Laparoscopic appendectomy in early pregnancy. Case report and literature review

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Abstract

Background: Acute appendicitis is the most common surgical disease during pregnancy with potential risk of obstetric complications if not treated promptly. The approach of surgical resolution has been controversial over the years since the introduction of laparoscopy. The open procedure is currently being displaced by laparoscopic procedure during any trimester of pregnancy, but there are reports in the literature about postoperative complications such as injury of gravid uterus and fetal loss, more important in the first trimester of pregnancy.

Clinical case: In this study we describe a case of 27-year-old female diagnosed with acute appendicitis and 4.3 weeks of pregnancy confirmed by ultrasound. The patient was operated by laparoscopy at the Xoco General Hospital, Secretaría de Salud, Mexico City, finding an edematous appendix with abscess at the tip and an increased uterine size evident in laparoscopy; appendectomy and cavity drying were performed. The patient evolved without abdominal or obstetric early complications in the postoperative period.

Conclusions: Laparoscopy is a safe procedure during the first trimester of pregnancy. Postoperative results are adequate and do not affect either mother or neonate in the long term.

Key words: Appendicitis, pregnancy, laparoscopy.

Introduction

In 1/500-635 patients, non-obstetric conditions may arise during pregnancy requiring surgical intervention for their resolution. The most common are acute appendicitis, acute cholecystitis and intestinal obstruction.1 Acute appendicitis manifests itself in 1/1500 pregnant patients and constitutes the most frequent condition requiring surgery during pregnancy.2,3 In Mexico, appendicitis is the most frequent cause of acute abdominal pain and represents 47.79% of all emergency surgical admissions. It affects males more than females (1.2-1.7:1) and is more frequent in the second and third decades of life.4,5 Currently, the open vs. laparoscopic approach continues to be controversial, despite having been shown that laparoscopic appendectomy (LA) is a safe and reliable treatment for nonobstetric surgical diseases in pregnant patients and, especially, in early stages of pregnancy.3,6 However, there are reports of injury to the pregnant uterus with fetal loss.8

We report the case of a 27-year-old patient treated in the General Hospital Xoco of the Secretary of Health (Mexico) with ultrasound diagnosis of acute appendicitis and pregnancy of 4.3 weeks of gestation, which was treated by LA with optimal results during postoperative follow-up. No subsequent abdominal or obstetric complications were reported.

Clinical Case

The case we report is a 27-year-old female without any significant past medical history. Obstetric/gynecological history reports six pregnancies, three births, two abortions, and no cesarean section. The patient experienced amenorrhea for 4 weeks from the date of the last menstruation. The manifestations appeared 24 h prior and were characterized by progressive abdominal pain, burning in the right lower quadrant and periumbilically that progressed for 8 h to a colicky type pain. It became constant and increased in inten-
sity, radiating to the right iliac fossa without exacerbating symptoms. Pain was accompanied by nausea and vomiting of food contents. The patient also had fever that was not quantified and chills, but denied any urinary or gynecological symptoms. Physical examination found the abdomen distended with increase in uterine volume at 4 cm above the symphysis pubis, pain on superficial and deep palpation in the right iliac fossa with positive McBurney, Rovsing, Lanz, Capurro, Psoas, Obturador, Von Blumberg and talopercussion signs, diminished frequency of peristalsis. Paraclinical studies on admission reported leukocytosis of 16,000/mm³ and 90% neutrophils. The use of x-rays was avoided because of the history of amenorrhea and an ultrasound was carried out that revealed a pregnancy of 4.3 weeks gestation, with images suggestive of inflamed appendix, free fluid in the cul de sac and right gutter (Figure 1). Based on the clinical and paraclinical data characteristic of acute appendicitis, the surgical team opted for carrying out a laparoscopy under general anesthesia. Karl Storz® (model 222010 20) laparoscopic equipment with optics and high-definition monitor was used. Under general balanced anesthesia, the introduction of the first port (12 mm) was done transumbilically under direct vision using Hasson technique. A 30° scope with 10 mm lens was used. Two additional ports were placed: one on the left flank (5 mm) and the other on the right flank (12 mm), both under laparoscopic vision (Figure 2). A pneumoperitoneum was created with an intraabdominal pressure of 12 mmHg at 4°C with CO₂ with an insufflator at 3 l/min (thermoflator 264320 20). The position of the side ports was determined in both flanks due to an increase in uterine volume and possible superior displacement of the appendix towards the right gutter. A basic laparoscopic instrument was used (Maryland dissector), 5- and 10-mm Babcock clamps, laparoscopic cut, knot pusher, and Harmonic scalpel.) Maternal PCO₂ was monitored with a capnograph, with a mean of 34 mmHg during the intraoperative period. IV antibiotic prophylaxis was given with 1 g ampicillin for 8 h. Thromboprophylaxis was provided with an elastic compressive bandage of the lower extremities and administration of 40 mg of enoxaparin s.c. 1 h prior to the procedure and until the patient’s discharge. During the period of anesthesia there were no periods of uterine activity. The immediate intraoperative fetal heart rate was 146 beats/min corroborated with ultrasound.

