

## LAPAROSCOPIC VS OPEN APPENDICECTOMY: WHAT'S THE BEST FOR PREGNANT PATIENTS

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### ABSTRACT

**Objective:** To compare the post-operative outcomes in pregnant patients with appendicitis undergoing laparoscopic versus open appendectomy.

**Study Design:** Comparative prospective study.

**Place and Duration of Study:** Surgery Department, Qazi Hussain Ahmed Medical Complex, Nowshera Pakistan, from Jan 2018 to Dec 2019.

**Methodology:** This study consisted of patients with acute appendicitis during pregnancy who were presented to Surgery Department or referred to it from Obstetrics and Gynecology Department. Patients were divided into 2 groups: Group A had patients who underwent Laparoscopic appendectomy and Group B had patients who underwent Open appendectomy. Postoperative outcomes in both groups including fetal loss, preterm delivery, operative time and surgical complications were observed. The *p*-value of <0.05 was considered significant.

**Results:** Total of 90 pregnant women were included. Group A consisted of 44 cases and 46 patients were in Group B. The mean maternal age was  $24.5 \pm 5.2$  year (Group A) and  $23.5 \pm 4.2$  years (Group B). About 30 patients (33.33%) were in the first trimester, 38 (42.22%) in second while 22 (24.44%) patients were in the third trimester. Wound infection occurred in two patients in Group B (*p*=0.08). Fetal loss occurred in one patient in Group A and in 3 patients in Group B (*p*=0.09). Hospital stay was significantly shorter in Group A ( $1.4 \pm 1.9$  days).

**Conclusions:** Laparoscopic appendectomy is safe with low incidence of post operative maternal as well as fetal complications.

**Keywords:** Appendicitis, Laparoscopy Appendectomy, Open Appendectomy, Pregnancy.

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### INTRODUCTION

Acute appendicitis is the most common cause of abdominal pain having incidence between 7-9%. Appendectomy is one of the most commonly performed surgical procedures. McBurney originally described the open operation to appendectomy. For the last 100 years it is one the standard treatment for acute appendicitis due to its safety. Since the introduction of laparoscopy, it has been used increasingly for appendectomy procedure as it is less invasive approach, first reported by Semm *et al.*<sup>1</sup> Although laparoscopic appendectomy (LA) has gained much popularity but still it is not much popular among some surgeons as compared to open appendectomy (OA).

Acute appendicitis remains as one of the most common indication for surgical emergency in general population as well as in pregnant women affecting from 1 in 800 for pregnancies worldwide. Acute appendicitis when occurs during pregnancy is the most common non-obstetric cause requiring urgent surgical

intervention.<sup>2</sup> Surgical intervention of acute appendicitis in pregnant patients is first line treatment either with open or laparoscopic appendectomy, just like general population. There are a number of advantages of laparoscopic technique like less postoperative pain, little hospital stay, faster recovery, reduced cosmetic issues and reduced postoperative ileus rate, and hence seems to be preferred method for treating appendicitis in the general population. Despite of some contraindications LA has been performed in pregnant women from the last decade.<sup>3,4</sup>

Abdominal pain during pregnancy can be caused by wide variety of obstetric and non-obstetric pathology that make diagnosis of acute appendicitis a quiet challenging problem. Limitation of CT scanning, natural pregnancy related anatomical and physiological changes like leukocytosis associated with pregnancy are also contributing factors for difficult diagnosis.<sup>2,5,6</sup>

For a pregnant patient having acute appendicitis has multiple implications like poor pregnancy outcomes such as fetal loss, preterm labor, as well as perinatal mortality.<sup>5,7</sup> Perforation one of the deadliest complication of untreated appendicitis has reported rate of

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fetal loss to be 20% as compared to 1.5% for appendicitis without complications. Delay in the diagnosis and treatment of acute appendicitis increases complications both in the mother as well as in fetus.<sup>8,9</sup> Hence we have evaluated clinical outcomes of a laparoscopic appendectomy compared with Open appendectomy in pregnant women.

## METHODOLOGY

This comparative prospective study consisted of pregnant women with suspected acute appendicitis from January 2018 to December 2019, presented to Surgery Department or referred to it from Obstetrics and Gynecology Department because of suspected acute appendicitis at Qazi Hussain Ahmed Medical Complex Nowshera. Universal sampling technique was used for sampling.

Diagnosis of acute appendicitis was made after complete evaluation through detailed history, physical examination, laboratory investigations (CBC, LFTs, urea and creatinine), Alvarado Scoring and abdominal ultrasonography.

**Inclusion criteria:** Alvarado scoring includes Migratory pain (1 point) Anorexia (1 point), Nausea (1 point), Tenderness (2 points), Rebound tenderness (1 point), Elevated temperature (1 point), Leukocytosis (2 points) and Shift of white blood shift to left (1 point). The score of 7 or more confirms the diagnosis of appendicitis

**Exclusion criteria:** Patients with liver diseases like cirrhosis and coagulopathy, generalized peritonitis, large abdominal wall defects, small bowel laparotomies previously done and ascites, severe cardiac and pulmonary diseases were excluded.

Ethical committee approval (H15REA156/QHAMC) and written consent were taken before conducting the study. Patients were classified randomly through lottery method into two groups: Group A having patients who underwent laparoscopic appendectomy (LA) and Group B consisted of patients with open appendectomy (OA).

