
Author(s): Tinoco-González, José; Rubio-Manzanares-Dorado, Mercedes; Senent-Boza, Ana; Durán-Muñoz-Cruzado, Virginia; Tallón-Aguilar, Luis; Pareja-Ciuró, Felipe; Padillo-Ruíz, Javier

Source: Emergencias : revista de la Sociedad Española de Medicina de Emergencias; vol. 30 (no. 4); p. 261-264

Publication Type(s): Journal Article

Abstract: OBJECTIVES To analyze the clinical presentation, management, and outcome of acute appendicitis (AA) in pregnant and nonpregnant women of childbearing age. MATERIAL AND METHODS Descriptive study of 2 cohorts of women (pregnant -P- and nonpregnant -NP-). The women, who were matched according to risk factors, were included when they underwent an emergency appendectomy based on clinical suspicion of AA. We recorded age, medical history, clinical presentation, management, and outcome. Pregnant women were classified according to gestational age of the fetus (trimester).

RESULTS. We included 153 women (51 P, 102 NP). The mean (SD) age was 28.8 (6.5) years (P women, 29.7 [5.8] years; NP, 28.3 [6.8]; P=.242). The mean Alvarado score was 7.1 (1.6) (P, 6.7 [1.7]; NP, 7.3 [1.5]; P=.016). The rate of complicated AA was higher in P (19.6%) than NP (2.9%) women (P<.001). Pregnancy was also associated with higher rates of surgical wound infection (P, 14.0%; NP, 3.0%; P=.016) and a longer mean hospital stay (P, 5.1 [4.8] days; NP, 1.7 [1.0]; P<.001). In the third trimester of P, poorer outcomes were recorded in relation to these risks (P=.031; P=.003, and P<.001, respectively). CONCLUSION The atypical clinical presentation of AA during pregnancy makes diagnosis difficult and may lead to a higher incidence of complicated AA and surgical wound infection as well as longer hospital stays, particularly when AA presents in the third trimester.

Database: Medline
2. Suspicion of appendicitis in pregnant women: emergency evaluation by sonography and low-dose CT with oral contrast.

Author(s): Poletti, Pierre-Alexandre; Botsikas, Diomidis; Becker, Minerva; Picarra, Marlise; Rutschmann, Olivier T; Buchs, Nicolas C; Zaidi, Habib; Platon, Alexandra

Source: European radiology; Jan 2019; vol. 29 (no. 1); p. 345-352

Publication Date: Jan 2019

Publication Type(s): Journal Article

PubMedID: 29948087

Available at European radiology from SpringerLink

Abstract: OBJECTIVESTo evaluate non-intravenously enhanced low-dose computed tomography with oral contrast (LDCT) for the assessment of pregnant women with right lower quadrant pain, when magnetic resonance imaging (MRI) is not immediately available. METHODS One hundred and thirty-eight consecutive pregnant women with acute abdominal pain were admitted in our emergency centre. Thirty-seven (27%) of them, with clinical suspicion of acute appendicitis, underwent abdominal ultrasonography (US). No further examination was recommended when US was positive for appendicitis, negative with low clinical suspicion or showed an alternative diagnosis which explained the clinical presentation. All other patients underwent LDCT (<2.5 mSv). Standard intravenously enhanced CT or MRI was performed when LDCT was indeterminate. RESULTSEight (22%) of 37 US exams were reported normal, 25 (67%) indeterminate, 1 (3%) positive for appendicitis, 3 (8%) positive for an alternative diagnosis. LDCT was obtained in 29 (78%) patients. It was reported positive for appendicitis in 9 (31%), for alternative diagnosis in 2 (7%), normal in 13 (45%) and indeterminate in 5 (17%). Further imaging (standard CT or MRI) showed appendicitis in 2 of these 5 patients, was truly negative in 1, indeterminate in 1 and falsely positive in 1. An appendicitis was confirmed at surgery in 12 (32%) of the 37 patients. The sensitivity and the specificity of the algorithm for appendicitis were 100% (12/12) and 92% (23/25), respectively. CONCLUSIONSThe proposed algorithm is very sensitive and specific for detection of acute appendicitis in pregnant women; it reduces the need of standard CTs when MRI is not available as second-line imaging. KEY POINTS • In pregnant women, US is limited by an important number of indeterminate results • Low-dose CT can be used after an inconclusive US for the diagnosis of appendicitis in pregnant women • An algorithm integrating US and low-dose CT is highly sensitive and specific for appendicitis in pregnant women.

Database: Medline
3. Differential diagnoses of magnetic resonance imaging for suspected acute appendicitis in pregnant patients.

Author(s): Jung, Ji Yong; Na, Ji Ung; Han, Sang Kuk; Choi, Pil Cho; Lee, Jang Hee; Shin, Dong Hyuk

Source: World journal of emergency medicine; 2018; vol. 9 (no. 1); p. 26-32

Publication Date: 2018

Publication Type(s): Journal Article

PubMedID: 29290892

Abstract: BACKGROUND Accurate and timely diagnosis of acute surgical disease in pregnant patient is challenging. Although magnetic resonance imaging (MRI) is the most accurate modality to diagnose acute appendicitis in pregnant patients, it is often used as a last resort because of high cost and long scan time. We performed this study to analyze differential diagnoses of appendix MRI and to investigate if there are any blood tests that can predict surgical condition in pregnant patients.

METHODS A retrospective, cross-sectional study was conducted on 46 pregnant patients who underwent non-enhanced appendix MRI in suspicion of acute appendicitis from 2010 to 2016. Differential diagnoses of appendix MRI were analyzed and blood tests were compared between those who had surgical and non-surgical disease.

RESULTS Appendix MRI differentiated two surgical disease; acute appendicitis and ovarian torsion; and various non-surgical conditions such as uterine myoma, hydronephrosis, ureterolithiasis and diverticulitis among clinically suspected acute appendicitis in pregnancy. The diagnostic accuracy of MRI for acute appendicitis in this study was 93.5%. Patients who had surgical disease showed significantly higher WBC count (≥11,000/mm3), proportion of neutrophils in the WBC (≥79.9%), neutrophil-to-lymphocyte ratio (NLR≥6.4), levels of C-reactive protein (CRP≥1.82 mg/dL) and bilirubin (≥0.66 mg/dL) than those who had non-surgical disease.

CONCLUSION MRI can reliably differentiate surgical conditions and several blood tests (WBC, proportion of neutrophils in the WBC, NLR, CRP, bilirubin) can help anticipate acute surgical condition among pregnant patients suspected to have acute appendicitis.

Database: Medline

**Author(s):** Ghali, Mohamed Amine El; Kaabia, Ons; Mefteh, Zaineb Ben; Jgham, Maha; Tej, Amel; Sghayer, Asma; Gouidar, Amine; Brahim, Afra; Ghrissi, Rafik; Letaief, Rached

**Source:** The Pan African medical journal; 2018; vol. 30 ; p. 212

**Publication Date:** 2018

**Publication Type(s):** Journal Article

**PubMedID:** 30574231

Available at [The Pan African medical journal](https://panafмедjournal.org) - from Europe PubMed Central - Open Access

**Abstract:** The occurrence of acute appendicitis during pregnancy may pose diagnostic and therapeutic difficulties. In fact pregnancy can make the clinical diagnosis delicate and the use of morphological examinations is still subject to controversy. The debates concerning the ideal surgical approach during pregnancy continue. On the other hand, in some cases the occurrence of acute appendicitis, especially in its complicated form, which is frequent in pregnant women, exposes to obstetrical complications and an increased risk of premature delivery. We aims to describe the clinical and management features of acute appendicitis in pregnant women and the maternal and neonatal outcomes and carry out a review of the literature on this topic. It is a retrospective analysis of a series of 33 cases of appendicitis in pregnant women who were diagnosed and managed, in collaboration between the departments of General and digestive surgery, Gynecology and Obstetrics and Anaesthesia at Farhat Hached University Hospital Sousse Tunisia between January 2005 and December 2015. The average age of the patients was 29 (20-40). Fourteen patients were in the first trimester, twelve in the 2nd and seven in the third trimester. The main symptom was pain in the right iliac fossa. The mean delay between consultation and surgery was 2.7 days. Twenty five patients had a preoperative ultrasound. Eight of the 33 pregnant patients presented complicated appendicitis with localized or generalized peritonitis. Thirty patients underwent laparotomic appendectomy: 28 with a Mc Burney incision and 2 with a midline incision and only three patients underwent laparoscopy. Preventive tocolysis was given to 14 patients, maternal mortality was null. Twenty four pregnancies were followed until delivery: one case of premature birth and one case of preterm labor were observed. Pregnancy makes it difficult to diagnose appendicitis, which explains the high rate of complicated acute appendicitis in our series. An early treatment improves maternal and fetal outcome.

**Database:** Medline
5. Appendicectomy during pregnancy and the risk of preterm birth: A population data linkage study

Author(s): Ibiebele I.; Nippita T.; Ford J.B.; Schnitzler M.

Source: Australian and New Zealand Journal of Obstetrics and Gynaecology; 2018

Publication Date: 2018

Publication Type(s): Article In Press

Available at Australian and New Zealand Journal of Obstetrics and Gynaecology - from Wiley Online Library Science, Technology and Medicine Collection 2017

Abstract: Background: Suspected appendicitis is a common non-obstetric indication for emergency abdominal surgery during pregnancy. Aims: Assess the risk of preterm birth and other maternal and neonatal adverse birth outcomes following appendicectomy during pregnancy. Methods: Population-based data linkage study of women with singleton births in New South Wales, Australia, 2002-2014. Pregnancies with appendicitis and appendicectomy were compared to pregnancies without appendicitis. Crude and adjusted hazard ratios (aHR) with 95% confidence intervals (CI) for preterm birth were estimated. Modified Poisson regression with robust variance was used to estimate crude and adjusted risk ratios (aRR) with 99% CI for other outcomes. Results: Of 1,124,551 eligible pregnancies, 1,024 (0.9/1000 pregnancies) had appendicitis and appendicectomy. Of these, 566 (55.3%) had laparoscopic and 458 (44.7%) had open appendicectomy. Appendicectomy at later gestational ages was associated with increasing rates of preterm birth. After adjustment for maternal and pregnancy factors, appendicectomy was associated with increased risk of preterm birth (overall aHR 1.73, 95% CI 1.42-2.09; planned aHR 2.08, 95% CI 1.60-2.72), maternal morbidity (aRR 2.68, 99% CI 1.88-3.83) and neonatal morbidity (aRR 1.42, 99% CI 1.03-1.94). However, there was no difference in perinatal mortality rates. Conclusion: Appendicectomy during pregnancy is associated with increased risk of spontaneous and planned preterm birth, maternal and neonatal morbidity. Availability of resources to prevent or manage preterm labour should be considered when appendicectomy is performed at gestational ages of 20 weeks or more.

Copyright © 2018 ANZJOG.

Database: EMBASE
6. Delaying laparoscopic surgery in pregnant patients with an equivocal acute appendicitis: a step-wise approach does not affect maternal or fetal safety.

**Author(s):** Tankel, James; Yellinek, Shlomo; Shechter, Yonat; Greenman, Dmitry; Ioscovich, Alexander; Grisaru-Granovsky, Sorina; Reissman, Petachia

**Source:** Surgical endoscopy; Dec 2018

**Publication Date:** Dec 2018

**Publication Type(s):** Journal Article

**PubMedID:** 30515611

Available at Surgical endoscopy - from SpringerLink

**Abstract:** BACKGROUND Accurate and timely diagnoses of acute appendicitis (AA) during pregnancy avoids maternal and fetal morbidity and mortality. We present our experience of using an initial transabdominal ultrasound (US) performed at presentation to diagnose AA in pregnant patients as well as the value of a delayed repeat study in those who remain equivocal. We explore the sensitivity and specificity of this algorithm as well as the maternal and fetal safety of this approach.

**METHODS** Of the 225 patients identified within the study period who underwent laparoscopic appendectomy, 216 met the inclusion criteria and were retrospectively analyzed. If the US performed on presentation revealed AA, surgery was performed. Patients with a non-diagnostic US were admitted with surgery performed if there was clinical and/or biochemical deterioration. Patients who remained equivocal underwent a repeat delayed study. The results of the initial versus delayed studies were compared. Maternal and fetal complications were recorded and contrasted.

**RESULTS** Of the 216 patients included, 164 (75.9%) had AA, 14 (6.5%) had complicated AA and 38 (17.6%) had a normal appendix. Initial US was diagnostic for 125/216 (57.9%) of patients and 19/34 (55.8%) of patients who underwent a delayed repeat study. The remaining patients underwent empirical surgery. The pooled sensitivity and specificity of US for the cohort was 79.2% and 92.1%, respectively. There was no difference in proxies of maternal or fetal safety between the groups.

**CONCLUSION** US is a useful tool for diagnosing AA in pregnancy. In this cohort, performing a delayed repeat US during a period of observation in those patients who remained otherwise equivocal increased the diagnostic yield of the US. Delaying surgery in this specific group of patients does not affect maternal or fetal safety.

**Database:** Medline
7. Diagnostic performance of MRI for pregnant patients with clinically suspected appendicitis.

**Author(s):** Wi, Sung Ah; Kim, Dae Jung; Cho, Eun-Suk; Kim, Kyoung Ah

**Source:** Abdominal radiology (New York); Dec 2018; vol. 43 (no. 12); p. 3456-3461

**Publication Date:** Dec 2018

**Publication Type(s):** Journal Article

**PubMedID:** 29869102

**Abstract:**
PURPOSE: To evaluate the accuracy of magnetic resonance imaging (MRI) in the diagnosis of acute appendicitis in pregnant patients and the value of additional diffusion-weighted MRI (DWI).

METHODS: A total of 125 pregnant patients with clinically suspected appendicitis who underwent 1.5 T MRI were enrolled between May 2011 and January 2016. During this period, two radiologists prospectively predicted acute appendicitis on MRI during daily interpretation. We retrospectively reviewed clinical records, and radiological results were correlated with surgical pathology and clinical outcomes. We calculated the sensitivity, specificity, and accuracy of MRI for diagnosing acute appendicitis. We performed additional DWI between August 2014 and January 2016, and we calculated sensitivity, specificity, and accuracy of MRI with or without DWI.

RESULTSThe sensitivity, specificity, and accuracy of MRI for acute appendicitis were 100%, 95%, and 96%, respectively. The sensitivity, specificity, and accuracy of MRI without DWI (n = 72) vs. with DWI (n = 53) were 100%, 94.7%, and 95.8% versus 100%, 95%, and 96%, respectively.

CONCLUSIONSMRI has high accuracy for the diagnosis of acute appendicitis in pregnant patients. Therefore, MRI is recommended for use as a first-line diagnostic test for pregnant patients with clinically suspected appendicitis.

**Database:** Medline

8. Significance of hemogram on diagnosis of acute appendicitis during pregnancy.

**Author(s):** Çinar, Hamza; Aygün, Ali; Derebey, Murat; Tarım, Ismail Alper; Akalın, Çağrı; Büyükakıncak, Sercan; Erzurumlu, Kenan

**Source:** Ulusal travma ve acil cerrahi dergisi = Turkish journal of trauma & emergency surgery : TJTES; Sep 2018; vol. 24 (no. 5); p. 423-428

**Publication Date:** Sep 2018

**Publication Type(s):** Journal Article

**PubMedID:** 30394495

**Abstract:**
BACKGROUND: Acute appendicitis (AA) is the most common emergency surgical condition during pregnancy after obstetric and gynecological pathologies. Urgent and accurate diagnosis of AA in pregnant patients reduces maternal and fetal morbidity/mortality rates. This study evaluated the significance of hemogram to diagnose AA during pregnancy.

METHODS: Forty-seven pregnant patients operated for AA in the Ordu or Ondokuz Mayis University Medical School Hospitals between January 2007 and December 2017 were compared with 47 healthy pregnant women in terms of hemogram parameters, including the white blood cell (WBC) count, neutrophil count, lymphocyte count, platelet count, neutrophil-to-lymphocyte ratio (NLR), platelet-to-lymphocyte ratio (PLR), mean platelet volume (MPV), and red cell distribution width (RDW) values. The operated group was evaluated based on post-operative pathologic results and subclassified into appendicitis positive (Group A) and appendicitis negative (Group B) groups. The subgroups were compared to the control group.

RESULTSThe WBC and neutrophil count and mean NLR and PLR values were significantly higher in Group A compared to Group B and the control group (p<0.001). The mean lymphocyte count was significantly lower in Group A compared to other groups (p<0.05). When cutoff values for WBC, neutrophil count, NLR, PLR, and lymphocyte counts were set to >10300, >7950, >5.50, >155.2,
and ≤1330, respectively, the sensitivity rates were 72.5%, 80%, 90%, 77.5% and 85%, whereas specificity rates were 72.3%, 79.7%, 89.4%, 74.5%, and 82.5%, respectively.

**CONCLUSION**

When comparing pregnant women diagnosed with AA to patients operated for suspected AA and healthy pregnant women, the WBC and neutrophil count and NLR and PLR values were found to be significantly higher, whereas lymphocyte counts were lower. In addition to medical history, physical examination and imaging techniques, hemogram parameters should be considered to diagnose AA in pregnant women.

**Database:** Medline

---


**Author(s):** Aguilera, Fabiola; Gilchrist, Brian F; Farkas, Daniel T

**Source:** The American surgeon; Aug 2018; vol. 84 (no. 8); p. 1326-1328

**Publication Date:** Aug 2018

**Publication Type(s):** Journal Article

**PubMedID:** 30185310

Available at [The American surgeon](https://www.ncbi.nlm.nih.gov/pubmed/30185310) from ProQuest (Hospital Premium Collection) - NHS Version

**Abstract:**

Appendectomy for presumed appendicitis is the most common surgical emergency during pregnancy. Delayed diagnosis and treatment of appendicitis carries risk for the fetus and mother. We sought to evaluate the accuracy of MRI in pregnant patients with suspected appendicitis. All pregnant patients with suspected appendicitis between January 2014 and April 2016 were included. MRI reports were categorized into positive, negative, and inconclusive groups. Diagnosis of appendicitis was based on pathology report. Fifty-two patients were included in the study. The MRI was positive in two, negative in 29, and inconclusive in 21 patients. Twelve patients had surgery, 11 of which had positive appendicitis on pathology. Both positive MRI patients had appendicitis. In the negative MRI group, 3 of 29 (10%) had appendicitis. In the inconclusive MRI group, 6 of 21 (29%) had appendicitis. A positive MRI result was very specific with a 100 per cent positive predictive value; however, the sensitivity was as low as 18 per cent (diagnosed only 2 of 11 cases). Although a positive MRI finding was reliable in making a decision to operate, a negative or inconclusive MRI was not. In patients with a high clinical suspicion of appendicitis, surgery should still be considered even without definitive positive MRI findings.

**Database:** Medline
Efficacy of laboratory tests and ultrasonography in the diagnosis of acute appendicitis in gravid patients according to the stages of pregnancy.

**Author(s):** Başkıran, Adil; İnce, Volkan; Çiçek, Egemen; Şahin, Tolga; Dirican, Abuzer; Balıkçı Çiçek, İpek; Işık, Burak; Yılmaz, Sezai

**Source:** Ulusal travma ve acil cerrahi dergisi = Turkish journal of trauma & emergency surgery : TJTES; Jul 2018; vol. 24 (no. 4); p. 333-336

**Publication Date:** Jul 2018

**Publication Type(s):** Journal Article Evaluation Studies

**PubMedID:** 30028491

**Abstract:**

**BACKGROUND**

Normal physiologic changes during pregnancy result in similar laboratory and symptomatology changes as those during acute appendicitis (AA), making the diagnosis extremely difficult. The aim of the present study was to analyze the efficacy of conventional laboratory and radiologic tests in the diagnosis of AA according to different stages of pregnancy.

**METHOD**

Twenty-five pregnant patients with pathologically confirmed AA operated at our department between 2012 and 2017 were retrospectively analyzed in terms of changes in conventional laboratory parameters as well as neutrophil-to-lymphocyte (NLR) and platelet-to-lymphocyte (PLR) ratios to aid the diagnosis of AA according to different stages of pregnancy.

**RESULT**

There were no significant changes in C-reactive protein levels, leukocyte and neutrophil counts, and accuracy of ultrasonography between patients in the first (group 1) and second + third trimesters (group 2) (p>0.05). Lymphocyte count was significantly lower (p>0.05), whereas NLR and PLR were significantly higher in group 2 (p<0.05).

**CONCLUSION**

Laboratory values change significantly during pregnancy, and NLR and PLR seems to be valuable tools for evaluating AA in a stage-specific manner in pregnant patients.

**Database:** Medline
Outcomes after open and laparoscopic appendectomy during pregnancy: A meta-analysis.

Author(s): Prodromidou, Anastasia; Machairas, Nikolaos; Kostakis, Ioannis D; Molmenti, Ernesto; Spartalis, Eleftherios; Kakkos, Athanasios; Lainas, Georgios T; Sotiropoulos, Georgios C

Source: European journal of obstetrics, gynecology, and reproductive biology; Jun 2018; vol. 225; p. 40-50

Publication Date: Jun 2018
Publication Type(s): Meta-analysis Journal Article Review
PubMedID: 29656140

Abstract:OBJECTIVESAcute appendicitis is the most prevalent cause of non-obstetrical surgical disease during pregnancy. There is no consensus on the optimal surgical management of acute appendicitis in pregnancy. Our aim is to identify surgical and obstetrical outcomes of laparoscopic (LA) and open approach (OA) in pregnant patients with acute appendicitis.STUDY DESIGNMedline, Scopus, Google Scholar, Cochrane CENTRAL Register of Controlled Trials and Clinicaltrials.gov databases were searched for articles published up to May 2017, along with the references of all articles. Prospective and retrospective trials reporting outcomes among pregnant women undergoing laparoscopic and open appendectomy were included. Of the 493 records screened, 20 were eligible for meta-analysis. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed. Statistical meta-analysis was performed using the RevMan 5.3 software.RESULTSA total of 6210 pregnant women from twenty studies were included in meta-analysis. Laparoscopic appendectomy was associated with significantly lower overall complication rates and shorter hospital stays (1835 patients OR 0.48 95% CI 0.29, 0.80 p = 0.005). While the open appendectomy group showed prolongation of gestational age for term deliveries, laparoscopic appendectomy patients had higher rates of fetal loss (543 patients MD -0.46 weeks 95% CI-0.87 to -0.04, p = 0.03 and 4867 patients OR 1.82 95% CI 1.30 to 2.57, p = 0.0006, respectively).CONCLUSIONSCurrent literature remains inconclusive on the optimal approach of appendectomy in pregnant women. Further larger-volume studies are needed in order to elucidate the critical effect of laparoscopic appendectomy on fetal loss rates.

Database: Medline
12. Clinical utility of magnetic resonance imaging in the evaluation of pregnant females with suspected acute appendicitis.

**Author(s):** Kereshi, Borko; Lee, Karen S; Siewert, Bettina; Mortele, Koenraad J

**Source:** Abdominal radiology (New York); Jun 2018; vol. 43 (no. 6); p. 1446-1455

**Publication Date:** Jun 2018

**Publication Type(s):** Journal Article

**PubMedID:** 28849364

**Abstract:**

**OBJECTIVES** To assess the diagnostic performance of magnetic resonance imaging (MRI) in a large cohort of pregnant females with suspected acute appendicitis and to determine the frequency of non-appendiceal causes of abdominal pain identified by MRI in this population.

**METHODS** This HIPAA compliant, retrospective study was IRB-approved and informed consent was waived. 212 MRI exams were performed consecutively on pregnant women aged 17-47 years old suspected of having acute appendicitis; eight exams were excluded and analyzed separately due to equivocal findings or lack of clinical follow up. Radiology reports for the MRI and any preceding ultrasound exams were reviewed as well as the patients’ electronic medical record for surgical, pathological, or clinical follow up.

