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Research Article

Assessment of Surgical Outcome of Laparoscopic Appendectomy in Pregnant Women

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Abstract

Introduction: Laparoscopic surgery during pregnancy is contraindicated absolutely or relatively through the last 10 years, however laparoscopic appendectomy (LA) still practiced for wome in pregnancy.

Patients and methods: 297 pregnant female diagnosed as acute appendicitis and managed with OA or LA in the emergency unit of the department of general surgery from June 2015 to December 2018.

Results: 162 patients underwent LA, while 117 patients underwent OA. No difference was noticed between both groups regarding the operative duration, fetal and maternal outcomes. However, the group of LA had faster first flatus, shorter inpatient duration than OA patients.

Conclusion: Laparoscopic appendectomy has been distinguished with efficacy and safety operation throughout pregnancy and should be considered a good replacement for open appendectomy.

Keywords: Appendix; laparoscopy; pregnancy; appendectomy

Abbreviations: LA: Laparoscopic Appendectomy; OA: Open Appendectomy; SAGES: Society of American Gastrointestinal and Endoscopic Surgeons

Introduction

Abdominal pain in pregnant females could be caused by variant pathologies that made diagnosing of acute inflammation of appendix in pregnant women is quite difficult problem. Limitation of CT scanning, anatomical and physiological changes during pregnancy like physiological leukocytosis that could be associated with pregnancy were also contributing factors for difficult diagnosis [1]. Acute inflammation of appendix is the most common problem not related to pregnancy requiring urgent operative interference in pregnant women with an incidence between 0.05% and 0.13% [2]. The rate of complications in acute inflammation of appendix is much more increased in pregnant females [3]. Late recognition increases hazards of complications to the mother and her fetus when acute inflammation is in suspicious, so immediate intervention is better [4]. Laparoscopic appendectomy during pregnancy is recommended in the first and second trimester. Regarding the third trimester no clear guidelines for performing laparoscopic appendectomy [5]. The benefits of laparoscopic appendectomy over open appendectomy are less postoperative pain, early discharge, less risk for wound infection and giving feasibility for laparoscopic abdominal exploration [1,6]). In the current study, we assessed the feasibility and efficacy of laparoscopic appendectomy (LA) in pregnant females.

Patients and Methods

It is a retrospective study which was acheived in the casuality of the general surgery department, Elsahel Teaching Hospital and Helwan University teaching hospitals from June 2015 to December 2018. 279 pregnant women were included in this study. All of them

were complaining of pain in the abdomen lower and right with or without fever, suggesting acute appendicitis. All patients underwent perioperative obstetric consultation and fetal monitoring. Complete blood count and pelvi-abdominal ultrasound were carried out to confirm the diagnosis and assess pregnancy. All pre-operative data including age, history of previous section, gestation age at operation and accuracy of the diagnostic U/S were recorded. Also, all operative data including the surgery duration, return time to normal bowel movement, inpatient length, postoperative complications and final pathology were recorded. Obstetric data and data of the fetus including the incidence of preterm labor, type of delivery, and fetal mortality were also recorded.

Technique of laparoscopic appendectomy (LA) in pregnant female

Procedure has been done while patient is supine and tilted slightly to the left side (20°-30°). The procedure was done using general anesthesia with maintained continuous end tidal volume CO_2 monitoring. Insertion of Foley catheter was also practiced and using of pneumatic compression devices on the legs. A prophylactic antibiotic was administrated. Also, prophylactic tocolysis were administrated. We performed the operation by insertion of three ports. The first one supra-umbilical 10mm portion respect to the uterus dimentions (3-4cm higher than the uterine upper level) for the camera was inserted by open method (HASSON method) to avoid injury of the uterus. Another two working 5mm ports were inserted in both sides depending on the gestation age. Pneumoperitoneum by co_2 was adjusted to be (10-12mm Hg). The appendix was elevated and the mesoappendix was divided using the bipolar diathermy or harmonic scalpel. The stump of the appendix was ligated by an endo-loop or intracorporeal stitches. Retrieval of the appendix in a glove was done through the umbilical port site. A drain was inserted to be removed after 1-2 days postoperative (Figure 1).

