Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13238 – 13254
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6233

Appendicitis in Pregnancy: An Updated Review for Healthcare Professionals and the Main Roles of Emergency Professionals

Hind Hussein Alonizi[1], Bader Ali Alotaibi[2], Dheifallah Saud Alrashidi[3], Ghadah Ahmad Alfaqeeh[4], Adel Sarhan Awadh Alasmari[5], Saeed Mohammed Muhy Alqahtani[6], Adel Mohammed Alghurab[7], Saleh Khalaf Jadhan Al Onazi[8], Albariqi, Ahmed Amer M[9], Amjad Mohammed Alanazi[10], Taghreed Saad Salim Albalawi[11], Hanan Sameer Alatawi[12], Manar Mohammed Albalawi[13], Ashwaq Ahmed Madkhali[14], Omar Muhsen M Hakami[15]

Abstract

Acute appendicitis is the most common non-obstetric surgical condition during pregnancy, requiring prompt diagnosis and management to prevent complications such as perforation, peritonitis, and preterm labor. Diagnosing appendicitis in pregnancy is challenging due to physiological changes, including displacement of the appendix and overlapping symptoms with pregnancy-related conditions. Imaging techniques like ultrasound and MRI are preferred to minimize fetal radiation exposure, and surgical intervention, particularly laparoscopic appendectomy, is the primary treatment.This review aims to provide an updated overview of the diagnosis, management, and treatment of acute appendicitis in pregnant patients, emphasizing the roles of emergency professionals in ensuring timely and effective care.The review synthesizes current literature on the etiology, epidemiology, pathophysiology, and diagnostic challenges of acute appendicitis in pregnancy. It evaluates the roles of clinical assessment, laboratory testing, and imaging modalities, including ultrasound, CT, and MRI. The review also discusses surgical and nonsurgical management strategies, highlighting the importance of a multidisciplinary approach involving obstetricians, surgeons, and anesthesiologists.Acute appendicitis in pregnancy presents atypically due to anatomical and physiological changes, complicating diagnosis. Ultrasound and MRI are safe and effective imaging tools, while laparoscopic appendectomy is the preferred surgical approach, though open surgery may be necessary in advanced pregnancy. Delayed diagnosis increases the risk of complications, including perforation and preterm labor. A multidisciplinary approach is essential for optimizing maternal and fetal outcomes.Timely diagnosis and treatment of acute appendicitis in pregnancy are critical to minimizing risks to both mother and fetus. Emergency professionals play a pivotal role in early recognition, diagnostic imaging, and coordination of care. A multidisciplinary approach, combined with appropriate imaging and surgical intervention, ensures optimal outcomes.

Keywords: *Acute Appendicitis, Pregnancy, Diagnosis, Imaging, Laparoscopic Appendectomy, Multidisciplinary Care, Emergency Professionals.*

[1] Ksa, Ministry of Health, Price Sultan Military Medical City
[2] Ksa, Ministry of Health, Rumah Hospital.
[3] Ksa, Ministry of Health.
[4] Ksa, Ministry of Health, Riyadh Third Health Cluster.
[5] Ksa, Ministry of Health, Health Services Center and School
[6] Ksa, Ministry of Health, Prince Sultan Military Medical City
[7] Ksa, Ministry of Health, Prince Sultan Military Medical City
[8] Ksa, Ministry of Health, Msd
[9] Ksa, Ministry of Health, Health Services Center and School
[10] Ksa, Ministry of Health,Maternity And Children's Hospital In Tabuk
[11] Ksa, Ministry of Health, Maternity and Children's Hospital in Tabuk
[12] Ksa, Ministry of Health, Maternity and Children's Hospital in Tabuk
[13] Ksa, Ministry of Health, Maternity and Children's Hospital in Tabuk
[14] Ksa, Ministry of Health, Maternity and Children's Hospital in Tabuk
[15] Ksa, Ministry of Health, Mental Health Hospital

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13238 – 13254
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6233

Introduction

Acute appendicitis is a clinical condition confirmed through histopathological examination, which identifies inflammation of the vermiform appendix. The condition usually presents within 24 hours with acute symptoms, but the clinical course can vary. If appendiceal perforation leads to a localized abscess, symptoms may develop more gradually and may not be immediately recognized [1][2][3][4]. The presentation of acute appendicitis is not always uniform, making the diagnosis complex, particularly in specific populations such as pregnant patients. Acute appendicitis is the most common non-obstetric surgical condition requiring intervention during pregnancy. Immediate diagnosis and management are crucial to prevent complications that could pose serious risks to both the mother and fetus [5]. However, diagnosing acute appendicitis in pregnancy presents challenges, as the typical clinical manifestations may not be evident or may be mistaken for common pregnancy-related symptoms. The physiological changes associated with pregnancy, including displacement of abdominal organs by the expanding uterus, can alter the appendix's location, further complicating the diagnostic process. This displacement may result in atypical symptom presentation, making clinical assessment less straightforward. Furthermore, standard laboratory and biochemical markers commonly used to diagnose acute appendicitis in the general population may be unreliable in pregnant patients due to pregnancy-induced physiological variations [6].

The pathogenesis, diagnostic approaches, and treatment strategies for acute appendicitis in pregnancy are generally similar to those applied to nonpregnant individuals, but specific adaptations are required to account for maternal and fetal physiology. Imaging techniques such as ultrasound and magnetic resonance imaging (MRI) are preferred in pregnant patients to minimize fetal exposure to ionizing radiation. Surgical intervention remains the primary treatment, with laparoscopic appendectomy increasingly favored due to its advantages, including reduced postoperative pain and faster recovery. However, in advanced pregnancy, an open surgical approach may sometimes be necessary to ensure better visualization and access. The management of acute appendicitis during pregnancy necessitates a multidisciplinary approach involving obstetricians, surgeons, and anesthesiologists to optimize maternal and fetal outcomes. Delayed diagnosis and treatment increase the risk of complications, including perforation, peritonitis, and preterm labor. Therefore, heightened clinical awareness and the use of appropriate diagnostic and therapeutic strategies are essential in ensuring positive outcomes for both the mother and the fetus.

Etiology

The primary cause of acute appendicitis is mechanical obstruction of the appendiceal lumen, often due to an appendicolith. However, other factors can contribute to luminal blockage, including appendiceal tumors, intestinal parasites, or hypertrophied lymphatic tissue. In pediatric patients, lymphatic tissue hypertrophy is a more common cause, while adults are more frequently affected by infections, fecaliths, or neoplastic growths [7]. The appendix contains both aerobic and anaerobic bacteria, including *Escherichia coli* and *Bacteroides* species. When luminal obstruction occurs, the bacterial load increases, leading to acute inflammation and potential abscess formation. Advanced sequencing techniques have demonstrated that patients with perforated appendicitis exhibit a significantly higher bacterial load in certain phyla compared to those with uncomplicated cases [8]. The underlying causes of acute appendicitis in pregnant individuals are largely similar to those in nonpregnant adults [9]. However, *Fusobacterium nucleatum*, an anaerobic bacterium commonly found in the oral cavity and linked to periodontal disease, has been implicated in pregnancy-related complications such as chorioamnionitis, preterm labor, stillbirth, neonatal sepsis, and preeclampsia. Despite these associations, current evidence does not conclusively support distinct microbiological contributors to acute appendicitis during pregnancy [10].

Epidemiology

Acute appendicitis is one of the most frequent causes of acute abdominal conditions, with an incidence ranging from 100 to 223 cases per 100,000 individuals each year [11][12]. In the United States, around 300,000 hospital visits annually are attributed to appendicitis-related conditions, highlighting its significant impact on healthcare systems [13][9]. The condition primarily affects individuals between the ages of 5 and

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13238 – 13254
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6233

45, with an average age of occurrence at 28 years [9]. While appendicitis can develop at any age, it is more common in younger individuals, particularly adolescents and young adults. The prevalence of acute appendicitis in pregnant individuals is comparable to that of nonpregnant adults, with incidence rates ranging between 1 in 181 and 1 in 1,700 pregnancies [14]. Among the three trimesters, the second trimester has the highest reported incidence of the condition [15][16]. Acute appendicitis remains the most common nontraumatic surgical emergency during pregnancy, accounting for approximately two-thirds of all such cases [5]. The diagnosis of appendicitis in pregnancy can be complex due to physiological changes that may mask symptoms or lead to misinterpretation. The risk of complications, including perforation and peritonitis, increases with delayed diagnosis, which can further impact maternal and fetal outcomes. Despite these challenges, the overall incidence of appendicitis in pregnancy does not significantly differ from that of the general population, but the clinical approach requires careful evaluation to ensure timely intervention and reduce risks associated with both the condition and its treatment.