**RESULTS** Fifteen (7.3%) of 204 MRI scans were determined to be positive for appendicitis, 14 of which were proven on surgical pathology, and one was found to have ileocecal diverticulitis. Out of the remaining 189 scans, none were subsequently shown to have acute appendicitis either surgically or based on clinical follow up. Negative predictive value (NPV) was 100% and positive predictive value was 93.3%. Sensitivity and specificity were 100% and 99.5%, respectively. Non-appendiceal findings which may have accounted for the patient’s abdominal pain were seen in 91 (44.2%) of 189 scans. The most common extra-appendiceal causes of abdominal pain identified on MRI include degenerating fibroids (n = 11), significant hydronephrosis (n = 12), cholelithiasis (n = 6), and pyelonephritis (n = 3).

**CONCLUSION** Our large study cohort of pregnant patients confirms MRI to be of high diagnostic value in the workup of acute appendicitis with 100% NPV and sensitivity and 99.5% specificity. Furthermore, an alternative diagnosis for abdominal pain in this patient population can be made in nearly half of MRI exams which are deemed negative for appendicitis.

**Database:** Medline

---

13. Latest Considerations in Diagnosis and Treatment of Appendicitis During Pregnancy.

**Author(s):** Lotfipour, Shahram; Jason, Max; Liu, Vincent J; Helmy, Mohammad; Hoonponsimanont, Wirachin; McCoy, C Eric; Chakravarthy, Bharath

**Source:** Clinical practice and cases in emergency medicine; May 2018; vol. 2 (no. 2); p. 112-115

**Publication Date:** May 2018

**Publication Type(s):** Journal Article

**PubMedID:** 29849258

**Abstract:**

Pregnancy can obscure signs and symptoms of acute appendicitis, making diagnosis challenging. Furthermore, avoiding radiation-based imaging due to fetal risk limits the diagnostic options clinicians have. Once appendicitis has been diagnosed, performing appendectomies has been the more commonly accepted course of action, but conservative, nonsurgical approaches are now being considered. This report describes the latest recommendations from different fields and organizations for the diagnosis and treatment of appendicitis during pregnancy.

**Database:** Medline
Objective: To determine the effects of pregnancy on the presentation, management, surgical and obstetrics outcome of patients with acute appendicitis.

Methods: This prospective cohort study was conducted during a 2-year period from 2014 to 2016 in Shahid Faghihi hospital of Shiraz University of Medical Sciences. We enrolled all the pregnant individuals with acute appendicitis who required surgical appendectomy. We also enrolled age-matched controls of non-pregnant women undergoing open appendectomy during the study period. The presentation, clinical and laboratory characteristics, surgical and obstetrics outcomes were determined in both study groups and were further compared between them. In order to determine the determinants of outcome, we also ran a multivariate logistic regression model.

Results: Overall we included a total number of 584 patients with presumed appendicitis among whom there were 58 (9.94%) and 526 (90.06%) non-pregnant individuals. The pregnant patients had significantly longer duration of symptoms (p=0.038), lower temperature (p=0.026), longer duration of hospital stay (p=0.026) and higher rate of hospital admission longer than 2 days (p=0.031). The complications of the surgical procedure were comparable between the two study groups except for the pneumonia which was significantly higher in pregnant patient (p=0.041). After adjusting for confounders such as age and ethnicity, pregnancy remained significantly associated with lower temperature (p=0.018), longer symptom duration (p=0.042) and higher rate of pneumonia (p=0.049).

Conclusion: Acute appendicitis during the pregnancy was associated with longer duration of symptoms, lower body temperature and higher rate of pneumonia. The pregnancy and neonatal outcomes were comparable to the previously reported data.

Database: Medline
15. Optimisation of the MR protocol in pregnant women with suspected acute appendicitis.

**Author(s):** Shin, Ilah; Chung, Yong Eun; An, Chansik; Lee, Hye Sun; Kim, Honsoul; Lim, Joon Seok; Kim, Myeong-Jin

**Source:** European radiology; Feb 2018; vol. 28 (no. 2); p. 514-521

**Publication Date:** Feb 2018

**Publication Type(s):** Journal Article

**PubMedID:** 28894912

Available at [European radiology](https://link.springer.com/journal/308) from SpringerLink

**Abstract:**

**PURPOSE**

To investigate the optimal magnetic resonance (MR) imaging protocol in pregnant women suspected of having acute appendicitis.

**MATERIALS AND METHODS**

One hundred and forty-six pregnant women with suspected appendicitis were included. MR images were reviewed by two radiologists in three separate sessions. In session 1, only axial single-shot turbo spin echo (SSH-TSE) T2-weighted images (WI) were included with other routine sequences. In sessions 2 and 3, coronal and sagittal T2WI were sequentially added. The visibility of the appendix and diagnostic confidence of appendicitis were evaluated in each session using a 5-point grading scale. If diseases other than appendicitis were suspected, specific diagnosis with a 5-point confidence scale was recorded.

**Diagnostic performance for appendicitis and other diseases were evaluated.**

**RESULT**

Twenty-five patients (17.1%) were diagnosed with appendicitis. Among the patients with normal appendix, 28 were diagnosed with other disease. Diagnostic performance including sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and area under the curve values for diagnosing appendicitis and other diseases showed no significant difference among sets for both reviewers (p>0.05).

**CONCLUSION**

Diagnostic performance of MR in pregnant patients with suspected appendicitis can be preserved with omission of sagittal or both coronal and sagittal SSH-T2WI.

**KEY POINTS**

• Diagnostic performance of appendicitis is preserved with omission of sagittal/coronal T2WIs.

• Diagnosis of other disease may be sufficient with axial T2WIs only.

• Careful serial omission of sagittal and coronal T2WIs can be considered.

**Database:** Medline

---

16. Laparostomy during pregnancy: A case report

**Author(s):** Logrado A.; Constantino J.; Pereira J.; Casimiro C.

**Source:** International Journal of Surgery Case Reports; Jan 2018; vol. 51; p. 120-124

**Publication Date:** Jan 2018

**Publication Type(s):** Article

Available at [International Journal of Surgery Case Reports](https://www.sciencedirect.com/journal/international-journal-of-surgery-case-reports) - from Europe PubMed Central - Open Access

**Abstract:**

**Introduction:** Acute appendicitis is the main indication for surgery during pregnancy. Physiologic changes during pregnancy and fear of using ionising radiation exams are some of the reasons to delayed diagnosis and consequently to higher morbidity and mortality rates for mother and fetus. Presentation of case: We present the case of a 38-year-old woman that resorted to the emergency room on the 13th week of pregnancy with abdominal discomfort, nausea and vomiting that lasted for 7 days. She had been in the Obstetric Emergency Department 6 days prior with the same complaints. She had no fever and she was discharged home following normal obstetric ultrasound. On this second visit, after surgical consultation, septic shock with abdominal source was recognised and patient was taken for emergency exploratory laparotomy. Intraoperatively we found generalised purulent peritonitis secondary to perforated acute appendicitis. Appendectomy, thorough abdominal washing and laparostomy were performed. Patient was admitted on the
Intensive Care Unit with septic shock, need for vasopressor therapy and dialysis. Four days after the first intervention the abdominal cavity was closed. She was discharged home on the 14th post-operative day and maintained obstetric follow-up for the remaining uncomplicated pregnancy.

Discussion: In the presented clinical case, diagnostic delay evolves to abdominal sepsis that demanded a damage control approach. Laparostomy constitutes a damage control gesture, limiting abdominal contamination, preventing abdominal compartment syndrome and allowing subsequent surgical revisions. Conclusion: Acute abdominal approach using laparostomy allowed for a good outcome, maintaining ongoing pregnancy and with incisional hernia as the only observed morbidity.

Database: EMBASE

17. Outcomes of the patients diagnosed incidentally appendicitis during cesarean section.

Author(s): Kulhan, Mehmet; Kulhan, Nur Gozde; Nayki, Umit; Nayki, Cenk; Ulug, Pasa; Ata, Nahit; Toklucu, Hulya

Source: Ginekologia polska; 2017; vol. 88 (no. 3); p. 147-150

Publication Date: 2017

Publication Type(s): Journal Article

PubMedID: 28397204

Available at Ginekologia polska - from Free Medical Journals . com

Abstract: OBJECTIVES Appendicitis is the most common condition leading to an intraabdominal operation for a non obstetric problem in pregnancy and diagnosis of appendicitis is complicated by the physiologic and anatomic changes that occur during pregnancy. Although a surgical procedure carries the risk of fetal loss or preterm delivery, delay in diagnosis also increases the risk of complications in both mother and fetus. In this report we present our experience and analyze clinical characteristic and the pregnancy outcomes of appendicitis diagnosed incidentally during cesarean in the third trimester.

MATERIAL AND METHODS The study population consisted of 23 pregnant women who were diagnosed incidentally with appendicitis during cesarean at Erzincan University Hospital between 2015 and 2016.

RESULTS Appendectomy was performed on 23 patients during a caesarean section performed for any reason. The mean diameter of appendix was 7.82 ± 1.85 mm. The mean operation time was 67.39 ± 18.94 SD and antibiotic therapy was given to all patients. Postoperative complications were noted in 4 (17.4%) patients. Wound infection was seen in 4 (17.4%) patients, the other 19 patients revealed no postoperative complications. The mean of APGAR score of newborns in the postoperative period was 8.26 ± 0.86 SD and no complications were observed in both mothers and newborns. Histopathology of the specimen confirmed acute appendicitis in 23 (100%) cases.

CONCLUSIONS Acute appendicitis is a challenging diagnosis in the pregnant patient; however, early surgical intervention should be performed with any suspicion. The type of surgery depends on the surgeon’s preference and experience.

Database: Medline

Author(s): Tase A.; Kamarizan M.F.A.; Swarnkar K.
Source: International Journal of Surgery Open; 2017; vol. 6 ; p. 5-11
Publication Date: 2017
Publication Type(s): Review
Database: EMBASE


Author(s): Joo, Jeong Il; Park, Hyoung-Chul; Kim, Min Jeong; Lee, Bong Hwa
Source: The American journal of medicine; Dec 2017; vol. 130 (no. 12); p. 1467-1469
Publication Date: Dec 2017
Publication Type(s): Journal Article Observational Study
PubMedID: 28602871

Abstract:OBJECTIVEThe aim of the present study is to determine the feasibility and safety of antibiotics for uncomplicated simple appendicitis in pregnancy.METHODWe conducted a 6-year prospective observational study on 20 pregnant women in whom uncomplicated simple appendicitis (appendiceal diameter ≤11 mm and with no signs of appendicoliths, perforation, or abscess) was radiologically verified and managed with a 4-day course of antibiotics. Treatment failure rate, defined as the need for an appendectomy during hospitalization and recurrence in the follow-up period (median 25 months), and maternal or fetal complications during the pregnancy were evaluated.RESULTSMean age of patients was 33.4 years, and gestational age was 17.8 weeks. Three patients failed to respond to antibiotic therapy during hospitalization and underwent subsequent appendectomy (2 suppurative and 1 perforated appendicitis). There was 1 wound infection postoperatively. During follow-up, 2 patients during their ongoing pregnancy experienced recurrence at 3 and 6 months post-treatment, and a new course of antibiotics was determined. Patients also experienced recurrence at 8 and 10 months post-treatment and underwent appendectomy. Treatment failure occurred in 5 patients (25%) with no fetal complications during the pregnancy.CONCLUSIONSAntibiotic therapy for uncomplicated appendicitis in pregnancy may be a feasible treatment option without severe maternal and fetal complications.

Database: Medline
20. **Laparoscopic Appendectomy in Pregnancy With Acute Appendicitis: Single Center Experience With World Review.**

**Author(s):** Maimaiti, Abudukaiyoumu; Aierkin, Amina; Mahmood, Khan Muddassar; Apaer, Shadike; Maimaiti, Yilihamu; Yibulayin, Xiaokaiti; Li, Tao; Zhao, Jin-Ming; Tuxun, Tuerhongjiang

**Source:** Surgical laparoscopy, endoscopy & percutaneous techniques; Dec 2017; vol. 27 (no. 6); p. 460-464

**Publication Date:** Dec 2017

**Publication Type(s):** Journal Article Review

**PubMedID:** 28984719

Available at Surgical laparoscopy, endoscopy & percutaneous techniques - from Ovid (LWW Total Access Collection 2015 - Q1 with Neurology)

**Abstract:**

**OBJECTIVE** This clinical study is aiming to discuss the therapeutic benefit of laparoscopic appendectomy (LA) by comparing with conventional open appendectomy (OA) in pregnancy.

**MATERIALS AND METHODS** The clinical data of 26 pregnant women who underwent appendectomy from 2012 to 2016 was retrospectively analyzed. The variables analyzed included baseline information, operation characteristics, maternal complications, and infant health outcomes. The patients were divided in 2 LA and OA groups according to the surgical approach and their clinical characteristics were compared.

**RESULTS** OF reported 26 patients, 7 underwent LA whereas the remaining 19 patients underwent OA. The median age of the patients was 28 years (range, 19 to 39 y). The median gestational period was 21.5 weeks (range, 5 to 33 wk). The postoperative pathology showed complicated appendicitis 7 cases. The result showed significantly shorter operation time (42.14±8.63 vs. 65.21±26.58 min, P=0.003), hospital stay (4.14±1.77 vs. 6.47±2.72 d, P=0.021), and earlier recovery of gastrointestinal function in the LA group compared with OA group. There were no maternal and fetal deaths occurred in perioperative period in both groups.

**CONCLUSION** LA has not increased morbidity and mortality but displayed shorter hospital stay, operation time and recovery of gastrointestinal function to OA as well as good cosmetic results. Therefore, LA in patients with pregnancy can be considered as preferred approach in sophisticated hands without increased risks.

**Database:** Medline

21. **MRI of suspected appendicitis during pregnancy: interradiologist agreement, indeterminate interpretation and the meaning of non-visualization of the appendix.**

**Author(s):** Tsai, Richard; Raptis, Constantine; Fowler, Kathryn J; Owen, Joseph W; Mellnick, Vincent M

**Source:** The British journal of radiology; Nov 2017; vol. 90 (no. 1079); p. 20170383

**Publication Date:** Nov 2017

**Publication Type(s):** Journal Article

**PubMedID:** 28869395

Available at The British journal of radiology - from Europe PubMed Central - Open Access

**Abstract:**

**OBJECTIVE** To determine the degree of interradiologist agreement between the MRI features of appendicitis during pregnancy, the outcomes associated with an indeterminate interpretation and the negative predictive value of non-visualization of the appendix.

**METHODS** Our study was approved by the institutional review board at the Washington University in St. Louis, Missouri (WUSTL) and was HIPAA (Health Insurance Portability and Accountability Act of 1996)-compliant. The informed consent requirement was waived. Cases of suspected appendicitis during pregnancy evaluated using MRI were retrospectively identified using search queries. Scans were re-
reviewed by two radiologists (7 and 9 years experience, respectively) to evaluate the interradiologist agreement of different MRI features of appendicitis during pregnancy (visualization of the appendix, appendiceal diameter, appendiceal wall thickening, periappendiceal fat stranding, fluid-filled appendix and periappendiceal fluid). The radiologists were blinded to patient outcome, patient intervention, laboratory data, demographic data and the original MRI reports. Clinical outcomes were documented by surgical pathology or clinical observation. Interradiologist agreement was analysed using Cohen’s κ, while patient demographic and clinical data was analysed using Student’s t-testing.

RESULTS
233 females with suspected appendicitis during pregnancy were evaluated using MRI over a 13-year period (mean age, 28.4 years; range, 17-38 years). There were 14 (6%) positive examinations for appendicitis during pregnancy, including 1 patient whose MRI was interpreted as negative, proven by surgical pathology. The presence of periappendiceal soft-tissue stranding and the final overall impression had the most interradiologist agreement (κ = 0.81-1). There were no pregnant patients found to have acute appendicitis who had an indeterminate MR interpretation or when the appendix could not be visualized.

CONCLUSION
The final impression by the two retrospectively reviewing radiologists of MR examinations performed for suspected appendicitis during pregnancy had near-perfect agreement. In patients where the appendix could not be visualized or in patients that were interpreted as indeterminate, no patients had acute appendicitis.

Advances in knowledge: MR impression for suspected appendicitis in the pregnant patient has high interradiologist agreement, and a non-visualized appendix or lack of inflammatory findings at the time of MR, reliably excludes surgical appendicitis.

Database: Medline


Author(s): Burns, Michael; Hague, Cameron J; Vos, Patrick; Tiwari, Pari; Wiseman, Sam M

Source: Canadian Association of Radiologists journal = Journal l’Association canadienne des radiologistes; Nov 2017; vol. 68 (no. 4); p. 392-400

Publication Date: Nov 2017

Publication Type(s): Journal Article

PubMedID: 28728903

Abstract:PURPOSE: The objective of the study was to evaluate the performance of magnetic resonance imaging (MRI) for the diagnosis of appendicitis during pregnancy.

METHODS: We conducted a retrospective review of all MRI scans performed at our institution, between 2006 and 2012, for the evaluation of suspected appendicitis in pregnant women. Details of the MRI scans performed were obtained from the radiology information system as well as details of any ultrasounds carried out for the same indication. Clinical and pathological data were obtained by retrospective chart review.

RESULTS: The study population comprised 63 patients, and 8 patients underwent a second MRI scan during the same pregnancy. A total of 71 MRI scans were reviewed. The appendix was identified on 40 scans (56.3%). Sensitivity of MRI was 75% and specificity was 100% for the diagnosis of appendicitis in pregnant women. When cases with right lower quadrant inflammatory fat stranding or focal fluid, without appendix visualization, were classified as positive for appendicitis, MRI sensitivity increased to 81.3% but specificity decreased to 96.4%.

CONCLUSION: MRI is sensitive and highly specific for the diagnosis of appendicitis during pregnancy and should be considered as a first line imaging study for this clinical presentation.

Database: Medline

Author(s): Won, Roy P; Friedlander, Scott; Lee, Steven L

Source: The American surgeon; Oct 2017; vol. 83 (no. 10); p. 1103-1107

Publication Date: Oct 2017

Publication Type(s): Journal Article

Abstract: Acute appendicitis is a common nonobstetric indication for surgical intervention during pregnancy with serious potential complications for the mother and fetus. The aim of this study was to evaluate the presentation, management practices, outcomes, and costs of appendectomy during pregnancy. We did a retrospective analysis of 62,118 nonincidental appendectomies performed in women (age 15-45 years) identified from the California State Inpatient Database (2005-2011). Primary outcomes included diagnosis or type of appendicitis, use of laparoscopy, morbidity, length of stay, and cost. Pregnant women were less likely to undergo laparoscopy (OR = 0.51, P < 0.01). Pregnancy had no effect on perforation rates, but was associated with higher rates of negative appendectomy (OR = 9.29, P < 0.01). Pregnancy was not associated with nonpregnancy-related complications after appendectomy. Pregnant women had longer length of stay (RR = 1.07, P < 0.01) but similar costs. Appendectomy did increase risk of preterm delivery at the time of surgical admission (19.5 vs 8.8%, P < 0.01). However, once discharged, there was no difference in rates of preterm delivery (9.1 vs 8.9%, P = 0.23). Pregnant women had higher rates of negative appendectomy with lower rates of laparoscopy. Despite these differences, there was no difference in nonpregnancy-related morbidity and cost. Appendectomy did increase risk of preterm birth, but the increased risk normalized over time.

Database: Medline

24. T1 bright appendix sign to exclude acute appendicitis in pregnant women.

Author(s): Shin, Ilah; An, Chansik; Lim, Joon Seok; Kim, Myeong-Jin; Chung, Yong Eun

Source: European radiology; Aug 2017; vol. 27 (no. 8); p. 3310-3316

Publication Date: Aug 2017

Publication Type(s): Journal Article Evaluation Studies

Abstract:ObjectiveTo evaluate the diagnostic value of the T1 bright appendix sign for the diagnosis of acute appendicitis in pregnant women.

Material and MethodsThis retrospective study included 125 pregnant women with suspected appendicitis who underwent magnetic resonance (MR) imaging. The T1 bright appendix sign was defined as a high intensity signal filling more than half length of the appendix on T1-weighted imaging. Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of the T1 bright appendix sign for normal appendix identification were calculated in all patients and in those with borderline-sized appendices (6-7 mm).

ResultsThe T1 bright appendix sign was seen in 51% of patients with normal appendices, but only in 4.5% of patients with acute appendicitis. The overall sensitivity, specificity, PPV, and NPV of the T1 bright appendix sign for normal appendix diagnosis were 44.9%, 95.5%, 97.6%, and 30.0%, respectively. All four patients with borderline sized appendix with appendicitis showed negative T1
CONCLUSION

The T1 bright appendix sign is a specific finding for the diagnosis of a normal appendix in pregnant women with suspected acute appendicitis. KEY POINTS

• Magnetic resonance imaging is increasingly used in emergency settings.
• Acute appendicitis is the most common cause of acute abdomen.
• Magnetic resonance imaging is widely used in pregnant population.
• T1 bright appendix sign can be a specific sign representing normal appendix.

Database: Medline

25. Clinical use of MRI for the evaluation of acute appendicitis during pregnancy.

Author(s): Patel, Darshan; Fingard, Jordan; Winters, Sean; Low, Gavin

Source: Abdominal radiology (New York); Jul 2017; vol. 42 (no. 7); p. 1857-1863

Publication Date: Jul 2017

Publication Type(s): Multicenter Study Journal Article

PubMedID: 28194513

Available at Abdominal radiology (New York) - from ProQuest (Hospital Premium Collection) - NHS Version

Abstract: PURPOSE The purpose of this study was to determine the diagnostic accuracy of MRI for detecting acute appendicitis in pregnancy in a multi-institution study involving general body MR readers with no specific expertise in MR imaging of the pregnant patient. METHODS Retrospective review of MRI examinations on PACS in 42 pregnant patients was evaluated for acute right lower quadrant pain. Three fellowship-trained general body radiologists analyzed the MRI examinations in consensus and attempted to localize the appendix, assess for features of appendicitis, and exclude alternative etiologies for the right lower quadrant pain. Results Of the 42 MRI examinations, the readers noted 6 cases of acute appendicitis, 16 cases of a normal appendix, and 20 cases involving non-visualization of the appendix but where there were no secondary features of acute appendicitis. Based on the surgical data and clinical follow-up, there were 3 true-positive cases, 3 false-positive cases, 34 true-negative cases, and 2 false-negative cases of acute appendicitis on MRI. This yielded an accuracy of 88.1%, sensitivity of 60%, specificity of 91.9%, positive predictive value of 50%, and negative predictive value of 94.4% for the detection of acute appendicitis in the pregnant patient on MRI. Alternative etiologies for the right lower quadrant pain on MRI included torsion of an ovarian dermoid in 1 case and pyelonephritis in 1 case. CONCLUSION MRI is an excellent modality for excluding acute appendicitis in pregnant patients presenting with right lower quadrant pain.

Database: Medline
26. Laparoscopic or open appendicectomy for suspected appendicitis in pregnancy and evaluation of foetal outcome in Australia.

**Author(s):** Winter, Nicole N; Guest, Glenn D; Bozin, Michael; Thomson, Benjamin N; Mann, G Bruce; Tan, Stephanie B M; Clark, David A; Daruwalla, Juristine; Muralidharan, Vijayaragavan; Najan, Neeha; Pitcher, Meron E; Vilhelm, Karina; Cox, Michael R; Lane, Steven E; Watters, David A

**Source:** ANZ journal of surgery; May 2017; vol. 87 (no. 5); p. 334-338

**Publication Date:** May 2017

**Publication Type(s):** Comparative Study Journal Article

**PubMedID:** 27598241

Available at ANZ journal of surgery - from Wiley Online Library Science, Technology and Medicine Collection 2017

**Abstract:**

**BACKGROUND**
Recent data suggest that laparoscopic appendicectomy (LA) in pregnancy is associated with higher rates of foetal loss when compared to open appendicectomy (OA). However, the influence of gestational age and maternal age, both recognized risk factors for foetal loss, was not assessed.

