SUPPLEMENT

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Acute Appendicitis in Pregnant Women: Our Clinical Experience

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.

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Acute appendicitis, threatening the life of the mother and fetus, is the most common reason for surgery in pregnant women, with the exception of obstetric diseases [1]. In pregnancy, acute appendicitis is observed between 1/1250 and 1/1500 cases [2]. Anatomic and physiological changes occurred in pregnant women complicate the diagnosis. Difficulty in diagnosis and delayed treatment can lead to undesired results, including fetal loss and preterm labour in addition to the classical complications of acute appendicitis [3,4]. In this study, we aimed to retrospectively assess the pregnant patients who were operated on due to acute appendicitis diagnosis in our clinic, and to compare these data with previously published data.

Materials and Methods

The records of 13 pregnant patients at the Turgut Özal University Research and Application Hospital, who underwent an appendectomy due to appendicitis diagnosis between January 2007 and December 2015, were retrospectively examined. Age, pregnancy data, complaint, time of application, time of diagnosis, physical examination findings, laboratory results, radiologic findings, surgical and anesthesia methods, usage of antibiotics, tocolysis application, post-surgical complications and hospitalization times of the patients were assessed. IBM SPSS Statistics 21.0 program (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.) was used for statistical analyses and calculations. This study was approved by the Clinical Research Ethics Committee of Turgut Özal University.

Results

Appendectomy was applied to 13 pregnant patients due to the diagnosis of acute appendicitis. Average age of the patients was 27.69 years (22-37 years). Six patients (46.2%) were between 20 and 25 years old, four patients (30.8%) were between 26 and 30 years old, two patients (15.4%) were between 31 and 35 years old and one patient (7.7%) was over 35 years old. Five patients (38.5%) were primiparous and eight (61.5%) were multiparous. Four patients (30.8%) had abortus history. Distribution of the patients according to their pregnancy periods can be seen in Table 1.

Distribution regarding to the time of application to a hospital after the symptoms had started and time elapsed till the surgery can be seen in Table 2. Most common application complaints of the patients were abdominal pain, loss of appetite and nausea. Distribution of the patients according to

TABLE 1. Distribution of the patients according to their pregnancy periods

	n	%
1 st trimester	3	23.1
2 nd trimester	8	61.5
3 rd trimester	2	15.4

TABLE 2. Distribution regarding to the time of application to a hospital of the patients after the symptoms have started and time elapsed till the surgery after

	Time	n	%
Application time			
	Within 24 hours	7	53.8
	In 24-48 hours	1	7.7
	After 48 hours	5	38.5
Application after surgery			
	Within 12 hours	11	84.6
	After 12 hours	2	15.4

TABLE 3. Distribution of the patients according to their complaints at the time of application

	n	%
Abdominal pain	13	100
Loss of appetite	11	84.6
Nausea	9	69.2
Vomiting	5	38.5
Fever	1	7.7
Diarrhea	1	7.7
Constipation	1	7.7

TABLE 4. Distribution of the patients according to their physical examination findings

	n	%
Tenderness at right lower quadrant	12	92.3
Diffuse tenderness	1	7.7
Defans	2	15.4
Rebound tenderness	8	61.5
Rowsing sign	5	38.5
Fever	1	7.7

their complaints at the time of application is given in Table 3. Most common physical examination findings were tenderness in the right lower quadrant and rebound tenderness. Distribution of the patients according to their physical examination findings is shown in Table 4.

Leucocyte quantity was measured as $\leq 10,000 \text{ mm}^3$ in one patient (7.7%), $>10,000$ and $\leq 15,000 \text{ mm}^3$ in five patients (38.5%), $>15,000$ and $\leq 20,000 \text{ mm}^3$ in four patients (30.8%) cases and $>20,000 \text{ mm}^3$ in three patients (23.1%). Neutrophil ratio had increased in 12 patients (92.3%) patients and was normal in one patients (7.7%). Average value of C-reactive protein (CRP) was 39.00 mg/L (7.30-92.90 mg/L). Average value of MPV was 8.88 fL (6.8-10.8 fL). Ultrasonography (USG) was used in all the cases for the diagnosis of appendicitis. Only in eight patients (61.5%) was appendicitis-related USG findings observed. In other five patients (38.5%) with no diagnosed appendicitis, surgery was decided via clinical diagnosis.

General anesthesia was applied to nine patients (69.2%), spinal anesthesia was applied to one patient (7.7%) and epidural anesthesia was applied to three patients (23.1%). While appendectomy was laparoscopically applied to one patient (7.7%), it was applied as open via Mc Burney incision in 12 patients (92.3%). During the surgery, the position of appendix was in the right lower quadrant in eight patients (61.5%), in the right area in umbilicus level in four patients (30.8%) and in the right upper quadrant in one patient (7.7%) patient. In all cases, appendix was macroscopically observed as hyperemic, edematous and had increased calibration, but no perforation was observed. Histopathologic findings were reported as "acute appendicitis" for nine patients (69.2%), "necrotizing or suppurative appendicitis" for three patients (23.1%) and "acute appendicitis and mucocoele" for one patient (7.7%). While no antibiotic treatment was supplied for three patients (23.1%), antibiotic was given to 10 patients (76.9%). While no prophylactic tocolysis was applied to 8 patients (61.5%), it was applied to five (38.5%). Average hospitalization period was 1.69 days. Seven patients (53.8%) were hospitalized for 1 day, three patients (23.1%) for 2 days and three patients (23.1%) for 3 days. After all the patients are discharged, they were followed up for 2 weeks through the Obstetrics Department. Maternal or fetal loss, preterm delivery, wound infection or postoperative ileus was not seen in any of the cases.