Pathophysiology

The pathophysiology of acute appendicitis during pregnancy is similar to that in nonpregnant individuals. The condition primarily results from obstruction of the appendiceal lumen, which can be caused by lymphoid hyperplasia, parasitic infections, fecaliths, or neoplastic growths, either benign or malignant. Following obstruction, mucus accumulates within the appendix, causing progressive distension and increased intraluminal and intramural pressure. This leads to small vessel occlusion, thrombosis, and lymphatic congestion. As vascular and lymphatic compromise worsens, ischemia and necrosis develop in the appendiceal wall. The obstructed appendix undergoes bacterial overgrowth, with aerobic organisms dominating in the early stages and a mixed population of aerobes and anaerobes appearing later. Frequently identified bacteria include *Escherichia coli, Peptostreptococcus, Bacteroides*, and *Pseudomonas*. If the inflammation and necrosis progress significantly, the appendix may perforate, leading to localized abscess formation or, in severe cases, peritonitis [17][18]. The initial symptom of acute appendicitis is usually vague visceral pain, which results from appendiceal distension. This discomfort is often diffuse and poorly localized. As the inflammation progresses, pain typically shifts to the right lower quadrant when the inflamed appendiceal tip irritates the adjacent parietal peritoneum or when perforation occurs, leading to localized peritonitis. However, in pregnant individuals, the enlarging uterus lifts and stretches the anterior abdominal wall, altering the position of the appendix. This displacement reduces the likelihood of direct irritation to the parietal peritoneum, potentially modifying the typical presentation of appendicitis-related pain. Consequently, diagnosis in pregnancy can be more challenging due to these anatomical and physiological changes.

Histopathology

Distinct histopathological findings specific to acute appendicitis in pregnancy have not been well established. The histopathological features and classifications used for nonpregnant patients are also applied to pregnant individuals. The primary microscopic feature of acute appendicitis is neutrophilic infiltration within the muscularis propria. The severity and extent of inflammation correlate with the duration of the disease and the progression of infection. As the condition advances, inflammatory changes extend to involve the appendiceal fat and surrounding tissues [19][9]. Acute appendicitis is classified histopathologically into three main categories: suppurative (phlegmonous) appendicitis, gangrenous and perforated appendicitis, and periappendicitis. These classifications help guide diagnosis and determine the severity of appendiceal inflammation.

Suppurative (Phlegmonous) Appendicitis

This type is characterized by extensive neutrophilic infiltration of the appendiceal mucosa, submucosa, and muscularis propria. The inflammatory process affects the entire appendiceal wall and can cause significant ulceration. Intramural microabscesses and vascular thrombosis are also common findings. Although the appendix may appear grossly normal in some cases, certain changes can be observed. These may include a poorly demarcated serosal surface, dilation, vascular congestion, or fibrinopurulent serosal exudates. The diameter of the appendix may also increase, though this finding is inconsistent [9].

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13238 – 13254
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6233

Gangrenous and Perforated Appendicitis

This category is defined by appendiceal wall necrosis, which, if left untreated, leads to perforation. When perforation occurs, there is transmural inflammation with extensive mucosal ulceration and necrotic tissue. The inflammatory process extends beyond the appendix, involving the surrounding tissues, particularly the mesoappendix. Grossly, the appendix wall appears friable and discolored, showing shades of purple, green, or black. Perforation is associated with more severe complications, including abscess formation and peritonitis [20].

Periappendicitis

Periappendicitis refers to inflammation confined to the serosa and subserosa, with no extension into the muscularis propria. Mucosal erosions may be present, indicating tissue damage. The gross appearance of the appendix in periappendicitis can range from normal to congested serosa with exudative infiltration. This form of appendicitis may be associated with secondary causes of inflammation, such as adjacent infections or systemic inflammatory conditions [21][9][20].

Complicated vs. Uncomplicated Appendicitis

Appendicitis is further categorized as uncomplicated or complicated. Uncomplicated appendicitis refers to cases where inflammation remains localized, without necrosis or perforation. Complicated appendicitis, on the other hand, may occur with or without perforation. Nonperforated complicated appendicitis includes severe phlegmonous and gangrenous forms, both of which are associated with a high degree of tissue damage. Histopathological evaluation plays a crucial role in confirming the final diagnosis of appendicitis. The findings help determine disease severity and guide appropriate management strategies. Since the histopathological patterns of appendicitis do not significantly differ between pregnant and nonpregnant patients, the same diagnostic criteria apply to both groups.

History and Physical

Acute appendicitis presents with generalized or periumbilical abdominal pain that later localizes to the right lower quadrant. This symptom progression is characteristic of the transition from visceral to somatic pain. Approximately 75% of patients with acute appendicitis seek medical attention within 24 hours of symptom onset. However, pregnant patients often exhibit subtler symptoms, and the likelihood of presenting with the classic triad of migratory pain, nausea, and anorexia is lower than in nonpregnant patients, especially in late pregnancy [22][17][23][24][25][26]. As pregnancy progresses, physiological and anatomical changes may further obscure the clinical picture, delaying diagnosis and increasing the risk of complications.

Symptoms and Clinical Presentation

The primary symptom of acute appendicitis is abdominal pain. While the base of the appendix is relatively fixed, its tip can be positioned in various locations, including retrocecal, subcecal, pre-ileal, post-ileal, and pelvic. In the early stages of inflammation, visceral afferent nerve fibers from T8 to T10 transmit pain signals, leading to vague midabdominal discomfort. As inflammation advances, pain localizes to the lower right quadrant due to irritation of the adjacent parietal peritoneum. However, not all patients experience this classic migratory pain pattern [22][17][23][24][25][26]. Additional symptoms commonly reported in patients with acute appendicitis include anorexia, nausea with or without vomiting, and low-grade fever. Fever is present in approximately 40% of cases but is typically a late finding. In addition to the classic symptoms, some patients present with atypical manifestations such as malaise, heartburn, flatulence, constipation, or diarrhea [22][17][23][24][25][26]. The location of the appendiceal tip influences the symptomatology. When the appendix is positioned in the pelvis, patients may experience urinary urgency, frequency, dysuria, tenesmus, or diarrhea [27][9][22][17][23][24][25][26]. Retrocecal appendicitis may not cause significant lower quadrant pain but can lead to back or flank pain instead. These variations in presentation underscore the importance of considering appendicitis even in patients who do not exhibit the textbook symptom pattern.

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13238 – 13254
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6233

Appendicitis in Pregnancy

Despite the displacement of abdominal organs by the gravid uterus, most pregnant patients with acute appendicitis experience abdominal pain. The pain often localizes to the right lower quadrant near McBurney's point, which is one-third of the distance between the anterior superior iliac spine and the umbilicus. However, as pregnancy advances, the appendix may be displaced superiorly due to uterine enlargement, resulting in pain that may be described in the right flank or right upper quadrant [28][29][30][31][32][26][33][34][35]. The altered anatomical positioning of the appendix during pregnancy may also contribute to diagnostic delays, increasing the risk of perforation and associated complications. Pregnant patients are less likely to present with the classic symptoms of anorexia, nausea, and vomiting, and their clinical presentation may be mistaken for other pregnancy-related conditions such as round ligament pain, gastroenteritis, or urinary tract infections [22][17][23][24][25][26]. Fever and leukocytosis, which are common findings in appendicitis, may also be less reliable indicators in pregnancy due to the physiological leukocytosis associated with gestation. Given these diagnostic challenges, a high index of suspicion is necessary to ensure timely diagnosis and management.

Physical Examination Findings

The physical examination findings in acute appendicitis can be subtle, particularly in the early stages of the disease. As inflammation progresses, signs of peritoneal irritation develop, including rebound tenderness and involuntary guarding. In both pregnant and nonpregnant patients, the most common physical examination findings include right lower quadrant tenderness, localized peritoneal signs, and abdominal rigidity [22][17][23][24][25][26][36]. The location of tenderness may shift in pregnancy as the appendix is displaced superiorly by the growing uterus. Pelvic appendicitis may cause tenderness below McBurney's point, particularly in pregnant patients. In cases of retrocecal appendicitis, tenderness may be elicited through a rectal or vaginal examination rather than direct palpation of the abdomen. The psoas sign (pain with passive extension of the right hip) and the obturator sign (pain with internal and external rotation of the flexed hip) may also be positive in cases where the appendix is in a retrocecal or pelvic location. However, these signs are not consistently present and should not be relied upon exclusively for diagnosis [22][17][23][24][25][26][36].

Diagnostic Challenges and Considerations

The diagnosis of acute appendicitis in pregnancy is complicated by overlapping symptoms with other gestational conditions, anatomical displacement of the appendix, and physiological changes that alter the typical inflammatory response. Imaging modalities such as ultrasound and MRI are often employed to confirm the diagnosis, particularly in cases where clinical findings are inconclusive. Delayed diagnosis increases the risk of appendiceal perforation, which is associated with higher rates of maternal and fetal morbidity. Therefore, a combination of clinical assessment, laboratory findings, and imaging studies is essential for accurate and timely diagnosis [28][29][30][31][32][26][33][34][35].