**METHOD**
This was a multicentre retrospective review of all pregnant patients who underwent appendicectomy for suspected appendicitis from 2000 to 2012 across seven hospitals in Australia. Perioperative data and foetal outcome were evaluated.

**RESULTS**
Data on 218 patients from the seven hospitals were included in the analysis. A total of 125 underwent LA and 93 OA. There were seven (5.6%) foetal losses in the LA group, six of which occurred in the first trimester, and none in the OA group. After matching using propensity scores, the estimated risk difference was 5.1% (95% confidence interval (CI): 1.4%, 9.8%). First trimester patients were more likely to undergo LA (84%), while those in the third were more likely to undergo OA (85%). Preterm delivery rates (6.8% LA versus 8.6% OA; CI: -12.6%, 5.3%) and hospital length of stay (3.7 days LA versus 4.5 days OA; CI: -1.3, 0.2 days) were similar.

**CONCLUSION**
This is the largest published dataset investigating the outcome after LA versus OA while adjusting for gestational and maternal age. OA appears to be a safer approach for pregnant patients with suspected appendicitis.

**Database:** Medline

**Author(s):** Theilen, Lauren H; Mellnick, Vincent M; Shanks, Anthony I; Tuuli, Methodius G; Odibo, Anthony O; Macones, George A; Cahill, Alison G

**Source:** American journal of perinatology; May 2017; vol. 34 (no. 6); p. 523-528

**Publication Date:** May 2017

**PubMedID:** 27788534

**Abstract:**

**Objective** The objective of this study was to identify clinical factors predictive of appendicitis in pregnant women and associated obstetric outcomes. Study Design We performed a single-center, retrospective cohort study of pregnant women who underwent magnetic resonance imaging for suspected appendicitis from 2007 to 2012. Rates and odds of appendicitis based on presenting signs and symptoms were estimated. We also estimated rates and odds of adverse obstetric outcomes among women with a diagnosis of appendicitis. Results Of 171 pregnant women evaluated, 14 (8.2%) had pathology-confirmed appendicitis. White blood cell (WBC) count on admission was moderately predictive of appendicitis (area under the receiver operating characteristic curve, 0.74). A WBC count > 18,000 made the diagnosis of appendicitis more than 10 times more likely (adjusted odds ratio, 10.51; 95% confidence interval, 1.67-43.1). Of 127 women with complete pregnancy follow-up, women with appendicitis had a higher rate of pregnancy loss < 20 weeks (2/13 [15.4%] vs. 3/104 [2.9%], p < 0.01) and < 24 weeks (3/13 [23.1%] vs. 4/104 [3.8%]) than those without appendicitis. Appendicitis diagnosed in the first trimester was associated with increased risk of pregnancy loss. 18,000 on admission is significantly associated with appendicitis in pregnant women undergoing evaluation for appendicitis. Appendicitis during the first trimester of pregnancy is associated with previable pregnancy loss.

**Database:** Medline

28. Acute Appendicitis During Pregnancy: Different from the Nonpregnant State?

**Author(s):** Segev, L; Segev, Y; Rayman, S; Nissan, A; Sadot, E

**Source:** World journal of surgery; Jan 2017; vol. 41 (no. 1); p. 75-81

**Publication Date:** Jan 2017

**PubMedID:** 27730353

**Abstract:**

**BACKGROUND** Acute appendicitis is the most common nonobstetric indication for surgical intervention during pregnancy. However, the current literature is scarce and composed of relatively small case series. We aimed to compare the presentation, management, and surgical outcomes of presumed acute appendicitis between a contemporary cohort of pregnant women and nonpregnant women of reproductive age. **METHODS** The study group included 92 pregnant patients who underwent appendectomy for presumed acute appendicitis at a single tertiary medical center in 2000-2014. Preoperative, operative, and postoperative clinical data were derived from medical records and compared to data for 494 nonpregnant patients of reproductive age who underwent appendectomy in 2004-2007 at the same institution. **RESULTS** Median age was 28 years (range 25-33) in the study group and 26 years (range 20-34) in the control group (P = 0.1). There were no between-group differences in mean white blood cell count, patient interval, hospital interval, or operative time. Preoperative abdominal ultrasound was used in a significantly higher proportion of patients in the pregnant group than in the nonpregnant group (73 and 27 %, respectively, P < 0.001) and
computed tomography, in a significantly lower proportion of patients (1 vs. 16 %, respectively, \( P < 0.001 \)). The two groups had similar rates of negative appendectomy (23 and 22 %, \( P = 0.9 \)), complicated appendicitis (12 and 11 %, \( P = 0.9 \)), and overall postoperative complications (15 and 12 %, \( P = 0.3 \)).

CONCLUSIONSThe clinical presentation and outcome of presumed acute appendicitis are similar in pregnant women and nonpregnant women of reproductive age. Therefore, similar perioperative management algorithms may be applied in both patient populations.

Database: Medline


Author(s): Burcu, Busra; Ekinci, Ozgur; Atak, Tuba; Orhun, Kivilcim; Eren, Turgut Tunc; Alimoglu, Orhan

Source: Northern clinics of Istanbul; 2016; vol. 3 (no. 1); p. 60-63

Publication Date: 2016

Publication Type(s): Journal Article

PubMedID: 28058387

Available at Northern clinics of Istanbul - from Europe PubMed Central - Open Access

Abstract:OBJECTIVEAcute appendicitis is one of the most common acute surgical pathology we encountered. In this study we investigated our pregnant cases of appendicitis, and reviewed literature.

METHODSA total of 21 pregnant women who underwent appendectomy with the initial diagnosis of acute appendicitis in Istanbul Medeniyet University Clinics of General Surgery between January 2012, and December 2014 were retrospectively analyzed. The patients's ages, trimesters, complaints, abdominal examination, laboratory, and ultrasonographic findings, surgical techniques, complications and hospital stay were noted.

RESULTSThe patients were in their first (n=12; 57.1%), second (n=5; 23.8%), and third trimesters (n=4; 19.0%) of their pregnancies. Median age was 23.9 years. All of the patients had abdominal pain. Median value of WBC count was 13.297/mm³. Ultrasound was positive in 12 patients (57.1%). In 14 (66.6%) patients McBurney incision, and in 6 (28.6%) cases right paramedian incision were used. One patient (4.8%) underwent laparoscopic appendectomy. Nineteen cases were acute appendicitis (90.5%), and two cases were perforated appendicitis (9.5%). Average hospital stay was 3.8 days. Two cases with perforated acute appendicitis developed wound infection and treated conservatively. There were no fetomaternal mortality.

CONCLUSIONPhysiologically anatomic and biochemical changes occurring during pregnancy can delay the diagnosis of acute appendicitis threaten the lives of both the mother and the fetus. Therefore, rapid diagnosis and appropriate treatment convey importance.

Database: Medline
30. Maternal and fetal outcomes after laparoscopic vs. Open appendectomy in pregnant women: data from two tertiary referral centers.

Author(s): Karaman, Erbil; Aras, Abbas; Çim, Numan; Kolusari, Ali; Kiziltan, Remzi; Celik, Sebahattin; Anuk, Turgut

Source: Ginekologia polska; 2016; vol. 87 (no. 2); p. 98-103

Publication Date: 2016

Publication Type(s): Comparative Study Journal Article

PubMedID: 27306285

Available at Ginekologia polska - from Free Medical Journals.com

Abstract: Objectives: Appendectomy is the most common cause of non-obstetric surgery in pregnant women. Our aim was to compare the clinical characteristics, peri-and post-operative data of pregnant women undergoing either laparoscopic appendectomy (LA) or open appendectomy (OA). Materials and methods: This was a retrospective study of medical records of all pregnant women diagnosed and treated surgically for acute appendicitis at two referral centers of Yuzuncu Yil University Medical Faculty and Kafkas University Medical Faculty, from January 2010 to January 2015. Results: The study included 48 patients, divided to two groups (12 - LA and 36 - OA). There were no significant differences in demographic characteristics of the studied population, including age, BMI, gestational age at operation, gravidity, parity, and history of cesarean sections. A far as obstetric and fetal outcomes are concerned, no significant differences were found in terms of preterm delivery, fetal loss, delivery mode, birth weight, APGAR score, and maternal death between the two investigated groups. One perioperative complication of intra-abdominal abscess was noted in the OA group. However, the LA group had shorter hospital stay (3.25±2.45 vs. 4.28±3.31, p=0.004), earlier mobilization time (8.1±2.2 vs. 10.1±1.6, p=0.025), and shorter time to first flatus (2.3±0.3 vs. 4.0±1.6, p=0.032) as compared to the OA group. The OA group had statistically shorter operation time than the LA group (38.61±11.5 vs. 49.42±11.38, p=0.007). Conclusion: LA is related to shorter hospital stay, faster return to daily activities, and shorter time to first flatus. LA appears to be as safe and effective as OA in pregnant patients without increasing adverse perinatal outcomes.

Database: Medline

**Author(s):** Türkan, Ahmet; Yalaza, Metin; Kafadar, Mehmet Tolga; Değirmencioğlu, Gürka

**Source:** Clinical and investigative medicine. Medecine clinique et experimentale; Dec 2016; vol. 39 (no. 6); p. 27521

**Publication Date:** Dec 2016

**Publication Type(s):** Clinical Trial Journal Article

**PubMedID:** 27917811

Available at [Clinical and investigative medicine. Medecine clinique et experimentale](https://www.proquest.com) - from ProQuest (Hospital Premium Collection) - NHS Version

**Abstract:**

**PURPOSE** The purpose of this study was to analyse 13 patients who were treated in our clinic due to acute appendicitis during pregnancy.

**METHODS** Records of the patients who received appendectomy with appendicitis diagnosis in our Turgut Özal University Research and Application Hospital between January 2007 and December 2015 have been analyzed retrospectively.

**RESULTS** Appendectomies were performed on 13 pregnant patients with an acute appendicitis diagnosis. Average age of the patients was 27.69 years (between 22-37 years). Most frequent complaint of the patients was abdominal pain and most frequent examination finding was tenderness at right lower quadrant. Ultrasonography was used in all cases for diagnosis. Surgery was decided with clinical diagnosis for five cases (38.5%) where appendix had not been identified with ultrasonography. While laparoscopic appendectomy was applied in one case (7.7%) and open appendectomy was applied using a McBurney incision in 12 cases (92.3%). Average hospitalization duration was 1.69 days. All patients were tracked together through the Gynaecology Department for two weeks after they had been discharged from the hospital. Preterm delivery, maternal and fetal loss did not occur.

**CONCLUSION** It is considered appropriate to apply ultrasonography routinely to all pregnant patients in whom acute appendicitis is suspected. Concern for maternal or fetal complication that may occur in consequence of an unnecessary surgery should not be at a level that will delay surgical treatment needed by the patient.

**Database:** Medline
32. MRI for appendicitis in pregnancy: is seeing believing? clinical outcomes in cases of appendix nonvisualization.

Author(s): Al-Katib, Sayf; Sokhandon, Farnoosh; Farah, Michael

Source: Abdominal radiology (New York); Dec 2016; vol. 41 (no. 12); p. 2455-2459

Publication Date: Dec 2016

Publication Type(s): Multicenter Study Journal Article

PubMedID: 27511366

Available at Abdominal radiology (New York) - from ProQuest (Hospital Premium Collection) - NHS Version

Abstract:
PURPOSE The primary objective of this study was to determine the clinical outcomes in cases of appendix nonvisualization with MRI in pregnant patients with suspected appendicitis and the implications of appendix nonvisualization for excluding appendicitis.

METHODS Fifty-eight pregnant patients with suspected appendicitis evaluated with MRI at three centers from a single institution were retrospectively reviewed by three radiologists with varying levels of abdominal imaging experience. All scans were performed on a 1.5-Tesla Siemens unit. Cases were evaluated for diagnostic quality, visualization of the appendix, presence of appendicitis, and alternate diagnoses. Clinical outcomes were gathered from the electronic medical record.

RESULTS Of the 58 patients who underwent MRI for suspected appendicitis, 50 cases were considered adequate diagnostic quality by all three radiologists. The rate of appendix visualization among the three radiologists ranged from 60 to 76% (p = 0.44). The appendix was nonvisualized by at least one of the three radiologists in 25 cases (50%). Of these, none had a final diagnosis of appendicitis including one patient who underwent appendectomy. MRI suggested an alternate diagnosis in 6 (24%) patients with appendix nonvisualization. For the three reviewers, the agreement level on whether or not the appendix was visualized on the MRI had a Light's kappa value of 0.526, indicating a "moderate" level of agreement (p value < 0.01).

CONCLUSION Despite only moderate level of interobserver agreement for appendix visualization, appendix nonvisualization on MRI in pregnant patients with suspected appendicitis confers a significant reduction in the risk of appendicitis compared to all comers as long as the study is adequate diagnostic quality and there are no secondary signs of appendicitis present.

Database: Medline

Author(s): Arer, İlker Murat; Alemdaroğlu, Songül; Yeşilağaç, Hasan; Yabanoğlu, Hakan

Source: Ulusal travma ve acil cerrahi dergisi = Turkish journal of trauma & emergency surgery : TJTES; Nov 2016; vol. 22 (no. 6); p. 545-548

Publication Date: Nov 2016

Publication Type(s): Case Reports Journal Article

PubMedID: 28074461

Abstract: BACKGROUND Acute appendicitis (AA) is the most common cause of acute abdomen during pregnancy. Most of the signs of appendicitis are also found during normal pregnancy period, however, and diagnosis of appendicitis during pregnancy remains challenging. The aim of the current study was to report our clinical experience of AA during pregnancy and investigate optimal management of this difficult situation.

METHODS Records of 20 pregnant women with diagnosis of AA who underwent appendectomy between 2005 and 2015 were included in this study. Data were collected retrospectively. Patients were evaluated according to age, signs and symptoms, gestational age, physical findings, serum white blood cell count, ultrasound (US) findings, pathology reports, surgical technique, operation time, and complications.

RESULTS Of 20 patients, 16 (80%) underwent open appendectomy and 4 (20%) underwent laparoscopic appendectomy. Mean age of patients was 29.6±5.6 years. Most common symptom was abdominal pain (95%). Six (30%) patients were in first trimester, 9 (45%) patients were in second trimester and 5 (25%) patients in were in third trimester. US findings consistent with AA were found in 12 (60%) patients. Negative appendectomy rate was 30%. Maternal complication was seen in only 1 (5%) patient. No fetal complication was observed.

CONCLUSION Accurate diagnosis and prompt surgical treatment of AA in pregnant women should be performed due to high rates of maternal and fetal complications.

Database: Medline


Author(s): Segev, Lior; Segev, Yakir; Rayman, Shlomi; Shapiro, Ron; Nissan, Aviram; Sadot, Eran

Source: Journal of laparoendoscopic & advanced surgical techniques. Part A; Nov 2016; vol. 26 (no. 11); p. 893-897

Publication Date: Nov 2016

Publication Type(s): Comparative Study Journal Article

PubMedID: 27668544

Abstract: BACKGROUND The optimal surgical approach to acute appendicitis in pregnancy remains controversial. Our aim was to compare perioperative and obstetric outcomes associated with laparoscopic and open appendectomy in a large contemporary cohort of pregnant women.

METHODS Retrospective review of all women who underwent appendectomy during pregnancy in a single hospital during 2000-2014.

RESULTS Ninety-two patients met the study criteria. Fifty (54%) underwent laparoscopic appendectomy and 42 (46%) open appendectomy. The laparoscopy group had a lower median gestational age at surgery (16 weeks versus 24 weeks, P < .001), a shorter median hospital stay (5 days versus 3 days, P < .001), and a lower rate of postoperative complications (8% versus 24%, P = .04). There were no significant between-group differences in the rates of gestational age at delivery, Apgar scores, preterm delivery, and fetal loss.

CONCLUSION Laparoscopic appendectomy during pregnancy is safe and associated with better surgical outcomes than open appendectomy, with no difference in obstetric outcomes.

Database: Medline

Author(s): Amitai, Michal M; Katorza, Eldad; Guranda, Larisa; Apter, Sara; Portnoy, Orith; Inbar, Yael; Konen, Eli; Klang, Eyal; Eshet, Yael

Source: The Israel Medical Association journal : IMAJ; Oct 2016; vol. 18 (no. 10); p. 600-604

Publication Date: Oct 2016

Publication Type(s): Journal Article

PubMedID: 28471619

Abstract: BACKGROUND Pregnant women with acute abdominal pain pose a diagnostic challenge. Delay in diagnosis may result in significant risk to the fetus. The preferred diagnostic modality is magnetic resonance imaging (MRI), since ultrasonography is often inconclusive, and computed tomography (CT) would expose the fetus to ionizing radiation. OBJECTIVES To describe the process in setting up an around-the-clock MRI service for diagnosing appendicitis in pregnant women and to evaluate the contribution of abdominal MR in the diagnosis of acute appendicitis. METHODS We conducted a retrospective study of consecutive pregnant women presenting with acute abdominal pain over a 6 year period who underwent MRI studies. A workflow that involved a multidisciplinary team was developed. A modified MRI protocol adapted to pregnancy was formulated. Data regarding patients' characteristics, imaging reports and outcome were collected retrospectively. RESULTS 49 pregnant women with suspected appendicitis were enrolled. Physical examination was followed by ultrasound: when positive, the patients were referred for MR scan or surgery treatment; when the ultrasound was inconclusive, MR scan was performed. In 88% of women appendicitis was ruled out and surgery was prevented. MRI diagnosed all cases with acute appendicitis and one case was inconclusive. The overall statistical performance of the study shows a negative predictive value of 100% (95%CI 91.9-100%) and positive predictive value of 83.3% (95%CI 35.9-99.6%). CONCLUSIONS Creation of an around-the-clock imaging service using abdominal MRI with the establishment of a workflow chart using a dedicated MR protocol is feasible. It provides a safe way to rule out appendicitis and to avoid futile surgery in pregnant women.

Database: Medline
The diagnosis of acute appendicitis in pregnant versus non-pregnant women: A comparative study.

Author(s): Aras, Abbas; Karaman, Erbil; Pekşen, Çağhan; Kızıltan, Remzi; Kotan, Mehmet Çetin

Source: Revista da Associacao Medica Brasileira (1992); Oct 2016; vol. 62 (no. 7); p. 622-627

Publication Date: Oct 2016

Publication Type(s): Comparative Study Journal Article

PubMedID: 27925040

Abstract: Objective: To investigate whether the diagnosis of acute appendicitis is affected by pregnancy or not. Method: A retrospective study with the analysis of the medical records of all women suspected of having appendicitis who underwent appendectomy at our hospital between June 2010 and March 2015 were reviewed. The patients were divided into two groups according to whether they were pregnant or not during the surgery: group I, pregnant women, and group II, non-pregnant women. Results: During the study period, 38 pregnant women and 169 non-pregnant women underwent appendectomy. The time from admission to the operation was not statistically different (2.17±1.47 days in group I vs. 1.98±1.66 day in group II; p=0.288). The pregnant group had longer hospital stay than the non-pregnant group (p=0.04). Ultrasonography (USG) was used as the first diagnostic modality in 36/38 patients in group I and 161/169 in group II. The non-visualized appendix on ultrasound was seen in 17 patients in group I and 51 patients in group II, which was not statistically different. Sensitivity and specificity of USG in diagnosis of acute appendicitis were 61.29 and 80.00% in group I, and 93.0 and 31.6% in group II, respectively. Conclusion: Although the diagnosis of appendicitis in pregnant women is not delayed, careful assessment of these patients suspected of having appendicitis should be encouraged when USG examination is normal or nondiagnostic.

Database: Medline
37. The diagnostic performance of ultrasound for acute appendicitis in pregnant and young nonpregnant women: A case-control study.

**Author(s):** Segev, Lior; Segev, Yakir; Rayman, Shlomi; Nissan, Aviram; Sadot, Eran

**Source:** International journal of surgery (London, England); Oct 2016; vol. 34 ; p. 81-85

**Publication Date:** Oct 2016

**Publication Type(s):** Comparative Study Journal Article

**PubMedID:** 27554180

**Abstract:** BACKGROUND Ultrasonography is frequently used to diagnose acute appendicitis in women of reproductive age, but its diagnostic value in pregnant patients remains unclear. This study sought to compare the diagnostic performance of ultrasound in pregnant and young nonpregnant women with suspected acute appendicitis.

METHODS The database of a single tertiary medical center was reviewed for all women of reproductive age who underwent appendectomy either during pregnancy (2000-2014) or in the nonpregnant state (2004-2007) following ultrasound evaluation. The performance of ultrasound in terms of predicting the final pathologic diagnosis was compared between the pregnant and nonpregnant groups using receiver operating characteristic curve analysis.

RESULTS Of 586 young women treated for appendicitis during the study periods (92 pregnant, 494 non-pregnant), 200 underwent preoperative ultrasound [67 pregnant, and 133 nonpregnant young women]. The pregnant and nonpregnant groups were comparable in age and presenting symptoms. There was no significant difference in the predictive performance of ultrasound between the two groups (AUC 0.76 and 0.73 respectively, p = 0.78) or within the pregnant group, by trimester [first (n = 23), AUC 0.73; second (n = 32), AUC 0.67; third (n = 12), AUC 0.86; p = 0.4]. Ultrasound had a positive predictive value of 0.94 in the pregnant group and 0.91 in the nonpregnant group; corresponding negative predictive values were 0.40 and 0.43.

CONCLUSIONS There appears to be no difference in the ability of ultrasound to predict the diagnosis of acute appendicitis between pregnant women and nonpregnant women of reproductive age. Therefore, similar preoperative imaging algorithms may be used in both patient populations.

**Database:** Medline
38. Laparoscopic appendectomy during pregnancy is safe for both the mother and the fetus.

**Author(s):** Laustsen, Jesper Frølund; Bjerring, Ole Steen; Johannessen, Øyvind; Qvist, Niels

**Source:** Danish medical journal; Aug 2016; vol. 63 (no. 8)

**Publication Date:** Aug 2016

**Publication Type(s):** Multicenter Study Journal Article

**PubMedID:** 27477796

**Abstract:**
INTRODUCTION
The diagnosis and treatment of acute appendicitis during pregnancy is still debated. While laparoscopic appendectomy in general has become the gold standard, this procedure has not generally been implemented for pregnant women.

METHODS
We retrospectively reviewed the patient charts of all patients who underwent appendectomy during pregnancy in the period from 2000 to 2012. Open appendectomy (OA) was performed in 25 cases and laparoscopic (LA) in 19.

RESULTS
We observed a significantly longer operation time (69 versus 49 min., p = 0.002), but fewer complications, a shorter hospital stay (2.6 versus 5.5 days, p = 0.004) and a lower rate of negative appendectomies (16% versus 52%, p = 0.02) in the LA group compared with the OA group. The mean gestation age at appendectomy was significantly lower in the LA group. There were no significant differences in gestational age at birth, Apgar score, birth weight or height between the two groups. Five births (11%) were categorised as mildly to moderately preterm. There were no cases of fetal loss.

CONCLUSION
Laparoscopic appendectomy is safe for both the mother and the fetus during pregnancy irrespective of gestational age, and the procedure is associated with a low risk of post-operative complications.

**FUNDING:** none.

**TRIAL REGISTRATION:** not relevant.

**Database:** Medline

39. Laparoscopic appendectomy and cholecystectomy versus open: a study in 1999 pregnant patients.

**Author(s):** Cox, T C; Huntington, C R; Blair, L J; Prasad, T; Lincourt, A E; Augenstein, V A; Heniford, B T

**Source:** Surgical endoscopy; Feb 2016; vol. 30 (no. 2); p. 593-602

**Publication Date:** Feb 2016

**Publication Type(s):** Comparative Study Journal Article

**PubMedID:** 26091987

Available at Surgical endoscopy - from ProQuest (Hospital Premium Collection) - NHS Version
Available at Surgical endoscopy - from SpringerLink

**Abstract:**
BACKGROUND
When pregnant patients require surgery, whether to perform an operation open or laparoscopic is often debated. We evaluated the impact of laparoscopy for common general surgical problems in pregnancy to determine safety and trends in operative approach over time.

