



Journal Homepage: - [www.journalijar.com](http://www.journalijar.com)

## INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/18635  
DOI URL: <http://dx.doi.org/10.21474/IJAR01/18635>



### RESEARCH ARTICLE

#### PERIOPERATIVE MANAGEMENT OF AN ABDOMINAL EMERGENCY IN A PREGNANT PATIENT OUTSIDE THE OBSTETRICAL SETTING

Salim Chajai, Hamza Zarouali, Larbi Aberouch, Jaouad Tadili, Ali Kettani and Mamoun Faroudy

#### Manuscript Info

##### Manuscript History

Received: 28 February 2024

Final Accepted: 31 March 2024

Published: April 2024

#### Abstract

Acute appendicitis can complicate 1 in 500 to 2000 pregnancies, and can adversely affect maternal and fetal outcomes when the diagnosis and management are delayed. We report the case of a 31 years old prime gravid patient with a gestational age presenting with an acute abdomen evolving for five days in a non obstetrical hospital. The diagnosis of acute perforated appendicitis with acute intestinal occlusion was made. The patient was treated surgically with hemodynamic, respiratory and metabolic optimization. Fetal well-being was monitored intermittently using point of care fetal ultrasound, by measuring fetal heart rate (FHR) with M-mode on the fetal heart. The patient was transferred shortly after stabilization to a maternal care facility. This case reports highlights diagnostic challenges associated with acute appendicitis in pregnancy, perioperative management and monitoring options outside the obstetrical setting, and the importance of an early transfer to a maternal critical care department.

Copy Right, IJAR, 2024,. All rights reserved.

#### Introduction:-

A non obstetric surgical condition can complicate 1 in 500 pregnancies (1). Acute appendicitis can complicate 1 in 500 to 2000 pregnancies, and can adversely affect maternal and fetal outcomes when the diagnosis and management are delayed (2). We report the case of a 31 years old patient at 28 weeks gestational age presenting for an acute abdomen in a non obstetric hospital. The patient posed some perioperative challenges that we will discuss.

#### Case Report

We report the case of a 31 years old patient, prime gravid with a gestational age 28 weeks presenting for an acute abdomen. She was attending antenatal clinic and her pregnancy was uneventful. She had no significant past medical or surgical history. She complained 5 days before presentation of a sudden onset abdominal pain, with vomiting, fever, and 4 days before presentation she wasn't passing gas or stool. The patient sought medical attention twice but received antiemetics and analgesics, and presented to our center because of her worsening condition.

On general examination she was ill-looking, fully conscious with an axillary temperature of 38.8°C and subtle jaundice. Her pulse was 140 bpm and blood pressure 120/70 mmHg, no signs of hypo perfusion. She had symmetric bilateral lower limb edema without any signs of right sided heart failure. Cardiac auscultation was normal. The patient was tachypneic at 40 cycles per minute and her thoracic ampliation was limited by the volume of her abdomen. She had an SpO2 at 91% on room air reaching 100% on high flow oxygen and lung auscultation was normal. Airway evaluation showed adequate mouth opening and thyromental distance, with a Cormack and Lehane

**Corresponding Author:- Salim Chajai**

Address:- Emergency Surgical Critical Care Department. Ibn Sina University Hospital, Rabat, Morocco.

grade II. Her abdomen was distended, painful, with marked tympanism. Obstetric examination found a long closed posterior cervix with intact membranes. Obstetric ultrasound showed a live singleton intrauterine pregnancy.

The patient had two peripheral venous catheters with ongoing fluid loading, nasogastric tube, foley catheter, high flow oxygen, and turned on her left side to 15°. The CT scan revealed an acute intestinal obstruction with appendicitis and abundant peritoneal effusion (Figure 1). Her Natrema was at 133mmol/l, potassium 3.6mmol/l, chloride 97 mmol/l and bicarbonate 15 mmol/l, she had normal renal function, total bilirubine was 36mg/l with conjugated bilirubine at 22 mg/l. Her C reactive protein was at 216.2 mg/l and her leucocyte count was at  $16 \times 10^9/l$ . Hemoglobin was at 118 g/l and platelets 368000/mcl, and her coagulation tests were normal.