Evaluation of Acute Appendicitis

The diagnosis of acute appendicitis, particularly in pregnant patients, can be challenging due to the overlap of symptoms with other conditions and the anatomical changes associated with pregnancy. To assist in diagnosis, several scoring systems and diagnostic tools have been developed. These systems typically rely on clinical presentation, laboratory findings, and imaging techniques, including abdominal ultrasonography, to increase the accuracy of diagnosis and guide treatment decisions. The most widely used scoring system is the Alvarado score, developed in 1986, which is particularly effective in nonpregnant patients and shows promise in pregnant individuals as well [37].

Laboratory Testing in Acute Appendicitis in Nonpregnant Patients

In nonpregnant individuals, laboratory testing plays a crucial role in diagnosing acute appendicitis. Key laboratory markers include the total leukocyte count (WBC), neutrophil percentage, and C-reactive protein

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13238 – 13254
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6233

(CRP) concentration. A leukocytosis, characterized by a WBC count exceeding 10,000 cells/mm³, is commonly found in two-thirds of patients with acute appendicitis and is considered a strong predictor of the condition. A left shift, or the presence of bandemia, often accompanies this finding, indicating the body's response to infection. CRP is also elevated in many cases of acute appendicitis and, when combined with elevated WBC, can strengthen the diagnostic certainty [38]. However, normal levels of WBC and CRP are also valuable. A normal WBC and CRP, particularly when obtained early in the disease course, have a high negative predictive value for acute appendicitis, making them useful for excluding the diagnosis. These tests also help differentiate between uncomplicated and complicated appendicitis, with elevated WBC and CRP levels correlating with an increased likelihood of complications such as perforation or abscess formation. A WBC count ≥17,000 cells/mm³ is commonly associated with complicated appendicitis [39]. Microscopic hematuria and pyuria may be observed in cases where the inflamed appendix is near the bladder or ureter. However, these findings are not specific to appendicitis and are typically seen in fewer than 20% of cases [40].

Laboratory Testing in Acute Appendicitis in Pregnant Patients

Leukocytosis, which is common in acute appendicitis, poses particular challenges in pregnancy due to the physiological leukocytosis seen in the gestational period. Leukocyte counts as high as 16,900 cells/mm³ can be a normal finding, especially in the third trimester, and may rise up to 29,000 cells/mm³ during labor, with a slight neutrophilic predominance [41][42][43][44][45][46]. Therefore, leukocytosis cannot be relied upon as a definitive indicator for acute appendicitis in pregnant patients, as it may occur due to the physiological changes of pregnancy rather than the presence of infection. An alternative marker for appendiceal perforation is serum bilirubin. Mild elevations in bilirubin levels have been shown to correlate with appendiceal perforation, demonstrating 70% sensitivity and 86% specificity [47]. However, the use of this isolated marker in clinical practice is not recommended due to its limited diagnostic value. Recent studies have also explored the use of the neutrophil-to-lymphocyte ratio (NLR) and platelet-to-lymphocyte ratio (PLR) as diagnostic adjuncts for acute appendicitis in pregnant patients. These markers have shown promise in improving diagnostic accuracy, suggesting that a combination of these ratios may help in distinguishing between uncomplicated and complicated appendicitis during pregnancy [48].

Imaging Studies

Imaging studies are integral to the diagnosis of acute appendicitis, especially in cases where the clinical presentation is unclear or when the diagnosis is uncertain. The primary imaging modalities include graded compression ultrasound, computed tomography (CT), and magnetic resonance imaging (MRI). Ultrasound is often the first imaging technique used due to its non-invasive nature and safety, particularly in children and pregnant women. However, ultrasound has lower sensitivity and specificity compared to CT, especially in obese patients or those with atypical appendiceal locations. Nonetheless, ultrasound remains valuable in excluding other abdominal conditions, such as ovarian torsion or pelvic inflammatory disease. CT is considered the gold standard for diagnosing acute appendicitis, offering high sensitivity and specificity. However, due to the risks associated with ionizing radiation, its use is generally limited in pregnant patients and children. In pregnant women, MRI can serve as a valuable alternative, particularly when ultrasound results are inconclusive. MRI provides high-quality imaging without the risks associated with radiation, making it ideal for use in pregnant patients suspected of having appendicitis [9].

In pregnancy, the decision to use imaging is influenced by the increased risks associated with negative appendectomies, which can result in unnecessary surgical interventions and potential harm to the fetus. As such, imaging studies are recommended for all pregnant women with suspected acute appendicitis to improve diagnostic accuracy and guide management decisions. MRI is increasingly favored for its safety profile and diagnostic capability, especially in cases where ultrasound does not provide conclusive results. In summary, the evaluation of acute appendicitis in both pregnant and nonpregnant individuals involves a combination of clinical assessment, laboratory testing, and imaging studies. While the Alvarado score and other scoring systems can aid in diagnosis, the clinical presentation of appendicitis can vary, particularly in pregnant women due to anatomical and physiological changes. Laboratory markers, including WBC count and CRP, play a critical role in confirming the diagnosis and assessing the severity of the condition. Imaging,

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13238 – 13254
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6233

particularly ultrasound and MRI, is essential in pregnant patients to avoid unnecessary radiation exposure and improve diagnostic accuracy. The integration of these diagnostic modalities ensures timely and accurate identification of acute appendicitis, allowing for appropriate surgical intervention and reducing the risk of complications.

Ultrasonography

Abdominal ultrasonography is a commonly used, non-invasive diagnostic tool for evaluating patients with acute abdominal pain, particularly in those with suspected appendicitis. It is the first imaging modality of choice due to its widespread availability and lack of radiation exposure. The diagnostic criteria for acute appendicitis include an anteroposterior appendiceal diameter greater than 6 mm, the presence of an appendicolith, and increased echogenicity in the periappendiceal fat. Additionally, a specific compressibility index along with a diameter of less than 5 mm can be used to exclude appendicitis [49][9]. Despite its utility, ultrasonography has inherent limitations, particularly in patients with obesity, where visualizing the appendix may be difficult due to increased tissue thickness. The accuracy of ultrasonography also heavily depends on the operator's skill and experience. Furthermore, in patients with peritonitis, the required graded compression for a complete assessment is often poorly tolerated, reducing the reliability of the results. In pregnant patients, the presence of a gravid uterus further limits the sensitivity and specificity of ultrasound for diagnosing acute appendicitis, although the modality remains a safe option that can also provide insights into fetal well-being and other obstetric causes of abdominal pain [50].

Computed Tomography

Abdominopelvic computed tomography (CT) offers a high level of accuracy, with more than 95% diagnostic sensitivity for acute appendicitis. CT criteria for appendicitis include an enlarged appendix, thickened appendiceal walls, periappendiceal fat stranding, appendiceal wall enhancement, and the appearance of inflamed tissue separating the appendix from the cecum. Additionally, the presence of an appendicolith is a common finding [52][9]. Despite its high accuracy, the primary concern with using CT for diagnosing acute appendicitis is the exposure to ionizing radiation. The typical radiation dose from an abdominopelvic CT scan is approximately 4 mSv, which is slightly higher than the background radiation dose of around 3 mSv. Although this radiation exposure is generally considered to be low and below levels that might cause fetal harm, caution is exercised when using CT in pregnant patients. In cases where ultrasonography is inconclusive and MRI is not available, CT may still be used, but only in selected situations [53][54][55][9][50][56][40][57].

Magnetic Resonance Imaging

Magnetic resonance imaging (MRI) has emerged as a highly sensitive and specific modality for diagnosing acute appendicitis, particularly in pregnant patients. MRI offers exceptional diagnostic accuracy with a sensitivity of 91.8% and specificity of 97.9%, making it a preferred tool for pregnant patients at risk of radiation exposure [58]. The advantage of MRI over CT lies in its lack of ionizing radiation, making it ideal for pregnant women and those with specific concerns about radiation-related complications. The MRI protocols for diagnosing appendicitis typically involve imaging in three planes using T2-weighted sequences, with some protocols incorporating T2 fat-suppressed imaging for better clarity of the appendix and surrounding structures. MRI findings for acute appendicitis mirror those seen on CT, including luminal distension, wall thickening, and the presence of periappendiceal free fluid [58][9]. Studies have demonstrated that routine use of MRI in pregnant patients with suspected appendicitis can significantly reduce the negative appendectomy rate by nearly 50%, without increasing the perforation rate. This makes MRI a highly effective diagnostic tool in pregnant patients, particularly when ultrasound results are inconclusive. While MRI is not as widely available as ultrasound or CT, when accessible, it is strongly recommended for pregnant patients suspected of having acute appendicitis [59][60]. In situations where MRI is unavailable or limited, the decision to delay appendectomy for an MRI study should be carefully considered, weighing the risks of both negative appendectomy and appendiceal perforation. The potential severity of these outcomes underscores the importance of obtaining comprehensive clinical and imaging data to make the most informed decision possible [50].