METHODS
Pregnant patients undergoing appendectomy or cholecystectomy were identified using the National Surgical Quality Improvement Program (NSQIP) database. We analyzed demographics, operative characteristics, and outcomes. Univariate comparison and multivariate regression analysis (MVA) were performed adjusting for confounding factors: age, body mass index (BMI), diabetes, and smoking, and an additional MVA was performed for perforated cases.

RESULTS
A total of 1999 pregnant patients between 2005 and 2012 were evaluated. Of 1335 appendectomies, 894 were performed laparoscopically (LA) and 441 open (OA). For 664 cholecystectomies, 606 were laparoscopic (LC) and 58 open (OC). There were no deaths. For LA versus OA, patient characteristics were not different (age: 27.7 vs. 28.2 years, p = 0.19; diabetes: 1.8 vs. 0.9%, p = 0.24; smoking: 19 vs. 16.1%, p = 0.2) except for BMI (27.9 vs. 28.4 kg/m(2); p = 0.03). LA had shorter operative times (ORT), length of stay (LOS), and fewer postoperative complications compared to OA. In MVA, difference between approaches remained statistically significant for ORT (<0.0001), LOS (<0.01), and
wound complications (<0.01). MVA was performed for perforated cases alone: LA had equal ORT (p = 0.19) yet shorter LOS (p = <0.001). The majority of LA were performed in the last 4 years versus the first 4 years (61 vs. 39%, p < 0.001). For LC versus OC, patient characteristics were not different: age (28.3 vs. 28.7 years; p = 0.33), BMI (31.4 vs. 33.2 kg/m², p = 0.25), diabetes (2.8 vs. 3.5%, p = 0.68), and smoking (21.1 vs. 25.9%, p = 0.4). LC had a shorter ORT, LOS, and fewer postoperative complications than OC. In MVA, the difference between approaches remained statistically significant for ORT (<0.0001), LOS (<0.0001), and minor complications (0.05). The percentage of LC cases appeared to increase over time (89 vs. 93%, p = 0.06).

CONCLUSION

While fetal events are unknown, LA and LC in pregnant patients demonstrated shorter ORT, LOS, and reduced complications and were performed more frequently over time. Even in perforated cases, laparoscopy appears safe in pregnant patients.

Database: Medline

40. Challenges in magnetic resonance imaging for suspected acute appendicitis in pregnant patients.

Author(s): Ditkofsky, Noah G; Singh, Ajay

Source: Current problems in diagnostic radiology; 2015; vol. 44 (no. 4); p. 297-302

Publication Date: 2015

Publication Type(s): Journal Article Review

PubMedID: 25754942

Abstract: The assessment of a gravid patient with abdominal pain is a clinical challenge, as one must consider not only the common etiologies for abdominal pain but also etiologies resulting from the pregnancy. Further complicating the assessment is the altered anatomy and physiology that result from the enlarged uterus displacing and compressing normal anatomical structures. This alteration of anatomy makes the symptoms of appendicitis more variable and thus the diagnosis more difficult. Appropriate and timely imaging can result in better patient outcomes, and when appendicitis is suspected, imaging investigation should not be delayed. This article reviews some of the challenges of magnetic resonance imaging in gravid patients with suspected appendicitis and presents strategies for imaging this population.

Database: Medline
41. Acute appendicitis in pregnancy: literature review.

Author(s): Franca Neto, Antônio Henrique de; Amorim, Melânia Maria Ramos do; Nóbrega, Biança Maria Souza Virgolino

Source: Revista da Associação Médica Brasileira (1992); 2015; vol. 61 (no. 2); p. 170-177

Publication Date: 2015

Publication Type(s): Journal Article Review

PubMedID: 26107368

Abstract: INTRODUCTION suspected appendicitis is the most common indication for surgery in non-obstetric conditions during pregnancy and occurs in about one in 500 to one in 635 pregnancies per year. This occurs more often in the second trimester of pregnancy. Acute appendicitis is the most common general surgical problem encountered during pregnancy. METHODS a literature review on research of scientific articles, under the terms "acute appendicitis" and "pregnancy", in PubMed, Lilacs/SciELO, Scopus, Cochrane Library and Uptodate databases. RESULTS the clinical manifestations of appendicitis are similar to non-pregnant women, however, without a classic presentation, which often occurs, diagnosis is difficult and must be supported by imaging. DISCUSSION clinical diagnosis should be strongly suspected in pregnant women with classic findings such as abdominal pain that migrates to the right lower quadrant. The main purpose of imaging is to reduce delays in surgical intervention due to diagnostic uncertainty. A secondary objective is to reduce, but not eliminate, the negative appendectomy rate. Differential diagnosis of suspected acute appendicitis usually includes pathologies considered in non-pregnant people. CONCLUSION the imaging study of choice is ultrasound, MRI may be used when the former is not conclusive and, as a last resort, a CT scan can be performed. The treatment remains appendectomy by laparotomy, since the feasibility of video-assisted surgery in these cases remains controversial.

Database: Medline
42. Laparoscopic surgery in pregnant patients with acute abdomen.

**Author(s):** Kocael, Pinar Cigdem; Simsek, Osman; Saribeyoglu, Kaya; Pekmezci, Salih; Goksoy, Ertugrul

**Source:** Annali italiani di chirurgia; 2015; vol. 86 (no. 2); p. 137-142

**Publication Date:** 2015

**Publication Type(s):** Comparative Study Journal Article

**PubMedID:** 25952362

**Abstract:** AIM Notwithstanding the significant advantages compared to open surgery, laparoscopic surgery was considered to be contraindicated in pregnant patients. Currently, there are opposing views on the safety of laparoscopic surgery during pregnancy, especially in last trimester. The aim of this study was to examine feasibility of laparoscopic surgery in pregnant women with acute abdomen.

**Patients and Methods:** We retrospectively reviewed records of all patients who were admitted to the Emergency Department of Cerrahpasa Medical Faculty between January 1995 and January 2013. All clinical data of pregnant patient who underwent laparoscopic surgery were analyzed including inpatient records, operative reports, pathology records, and delivery information.

**Results:** Fourteen pregnant patients (mean gestational age 19.2 weeks, ranged from 9 to 33 weeks) who underwent laparoscopy for appendectomy (n=11), cholecystectomy (n=2), and diagnostic reasons (n=1) were included. Average time of delivery was 37.4 gestational weeks (range 35-40 weeks). Two patients had preterm labor. No complications such as uterine injury, fetal death, or maternal mortality were encountered during laparoscopic procedures.

**Conclusion:** Laparoscopic surgery can be safely performed at all trimesters of pregnancy. Laparoscopy may be useful in differentiation of acute abdominal pain in pregnancy and may decrease fetal loss due to delay in diagnosis. Shorter operative time reduces negative effects of surgery on mother and fetus.

**Database:** Medline

43. Recent trend of acute appendicitis during pregnancy.

**Author(s):** Kumamoto, Kensuke; Imaizumi, Hideko; Hokama, Naoko; Ishiguro, Toru; Ishibashi, Keiichiro; Baba, Kazunori; Seki, Hiroyuki; Ishida, Hideyuki

**Source:** Surgery today; Dec 2015; vol. 45 (no. 12); p. 1521-1526

**Publication Date:** Dec 2015

**Publication Type(s):** Journal Article

**PubMedID:** 25721173

**Abstract:** PURPOSE We report the clinical presentation, management and outcomes of 33 patients who underwent surgery for acute appendicitis during pregnancy between April 1997 and March 2011.

**Methods:** Several variables were compared between these 33 patients (pregnant group, n = 33) and non-pregnant females aged 20-40 years who underwent an acute appendectomy during the same period (control group, n = 124). RESULTS No significant differences were found between the two groups in terms of the type of anesthesia, operative method, duration of surgery, pathology, duration of antibiotic use, and incidence of surgical site infection, except for a higher frequency of pararectal incision performed and higher leukocyte counts in the pregnant group (P < 0.01). Tocolytic agents were administered to 17 patients (52%). Preterm labor occurred in 10 patients (30%), one of whom experienced preterm delivery.

**Conclusion:** These results suggest that acute appendicitis during pregnancy can be managed successfully without fetal loss.

**Database:** Medline
44. Predictive role of neutrophil-to-lymphocyte and platelet-to-lymphocyte ratios for diagnosis of acute appendicitis during pregnancy.

Author(s): Yazar, Fatih Mehmet; Bakacak, Murat; Emre, Arif; Urfalıoglu, Aykut; Serin, Salih; Cengiz, Emrah; Bülbüloglu, Ertan

Source: The Kaohsiung journal of medical sciences; Nov 2015; vol. 31 (no. 11); p. 591-596

Publication Date: Nov 2015

Publication Type(s): Journal Article

PubMedID: 26678940

Abstract: Acute appendicitis (AA) is not uncommon during pregnancy but can be difficult to diagnose. This study evaluated the neutrophil-to-lymphocyte ratio (NLR) and platelet-to-lymphocyte ratio (PLR) in addition to conventional diagnostic indicators of the disease to diagnose AA during pregnancy. Age, gestational age, white blood cell (WBC) count, Alvarado scores, C-reactive protein (CRP), lymphocyte count, NLR and PLR were compared among 28 pregnant women who underwent surgery for AA, 35 pregnant women wrongly suspected as having AA, 29 healthy pregnant women, and 30 nonpregnant healthy women. Mean WBC counts and CRP levels were higher in women with proven AA than in those of control groups (all p < 0.05). Among all the groups, the median NLR and PLR were significantly different in women with proven AA (all p < 0.05). Receiver operating characteristic analysis was used to determine cut-off values for WBC count, CRP, lymphocyte count, NLR and PLR, and multiple logistic regression analysis showed that NLR and PLR used with routine methods could diagnose AA with 90.5% accuracy. Used in addition to routine diagnostic methods, NLR and PLR increased the accuracy of the diagnosis of AA in pregnant women.

Database: Medline
45. Magnetic resonance imaging of acute appendicitis in pregnancy: a 5-year multiinstitutional study.

Author(s): Burke, Lauren M B; Bashir, Mustafa R; Miller, Frank H; Siegelman, Evan S; Brown, Michele; Alobaidy, Mamdoh; Jaffe, Tracy A; Hussain, Shahid M; Palmer, Suzanne L; Garon, Bonnie L; Oto, Aytekin; Reinhold, Caroline; Ascher, Susan M; Demulder, Danielle K; Thomas, Stephen; Best, Shaun; Borer, James; Zhao, Ken; Pinel-Giroux, Fanny; De Oliveira, Isabela; Resende, Daniel; Semelka, Richard C

Source: American journal of obstetrics and gynecology; Nov 2015; vol. 213 (no. 5); p. 693

Publication Date: Nov 2015

Publication Type(s): Multicenter Study Journal Article

PubMedID: 26215327

Abstract: OBJECTIVE The purpose of this study was to determine the diagnostic performance of magnetic resonance imaging (MRI) in the diagnosis of acute appendicitis during pregnancy in a multiinstitutional study. STUDY DESIGN In this multicenter retrospective study, the cases of pregnant women who underwent MRI evaluation of abdominal or pelvic pain and who had clinical suspicion of acute appendicitis between June 1, 2009, and July 31, 2014, were reviewed. All MRI examinations with positive findings for acute appendicitis were confirmed with surgical pathologic information. Sensitivity, specificity, negative predictive values, and positive predictive values were calculated. Receiver operating characteristic curves were generated, and area under the curve analysis was performed for each participating institution. RESULTS Of the cases that were evaluated, 9.3% (66/709) had MRI findings of acute appendicitis. Sensitivity, specificity, accuracy, positive predictive value, and negative predictive values were 96.8%, 99.2%, 99.0%, 92.4%, and 99.7%, respectively. There was no statistically significant difference between centers that were included in the study (pair-wise probability values ranged from 0.12-0.99). CONCLUSION MRI is useful and reproducible in the diagnosis of suspected acute appendicitis during pregnancy.

Database: Medline
46. MRI: first-line imaging modality for pregnant patients with suspected appendicitis.

**Author(s):** Konrad, Joseph; Grand, David; Lourenco, Ana

**Source:** Abdominal imaging; Oct 2015; vol. 40 (no. 8); p. 3359-3364

**Publication Date:** Oct 2015

**Publication Type(s):** Journal Article

**PubMedID:** 26338256

Available at Abdominal imaging - from ProQuest (Hospital Premium Collection) - NHS Version

**Abstract:**

**PURPOSE**
The purpose of our study was to evaluate the sensitivity, specificity, and accuracy of ultrasound (US) as compared to magnetic resonance imaging (MRI) in pregnant patients with suspected appendicitis for visualization of the appendix, accuracy at diagnosing acute appendicitis, the ability of each modality to identify alternate diagnoses of pain and whether gestational age (GA) has an association with appendix identification rates.

**METHODS**
We retrospectively reviewed the records of 140 pregnant patients with suspected appendicitis to determine the efficacy of US and MRI to identify the appendix, diagnose or exclude acute appendicitis, identify alternative etiologies for clinical presentation, and the affect of GA on identification of the appendix. Imaging results were correlated with surgical pathology in patients who underwent surgery. The electronic medical record was used to assess clinical outcomes in patients who did not undergo surgery.

**RESULTS**
The appendix was visualized in 7% (8/117) of US exams and in 80% (91/114) of MRI exams. Alternate etiologies of pathology were determined in 3% (3/117) of US exams and 12% (14/114) of MRI exams. The sensitivity and specificity of MRI for acute appendicitis were both 100% and 98%, respectively, as compared to 18% and 99%, respectively, with US. GA did not affect MRI or ultrasound visualization rates of the appendix.

**CONCLUSION**
Given the low likelihood of visualization of the appendix at US, the excellent accuracy of MRI and the ability of MRI to identify alternate diagnoses, we suggest that at certain institutions MRI may be considered a first-line imaging modality for pregnant patients of any GA with suspected appendicitis.

**Database:** Medline
47. Laparoscopic appendectomy versus open appendectomy in pregnancy: a population-based analysis of maternal outcome.

Author(s): Cheng, Han-Tsung; Wang, Yu-Chun; Lo, Hung-Chieh; Su, Li-Ting; Soh, Khay-Seng; Tzeng, Chia-Wei; Wu, Shih-Chi; Sung, Fung-Chang; Hsieh, Chi-Hsun

Source: Surgical endoscopy; Jun 2015; vol. 29 (no. 6); p. 1394-1399

Publication Date: Jun 2015

Publication Type(s): Research Support, Non-u.s. Gov't Journal Article

PubMedID: 25171885

Available at Surgical endoscopy - from ProQuest (Hospital Premium Collection) - NHS Version

Available at Surgical endoscopy - from SpringerLink

Abstract: BACKGROUND Laparoscopic appendectomy (LA) is the standard treatment of acute appendicitis for the general population; however, there is still some doubt regarding its safety for pregnant patients. Therefore, the purpose of this study is to investigate and compare the maternal outcome of pregnant patients with acute appendicitis following either an open appendectomy (OA) or LA from a population-based database.

METHODS This study is based on the National Health Insurance Research Database. Patients with both ICD-9-CM codes for appendicitis (540.9, 540.0, and 540.1) and pregnancy (V22) in the same admission were considered to have acute appendicitis during pregnancy. These patients were divided into three groups according to the type of treatment: LA, OA, and non-operative treatment. Outcome measures that were compared between the groups included maternal complications such as preterm labor, abortion, and the need of cesarean section. Besides, the differences of medical expenditure and length of hospital stay between the groups were also analyzed.

RESULTS From 2005 to 2010, a total of 859 pregnant women who had acute appendicitis were identified. They had increased risks for preterm labor, abortion, and increased requirement of cesarean section compared to the control group (i.e., those without acute appendicitis). Among the three groups, the non-operated group has the highest risk of preterm labor. Patients who underwent LA did not have any increased risk of maternal complications compared to the OA group. Furthermore, LA patients had shorter hospital stay than OA.

CONCLUSION Compared to non-operative treatment, appendectomy is the preferred treatment for pregnant patients who have acute appendicitis. LA can be performed safely in pregnant patients without bringing additional maternal complications compared to OA.

Database: Medline

Author(s): Drake, Frederick T; Kotagal, Meera; Simmons, LaVone E; Parr, Zoe; Dighe, Manjiri K; Flum, David R

Source: The journal of maternal-fetal & neonatal medicine : the official journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstetricians; Apr 2015; vol. 28 (no. 6); p. 727-733

Publication Date: Apr 2015

Publication Type(s): Research Support, Non-u.s. Gov't Research Support, N.i.h., Extramural Journal Article Research Support, U.s. Gov't, P.h.s.

PubMedID: 24913357

Abstract: OBJECTIVE Assess the performance of ultrasound (US) in pregnant patients presenting with acute abdominal pain concerning for appendicitis. METHODS Descriptive analysis of pregnant patients who underwent an US for acute abdominal pain over a 6-year period using data from a statewide quality improvement collaborative and a single center. RESULTS Statewide, 131 pregnant patients underwent an appendectomy and 85% had an US. In our single-center case series, 49 pregnant patients underwent an US for acute abdominal pain and four patients had appendicitis (8%). Of those, three were definitively diagnosed with US. The appendix was visualized by US in five patients (3 appendicitis/2 normal). Mean gestational age was 11 weeks for visualization of the appendix versus 20 weeks for non-visualization (p < 0.001). Concordance between US and pathology was similar statewide and at our institution (43%). CONCLUSIONS US appears to play a central role in the evaluation of appendicitis in pregnant women, especially in the first trimester, and often contributes to definitive disposition. US performed less well in excluding appendicitis; however, in certain clinical settings, providers appeared to trust US findings. From these results, we developed a multidisciplinary imaging pathway for pregnant patients who present with acute abdominal pain concerning for appendicitis.

Database: Medline

Author(s): Ramalingam, Vijay; LeBedis, Christina; Kelly, Jacqueline R; Uyeda, Jennifer; Soto, Jorge A; Anderson, Stephan W

Source: Emergency radiology; Apr 2015; vol. 22 (no. 2); p. 125-132

Publication Date: Apr 2015

Publication Type(s): Journal Article Evaluation Studies

PubMedID: 25148766

Available at Emergency radiology - from EBSCO (CINAHL Plus with Full Text)

Available at Emergency radiology - from ProQuest (Hospital Premium Collection) - NHS Version

Available at Emergency radiology - from SpringerLink

Abstract: The purpose of this study is to evaluate the performance of a sequential multi-modality imaging algorithm for diagnosing acute appendicitis in pregnancy. This IRB-approved, HIPAA compliant study included 127 consecutive pregnant patients imaged for suspected appendicitis between October 2007 and May 2012; all patients initially underwent ultrasound (US) examination, followed by magnetic resonance imaging (MRI) if results of US were negative or equivocal. Computerized tomography (CT) was reserved for cases with inconclusive US and MRI results. The EMR was reviewed, recording results of imaging examinations and clinical outcomes. The diagnostic performance of this sequential multi-modality imaging algorithm was calculated with pathology correlation. Two (1.9 %) of the 127 US examinations reported suspected appendicitis; 125 (98.4 %) were inconclusive. Of the 125 patients with inconclusive US examinations, 103 underwent MRI, of which eight (6.2 %) demonstrated findings of acute appendicitis. Of the 103 patients that received MRI, nine (8.7 %) underwent CT. One patient had a CT performed directly after an inconclusive US exam. No additional cases of appendicitis were detected with CT. The sensitivity and specificity of US alone was 12.5 and 99.2 %, respectively; MRI was 100 and 93.6 %; the sequential multi-modality modality algorithm including US, CT, and MRI was 100 and 98.3 %. The diagnostic performance of this sequential multi-modality imaging algorithm for diagnosing acute appendicitis in pregnancy is high. Given the low yield of US, MRI should be considered the first-line imaging test. Although CT was employed in a small fraction of inconclusive MRI examinations, it still has a role in the diagnostic work-up of the pregnant patient with suspected appendicitis.

Database: Medline

**Author(s):** Aggenbach, L; Zeeman, G G; Cantineau, A E P; Gordijn, S J; Hofker, H S

**Source:** International journal of surgery (London, England); Mar 2015; vol. 15; p. 84-89

**Publication Date:** Mar 2015

**Publication Type:** Journal Article

**PubMedID:** 25638737

**Abstract:**

**BACKGROUND**

Acute appendicitis during pregnancy may be associated with serious maternal and/or fetal complications. To date, the optimal clinical approach to the management of pregnant women suspected of having acute appendicitis is subject to debate. The purpose of this retrospective study was to provide recommendations for prospective clinical management of pregnant patients with suspected appendicitis.

**METHOD**

Case records of all pregnant patients suspected of having appendicitis whom underwent appendectomy at our hospital between 1990 and 2010 were reviewed.

**RESULTS**

Appendicitis was histologically verified in fifteen of twenty-one pregnant women, of whom six were diagnosed with perforated appendicitis. Maternal morbidity was seen in two cases. Premature delivery occurred in two out of six cases with perforated appendicitis cases and two out of six cases following a negative appendectomy. Perinatal mortality did not occur.

**CONCLUSION**

Both (perforated) appendicitis and negative appendectomy during pregnancy are associated with a high risk of premature delivery. Clinical presentation and imaging remains vital in deciding whether surgical intervention is indicated. We recommend to cautiously weigh the risks of delay until correct diagnosis with associated increased risk of appendiceal perforation and the risk of unnecessary surgical intervention. Based upon current literature, we recommend clinicians to consider an MRI following an inconclusive or negative abdominal ultrasound aiming to improve diagnostic accuracy to reduce the rate of negative appendectomies. Accurate and prompt diagnosis of acute appendicitis should be strived for to avoid unnecessary exploration and to aim for timely surgical intervention in pregnant women suspected of having appendicitis.

**Database:** Medline
OBJECTIVE The purpose of this study was to estimate the rate and risk of appendix nonvisualization and alternative diagnoses made with magnetic resonance imaging (MRI) for suspected appendicitis in pregnant women.

STUDY DESIGN We performed a retrospective cohort study of consecutive pregnant women who underwent MRI for suspected appendicitis at a single center from 2007-2012. Data on clinical presentation, imaging, and surgical pathologic evidence were extracted from electronic medical records. Odds ratios estimated risk factors for nondiagnosis. Radiologic diagnoses were identified, and rates of diagnoses were calculated. Subgroup analysis was performed among women who underwent initial imaging with ultrasound scanning.

RESULTS Over the 5-year period, 171 pregnant women underwent MRI for suspected appendicitis. The rate of nonvisualization was 30.9% (n = 53). Of the remaining 118 women with a visualized appendix, 18 women had imaging findings that were consistent with appendicitis and underwent appendectomy. Twelve cases of appendicitis were confirmed on pathologic evaluation (66.7%). Women with nonvisualization of the appendix on MRI were more likely to be beyond the first trimester (odds ratio, 2.1; 95% confidence interval, 1.0-4.5). Seventy-four women had disease diagnosed on MRI (43.3%). In the group of 43 women who had a nondiagnostic ultrasound scanning before the MRI, the rate of subsequent diagnostic MRI was 65% (n = 28).

CONCLUSION MRI yields a high diagnostic rate and accuracy in pregnant women with suspected appendicitis and provides alternative diagnoses to guide further management. Given the high rate of appendix nonvisualization on ultrasound scanning that has been reported in the literature, we recommend MRI as the imaging modality of choice for this population in settings in which MRI is readily available.

