommon [5]. The incidence of acute appendicitis is in the range of 1 in 800 to 1 in 1,500 pregnancies [6]. The relative rarity of this occurrence can result in surgeon discomfort, particularly in lower volume centers, which is a concern as this disease process requires rapid diagnosis and operative intervention.

Diagnosis of appendicitis itself is not easy during pregnancy as the classic clinical presentation of appendicitis is typically not present [5]. Pregnant patients often exhibit poorly localized, nonspecific symptoms that overlap with symptoms associated with expected normal pregnancy [1, 7]. The deviation from the classic presentation is more pronounced in the later stages of pregnancy [1]. Furthermore, the gravid uterus can displace the appendix cephalad clouding the clinical picture [8]. This is likely what occurred in the case described here.

In addition to the history, objective measures typically used to aid in diagnosis can also be deceiving. Physical examination of the gravid abdomen can be difficult [1]. Laboratory findings that can usually be relied upon cannot be trusted as they may be normal findings in the setting of pregnancy [9]. Imaging is difficult as the often used CT is shied away from in pregnant patients. Ultrasound is a safe mode of imaging

during pregnancy, but the sensitivity and specificity of the exam is compromised in the setting of a gravid uterus [10]. One study found ultrasound sensitivity to be only 20-36% [11]. Magnetic Resonance Imaging is generally favored for the diagnosis of appendicitis in pregnant patients, though it has its own deficiencies [12].

Misdiagnosis and delay in diagnosis can lead to increased risk of both mother and fetal demise. The challenge of diagnosis often leads to this delay and increases the chance of perforation, which, in turn, leads to higher rates of maternal and fetal mortality [7]. With delayed diagnosis, but in the absence of perforation, risk of fetal loss during uncomplicated appendectomy is 2-5% [7, 13]. When perforation occurs, this risk rises to 36% [7]. Maternal mortality is low and comparable to that of non-pregnant women in uncomplicated appendicitis but rises to 4% in the setting of perforation [14, 15].

Perforation occurs more frequently in the later stages of pregnancy, though the incidence of appendicitis is lowest in the third trimester [6, 16, 17]. The higher perforation rate can probably be attributed to the more ambiguous presentation often seen later in pregnancy. Patients and clinicians both may incorrectly, though perhaps often reasonably, attribute symptoms to normal pregnancy. It is likely that the patient presented here misattributed early symptoms to symptoms of normal pregnancy prior to presentation in the emergency room. This combination of factors has the potential to put mother and fetus at great risk and helps emphasize the importance of having a high level of clinical suspicion to recognize the diagnosis rapidly and intervene emergently in these scenarios, as the surgeon did here.

In this case, C-section was completed concomitantly with exploratory laparotomy and appendectomy. This is unusual as concomitant C-section is rarely indicated at the time of appendectomy unless the fetus has surpassed 37 weeks of gestation [12]. However, in the setting of a non-reassuring fetal heart rate tracing, this was a warranted course of action, and the baby did well after delivery.

Damage control in the setting of C-section, as used in this case, or delivery is also rare [18]. It has been reported in the setting of severe post-partum bleeding such as in the setting of abruption placentae, placenta previa being the most common [19]. The other setting is in major trauma after a laparotomy and stat C-section. However, the use of damage control surgery for primary intra-abdominal pathology in the setting of C-section is rarely reported [20]. There are multiple interesting reports of gastrointestinal perforations during pregnancy, including perforation from appendicitis, with mixed outcomes, but damage control techniques were not employed [21, 22]. Turnock *et al.* reported its use in a case of perforated appendicitis during the second trimester, but the fetus was not delivered at that time [23]. Yetisir *et al.* reported an interesting case where damage control was used in a case of spontaneous jejunal perforation after emergent C-section, and both mother and baby did well [24].

After damage control surgery, abdominal closure is a challenge, and after major trauma, it can become a problem [25]. However, after delivery increased abdominal domain as a result of the pregnancy may allow for accommodation of the edematous viscera that may develop and abdominal closure can be achieved [26].

Conclusion

Appendicitis, though the most common general surgery problem in pregnancy, has a complicated presentation with which surgeons should be familiar. Quick recognition of the diagnosis and emergent operative intervention are imperative to minimize maternal and fetal morbidity and mortality. Damage control techniques should be used as needed to this end.

Data Availability

Data is all contained in the electronic medical record. However, this cannot be shared in compliance with HIPAA.

Conflicts of Interest

None.

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