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13238 – 13254
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6233

Surgical Treatment of Acute Appendicitis Without Perforation

The primary treatment for acute appendicitis is appendectomy. Perioperative antibiotic therapy is essential and should cover a broad spectrum of bacteria, including Gram-negative and Gram-positive organisms, with a second-generation cephalosporin, as well as anaerobes, typically managed with clindamycin or metronidazole. Delaying the surgical intervention beyond 24 hours from symptom onset increases the risk of perforation and complications [61][62][63]. Two main approaches for appendectomy exist: laparoscopic and open techniques. While no randomized trials definitively demonstrate one method as superior, the choice of approach should depend on several factors, including the clinical status of the patient, gestational age and size of the gravid uterus, and the surgeon's experience. Current guidelines recommend laparoscopic appendectomy as the standard of care for pregnant patients. This approach is considered safe, allows for easier identification of the appendix in varied locations, and provides the added benefit of allowing the surgeon to inspect the abdomen for any associated pathological conditions [64].

Despite its advantages, multiple systematic reviews comparing laparoscopic and open appendectomy have indicated a slightly higher risk of fetal loss in patients undergoing laparoscopic surgery [65][66]. Nevertheless, laparoscopic appendectomy has significant benefits, such as reduced surgical time and shorter hospital stays, with comparable obstetric outcomes between laparoscopic and open appendectomy groups. These findings highlight the effectiveness of laparoscopic appendectomy in managing acute appendicitis in pregnant patients, underscoring its broader clinical benefits [14]. Several modifications are recommended when performing laparoscopic appendectomy in pregnant patients, especially after 20 weeks of gestation. These include placing the patient in a slight left-lateral position to avoid compression of the inferior vena cava, using an open-access technique for the initial trocar insertion to minimize the risk of injury to the gravid uterus, limiting intraabdominal insufflation pressure to less than 12 mmHg, and adjusting the position of the ports according to the fundal height of the uterus [67][68]. When performing an open appendectomy in a pregnant patient, the surgeon typically makes a transverse incision at the site of maximal tenderness rather than at the McBurney point, as the appendix's position can vary. In cases where the diagnosis is uncertain, a lower midline vertical incision may be used, as it allows for better exposure of the abdomen and facilitates the diagnosis and treatment of other conditions that could mimic appendicitis [29][30].

Nonsurgical Management

Nonsurgical management of acute appendicitis using antibiotics alone has been explored as a potential alternative to surgery, particularly in pregnant patients. However, evidence suggests that antibiotic therapy alone is associated with a higher likelihood of adverse outcomes, including complications and a higher rate of negative appendectomy. As a result, appendectomy remains the standard and preferred treatment for acute appendicitis during pregnancy, with surgery generally considered more effective in preventing complications such as perforation or abscess formation [69][70].

Treatment of Complicated Acute Appendicitis with Perforation

The management of acute appendicitis with perforation depends on the nature of the perforation. In cases of a free perforation, where pus and fecal material are disseminated into the peritoneal cavity, the patient is likely to present with severe illness and potentially develop septic conditions. These patients are at an increased risk of complications such as preterm labor, preterm delivery, and fetal loss in pregnant women. Immediate surgical intervention is required, typically in the form of laparotomy. The procedure involves appendectomy with thorough irrigation and drainage of the peritoneal cavity to prevent further contamination and manage infection [71][72]. In nonpregnant patients, those with symptoms lasting more than five days, suggesting a contained perforation, are generally managed with conservative measures. These include antibiotics, intravenous fluids, and bowel rest. Immediate surgical intervention in this scenario may lead to increased morbidity due to the presence of adhesions and inflammation, which can complicate the surgical procedure. It is also associated with a higher risk of damage to adjacent structures. If surgery is performed too early, patients may develop serious postoperative complications such as abscesses or enterocutaneous fistulae, necessitating reoperation for more extensive resections and potentially requiring

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13238 – 13254
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6233

the creation of colostomies. The evidence regarding the management of contained appendiceal perforation in pregnant patients is limited and less well-defined. Given the increased risk of sepsis, preterm labor, and fetal loss in these cases, close monitoring in the hospital is essential. Current guidelines emphasize caution, with a focus on preventing sepsis and avoiding unnecessary fetal risk. However, there is insufficient information available regarding the use of interventional drainage for appendiceal abscesses in pregnant patients, which remains an area requiring further research and exploration [73].

Differential Diagnosis

The differential diagnosis of acute appendicitis during pregnancy includes conditions that are typically considered in nonpregnant individuals, as well as pregnancy-related issues. The clinician must consider a range of gastrointestinal, urological, and gynecological conditions, as well as pregnancy-related complications.

- Gastrointestinal Conditions: These include cecal diverticulitis, Meckel diverticulitis, acute ileitis, inflammatory bowel disease, renal colic, and urinary tract infections.

- Gynecological Conditions: These include tubo-ovarian abscess, pelvic inflammatory disease, ruptured ovarian cyst, and adnexal torsion.

- Pregnancy-Related Causes: Conditions such as placental abruption, uterine rupture, preeclampsia, and HELLP syndrome (hemolysis, elevated liver function tests, low platelets) should also be considered, as they can present symptoms similar to acute appendicitis.

- Other Considerations: In early pregnancy, ectopic pregnancy should be ruled out. Additionally, round ligament syndrome, which can cause lower quadrant pain during periods of rapid uterine growth, must be considered in the differential diagnosis.

Surgical Oncology

Appendiceal malignancies are rare, with an incidence of 1.2 cases per 100,000 individuals in the United States. Although most cases occur in patients aged 50 to 55 years, appendiceal neoplasms can present in the reproductive years. Approximately 30% of appendiceal malignancies present acutely, and the types of malignancies vary widely.

Gastroenteropancreatic Neuroendocrine Tumors (GEP-NETs)

- GEP-NETs are the most common histopathological subtype of appendiceal malignancies. These tumors typically have a low rate of metastasis to the liver or lymph nodes, but when metastasis is suspected, further evaluation of the liver and the ileocolic lymph node basin is essential. The size of the primary tumor will influence the surgical approach.

Goblet Cell Carcinoma

- Goblet cell carcinomas are common in appendiceal malignancies and share diagnostic features with both appendiceal adenocarcinoma and neuroendocrine tumors. A thorough peritoneal evaluation should be performed, including documentation of the peritoneal cancer index score, to guide treatment decisions.

Lymphoma

- Non-Hodgkin lymphoma (NHL), including mucosa-associated lymphoid tissue (MALT) lymphomas, may initially present as acute appendicitis. Although rare, NHL is a potential cause of

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13238 – 13254
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6233

appendicitis. Surgical management typically involves a simple appendectomy, though a comprehensive systemic evaluation should be done to exclude metastatic sites.

Adenocarcinoma

- Appendiceal adenocarcinoma, though rare, often presents symptoms mimicking acute appendicitis. The most common histopathological subtypes of appendiceal adenocarcinoma require a standard treatment of right hemicolectomy, regardless of the tumor size or lymph node involvement.

Mucocele and Mucinous Neoplasm

- Appendiceal mucocele can present with acute appendicitis and arises from a benign or malignant spectrum of mucosal hyperplasia and cystic formations. Preoperative radiological features that suggest an appendiceal mucocele include a well-encapsulated cystic structure in the right lower quadrant. However, a definitive diagnosis often requires intraoperative evaluation and histopathological examination.

- Surgical management: Appendectomy is the preferred treatment for appendiceal mucocele. Care must be taken to prevent rupture of the capsule during surgery. A comprehensive peritoneal evaluation, including documentation of the peritoneal cancer index score, should be performed. The use of a laparoscopic approach is appropriate for cases with radiological features of a homogenous cyst, but patient selection is crucial to ensure safe surgical management [74][75][76][77][78].

Prognosis

Appendectomy is generally considered a safe surgical procedure. A global observational study found the overall mortality rate for appendicitis to be 0.28% in the general population.[79] Several factors are associated with higher mortality rates, including age over 80 years, immunosuppression, severe cardiovascular disease, other comorbidities, prior episodes of suspected appendicitis, and previous antimicrobial therapy. When acute appendicitis is diagnosed early and treated promptly, recovery typically occurs within 24 to 48 hours. However, complications such as advanced abscesses, peritonitis, or sepsis may lead to a more prolonged and complex recovery, potentially requiring further surgical intervention. For pregnant patients undergoing appendectomy, the long-term prognosis is typically positive. The greater risk for adverse obstetric events lies in preexisting morbidities, not the surgery itself.[80][81] Maternal morbidity and mortality following appendectomy are low, and outcomes are similar to those observed in nonpregnant individuals.[82]

Complications

Appendectomy in pregnancy presents risks to both the pregnancy and the patient. Complications include bleeding, infection, intraperitoneal abscess formation, injury to surrounding tissues, pain, and scarring. However, untreated appendicitis carries a significant risk of appendiceal perforation. Free perforations can release purulent and feculent material into the peritoneal cavity, increasing the risk of preterm labor, preterm delivery, and fetal loss. The fetal loss rate during uncomplicated appendectomies is 2%, but if generalized peritonitis or peritoneal abscesses are present, fetal loss can rise to 6%.[72] In cases of free appendiceal perforation, the risk of fetal loss increases to 36%.[71] The incidence of preterm labor following appendectomy is 4%, escalating to 11% in complicated appendicitis. Negative appendectomy is associated with a 10% risk of preterm labor and a 4% risk of fetal loss.[72] Early diagnosis and treatment of acute appendicitis during pregnancy significantly lower the morbidity and mortality rates for both the gravida and fetus.

