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Original Research Article

A cohort comparative study between laparoscopic and open appendectomy in pregnant women

Srujan Kumar Bellapu*

Department of General Surgery, Malla Reddy Institute of Medical Sciences, Suraram, Quthubullapur, Hyderabad, India

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***Correspondence:**
Dr. Srujan Kumar Bellapu,
E-mail: srujanjoins@gmail.com

ABSTRACT

Background: Despite the initial absolute contraindication of laparoscopic surgery during pregnancy, in the last decade, laparoscopic appendectomy (LA) has been performed in pregnant women but to compare the outcomes of LA compared with open appendectomy (OA). The objective of the study was to evaluate the safety and efficacy of LA compared with OA in pregnant women.
Methods: A cohort study was conducted among pregnant women with a diagnosis of acute appendicitis who were undergoing LA or OA between June 2013 to July 2014. Pre-operative data and post-operative complication were monitored. Epi-info 7 was used for analysis.
Results: Sixty patients (20 LA and 40 OA) enrolled in our study. There were no significant differences in duration of surgery, postoperative complication rate and obstetric outcomes, including incidence of preterm labour, delivery type. The mean time to normal bowel movement in the LA group was significantly shorter than that in the OA group. Also, the mean time to adequate oral intake in the LA group was earlier than in the OA group (2.1±0.4 d v. 4.1±1.8 d, p=0.02). Duration of hospital stay in the LA group was 4.1±2.6 days, and that of the OA group was 6.6±3.2 days (p=0.04).
Conclusions: Laparoscopic appendectomy is a clinically safe and current procedure in all trimesters of pregnancy and should be well-thought-out as a standard treatment alternative to OA.

Keywords: Laparoscopic appendectomy, Open appendectomy, Cohort, Preterm labour

INTRODUCTION

Acute appendicitis is the most common non-obstetric state requiring emergency surgery during pregnancy, with an estimated incidence between 0.05% and 0.13%.[1] Though the incidence of acute appendicitis during pregnancy is parallel to that in non-pregnant women, the rate of complicated appendicitis is much higher in pregnant women.[2] Delay in diagnosis increases the risk of complications in the mother and fetus. When acute appendicitis is suspected, an aggressive approach is recommended.[3] In non-pregnant patients, the advantages of laparoscopic appendectomy (LA), including reduced postoperative pain, fewer wound infections, earlier hospital discharge and faster return to work, are widely accepted.[4] Despite the initial absolute contraindication of laparoscopic procedures during pregnancy, in the last decade LA has been performed in pregnant women. Several reports have predicted the feasibility, safety and effectiveness of LA in pregnant females. However, there is very limited information on the outcomes of LA compared with open appendectomy (OA).[3-5] Therefore, the rationale behind this study was to investigate clinical outcomes to evaluate the safety and efficacy of LA compared with OA in pregnant women.

METHODS

A cohort comparative study was conducted in Department of Surgery and Obstetrics and Gynaecology of Tertiary care centre between June 2013 to July 2014. Pregnant women with a diagnosis of acute appendicitis who were undergoing LA or OA were included in the study. Consecutive sampling Technique was used for selecting the required sample size. Total 60 patients (20 LA and 40 OA) were selected. Written informed consent was obtained from all the study participants. The study was approved by Institutional ethics committee.

Ultrasounds and complete blood counts (CBC) were routinely obtained preoperatively. The diagnosis of acute appendicitis was confirmed by clinical examination and ultrasonography. We retrospectively analyzed the medical records to compare the 2 groups. Preoperative clinical data included age, body mass index (BMI), gestation age at operation, perioperative data included the duration of surgery, return to normal bowel movement, return to adequate oral intake, length of stay in hospital (LOS), postoperative complications and final pathology. Obstetric data included gestation age at delivery, incidence of preterm labour, delivery type. The patient was placed on the table in the supine position with a slight left side tilt (20°-30°). We performed the procedure with the patient under general anesthesia and maintained continuous end-tidal CO_2 monitoring within the physiologic range (30-40 mm Hg). Routinely, we inserted a Foley catheter, used pneumatic compression devices on the legs and administered prophylactic antibiotics intravenously before the incision.

Statistical analysis

Recorded observations presented as means±standard deviations. SPSS version 14.0 was used for all statistical comparisons, and $p<0.05$ is considered statistically significant. Analysis was done using the Mann-Whitney U test or χ^2 test, as appropriate.

RESULTS

As per Table 1, sixty patients enrolled in our study. In all 20 patients who had LA, the procedure was completed laparoscopically while 40 had OA. The mean age of the LA group was 29.2±3.8 years, and that of the OA group was 30.6±4.2 years (p=0.41). There were no significant differences in BMI (21.6±2.8 v. 22.4±3.4, p=0.81). In the LA group, 5 (25%) patients were in the first trimester, 12 (55%) were in the second trimester and 2 (20%) were in the third trimester. In the OA group, 20 (50%) patients were in the first trimester, 10 (26%) were in the second trimester and 9 (24%) were in the third trimester. The rate of previous Caesarean section in the LA group was 28%, and that of the OA group was 28% (p=0.55). In all patients, we obtained an ultrasound preoperatively to clarify the diagnosis of acute appendicitis.

Table 1: Demographic and clinical characteristics of study participants.

Characteristics	LA (n=20)	OA (n=40)	P value
	N (%)	N (%)	
Age (Mean±SD)	29.2±3.8	30.6±4.2	0.41
BMI (Mean±SD)	21.6±2.6	22.4±3.4	0.81
Previous LSCS	6 (28)	12 (28)	0.55
False+USG	3 (14)	7 (22)	0.42
False–USG	5 (25)	9 (24)	0.11
Gestational age at operation			
1st trimester	5 (25)	20 (50)	-
2nd trimester	12 (55)	10 (26)	-
3rd trimester	2 (20)	9 (24)	-

LA- laparoscopic appendectomy, OA- open appendectomy.