The patient had a right jugular central venous line and right radial arterial line, fluid loading, piperacillin tazobactam, and betamethasone for fetal lung maturity, then taken to the operating room. She was placed in the semi-fowler's position, with a left table tilt at 15°, and monitoring of ECG, invasive blood pressure and oxygen saturation. She was preoxygenated for 3 minutes on 100% FiO<sub>2</sub> with a tight-fitting face mask, then we performed rapid sequence induction with fentanyl, ketamine, propofol, rocuronium and intubated using videolaryngoscopy the patient without any desaturation. Maintenance of anesthesia was conducted using isoflurane and drugs reinjection, and had a continuous fluids and electrolytes replacement. Ventilatory parameters were Vt 420ml RR 16cpm PEEP 10cmH<sub>2</sub>O FiO<sub>2</sub> 50% with ETCO<sub>2</sub> 30% and Spo<sub>2</sub> 100%. Surgical exploration found a perforated and phlegmonous laterocaecal appendix with a purulent peritoneal effusion and false membranes (Figure 2). An appendectomy was performed with intraperitoneal lavage with saline, then manual bowel decompression was performed with a nasogastric tube aspirating through the stomach. The surgery lasted two hours, and a drain was left in the recto-uterine pouch. The patient remained stable and didn't need vasopressors.

The patient was then transferred to the intensive care department, she was positioned in a semi-fowler's position and left table tilt at 15°. Patient was warmed using a forced air warming system, and received acetaminophen and morphine for analgesia. Post operative arterial blood gas analysis found a pH at 7.36, pCO<sub>2</sub> 31mmHg, BE - 7.35, HCO<sub>3</sub><sup>-</sup> 16.9 and PaO<sub>2</sub> at 105mmHg at 30% FiO<sub>2</sub>, Natrema at 139 and Kaliemia 3.4. Patient was extubated successfully with an Aldrete score at 10. The nasogastric tube was kept to maintain aspiration of gastric stasis fluid, with each loss compensated with normal saline and potassium loading. Incentive spirometry was instituted early with adequate analgesia. Because we lacked a cardiotocograph, we monitored fetal well being using the ultrasound, that showed fetal movements, and a fetal heart rate (FHR) at 135bpm using M mode on the fetal heart. A gynecological exam revealed a long posterior closed cervix, absent uterine contractions and a positive fetal cardiac activity. As the patient had stable hemodynamics (heart rate 85 bpm, BP 120/70 mmHg) and was breathing on room air with a RR at 22cpm and SpO<sub>2</sub> at 98%, she was transferred to the maternity hospital for further management.

### Discussion:-

A nonobstetric surgical condition can complicate 1 in 500 pregnancies (1), the most common causes include acute appendicitis (1/500-2000), acute cholecystitis (1/1600-10 000), bowel obstruction (1/1500-16 000), acute pancreatitis and abdominal trauma (2). Maternal appendicitis increases the risk of fetal loss (miscarriage, fetal death in utero, abortion) particularly when the infection is advanced, the risk being <1.5% in a non-perforated appendix versus 25 to 30% in a perforated appendix (2). An accurate and timely diagnosis is therefore very important to preserve maternal and fetal outcomes.