Consultations

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13238 – 13254
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6233

Any suspected case of acute appendicitis in pregnancy warrants an obstetric consultation to exclude obstetric and gynecological causes of abdominal pain and assess the fetus' well-being before, during, and after anesthesia.

Patient Education

Acute appendicitis is a common condition during the reproductive years and is the most frequent non-obstetric surgical diagnosis in pregnancy. The risks of appendectomy during pregnancy are generally low for both the gravida and fetus. However, appendiceal perforation, particularly free perforation, poses significant risks. The risk of rupture is variable but approximately 2% at 36 hours after symptom onset, increasing by about 5% every 12 hours thereafter. Pregnant patients should be counseled to seek medical attention if they experience persistent abdominal pain, especially if accompanied by anorexia, nausea, vomiting, or fever.

Enhancing Healthcare Team Outcomes

Diagnosing acute appendicitis in pregnancy can be challenging due to nonspecific symptoms like nausea, vomiting, and leukocytosis. Various potential causes for acute abdominal pain need to be considered, including gynecological, obstetric, gastrointestinal, urological, metabolic, and vascular conditions. Although physical examination may suggest a surgical abdomen, identifying the underlying cause can be difficult. A coordinated approach is essential when managing pregnant patients with acute appendicitis. Physicians, advanced practice providers, nurses, pharmacists, and other healthcare professionals should collaborate to ensure patient-centered care, improve outcomes, and optimize safety for both the gravida and fetus. Physicians and advanced practice providers must understand the unique anatomical and physiological changes during pregnancy that may affect both diagnosis and treatment. Prompt diagnosis and treatment are crucial to minimizing risks. Obstetric care providers and general surgeons must work together to develop a treatment plan tailored to the pregnancy's stage, the severity of appendicitis, and the potential impact on maternal and fetal health. When the evidence is inconclusive, specialists' expert opinions may guide the selection of imaging and treatment approaches.[64] The anesthesia team must assess the most suitable anesthetic technique for the selected intervention, considering both the stage of pregnancy and patient preferences. Clinical nurses play a critical role in perioperative assessment, monitoring vital signs, and evaluating fetal well-being, particularly during surgery. They also educate patients on self-care, pain management, and postoperative recovery. The clinical pharmacy team is integral to managing medication regimens that are safe for pregnancy while assisting the interprofessional team. By leveraging their skills, fostering effective interprofessional communication, and adopting a patient-centered approach, healthcare professionals can improve patient outcomes, safety, and satisfaction when managing pregnant patients with acute appendicitis. Continuous education, evidence-based practice, and individualized care are essential for successful teamwork.

Role of Emergency Professionals

Emergency medical professionals play a critical role in the diagnosis, management, and care of pregnant patients presenting with acute appendicitis. This condition, although relatively common in nonpregnant individuals, poses unique challenges in pregnant patients due to the physiological and anatomical changes during pregnancy. Emergency professionals, including emergency physicians, paramedics, nurses, and other healthcare providers, are essential in ensuring timely diagnosis, minimizing risks to the gravida (pregnant patient) and fetus, and coordinating appropriate treatment interventions.

Early Recognition and Diagnosis

The first and foremost role of emergency professionals is the early recognition of acute appendicitis. In pregnant patients, the presentation of acute appendicitis can be atypical due to the shifting of abdominal organs as pregnancy progresses. Symptoms such as abdominal pain, nausea, vomiting, and fever, common in acute appendicitis, may overlap with those of pregnancy-related conditions, such as round ligament pain, urinary tract infections, and gastrointestinal disturbances. Emergency physicians must therefore maintain a

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13238 – 13254
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6233

high index of suspicion and differentiate between various differential diagnoses, which may include gynecological, obstetric, and gastrointestinal causes of abdominal pain. The challenge is heightened by the fact that some symptoms, such as leukocytosis (elevated white blood cell count), are common to both pregnancy and appendicitis. Prompt recognition of these signs, combined with a thorough clinical examination and appropriate use of diagnostic tools, is essential.

Diagnostic Imaging and Consultation

Once acute appendicitis is suspected, emergency professionals must quickly decide on appropriate diagnostic tests. However, imaging techniques that are commonly used in nonpregnant patients, such as computed tomography (CT), carry risks of radiation exposure to the fetus. Ultrasound is often the first-line imaging modality in pregnant patients, as it avoids radiation and can provide valuable information about the appendix and any associated complications, such as abscess formation or perforation. If ultrasound results are inconclusive, magnetic resonance imaging (MRI) may be used as an alternative. It is crucial for emergency physicians to collaborate with radiologists to ensure that the chosen imaging technique provides the necessary diagnostic information while minimizing fetal risk. An obstetrical consultation is mandatory when appendicitis is suspected in a pregnant patient. The obstetrician's expertise is essential in assessing the potential impact of surgery on both the gravida and fetus. This consultation can help determine the gestational age of the pregnancy, evaluate fetal well-being, and provide guidance on the safest approach to managing anesthesia and surgery. Timely coordination between the emergency physician and obstetrician ensures that both maternal and fetal health are prioritized throughout the diagnostic and treatment processes.

Timely Surgical Intervention and Coordination

Once appendicitis is diagnosed, the next critical step is to arrange for timely surgical intervention. Delay in treatment, especially if perforation occurs, can significantly increase maternal and fetal morbidity and mortality. Emergency physicians must coordinate with general surgeons and anesthesiologists to arrange for urgent appendectomy. The surgeon must take into account the gestational stage of pregnancy, as the surgical approach may need to be adjusted accordingly. In the second trimester, for instance, the appendix may be displaced, requiring a more tailored surgical approach. Emergency professionals must ensure that the patient is adequately prepared for surgery, which includes securing intravenous access for fluid resuscitation, administering appropriate analgesia, and addressing any immediate medical issues such as electrolyte imbalances or signs of sepsis. Nurses play a key role in monitoring vital signs and ensuring that the patient is stable prior to surgery. They must also assess fetal heart tones and any signs of distress during the preoperative period to ensure fetal well-being.

Anesthesia Management

Anesthesia professionals are integral members of the emergency team, as anesthesia during pregnancy requires careful consideration of both maternal and fetal safety. The choice of anesthetic agents and techniques must consider the changes in maternal physiology, including increased blood volume, altered respiratory mechanics, and the potential for a more rapid progression of hypoxia or hypotension. Emergency anesthesiologists must balance the need for adequate maternal anesthesia with minimizing risks to the fetus, often opting for regional anesthesia (such as spinal or epidural anesthesia) over general anesthesia when possible. Emergency physicians, in collaboration with anesthesia providers, must carefully assess the risks and benefits of different anesthetic options and communicate effectively to ensure that the anesthetic plan is appropriate for the patient's condition and gestational age. Close monitoring of both maternal vital signs and fetal heart rates is essential throughout the surgical procedure to minimize any potential adverse outcomes.

Postoperative Care and Monitoring

After the appendectomy, emergency professionals continue to play a vital role in the postoperative care and monitoring of both the gravida and the fetus. The initial recovery phase, especially in pregnant patients,

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13238 – 13254
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6233

requires close surveillance for complications such as infection, bleeding, or adverse reactions to anesthesia. Nurses must conduct thorough postoperative assessments, including the monitoring of vital signs, wound site inspection, and signs of infection or hemorrhage. They must also assess the fetus for any signs of distress, particularly if the patient is in the later stages of pregnancy. Postoperative pain management is another area where emergency professionals must be vigilant. Effective pain control is crucial for maternal recovery, but analgesics must be carefully selected to avoid harm to the fetus. Nonsteroidal anti-inflammatory drugs (NSAIDs) are typically avoided in the third trimester due to potential risks, and opioid use must be carefully managed to prevent neonatal withdrawal symptoms.

Interdisciplinary Collaboration

The management of acute appendicitis in pregnancy is inherently multidisciplinary. Emergency physicians, obstetricians, surgeons, anesthesiologists, nurses, and pharmacists must work together seamlessly to ensure optimal outcomes. Each team member must be aware of their specific role and the potential risks that pregnancy poses to both maternal and fetal health. Regular communication between team members ensures that the patient receives the most appropriate care based on her clinical condition and the stage of her pregnancy. Effective teamwork and interdisciplinary collaboration are essential in ensuring timely diagnosis, appropriate treatment, and comprehensive care. The coordination of care not only improves patient outcomes but also enhances safety and minimizes the risk of complications for both the gravida and fetus. Emergency professionals are pivotal in managing acute appendicitis during pregnancy, a condition that requires timely diagnosis, careful treatment, and a coordinated approach. The role of emergency physicians extends beyond initial assessment and diagnostic workup to include collaboration with obstetricians, surgeons, anesthesiologists, and nurses to ensure that both maternal and fetal health are prioritized. Given the complexities involved, emergency professionals must be well-equipped with knowledge of the physiological changes in pregnancy and the unique challenges of diagnosing and treating appendicitis in this population. By working together, the healthcare team can significantly reduce the risks of maternal and fetal morbidity and mortality, improving both short- and long-term outcomes for pregnant patients with acute appendicitis.

