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NON-OBSTETRIC ABDOMINAL SURGERY DURING PREGNANCY: A CONTEMPORARY PERSPECTIVE ON SAFETY AND OUTCOMES

Abstract

Non-obstetric abdominal surgery during pregnancy represents a complex clinical challenge requiring a multidisciplinary approach involving obstetricians-gynecologists, surgeons, and anesthesiologists. Physiological changes associated with pregnancy may mask the clinical manifestations of acute surgical conditions and complicate their timely diagnosis. In addition, limitations regarding the use of certain imaging modalities and medications create further challenges in selecting the optimal treatment strategy. The most common indications for surgical intervention include acute appendicitis, acute cholecystitis, adnexal pathology, intestinal obstruction, and other urgent conditions. Delaying necessary surgical treatment may result in severe maternal and perinatal complications, including septic conditions, preterm birth, fetal distress, and increased perinatal morbidity.

This review analyzes current literature regarding the diagnosis, anesthetic management, and surgical treatment of non-obstetric abdominal diseases during pregnancy. The advantages and limitations of both laparoscopic and open surgical approaches are discussed, along with specific considerations for patient management according to gestational age. Particular attention is given to current

recommendations concerning the timing of surgical intervention, prevention of complications, and maintenance of maternal and fetal safety throughout the perioperative period. Contemporary evidence regarding the safety of anesthesia and laparoscopic procedures for both mother and fetus is summarized.

The analysis indicates that, when clinically indicated, timely surgical intervention is safe and is associated with more favorable outcomes compared with unjustified postponement of surgery. In most cases, laparoscopy may be considered the preferred surgical approach when performed according to current guidelines and by an experienced surgical team. Early diagnosis and an appropriate surgical strategy can minimize maternal and fetal risks and improve obstetric and perinatal outcomes.

Keywords: pregnancy, non-obstetric surgery, abdominal surgery, acute appendicitis, acute cholecystitis, laparoscopy, anesthesia, perinatal outcomes.

Problem statement. Approximately 1 in 500 women requires non-obstetric abdominal surgery during pregnancy [1, 13]. Despite the relatively low incidence of such procedures, they represent a significant clinical challenge due to the need to ensure the safety of both the mother and the fetus simultaneously. The diagnosis of acute surgical conditions in pregnant women is often complicated by the physiological and anatomical changes associated with pregnancy, which may mask the classic manifestations of disease and hinder the interpretation of laboratory and imaging findings.

The most common non-obstetric surgical emergencies complicating pregnancy are acute appendicitis and cholecystitis [14, 15]. These conditions require timely diagnosis and treatment, as delays in surgical intervention may lead to severe complications, including peritonitis, sepsis, preterm birth, and intrauterine fetal death. Other conditions that may necessitate surgery during pregnancy include ovarian cysts, adnexal masses and torsion, symptomatic

cholelithiasis, adrenal tumors, splenic disorders, symptomatic hernias, complications of inflammatory bowel disease, and other rare disorders [16].

Particular attention has been focused on determining the optimal surgical approach in pregnant patients. More than two decades ago, some researchers and clinicians considered laparoscopy contraindicated during pregnancy because of concerns regarding uterine injury during trocar insertion and impaired uteroplacental perfusion resulting from pneumoperitoneum. However, advances in minimally invasive surgical techniques, improvements in anesthetic management, and the accumulation of clinical experience have led to a reassessment of these concerns. Currently, laparoscopic procedures are widely used for the treatment of various urgent surgical conditions during pregnancy and are considered a safe alternative to open surgery when performed in accordance with established guidelines.

More than 1 in 20 women of reproductive age diagnosed with acute appendicitis are pregnant [11]. Acute appendicitis remains the leading indication for emergency abdominal surgery during pregnancy. Previous studies have demonstrated that timely appendectomy for uncomplicated acute appendicitis is safe and helps prevent severe maternal and perinatal complications [12]. Nevertheless, the effects of different surgical approaches, anesthetic techniques, and timing of intervention on pregnancy outcomes and fetal well-being remain subjects of ongoing investigation, highlighting the need for further analysis and synthesis of current evidence.

Analysis of recent research and publications. Contemporary studies indicate that timely non-obstetric surgical intervention during pregnancy can prevent severe maternal and perinatal complications. A considerable body of research has focused on evaluating the safety of anesthetic management, determining the optimal surgical approach, and assessing obstetric outcomes following surgery. According to ACOG recommendations and recent review articles, no currently

used anesthetic agent has demonstrated proven teratogenic effects when administered in standard clinical doses. Particular emphasis is placed on maintaining adequate maternal oxygenation, hemodynamic stability, and normothermia throughout the perioperative period.

