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Case report

Medical management of appendicitis in early-term pregnancy

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SUMMARY

A 19-year-old G1 at 37 weeks presented with acute non-ruptured appendicitis. Her advanced gestational age and surgical anatomy presented a complex surgical scenario. She was treated with intravenous antibiotics and induction of labour, which resulted in resolution of the appendicitis and an uncomplicated vaginal delivery at early term. This case is an example that appendicitis occurring in early-term pregnancy can be successfully managed with intravenous antibiotics, but this is a complex clinical scenario with a limited evidence base to make management decisions. Future studies of medical management of appendicitis in pregnancy, specifically in later gestation, are needed to provide additional information to guide clinicians.

BACKGROUND

Appendicitis is the leading cause of non-obstetric surgical intervention during pregnancy.[1] Historically, immediate surgical management has been the standard treatment in pregnant patients with acute appendicitis; this recommendation has been based in part on retrospective data that demonstrated lower fetal and maternal morbidity and mortality in women who underwent early surgery.[2] Over the last decade, there has been renewed debate in the surgical literature regarding the safety of medical management of acute uncomplicated appendicitis in the general population, however, pregnant patients have been routinely excluded from these studies. Studies of medical management of unruptured appendicitis in pregnancy are rare and thus far include a prospective observational series which followed the outcomes of antibiotic therapy in 20 pregnant women with a gestational age ranging from 8 to 28 weeks and simple appendicitis defined as appendiceal diameter of less than 11 mm and no signs of appendicoliths or perforations.[3] Additionally, Young *et al* presented two cases of ruptured appendicitis in pregnancy who were treated medically,[4] both of which ultimately underwent an appendectomy—the first during caesarean section and the second within months of vaginal delivery. While these few publications have described the feasibility and began to explore the safety of medical management of appendicitis in earlier gestational ages, the size of an early-term uterus increases the surgical difficulty of accessing the appendix and thus can change the risk/benefit ratios of treatment options for unruptured appendicitis. Additionally, there have been no publications of medical management of appendicitis in early-term pregnancy. Furthermore, many previous reports ultimately ended in appendectomy within months of delivery. Therefore, we present a case of appendicitis in early-term pregnancy that was successfully managed by a multidisciplinary team using antibiotic therapy and highlight specific factors to consider when deciding to treat medically.

CASE PRESENTATION

A 19-year-old G1P0 with an uncomplicated antenatal course presented to the obstetrics evaluation centre at 37 weeks of gestation with acute onset of sharp abdominal pain, nausea and a single episode of vomiting. She was afebrile with normal vital signs (blood pressure: 107/61 mm Hg, heart rate: 74 beats/min, respiratory rate: 16 breaths/min, temperature: 98.8°F). On physical examination, she had diffuse abdominal tenderness. Fetal monitoring showed a reactive tracing without contractions. Laboratory work demonstrated leucocytosis with a white cell count of 15×10^9/L. Her urinalysis, liver enzymes, lipase and glucose testing showed no abnormalities. She was admitted for observation and underwent an amniocentesis, which showed normal glucose and no signs of chorioamnionitis. On hospital day (HD) 2, the patient's diffuse abdominal tenderness had consolidated to her right abdomen and was effectively managed with 4 mg of intravenous morphine. A non-contrast abdominal MRI obtained on a 1.5 T magnet demonstrated a dilated 12 mm retrocecal appendix with adjacent fluid; this was compatible with acute appendicitis (figure 1A–D). Her clinical status remained stable and she was routinely monitored with repeated vital signs and serial examinations.

A multidisciplinary meeting was held involving obstetrics/gynaecology, general surgery and anaesthesiology. While recognising previous publications have not established antibiotics as a first-line treatment in any demographic, consideration was given to a recent publication of a large clinical trial of medical management of uncomplicated acute appendicitis and their 5-year follow-up on those patients.[5 6] Although this study was unable to demonstrate the non-inferiority of antibiotic treatment relative to appendectomy, they did show that 186 of 256 patients (72%) were treated successfully with antibiotic treatment alone. Importantly, we realised that there were no pregnant women in this