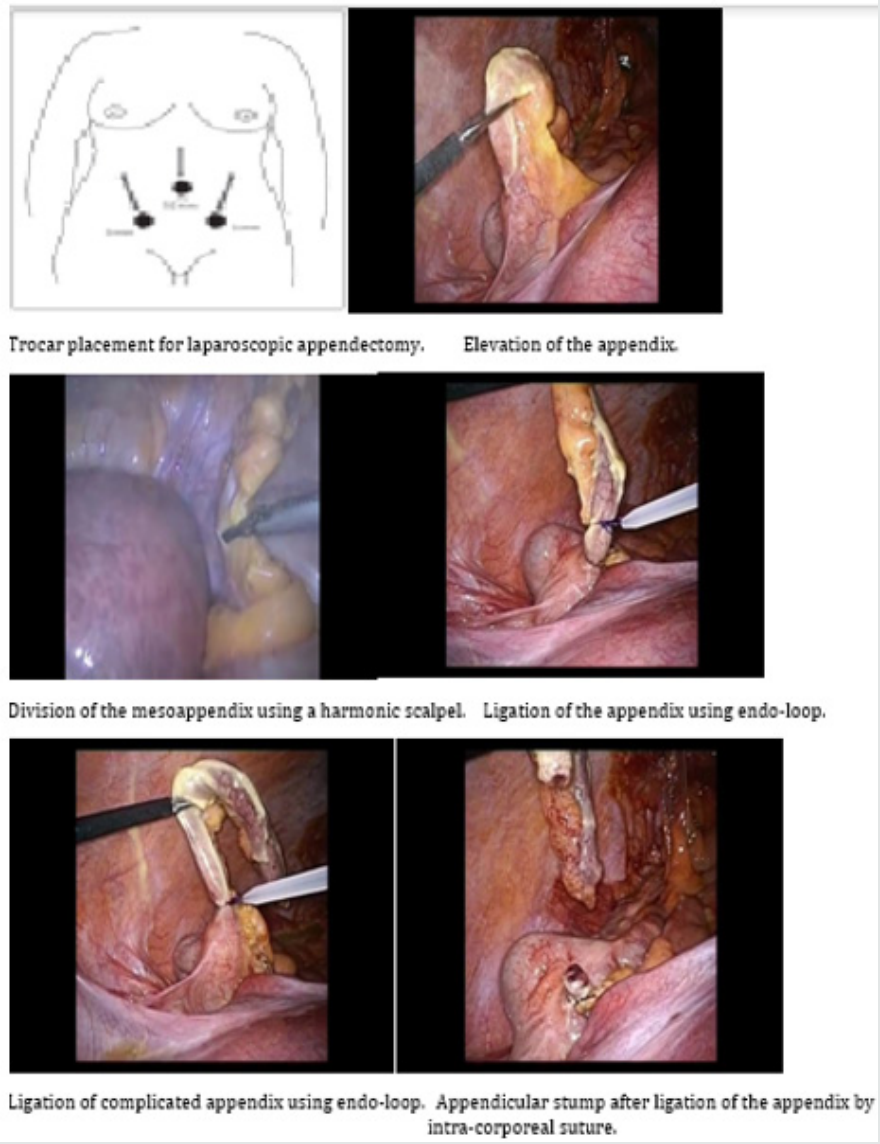

Figure 1: Laparoscopic appendectomy in pregnant female.

Statistical Analysis

Data are presented in the forms of means ± standard deviations. Comparison between patient groups was done using the Mann-Whitney *U* test or χ^2 tes. Using of SPSS version 14.0 for all statistical comparisons, and results at $p < 0.05$ were considered significant.

Results

279 pregnant patients were selected for our study. 162 patients underwent laparoscopic appendectomy (LA), while 117 patients had an open appendectomy (OA). The mean age of the laparoscopic appendectomy (LA) patients' group has been 26 ± 2.8 years and that of the OA patients' group was 29.2 ± 3.2 years. There were no significant variations) in BMI or the gestational age before surgery between the two groups. Regarding all patients, 63 patients (36 LA and 27 OA) were in the 1st trimester, 144 patients (99 LA and 54 OA) were in the 2nd trimester, and 8 patients (27 LA and 45 OA) were in the 3rd trimester. In all patients, pre-operative ultrasound was done with a false positive rate (16.13 %) and false negative rate (12.9%) for all patients (Table 1).

Table 1: Preoperative demographic and clinical data.