Conclusion

Acute appendicitis during pregnancy presents unique diagnostic and therapeutic challenges due to the physiological and anatomical changes associated with gestation. The condition is the most common non-obstetric surgical emergency in pregnancy, and its timely diagnosis is crucial to prevent complications such as perforation, peritonitis, and preterm labor. However, the clinical presentation of appendicitis in pregnant patients is often atypical, with symptoms overlapping those of common pregnancy-related conditions, making diagnosis complex. The displacement of the appendix by the gravid uterus further complicates the clinical picture, necessitating a high index of suspicion and the use of advanced diagnostic tools. Imaging plays a critical role in the accurate diagnosis of appendicitis in pregnancy. Ultrasound is the first-line imaging modality due to its safety and accessibility, while MRI is increasingly favored for its high sensitivity and specificity without exposing the fetus to ionizing radiation. CT scans, though highly accurate, are used sparingly due to radiation risks. Laboratory markers such as leukocyte count and C-reactive protein are less reliable in pregnancy due to physiological leukocytosis, underscoring the importance of imaging in confirming the diagnosis. Surgical intervention remains the cornerstone of treatment for acute appendicitis in pregnancy. Laparoscopic appendectomy is the preferred approach, offering benefits such as reduced postoperative pain and faster recovery. However, in advanced pregnancy, an open surgical approach may be necessary to ensure better visualization and access. The management of appendicitis in pregnancy requires a multidisciplinary approach, involving obstetricians, surgeons, anesthesiologists, and emergency professionals, to optimize maternal and fetal outcomes. Emergency professionals play a pivotal role in the early recognition, diagnosis, and coordination of care for pregnant patients with acute appendicitis. Their ability to differentiate appendicitis from other pregnancy-related conditions, utilize appropriate imaging techniques, and facilitate timely surgical intervention is critical to reducing morbidity and mortality. Effective interdisciplinary collaboration ensures that both maternal and fetal health are prioritized throughout the diagnostic and treatment processes. In conclusion, acute appendicitis in pregnancy demands

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13238 – 13254
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6233

a high level of clinical awareness, timely diagnostic imaging, and a multidisciplinary approach to care. By leveraging the expertise of emergency professionals and adopting evidence-based diagnostic and therapeutic strategies, healthcare teams can significantly improve outcomes for both the mother and the fetus.

References

Vaos G, Dimopoulou A, Gkioka E, Zavras N. Immediate surgery or conservative treatment for complicated acute appendicitis in children? A meta-analysis. Journal of pediatric surgery. 2019 Jul:54(7):1365-1371. doi: 10.1016/j.jpedsurg.2018.07.017.

Gignoux B, Blanchet MC, Lanz T, Vulliez A, Saffarini M, Bothorel H, Robert M, Frering V. Should ambulatory appendectomy become the standard treatment for acute appendicitis? World journal of emergency surgery : WJES. 2018:13():28. doi: 10.1186/s13017-018-0191-4.

Eng KA, Abadeh A, Ligocki C, Lee YK, Moineddin R, Adams-Webber T, Schuh S, Doria AS. Acute Appendicitis: A Meta-Analysis of the Diagnostic Accuracy of US, CT, and MRI as Second-Line Imaging Tests after an Initial US. Radiology. 2018 Sep:288(3):717-727. doi: 10.1148/radiol.2018180318.

Kartal İ. Childhood neuroendocrine tumors of the digestive system: A single center experience. Medicine. 2022 Feb 11:101(6):e28795. doi: 10.1097/MD.0000000000028795.

Choi YS, Seo JH, Yi JW, Choe YM, Heo YS, Choi SK. Clinical Characteristics of Acute Appendicitis in Pregnancy: 10-Year Experience at a Single Institution in South Korea. Journal of clinical medicine. 2023 May 4:12(9):. doi: 10.3390/jcm12093277.

Brown JJ, Wilson C, Coleman S, Joypaul BV. Appendicitis in pregnancy: an ongoing diagnostic dilemma. Colorectal disease : the official journal of the Association of Coloproctology of Great Britain and Ireland. 2009 Feb:11(2):116-22. doi: 10.1111/j.1463-1318.2008.01594.x.

Narula N, Gibbs KE, Kong F, Mukherjee I. Appendiceal Intussusception, Diverticula, and Fecalith Associated With Appendicitis. The American surgeon. 2022 Sep 8:():31348221126954. doi: 10.1177/00031348221126954.

Bhangu A, Søreide K, Di Saverio S, Assarsson JH, Drake FT. Acute appendicitis: modern understanding of pathogenesis, diagnosis, and management. Lancet (London, England). 2015 Sep 26:386(10000):1278-1287. doi: 10.1016/S0140-6736(15)00275-5.

Jones MW, Lopez RA, Deppen JG. Appendicitis. StatPearls.

Han YW. Fusobacterium nucleatum: a commensal-turned pathogen. Current opinion in microbiology. 2015 Feb:23():141-7. doi: 10.1016/j.mib.2014.11.013.

Buckius MT, McGrath B, Monk J, Grim R, Bell T, Ahuja V. Changing epidemiology of acute appendicitis in the United States: study period 1993-2008. The Journal of surgical research. 2012 Jun 15:175(2):185-90. doi: 10.1016/j.jss.2011.07.017.

Sahm M, Koch A, Schmidt U, Wolff S, Pross M, Gastinger I, Lippert H. [Acute appendicitis - clinical health-service research on the current surgical therapy]. Zentralblatt fur Chirurgie. 2013 Jun:138(3):270-7. doi: 10.1055/s-0031-1283947.

Addiss DG, Shaffer N, Fowler BS, Tauxe RV. The epidemiology of appendicitis and appendectomy in the United States. American journal of epidemiology. 1990 Nov:132(5):910-25

Lipping E, Saar S, Rull K, Tark A, Tiiman M, Jaanimäe L, Lepner U, Talving P. Open versus laparoscopic appendectomy for acute appendicitis in pregnancy: a population-based study. Surgical endoscopy. 2023 Aug:37(8):6025-6031. doi: 10.1007/s00464-023-10075-0.

Andersson RE, Lambe M. Incidence of appendicitis during pregnancy. International journal of epidemiology. 2001 Dec:30(6):1281-5

Zingone F, Sultan AA, Humes DJ, West J. Risk of acute appendicitis in and around pregnancy: a population-based cohort study from England. Annals of surgery. 2015 Feb:261(2):332-7. doi: 10.1097/SLA.0000000000000780.

Prystowsky JB, Pugh CM, Nagle AP. Current problems in surgery. Appendicitis. Current problems in surgery. 2005 Oct:42(10):688-742

Hamilton AL, Kamm MA, Ng SC, Morrison M. Proteus spp. as Putative Gastrointestinal Pathogens. Clinical microbiology reviews. 2018 Jul:31(3):. doi: 10.1128/CMR.00085-17.

Redden M, Ghadiri M. Acute appendicitis with associated trichobezoar of feline hair. Journal of surgical case reports. 2022 Mar:2022(3):rjac133. doi: 10.1093/jscr/rjac133.

Hoffmann JC, Trimborn CP, Hoffmann M, Schröder R, Förster S, Dirks K, Tannapfel A, Anthuber M, Hollerweger A. Classification of acute appendicitis (CAA): treatment directed new classification based on imaging (ultrasound, computed tomography) and pathology. International journal of colorectal disease. 2021 Nov:36(11):2347-2360. doi: 10.1007/s00384-021-03940-8.

Correa J, Jimeno J, Vallverdu H, Bizzoca C, Collado-Roura F, Estalella L, Hermoso J, Silva N, Sanchez-Pradell C, Parés D. Correlation between intraoperative surgical diagnosis of complicated acute appendicitis and the pathology report: clinical implications. Surgical infections. 2015 Feb:16(1):41-4. doi: 10.1089/sur.2013.155.

Wray CJ, Kao LS, Millas SG, Tsao K, Ko TC. Acute appendicitis: controversies in diagnosis and management. Current problems in surgery. 2013 Feb:50(2):54-86. doi: 10.1067/j.cpsurg.2012.10.001.