Database: Medline
52. Appendectomy and pregnancy: Gestational age does not affect the position of the incision

**Author(s):** De Moya M.A.; Sideris A.C.; Cropano C.M.; Choy G.; Chang Y.; Landman W.B.; Cohn S.M.

**Source:** American Surgeon; Mar 2015; vol. 81 (no. 3); p. 282-288

**Publication Date:** Mar 2015

**Publication Type(s):** Article

**PubMedID:** 25760205

**Abstract:** The position of the base of the appendix during advancing gestational age is based on inadequate data. Therefore, the proper location for an appendectomy incision during pregnancy is highly unclear. This study investigated the location of the appendix during pregnancy to determine the optimal location for an incision in pregnant patients with appendicitis relative to McBurney's point. Magnetic resonance images (MRIs) were reviewed independently by two fellowship-trained abdominal MRI radiologists blinded to the imaging report. The distance of the appendix from anatomic landmarks was measured in a total of 114 pregnant women with an abdominal or pelvic MRI who were admitted between 2001 and 2011 at a Level I trauma center. Patients with a history of appendectomy were excluded. The distance from the base of the appendix to McBurney's point changed over the course of the gestation by only 1.2 cm and which did not amount to a clinically or statistically significant change in position. Our data provide evidence that there is minimal upward or lateral displacement of the appendix during pregnancy, and therefore its distance from the McBurney's point remains essentially unchanged. These findings justify the use of the McBurney's incision for appendectomy during pregnancy regardless of the trimester.

**Database:** EMBASE

Author(s): Zingone, Fabiana; Sultan, Alyshah Abdul; Humes, David James; West, Joe

Source: Annals of surgery; Feb 2015; vol. 261 (no. 2); p. 332-337

Publication Date: Feb 2015

Publication Type(s): Research Support, Non-u.s. Gov't Journal Article

PubMedID: 24950289

Abstract:

OBJECTIVE: To determine the absolute and relative risk of acute appendicitis during the antepartum and postpartum periods compared with the time outside pregnancy among women of childbearing age.

BACKGROUND: Acute appendicitis is the most common nonobstetric surgical emergency during pregnancy. Estimates of the incidence of acute appendicitis in pregnancy remain imprecise and inconsistent.

METHODS: All potential fertile women aged 15 to 44 years registered within Clinical Practice Research Datalink with linkages to the Hospital Episodes Statistics between 1997 and 2012 were identified. Absolute rates of acute appendicitis were calculated during the antepartum and postpartum periods and were compared with the time outside pregnancy in terms of incidence rate ratio (IRR) using a Poisson regression model.

RESULTS: Among 1,624,804 women, there were 362,219 pregnancies resulting in live or stillbirths. Compared with the time outside pregnancy, the rate of acute appendicitis was 35% lower during the antepartum period [IRR, 0.65; 95% confidence interval (CI), 0.55-0.76], with the lowest rate reported during the third trimester (IRR, 0.47; 95% CI, 0.35-0.64) for all ages; no increased risk of acute appendicitis was observed in the postpartum period compared with the time outside pregnancy among women aged 15 to 34 years but an 84% increased risk for women older than 35 years (IRR, 1.84; 95% CI, 1.18-2.86). The highest and lowest rates of negative appendectomy were encountered in the second and the third trimesters, respectively.

CONCLUSIONS: Pregnant women are less likely to be diagnosed with acute appendicitis than nonpregnant women, with the lowest risk reported during the third trimester.

Database: Medline

54. Appendicitis during pregnancy with a normal MRI

Author(s): Thompson M.M.; Kudla A.U.; Chisholm C.B.

Source: Western Journal of Emergency Medicine; 2014; vol. 15 (no. 6); p. 652-654

Publication Date: 2014

Publication Type(s): Article

PubMedID: 25247035

Abstract: Abdominal pain frequently represents a diagnostic challenge in the acute setting. In pregnant patients, the gravid abdomen and concern for ionizing radiation exposure further limit evaluation. If undiagnosed, appendicitis may cause disastrous consequences for the mother and fetus. We present the case of a pregnant female who was admitted for right lower quadrant abdominal pain. Advanced imaging of the abdomen and pelvis was interpreted to be either indeterminate or normal and a diagnosis of acute appendicitis was made on purely clinical grounds. This patient's management and a literature review of diagnostic techniques for acute appendicitis during pregnancy are discussed.

Database: EMBASE

Author(s): Walker, Humphrey G M; Al Samaraee, Ahmad; Mills, Sarah J; Kalbassi, M Reza

Source: International journal of surgery (London, England); Nov 2014; vol. 12 (no. 11); p. 1235-1241

Publication Date: Nov 2014

Publication Type(s): Journal Article Review

PubMedID: 25219891

Abstract: UNLABELLED 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.

Database: Medline

56. Management and outcomes of acute appendicitis in pregnancy-population-based study of over 7000 cases.

Author(s): Abbasi, N; Patenaude, V; Abenhaim, H A

Source: BJOG : an international journal of obstetrics and gynaecology; Nov 2014; vol. 121 (no. 12); p. 1509-1514

Publication Date: Nov 2014

Publication Type(s): Research Support, Non-u.s. Gov't Comparative Study Journal Article Evaluation Studies

PubMedID: 24674238

Available at BJOG : an international journal of obstetrics and gynaecology - from Wiley Online Library Science, Technology and Medicine Collection 2017

Abstract: OBJECTIVE To compare outcomes and management practices among pregnant and nonpregnant women with acute appendicitis. DESIGN Population-based matched cohort study. SETTING United States of America. SAMPLE A total of 7114 women with appendicitis among 7,037,386 births. METHODS Logistic regression analyses to calculate the odds ratio (OR) and corresponding 95% confidence intervals (95% CIs) for variables and outcomes of interest. MAIN OUTCOME MEASURES Maternal morbidities associated with appendicitis; management practices for pregnant and age-matched nonpregnant women with appendicitis. RESULTS There was an overall incidence of 101.1 cases of appendicitis per 100,000 births. Appendicitis was diagnosed in 35,570 nonpregnant women during the corresponding time frame. Peritonitis occurred in 20.3% of pregnant women with appendicitis, with an adjusted OR of 1.3 (95% CI 1.2-1.4) when compared with nonpregnant women with appendicitis. In pregnancy, there was an almost two-fold increase in sepsis and septic shock, transfusion, pneumonia, bowel obstruction, postoperative infection and length of stay >3 days. Whereas 5.8% of appendicitis cases among pregnant women were managed conservatively, they were associated with a considerably increased risk of shock, peritonitis and venous thromboembolism as compared to surgically managed cases. CONCLUSIONS Compared with nonpregnant women, pregnant women with acute appendicitis have higher rates of adverse outcomes. Conservative management should be avoided given the serious risk of adverse outcomes in pregnancy.

Database: Medline
57. Evaluation of obstetrical and fetal outcomes in pregnancies complicated by acute appendicitis.

Author(s): Abbasi, Nimrah; Patenaude, Valerie; Abenhaim, Haim A

Source: Archives of gynecology and obstetrics; Oct 2014; vol. 290 (no. 4); p. 661-667

Publication Date: Oct 2014

Publication Type(s): Research Support, Non-u.s. Gov't Journal Article

PubMedID: 24838290

Abstract: PURPOSE: The purpose of our study was to evaluate obstetrical and fetal outcomes in pregnancies complicated by acute appendicitis, and to specifically evaluate the impact of peritonitis.

METHODS: We conducted a population-based cohort study using the Healthcare Cost and Utilization Project-Nationwide Inpatient Sample from 2003 to 2010 to evaluate perinatal outcomes in pregnant patients with appendicitis and delivery in the same admission compared to women delivering without appendicitis. Logistic regression was used to calculate the odds ratio (OR) and corresponding 95% confidence intervals (CIs) for variables and outcomes of interest.

RESULTS: Among seven million maternities, there were 1,203 women with appendicitis who delivered in the same admission. Pregnant women with appendicitis were more likely to deliver preterm OR 2.68 (95% CI 2.31-3.11) and had an increased risk in abruptio. Among the 27% of patients with peritonitis, the rate of preterm birth was fourfold higher, and the caesarean section rate was almost doubled.

CONCLUSIONS: Although rare, appendicitis in pregnancy is associated with adverse maternal outcomes and worsened in cases of peritonitis. Measures to decrease risk of peritonitis should be taken in order to limit associated morbidities.

Database: Medline
58. The impact of pregnancy on the accuracy and delay in diagnosis of acute appendicitis.

Author(s): Hiersch, Liran; Yogev, Yariv; Ashwal, Eran; From, Anat; Ben-Haroush, Avi; Peled, Yoav

Source: The journal of maternal-fetal & neonatal medicine: the official journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstetricians; Sep 2014; vol. 27 (no. 13); p. 1357-1360

Publication Date: Sep 2014
Publication Type(s): Journal Article
PubMedID: 24151869

Abstract: OBJECTIVE To determine the accuracy and the delay in diagnosis of presumed acute appendicitis in pregnancy. METHODS Pregnant women undergoing appendectomy for presumed acute appendicitis were compared to non-pregnant age-matched women in a 3:1 ratio undergoing appendectomy in a tertiary medical center from 2001 to 2012. RESULTS Out of 1618 women who underwent appendectomy during the study period, 81 (4.2%) were pregnant who were compared to 243 age-matched non-pregnant women. There was a significantly shorter interval between admission to the hospital and surgery and shorter surgery length (10.2 versus 15.7 h, 1.2 ± 0.4 versus 1.4 ± 0.5 h, respectively, p < 0.001) in the pregnant group with similar rates of negative appendectomy (19.8% versus 21.8%, respectively, p = 0.86). The positive and negative predictive values of ultrasonography (US) for the diagnosis of acute appendicitis were 88.2% and 100%, and 92.9% and 57.1%, among the pregnant and the non-pregnant group, respectively. In multivariate analysis, early gestational age was found to be independently associated with higher rate of accurate US results (OR = 0.92, 95% CI 0.85-0.99, p = 0.39). CONCLUSION Pregnant women undergoing appendectomy have shorter admission to surgery interval and surgical length with similar negative appendectomy rates compared to non-pregnant women. Ultrasound is an accurate tool for the diagnosis of acute appendicitis during pregnancy, especially during early gestation.

Database: Medline

59. The use of magnetic resonance imaging in the diagnosis of suspected appendicitis in pregnancy: shortened length of stay without increase in hospital charges.

Author(s): Fonseca, Annabelle L; Schuster, Kevin M; Kaplan, Lewis J; Maung, Adrian A; Lui, Felix Y; Davis, Kimberly A

Source: JAMA surgery; Jul 2014; vol. 149 (no. 7); p. 687-693

Publication Date: Jul 2014
Publication Type(s): Journal Article
PubMedID: 24871698

Abstract: IMPORTANCE Making an accurate diagnosis of appendicitis in pregnancy is critical for maternal and fetal outcomes. OBJECTIVE To determine whether magnetic resonance (MR) imaging in pregnant patients with suspected appendicitis improves outcomes, minimizes length of stay (LOS), and lowers hospital charges. DESIGN, SETTING, AND PARTICIPANTS Retrospective review at a university tertiary referral center of all pregnant patients seen with abdominal pain and suspected appendicitis who were followed up through delivery during an 11-year period. MAIN OUTCOMES AND MEASURES Time to operation, LOS, complications, nontherapeutic exploration, fetal outcomes, and hospital charges. RESULTS Seventy-nine patients were included in this study, 34 of whom had pathology-confirmed appendicitis. Thirty-one patients underwent MR imaging. A trend toward fewer operations (odds ratio [OR], 0.45; 95% CI, 0.18-1.16; P = .07) was observed in the MR imaging group. Seven nontherapeutic explorations were performed in the non-MR imaging group and 1 nontherapeutic exploration in the MR imaging group (OR, 0.44; 95% CI, 0.08-2.32; P = .13). Patients
in the MR imaging group were more frequently discharged from the emergency department (OR, 0.35; 95% CI, 0.13-0.94; P = .04) and had shorter LOS (33.7 vs 64.8 hours, P < .001). Gestational age, time to operation, and the presence of perforated appendicitis were similar between groups. No patient discharged without operation returned with appendicitis in either group. On multivariable analysis, the receipt of MR imaging (P < .001) and the absence of operative intervention (P = .001) were associated with shorter LOS. The mean hospital charges were similar in those with vs without appendicitis. One fetal loss occurred in the non-MR imaging group.

CONCLUSIONS AND RELEVANCE Magnetic resonance imaging in pregnant patients with suspected appendicitis does not affect clinical outcomes or hospital charges. It allows safe discharge from the emergency department and improves resource use.

Database: Medline

60. Suspected appendicitis in pregnancy.

Author(s): Flexer, S M; Tabib, N; Peter, M B

Source: The surgeon : journal of the Royal Colleges of Surgeons of Edinburgh and Ireland; Apr 2014; vol. 12 (no. 2); p. 82-86

Publication Date: Apr 2014

Publication Type(s): Journal Article Review

PubMedID: 24429161

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. METHODSA 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. RESULTSThere 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.

Database: Medline
61. Appendectomy during pregnancy—Is pregnancy outcome depending by operation technique?

**Author(s):** Peled, Yoav; Hiersch, Liran; Khalpari, Ortal; Wiznitzer, Arnon; Yogev, Yariv; Pardo, Joseph

**Source:** The journal of maternal-fetal & neonatal medicine : the official journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstetricians; Mar 2014; vol. 27 (no. 4); p. 365-367

**Publication Date:** Mar 2014

**Publication Type(s):** Comparative Study Journal Article Evaluation Studies

**PubMedID:** 23795902

**Abstract:**

OBJECTIVE: To compare perioperative and pregnancy outcome between women undergoing laparoscopic appendectomy and those undergoing open appendectomy during pregnancy for presumed acute appendicitis.

METHODS: A retrospective cohort study of all women undergoing appendectomy during pregnancy in a tertiary referral medical center from 2000 to 2009. Outcome was compared between those undergoing laparoscopic appendectomy and those undergoing open appendectomy.

RESULTS: Overall, 83,510 deliveries occurred during the study period, 85 (0.10%) were eligible for the study group. Of these, 26 (31%) had a laparoscopic appendectomy and 59 (69%) had an open appendectomy. No significant difference was found in the general, delivery and neonatal outcome characteristics between the two groups. There was a significant difference in the mean gestational age at surgery between laparoscopic appendectomy and the open appendectomy groups (14.6 versus 19.3 weeks respectively, p = 0.009). Post-operative complications (fever >38.0 °C or the presence of uterine contractions) rate was higher in the open appendectomy compared to the laparoscopic appendectomy group (25.5% versus 3.8%, respectively, p = 0.009).

CONCLUSION: Laparoscopic appendectomy appears to be a safe procedure for presumed acute appendicitis during pregnancy with less post-operative complications as compared to open appendectomy.

**Database:** Medline

62. Fetomaternal outcome of pregnancies complicated by acute appendicitis

**Author(s):** Lashari A.A.; Bhatti K.; Mahar T.; Hafeez R.

**Source:** Medical Forum Monthly; Mar 2014; vol. 25 (no. 3); p. 71-73

**Publication Date:** Mar 2014

**Publication Type(s):** Article

**Abstract:**

Objective: To observe the frequency and Fetomaternal outcome of pregnancies with acute appendicitis.

Study Design: Prospective / observational study

Place and Duration of Study: This study was conducted in gynecology and surgical department of Ghulam Muhammad Mahar Medical College Teaching Hospital Khairpur Sindh from January 2010 to December 2012.

Materials and Methods: All pregnant ladies admitted in Gynae and surgical department with history of acute pain in abdomen and strong suspicious of acute appendicitis on the basis of history, clinical examination and ultrasound findings after exclusion of other gynecological and surgical causes of acute abdomen during pregnancy were included in the study for following variables: Presentation, duration of symptoms, operative findings and complications associated with disease and operative procedure were noted. Data was collected on pre-designed Performa and analyzed on SPSS version 15.

Results: During 3 year study period total 8700 Obstetric admission and cases with strong suspicious of acute appendicitis in pregnancy was 20 (0.22%), most women belongs to age between 18-40 years. More cases seen 2nd trimester 11(55%), duration of symptoms < 24 hours seen in 85% and >24 hours seen in 15% of cases. Abdominal pain was leading symptom present in 80% of cases while lower abdominal tenderness was leading sign seen in 90%. On surgery signs of acute appendicitis seen in 75%, normal looking appendix in 10%, while perforated appendix with moderate pus in peritoneal
cavity seen in 15% of cases. One maternal death was seen in study population due to septicemia, most probably because of late presentation. Conclusion: The evaluation of a pregnant woman presenting with acute abdominal pain warrants a careful workup due to the possible risks for the fetus and mother if appendix perforates.

Database: EMBASE

63. Cost-effectiveness of preoperative imaging for appendicitis after indeterminate ultrasonography in the second or third trimester of pregnancy.

Author(s): Kastenberg, Zachary J; Hurley, Michael P; Luan, Anna; Vasu-Devan, Vidya; Spain, David A; Owens, Douglas K; Goldhaber-Fiebert, Jeremy D

Source: Obstetrics and gynecology; Oct 2013; vol. 122 (no. 4); p. 821-829

Publication Date: Oct 2013

Publication Type(s): Research Support, N.I.H., Extramural Comparative Study Research Support, U.S. Gov't, Non-p.h.s. Journal Article Research Support, U.S. Gov't, P.h.s.

PubMedID: 24084540

Available at Obstetrics and gynecology - from Ovid (Journals @ Ovid) - Remote Access

Abstract: OBJECTIVE To assess the cost-effectiveness of diagnostic laparoscopy, computed tomography (CT), and magnetic resonance imaging (MRI) after indeterminate ultrasonography in pregnant women with suspected appendicitis. METHODSA decision-analytic model was developed to simulate appendicitis during pregnancy taking into consideration the health outcomes for both the pregnant women and developing fetuses. Strategies included diagnostic laparoscopy, CT, and MRI. Outcomes included positive appendectomy, negative appendectomy, maternal perioperative complications, preterm delivery, fetal loss, childhood cancer, lifetime costs, discounted life expectancy, and incremental cost-effectiveness ratios. RESULTS Magnetic resonance imaging is the most cost-effective strategy, costing $6,767 per quality-adjusted life-year gained relative to CT, well below the generally accepted $50,000 per quality-adjusted life-year threshold. In a setting where MRI is unavailable, CT is cost-effective even when considering the increased risk of radiation-associated childhood cancer ($560 per quality-adjusted life-year gained relative to diagnostic laparoscopy). Unless the negative appendectomy rate is less than 1%, imaging of any type is more cost-effective than proceeding directly to diagnostic laparoscopy. CONCLUSION Depending on imaging costs and resource availability, both CT and MRI are potentially cost-effective. The risk of radiation-associated childhood cancer from CT has little effect on population-level outcomes or cost-effectiveness but is a concern for individual patients. For pregnant women with suspected appendicitis, an extremely high level of clinical diagnostic certainty must be reached before proceeding to operation without preoperative imaging.

Database: Medline
64. Clinical outcomes compared between laparoscopic and open appendectomy in pregnant women.

Author(s): Chung, Jun Chul; Cho, Gyu Seok; Shin, Eung Jin; Kim, Hyung Chul; Song, Ok Pyung

Source: Canadian journal of surgery. Journal canadien de chirurgie; Oct 2013; vol. 56 (no. 5); p. 341-346

Publication Date: Oct 2013

Publication Type(s): Comparative Study Journal Article

PubMedID: 24067519

Abstract: Despite the initial absolute or relative contraindication of laparoscopic surgery during pregnancy, in the last decade, laparoscopic appendectomy (LA) has been performed in pregnant women. But few studies compare the outcomes of LA compared with open appendectomy (OA). We investigated clinical outcomes to evaluate the safety and efficacy of LA compared with OA in pregnant women. We recruited consecutive pregnant patients with a diagnosis of acute appendicitis who were undergoing LA or OA between May 2007 and August 2011 into the study. RESULTSSixty-one patients (22 LA and 39 OA) enrolled in our study. There were no significant differences in duration of surgery, postoperative complication rate and obstetric and fetal outcomes, including incidence of preterm labour, delivery type, gestation age at delivery, birth weight and APGAR scores between the 2 groups. However, the LA group had shorter time to first flatus (2.4 ± 0.4 d v. 4.0 ± 1.7 d, p = 0.034), earlier time to oral intake (2.3 ± 1.6 d v. 4.1 ± 1.9 d, p = 0.023) and shorter postoperative hospital stay (4.2 ± 2.9 d v. 6.9 ± 3.7 d, p = 0.043) than the OA group. CONCLUSION Laparoscopic appendectomy is a clinically safe and effective procedure in all trimesters of pregnancy and should be considered as a standard treatment alternative to OA. Further evaluation including prospective randomized clinical trials comparing LA with OA are needed to confirm our results.

Database: Medline
65. Association between pregnancy and acute appendicitis in South Korea: a population-based, cross-sectional study.

Author(s): Yuk, Jin-Sung; Kim, Yong Jin; Hur, Jun-Young; Shin, Jung-Ho

Source: Journal of the Korean Surgical Society; Aug 2013; vol. 85 (no. 2); p. 75-79

Publication Date: Aug 2013

Publication Type(s): Journal Article

PubMedID: 23908964

Abstract:

PURPOSE To estimate the prevalence of acute appendicitis and the relationship between pregnancy and acute appendicitis among South Korean women in 2009.

METHODS This was a cross-sectional study over 1 year period using a national registry data. We analyzed a national patient sample (n = 1,116,040) from a database compiled by the South Korean National Health Insurance in 2009.

RESULTS We identified 15,974 cases of acute appendicitis from 2009. The prevalence rate of acute appendicitis was 228 ± 2 per 100,000 persons. The prevalence in men was higher than in women. The peak prevalence of the disease in both genders occurred in patients aged 10 to 14 years. After that, prevalence declined with age. The prevalence of acute appendicitis in women aged 20 to 39 years was negatively associated with age and pregnancy (P < 0.001) but was not associated with socioeconomic status. The prevalence of perforated appendicitis cases by age is represented by a U-shaped curve. The prevalence was highest in people less than five years of age and in people older than 60 years.

CONCLUSION We found that the prevalence of acute appendicitis decreased with increasing age after early teens, and that the prevalence of acute appendicitis in pregnant women was lower than in nonpregnant women.

Database: Medline

66. Integrating MR imaging into the clinical workup of pregnant patients suspected of having appendicitis is associated with a lower negative laparotomy rate: single-institution study.

Author(s): Rapp, Elliot J; Naim, Farah; Kadivar, Khadijeh; Davarpanah, Amir; Cornfeld, Daniel

Source: Radiology; Apr 2013; vol. 267 (no. 1); p. 137-144

Publication Date: Apr 2013

Publication Type(s): Journal Article

PubMedID: 23360736

Abstract:

PURPOSE To determine if integrating magnetic resonance (MR) imaging into the workup of right lower quadrant pain in pregnant patients was associated with improved outcomes as measured by the negative laparotomy rate (NLR) and the perforation rate (PR).

METHODS Institutional review board approval was obtained for this retrospective review of medical records. Two hundred sixty-seven pregnant patients who underwent either surgery (n = 82) or an MR imaging examination (n = 217) because of suspicion of appendicitis between January 1, 1996, and August 31, 2011, were identified. Relevant ultrasonographic and MR imaging reports were classified as showing true-positive, false-positive, true-negative, false-negative, or equivocal findings. MR imaging utilization was analyzed to define pre- and post-MR imaging cohorts. NLR and PR were calculated for both cohorts and were compared by using a Fisher exact probability test. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) for MR imaging were calculated.

RESULTS MR imaging was introduced into the clinical workup in 2004. From 1996 to 2003, the NLR for pregnant patients was 55% (17 of 31), and the PR was 21% (three of 14). From 2004 to 2011, the NLR was 29% (15 of 51), and the PR was 26% (nine of 35). The 47% decline in the NLR
(55%-29%)/55%) was statistically significant (P = .02). The change in PR was not significant (P > .99). The sensitivity, specificity, PPV, and NPV of MR imaging in the diagnosis of appendicitis were 89% (17 of 19), 97% (187 of 193), 74% (17 of 23), and 99% (187 of 189), respectively.

CONCLUSION The routine incorporation of MR imaging into the clinical workup for suspicion of appendicitis in pregnant patients at this institution was associated with a decrease in the NLR of 47% without a significant change in the PR.