Perioperative Data	LA (162 patients)	OA (117 patients)	P value
Age	18-29 (26 ± 2.8) yrs.	23-35 (29.2± 3.2) yrs.	0.7*
BMI	23.4 ± 3.1	23.1 ± 2.8	0.366*
Gestation age at operation	18.4 ± 6.2 weeks	18.6 ± 5.4 weeks	0.317*
1st trimester	36(22.22%)	27 (23.08%)	
2nd trimester	99 (61.11%)	45 (38.46%)	0.342**
3rd trimester	27 (16.67%)	45 (38.46%)	
Previous CS	36 (22.22%)	72(53.85%)	0.069**
Pre-operative U/S	162(100%)	117 (100%)	
False positive	18 (11.11%)	27 (23.08%)	0.764**
False negative	18(11.11%)	18 (15.38%)	

* t-test p-value ** chi-square test p-value

Regarding the final histopathology of the appendix, in the laparoscopic cases normal appendix was presented in 18 patients, acute suppurative in 90 cases, while complicated appendix was presented in 54 cases. In open cases, normal appendix was presented in 27 patients, acute suppurative in 54 cases, while complicated appendix was presented in 36 cases (Table 2) [7]. The duration of surgery in LA in this study was 40± 18.4 minutes, and in the OA was 45± 15.6 minutes. The time of the first flatus and the time of starting oral fluid were earlier in LA. Postoperative complications occurred in three patients. Nine patient developed intra-abdominal abscess occurred two weeks after a laparoscopic appendectomy. They were treated with application of pigtail US-guided and antibiotics. They completed their pregnancy and delivered a healthy baby. 18 patients developed wound infection after an open appendectomy, was managed with repeated dressing and antibiotics (Table 3).

Table 2: Preoperative demographic and clinical data.

Trimester	Final Histopathology	LA (162 patients)	OA (117 patients)
1st trimester	Normal appendix	0	0
	Acute suppurative appendix	27	18
	Complicated appendix	9	9
2nd trimester	Normal appendix	9	18
	Acute suppurative appendix	63	18
	Complicated appendix	27	9
3rd trimester	Normal appendix	9	9
	Acute suppurative appendix	0	18
	Complicated appendix	18	18

Table 3: Operative data of laparoscopic appendectomy (LA) and open appendectomy (OA) while pregnancy.

Outcomes	LA (162 patients)	OA (117 patients)	P value
Operative duration	40 ± 18.4 min	45 ± 15.6 min	0.284*
Time to 1st flatus	1.4 ± 0.5 days	2.7 ± 1.2 days	1*
Time to oral fluid	2.2 ± 0.4 days	4.1 ± 1.9 days	1*

Length of hospital stay	3.2 ± 1.8 days	5.9 ± 2.6 days	0.9*
Complications	9 (pelvic abscess)	18 (wound infection)	0.361**

* t-test p-value ** chi-square test p-value

In our study, no mortality and all patients had uncomplicated deliveries. 9 patients had a preterm labor healthy baby. The two groups had the same results regarding the fetal outcomes with no problems or morbidity (Table 4).

Table 4: Operative data of laparoscopic appendectomy (LA) and open appendectomy (OA) while pregnancy.

Outcomes	LA (162 patients)	OA (117 patients)	X2 P value
Preterm labour	9 (5.56%)	0	9
C.S delivery	117 (72.22%)	81(69.23%)	0.856
Vaginal delivery	45 (27.78%)	36 (30.77%)	0.856

Discussion

The most common abdominal surgery during pregnancy for non-obstetric causes is acute appendicitis and the incidence equals that of nonpregnant women, diagnosis is not easy due to the physiologic and anatomic diferences that happened while pregnancy [8]. The prevalence of acute inflammation of appendix does not appear to be higher in pregnancy, but the incidence of complications during pregnancy is higher than in general [3]. Complications may cause morbidity of both fetus and mother up to loss of the fetus, hence pregnant females had to undergo immediate surgery when appendicitis is suspected, irrespective of the gestational age [9]. Acute appendicitis can present at any trimester, but half of the cases can be seen on the 2nd trimester an observation that published by Kapanet al. In our study more than half of the cases were presented in the 2nd trimester. But in a study of Kazar et al. and Mazze et al. they observed that the most accurate diagnosis for acute appendicitis was during the first trimester [10,11].