Lee SL, Walsh AJ, Ho HS. Computed tomography and ultrasonography do not improve and may delay the diagnosis and treatment of acute appendicitis. Archives of surgery (Chicago, Ill. : 1960). 2001 May:136(5):556-62

Birnbaum BA, Wilson SR. Appendicitis at the millennium. Radiology. 2000 May:215(2):337-48

Chung CH, Ng CP, Lai KK. Delays by patients, emergency physicians, and surgeons in the management of acute appendicitis: retrospective study. Hong Kong medical journal = Xianggang yi xue za zhi. 2000 Sep:6(3):254-9

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13238 – 13254
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6233
House JB, Bourne CL, Seymour HM, Brewer KL. Location of the appendix in the gravid patient. The Journal of emergency medicine. 2014 May:46(5):741-4. doi: 10.1016/j.jemermed.2013.09.033.
Snyder MJ, Guthrie M, Cagle S. Acute Appendicitis: Efficient Diagnosis and Management. American family physician. 2018 Jul 1:98(1):25-33
Mourad J, Elliott JP, Erickson L, Lisboa L. Appendicitis in pregnancy: new information that contradicts long-held clinical beliefs. American journal of obstetrics and gynecology. 2000 May:182(5):1027-9
Hodjati H, Kazerooni T. Location of the appendix in the gravid patient: a re-evaluation of the established concept. International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics. 2003 Jun:81(3):245-7
Popkin CA, Lopez PP, Cohn SM, Brown M, Lynn M. The incision of choice for pregnant women with appendicitis is through McBurney's point. American journal of surgery. 2002 Jan:183(1):20-2
Oto A, Srinivasan PN, Ernst RD, Koroglu M, Cesani F, Nishino T, Chaljub G. Revisiting MRI for appendix location during pregnancy. AJR. American journal of roentgenology. 2006 Mar:186(3):883-7
Pates JA, Avendiano TC, Zaretsky MV, McIntire DD, Twickler DM. The appendix in pregnancy: confirming historical observations with a contemporary modality. Obstetrics and gynecology. 2009 Oct:114(4):805-808. doi: 10.1097/AOG.0b013e3181b6f6cc.
Cunningham FG, McCubbin JH. Appendicitis complicating pregnancy. Obstetrics and gynecology. 1975 Apr:45(4):415-20
McGee TM. Acute appendicitis in pregnancy. The Australian & New Zealand journal of obstetrics & gynaecology. 1989 Nov:29(4):378
Sivanesaratnam V. The acute abdomen and the obstetrician. Bailliere's best practice & research. Clinical obstetrics & gynaecology. 2000 Feb:14(1):89-102
van Aerts RMM, van de Laarschot LFM, Banales JM, Drenth JPH. Clinical management of polycystic liver disease. Journal of hepatology. 2018 Apr:68(4):827-837. doi: 10.1016/j.jhep.2017.11.024.
Awayshih MMA, Nofal MN, Yousef AJ. Evaluation of Alvarado score in diagnosing acute appendicitis. The Pan African medical journal. 2019:34():15. doi: 10.11604/pamj.2019.34.15.17803.
Yang HR, Wang YC, Chung PK, Chen WK, Jeng LB, Chen RJ. Laboratory tests in patients with acute appendicitis. ANZ journal of surgery. 2006 Jan-Feb:76(1-2):71-4
Withers AS, Grieve A, Loveland JA. Correlation of white cell count and CRP in acute appendicitis in paediatric patients. South African journal of surgery. Suid-Afrikaanse tydskrif vir chirurgie. 2019 Dec:57(4):40
Bailey LE, Finley RK Jr, Miller SF, Jones LM. Acute appendicitis during pregnancy. The American surgeon. 1986 Apr:52(4):218-2
Mahmoodian S. Appendicitis complicating pregnancy. Southern medical journal. 1992 Jan:85(1):19-24
Coleman C, Thompson JE Jr, Bennion RS, Schmit PJ. White blood cell count is a poor predictor of severity of disease in the diagnosis of appendicitis. The American surgeon. 1998 Oct:64(10):983-5
Tehrani HY, Petros JG, Kumar RR, Chu Q. Markers of severe appendicitis. The American surgeon. 1999 May:65(5):453-5
Thompson MM, Underwood MJ, Dookeran KA, Lloyd DM, Bell PR. Role of sequential leucocyte counts and C-reactive protein measurements in acute appendicitis. The British journal of surgery. 1992 Aug:79(8):822-4
Lurie S, Rahamim E, Piper I, Golan A, Sadan O. Total and differential leukocyte counts percentiles in normal pregnancy. European journal of obstetrics, gynecology, and reproductive biology. 2008 Jan:136(1):16-9
KUVIN SF, BRECHER G. Differential neutrophil counts in pregnancy. The New England journal of medicine. 1962 Apr 26:266():877-8
Sand M, Bechara FG, Holland-Letz T, Sand D, Mehnert G, Mann B. Diagnostic value of hyperbilirubinemia as a predictive factor for appendiceal perforation in acute appendicitis. American journal of surgery. 2009 Aug:198(2):193-8. doi: 10.1016/j.amjsurg.2008.08.026. E
Yazar FM, Bakacak M, Emre A, Urfalıoglu A, Serin S, Cengiz E, Bülbüloglu E. Predictive role of neutrophil-to-lymphocyte and platelet-to-lymphocyte ratios for diagnosis of acute appendicitis during pregnancy. The Kaohsiung journal of medical sciences. 2015 Nov:31(11):591-6. doi: 10.1016/j.kjms.2015.10.005.
Hwang ME. Sonography and Computed Tomography in Diagnosing Acute Appendicitis. Radiologic technology. 2018 Jan:89(3):224-237
Khandelwal A, Fasih N, Kielar A. Imaging of acute abdomen in pregnancy. Radiologic clinics of North America. 2013 Nov:51(6):1005-22. doi: 10.1016/j.rcl.2013.07.007.
Parks NA, Schroeppel TJ. Update on imaging for acute appendicitis. The Surgical clinics of North America. 2011 Feb:91(1):141-54. doi: 10.1016/j.suc.2010.10.017.
Rao PM. Cecal apical changes with appendicitis: diagnosing appendicitis when the appendix is borderline abnormal or not seen. Journal of computer assisted tomography. 1999 Jan-Feb:23(1)
Pooler BD, Repplinger MD, Reeder SB, Pickhardt PJ. MRI of the Nontraumatic Acute Abdomen: Description of Findings and Multimodality Correlation. Gastroenterology clinics of North America. 2018 Sep:47(3):667-690. doi: 10.1016/j.gtc.2018.04.010.
Swenson DW, Ayyala RS, Sams C, Lee EY. Practical Imaging Strategies for Acute Appendicitis in Children. AJR. American journal of roentgenology. 2018 Oct:211(4):901-909. doi: 10.2214/AJR.18.19778.
Kim DW, Suh CH, Yoon HM, Kim JR, Jung AY, Lee JS, Cho YA. Visibility of Normal Appendix on CT, MRI, and Sonography: A Systematic Review and Meta-Analysis. AJR. American journal of roentgenology. 2018 Sep:211(3):W140-W150. doi: 10.2214/AJR.17.19321. Epub 2018 Jul 24
Ames Castro M, Shipp TD, Castro EE, Ouzounian J, Rao P. The use of helical computed tomography in pregnancy for the diagnosis of acute appendicitis. American journal of obstetrics and gynecology. 2001 Apr:184(5):954
Lazarus E, Mayo-Smith WW, Mainiero MB, Spencer PK. CT in the evaluation of nontraumatic abdominal pain in pregnant women. Radiology. 2007 Sep:244(3):784-90

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13238 – 13254
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6233

Kave M, Parooie F, Salarzaei M. Pregnancy and appendicitis: a systematic review and meta-analysis on the clinical use of MRI in diagnosis of appendicitis in pregnant women. World journal of emergency surgery : WJES. 2019:14():37. doi: 10.1186/s13017-019-0254-1.

Kereshi B, Lee KS, Siewert B, Mortele KJ. Clinical utility of magnetic resonance imaging in the evaluation of pregnant females with suspected acute appendicitis. Abdominal radiology (New York). 2018 Jun:43(6):1446-1455. doi: 10.1007/s00261-017-1300-7.

Kearl YL, Claudius I, Behar S, Cooper J, Dollbaum R, Hardasmalani M, Hardiman K, Rose E, Santillanes G, Berdahl C. Accuracy of Magnetic Resonance Imaging and Ultrasound for Appendicitis in Diagnostic and Nondiagnostic Studies. Academic emergency medicine : official journal of the Society for Academic Emergency Medicine. 2016 Feb:23(2):179-85. doi: 10.1111/acem.12873.

Bickell NA, Aufses AH Jr, Rojas M, Bodian C. How time affects the risk of rupture in appendicitis. Journal of the American College of Surgeons. 2006 Mar:202(3):401-6

Yilmaz HG, Akgun Y, Bac B, Celik Y. Acute appendicitis in pregnancy--risk factors associated with principal outcomes: a case control study. International journal of surgery (London, England). 2007 Jun:5(3):192-7

Chen CY, Chen YC, Pu HN, Tsai CH, Chen WT, Lin CH. Bacteriology of acute appendicitis and its implication for the use of prophylactic antibiotics. Surgical infections. 2012 Dec:13(6):383-90. doi: 10.1089/sur.2011.135.