Recent meta-analyses and clinical studies have confirmed the high effectiveness of laparoscopic surgery in the management of acute surgical conditions during pregnancy. However, the impact of different surgical techniques on pregnancy progression and perinatal outcomes remains a topic of scientific debate, underscoring the need for continued evaluation and synthesis of available evidence.

Purpose of the article. The aim of this study was to analyze current literature regarding the indications, specific features, and outcomes of non-obstetric abdominal surgery during pregnancy, as well as to assess its impact on maternal health, the course of pregnancy, and perinatal outcomes.

Presentation of the main material of the study. Non-obstetric surgery may be required during any trimester of pregnancy, creating the unique challenge of simultaneously caring for two patients. When surgical management is necessary, it is important for the treating physician to consult an obstetrician before performing non-obstetric surgery as well as certain invasive and endoscopic procedures, as obstetricians possess specialized expertise in the physiological and anatomical changes associated with pregnancy that may affect maternal and fetal well-being during surgery [1, 2].

In the past, laparoscopic procedures during pregnancy were considered hazardous and nearly impossible to perform safely. However, owing to favorable clinical outcomes and growing surgical experience, laparoscopy is now recommended as an operative approach for many emergency conditions encountered during pregnancy [3, 12].

According to the recommendations of the American College of Obstetricians and Gynecologists (ACOG), there is currently no evidence that anesthetic agents used during surgical procedures have teratogenic effects on the fetus or cause fetal brain hypoxia at any stage of pregnancy. The guidelines also emphasize that elective procedures should be postponed until after delivery whenever possible, whereas urgent and emergency operations should not be delayed [1, 2].

Studies evaluating the risks associated with surgery during different trimesters of pregnancy have demonstrated several important considerations. During the first trimester, anesthetic agents themselves do not appear to interfere with organogenesis; however, prolonged maternal hypo- or hyperthermia, hypoxemia, hypercarbia, and hypotension should be avoided because of their potential adverse effects on the fetus. Premedication, including benzodiazepines and opioids, can generally be administered safely without significant concern regarding cleft palate formation due to the limited dose and duration of exposure. The second trimester is considered the safest period for non-elective surgical interventions because the risk of miscarriage is lower, the uterus remains relatively small and allows better visualization of abdominal organs, and the major fetal organ systems have already developed. During the third trimester, the use of nonsteroidal anti-inflammatory drugs is generally discouraged because of the risk of premature closure of the ductus arteriosus. Furthermore, anatomical and physiological adaptations resulting from hormonal changes and progressive fetal growth must be carefully considered when performing surgical and anesthetic procedures [2, 4]. Recent evidence suggests that laparoscopic surgery can be safely performed during any trimester of pregnancy without increasing maternal or fetal risk [22, 23].

Importantly, postponing necessary surgical procedures until after delivery has, in some cases, been associated with an increased incidence of complications for both the mother and the fetus.

A retrospective 10-year study that included 76 pregnant patients demonstrated that, in emergency situations, surgical intervention and anesthesia were not directly responsible for the observed rates of preterm birth (less than 15%) and miscarriage (7%). In contrast, conservative management in these patients could have resulted in life-threatening consequences. The most common indications for surgery were acute appendicitis, adnexal pathology, cholelithiasis, and oncological diseases. Only three patients experienced complications or required repeat surgical intervention [3].

Using data from a Danish national registry, another group of investigators conducted a retrospective cohort study and found that surgery during pregnancy may be associated with an increased risk of adverse birth outcomes. Surgical intervention during pregnancy was linked to a higher risk of small-for-gestational-age infants, very preterm birth, and preterm delivery. The risk of miscarriage was highest during the first week after surgery and gradually declined after two weeks [9].

A retrospective Australian study using data collected between 2009 and 2018 aimed to address this controversy. According to its findings, the incidence of adverse perinatal outcomes following non-obstetric surgery during pregnancy was low and comparable to that observed in the general population [10].

The assessment of the safety of laparoscopic interventions during pregnancy has demonstrated both high efficacy and a favorable safety profile in the management of adnexal pathology. In a single-center study, no serious intraoperative or postoperative complications were reported among the operated pregnant patients. Histopathological examination revealed various adnexal lesions, including high-grade serous ovarian carcinoma, borderline serous cystadenoma, simple ovarian cyst, endometrioma, and mesosalpinx cyst. Five patients delivered vaginally at term, whereas one woman underwent a preterm cesarean section followed by comprehensive surgical staging for ovarian cancer [5].