In a Swedish registry study of 778 cases, appendicitis was misdiagnosed in 23% of cases during the first trimester of pregnancy, and in 43% of cases in the last two trimesters (3). The diagnostic difficulties may be linked to many factors. Clinical features such as vomiting, nausea, constipation and abdominal distention can be present early in normal pregnancy and in abdominal emergencies, but persistent vomiting beyond 20 weeks of pregnancy should be considered pathologic and requires diagnostic work-up. The cephalad displacement of the appendix by the enlarged uterus may be misleading, and classical signs such as rebound tenderness and muscular guarding can be partially masked (2). The white blood cell count may reach 15,000/mm<sup>3</sup> in normal pregnancy, which doesn't make it very helpful. Finally, clinicians may be reluctant to prescribe radiating imaging studies. Ultrasound should be the first diagnostic test and it is very helpful in the first trimester, but its diagnostic accuracy depends on the experience of the provider. MRI has a sensitivity of 100% and specificity of 94%, if unavailable in a timely manner, CT has a sensitivity of 92% and specificity of 99% (2). In the reported case, the CT scan identified the presence of complicated appendicitis, but in a delayed fashion, as the patient was symptomatic for 5 days and presented with

maternal sepsis. The maternal benefit from an early and accurate diagnosis of acute appendicitis outweighs the theoretical fetal risks of irradiation from a CT scan.

The perioperative management of a pregnant patient with an acute abdomen can pose some clinical challenges. Among them, respiratory complications can arise because of a constellation of pregnancy, disease, and surgery related factors. Physiological respiratory modifications with pregnancy include a decreased functional residual capacity (FRC) by approximately 20% as the gravid uterus expands, with decreased oxygen reserve and the potential for airway closure (4). This is further aggravated by the acute intestinal occlusion and the resultant abdominal distention. Moreover, the supine position and induction of anesthesia further promote the cephalic displacement of the diaphragm and decrease in FRC. The oxygen consumption increases to meet the mothers and fetus metabolic demands, which decreases apnea tolerance. Tracheal intubation can be complicated by weight gain and capillary engorgement of the upper airway. The distortion of gastric and pyloric anatomy and the incompetence of the lower esophageal sphincter, adding to the delayed gastric emptying secondary to the presence of an acute intestinal occlusion, put the patient at a significant risk of aspiration. Reflex postoperative diaphragmatic dysfunction, pain related voluntary restriction of respiratory movements, tissue trauma, decreased respiratory drive and airway protection secondary to anesthesia agents can contribute to postoperative pulmonary complications. In a study of postoperative pulmonary complications after laparotomy, an emergency surgery increased 6 times the risk of postoperative respiratory complications, and upper/lower incisions came with a 7 fold increase of risk (5).

In our patient, some strategies were implemented to mitigate those risks. First, we maintained a semi-Fowler position as a 30° head up position significantly increases FRC in pregnant patients (6), and provided sufficient preoxygenation. Rapid sequence intubation was performed by an experienced provider due to the full-stomach status and potential difficulty to intubate. Ventilator settings are extrapolated from data on non-pregnant patients, and lung protective ventilation with low tidal volumes (6ml/kg ideal body weight) and plateau pressures not exceeding 30cmH<sub>2</sub>O seem to be a reasonable approach. Recruitment manoeuvres early after induction and throughout the surgery may have been beneficial to overcome the rapidly occurring atelectasis, a study investigating recruitment maneuvers with positive end expiratory pressure in women undergoing general anesthesia for elective cesarean section showed they were safe and effective in improving lung compliance and both intraoperative and postoperative oxygenation (8). However, they were performed in healthy, euvolemic women, after fetal extraction. How recruitment maneuvers may affect placental circulation through effects on maternal cardiac output and venous congestion isn't elucidated. Determining the ideal positive end expiratory pressure in pregnant women is important to prevent the cycling opening and closing of the alveoli and atelectrauma. Because of the modifications we described above, there is a decrease in transpulmonary pressure in the later stages of pregnancy. Esophageal pressure may be used to titrate PEEP to ensure a positive transpulmonary pressure gradient at end expiration. In our patient, maintaining a PEEP at 10 cmH<sub>2</sub>O resulted in the best compliance, with satisfying gas exchange. Manual bowel decompression, was used to decrease intra abdominal pressure and improve post operative respiratory mechanics. Non invasive ventilation (NIV) use has been reported in pregnant patients, it should be instituted in an alert patient able to protect her airway, with a gastric tube to decompress the stomach and kept nil by mouth (7). We considered our patient at a high risk of aspiration for the reasons we mentioned earlier, therefore, we first encouraged the patient to perform forced inspirations before extubation, then we opted for incentive spirometry and adequate analgesia. This approach proved sufficient to wean the patient from oxygen shortly after surgery.