Intraoperative findings were as follows: increase in uterine volume and free seropurulent fluid (Figure 3). The edematous, hyperemic pelvic appendix was located with an abscess at the tip (Figure 4). The mesoappendix was dissected and the appendiceal artery was coagulated with harmonic scalpel and was ligated at its base with an extracorporeal knot with non-absorbable material (Figures 5 and 6). The surgical specimen was removed and the cavity was dried and the surgery was completed with a total time of 15 min. Two weeks later the histopathological results were re-
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Figure 3. In initial laparoscopy, increase in uterine volume and free seropurulent liquid are demonstrated.

Figure 4. Macroscopic appendicular inflammation: hyperemic appendix, edematous and with abscess in the tip.

Figure 5. Treatment of the mesoappendix with extracorporeal ligature in the base.

Figure 6. Appendiceal cut with harmonic scalpel and extraction of surgical specimen.

The immediate postoperative period was without any obstetrical problems or data of uterine activity. There were no surgical complications and 72 h later the patient was discharged with a good clinical status, tolerating oral feeding, initiating ambulation, and without data of uterine activity. Follow-up was done at 4 and 10 weeks later. During both examinations the patient was found to be in optimal clinical status without evidence of obstetrical or abdominal postoperative complications and the pregnancy progressed in a satisfactory manner.

Discussion

Epidemiological Considerations of the Appendix

Saunders and Milton reported in a series of 48,482 laparotomies performed in pregnant patients, with ovarian cysts and appendicitis being the most common causes. Preoperative diagnosis was correct in 53% of the cases and 62% of the laparotomies were necessary. The remaining 38% were nontherapeutic and the range of fetal loss in this series was 23%.\(^\text{10}\) Initially the McBurney incision was done for the abdominal approach, with lengthening of the incision.\(^\text{11,12}\) King and Anderson\(^\text{12}\) prescribed progesterone to decrease the risk of premature labor.

The incidence of acute appendicitis in the general population is between 12 and 28%, with greater prevalence in the third decade of life. In women, the incidence is 6.7%,\(^\text{13}\) and in pregnant women from 0.15-2.10/1000 pregnancies.\(^\text{1,6}\) In the U.S., it is shown that 20% of the women with a diagnosis of acute appendicitis had a laparoscopic procedure,\(^\text{14}\) a resource that is used each time with greater frequency and

ported, which confirmed the purulent appendix with partial necrosis of the mucosa.
has been implemented in pregnancy because it is a minimally invasive surgery that has proven its safety in surgical treatment of uncomplicated acute appendix.

Ito et al.13 found that negative appendectomies in pregnant women are not free of risk. Therefore, they insist that when the suspicion is high, diagnosis must be supported by an ultrasound or computed tomography.

**Diagnosis of Appendicitis in Pregnancy**

Even though the current laparoscopy results are promising, the diagnosis of appendicitis in pregnancy remains a challenge, especially if the patient is unaware if she is pregnant and there is only the clinical suspicion in the initial interview. In addition, acute appendicitis has an atypical presentation when it is associated with pregnancy and the most common symptoms are usually nausea, vomiting, and clinical data suggestive of peritonitis.16,17 Without a careful diagnosis, one can have a wide range of negative appendectomies that may range from 30-50% in pregnant women.17 The sensitivity and specificity are different depending on the procedure used. Ultrasound has a sensitivity of 86% and a specificity of 81% for the detection of appendicitis in children and adults. Computed tomography has a sensitivity of 77-100% and a specificity of 83-100% for the diagnosis of appendicitis. The latter cannot be used during pregnancy because the exposure to ionizing radiation exceeds the limits permitted in pregnancy and therefore the risk of congenital malformations and neoplasms increases in neonates exposed to radiation. For this reason, ultrasound in patients with suspected appendicitis and pregnancy, especially in the 1st and 2nd trimesters is of great use and efficacy.17,18

**Epidemiological Considerations in Laparoscopy**

Wei et al.19 carried out a meta-analysis to compare LA with open appendectomy (OA) in the general population. In general terms, laparoscopy took 10.71 min more in time than OA. For hospital costs, the differences were not significant for both procedures. With regard to postoperative complications the incidence of wound infection was significantly lower for laparoscopy, but there was no difference between both procedures for intraabdominal abscesses or postoperative ileus. The hospital stay was reported to be shorter for LA than for OA.