SUPPLEMENTAL MATERIAL

Database: Medline

67. MRI evaluation of acute appendicitis in pregnancy.

Author(s): Dewhurst, Catherine; Beddy, Peter; Pedrosa, Ivan

Source: Journal of magnetic resonance imaging: JMRI; Mar 2013; vol. 37 (no. 3); p. 566-575

Publication Date: Mar 2013

Publication Type(s): Journal Article Review

PubMedID: 23423797

Available at Journal of magnetic resonance imaging: JMRI - from Wiley Online Library Science, Technology and Medicine Collection 2017

Abstract: In recent years, magnetic resonance imaging (MRI) has become a valuable diagnostic tool for evaluation of acute abdominal pain in pregnancy. MRI offers an opportunity to identify the normal or inflamed appendix as well as a variety of other pathologic conditions that can masquerade clinically as acute appendicitis in pregnant women. Visualization of the normal appendix by MRI virtually excludes the diagnosis of acute appendicitis and may help reduce the negative laparotomy rate in this patient population. Here we discuss a comprehensive MRI protocol for evaluation of pregnant women with abdominal pain, focusing on the appearance and location of the normal and diseased appendix, and we describe an approach to diagnosing acute appendicitis and other conditions with MRI.

Database: Medline
68. Management of acute appendicitis in pregnancy.

**Author(s):** Kapan, Selin; Bozkurt, Mehmet Abdussamet; Turhan, Ahmet Nuray; Gönenç, Murat; Alış, Halil

**Source:** Ulusal travma ve acil cerrahi dergisi = Turkish journal of trauma & emergency surgery : TJTES; Jan 2013; vol. 19 (no. 1); p. 20-24

**Publication Date:** Jan 2013

**Publication Type(s):** Journal Article

**PubMedID:** 23588974

**Abstract:** BACKGROUND Acute appendicitis is the most common surgical non-obstetric pathology during pregnancy. In this report, pregnant patients operated with a diagnosis of acute appendicitis in the last three years are evaluated retrospectively. METHODS Between January 2009 and January 2011, 20 pregnant patients were operated for acute appendicitis. Patients were evaluated regarding age, gestational age, clinical and laboratory examinations, imaging studies, operative findings, mean hospital stay, mean operative time, and outcome. RESULTS In 17 of 20 patients, acute appendicitis was confirmed and appendectomy was performed. Ten of the patients were operated with laparoscopic technique and the remaining 10 had open appendectomy. There was no fetal or maternal morbidity or mortality in any patient. All 20 patients delivered healthy babies during the postoperative course. CONCLUSION Acute appendicitis is a challenging diagnosis in the pregnant patient; however, early surgical intervention should be performed with any suspicion. The type of surgery depends on the surgeon’s preference and experience.

**Database:** Medline

69. Appendicitis during pregnancy. A two-year experience and comparison with general population

**Author(s):** Kontopodis N.; Kouraki A.T.; Miliadis O.; Volakakis J.; Psarakis F.; Spiridakis K.

**Source:** Chirurgia (Turin); Dec 2012; vol. 25 (no. 6); p. 401-405

**Publication Date:** Dec 2012

**Publication Type(s):** Article

**Abstract:** Aim. Acute appendicitis is the most common non-obstetric cause of acute abdominal pain in pregnant patients. Physiologic changes during pregnancy may alter clinical presentation and obscure diagnosis. Delayed diagnosis and treatment leads to increased rates of maternal and fetal mortality. We reviewed the appendicities during pregnancy we came along during a two years period. The aim of our study was to compare parameters such as clinical presentation, pathological findings and surgical results in terms of total hospital stay and time until definite trauma closure to those of general population. Methods. During two years time, from September 2009 to August 2011, we managed 88 patients suffering from appendicitis in our department. 5 of these patients were pregnant. After the diagnosis was established by clinical examination, laboratory findings and imaging techniques, all patients underwent appendectomy. Results. Clinical presentation of appendicitis was found to be different during pregnancy. Although abdominal pain was present in all pregnant and non pregnant patients nausea and vomiting were much more common during pregnancy while anorexia that is found almost universally in general population was present only in 40% during pregnancy. Right upper quadrant tenderness and minimal peritoneal irritation were common in pregnant patients. Higher rates of perforation occur during pregnancy. Longer times of hospitalization were required in pregnant patients compared to general population (9.6 days vs. 6.15 days) as well as time until definite trauma closure (14 days vs. 12.1 days). Conclusion. Early diagnosis of acute appendicitis is essential to avoid perforation that leads to increased hospital stay, delayed trauma closure and complications such as maternal and fetal mortality.
70. Systematic review and meta-analysis of safety of laparoscopic versus open appendicectomy for suspected appendicitis in pregnancy.

Author(s): Wilasrusmee, C; Sukrat, B; McEvoy, M; Attia, J; Thakkinstian, A

Source: The British journal of surgery; Nov 2012; vol. 99 (no. 11); p. 1470-1478

Publication Date: Nov 2012

Publication Type(s): Meta-analysis Comparative Study Journal Article Review

PubMedID: 23001791

Available at The British journal of surgery - from Wiley Online Library Science, Technology and Medicine Collection 2017

Abstract: BACKGROUND Laparoscopic appendicectomy has gained wide acceptance as an alternative to open appendicectomy during pregnancy. However, data regarding the safety and optimal surgical approach to appendicitis in pregnancy are still controversial. METHOD This was a systematic review and meta-analysis of studies comparing laparoscopic and open appendicectomy in pregnancy identified using PubMed and Scopus search engines from January 1990 to July 2011. Two reviewers independently extracted data on fetal loss, preterm delivery, wound infection, duration of operation, hospital stay, Apgar score and birth weight between laparoscopic and open appendicectomy groups. RESULTSEleven studies with a total of 3415 women (599 in laparoscopic and 2816 in open group) were included in the analysis. Fetal loss was statistically significantly worse in those who underwent laparoscopy compared with open appendicectomy; the pooled relative risk (RR) was 1·91 (95% confidence interval (c.i.) 1·31 to 2·77) without heterogeneity. The pooled RR for preterm labour was 1·44 (0·68 to 3·06), but this risk was not statistically significant. The mean difference in length of hospital stay was -0·49 (-1·76 to -0·78) days, but this was not clinically significant. No significant difference was found for wound infection, birth weight, duration of operation or Apgar score. CONCLUSION The available low-grade evidence suggests that laparoscopic appendicectomy in pregnant women might be associated with a greater risk of fetal loss.

Database: Medline
71. Appendicitis in pregnancy

**Author(s):** Windrim C.M.; Czik M.J.

**Source:** Fetal and Maternal Medicine Review; Nov 2012; vol. 23 (no. 3); p. 276-295

**Publication Date:** Nov 2012

**Publication Type(s):** Article

Available at Fetal and Maternal Medicine Review - from ProQuest (Hospital Premium Collection) - NHS Version

**Abstract:** Acute appendicitis is the most common non-obstetric indication for surgical intervention in pregnancy, complicating 1/500 to 1/2000 deliveries. Due to the anatomical and physiological changes associated with pregnancy, appendicitis may present a diagnostic dilemma, leading to management delays and thus increasing the risk of appendiceal perforation. Many of the common presenting symptoms of appendicitis are common features of normal pregnancy including lower abdominal pain, nausea, vomiting and leukocytosis. Furthermore, the enlarging gravid uterus may displace the appendix to varying degrees thus altering the classic symptom pattern of appendicitis. The often nonspecific presentation in pregnancy may necessitate the utilization of diagnostic imaging to aid in accurate diagnosis. However, the perforated appendix is the most common surgical cause of fetal loss and the time required for any diagnostic aid must be weighed against the increasing risk of perforation caused by delay in surgical intervention. © Cambridge University Press 2012.

**Database:** EMBASE


**Author(s):** Miloudi, N; Brahem, M; Ben Abid, S; Mzoughi, Z; Arfa, N; Tahar Khalfallah, M

**Source:** Journal of visceral surgery; Aug 2012; vol. 149 (no. 4); p. e275

**Publication Date:** Aug 2012

**Publication Type(s):** Journal Article Evaluation Studies

**PubMedID:** 22748895

**Abstract:** INTRODUCTION Acute appendicitis is the most frequent surgical emergency arising during pregnancy. Definitive diagnosis is often difficult. The therapeutic options remain the same, i.e. appendectomy. PATIENTS AND METHODS We present a series of 29 pregnant women who underwent surgery for acute appendicitis over a period of 10 years. The mean age was 28.6 years. Mean gravidity was 1.75 and mean parity was 0.84. The average period of gestation was 18 weeks and 5 days since the last menses. Seven patients underwent surgery during the 1st trimester, 15 during the 2nd trimester, and 7 during the 3rd trimester. Eighteen patients underwent appendectomy through a laparoscopic approach and 11 through a McBurney incision. RESULTS The postoperative course was uncomplicated in 27 patients. Two patients miscarried in the week following surgery. CONCLUSIONS Acute appendicitis puts both maternal and fetal prognosis at risk. Management should be prompt and undertaken by a multidisciplinary team approach. Morbidity and mortality are not negligible.

**Database:** Medline
73. Utility of ultrasound for evaluating the appendix during the second and third trimester of pregnancy.

Author(s): Lehnert, Bruce E; Gross, Joel A; Linnau, Ken F; Moshiri, Mariam

Source: Emergency radiology; Aug 2012; vol. 19 (no. 4); p. 293-299

Publication Date: Aug 2012

Publication Type(s): Journal Article

PubMedID: 22370694

Available at Emergency radiology - from EBSCO (CINAHL Plus with Full Text)

Available at Emergency radiology - from ProQuest (Hospital Premium Collection) - NHS Version

Available at Emergency radiology - from SpringerLink

Abstract: This study aims to retrospectively evaluate the right lower quadrant ultrasounds in women presenting during the second or third trimester of pregnancy for the frequency of appendix visualization and accuracy in diagnosing appendicitis. Institutional Review Board approval was obtained for this Health Insurance Portability and Accountability Act-compliant study. We reviewed imaging records from 99 consecutive pregnant women from 2001 to 2011 who presented during the second (≥14 weeks gestation) or third trimester for right lower quadrant ultrasound to evaluate the appendix. Visualization of the appendix as well as the size and compressibility, if identified, were recorded. The medical records and labs related to the initial patient presentation, subsequent management, and follow-up were reviewed for surgical and clinical outcomes. Pathology records were reviewed to determine if appendicitis was present when appendectomy was performed. Patients who underwent appendectomy were considered to have appendicitis based on pathology results, and patients managed non-operatively with symptom improvement and those with a normal appendix at pathology were considered to not have appendicitis. During the study period, 99 women meeting inclusion criteria presented to our institution for right lower quadrant ultrasound to evaluate the appendix during the second or third trimester of pregnancy. The mean gestational age at presentation was 23 weeks (±7 weeks). The mean maternal age was 28 years (±6.6 years). The appendix was not visualized in 97% (96/99) of right lower quadrant ultrasound examinations. Of the three studies in which the appendix was visualized, two were considered positive for appendicitis and one was considered negative. Eight patients in this group ultimately underwent appendectomy, including the two patients with positive right lower quadrant ultrasounds, and appendicitis confirmed at pathology in seven of these cases (87.5%). Right lower quadrant ultrasound successfully demonstrated an abnormal appendix in 28.7% (two of seven) of surgically confirmed cases; however, this technique did not detect appendicitis in 71% (five of seven) of patients with surgically proven disease due to nonvisualization of the appendix. Retrospective review of right lower quadrant ultrasounds performed during the second and third trimester of pregnancy suggests that this modality has limited utility for diagnosing appendicitis due to infrequent visualization of the appendix.

Database: Medline
74. Appendectomy during pregnancy. A comparison of laparoscopic with open appendicectomy in respect of safety and morbidity to mother and fetus

**Author(s):** Khan A.M.; Dalwani A.G.; Memon M.; Shaikh U.

**Source:** Medical Forum Monthly; Jul 2012; vol. 23 (no. 7); p. 51-55

**Publication Date:** Jul 2012

**Publication Type(s):** Article

**Abstract:**
Introduction: Acute appendicitis is the most frequent non-obstetric emergency that requires surgery for the period of pregnancy. The aim of the study was to assess Laparoscopic versus Open method of appendicectomy in pregnant patients in respect of benefits and hazards to patients and fetus. Study Design: Comparative Study. Place and Duration of Study: This study was conducted at Alrass General Hospital Saudi Arabia from 1st March 2008 to 1st June 2010. Materials and Methods: Pregnant women having acute appendicitis admitted in Alrass General Hospital Saudi Arabia and underwent open or laparoscopic appendicectomy were studied. Results: A total of 118 pregnant women were operated for acute appendicitis. 66 (55.9%, n=118) patients underwent open and 52 (44.1%, n=118) patients underwent Laparoscopic appendicectomy. Mean age +/- SD (range) of patients 23.45 +/- 4.5 years (18-38) in OA (open appendicectomy) group and 22.00 +/- 2.94 years (17-37) in LA (Laparoscopic appendicectomy) group. Mean gestational age was 16.51 +/- 4.17 weeks (11-26) in OA and 18.28 +/- 4.61 weeks (10-27) in LA group. There were no fetal loss in any group. Pre-term delivery occurred in 6 (9.1%) patients in OA and in 4 (3.7%) patients of LA group. Conclusion: In laparoscopic surgery there is no increased risk to mother and fetus as compared to open surgery.

**Database:** EMBASE

75. Appendicitis during Pregnancy: The Clinical Experience of a Secondary Hospital.

**Author(s):** Jung, Soo Jung; Lee, Do Kyung; Kim, Jun Hyun; Kong, Pil Sung; Kim, Kyung Ha; Bae, Sung Woo

**Source:** Journal of the Korean Society of Coloproctology; Jun 2012; vol. 28 (no. 3); p. 152-159

**Publication Date:** Jun 2012

**Publication Type(s):** Journal Article

**PubMedID:** 22816059

Available at [Journal of the Korean Society of Coloproctology](http://www.ncbi.nlm.nih.gov/pubmed/22816059) - from Europe PubMed Central - Open Access

**Abstract:**
PURPOSE: Appendicitis is the most common condition leading to an intra-abdominal operation for a non-obstetric problem in pregnancy. The aim of this study was to examine our experience and to analyze the clinical characteristics and the pregnancy outcomes for appendicitis during pregnancy that was reported in Korea. METHODS: We reported 25 cases of appendicitis during pregnancy that were treated at Good Moonhwa Hospital from January 2004 to March 2010. We also analyzed appendicitis during pregnancy reported in Korea between 1970 and 2008 by a review of journals. RESULTS: The incidence of acute appendicitis during pregnancy was one per 568 deliveries. The mean age was 27.92 years old, the gestational stage at the onset of symptoms was the first trimester in 10 patients (40%), the second trimester in 14 patients (56%), and the third trimester in 1 patient (4%). Among the 25 cases, 21 were treated with an open appendectomy and 4 with laparoscopic appendectomies. The postoperative complications were 2 wound infections and 1 spontaneous abortion. CONCLUSION: Our experience demonstrated that appendectomies on pregnant patients can be successfully performed at secondary hospitals.

**Database:** Medline
Acute appendicitis and adverse pregnancy outcomes: a nationwide population-based study.

Author(s): Wei, Po-Li; Keller, Joseph J; Liang, Hung-Hua; Lin, Herng-Ching

Source: Journal of gastrointestinal surgery: official journal of the Society for Surgery of the Alimentary Tract; Jun 2012; vol. 16 (no. 6); p. 1204-1211

Publication Date: Jun 2012

Publication Type(s): Research Support, Non-u.s. Gov't Comparative Study Journal Article

PubMedID: 22402956

Available at Journal of gastrointestinal surgery: official journal of the Society for Surgery of the Alimentary Tract - from ProQuest (Hospital Premium Collection) - NHS Version

Available at Journal of gastrointestinal surgery: official journal of the Society for Surgery of the Alimentary Tract - from SpringerLink

Abstract: BACKGROUND/OBJECTIVE Acute appendicitis is the most common non-obstetric surgical procedure in pregnant women. Using two large-scale nationwide population-based datasets, this study aimed to assess the risk of adverse pregnancy outcomes between mothers with and without appendicitis in Taiwan. METHOD This study used two nationwide population-based datasets: the Taiwan National Health Insurance Research Dataset and the Taiwan national birth certificate registry. This study included 908 women who had live singleton births and who had been hospitalized with a diagnosis of acute appendicitis, and another randomly selected 4,540 women as a comparison group. Conditional logistic regression analyses were performed to calculate the risk of adverse pregnancy outcomes including low birth weight (LBW), preterm birth, small for gestational age (SGA), cesarean section (CS), congenital anomalies, Apgar scores at 5 min (<7), and pre-eclampsia/eclampsia. RESULTS The adjusted odds ratios for LBW, preterm birth, SGA, CS, and congenital anomalies in women with acute appendicitis were 1.82 (95 % CI = 1.43-2.30), 1.59 (95 % CI = 1.25-2.02), 1.33 (95 % CI = 1.12-1.60), 1.24 (95 % CI = 1.07-1.44), and 2.07 (95 % CI = 1.07-4.03), respectively, compared with women without acute appendicitis after adjusting for highest maternal educational level, marital status, geographic region, gestational diabetes, gestational hypertension, coronary heart disease, anemia, hyperlipidemia, obesity, and alcohol abuse/alcohol dependence syndrome, infant sex and parity, and paternal age. CONCLUSION There were increased risks for having LBW, preterm infants, SGA, congenital anomalies, and for experiencing CS among women with acute appendicitis than comparison women.

Database: Medline
77. Laparoscopic appendectomy in pregnant women: experience in Chittagong, Bangladesh.

**Author(s):** Hannan, Md Jafrul; Hoque, Md Mozammel; Begum, Lutfun Naher

**Source:** World journal of surgery; Apr 2012; vol. 36 (no. 4); p. 767-770

**Publication Date:** Apr 2012

**Publication Type(s):** Journal Article

**PubMedID:** 22311138

Available at [World journal of surgery](https://www.worldjournal.com) from ProQuest (Hospital Premium Collection) - NHS Version

Available at [World journal of surgery](https://www.worldjournal.com) from SpringerLink

**Abstract:**

**BACKGROUND:** Surgery may be needed during pregnancy for nonobstetric reasons, most commonly appendicitis, and laparoscopy is considered as safe as the open method, for both mother and fetus. The aim of the present study was to emphasize the feasibility of laparoscopic appendectomy during pregnancy in a developing country, and also to report the first study of its kind from Bangladesh.

**MATERIALS AND METHODS:** From 7 October 2005 to 6 October 2010, 31 pregnant women were diagnosed with acute appendicitis. Diagnoses were based on clinical suspicion supported by ultrasonogram. Under general endotracheal anesthesia, laparoscopy was done in all 31 cases. One gynecologist was always present to monitor the conditions of the fetus preoperatively and postoperatively. Feeding was allowed 6 h after surgery, and the majority of the patients were discharged on the second postoperative day. Age, gestational period, operative time, hospital stay, maternal and fetal outcome, and complications were evaluated.

**RESULTS:** Age ranged from 19 to 35 years and gestational period ranged from 6 to 31 weeks. Right lower quadrant pain was the presenting complaint in majority of cases. Average operative time was $34 \pm 10.19$ min, and there were no conversions to open surgery. There were no intraoperative or immediate postoperative hazards. Postoperative recovery was uneventful in all cases. Histopathology of 30 cases confirmed appendicitis. One patient, whose fetus was at 12 weeks gestation at the time of the appendectomy had a spontaneous abortion 1 month later. There were no adverse outcomes during the follow-up period.

**CONCLUSION:** Laparoscopy is a safe and effective technique for the treatment of appendicitis during pregnancy and can be performed in a developing country.

**Database:** Medline
78. Safety and clinical efficacy of laparoscopic appendectomy for pregnant women with acute appendicitis.

**Author(s):** Eom, Jeong Min; Hong, Jin Hwa; Jeon, Seung Wook; Choi, Joong Sub; Lee, Jung Hun; Kim, Hyung Ook; Kim, Hungdai; Choi, Pil Cho; Han, Sang Kuk

**Source:** Annals of the Academy of Medicine, Singapore; Feb 2012; vol. 41 (no. 2); p. 82-86

**Publication Date:** Feb 2012

**Publication Type(s):** Journal Article

**PubMedID:** 22498855

**Abstract:**
INTRODUCTION The aim of this study was to investigate the clinical efficacy and safety of laparoscopic appendectomy (LA) during pregnancy by comparing the operative and obstetric outcomes of patients who during pregnancy underwent LA performed by an expert gynaecologic laparoscopist (LA group) with those patients who underwent an open appendectomy (OA) by a general surgeon (OA group).

MATERIALS AND METHODS In this retrospective study, we evaluated all patients consecutively who had undergone appendectomy for acute appendicitis during pregnancy from January 2000 to December 2010. Twenty-eight patients underwent OA and 15 were treated by LA. We reviewed the clinical charts and analysed the data for each patient’s age, parity, body mass index, gestational age at appendectomy, type of appendectomy, operating time, haemoglobin change, hospital stay, histopathological results, postoperative analgesics, complications, and obstetric outcomes.

RESULTS There were no significant differences between the OA and LA groups in terms of clinical characteristics, hospital stay, haemoglobin change, return of bowel activity, complication rates, gestational age at delivery, and birth weight. However, there were significantly shorter operating time and less usage of postoperative analgesics in LA group.

CONCLUSION LA performed by an expert gynaecologist can be a safe and effective method for treating acute appendicitis during the first and second trimester of pregnancy.

**Database:** Medline


**Author(s):** Ito, Kaori; Ito, Hiromichi; Whang, Edward E; Tavakkolizadeh, Ali

**Source:** American journal of surgery; Feb 2012; vol. 203 (no. 2); p. 145-150

**Publication Date:** Feb 2012

**Publication Type(s):** Journal Article

**PubMedID:** 21784406

Available at [American journal of surgery](https://www.proquest.com) from ProQuest (Hospital Premium Collection) - NHS Version

**Abstract:**
BACKGROUND In pregnant women, a high negative appendectomy (NA) rate often is reported; however, the outcome of pregnancy after a NA is not well studied.

METHODS Among 1,696 consecutive patients (728 men and 968 women) who underwent an appendectomy at our institution (1996-2005), 87 pregnant women were identified. Postoperative surgical and obstetric outcomes were analyzed based on the final pathologic report of the appendix (normal appendix, inflamed, or perforated).

RESULTS The NA rate was significantly higher in pregnant women compared with nonpregnant women (36% vs 14%; P < .05). The fetal demise rate was similar between the NA group and the inflamed group (3% vs 2%; P = NS), and highest (14%) in the perforated group, although this difference did not reach statistical significance (P = .3). Wound infections were most frequent in the perforated group (P < .05).

CONCLUSIONS NA during pregnancy is not free of risk to the fetus. We recommend careful assessment to avoid unnecessary exploration when appendicitis is suspected in pregnant women.
**80. Suspicion of acute appendicitis in the third trimester of pregnancy: pros and cons of a laparoscopic procedure.**

**Author(s):** Donkervoort, S C; Boerma, D

**Source:** JSLS : Journal of the Society of Laparoendoscopic Surgeons; 2011; vol. 15 (no. 3); p. 379-383

**Publication Date:** 2011

**Publication Type(s):** Case Reports Journal Article

**PubMedID:** 21985728

Available at JSLS : Journal of the Society of Laparoendoscopic Surgeons - from Europe PubMed Central - Open Access

**Abstract:** The presentation of acute appendicitis during pregnancy may cause diagnostic and therapeutic difficulty. Delay in diagnosis may lead to increased maternal and fetal risk. Therefore, an aggressive surgical approach is mandatory, even though this may result in an increased number of appendectomies for normal appendices. Diagnostic laparoscopy, followed by laparoscopic appendectomy in case of inflammation, seems a logical strategy. We present the case of a 36-week pregnant woman who presented with suspicion of acute appendicitis. The pro and cons of a laparoscopic approach in the third trimester of pregnancy are discussed as is its safety by reviewing the literature.