The patient was also at risk of hemodynamic compromise. First, she had abdominal sepsis with a delayed diagnosis. Second, she presented to hypovolemia secondary to vomiting, third-spacing, and fever. Third, her venous return could be impeded by increased intra-abdominal pressure and inferior vena cava compression by the gravid uterus. Anesthesia induction, and periods of bacteremia during adhesiolysis are critical moments at risk for hypotension. Early antibiotics, adequate fluid resuscitation, patient positioning, monitoring, and goal-directed therapy and infection source control are of paramount importance in the management of such patients. Vasopressors should be started early, the risk of placental vasoconstriction should be weighted against the risk of hypo perfusion caused by systemic hypotension.

Fetal monitoring was an issue, as the patient was emergently managed outside the obstetric setting. The American College of Obstetricians and Gynecologists recommend simultaneous fetal heart rate and contraction monitoring before after surgery to assess fetal well-being and the absence of contractions in viable fetuses. Intraoperative fetal monitoring may be appropriate in viable fetuses when physically possible, an obstetric surgeon is available, maternal consent for emergency cesarean delivery for fetal indications is obtained when possible, and the nature of the

planned surgery allows the safe interruption or alteration of the procedure to provide access to perform emergency delivery (9). Because we lacked a cardiotocograph, we relied on FHR monitoring using ultrasound. Fukuda et al. reported the intraoperative monitoring of FHR using a transesophageal echographs (TEE) probe attached to the mothers abdomen during a neurosurgery in a 34 years old women in her 16th week of gestation, with a favorable outcome (10). Singh et al. reported the use of point of care ultrasound for intermittent FHR monitoring using M mode during a laparoscopic appendectomy in a second trimester (18 weeks) pregnant patient : pre-induction, at the time of pneumoperitoneum and after completion of the surgery (11). Goyal et al reported the use of a TEE probe attached to the abdominal wall of a patient in 25 weeks of pregnancy during neurosurgery, the child was born with a low Apgar score at 1 min (12). FHR monitoring may allow for optimization of the maternal condition at critical phases of the perioperative management if the fetus shows sign of compromise, by adjusting maternal position, blood pressure, oxygenation, and acid-base status (4). A limitation to the use of ultrasound with an M-mode is the intermittent nature of the monitoring. Adding to that, it doesn't indicate the presence of uterine contractions and it doesn't evaluate FHR variability, which is present by 25 to 27 weeks gestation.

Complicated appendicitis increases the risk of abortion and preterm delivery (2). Inhaled anesthetics decrease myometrial irritability and their use could be beneficial for abdominal procedures. The routine use of prophylactic tocolytics isn't supported by the literature (4). Our patient didn't present uterine contractions, although they could have been masked during her ICU stay because of the strong analgesia she was provided. The administration of tocolytic agents before patients stabilization could have been detrimental, given their possible maternal side effects, and they should be selected carefully : beta adrenergic receptor agonists could have exacerbated the hypokalemia and tachycardia, calcium entry-blocking agents could have been poorly tolerated because of hypotension. Our patient was transferred as soon as possible to a maternity hospital to allow for an adequate postoperative monitoring for preterm labor and fetal well-being, and to ensure a neonatal intensive care facility is close in the event of preterm delivery.