Discussion

Acute appendicitis can be seen in every trimester, but approximately half of the cases in pregnancy are observed in the 2nd trimester [5]. We saw more acute appendicitis in the

2nd trimester (eight patients, 61.5%). Symptoms and findings such as nausea, vomiting, stomach pain and leukocytosis can also develop due to the physiological changes in pregnancy. Delay in the application regarding the symptoms and findings related to pregnancy, no—faithful abdominal examination due to the anatomy varying according to gestational age, limitation in the availability of imaging methods, avoidance of unnecessary surgical operations due to the possible maternal and fetal complications aggravate the diagnosis or acute appendicitis and delay treatment in pregnancy [4,6]. Five of our cases (38.5%) had applied to hospital 48 hours after the symptoms started. Surgery decision for two patients (15.4%) was given within 12-24 hours after application and after clinical observation.

Stomach pain was notified as a complaint in all the cases. Because the localization of appendix may be shifted upwards over time, due to the effect of fetal growth in the uterus, so the typical right lower quadrant pain may not be observed in some patients [7]. Tenderness was present in the right lower quadrant in 12 patients (92.3%) and in all the quadrants in one patient (7.7%). Defense is not usually observed due to the distention of abdominal wall in pregnancy [8]. Accordingly, defence was only observed in two patients (15.4%).

Leukocytosis was absent in only one patient (7.7%) and an increase was observed in the neutrophil ratio of 12 patients (92.3%). CRP levels were high in all patients. In the patient without leukocytosis, an increase in neutrophil ratio and increase in CRP value were observed. We consider that interpretation of the combination of these three parameters will be more reliable in diagnosis. There are positive and negative opinions regarding to the availability of MPV, that is specified as an inflammatory marker for some diseases, in the diagnosis of acute appendicitis [9,10]. While MPV value is observed as low in only one patient (7.7 %), it was measured as normal in other patients.

Because it does not require the use of radiation and it is an easily applied and repeatable procedure, USG is preferred for the diagnosis of acute appendicitis in pregnant women. During the first trimester of pregnancy, the diagnosis value of USG is similar for pregnant and non-pregnant patients; but diagnosis value weakens in the second trimester of pregnancy due to the change in appendix localization and the uterus size (6). In the pregnant patients who cannot be diagnosed despite the combination of clinical findings and USG; a profit/loss calculation is done and although it is specified that they can be used in abdominal tomography, its routine usage is not recommended due to the high radiation level. In such cases, magnetic resonance imaging (MRI) can be considered as an

alternative method [11]. USG was used as the imaging method in all the cases in the study; however, no appendix was observed via USG in five patients (38.5%) and in these patients, surgery was decided via clinical diagnosis. MRI is not used for any of the patients.

There are differences of opinion about the application of open or laparoscopic appendectomy in pregnant women; however, it has been reported that laparoscopic appendectomy is similar to open appendectomy regarding fetal results and maternal recovery status and it can be safely and efficiently applied in all trimesters of pregnancy [12]. Regarding the fetal hypercapnia and acidosis that may occur due to pneumoperitoneum, pressure is recommended as ≤ 12 mmHg. No difference was observed between 10 and 12 mmHg [13,14]. Among our patients, while laparoscopic appendectomy was applied to one patient, open appendectomy was applied to one patient after diagnostic laparoscopy. In both cases, pneumoperitoneum pressure was adjusted as 10 mmHg. In both cases, no preterm action or fetal loss was observed.

Brown *et al.* specified that negative laparotomy in the pregnant patients, who were operated due to acute appendicitis, was about 25-50% [2]. Negative laparotomy was not observed in any of our cases. Giorgakis *et al.* specified that fetal mortality that developed due to acute appendicitis in pregnant women was 5% and maternal mortality was approximately 1% and if perforation had occurred, these numbers increased to 20% and 4%, respectively [4]. Perforation or mortality was not observed in any of our patients.

Regardless of the anesthesia method applied in pregnant women for whom appendectomy is planned, it is not possible to eliminate all the risks even when all the required precautions are taken [15]. General anesthesia was applied to nine patients (69.2%), spinal anesthesia was applied to one patient (7.7%) and epidural anesthesia was applied to three patients (23.1%) and no complications related to anesthesia were observed.

Prophylactic tocolysis application is contradictive in the pregnant women who are diagnosed with acute appendicitis and its routine application is not recommended [16]. Prophylactic tocolysis was applied to five patients (38.5%) as recommended by the Obstetrics and Gynecology Department. No maternal or fetal loss, preterm action, wound infection or postoperative ileus were observed in any of the patients.

Conclusion

The occurrence of pregnancy-related complications delays the suspicion and diagnosis of acute appendicitis in women

complaining of stomach pains, and thus mortality and morbidity risks increase. To prevent or minimize this, anamnesis should be assessed (by the same medical staff member) by correlating the repeated physical examination findings, laboratory and USG findings. It was found to be suitable to apply routine USG to every pregnant patient with suspected acute appendicitis. Concern over maternal or fetal complications, which may occur due to an unnecessary surgery, should not cause the delay of the required surgical treatment. Delay and complications in treatment may be reduced via the coordinated follow-up of General Surgery and Obstetrics and Gynecology Departments.

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