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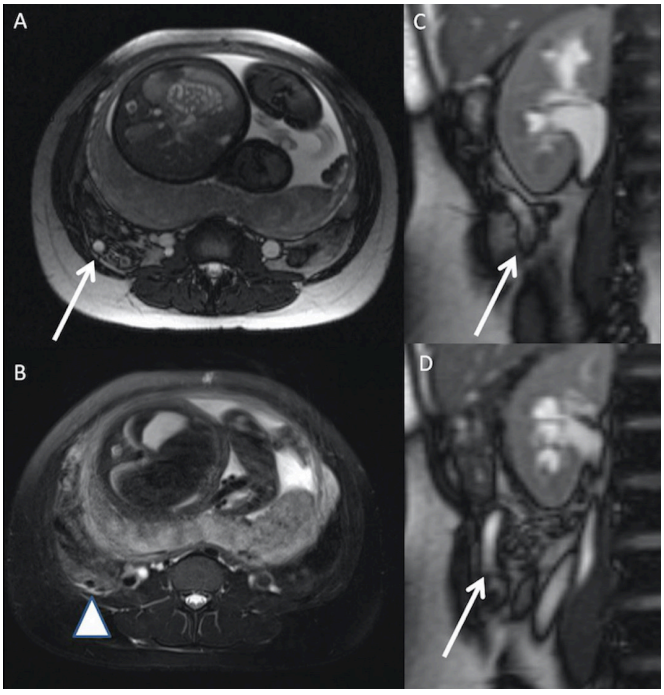

Figure 1 (A–D) Axial and coronal T2-weighted sequences demonstrate a dilated fluid filled appendix (arrows) in the right lower quadrant with adjacent oedema (arrowhead). The appendix measures up to 1.2 cm and findings are consistent with acute appendicitis.

study and thus additional consideration was given to establish the risk/benefit profile of medical management versus surgical management in this specific patient, and the decision was made to recommend medical management of the appendicitis. A primary consideration in this decision was the difficulty of operating around the early-term gravid uterus while accessing a retrocecal appendix. There was concern that this would require significant uterine manipulation and potentially increase the risk of placental abruption. In addition to medical management of the appendicitis, induction of labour was recommended to minimise the risk to the fetus if antibiotic therapy failed. Had the patient's clinical status worsened with unsuccessful medical management of the appendicitis, this would have prompted surgical intervention by in-house general surgeons.

The patient consented to medical management and treatment with intravenous cefoxitin and metronidazole was started on HD 2. On HD 3, the patient's pain and clinical status were stable, and induction of labour was begun using oxytocin followed by artificial rupture of membranes. Induction of labour was delayed to HD 3 to distinguish labour pain from abdominal pain that may be caused by progression of appendicitis. On HD 4, the patient underwent an uncomplicated vaginal delivery of a female infant weighing 2680 g with Apgar scores of 8 and 9. By HD 6, the patient's abdominal pain and leucocytosis had resolved and she was discharged home with a 10-day course of oral ciprofloxacin and metronidazole. The patient's medications were considered to be safe for breastfeeding and she was able to successfully breastfeed.

OUTCOME AND FOLLOW-UP

The patient was scheduled for outpatient follow-up with general surgery to discuss an elective appendectomy as well as with obstetrics and gynaecology for routine postpartum care. She chose to not have an elective appendectomy and at 20-months postpartum, the patient reports that she and her baby are doing well with complete resolution of her abdominal pain.

DISCUSSION

Appendicitis occurs in 0.04%–0.2% of pregnancies.[1] While appendectomy has been the standard treatment for appendicitis since the procedure was first introduced over a century ago, non-operative treatment of appendicitis has been considered since 1959.[2] Recently, Salminen *et al* conducted a randomised clinical trial (329 men and 201 women ages 18–60) comparing antibiotic versus surgical management of uncomplicated appendicitis. Although the study failed to demonstrate the non-inferiority of antibiotic treatment, they did show that 72% of the patients were successfully treated with antibiotics alone and that medical management may be an alternative method of treatment for uncomplicated appendicitis in the general population.[5] Notably, this study excluded pregnant patients, and it is possible that the physiological changes to the immune system and surgical anatomy that occur in pregnancy result in a different safety and efficacy profile compared with that of the general population. Thus, additional data are needed to establish the safety and efficacy of this modality before applying their conclusions to gravid women.

Reports of medical management of unruptured appendicitis in pregnancy are limited to a prospective observational series of 20 pregnant women with a gestational age ranging from 8 to 28 weeks and simple appendicitis defined as appendiceal diameter of less than 11 mm and no signs of appendicoliths or perforations.[3] Seventy-five per cent of women in that series did not require an appendectomy during their hospital stay or have recurrence of appendicitis in their respective follow-up periods ranging from 6 to 46 months. Young *et al* presented two cases of ruptured appendicitis in pregnancy who were treated medically.[4] In the first case, a woman presented with ruptured appendicitis and preterm labour at 32 weeks of gestation and was treated successfully with intravenous antibiotics. She then had an uncomplicated vaginal delivery at 38 weeks followed by elective appendectomy 2 months postpartum. In the second case, a woman presented with ruptured appendicitis at 26 weeks of gestation and was treated with intravenous antibiotics. She had recurrence of appendicitis at 32 weeks and was again treated medically. She ultimately had a caesarean section and appendectomy at 34 weeks for breech presentation and preterm labour. The present case adds to the growing body of literature in that we describe successful management of appendicitis in early-term pregnancy. It is important to explore the safety profile at different gestational ages because it is possible that the risk/benefit ratio of surgical versus medical management of appendicitis in pregnancy changes as gestation progresses due to the increasing surgical difficulty of accessing the appendix in the setting of unfamiliar anatomy. While additional studies are needed to guide the development of practice guidelines, the successful outcome in this case suggests that stratifying surgical risk by gestational age, or perhaps by trimester, may provide a useful framework for decision-making when deciding between surgical and medical management.