Regarding acute appendicitis during pregnancy, the results of a U.S. study indicate that timely surgical management of complicated appendicitis is associated with a lower risk of maternal infectious complications without increasing the incidence of adverse perinatal outcomes. In contrast, unsuccessful conservative treatment was associated with poorer clinical outcomes for both the mother and the fetus [6].

Therefore, surgery remains the treatment of choice for acute appendicitis during pregnancy. Current evidence suggests that antibiotic therapy alone should not be considered an adequate alternative to surgery because of the increased risk of severe infectious complications, including septic shock. The choice of surgical approach remains a matter of debate. Although laparoscopy is widely used in contemporary surgical practice, some studies and meta-analyses have failed to demonstrate clear advantages over open appendectomy in pregnant women, and several authors have reported a higher risk of fetal loss associated with the laparoscopic approach [17]. During laparotomy, a transverse incision should be placed at the point of maximal tenderness rather than relying exclusively on the classical McBurney's point, due to displacement of the appendix by the enlarging uterus.

Cholecystectomy is the second most common surgical procedure performed during pregnancy, with an incidence of approximately 0.8% [18]. Numerous risk factors are associated with biliary tract disease, including female sex, obesity, parity, and the normal physiological changes of pregnancy. For example, mechanical compression by the enlarging uterus may contribute to gastrointestinal symptoms and biliary dysfunction. In obese women, gestational increases in body mass index (BMI) have been identified as a strong predictor of gallbladder disease, including acute cholecystitis. Furthermore, the risk of biliary tract disorders is higher among multiparous women than among nulliparous women, with reported rates of 19% and 7%, respectively [19].

Gallstone disease is characterized by the presence of gallstones within the gallbladder. Approximately 0.2–2% of pregnant women develop symptomatic gallstone disease, whereas the majority of cases remain asymptomatic and are diagnosed incidentally. In addition, elevated levels of estrogen and progesterone during pregnancy may promote biliary stasis. Specifically, increased progesterone levels reduce gallbladder emptying, while elevated estrogen levels enhance cholesterol secretion and increase bile saturation. Consequently, biliary stasis combined with impaired gallbladder emptying contributes to gallstone formation [18].

In cases of symptomatic gallstone disease, laparoscopic cholecystectomy is considered a more effective treatment option than conservative management consisting of intravenous hydration, electrolyte correction, and bowel rest [18, 19].

Acute pancreatitis affects approximately 1 in 1,000–5,000 pregnancies and most commonly occurs during the third trimester or in the immediate postpartum period. Gallstone disease is the leading cause of pregnancy-associated acute pancreatitis, accounting for more than 65% of cases, followed by alcohol consumption and hyperlipidemia [20]. Management is generally similar to that of non-pregnant patients and includes nil per os (NPO), fluid and electrolyte resuscitation, nasogastric decompression when indicated, and adequate analgesia. Intensive care unit admission may be the optimal setting for the management of severe cases [20, 21].

Intestinal obstruction complicates approximately 1 in 1,500–3,000 pregnancies and represents the third most common indication for non-obstetric laparotomy during pregnancy. Approximately two-thirds of cases are secondary to postoperative adhesions, although other causes include intussusception, hernias, neoplasms, and appendicitis. Pregnant women are significantly more likely to develop obstruction due to volvulus than non-pregnant women. This complication occurs most frequently during the second trimester because of the rapid

enlargement of the uterus. Displacement and distortion of the bowel by the gravid uterus may result in twisting of intestinal loops, leading to bowel obstruction. Surgical intervention is indicated when conservative management fails [7].

Among the rare complications reported during pregnancy is the incarceration of a gravid uterus within an umbilical hernia, as described in a case report from Morocco. The diagnosis was established clinically and confirmed using imaging modalities, including ultrasonography and magnetic resonance imaging (MRI). The patient was successfully treated laparoscopically. The authors emphasized the importance of timely management of umbilical hernias, particularly in women of reproductive age [8].

Conclusions. Non-obstetric abdominal surgical interventions during pregnancy constitute an essential component of emergency medical care and, in most cases, cannot be postponed until the completion of gestation. Current evidence indicates that the risks associated with disease progression and delayed treatment often outweigh the potential risks of surgical intervention. Therefore, treatment decisions should be based on an individualized assessment of maternal and fetal condition, gestational age, and the nature of the underlying disease.

Advances in minimally invasive surgery and improvements in anesthetic management have substantially enhanced the safety of surgical procedures in pregnant patients. When current clinical guidelines are followed, laparoscopic surgery can be successfully performed for the majority of emergency surgical conditions during pregnancy. Early diagnosis, multidisciplinary collaboration, and timely surgical intervention remain the key factors contributing to favorable maternal and perinatal outcomes.

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