

# Acute appendicitis in pregnancy: Case series and review

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## ABSTRACT

**OBJECTIVE:** Acute 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.

**METHODS:** A 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.

**RESULTS:** The 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/mm<sup>3</sup>. 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.

**CONCLUSION:** Physiologically 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.

*Key words: Acute appendicitis; appendectomy; fetus; laparoscopic appendectomy; pregnancy.*

The most frequently seen pathology in pregnancy which requires emergency surgery apart from obstetrical indications is suspect appendicitis [1]. We can encounter appendicitis in all three tri-

mesters. Compared with the healthy pregnant, they harbour increased risks of premature birth, miscarriage, and cesarean section [2]. Complaints physiologically related to pregnancy, changing physical

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examination findings, ineffective use of radiological methods can delay the diagnosis. Delayed cases confront us with higher rates of perforation. Rapid diagnosis, and surgery is a must for decreasing complication rates. In the past open appendectomy was performed beyond dispute, while in recent years laparoscopy is an alternative with accepted safety.

In this paper we aimed to investigate our pregnant patients operated with the diagnosis of appendicitis in our clinic.

## MATERIALS AND METHODS

A 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. Data about patients' ages, gestational weeks, complaints, physical examination findings, leukocyte counts, blood biochemistry, complete urinalysis, ultrasonographic findings, the surgical technique applied, type of surgical incision, postoperative complications, and duration of hospitalization were recorded. All patients received single prophylactic doses of ampicillin-sulbactam 1 gr. In two cases with surgical field infection, antibiotherapy was completed to seven days. Any tocolytic agent was not used in any patient.

## RESULTS

Median age of the patients was 23.9 years. At admission, the cases were in their first ( $n=12$ ; 57.1%), second ( $n=5$ ; 23.8%), and third trimesters ( $n=4$ ; 19.0%) of their pregnancies. Median gestational week was 20.4 weeks. The patients were pregnant for the first ( $n=11$ ; 52.4%), second ( $n=5$ ; 19.0%), third ( $n=4$ ; 23.8%), and fifth ( $n=1$ ; 4.8%) time. Their medical past was unremarkable excluding one patient with MTHFR (methylene tetrahydrofolate reductase) gene mutation, and abortion. All patients consulted with admission complaints of abdominal pain. On physical examination abdominal guarding ( $n=5$ ; 23.8%) or rebound tenderness together with abdominal guarding ( $n=16$ ; 76.2%) were observed. In one patient (4.8%) widespread abdominal tenderness was detected. At admission the patients complaints were loss of appetite (19.1%), nausea

(52.3%), and vomiting (14.2%). Median WBC count was  $13.297/\text{mm}^3$  (range, 9.200–18.500/ $\text{mm}^3$ ). Complete urinalysis was unremarkable in only three patients (14.3%). While bacterial positivity ( $n=9$ ; 42.9%), leucocyte esterase positivity ( $n=4$ ; 19.0%), epithelial cells ( $n=4$ ; 19.0%), and glucosuria ( $n=1$ ; 4.8%) were detected in indicated number of patients. Biochemical parameters were within normal limits in 17 (81.0%) patients. While increased LDH levels ( $n=2$ ; 9.5%), and hyperglycemia ( $n=2$ ; 9.5%) were also detected. On abdominal ultrasound findings compatible with acute appendicitis were detected in 12 (57.1%) patients. In only one patient (4.8%), magnetic resonance imaging was used which demonstrated findings consistent with appendicitis. One patient underwent spinal anesthesia, and 20 patients received general anesthesia. Any complication was not detected in the patient (4.8%) who received spinal anesthesia. 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. During the postoperative period, none of the patients received any tocolytic agent. Histopathological evaluation of all the (100%) cases were compatible with acute appendicitis. Negative appendectomy was not detected. Median hospital stay was 3.8 days (range: 2–8 days). During postoperative period surgical site infection was developed in two (9.5%) patients. Two cases with perforated appendicitis which contained abscess material. In both cases preoperative white blood cell counts were higher than  $16.000/\text{mm}^3$  which was compatible with the literature findings. Medical history of the patient who underwent laparoscopic appendectomy was unremarkable. Preoperative white blood cell count was  $12.050/\text{mm}^3$ . On histopathological examination phlegmonous appendicitis was detected.

Postoperative period was uneventful, and the patients were discharged within 4 days. Fetomaternal mortality was not detected.

## DISCUSSION

The most frequently nonobstetrical indication of emergency surgery is acute appendicitis. It is seen nearly one out of 1700 pregnant [3]. As a result of changing physiological, and anatomical parameters, its diagnosis is delayed with resultant maternofetal risks.

Twenty-five to thirty percent of pregnant women who undergo surgical treatment with the presumed indication of acute abdomen are eventually diagnosed as acute appendicitis [4]. However, the incidence of acute appendicitis is similar to that seen in normal population [5]. It is seen most frequently during the second decade of life [6]. In many studies, its occurrence is frequently reported during the 2. trimester. Kim et al. indicated that it is more frequently seen in the first trimester, while according to Cho et al. it is more often observed during the 3. trimester. Finally Lee et al. reported that any difference between trimesters as for incidence rates was not seen [6]. In our daily practice we observed acute appendicitis more frequently during the second trimester.