One critical issue regarding medical versus surgical management of appendicitis in pregnancy is the risk of appendiceal perforation, which can result in increased maternal and fetal morbidities. Studies have suggested that time delay in surgical intervention greater than 36 hours after symptom onset increases the risk of appendiceal perforation from <2% to 5%.[7] Furthermore, appendicitis complicated by peritonitis has been

associated with a significant increased risk in preterm birth (34.5% vs 11.4%).[8] In addition to fetal considerations, Abassi *et al* found that conservative management of appendicitis in pregnancy is associated with increased maternal risks including sepsis (3.1% vs 1.2%), septic shock (1% vs 0.1%) and venous thromboembolism (1% vs 0.4%).[9] These observations led Abassi *et al* to conclude that, when managing appendicitis in pregnancy, a surgical approach has a more favourable risk/benefit ratio. However, their study did not take gestational age or challenging surgical anatomy into account, both of which impact medical decision-making. The present case highlights the importance of considering the changes in surgical risk that are associated with advanced gestational age and the impact of challenging surgical anatomy such as a retrocecal appendix. Access to resources such as in-house surgeons, expert radiologists and perinatologists also likely contributes to safety outcomes.

As level I evidence is unavailable to guide management in cases of early-term pregnant patients presenting with acute appendicitis, this case highlights several factors that, in shared decision-making with the patient, led us to recommend antibiotic management of her appendicitis. The first of these was that the mother and fetus were clinically stable, had well-controlled pain, normal vital signs, no signs of peritonitis and a reassuring fetal heart rate tracing. Also, the early-term gestational age and retrocecal positioning of the appendix in this case presented a risk/benefit ratio that we believe favoured medical management. The decision to induce labour in this patient was made given the consideration of the risks and concerned that medical management may be insufficient to treat the appendicitis which could precipitate a more urgent clinical scenario. While there is no uniformly accepted gestational age to consider elective induction of labour, doing so in this case allowed for a controlled delivery with minimal risk regarding fetal maturity. The risk/benefit ratio for induction of labour would clearly be different at earlier gestational ages. Ultimately, intravenous antibiotics resolved this patient's appendicitis, allowed the patient to avoid primary caesarean delivery as well as the risks associated with surgery during pregnancy and led to an uncomplicated vaginal delivery at early term without negative maternal or neonatal sequelae.

In conclusion, this case presents a timely illustration of the impact of recent general surgery literature in the obstetrics/gynaecology community and represents the first report of successful medical management of appendicitis in an early-term pregnancy. Since our understanding of non-operative management of appendicitis is still growing and there are currently no guidelines suggesting it as a first-line treatment in any demographic, many providers are understandably hesitant to pursue this course, especially in pregnancy. Therefore, additional studies are needed to confirm the safety of this approach. Informed maternal consent for undergoing medical management of appendicitis should involve discussion of the risk/benefit ratio of the case, the possibility of antibiotic failure and the potential adverse maternal and fetal outcomes.

Learning points

- While data regarding the safety and efficacy of medical management of appendicitis in pregnancy are lacking, this case represents successful medical management without negative sequelae. Since additional research is needed to determine the role of medical management of appendicitis in pregnancy, it is important to emphasise that appendectomy continues to be the first-line treatment of appendicitis.
- Delaying surgery can lead to a ruptured appendix and not having an appendectomy increases the chance of recurrence. Additional studies of medical management of appendicitis in early-term pregnancy are needed to provide further information to guide clinicians. It is important to ensure that the patient understands these risks and is appropriately consented.
- Prior to considering medical management of appendicitis in pregnancy, many factors including, but not limited to, medical stability of mother and fetus, size of gravid uterus and location of appendix must be carefully considered by a multidisciplinary team. That multidisciplinary team should have input from an obstetrician/gynaecologist, general surgeon, anaesthesiologist, radiologist and the patient herself. Consideration should also be given to the resources and expertise available to manage possible negative sequelae if medical management is chosen.

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