### Conclusion:-

Acute appendicitis is the most common nonobstetrical surgical emergency. Its presentation can pose diagnostic difficulties and delay patients management. The management of an abdominal emergency in a pregnant patient can pose significant respiratory, hemodynamic and metabolic challenges. In the event of a serious maternal illness, fetal risks are of secondary importance. Point of care ultrasound may be used to monitor fetal well being outside the obstetrical setting, although it has many limitations. Patients should be transferred as soon as possible to a maternal care facility to optimize maternal and fetal outcomes.

### Figures:

**Figure 1:-** CT scan showing air-fluid levels in distended intestines, and increased abdominal volume.

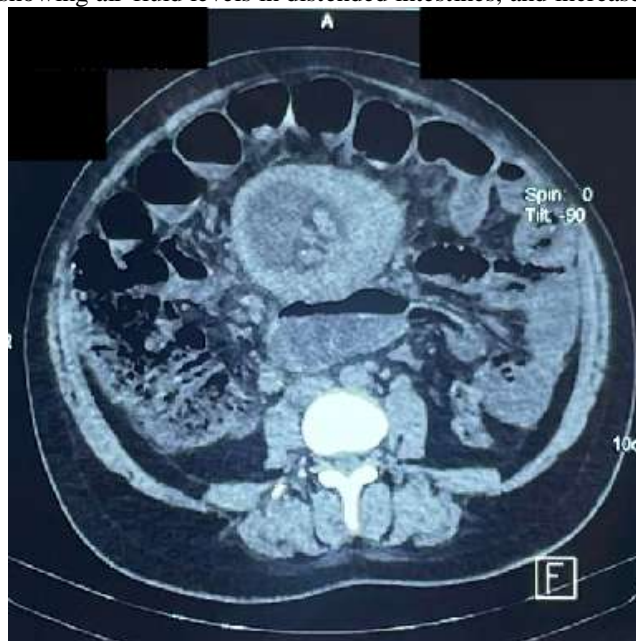
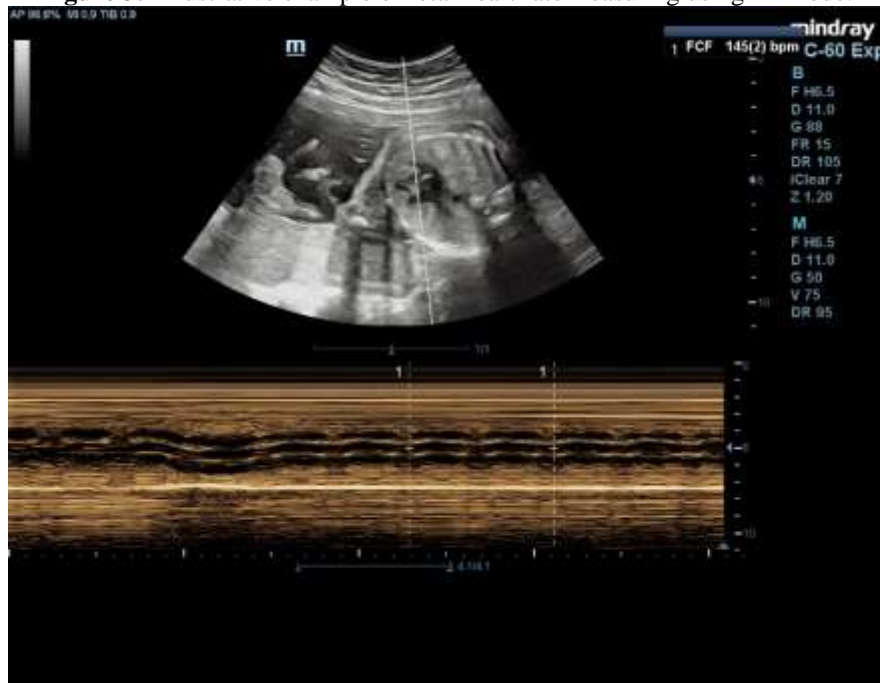


Figure 2:- Phlegmonous appendix.



