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The Surgeon, Journal of the Royal Colleges  
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## Review

## Suspected appendicitis in pregnancy



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## ARTICLE INFO

## Article history:

Received 14 October 2013

Received in revised form

24 November 2013

Accepted 25 November 2013

Available online 13 January 2014

## Keywords:

Appendicitis

Pregnancy

Radiology

## ABSTRACT

**Aim:** Acute appendicitis is one of the most common acute surgical presentations. However investigation and management is sometimes confounded in a pregnant patient. Appendicitis in pregnancy is often managed jointly by both the surgical and obstetric teams, which can lead to discrepant pathways, which may be detrimental to the patient.

This review sets out to identify the normal physiological changes of pregnancy that pose diagnostic and therapeutic difficulties to the clinician, assess the more common differential diagnoses and review the current evidence to assist achieving a swift diagnosis and appropriate treatment.

**Methods:** A literature review of the investigation and management of suspected appendicitis in pregnancy was undertaken. Guidelines by the relevant surgical, obstetric and radiological societies were also reviewed.

**Results:** There remains no consensus on the best diagnostic pathway for appendicitis in pregnancy; which is unsurprising given that appendicitis in non-pregnant patients can yield diagnostic conundrums. However this review identifies a role for MRI scanning as a useful adjunct in these patients. The increasing role of laparoscopy in these patients is also becoming more apparent.

**Conclusion:** Appendicitis in pregnancy remains a complex problem necessitating a close working relationship between various specialties to achieve the best outcome for mother and fetus.

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## Introduction

Acute abdominal pain in pregnancy presents a diagnostic and therapeutic challenge to the clinician. A serious cause of acute abdominal pain in pregnancy is an acute appendicitis.<sup>1</sup> These patients are often managed jointly by surgical and obstetric

teams. However, depending on service provision they are usually admitted under a parent team which could either be surgical or obstetric; leading to discrepant investigative and management pathways.

The aim of this paper is to review the current literature on appendicitis during pregnancy and discuss investigative and management strategies.

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<http://dx.doi.org/10.1016/j.surge.2013.11.022>

## Background

Acute appendicitis is seen in approximately 1 in 1700 pregnancies; and is most common in the second trimester of pregnancy.<sup>2,3</sup> Appendectomy is the commonest non obstetric operation performed during pregnancy.<sup>4</sup> Prompt diagnosis and appropriate management of acute appendicitis in pregnancy is vital to reduce the potential risks to both mother and fetus.

### Maternal and fetal outcomes of appendicitis during pregnancy

Acute appendicitis in pregnancy has been proven to be associated with adverse pregnancy outcomes. A study of 908 women with an acute appendicitis during pregnancy reported an increased frequency of adverse outcomes for the fetus compared to healthy pregnant women. These included an increased frequency of; Small for Gestational Age (SGA), Low Birth Weight (LBW), preterm labor and major congenital anomalies of the fetus.<sup>2</sup> Congenital abnormalities were only seen in women with acute appendicitis in the first trimester of pregnancy. SGA and LBW are significant as they are both associated with higher rates of infant mortality.<sup>5–7</sup>

Appendiceal perforation is a major risk factor related to both fetal morbidity and mortality.<sup>8–10</sup> Literature suggests that perforation becomes more common in successive trimesters.<sup>8,11</sup> Ueberrueck et al. reported an overall perforation rate of appendicitis in pregnancy of 14.9%; with perforation rates of 8.7%, 12.5% and 26.1% during the three trimesters respectively.<sup>8</sup> These findings suggest that diagnosis may become progressively more difficult during the length of pregnancy; also there may be reluctance for surgeons to operate on patients in the second and third trimesters of pregnancy, leading to delays in treatment and increasing the risk to both mother and fetus.

### Diagnostic challenges

Acute appendicitis is traditionally a clinical diagnosis. However there is a broad list of differential diagnoses in non-pregnant pre-menopausal women presenting with acute abdominal pain; posing a diagnostic challenge.<sup>12,13</sup> Clinical scoring systems such as the Alvarado scale have been designed to predict the likelihood of appendicitis in view of the relevant clinical and biochemical findings.<sup>13,14</sup> However there is no validated score for use in pregnancy. Secondly the Alvarado score is not widely used and diagnostic uncertainty is commonplace.

The diagnostic challenges of an acute appendicitis are amplified in pregnancy due to the anatomical and physiological changes that occur. The gravid uterus displaces the normal position of the appendix making examination findings variable and minor complaints of normal pregnancy such as nausea, vomiting and anorexia cannot be distinguished from common symptoms of appendicitis. Biochemical findings are also unreliable with a leukocytosis often seen in normal pregnancy and a raised c-reactive protein not directly linked to inflammation.<sup>4,15</sup>

There is a wide range of differential diagnoses for patients with lower abdominal pain in pregnancy (Table 1). Some

**Table 1 – Differential diagnosis of some of causes of acute abdominal pain in pregnancy.**

Non-obstetric	Obstetric
Acute appendicitis	Labor
Cholecystitis	Preterm labor
Inflammatory bowel disease	Placental abruption
Pancreatitis	Uterine rupture
Gastritis	
Mesenteric adenitis	
Diverticulitis	
Urinary tract calculi	
Urinary tract infection	
Ovarian torsion	
Ovarian cyst rupture	
Ectopic pregnancy	
Pelvic inflammatory disease	
Adnexal mass	
Fibroids	

require urgent intervention whereas others can be treated conservatively.

### Diagnostic tools

History and examination are the foundations for clinical diagnosis of acute appendicitis. In addition an obstetric history should be sought and any concerns over the fetus should be fully investigated by the obstetric team. A detailed history and examination is vital to differentiate between the broad diagnoses in Table 1. Diagnostic tools including biochemical tests and radiological investigations can be useful adjuncts to history and examination.

In the general population the reported negative appendectomy rate based on histological findings after clinical diagnosis alone is as high as 25%.<sup>13,16</sup> Biochemical investigations are relatively cheap, non invasive and readily available. However as alluded to earlier in this article a leukocytosis and raised c-reactive protein are common findings in a healthy pregnancy.<sup>4,15</sup> The trend in inflammatory markers is a more helpful guide when observing these patients. Urine analysis is imperative to exclude a urinary tract infection as the cause of acute abdominal pain.

In non-pregnant patients who have had computer tomography (CT) imaging prior to appendectomy, the negative appendectomy rate is reported to be as low as 4%.<sup>17</sup> These findings highlight the benefit of radiological imaging in confirming a diagnosis of appendicitis and reducing the false positive rate. The different radiological investigations are discussed below.

### Radiological – UltraSound Sonography Scan (USS)

USS is a quick and safe imaging modality for use in pregnancy and can be used to help diagnose appendicitis and also diagnose other conditions that may present as acute abdominal pain. Findings such as an ovarian torsion or large ovarian cyst can then be treated appropriately.

As with the non-pregnant population, classic findings of appendicitis on USS are a dilated, aperistaltic, non-compressible, blind ending tubular structure arising from the caecum.<sup>10,16</sup>

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