It was known that the change in the physiology and the anatomy while pregnancy made the recognition of acute inflammation of the appenex difficult in pregnant females [7]. The number of normal appendices after laparoscopic and open surgery while pregnancy ranges from 0% up to 50% and 15% up to 50% in a respective manner. In the current study, the negative appendectomy percentage has been 16.13 % (45 patients) it was 11.11 % (18 patients) in LA and 23.08% (27 patients) in OA. In a study by Jun Chul et al. the all negative appendectomies percentage was 9.8% (9.1% for the laparoscopic appendectomies and 10.3% for the open appendectomies) [7]. In our study, there was no conversion of laparoscopic to open because the operation is done by a highly experienced laparoscopic surgeon. Walsh et al reported 1% as a rate of conversion of laparoscopic to open appendectomy [12].

Imaging are usually used to clarify a difficult clinical situation. Ultrasonography has been used frequently as a first-line diagnostic tool because it is safe for the mother and her fetus and it is highly sensitive and specific for many intraperitoneal events. In the current study, U/S has been done in whole patients; acute inflammation of appendex was found in 77.78 % (126 females) in laparoscopic appendectomy (LA) and was found in 69.23 % (81 females) in open appendectomy (OA). In a study by Jun Chul et al; acute appendicitis has been found in 15 (68.2%) patients in the laparoscopic appendectomies and 28 (71.8%) in the open appendectomies [7]. In last decades, the preferred treatment for acute inflammation of appendex while pregnancy was open appendectomy. But so recently laparoscopic appendectomy could be done in pregnant women with good results for both mother and her fetus [13]. Our study supported the safety of LA; the outcomes of LA and OA were the same. Also, many benefits of LA, including good intraoperative visualization, lesser operative trauma, less manipulation of the uterus, postoperative hospital stay is shorter and return to work is faster, which is of more importance in pregnant females [14]. In the current study, laparoscopic group had rapid return of bowel function to normal and stay at hospital is shorter.

The Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) have previously published guidelines concerning laparoscopic procedures while pregnancy [15] and refinements done by Moreno et al [16]. A pneumoperitoneum pressure10-12 mmHg is advised as studies done on animals have demonstrated hypercapnia and acidosis of the fetus due to CO2 pneumoperitoneum in pregnancy [15]. In our study, pneumoperitoneum was adjusted to 10-12 mmHg all the duration of the operation. There was high recommendation to put the patient on her left side during operation to facilitate access to the appendix and prevent pressure on the inferior vena cava) [17]. Morrell and colleagues [18] have advicd that operating table should be rotated to the left side to take away the uterus for a better venous return. In the current study, all patients have been put in a supine position slightly tilted to the left side (20°-30°). The most important concern during laparoscopic appendectomy (LA) in pregnancy is a possible risk of injury to the uterus during port insertion. Hasson open technique or the Veress needle can be used to access the abdominal Cavity. Possible complications have been described for both methods but the most serious is inadvertent puncture of the uterus with a Veress needle [19]. Friedman and colleagues [20] had results in a pregnant woman at 21 weeks of pregnancy that underwent laparoscopic appendectomy (LA) for suspected appendicitis. Serosal tear of the

uterus with Veress needle resulted in postoperative pneumoamnion with loss of the fetus. In the current study, we insert camera port supraumbilical 3-4cm above the uterine fundus with open method (HASSON method) according to SAGES guidelines for laparoscopy during pregnancy [15].

Blood stasis in the lower limbs is anticipated in pregnant women, so pregnant females are more susceptible to thromboembolic events. The SAGES guidelines recommended pneumatic intermittent compression devices to be used during intraoperative and postoperative periods with early ambulation postoperatively to lower the incidence of deep vein thrombosis in pregnant Women [15], and this was applied in the study with no postoperative thromboembolic complications. The risk of preterm labors with any operative interference during pregnancy reported to be 10-15%. The same was observed after laparoscopic or open appendectomies that were reported by Kazar et al. [10]. The overall rate of preterm labors was one patient (3.22%) in LA. In conclusion, laparoscopic appendectomy is distinguished by safety and efficacy throughout pregnancy and had good fetal and maternal outcome like open appendectomy. Added to all the advantages of laparoscopy, laparoscopic appendectomy is associated with short postoperative stay, early restoration of function of bowel and low incidence of trauma to the gravid uterus.

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