Figure 3:- Illustrative example of fetal heart rate measuring using M-Mode.



**References:-**

1. Griffen, W. O., Dilts, P., & Roddick, J. (1969). Non-obstetric surgery during pregnancy. *Current Problems in Surgery*, 6(11), 3–56. [https://doi.org/10.1016/s0011-3840\(69\)80003-1](https://doi.org/10.1016/s0011-3840(69)80003-1)
2. Bouyou, J., Gaujoux, S., Marcellin, L., Leconte, M., Goffinet, F., Chapron, C., & Dousset, B. (2015). Abdominal emergencies during pregnancy. *Journal of Visceral Surgery*, 152(6), S105–S115. <https://doi.org/10.1016/j.jviscsurg.2015.09.017>
3. Mazze RI, Källén B. Appendectomy during pregnancy: a Swedish registry study of 778 cases. *Obstet Gynecol*. 1991 Jun;77(6):835-40. PMID: 2030853.
4. Bauchat, J. R., & Van De Velde, M. (2019). Nonobstetric surgery during pregnancy. In *Chestnut's Obstetric Anesthesia Principles and Practice sixth edition* (pp. 368–391). Elsevier.
5. Smith PR, Baig MA, Brito V, Bader F, Bergman MI, Alfonso A. Postoperative pulmonary complications after laparotomy. *Respiration*. 2010;80(4):269-74. doi: 10.1159/000253881. Epub 2009 Oct 28. PMID: 19864881.
6. Hignett R, Fernando R, McGlennan A, McDonald S, Stewart A, Columb M, Adamou T, Dilworth P. A randomized crossover study to determine the effect of a 30° head-up versus a supine position on the functional residual capacity of term parturients. *Anesth Analg*. 2011 Nov;113(5):1098-102. doi: 10.1213/ANE.0b013e31822bf1d2. Epub 2011 Sep 14. PMID: 21918160.
7. Gaffney, A. (2014). Critical care in pregnancy—Is it different? *Seminars in Perinatology*, 38(6), 329–340. <https://doi.org/10.1053/j.semperi.2014.07.002>
8. Aretha D, Fligou F, Kiekkas P, Messini C, Panteli E, Zintzaras E, Karanikolas M. Safety and effectiveness of alveolar recruitment maneuvers and positive end-expiratory pressure during general anesthesia for cesarean section: a prospective, randomized trial. *Int J Obstet Anesth*. 2017 May;30:30-38. doi: 10.1016/j.ijoa.2016.12.004. Epub 2016 Dec 23. PMID: 28108076.
9. ACOG Committee Opinion No. 775: Nonobstetric surgery during pregnancy. (2019). *Obstetrics and Gynecology* (New York. 1953. Online)/*Obstetrics and Gynecology*, 133(4), e285–e286. <https://doi.org/10.1097/aog.0000000000003174>
10. Fukuda, K., Masuoka, J., Takada, S., Katsuragi, S., Ikeda, T., & Iihara, K. (2014). Utility of Intraoperative Fetal Heart Rate Monitoring for Cerebral Arteriovenous Malformation Surgery during Pregnancy. *Neurologia Medico-chirurgica*, 54(10), 819–823. <https://doi.org/10.2176/nmc.tn.2013-0359>
11. Singh, N., Mohanty, C. R., Nayak, B. M., & Mohanty, G. S. (2019). Point-of-care ultrasonography for fetal monitoring during non-obstetrical maternal surgery in the second trimester. *Canadian Journal of Anaesthesia/Canadian Journal of Anesthesia*, 66(6), 742–743. <https://doi.org/10.1007/s12630-019-01344-5>
12. Goyal K, Singh K, Mitra R, Tomar GS. Novel use of transoesophageal echocardiography in a pregnant patient undergoing neurosurgery. *Indian J Anaesth* 2017;61:681-2.