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Appendicitis and Pregnancy: A 06 Case Series with Literature Review

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Received: June 14, 2024; **Published:** June 28, 2024

Abstract

Introduction: We carried out this study to describe, thanks to our experiences, the epidemiological profile as well as the main problems encountered in the face of acute appendicitis, emphasizing the clinical, paraclinical, anesthetic and therapeutic particularities in a gravid woman as well as the limits and risks of the classical diagnostics tools during pregnancy.

Methodology: This is a retrospective study of cases of acute appendicitis during pregnancy in the gyneco-obstetrics department II CHU Hassan II Fez during a period from January 2014 until December 2017.

Results: The average age in our study was 26.5 years. The frequency was significantly high in the 3rd trimester (50%). The clinical examination was often confusing, hampered by the pregnancy. The most common clinical signs were: abdominal pain (83.33%) and fever (66.66%). Biological exams are an additional diagnostic tool, allowing to affirm or deny the diagnosis. Ultrasound was requested in all our patients revealing an aspect in favor of simple acute appendicitis which was used as the first-line examination. Treatment was surgical in 66.66% of our patients. The postoperative outcome was favorable in all patients.

Conclusion: The occurrence of acute appendicitis during pregnancy constitutes a real problem. The diagnostic difficulty is major and the delay in therapeutic care favors the occurrence of maternal and fetal complications.

Keywords: *Acute Appendicitis; Pregnancy; Management*

Introduction

Acute appendicitis is the most common non-obstetric surgical indication in pregnant women, but remains rare with an incidence of 1/500 to 1/635 [1]. Acute appendicitis most often occurs during the 2nd trimester of pregnancy following the anatomical changes that occur during this period [1], because the appendix is pushed upwards as the fetus grows and the uterus enlarges. The clinical diagnosis of acute appendicitis in pregnant women is often modified, which can wrongly direct us towards other etiologies. We then find defense and pain with the brutal decompression of the right iliac fossa but the pain at the Mac Burney point may be absent [2,3]. Additional examinations are necessary to make the diagnosis of acute appendicitis, mainly ultrasound and biological assessment [4,5]. The curative treatment of acute appendicitis remains appendectomy either by laparoscopy or laparotomy which obviously has less advantage than the previous one but which takes its place in our context. And for this, prevention of the threat of premature birth is required. Acute appendicitis in pregnant women presents a major problem requiring cooperation between different specialties in order to provide better maternal-fetal care.

Our work is based on a retrospective study of a series of 6 cases of acute appendicitis during pregnancy within the gyneco-obstetrics II department at the Hassan II Fez University Hospital spanning 4 years, from January 2014 until 'to December 2017. This study aims to describe the clinical, biological, radiological, therapeutic and progressive particularities of acute appendicitis during pregnancy, as well as to assess the risks it can cause to the mother and the fetus.

Methodology

This is a retrospective study of acute appendicitis during pregnancy, about 7 cases collected in the Gyneco-obstetrics II department, Hassan II University Hospital of Fez, over a period spanning from January 1, 2014 to 31 December 2017.

Patient characteristics were collected from follow-up records at the hospital on the day. For this reason, an exploration sheet was established to list the epidemiological, clinical, paraclinical, therapeutic and evolving parameters of each patient in our series. We then processed the data in Microsoft Word and Microsoft Excel.

Results

Acute appendicitis during pregnancy represents 0.104% of pregnancies (high-risk pregnancies, cesarean sections and vaginal deliveries) admitted to the gyneco-obstetrics department II of the Hassan II University Hospital over 4 years (2014 - 2015 - 2016 and 2017).

Over 4 years, acute appendicitis during pregnancy represents 1,038% of at-risk pregnancies (GAR) hospitalized in the gyneco-obstetrics department II, CHU Hassan II (Table 1).

Year	Number of cases	Number of hospitalised cases	Percentage
2014	1	1638	0,061%
2015	3	1482	0,202%
2016	1	1313	0,076%
2017	1	1302	0,076%
Average	1,5	1433,75	0,104%

Table 1: *Frequency of appendicitis during pregnancy in our series.*

In our series the average age of parturients was 26.5 years with extremes of 19 and 34 years, including 50% between 19 and 21 years and 50% between 28 and 34 years.

The distribution according to parity showed an equality between primiparous and pauciparous women of 50% (Table 2).