**Database:** Medline

---

**81. Appendectomy during pregnancy: follow-up of progeny.**

**Author(s):** Choi, Jacqueline J; Mustafa, Rose; Lynn, Elizabeth T; Divino, Celia M

**Source:** Journal of the American College of Surgeons; Nov 2011; vol. 213 (no. 5); p. 627-632

**Publication Date:** Nov 2011

**Publication Type(s):** Journal Article

**PubMedID:** 21856183

**Abstract:** BACKGROUND The incidence of appendicitis in pregnant patients is 0.04% to 0.20%, making it the most common nonobstetric surgical procedure in pregnancy. This study examines whether an appendectomy during any stage of pregnancy affects future development of motor, sensory, and social skills of the progeny. STUDY DESIGN A prospective survey was administered to women who underwent an appendectomy during pregnancy at Mount Sinai Hospital from 2000 to 2009. The survey, which ranged from 1 to 9 years postpartum, consisted of questions about motor, sensory, and social development of their progeny, based on established pediatric milestones. Data were collected from the medical records of mother and child. Additional follow-up was gathered from outpatient and emergency room records. RESULTS Fifty-two pregnant patients underwent an appendectomy during our study period. All pregnancies continued to full term with the exception of one fetal death due to extreme prematurity. Twenty-nine patients completed the follow-up survey, making the yield response rate 55.8%. There were 7 (26.9%), 14 (48.3%), and 8 (27.6%) appendectomies in the first, second, and third trimesters, respectively. Mean follow-up time was 47.2 months (range 13 to 117 months) after delivery. None of the children exhibited any developmental delay by their third year of life. Timing of the surgery (trimester) had no effect on child development. CONCLUSIONS Appendectomy during pregnancy is not associated with developmental delays in children, regardless of which trimester the procedure was performed. All children in this study had normal motor, sensory, and social development by 3 years of age.
82. The value of 3D T1-weighted gradient-echo MR imaging for evaluation of the appendix during pregnancy: preliminary results.

**Author(s):** Jang, Kyung Mi; Kim, Seong Hyun; Choi, Dongil; Lee, Soon Jin; Rhim, Hyunchul; Park, Min Jung

**Source:** Acta radiologica (Stockholm, Sweden : 1987); Oct 2011; vol. 52 (no. 8); p. 825-828

**Publication Date:** Oct 2011

**Publication Type(s):** Journal Article

**PubMedID:** 21835887

**Abstract:** BACKGROUND The use of oral contrast has been essential for the identification of a normal appendix on MR imaging during pregnancy. However, stool could be used as a positive oral contrast as it is characterized by a relatively high signal on T1-weighted imaging, and 3D T1-weighted gradient-echo (T1W-GRE) MR imaging has been used to evaluate 3 mm diameter intestines in fetuses. PURPOSE To evaluate the added value of 3D T1W-GRE MR imaging in combination with T2-weighted imaging (T2WI) compared to T2WI alone for evaluating the appendix during pregnancy. MATERIAL AND METHODSEighteen consecutive pregnant patients who were clinically suspected of having acute appendicitis underwent appendix MR imaging which included T2WI with or without spectral presaturation attenuated inversion-recovery (SPAIR) fat suppression, and 3D T1W-GRE with SPAIR fat suppression. Two radiologists reviewed the two image sets (the T2WI set and the combined set of T2WI and 3D T1W-GRE images). Pathologic and clinical results served as the reference standard. The differences in the degree of visibility of the appendix and confidence scale for diagnosing acute appendicitis between two image sets were compared by using the paired Wilcoxon signed rank test. RESULTS For both reviewers, the degree of visibility of the appendix using the combined T2WI and 3D T1W-GRE images was significantly higher than using T2WI alone (P < 0.01), and the confidence levels for acute appendicitis using combined T2WI and 3D T1W-GRE images were significantly different from those using T2WI alone (P < 0.01). In the 13 patients with a normal appendix, both reviewers showed improved confidence levels for appendicitis using combined T2WI and 3D T1W-GRE images than T2WI alone. CONCLUSION Adding 3D T1W-GRE images to T2WI is helpful for identification of the appendix, as compared to T2WI alone in pregnant women without ingestion of oral contrast material. This may improve diagnostic confidence for acute appendicitis in pregnant patients.
83. Safety and outcome of general surgical open and laparoscopic procedures during pregnancy

Author(s): De Bakker J.K.; Donkervoort S.C.; Dijksman L.M.

Source: Surgical Endoscopy; May 2011; vol. 25 (no. 5); p. 1574-1578

Publication Date: May 2011

Publication Type(s): Article

PubMedID: 21052721

Abstract: Background: Surgical procedures during pregnancy carry the risk of adverse fetal outcome. We analyzed outcomes of open and laparoscopic approaches in patients treated for symptomatic cholelithiasis and suspected appendicitis. We reviewed the literature for evidence on the safety of both procedures. Methods: We retrospectively reviewed the data of all patients who underwent surgery for symptomatic cholelithiasis and suspicion of appendicitis during pregnancy between January 2004 and March 2009. Fetal loss, preterm delivery, maternal outcome, and surgical complications were assessed. Results: Twenty patients were operated on during pregnancy: 5 of 652 (0.8%) patients with symptomatic cholelithiasis and 15 (4.5%) of 331 for suspected appendicitis. All cholecystectomies were performed by laparoscopic procedure; no premature deliveries or fetal death occurred. In patients with suspicion of appendicitis, three appendices sana were diagnosed laparoscopically, and nine laparoscopic appendectomies and three open appendectomies were performed. The outcome was two preterm deliveries and one fetal death. Conclusion: Reviewing our results and the available literature, we believe that the outcome of surgery during pregnancy is not dictated by the type of procedure but by the type of disease. The gain for fetal outcome in the future most likely lies in the diagnostic pathway rather than the type of surgery. © 2010 Springer Science+Business Media, LLC.

Database: EMBASE
84. MR imaging in cases of antenatal suspected appendicitis—a meta-analysis.

**Author(s):** Blumenfeld, Yair J; Wong, Amy E; Jafari, Anahita; Barth, Richard A; El-Sayed, Yasser Y

**Source:** The journal of maternal-fetal & neonatal medicine : the official journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstetricians; Mar 2011; vol. 24 (no. 3); p. 485-488

**Publication Date:** Mar 2011

**Publication Type(s):** Meta-analysis Comparative Study Journal Article

**PubMedID:** 20695758

**Abstract:**

**Objective:** Appendicitis is the most common surgical emergency in pregnancy. Acute appendicitis is often difficult to diagnose clinically, and concerns regarding antenatal CT imaging limit its use resulting in high false negative rates at laparotomy. MRI has recently been reported as a reasonable alternative to CT imaging in cases of suspected appendicitis. Our objective was to perform a meta-analysis of recently published data regarding the utility of MR imaging in cases of antenatal suspected acute appendicitis.

**Methods:** We searched the PubMed database using keywords 'MRI', 'appendicitis', and 'pregnancy'. Five case series describing the role of MRI in cases of antenatal appendicitis were included. The sensitivity, specificity, positive, and negative predictive values were calculated.

**Results:** Two hundred twenty-nine patients were included in the study. In the first analysis in which non-diagnostic scans were excluded, the sensitivity, specificity, positive and negative predictive values of MRI for diagnosing appendicitis were 95.0%, 99.9%, 90.4%, and 99.5%, respectively. In the second analysis, which included non-diagnostic scans, the sensitivity, specificity, positive and negative predictive values were 90.5%, 98.6%, 86.3%, and 99.0%, respectively.

**Conclusion:** MR imaging may be useful in cases of suspected antenatal appendicitis. Data are still limited and larger prospective studies are necessary to confirm this finding.

**Database:** Medline

---

85. Suspected appendicitis during pregnancy: Prevalence and management

**Author(s):** Dahamsheh H.S.

**Source:** Gynaecologia et Perinatologia, Supplement; Mar 2011; vol. 20 (no. 1); p. 16-20

**Publication Date:** Mar 2011

**Publication Type(s):** Article

**Abstract:**

**Objective.** An evaluation of the clinical picture, diagnostic procedures and outcome of appendicitis in pregnant women. Method. Retrospective analytic study of 28 appendectomies performed during pregnancy for suspected appendicitis in our hospital at period April 2004 to September 2006. All files and medical records of these patients were analyzed and studied. The including variables (demographic, clinical, laboratory and surgical outcomes data) were collected retrospectively. The number of correct and wrong diagnosis were reported and comparison of perinatal outcome, maternal morbidity and different variables in negative and positive laparotomy performed. Results. The prevalence of suspected appendicitis in pregnancy is 0.29%. Incidence of negative laparotomies was 36%. The most correct diagnostic findings for acute appendicitis were history of periumbilical pain, anorexia and iliac fossa findings. Delayed surgical intervention significantly increased maternal morbidity (p=0.003), rate of premature labor (p=0.031) and rate of abortion but not significantly (p=0.28). Conclusion. The prevalence of suspected appendicitis during pregnancy in our environment during this period was higher than the reported incidence; the rate of wrong diagnosis is still high. Good clinical assessment with adjunct ultrasonic examination could reduce the incidence of negative laparotomies and prevent late complications. Delay in operation is leading to higher rate of maternal morbidity and adversely affect the obstetric outcome.
86. Laparoscopic appendectomy is a safe and beneficial procedure in pregnant women.

Author(s): Jeong, Jun-So; Ryu, Dong Hee; Yun, Hyo Yung; Jeong, Eun-Hwan; Choi, Jeo-Woon; Jang, Lee-Chan

Source: Surgical laparoscopy, endoscopy & percutaneous techniques; Feb 2011; vol. 21 (no. 1); p. 24-27

Publication Date: Feb 2011

Publication Type(s): Research Support, Non-u.s. Gov't Journal Article

PubMedID: 21304384

Available at Surgical laparoscopy, endoscopy & percutaneous techniques - from Ovid (LWW Total Access Collection 2015 - Q1 with Neurology)

Abstract: BACKGROUND Appendectomy is the most common nongynecologic surgery performed during pregnancy. Pregnancy is no longer considered an absolute contraindication for laparoscopic procedures. Laparoscopic appendectomy (LA) is a safe, effective, and beneficial procedure for the treatment of acute appendicitis. However, limited data are available regarding the safety and feasibility of LA during pregnancy. METHODS Between May 2005 and May 2009, 20 patients with clinically suspected appendicitis in pregnancy underwent LA at Chungbuk National University Hospital. Clinical data collected retrospectively included demographic information. We compared maternal age, gestational age, operation time, anesthetic time, surgical complications, length of hospitalization, and final outcome of pregnancy. RESULTS All 20 patients who underwent LA did not need a conversion. Mean maternal age was 28.1 years (range, approximately 20 to 35 y), gestational age was 15.4 weeks (range, approximately 6 to 30 wk), mean operation time was 45.5 minutes (range, approximately 25 to 90 min), mean length of hospital stay was 4.7 days (range, approximately 2 to 11 d). Fifteen of 20 pregnant women delivered healthy term infants and 5 women have kept a healthy pregnancy. CONCLUSIONS Our data support the accumulating evidence that LA is a safe and feasible procedure for the treatment of acute appendicitis in all trimesters of pregnancy. Close maternal and fetal monitoring is essential during and after the operation.
87. A case series of 46 appendectomies during pregnancy.

Author(s): Terzi, Alpaslan; Yıldız, Fahrettin; Vural, Mehmet; Coban, Sacit; Cece, Hasan; Kaya, Murat

Source: Wiener klinische Wochenschrift; Dec 2010; vol. 122 (no. 23-24); p. 686-690

Publication Date: Dec 2010

Publication Type(s): Journal Article

PubMedID: 21104201

Available at Wiener klinische Wochenschrift - from SpringerLink

Abstract: OBJECTIVE Among appendicitis patients pregnant ones occupy only a small proportion. Still there are difficulties in the diagnosis and management of the acute appendicitis in pregnant population. We tried to find answers to these difficulties with our acute appendicitis cases in pregnant patients. STUDY DESIGN This study involved 46 pregnant patients who received an operation following diagnosis of acute appendicitis in our clinic from 2006 to 2009. Data were collected retrospectively from medical records. Age, time delay to diagnosis, leukocyte count (WBC), gestational age, gestational history, morbidity-mortality and pathology results were evaluated. RESULTS The mean age of patients, gestational age and number of prior pregnancies were 26, 21 and 2.6, respectively. The amount of time spent in the hospital, from presentation of first symptom to admission, was approximately 40 hours (range 6-120). The mean time from admission to operation was 5.89 (range 1-32) hours. The perforation rate among our cases was 21%. The negative appendectomy rate was 13%. The perforation rate was associated with advanced gestational age and delayed admission to the hospital (p ≤ 0.001 and p = 0.027, respectively). CONCLUSION The diagnosis of appendicitis in pregnancy is difficult, and the perforation rate is high. Particularly in term pregnancies, we recommend performing appendectomy immediately after cesarean section.

Database: Medline

88. Laparoscopy: a safe approach to appendicitis during pregnancy.

Author(s): Sadot, Eran; Telem, Dana A; Arora, Manjit; Butala, Parag; Nguyen, Scott Q; Divino, Celia M

Source: Surgical endoscopy; Feb 2010; vol. 24 (no. 2); p. 383-389

Publication Date: Feb 2010

Publication Type(s): Journal Article Evaluation Studies

PubMedID: 19551438

Available at Surgical endoscopy - from ProQuest (Hospital Premium Collection) - NHS Version

Available at Surgical endoscopy - from SpringerLink

Abstract: BACKGROUND The aim of this study was to evaluate laparoscopic versus open surgery for suspected appendicitis during pregnancy. METHODSA hospital-based retrospective review of 65 consecutive pregnant patients who underwent surgery for suspected appendicitis from 1999 to 2008 was performed. Significance was determined by Pearson's chi(2) test, Fisher's exact test, Mann-Whitney test, and Kruskal-Wallis test. RESULTS Of the 65 patients, 48 cases were laparoscopic and 17 open. Use of the laparoscopic versus open approach was significantly increased in the first (100% vs. 0%, p < 0.001) and second trimesters (73% vs. 27%, p < 0.001). The open approach was used more frequently in third-trimester patients (71% vs. 29%, p = NS). Significance was demonstrated in mean length of hospital stay in the laparoscopic versus open group (3.4 vs. 4.2 days, p = 0.001). No maternal mortalities occurred. Follow-up of fetal outcome was achieved in 89% of patients. No difference was demonstrated in fetal loss (1 in laparoscopic group), APGAR score, birth weight, and preterm delivery rate by operative approach. Adverse outcome was associated with maternal temperature greater than 38 degrees C, leukocytosis greater than 16 x 10(9)/l, or more than 48 h
between onset of symptoms and emergency room presentation. CONCLUSION: This article is the largest hospital-based series evaluating the laparoscopic versus open approach for pregnant patients with presumed acute appendicitis. While methodological limitations preclude a definitive recommendation, laparoscopy appears to be a safe, feasible, and efficacious approach for pregnant patients with presumed acute appendicitis. We conclude that it is likely not the surgical approach but the underlying diagnosis combined with maternal factors that determine the risk for pregnancy complications. A benefit of laparoscopy is the diagnostic ability to identify other intra-abdominal pathology which may mimic appendicitis and harbor pregnancy risks.

Database: Medline

89. Abdominal computed tomography during pregnancy for suspected appendicitis: a 5-year experience at a maternity hospital.

Author(s): Shetty, Mahesh K; Garrett, Nan M; Carpenter, Wendy S; Shah, Yogesh P; Roberts, Candace

Source: Seminars in ultrasound, CT, and MR; Feb 2010; vol. 31 (no. 1); p. 8-13

Publication Date: Feb 2010

Publication Type(s): Journal Article

PubMedID: 20102691

Abstract: The objective of this article is to evaluate the role of computed tomography (CT) in a pregnant patient with right lower quadrant pain in whom there was a clinical suspicion of acute appendicitis. During a 5-year period the clinical records of all pregnant women who underwent imaging examination for clinically suspected appendicitis were reviewed. The imaging findings were correlated with patient management and final outcome. Thirty-nine pregnant patients were referred for imaging, of which 35 underwent initial evaluation with sonography, 23 of these women underwent a computed tomographic examination, and an additional 4 patients were directly imaged with CT without earlier sonographic assessment. Surgery confirmed appendicitis in all 5 patients who were operated on on the basis of findings of appendicitis on a CT scan. Two patients underwent surgery based on an alternate diagnosis suggested preoperatively (tubal torsion = 1, ovarian torsion = 1). All patients with negative findings at CT had an uneventful clinical course. In those patients who were evaluated only with ultrasound, a diagnosis of appendicitis was missed in 5 patients. The sensitivity of CT in the diagnosis of appendicitis in our study group was 100%, compared with a sensitivity of 46.1% for ultrasound. CT provides an accurate diagnosis in patients suspected to have acute appendicitis and is of value in avoiding false negative exploratory laparatomy with its consequent risk of maternal and fetal mortality and morbidity. Although sonography is the preferred initial imaging modality as its lack of ionizing radiation, CT is more accurate in providing a timely diagnosis and its use is justified to reduce maternal mortality and mortality in patients with appendicitis.

Database: Medline
90. Laparoscopic appendectomy performed during pregnancy by gynecological laparoscopists

**Author(s):** Park S.H.; Park M.I.; Choi J.S.; Lee J.H.; Kim H.O.; Kim H.

**Source:** European Journal of Obstetrics Gynecology and Reproductive Biology; Jan 2010; vol. 148 (no. 1); p. 44-48

**Publication Date:** Jan 2010

**Publication Type(s):** Article

**PubMedID:** 19892457

**Abstract:** Objective: To evaluate the safety, feasibility, and pregnancy outcomes of laparoscopic appendectomy (LA) during pregnancy. Study design: A retrospective review of eight pregnant women who underwent LA from January 2007 to December 2008. Results: The median age of the patients and median parity were 29.5 years (range, 25-34 years) and 0 (range, 0-1), respectively. The median operating time of LA was 22.5 min (range, 15-40 min). The median length of hospital stay was 3 days (range, 2-4 days). There was no maternal or fetal mortality or morbidity, conversion to laparotomy, or uterine injury. Seven women delivered seven healthy infants. One patient chose to have an elective abortion in another hospital. The histopathological diagnoses of the resected appendices were of acute appendicitis. Conclusion: LA performed by gynecologic laparoscopists in pregnant women is safe, feasible, and effective. © 2009 Elsevier Ireland Ltd. All rights reserved.

**Database:** EMBASE

91. Laparoscopic appendectomy in all trimesters of pregnancy.

**Author(s):** Machado, Norman Oneil; Grant, Christopher S

**Source:** JSL: Journal of the Society of Laparoendoscopic Surgeons; 2009; vol. 13 (no. 3); p. 384-390

**Publication Date:** 2009

**Publication Type(s):** Journal Article

**PubMedID:** 19793481

**Abstract:** BACKGROUND The laparoscopic approach for appendicectomy in pregnancy was not considered the preferred procedure until recently. The aim of this study was to examine our experience with laparoscopic appendicectomy in pregnancy and review the scientific evidence available in the medical literature. METHOD The clinical data of all patients who underwent laparoscopic appendicectomy during pregnancy at our hospital between 1999 and 2007 were collected and retrospectively analyzed. A Medline literature search restricted to English language articles on laparoscopic appendicectomy in pregnancy was carried out. RESULT Twenty patients underwent laparoscopic appendicectomy during pregnancy. Of these, 8 were in the first trimester, 9 in the second trimester, and 3 in the third trimester. Fifteen patients had histologically confirmed appendicitis. The mean operating time was 45 minutes, and the average postoperative stay in the hospital was 1.5 days. All patients except one had a full-term normal delivery. LITERATURE SEARCH An additional 637 patients from the English literature were reviewed and summarized. CONCLUSION Our results demonstrate that laparoscopic appendicectomy can be safely performed during all trimesters of pregnancy. The literature search suggests that although laparoscopic appendicectomy in pregnancy is associated with a low rate of intraoperative complications in all trimesters it may be associated with a significantly higher rate of fetal loss compared with open appendicectomy.

**Database:** Medline
92. Diagnosis of appendicitis in pregnancy.

Author(s): Freeland, Michael; King, Erin; Safcsak, Karen; Durham, Rodney

Source: American journal of surgery; Dec 2009; vol. 198 (no. 6); p. 753-758

Publication Date: Dec 2009

Publication Type(s): Journal Article

PubMedID: 19969125

Available at American journal of surgery - from ProQuest (Hospital Premium Collection) - NHS Version

Abstract: BACKGROUND The diagnosis of appendicitis in pregnant patients is challenging. METHODS The records of pregnant patients with suspected appendicitis were reviewed. RESULTS Forty-seven patients with suspected appendicitis were identified. Twenty-four patients did not undergo surgery. Twenty-three patients had ultrasound (US), none of which visualized the appendix. Seventeen patients were followed up clinically and improved. Six patients had a negative computed tomography (CT) and none required surgery. Twenty-three patients underwent surgery for presumed appendicitis. Three patients had no imaging. Twelve patients had US only; US was positive in 5 patients and all had appendicitis. Seven patients who underwent surgery had a nondiagnostic US. One patient had appendicitis. Seven patients had a positive CT and appendicitis at surgery. One patient had a positive US and magnetic resonance imaging, and had appendicitis. A total of 43 patients had US, of which 86% were nondiagnostic. Six US were read as positive and all patients had appendicitis. Thirteen patients had CT with no false-positive or false-negative results. CONCLUSIONS US, when read as positive, requires no further confirmatory test other than surgery. If US is nondiagnostic, further imaging may avoid a negative appendectomy.

Database: Medline

93. Evaluation of MRI for the diagnosis of appendicitis during pregnancy when ultrasound is inconclusive.

Author(s): Vu, Lan; Ambrose, Devon; Vos, Patrick; Tiwari, Pari; Rosengarten, Mark; Wiseman, Sam

Source: The Journal of surgical research; Sep 2009; vol. 156 (no. 1); p. 145-149

Publication Date: Sep 2009

Publication Type(s): Journal Article Evaluation Studies

PubMedID: 19560166

Abstract: BACKGROUND To retrospectively evaluate the diagnostic performance and clinical utility of magnetic resonance imaging (MRI) in pregnant patients suspected of having acute appendicitis, when an ultrasound study generated an inconclusive result. METHODS The medical records of 19 consecutive women who underwent abdominal and pelvic MRI at a tertiary care referral center (St. Paul's Hospital, Vancouver, Canada), as part of the work up of clinically suspected acute appendicitis, were retrospectively reviewed. MRI was carried out when ultrasound findings were inconclusive. MRI findings were reviewed and compared with surgical findings and clinical follow-up data including pregnancy outcome. RESULTS One of the 19 patients (5.3%) in the study cohort had an appendicitis diagnosed by MRI that was confirmed at operation and by specimen histology. The remaining study patients were diagnosed as not having appendicitis by MRI. These patients were followed until delivery, which was uneventful for all but one patient who was found to have appendicitis during Cesarean section. Overall, the sensitivity, specificity, positive predictive value, negative predictive value, and accuracy of MRI for the diagnosis of appendicitis during pregnancy was 50.0%, 100%, 100%, 94.4%, and 94.7%, respectively. In three patients (16.7%) with no MRI evidence of appendicitis, MRI identified an alternative etiology for their abdominal pain (two
patients diagnosed with ovarian cysts, one patient diagnosed with a uterine fibroid). CONCLUSIONSMRI represents a useful diagnostic test for acute appendicitis in pregnant women, and decreases the need for an emergency operation. Its high negative predictive value makes MRI useful for ruling out appendicitis in pregnant patients who have an inconclusive ultrasound. However, the low sensitivity observed in this study suggests that MRI, like other imaging modalities, is not perfect, and may miss an acute appendicitis diagnosis. Thus, future prospective clinical study of MRI as a diagnostic test for the evaluation of women who present with acute abdominal pain and possible appendicitis during pregnancy is warranted.