Table 2: Histopathological diagnosis after operation.

Stage and diagnosis	LA (n=20)	OA (n=40)
1st trimester	4 (20%)	8 (20%)
Normal appendix	2	1
Focal appendicitis	1	4
Suppurative	1	2
Gangrenous	0	1
2nd trimester	12 (60%)	24 (60%)
Normal appendix	3	6
Focal appendicitis	6	12
Suppurative	2	4
Gangrenous	1	2
3rd trimester	3 (20%)	8 (20%)
Normal appendix	0	1
Focal appendicitis	1	3
Suppurative	2	2
Gangrenous	0	2

Table 2 demonstrates the postoperative histopathological diagnoses in both groups. In the LA group, 5 (9.1%) patients had a normal appendix, 8 (54.6%) had focal appendicitis, 5 (31.8%) had suppurative appendicitis and 1 (4.5%) had gangrenous appendicitis. In the OA group, 8 (10.3%) patients had a normal appendix, 19 (48.7%) had focal appendicitis, 8 (25.6%) had suppurative appendicitis and 5 (15.4%) had gangrenous appendicitis.

Table 3: Perioperative outcome in study participants.

Outcome	LA (n=20)	OA (n=40)	P value
Operation time (min)	43.2±16.2	48.4±14.2	0.53
Time of first flatus (d)	2.1±0.2	4.2±2.1	0.03*
Time of oral intake (d)	2.1±0.4	4.1±1.8	0.02*
Hospital stay (d)	4.1±2.6	6.6±3.2	0.04*
Complication rate (%)	1	2	0.22

*p<0.05 is significant.

As per Table 3, the mean duration of surgery in the LA group was 43.2±16.2 minutes, and that in the OA group was 48.4±14.2 minutes. The mean time to normal bowel movement in the LA group was significantly shorter than that in the OA group. Also, the mean time to adequate oral intake in the LA group was earlier than in the OA group (2.1±0.4 d v. 4.1±1.8 d, p=0.02). Duration of hospital stay in the LA group was 4.1±2.6 days, and that of the OA group was 6.6±3.2 days (p=0.04).

Table 4: Obstetric outcomes in pregnant women.

Outcome	LA (n=20)	OA (n=40)	P value
Gestational age at delivery (week)	37.2±1.8	38.2±3.4	0.41
Preterm labour	2	5	0.11
Delivery type			
Vaginal	12	30	0.10
LSCS	8	10	0.46

No patients were lost to follow-up, and they all had uncomplicated deliveries. There were no significant differences in the incidence of preterm labour (2 v 5, p=0.11) or delivery type (p=0.46) between the groups as per Table 4.

DISCUSSION

Acute appendicitis is the most common cause of non-obstetric abdominal surgery during pregnancy and its incidence is analogous to that in non-pregnant women, the diagnosis is difficult because of the anatomic and physiologic changes that occur during pregnancy.[5]The risk for appendicitis does not appear to be increased by pregnancy, but the incidence of perforated appendicitis in pregnant women is much higher than in the general population.[2]The reported rate of appendiceal perforation during pregnancy can be as high as 43%, compared with 19% in the general population.[1] Complicated appendicitis can lead to maternal and fetal morbidity and even fetal loss, so pregnant women with suspected appendicitis should undergo surgery immediately, regardless of the gestation age of the fetus.[6,7] Conventionally, the treatment of choice for acute appendicitis during pregnancy has been OA. But there is no evidence that the benefits of OA outweigh those of LA in pregnant women with respect to perioperative morbidity and mortality. It has been recommended to position the patient on her left side during surgery to prevent uterine compression of the inferior vena cava and to facilitate access to the appendix.[9] Morrell and colleagues have suggested lateral rotation of the operating table to displace the uterus for better venous return. In our hospital, all pregnant patients were placed in a supine position with a slight left side tilt (20°-30°).[10] There is consensus that laparoscopic procedures are safest in the second trimester of pregnancy because the uterus, owing to its small size, is less susceptible to traumatic injuries. Some authors have suggested that laparoscopic procedures performed during the first trimester are usually associated with greater risk for fetal loss because of teratogenicity of medications and decreased uterine blood due to the pneumoperitoneum.[11] However, Upadhyay and colleagues demonstrated that laparoscopic surgery in the third trimester of pregnancy is feasible and can be performed safely, and they recommended laparoscopic surgery in all 3 trimesters. In our study, LA was performed safely in all 3 trimesters without fetal mortality.[6] The CO_2 used for pneumoperitoneum is associated with pulmonary effects in pregnant women and a potential risk for acidosis in the fetus. It has been recommended that intra-abdominal pressure should be maintained at less than 12 mm Hg to avoid worsening pulmonary physiology in pregnant women.[12] Previously published animal studies reported no adverse fetal effects of CO_2 insufflation when the maximal intra-abdominal pressure was limited to 10-12 mm Hg for less than 60 minutes.[8] Although studies have demonstrated that laparoscopic surgery can be performed safely during any trimester with good maternal outcomes, the long- term effects on the child after delivery have not been well studied.[12] In the present study, intra-abdominal pressure was maintained at 10-12 mm Hg and the duration of surgery was less than 60 minutes.

CONCLUSION

LA is safe and effective in all trimesters and that it is associated with good maternal outcomes like those of OA. In addition, LA is associated with shorter postoperative LOS, earlier recovery of bowel function and shorter time to oral intake. LA in pregnant women should be measured as a standard treatment alternative to OA. Further assessment comparing LA with OA, are needed to confirm these results.

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