



Original research

Laparoscopic appendicectomy in pregnancy: A systematic review of the published evidence



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HIGHLIGHTS

- Surgical intervention for acute appendicitis during pregnancy carries significant risk to both mother and foetus.
- The safety of Laparoscopic Appendicectomy in pregnancy has been a matter of debate among clinicians.
- There is no current strong evidence as to the preferred modality of appendicectomy during pregnancy.
- Low grade evidence indicates that laparoscopic appendicectomy might be associated with higher rates of foetal loss.

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ABSTRACT

Surgical intervention for acute appendicitis during pregnancy carries significant risk to both mother and foetus. The safety of Laparoscopic Appendicectomy in pregnancy has been a matter of debate among clinicians. We have critically reviewed the available published evidence in regards with this debate.

Conclusion: There is no strong current evidence as to the preferred modality of appendicectomy; open or laparoscopic, during pregnancy from the prospect of foetal or maternal safety. However, low grade evidence shows that laparoscopic appendicectomy during pregnancy might be associated with higher rates of foetal loss.

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1. Introduction

Non-Obstetric causes of acute abdominal pain that require surgery during pregnancy are uncommon. However, these could carry significant risks to both mother and foetus through delay to diagnosis or the actual surgical intervention combined with general anaesthesia. It has been estimated that 2–3% of pregnant women are affected by various surgical causes of abdominal pain each year. Acute Appendicitis (AA) is perhaps the most common pathology; with rates reported in the literature varying between 1 in 500 to 1 in 2000 pregnancies. [1–4]

Both AA and normal uncomplicated pregnancy can be associated with abdominal pain, anorexia, nausea and vomiting, increased heart rate, and leucocytosis. Moreover, the upwards anatomical displacement of the appendix by the gravid uterus

throughout pregnancy can obscure the classical abdominal signs of AA [5–8].

The role of imaging in confirming the diagnosis of AA during pregnancy is limited by the risks of radiation and contrast on the foetus. Ultrasonography is probably the most frequently used imaging modality for abdominal pain in pregnancy. However, it is operator dependent, and the findings of a normal abdominal ultrasound do not exclude acute appendicitis [9]. Conversely, ultrasonography can help in excluding other causes of acute abdominal pain in pregnancy like acute cholecystitis and urolithiasis. In addition, it helps in establishing the foetal viability and the gestational age [10]. The risks of radiation and contrast that are associated with the use of Computerized Tomography (CT) scan, has limited its role in pregnancy. Exceptions include conditions that could risk the mother's life, such as polytrauma [9]. Non-Contrast abdominal Magnetic Resonance Imaging (MRI) has been reported to be useful in the diagnosis of acute appendicitis when ultrasonography is inconclusive [11,12]. However, potential risks include the heat effect of the magnetic field on the foetus, specifically in the first trimester [8,13].

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Therefore, the diagnosis of AA in pregnancy is challenging; with the potential for delayed surgical intervention and the development of serious complications [3,14]. It has been demonstrated that a 24 h delay in surgery after presentation can lead to a 66% increase in perforation rate, when compared to those operated on in under 24 h [15]. Complicated appendicitis in pregnancy carries significant risks to both mother and the foetus, with reported foetal loss rate around 20% in cases with perforated appendicitis and 35.7% with generalized peritonitis. On the other hand, foetal loss rate is estimated to be less than (5%) in cases of uncomplicated AA [16–20].

Moreover, surgical intervention for AA carries potential risks. All general anaesthetic drugs cross the placenta and there is no optimal general anaesthetic technique. It is not known in what way these drugs affect the human foetus, since it is not ethical to perform randomized controlled trials in this field. Performing laparoscopic surgery during pregnancy could lead into increased intra-abdominal pressure, resulting in decreased maternal cardiac output and as a result, decreased utero-placental perfusion. Nevertheless, there is some evidence indicating that there is no statistical difference between the open or laparoscopic approaches of surgery on foetus wellbeing. On the whole, it is highly recommended to use the least extensive anaesthetic technique with the shortest anaesthetic time possible to minimise potential foetal or maternal complications [21,22].

As a general rule, the clinical suspicion of acute appendicitis during pregnancy is an indication for an urgent surgical intervention, in order to avoid the development of serious complications for

both of the foetus and mother. Diagnostic imaging could help in establishing the diagnosis or rule out other causes of acute abdominal pain in pregnancy; however these are not always conclusive. The surgical approach to appendicectomy can be open (OA) or laparoscopic (LA).

The aim of this review is to evaluate whether LA is safe during pregnancy. The authors have not explored specific surgical techniques used in LA.

2. Methods

Electronic literature search of the databases (Medline, Pubmed, Ovid and Blackwell Synergy). The keywords used were appendicitis, appendicitis in pregnancy, laparoscopy in pregnancy and laparoscopic appendicectomy/appendectomy. Searches were screened for relevant studies and full text versions retrieved. The references to all retrieved texts were searched for further relevant studies. Studies were critically analysed and evidence was graded as follows:

- Level 1 – multiple randomised controlled trials (RCT) or meta-analysis.
- Level 2 – adequately powered single RCT.
- Level 3 – experimental non-randomised data.
- Level 4 – experimental design such as cohort study.
- Level 5 – single case report, expert opinion

The reviewed evidence has been summarised in [Tables 1 and 2](#).

Table 1
Individual studies.

Author	Level of evidence	Surgical method	Patient numbers	Average gestation (weeks)	Average operation time (minutes)	Length of stay (days)	Surgical complications	Foetal complications	Statistically significant findings	Laparoscopic safety
Eom et al. (2012) [23]	3	LA	15	15	27.5	4	Nil	6% (<i>n</i> = 1) post-operative uterine contraction	Significantly (<i>p</i> = 0.001) shorter operating times for LA, less use of analgesics post-operatively (<i>p</i> = 0.033)	Safe in 1st/2nd Trimester
		OA	28	17	55	5	11% (<i>n</i> = 3) post-operative fever and 4% PTD (<i>n</i> = 1) intraperitoneal abscess	11% (<i>n</i> = 3)		
Holzer et al. (2011) [24]	5	LA	1	33	N/A	N/A	Haemorrhage – converted to OA	Nil	N/A	In 3rd Trimester convert to open once diagnosis made
Corneille et al. (2010) [25]	3	LA	9	11	N/A	N/A	11% (<i>n</i> = 1) conversion to OA	11% (<i>n</i> = 1) PTD, 11% (<i>n</i> = 1) pre-eclampsia/eclampsia	No statistical analysis performed	Safe – regardless of access at risk for perinatal complications
		OA	40	17	N/A	N/A		13% (<i>n</i> = 5) PTD, 8% (<i>n</i> = 3) foetal death, 8% (<i>n</i> = 3) pre-eclampsia/eclampsia		
Park et al. (2010) [26]	4	LA	8	15.5	22.5	3	Nil	Nil	No statistical analysis performed	Safe
Sadot et al. (2010) [27]	3	LA	48	18.1	54	3.4	2% wound infection	29% PTD	Patients in 1st and 2nd trimester more likely to undergo LA (<i>p</i> < 0.001); shorter stays in LA group (<i>p</i> = 0.001)	Appears to be safe. Need a randomised control trial
		OA	17	24.3	55	4.2	6% abscess	19% PTD		
Buser (2009) [1]	4	LA	9	N/A	N/A	N/A	Nil	Nil	No statistical analysis performed	Safe, as long as surgeon is skilled
		OA	37	N/A	N/A	N/A				N/A

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