Parity	Number	Percentage
Primipara	3	50%
Pauciparous	3	50%
Multipara	0	0%
Total	6	100%

Table 2: *Distribution according to parity.*

The majority of our patients come from an low socio-economic background, of which 83.33% are housewives.

In our series, the maximum number of acute appendicitis was during the third trimester between 29 and 35 weeks, with a percentage of 50%.

Parturients with a monitored pregnancy represent 50% of cases.

Analysis of the history of the patients in our series revealed the following results:

- None of the parturients in our series presented: High blood pressure or diabetes.
- A patient operated on for a cyst.
- A patient who had a miscarriage.

The course of the current pregnancy was apparently normal in all our parturients (Table 3).

	History	Age	Married or not	Parity	Social eco-nomic level	G.E	Prenatal follow ups	Pregnancy history
Patient 1	None	19	Married	Primipare	Low	16w +1d	No	Normal
Patient 2	None	32	Married	Pauciparous	Low	2 months	No	Normal
Patient 3	None	34	Married	Pauciparous	Low	35W	Yes	No information
Patient 4	None	21	Married	Primipare	Low	13W +6D	Yes	Normal
Patient 5	None	19	Single	Primipare	Low	7 months	No	Normal
Patient 6	Miscarriage operated for ovarian cyst	28	Married	Pauciparous	Low	7 months	Yes	No information

Table 3: *Epidemiological characteristics and patients history in our study.*

G.E: Gestational Age.

The clinical presentation of acute appendicitis in our series was associated with: pain in the right iliac fossa in 83.33% of cases followed by fever in 66.66%, vomiting in 16.66% and the threat of premature delivery in 16.66% cases (Figure 1).

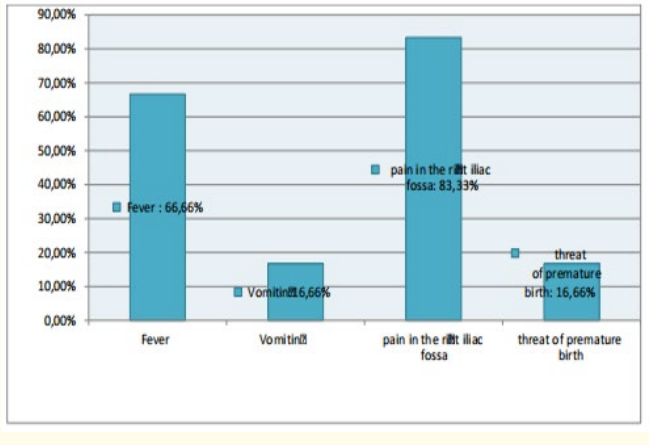

Figure 1: *The clinical signs of appendicitis in our series.*

All patients received an ultrasound. On the latter, all patients had signs suggestive of appendicitis, in all cases an active pregnancy with: One case of mono chorionic twin pregnancy and one case with transverse presentation.

Surgical treatment was deemed necessary in 4 patients, thus relying on an appendectomy by laparotomy: One patient underwent a mini laparotomy with drainage of a pyo-ovarium; The three other patients benefited from a laparotomy with Mc Burney incision although one patient was pregnant in the 1st trimester, the second in the second and the last and third. In our series, one patient was discharged against medical advice and therefore did not benefit from treatment.

Thanks to surgical and medical treatment, 50% of cases had complete remission, including disappearance of pain, apyrexia and absence of threat of premature birth. One patient suffered a complication, a pyo-ovarium which was treated surgically and the outcome was favorable.

Discussion

Acute appendicitis during pregnancy is a rare condition, however it remains the most common non-obstetric surgical pathology in pregnant women [1]. For some, the high level of progesterone during pregnancy promotes A.A, by reducing intestinal mobility [6]. The rarity of acute appendicitis during pregnancy has been reported by several studies: according to Mahmoudian., *et al*. [7], analyzed the results of 1,283,500 pregnancies, from 26 studies, over a period of 30 years. Finding then a rate of acute appendicitis during pregnancy ranging from 0.05 to 0.07%. We made the same observation, notably a low prevalence of acute appendicitis during pregnancy.