Korndorffer JR Jr, Fellinger E, Reed W. SAGES guideline for laparoscopic appendectomy. Surgical endoscopy. 2010 Apr:24(4):757-61. doi: 10.1007/s00464-009-0632-y.

Augustin G, Boric M, Barcot O, Puljak L. Discordant outcomes of laparoscopic versus open appendectomy for suspected appendicitis during pregnancy in published meta-analyses: an overview of systematic reviews. Surgical endoscopy. 2020 Oct:34(10):4245-4256. doi: 10.1007/s00464-020-07674-6.

Walker HG, Al Samaraee A, Mills SJ, Kalbassi MR. Laparoscopic appendicectomy in pregnancy: a systematic review of the published evidence. International journal of surgery (London, England). 2014 Nov:12(11):1235-41. doi: 10.1016/j.ijsu.2014.08.406.

Al-Fozan H, Tulandi T. Safety and risks of laparoscopy in pregnancy. Current opinion in obstetrics & gynecology. 2002 Aug:14(4):375-9

Guidelines Committee of the Society of American Gastrointestinal and Endoscopic Surgeons, Yumi H. Guidelines for diagnosis, treatment, and use of laparoscopy for surgical problems during pregnancy: this statement was reviewed and approved by the Board of Governors of the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES), September 2007. It was prepared by the SAGES Guidelines Committee. Surgical endoscopy. 2008 Apr:22(4):849-61. doi: 10.1007/s00464-008-9758-6.

Abbasi N, Patenaude V, Abenhaim HA. Management and outcomes of acute appendicitis in pregnancy-population-based study of over 7000 cases. BJOG : an international journal of obstetrics and gynaecology. 2014 Nov:121(12):1509-14. doi: 10.1111/1471-0528.12736.

Cheng V, Ashbrook M, Youssefzadeh AC, Kohrman N, Matsuo K, Inaba K, Matsushima K. Management for Acute Uncomplicated Appendicitis During Pregnancy: National Trends and Patient Outcomes. Annals of surgery. 2023 Dec 1:278(6):932-936. doi: 10.1097/SLA.0000000000005893.

Babaknia A, Parsa H, Woodruff JD. Appendicitis during pregnancy. Obstetrics and gynecology. 1977 Jul:50(1):40

McGory ML, Zingmond DS, Tillou A, Hiatt JR, Ko CY, Cryer HM. Negative appendectomy in pregnant women is associated with a substantial risk of fetal loss. Journal of the American College of Surgeons. 2007 Oct:205(4):534-40

Vasireddy A, Atkinson S, Shennan A, Bewley S. Surgical management of appendicitis remains best option during pregnancy. BMJ (Clinical research ed.). 2012 May 22:344():e3575. doi: 10.1136/bmj.e3575.

Van de Moortele M, De Hertogh G, Sagaert X, Van Cutsem E. Appendiceal cancer : a review of the literature. Acta gastro-enterologica Belgica. 2020 Jul-Sep:83(3):441

Zhang K, Meyerson C, Kassardjian A, Westbrook LM, Zheng W, Wang HL. Goblet Cell Carcinoid/Carcinoma: An Update. Advances in anatomic pathology. 2019 Mar:26(2):75-83. doi: 10.1097/PAP.0000000000000222.

Marte A, Sabatino MD, Cautiero P, Accardo M, Romano M, Parmeggiani P. Unexpected finding of laparoscopic appendectomy: appendix MALT lymphoma in children. Pediatric surgery international.

Xie X, Zhou Z, Song Y, Li W, Diao D, Dang C, Zhang H. The Management and Prognostic Prediction of Adenocarcinoma of Appendix. Scientific reports. 2016 Dec 16:6():39027. doi: 10.1038/srep39027.

Morano WF, Gleeson EM, Sullivan SH, Padmanaban V, Mapow BL, Shewokis PA, Esquivel J, Bowne WB. Clinicopathological Features and Management of Appendiceal Mucoceles: A Systematic Review. The American surgeon. 2018 Feb 1:84(2):273-281

Calis H. Morbidity and Mortality in Appendicitis in the Elderly. Journal of the College of Physicians and Surgeons--Pakistan : JCPSP. 2018 Nov:28(11):875-878. doi: 10.29271/jcpsp.2018.11.875.

Choi JJ, Mustafa R, Lynn ET, Divino CM. Appendectomy during pregnancy: follow-up of progeny. Journal of the American College of Surgeons. 2011 Nov:213(5):627-32. doi: 10.1016/j.jamcollsurg.2011.07.016.

Sachs A, Guglielminotti J, Miller R, Landau R, Smiley R, Li G. Risk Factors and Risk Stratification for Adverse Obstetrical Outcomes After Appendectomy or Cholecystectomy During Pregnancy. JAMA surgery. 2017 May 1:152(5):436-441. doi: 10.1001/jamasurg.2016.5045.

Silvestri MT, Pettker CM, Brousseau EC, Dick MA, Ciarleglio MM, Erekson EA. Morbidity of appendectomy and cholecystectomy in pregnant and nonpregnant women. Obstetrics and gynecology. 2011 Dec:118(6):1261-1270. doi: 10.1097/AOG.0b013e318234d7bc.

Freeling M, Maize Adh1 as a monitor of environmental mutagens. Environmental health perspectives. 1978 Dec;

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 13238 – 13254
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.6233

التهاب الزائدة الدودية أثناء الحمل: مراجعة محدثة للمهنيين الصحيين والأدوار الرئيسية للمهنيين في الطوارئ

الملخص:

الخلفية :يُعد التهاب الزائدة الدودية الحاد أكثر الحالات الجراحية غير المتعلقة بالولادة شيوعًا أثناء الحمل، ويتطلب التشخيص والإدارة السريعين لتجنب المضاعفات مثل التمزق، التهاب الصفاق، والولادة المبكرة. يُعد تشخيص التهاب الزائدة الدودية أثناء الحمل أمرًا معقدًا بسبب التغيرات الفسيولوجية، بما في ذلك انزياح الزائدة الدودية والأعراض المتداخلة مع الحالات المرتبطة بالحمل. تُفضل تقنيات التصوير مثل الأشعة الصوتية (السونار) والتصوير بالرنين المغناطيسي (MRI) لتقليل التعرض للإشعاع على الجنين، وتعد التدخلات الجراحية، وخاصة الاستئصال الجراحي بالمنظار، العلاج الرئيسي.

الهدف :تهدف هذه المراجعة إلى تقديم نظرة محدثة حول تشخيص وإدارة وعلاج التهاب الزائدة الدودية الحاد في المرضى الحوامل، مع التركيز على أدوار المهنيين في الطوارئ لضمان الرعاية السريعة والفعالة.

الطرق :تلخص هذه المراجعة الأدبيات الحالية حول الأسباب، والوبائيات، والفسيولوجيا المرضية، وتحديات التشخيص في التهاب الزائدة الدودية أثناء الحمل. كما تقوم بتقييم أدوار التقييم السريري، والاختبارات المخبرية، وتقنيات التصوير مثل السونار، والأشعة المقطعية(CT) ، والتصوير بالرنين المغناطيسي .(MRI) كما تناقش استراتيجيات الإدارة الجراحية وغير الجراحية، مع تسليط الضوء على أهمية النهج متعدد التخصصات الذي يشمل الأطباء النسائيين، والجراحين، وأطباء التخدير.

النتائج :يُظهر التهاب الزائدة الدودية الحاد أثناء الحمل عرضًا غير نمطي بسبب التغيرات التشريحية والفسيولوجية، مما يعقد التشخيص. يعتبر السونار و MRIأدوات تصوير آمنة وفعالة، بينما يُعد الاستئصال الجراحي بالمنظار هو الأسلوب الجراحي المفضل، على الرغم من أن الجراحة المفتوحة قد تكون ضرورية في حالات الحمل المتقدمة. يزيد التشخيص المتأخر من خطر المضاعفات، بما في ذلك التمزق والولادة المبكرة. يعتبر النهج متعدد التخصصات أمرًا أساسيًا لتحسين نتائج الأم والجنين.

الخاتمة :إن التشخيص والعلاج في الوقت المناسب لالتهاب الزائدة الدودية الحاد أثناء الحمل أمران حاسمان لتقليل المخاطر على كل من الأم والجنين. يلعب المهنيون في الطوارئ دورًا محوريًا في التعرف المبكر، والتصوير التشخيصي، وتنسيق الرعاية. يضمن النهج متعدد التخصصات، جنبًا إلى جنب مع التصوير المناسب والتدخل الجراحي، تحقيق أفضل النتائج.

الكلمات المفتاحية :التهاب الزائدة الدودية الحاد، الحمل، التشخيص، التصوير، استئصال الزائدة الدودية بالمنظار، الرعاية متعددة التخصصات، المهنيون في الطوارئ.