In a study encompassing 908 pregnant women, increased fetal risks have been reported for pregnant women with acute appendicitis relative to those healthy ones. These risks include SGA (small for gestational age: babies whose birth weight lies below the 10<sup>th</sup> percentile for that gestational age), low-birth weight), preterm labour, and major congenital anomalies). Congenital anomalies were only seen in pregnant women during their first trimester. However SGA, and LBW have been found to be associated with increased infant mortality [3]. Fetal mortality is 1.5% in the presence of uncomplicated appendicitis, while it increases to 37% in cases with perforation [1]. In general population incidence of perforation is 19%, while it can increase up to 43 percent [2]. Delay for more than 24 hours increases the risk of perforation for more than 66 percent [1]. Enlarging uterus prevents movement of omentum towards the area of inflammation which may be considered as the causative factor for perforation. [7]. Early diagnosis, and surgical intervention will decrease mortality rate [8]. It should not be forgotten that there is no difference between negative laparotomy, and appendectomy performed during the early stage of pregnancy as for preterm labour [4]. In this study, negative appendectomy was not detected, and preterm labour and /or mortality were/was not detected in all cases including those with perforation.

In acute appendicitis, typically pain starting from the periumbilical area and settling in the lower right quadrant is pathognomic. During pregnancy, conventional signs, and symptoms of appendicitis may not be seen. In 1932 Baer et al. demonstrated

upward displacement of appendix following 3. gestational week [9]. This shift in the position of appendix may relieve irritation of parietal peritoneum. The pain may settle in the right middle or upper quadrant. Although guarding, and rebound tenderness are seen in 70% of the patients, they are not sine qua non findings in the pregnant women due to relaxation of abdominal muscles [7]. Alvarado scoring system or like can not be used in pregnant women. Physiologically nausea, vomiting, and loss of appetite can be seen in pregnant women. Abdominal tenderness is the most frequently seen, and the most reliable diagnostic sign [6]. In this study, most frequently, complaints of abdominal pain were detected. Although nausea, and loss of appetite were anticipated findings, they were not seen at a higher rate. Contrary to the literature findings, on physical examination we mostly encountered abdominal guarding.

Leucocytosis is harmful during pregnancy. In normal pregnancy white blood cell count is around 12.000 /mm<sup>3</sup> which increases in number as the pregnancy progresses. It may also increase up to 30.000 mm<sup>3</sup> during delivery. Kim et al. indicated that WBC count higher than 16.000 /mm<sup>3</sup> should raise the suspicion of perforation [6]. However, increase in the number of neutrophil counts, and its shift to left aid in diagnosis [4]. In our cases median WBC count was 13.297/mm<sup>3</sup>. In perforated cases it was higher than 16.000 /mm<sup>3</sup> as indicated before.

Owing to its easy applicability, and reproducibility, ultrasound is an indispensable diagnostic tool. Inability to compress uterus because of enlarging uterus, obesity, intestinal gas, and its operator dependency are disadvantages of US. It has a 36–100% sensitivity, and 33–99% specificity [1]. Magnetic resonance imaging (MRI) which can be used safely in pregnant women has a higher sensitivity, and specificity. In many studies, it has been reported that MR which can visualize appendix has a 100% negative predictive value [1]. In an article which investigated diagnostic accuracy of MRI, rates of negative appendectomy, and perforation were indicated as 0, and 8%, respectively [3]. In cases where US does not yield net results, MR is a gold standard [10]. Computed-tomography strikingly protect normal population from undergoing negative appendectomies. In a study encompassing pregnant women com-

bined use of US, and CT resulted in minimal rates of negative appendectomy [3]. However radiation exposure carries risk for fetus, and it can be used in selected patients [11]. We observed that US aided in diagnosis in 57.1% of the cases. MR was used in only one case, and it yielded accurate results. In suspect cases we think that use of MR will increase the rate of accurate diagnosis, and decrease the incidence of perforation.

Recurrence rate of appendicitis treated with medical therapy is 30 percent [3]. Limited number of pregnant cases have been conservatively observed as reported in the literature. This approach has been seen to increase maternal morbidity, and fetal loss [2]. Conventional or laparoscopic appendectomy is applied. In the past debates about laparoscopy were entertained. Recent reports have indicated that it does not increase the risk for preterm labour, miscarriage, maternal complications when compared with conventional appendectomy [5]. Laparoscopic appendectomy has many advantages in addition to decreasing wound site infections which encounter us more frequently [6]. Intraabdominal access using Hasson technique, and laparoscopic procedure under 10–12 mm Hg insufflation pressure provided that it lasts less than 30 minutes are among recommended techniques. In this study we performed laparoscopic appendectomy on only one patient, and observed that it did not increase complication rates, and hospitalization period. We think that surgeons experienced in laparoscopy should not refrain from performing laparoscopy with the intention to be more careful in pregnant patients, and it will be a standard procedure with time. Besides, its safety of use in all three trimesters has been acknowledged [3].

In conclusion, absence of typical signs, and symptoms of appendicitis, and clinicians' predisposition to conservative approach can cause delay in treatment. To curtail perforation, and increased complications, abdominal pain in pregnant should be carefully investigated. With its cost-effectiveness, and easy applicability, US is the primary imaging modality. In cases of inadequacy, MR is the predominant radiological technique. If diagnosis of acute appendicitis is made, emergency surgi-

cal treatment is rapidly applied. Laparoscopy has some advantages as decreased postoperative pain, and wound infection. It also allows the chance of diagnosis without increasing the rate of complications.

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