The frequency of acute appendicitis is high among parturients aged 20 to 30 years [1,11]. This data would be linked to the fact that women are more fertile during this period of genital life on the one hand and on the other hand, this age group can be superimposed on the section of the general population most affected by acute appendicitis. In our study, the average age of parturients was 26.5 years. Most studies reveal a higher occurrence rate of acute appendicitis during the second trimester of pregnancy [1,8-10]. According to Davoodabadi., *et al*. [18], the occurrence rate of A.A was higher during the third trimester. In our series, 50% of women became pregnant in the third trimester, compared to 33.33% in the second trimester and 16.67% in the first trimester. Thus, our data matches those of Davoodabadi.

In the majority of studies, the prevalence of acute appendicitis is higher in primiparous patients [12,13]. This data is explained by the average age of onset of acute appendicitis. In our series, 50% of women were primiparous and 50% were pupiparous.

Abdominal pain is the main symptom found in the majority of studies. Generally, the pain is located at the level of the right iliac fossa, or less frequently at the level of the epigastrium, periumbilical, at the level of the right hypochondrium [9.14]. According to Tamir., *et al*. [10], the rotation of the appendix under the influence of the gravid uterus gradually moves it away from the viscera and the peritoneal wall, which would reduce the perception of pain and would make its precise location difficult. However, the pain would often be diffuse, without a maximum painful point on examination and would be associated with a high risk of perforation. According to other studies, the migration of the appendix is not accompanied by a change in the clinic, due to an unchanged pathophysiology of the pain pathway [14]. Thus, the pain is located in the right iliac fossa with a maximum McBurney point, whatever the stage of pregnancy [14].

Febrile feeling: In the majority of studies, feverish feeling is not reported. On the other hand, in our study, it is an important symptom with a prevalence of 66.66% among parturients.

Nausea and vomiting: According to studies, the frequency of nausea varies from 33% to 100% and of vomiting from 33% to 71%. In the study by Mahmoodian., *et al*. [14] the rate of patients who experienced nausea was 85%, and that of patients who experienced vomiting was 71%. None of these symptoms are constant. Their appearance in pregnant women in the 1st trimester of pregnancy does not always

alarm the patient or the clinician, however their occurrence in the 2nd and 3rd trimester should attract attention [14]. In our study, only one patient experienced nausea and vomiting. Uterine contractions: A non-specific symptom rarely reported in studies, only 4.5% of patients experienced uterine contractions. In our study, a patient presented uterine contractions with cervical changes. The evolution was favorable under tocolytic and surgical management of appendicitis.

Defense: The progressive stretching of the abdominal wall makes muscular defense difficult to demonstrate. Often absent during pregnancy, the defense has little diagnostic value since it reflects non-specific peritoneal irritation [10]. According to studies, the defense is present in 39% to 80% of cases [15,16]. In our study, one patient during the 3rd trimester presented a diffuse defense while three others presented a localized defense at the level of the IDF with positive Blumberg sign.

An abnormal leukocyte count with a prevalence of 66.66% presented leukocyte levels greater than 15,000/mm^3. CRP confirmed the presence of an inflammatory process in all our patients. She came back high in all cases. According to the authors, the association of a positive ECBU with acute appendicitis is not rare [18] and varies between 5 to 25% of cases. It was positive in three of them, hence the importance of not ignoring an association of appendicitis and pyelonephritis.

The majority of authors agree on the fact that abdominal ultrasound should not be done systematically: However, when the clinic is very in favor of the diagnosis, some authors consider that ultrasound is useless [18,19] and do not should not delay surgery. When the clinical probability is moderate, ultrasound is of particular interest. Thus, reducing the operating time [20] and the rate of 'white' surgery by 7.7% [17]. However, it modifies the therapy in 48% of cases [19]. But does not modify the rate of perforation [9] or postoperative complications or the duration of hospitalization [15]. In our study, abdominal ultrasound was requested by the visceral specialists in all patients showing an appearance of simple acute appendicitis in all cases.

Several studies have looked at the value of CT in diagnosis of A.A in pregnant women, in our study, it was not carried out since the diagnosis of acute appendicitis was made by ultrasound.