**Database:** Medline

94. Laparoscopic appendectomy in pregnant patients: a review of 45 cases.

**Author(s):** Lemieux, Patrice; Rheaume, Pascal; Levesque, Isabelle; Bujold, Emmanuel; Brochu, Gaetan

**Source:** Surgical endoscopy; Aug 2009; vol. 23 (no. 8); p. 1701-1705

**Publication Date:** Aug 2009

**Publication Type(s):** Journal Article

**PubMedID:** 19057956

Available at Surgical endoscopy - from ProQuest (Hospital Premium Collection) - NHS Version

Available at Surgical endoscopy - from SpringerLink

**Abstract:** BACKGROUND AND OBJECTIVES Laparoscopic surgery in pregnancy remains debated, especially in cases of suspected appendicitis. Cases of suspected appendicitis treated by the laparoscopic approach in a single institution over a 10-year period were reviewed (1997-2007). The objectives were to evaluate the immediate complications of the procedure and the outcome of pregnancies including foetal loss and preterm delivery. RESULTS Retrospective analysis of 45 consecutive cases of suspected appendicitis during pregnancy was carried out. Forty-two patients (93%) had a preoperative ultrasound, of which 13 (33%) confirmed an acute appendicitis. Out of 45 cases, 15 (33%) had the surgical procedure during the first trimester, 22 (49%) in the second and 8 (18%) in the third. Two (4%) patients had major complications (intra-abdominal abscess and uterine perforation) and two others (4%) had minor complications (cystitis and ileus). No patients underwent delivery in the month following surgery and there was no foetal loss in the follow-up. Three (8.1%) patients delivered prior to 35 weeks' gestation and 18.1% delivered before term (<37 weeks). As previously reported, a high rate of normal appendix (33%) was found at surgery. No significant differences were found in rates of preterm delivery, adverse outcome or operative time between trimesters of pregnancy at the time of surgery. Mean operative time was 49 +/- 19 min. DISCUSSION This large series from a single institution shows a low rate of preterm delivery and absence of foetal loss after laparoscopic appendectomy. Regardless of trimester, the low rate of complication makes it a valuable option for pregnant patients with suspicion of acute appendicitis. The rate of normal appendectomies remaining high, efforts have to be made towards new diagnostic modalities to lower the negative appendectomy rate in this specific population.

**Database:** Medline
95. Medical management of ruptured appendicitis in pregnancy.

**Author(s):** Young, Brett C; Hamar, Benjamin D; Levine, Deborah; Roqué, Henry

**Source:** Obstetrics and gynecology; Aug 2009; vol. 114 (no. 2); p. 453-456

**Publication Date:** Aug 2009

**Publication Type(s):** Case Reports Journal Article

**PubMedID:** 19622958

**Abstract:**
BACKGROUND: Ruptured appendicitis in pregnancy is an advanced stage of appendicitis that imposes significant maternal and fetal morbidity; the best treatment for the obstetric patient in this situation is unclear.
CASES: In the first case, a nulliparous woman at 32 weeks of gestation presented with ruptured appendicitis. She was treated nonsurgically with intravenous antibiotics and had an uncomplicated vaginal delivery at term. In the second case, a nulliparous woman presented at 27 weeks of gestation with ruptured appendicitis and was treated nonsurgically with intravenous antibiotics. She had a recurrence of appendicitis at 32 weeks of gestation, and again was treated with medical management. She delivered a viable infant by cesarean at 34 weeks of gestation for breech presentation and preterm labor.

**CONCLUSION:** Similar to in the nonpregnant population, medical management of ruptured appendicitis in pregnancy may be a reasonable treatment option.

**Database:** Medline

96. Appendicitis in pregnancy: experience of thirty-eight patients diagnosed and managed at a tertiary care hospital in Karachi.

**Author(s):** Kazim, Syed Faraz; Pal, K M Inam

**Source:** International journal of surgery (London, England); Aug 2009; vol. 7 (no. 4); p. 365-367

**Publication Date:** Aug 2009

**Publication Type(s):** Journal Article

**PubMedID:** 19527803

**Abstract:**
OBJECTIVE: To evaluate the clinical presentation, diagnosis, management, and outcome of acute appendicitis complicating pregnancy at a tertiary care hospital in Karachi.

METHODS: This was a retrospective analytical case note review of all patients clinically diagnosed with acute appendicitis during pregnancy at the Aga Khan University Hospital (AKUH), Karachi from January 01, 1990 to July 31, 2006.

RESULTS: During the review period, 38 pregnant patients were diagnosed with acute appendicitis; a total of 43,134 deliveries took place in the maternity department of the hospital during the same period. The mean age at presentation was 26 years and 66% of patients were multigravida. Thirty percent were in the 1st trimester, 37% in 2nd trimester, and 34% in the 3rd trimester. Abdominal pain was the chief complaint in all patients with the right lower quadrant being the commonest site (74%). Tenderness on physical examination was also mainly located in the same area (87%). Eighty-two percent patients had leukocytosis at presentation. An abdominal and pelvic ultrasound identified an inflamed appendix in 39%. Appendectomy was performed in 37 (97%) cases. One patient was managed conservatively. Thirty-five (95%) had an inflamed appendix on histology. Two patients were found to have a normal appendix, though one of these had an inflamed Meckel's diverticulum. Six (16%) patients developed postoperative complications; of these wound infection and pulmonary embolism were the most common and significant. Adequate deep venous thrombosis (DVT) prophylaxis with heparin was given in 8 (21%) patients. Preterm contractions developed in 5 (13%) patients and 3 (8%) patients had preterm delivery. There was no maternal mortality; however one fetal death was noted.

CONCLUSION: Timely diagnosis of acute appendicitis in pregnancy can be difficult. In most cases a correct diagnosis can be
arrived at on the basis of a history and physical examination with supportive routine laboratory tests. Urgent surgery is the treatment of choice but delay continues to be a common problem. Infective complications are well recognized in appendicitis; similarly this group of patients is at a higher risk of venous thrombosis and embolism, and routine prophylaxis should be considered in all.

**Database:** Medline

**97. Diagnosis of acute appendicitis during pregnancy: a systematic review.**

**Author(s):** Basaran, Ahmet; Basaran, Mustafa

**Source:** Obstetrical & gynecological survey; Jul 2009; vol. 64 (no. 7); p. 481

**Publication Date:** Jul 2009

**Publication Type(s):** Journal Article Review

**PubMedID:** 19545456

Available at [Obstetrical & gynecological survey - from Ovid (Journals @ Ovid) - Remote Access](https://www.ncbi.nlm.nih.gov/pubmed/19545456)

**Abstract:**

**OBJECTIVE**

To perform a systematic review to evaluate the diagnostic performance of computed tomography (CT) and magnetic resonance imaging (MRI) for the diagnosis of appendicitis in pregnancy.

**DATA SOURCES**

A systematic literature search of MEDLINE from 1966 through August 2008, MEDION database, OVID MEDLINE from 1950 through August 2008, and bibliographies of review articles and eligible studies.

**METHODS OF STUDY SELECTION**

Three articles related to the use of CT and 5 to the use of MRI for the diagnosis of acute appendicitis during pregnancy were identified. All of the identified studies were retrospective. Findings were compared to surgical pathology and/or clinical follow-up. Results were pooled using the Mantel-Haenszel fixed-effects model and the DerSimonian-Laird random-effects model.

**TABULATION, INTEGRATION, AND RESULT**

The pooled estimates of sensitivity and specificity, positive and negative likelihood ratios for the performance of CT in patients with prior normal/inconclusive ultrasonography result were 85.7% (95% CI: 63.7%-97%) and 97.4% (95% CI: 86.2%-99.9%), 10.1 (95% CI: 3.4-30.1), and 0.21 (95% CI: 0.05-0.88), respectively. The pooled estimates of sensitivity and specificity, positive and negative likelihood ratios for performance of MRI in patients with prior normal/inconclusive ultrasonography result were 80% (95% CI: 44%-98%) and 99% (95% CI: 94%-100%), 22.7 (95% CI: 6.0-87.5), and 0.29 (95% CI: 0.13-0.68), respectively.

**CONCLUSION**

This review is limited by the small number and retrospective nature of the available studies. With these limitations in mind, CT and MRI seem to be highly sensitive and specific for the diagnosis of appendicitis in pregnancy and their use should be considered when the results of ultrasonography are normal or inconclusive and appendicitis is suspected.

**Database:** Medline
98. Safety of laparoscopic appendectomy during pregnancy.

Author(s): Kirshtein, Boris; Perry, Zvi Howard; Avinoach, Eliezer; Mizrahi, Solly; Lantsberg, Leonid

Source: World journal of surgery; Mar 2009; vol. 33 (no. 3); p. 475-480

Publication Date: Mar 2009

Publication Type(s): Comparative Study Journal Article Evaluation Studies

PubMedID: 19137365

Abstract: BACKGROUND Use of laparoscopic appendectomy (LA) remains controversial during pregnancy because data regarding procedure safety are limited. The outcome of LA in pregnant women was evaluated and compared to results of open surgery.

METHODS Between January 1997 and December 2007, 42 pregnant women (mean age 24 years [range: 19-40 years]; range of gestation: 5-25 weeks) underwent appendectomy for suspected acute appendicitis: 23 laparoscopic (LA) and 19 open appendectomies (OA). Retrospective review of medical charts included preoperative information, surgery results, and outcome of the pregnancy.

RESULTS There was no difference between groups in surgery delay following arrival at the hospital. All procedures, except one case of Meckel's diverticulitis, were completed laparoscopically without need for conversion. Acute appendicitis was found in 19 cases and Meckel's diverticulitis in one case during LA (87%) and in 18 cases (95%) during OA. Complicated appendicitis was found in 7 (30%) pregnant women in the LA group and 1 (5%) in the OA group. Five women with normal preoperative abdominal ultrasonography had acute appendicitis (2 in the OA group and 3 in the LA group). The laparoscopic procedure was performed more often by senior surgeons (70% of cases), and OA was more commonly done by residents (47% of cases). There were no intraoperative or postoperative complications recorded. The length of postoperative hospital stay was slightly prolonged after LA-2.4 days versus 1.4 day after OA. There was one fetal loss in each group, 1 and 2 months after the operation.

CONCLUSIONS Laparoscopic appendectomy is safe and effective during pregnancy and is associated with good maternal and fetal outcome.

Database: Medline

**Author(s):** Pedrosa, Ivan; Lafornara, Michelle; Pandharipande, Pari V; Goldsmith, Jeffrey D; Rofsky, Neil M

**Source:** Radiology; Mar 2009; vol. 250 (no. 3); p. 749-757

**Publication Date:** Mar 2009

**Publication Type(s):** Journal Article

**PubMedID:** 19244044

Available at [Radiology](https://radiology.aimspub.com) - from Free Medical Journals . com

**Abstract:**
PURPOSETo investigate the effect of magnetic resonance (MR) imaging on the negative laparotomy rate (NLR) and the perforation rate (PR) in pregnant patients suspected of having acute appendicitis (AA) and to assess the need for computed tomography (CT) in this setting.

MATERIALS AND METHODSThe data of 148 consecutive pregnant patients (mean age, 29 years; age range, 15-42 years; mean gestational age, 20 weeks; gestational age range, 4-37 weeks) who were clinically suspected of having AA and examined with MR imaging between March 2002 and August 2007 were retrospectively analyzed in an institutional review board-approved HIPAA-compliant protocol. One hundred forty patients underwent ultrasonography (US) before MR imaging. The clinical and laboratory data and the findings of the initial US and MR image interpretations were recorded and analyzed at Student t and Fisher exact testing. The NLR and PR were calculated.

RESULTSFourteen (10%) patients had AA, and perforation occurred in three (21%) of them. US results were positive for AA in five (36%) patients with proved AA. MR results were positive in all 14 patients with AA. MR results were negative in 125 of the 134 patients without AA; there were nine false-positive cases (two positive, seven inconclusive). Among the patients without AA, the normal appendix could be visualized on US images in less than 2% (two of 126) of cases and on MR images in 87% (116 of 134) of cases (P < .0001). Twenty-seven (18%) patients underwent surgical exploration, and eight of them had negative laparotomy results, yielding an NLR of 30% and a PR of 21% (three of 14 patients). Only four (3%) patients underwent CT.

CONCLUSIONFor pregnant patients clinically suspected of having AA, use of MR imaging yields favorable combinations of NLR and PR compared with previously reported values. The radiation exposure associated with CT examination can be avoided in most cases.

**Database:** Medline
100. Diagnosis of appendicitis during pregnancy and perinatal outcome in the late pregnancy

Author(s): Zhang Y.; Zhao Y.-Y.; Qiao J.; Ye R.-H.

Source: Chinese Medical Journal; Mar 2009; vol. 122 (no. 5); p. 521-524

Publication Date: Mar 2009

Publication Type(s): Article

PubMedID: 19323901

Abstract: Background: Appendicitis is the most common surgical problem in pregnancy, however the particular dangers of appendicitis in pregnancy lie in the varied presentation of symptoms and the higher chance of delayed diagnosis. The aim of this study was to determine the risk factors associated with prenatal outcome in acute appendicitis during second and third trimester pregnancies. Methods: This was a retrospective single-center study that presented a descriptive analysis of the results. A total of 102 pregnant women who were diagnosed with acute appendicitis and operated upon in Peking University Third Hospital, China between January 1993 and December 2007 were presented. SPSS 12.0 for Windows was used for data analysis. Results: Seventy-eight pregnant women who were diagnosed with acute appendicitis (sixteen patients had a perforated appendix, 62 patients had a non-perforated appendix) were operated upon during late pregnancy. The interval between symptom onset and surgery was the only predictive variable. A longer interval between symptom onset and surgery was associated with appendix perforation ((109.5+/−52.7) hours) than with no appendix perforation ((35.1+/−19.62) hours; P=0.007). There was a significant difference in the rate of preterm labor (5.1% vs 1.3%) and the rate of fetal mortality (25% vs 1.7%) between patients with and without a perforated appendix. Conclusions: Delaying surgery correlates to more advanced disease with an increased risk of perforation. This contributes to an increased risk of further complications, including premature labor or abortion, and to higher maternal complication rates. Prompt diagnosis may improve the prenatal outcome.

Database: EMBASE


Author(s): Brown, J J S; Wilson, C; Coleman, S; Joypaul, B V

Source: Colorectal disease : the official journal of the Association of Coloproctology of Great Britain and Ireland; Feb 2009; vol. 11 (no. 2); p. 116-122

Publication Date: Feb 2009

Publication Type(s): Journal Article

PubMedID: 18513191

Available at Colorectal disease : the official journal of the Association of Coloproctology of Great Britain and Ireland - from Wiley Online Library Science, Technology and Medicine Collection 2017

Abstract: INTRODUCTION Appendicitis in pregnancy (AIP) is the most common nonobstetric cause of an acute abdomen requiring surgical intervention. Diagnostic difficulties arising from gestational symptoms compound the risk of foetal loss after negative appendicectomy and exponentially increase the risk to mother and foetus with delay in genuine cases. In this article, we investigate the symptoms and signs of AIP and attempt to identify consistent clinical features and review the role of imaging in diagnosis. METHOD MEDLINE and PubMed were searched for case-control studies recording preoperative symptoms/signs suggestive of AIP, as well as appendiceal pathology. Combined likelihood and odds ratios (OR) were created for clinical features across homogenous papers. Papers examining the use of laparoscopy, ultrasound (US), computerized tomography (CT) and magnetic resonance imaging (MRI) were assessed qualitatively. RESULTS Seven papers met the inclusion criteria for the analysis of consistent clinical features (450 patients). The only symptoms or
signs significantly associated with a diagnosis of appendicitis were nausea (OR: 2.21, 95%CI: 1.34-3.66), vomiting (OR: 0.82-15.6 range) and peritonism (OR: 1.80, 95%CI: 1.06-3.04). US, CT and MRI have all been used to successfully diagnose AIP. Laparoscopic appendicectomy has been safely undertaken in pregnancy.

CONCLUSION
Appendicitis will continue to challenge the diagnostic acumen of surgeons. Whilst useful, consensus regarding the safety of laparoscopy, CT and MRI in pregnancy is yet to be achieved.

Database: Medline

102. MRI vs. ultrasound for suspected appendicitis during pregnancy.

Author(s): Israel, Gary M; Malguria, Nagina; McCarthy, Shirley; Copel, Josh; Weinreb, Jeffrey

Source: Journal of magnetic resonance imaging : JMRI; Aug 2008; vol. 28 (no. 2); p. 428-433

Publication Date: Aug 2008

Publication Type(s): Comparative Study Journal Article

PubMedID: 18666160

Available at Journal of magnetic resonance imaging : JMRI - from Wiley Online Library Science, Technology and Medicine Collection 2017

Abstract: PURPOSE To compare the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of ultrasound (US) and MRI in evaluation of pregnant patients with a clinical suspicion of appendicitis. MATERIALS AND METHODS A total of 33 pregnant patients with suspected appendicitis underwent US and MRI. The original imaging reports generated at the time of presentation were used for data analysis. Pathology reports were used for disease confirmation in patients who underwent appendectomy. When surgery was not performed, a medical record review was performed. The sensitivity, specificity, PPV, and NPV were calculated for US and MRI in the diagnosis of appendicitis. RESULTS Five of the 33 patients had pathologically-proven appendicitis. Four of the five patients with appendicitis were correctly diagnosed at MRI while one was interpreted as indeterminate (appendix not seen). At US, one was correctly diagnosed, one was incorrectly diagnosed as normal, and three were interpreted as indeterminate (appendix not seen). In 13 patients, a normal appendix was diagnosed at MRI, none of whom had appendicitis. In three patients, a normal appendix was diagnosed at US, one of whom had appendicitis. When the appendix was visualized at MRI, the sensitivity, specificity, PPV, and NPV for the diagnosis of appendicitis was 100% for all parameters. When the appendix was visualized at US, the sensitivity, specificity, PPV, and NPV for the diagnosis of appendicitis was 50%, 100%, 100%, and 66%, respectively. CONCLUSION Based on a relatively small number of true-positives, our data suggests that MRI is very useful for the diagnosis and exclusion of appendicitis in pregnant women.

Database: Medline
103. Laparoscopic versus open appendicectomy in pregnancy: a systematic review.

Author(s): Walsh, Colin A; Tang, Tjun; Walsh, Stewart R

Source: International journal of surgery (London, England); Aug 2008; vol. 6 (no. 4); p. 339-344

Publication Date: Aug 2008

Publication Type(s): Comparative Study Journal Article Review

PubMedID: 18342590

Abstract: BACKGROUND Acute appendicitis is the most common non-obstetric indication for surgical intervention in pregnant women. The benefits of a laparoscopic over an open approach to appendicectomy are well established in the non-pregnant population. Data on the optimal surgical approach to acute appendicitis in pregnant women are conflicting. METHODS A systematic review of reported cases of laparoscopic appendicectomy (LA) in pregnancy over the period 1990 to 2007. Twenty-eight articles documenting 637 cases of LA in pregnancy were included. Data on pregnancy outcome, patient characteristics, operative technique and peri-operative complications were analysed. RESULTS The rate of fetal loss following LA in pregnancy approaches 6% and is significantly higher than that following open appendicectomy. Fetal loss was highest in cases of complicated appendicitis. Incidence of preterm delivery appears lower in the LA group although this complication is likely to be under-reported in a significant proportion of cases. Trimester at the time of LA does not appear to influence complication rates. The negative appendicectomy rate in this series was 27%, which is higher than in the non-pregnant population. Complication rates following LA with negative appendicitis are as high as with simple appendicitis. Rates of entry-related complications were 2.8% in the Veress needle group and 0% in the Hasson open entry group. The overall rate of conversion to laparotomy was 1%. No difference was found in the preterm delivery rate between women who received prophylactic tocolysis and those who were not tocolysed. CONCLUSIONS Laparoscopic appendicectomy in pregnancy is associated with a low rate of intra-operative complications in all trimesters. However, LA in pregnancy is associated with a significantly higher rate of fetal loss compared to open appendicectomy. Rates of preterm delivery appear similar or slightly better following a laparoscopic approach. Open appendicectomy would appear to be the safer option for pregnant women for whom surgical intervention is indicated.

Database: Medline
104. Influence of imaging on the negative appendectomy rate in pregnancy

Author(s): Wallace C.A.; Petrov M.S.; Soybel D.I.; Ferzoco S.J.; Ashley S.W.; Tavakkolizadeh A.

Source: Journal of Gastrointestinal Surgery; Jan 2008; vol. 12 (no. 1); p. 46-50

Publication Date: Jan 2008

Publication Type(s): Article

PubMedID: 17963012

Available at Journal of Gastrointestinal Surgery - from ProQuest (Hospital Premium Collection) - NHS Version

Available at Journal of Gastrointestinal Surgery - from SpringerLink

Abstract: Appendectomy is the most common non-gynecologic surgery performed during pregnancy. Little data exist on the accuracy of imaging studies in the diagnosis of appendicitis in pregnancy. The objective of this study was to evaluate the probability of ultrasound and computed tomography (CT) scan in diagnosing appendicitis in pregnancy, as reflected in the negative appendectomy rate. We retrospectively reviewed the charts of 86 pregnant women who underwent an appendectomy between January 1, 1997 and January 1, 2006. Patients were divided into three groups: clinical evaluation, ultrasound, and ultrasound followed by a CT scan. The clinical evaluation group had 13 patients, with a negative appendectomy rate of 54% (7/13). Fifty-five patients underwent an ultrasound alone, with a negative appendectomy rate 36% (20/55). In the ultrasound/CT group (n=13), the negative appendectomy rate was 8% (1/13). There was a significant reduction in the negative appendectomy rate in the ultrasound/CT scan group compared to clinical evaluation group (54 vs 8%, p<0.05). This reduction was not achieved in the ultrasound group when compared to the clinical evaluation group or the ultrasound/CT group (p=0.05). A significant reduction was achieved when the ultrasound/CT group was compared to the patients in the ultrasound only group who had a normal or inconclusive ultrasound (p<0.05). Our data documents a very high negative appendectomy rate in the pregnant patient. We recommend an ultrasound followed by a CT scan in patients with a normal or inconclusive ultrasound. © 2007 The Society for Surgery of the Alimentary Tract.

Database: EMBASE
<table>
<thead>
<tr>
<th>#</th>
<th>Database</th>
<th>Search term</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Medline</td>
<td>exp APPENDICITIS/</td>
<td>18235</td>
</tr>
<tr>
<td>2</td>
<td>Medline</td>
<td>(appendicitis).ti</td>
<td>11807</td>
</tr>
<tr>
<td>3</td>
<td>Medline</td>
<td>(1 OR 2)</td>
<td>19900</td>
</tr>
<tr>
<td>4</td>
<td>Medline</td>
<td>(pregnan*).ti</td>
<td>215284</td>
</tr>
<tr>
<td>5</td>
<td>Medline</td>
<td>exp PREGNANCY/</td>
<td>849306</td>
</tr>
<tr>
<td>6</td>
<td>Medline</td>
<td>(4 OR 5)</td>
<td>872033</td>
</tr>
<tr>
<td>7</td>
<td>Medline</td>
<td>(3 AND 6)</td>
<td>1083</td>
</tr>
<tr>
<td>8</td>
<td>Medline</td>
<td>7 [Languages English]</td>
<td>652</td>
</tr>
<tr>
<td>9</td>
<td>EMBASE</td>
<td>(appendicitis).ti</td>
<td>10535</td>
</tr>
<tr>
<td>10</td>
<td>EMBASE</td>
<td>exp APPENDICITIS/</td>
<td>22542</td>
</tr>
<tr>
<td>11</td>
<td>EMBASE</td>
<td>(9 OR 10)</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>EMBASE</td>
<td>(pregnan*).ti</td>
<td>234868</td>
</tr>
<tr>
<td>13</td>
<td>EMBASE</td>
<td>exp PREGNANCY/</td>
<td>622073</td>
</tr>
<tr>
<td>14</td>
<td>EMBASE</td>
<td>(12 OR 13)</td>
<td>670532</td>
</tr>
<tr>
<td>15</td>
<td>EMBASE</td>
<td>(11 AND 14)</td>
<td>1136</td>
</tr>
<tr>
<td>16</td>
<td>EMBASE</td>
<td>15 [DT FROM 2008] [English language]</td>
<td>564</td>
</tr>
</tbody>
</table>