Pearl et al.2 stated that laparoscopy can be performed safely during any trimester of pregnancy and gestational age of the fetus. In case of complications such as premature labor, for the procedure to be a complete success with a live fetus, it should be between 26 and 28 weeks gestational age. Lemieux et al.20 analyzed 45 cases of pregnant patients with appendicitis and in that series 33% were intervened during the first trimester, 49% in the second and 18% in the third trimester. Operative time was 48 min, with a mean of 50 min (range: 10-98 min). Of the patients, three had premature labor with a live fetus (8.1%). During postoperative follow-up of 40 patients, fetal loss was 0%, and the rate of conversion to open surgery was 2.2% (one patient) due to an intraoperative uterine perforation. The uterus was repaired at 22 weeks of gestation, the postoperative result was appropriate and the pregnancy went to term.20 McGory et al.21 reported that 4% of pregnant women who had negative appendectomies experienced fetal loss, 2% in patients with uncomplicated appendicitis, and 6% in patients with complicated appendectomies. They also arrived at the conclusion that in pregnant women the negative appendectomies are associated with a high risk of fetal loss similar to that of patients who had LA performed with correct diagnosis of appendicitis. The definitive risk of fetal loss was reported in 23% of negative appendectomies. The same authors reported fetal loss in negative LAs of 7% compared with OA, which was 3%; however, there were 454 patients with LA from this study and 31 patients suffered fetal loss compared with 2679 patients who had OA with 88 patients who had fetal loss due to the higher percentage in patients with LA.21

**Postoperative Period in Laparoscopic Appendectomies**

According to Cash et al.22 the pregnant patients intervened with LA had an adequate postoperative period with absence of uterine activity and transvaginal bleeding. Fetal monitoring progressed with stable vital signs and hospital discharge was satisfactory for both mother and baby. The variables analyzed by Cash et al.22 are the ability to tolerate fluids, ambulation and urination, pain control with oral analgesics (nonteratogenic), hemodynamic stability, adequate respiratory effort, no mental status disorders, and adequate control of nausea and vomiting.22 Choi et al.23 evaluated development of the children from mothers who had appendectomy performed and concluded that all the children in the study had normal motor, sensory and social development for age, up to 3 years of age.

**Safety of Laparoscopic Appendectomy and Special Considerations in Pregnant Women**

LA during pregnancy should guarantee that the pregnancy reach a favorable conclusion for the mother and child, and this safety and reliability is independent of the gestational stage at which the appendectomy is performed. There are reports that LA can be safely performed in the three trimesters and it has been demonstrated that there is risk of
fetal loss in patients with a history of recurrent abortions and uncomplicated appendicitis.\textsuperscript{24} Perforated appendicitis is the most common reason for fetal loss in pregnancy and may affect 20-37.5\% when there is generalized peritonitis, compared with a risk of 1.5\% for uncomplicated appendicitis.\textsuperscript{25} Among the potential complications during LA are as follows: \textit{1)} possibility of uterine injury with the Veress needle or with a trocar; \textit{2)} direct or indirect effects on the fetus and the patient by the CO\textsubscript{2} used for the creation of the pneumoperitoneum; \textit{3)} decrease in the uterine blood flow caused by the pneumoperitoneum, and \textit{4)} poor visualization of the laparoscopic surgical field that prevents injury of the gravid uterus.\textsuperscript{26-32} Among the anesthesia challenges for a successful procedure in these interventions are to maintain an adequate utero-placental flow, avoid and treat hypotension, avoid aorto-cava compression, use regional anesthesia whenever possible, avoid teratogenic anesthesia drugs, provide fetal monitoring and monitor uterine activity.\textsuperscript{33}

In conclusion, in past years, pregnancy was an absolute contraindication for laparoscopic procedures but is now considered safe and reliable for the mother and child due to the low incidence of complications. However, the open approach is still preferred due to the elevation and displacement of the cecum and the appendix by the pregnant uterus and the high suspicion of complicated acute appendicitis. There is scientific evidence that demonstrates that LA is as safe and effective as OA in cases of pregnant patients with uncomplicated acute appendicitis, and it is especially recommended in obese patients due to the accessibility and resolution capacity with low incidence of complications.\textsuperscript{34-40} In the case reported here, the LA performed during the first trimester of pregnancy was a safe and effective treatment option with an appropriate postoperative period for mother and child.

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References