Diagnostic laparoscopy is a surgical method that allows a diagnostic approach by visualizing the appendix and specifying its location [20]. It makes it possible to diagnose other causes of abdominal pain such as ectopic pregnancy and to avoid a white laparotomy given that the rate of the latter remains high, between 12% [16], and 27% [17,18]. It is contraindicated beyond the 20th week due to the risk of uterine wound and the fetal risk linked to abdominal hyperpressure and carbon dioxide pneumoperitoneum which would lead to a reduction in utero-placental blood flow [10]. However, some authors believe that laparoscopy is possible in the 2nd trimester and even beyond by exploiting the free space between the previously identified uterine fundus and the xiphoid appendage [8,12]. Laparoscopy is a theoretically dangerous procedure, although the complication rate is low, from 0% [16-18] to 4.5% [9,19]. We must emphasize the need to repeat clinical and paraclinical examinations before making the decision to perform diagnostic laparoscopy. In our study, we do not have experience in diagnostic laparoscopy for acute appendicitis during pregnancy.

The differential diagnoses are numerous [11] and require a careful examination in order to avoid unnecessary laparotomy or to indicate it without delay.

The treatment of A.A must meet two priority objectives: Be effective and rapid to avoid any complications and not expose the embryo or fetus to risk. The laparoscopic intervention allows minimal mobilization of the uterus, so as not to traumatize it and trigger a PAD [14].

Medical treatment is always associated with surgical treatment. In fact, it does not make it possible to treat appendicitis but to avoid certain secondary complications either to the pathology itself or to surgical treatment [13].

Systematic antibiotic therapy for acute appendicitis during pregnancy is widely discussed in the literature. Some authors prescribe it systematically even in cases of simple appendicitis, due to the rapid dissemination of the intra-abdominal infection and the high risk of complications [17], others reserve its use for complicated stages such as appendiceal abscess or peritonitis.

Tocolytic agents act on the contractility of uterine muscle fibers as well as on the maturation of the uterine cervix. Their effectiveness as a preventive measure, pre- or intra-operative, has never been demonstrated. In our series, three patients underwent tocolysis. Two patients received progesterone and one patient received the calcium channel blocker.

The surgical procedure during pregnancy poses several significant problems. The major difficulty in caring for a pregnant woman is that the surgeon must often urgently reconcile the risks linked to digestive pathology and pregnancy on the one hand with those linked to the surgical procedure and anesthesia other hand [1,2]. However, to maintain maternal and fetal safety, a pre, intra and postoperative risk assessment is mandatory. Furthermore, for patients whose anesthetic risk is considered too high, exclusive medical treatment may be offered. However, the lack of response is an indication to intervene anyway due to the risks involved [10].

Appendectomy by laparotomy has long been the surgical technique of reference for the treatment of acute appendicitis in pregnant women [13]. The surgical approach depends on several factors: gestational age, the progressive stage of the appendicitis, the patient's obesity, pre-existing abdominal incisions. On the other hand, in diffuse appendiceal peritonitis, the median incision straddling the umbilicus allows rapid access and careful exploration of the cavity [10-17]. Therefore, whatever the approach or surgical technique used, the appendectomy must be performed as soon as possible [10]. However, in recent years, pregnancy is no longer considered to be a contraindication to laparoscopy. The treatment of A.A can therefore also be done by laparoscopy following the diagnostic procedure [11]. The practice of laparoscopy during pregnancy requires trained teams, with close collaboration between the surgeon and the anesthesiologist.

The maternal-fetal prognosis depends on the severity of the condition and the therapeutic delay [12,17,18]. All our operated patients had simple and favorable postoperative outcomes.

Conclusion

Acute appendicitis occurring during pregnancy is a rare condition whose diagnosis sometimes remains difficult. Diagnosis is often easy in the first trimester and the symptoms are generally the same as outside of pregnancy. On the other hand, in the last two trimesters, the diagnosis can be made late due to a range of differential diagnoses further enriched by pregnancy. All of this contributes to a delay in therapeutic care and the occurrence of maternal and fetal complications. In pregnant women, abdominal-pelvic ultrasound and cytobacteriological examination of urine should be systematic in cases of abdominal pain. Diagnostic doubt requires surgical exploration. Intra-abdominal surgery in pregnant women represents a real challenge for the surgeon and the obstetrician. It must be delicate, neither rushed nor delayed and must be carried out according to a codified protocol. Maternal and fetal mortality has decreased thanks to progress made (antibiotic therapy, surgical techniques, intensive perioperative monitoring).

Conflicts of Interest

The authors declare no conflicts of interest.

Author Contributions

All authors participated in the care of the patient and in the writing and correction of the manuscript. They all also declare having read and approved the final version of the manuscript.

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Volume 13 Issue 7 July 2024