Surgical procedure was started with antibiotic prophylaxis given at time of induction of general anesthesia. Laparoscopic and open appendectomies were performed under general anesthesia. A urinary catheter and Pneumatic compression devices were applied to all patients.

Hasson's open approach was performed for pneumoperitoneum through supraumbilical transverse incision (in early pregnancy) and 3-4 cm above the palpable uterine fundus in late pregnancy, opening

the abdominal wall layers and peritoneum and 10 mm port was inserted. Tilting of the patient 20-30 degrees to the left side was done to create more space for laparoscopic approach and prevent inferior vena cava compression.

Carbon dioxide gas was adjusted to be below 12 mmHg to avoid fetal hypercapnia. LA was done by the same surgical team using standard ports, with telescope positioned at the umbilicus. Two ports were inserted in the left and right lower quadrants. Inflamed appendix was visualized in the abdominal cavity. The mesoappendix was cauterized with harmonic scalpel and the base ligated with 2 vicryl loops.

The appendix was delivered in a laparoscopic bag. For complicated appendicitis, a drain was left in place. Open appendectomies were performed through a McBurney's incision which was modified according to advanced gestational age. Prophylactic tocolysis was not given to any of our patients. The appendix was sent for histo-pathological examination. Both groups were compared for fetal loss, operative time, days of hospital stay, preterm delivery, conversion to open procedure and other surgical complications.

Data was analyzed using SPSS-17. Mean and SD were used for quantitative data while numbers and percentages (%) were used for qualitative data. Level of significance in quantitative variables was found using Student t-test while we used Chi square to analyze qualitative variables. *p*-value of  $\leq 0.05$  was considered statistically significant.

## RESULTS

This study included 90 pregnant women. Patients were randomly assigned into two groups: Group A consisted of 44 cases who underwent LA and 46 patients in Group B who underwent OA. In Group A, the mean maternal age was  $24.5 \pm 5.2$  year and while it was  $23.5 \pm 4.2$  years in Group B.

Out of 90 total patients, 30 patients (33.33%) were in the first trimester, 38 (42.22%) patients were in the second trimester while 22 (24.44%) patients were in the third trimester. Patients presenting in 1st, 2nd and 3rd trimester in Groups A and B are shown in table-I.

**Table-I: Trimester wise distribution of study population (n=90).**

Variables		Group A, (n=44)	Group B, (n=46)
Age	Mean	24.5 $\pm$ 5.2 year	23.5 $\pm$ 4.2 years
	Range	18-38 years	17-35 years
Trimester	1st	16 (36.3%)	14 (30.4%)
	2nd	18 (40.9%)	20 (43.47%)
	3rd	10 (22.7%)	12 (26.08%)

Operative time between Group A and Group B (mean op. time was  $44 \pm 16$  min vs.  $42 \pm 12$  min) was slightly different with longer in Group A. Wound infection was found in two patients in Group B (5%). Fetal loss occurred in only one patient in Group A (4.5%) and in about 3 patients in Group B (10%). In patients of Group A, the hospital stay was significantly reduced ( $1.4 \pm 1.9$  days) as compared to Group B ( $3.4 \pm 1.1$  days) as shown in (Table-II).

**Table-II: Post operative outcomes of appendicectomy in study population (n=90).**

Variables	Group A (n=44)	Group B (n=46)	p-value
Operative time Mean + SD	$44 \pm 16$ min	$42 \pm 12$ min	
Hospital stay. Mean + SD	$1.4 \pm 1.9$ days	$3.4 \pm 1.1$ days	
Fetal loss	1 (4.5%)	3 (10%)	0.09
Wound sepsis	-	2 (5%)	0.08

No intra-operative complication was seen in study population during the study period. Similarly pre term delivery was not found in either group. Negative appendicitis was found in 4 cases in Group B with 1 case in 1st trimester and 3 in 3rd trimester in Group B (Table-III).

**Table-III: Pathological intra operative findings of study population (n=90).**

Variables	Group A (n=44)	Group B (n=46)
Inflamed appendix	44 (100%)	42 (91.3%)
Normal appendix	-	4 (8.6%)

## DISCUSSION

The most common cause of abdominal pain in pregnancy is acute appendicitis and is one of the most important causes to impact fetal and maternal health.<sup>10</sup> Appendicitis in pregnancy has almost similar incidence to that of general population (0.05-0.13%).<sup>11</sup> Difficulty in diagnosing in this situation is due to natural physiological and other changes that occur during pregnancy. It is because of lack of diagnostic tests which results in increased rate of appendix complicated with perforation during pregnancy about 43% as compared to general population which is 19%.<sup>12</sup> Perforated appendicitis alone increases the risk of preterm delivery. Kazim *et al* and Aggenbach *et al*. reported risk of preterm delivery to be between 8% and 33%.<sup>13,14</sup> Although in present study we didn't observe any perforation and pre term delivery.

For the diagnosis of appendicitis, proper use of diagnostic imaging resulted in a decreased negative appendicectomy rate to approximately 1-3%.<sup>15</sup> The most accurate diagnosis for acute appendicitis can be done during first trimester as stated by Thomson *et al*.<sup>16</sup> Acute appendicitis in pregnant patients can be treated with surgical intervention including open as well as laparoscopic approach, just like general population. Zhang *et al* showed in a study that laparoscopic appendicectomy during pregnancy is feasible in all trimesters. Laparoscopic surgery in pregnant patients has almost similar and comparable results as to non pregnant patients.<sup>17</sup> During first two trimesters laparoscopic approach is more used so as to look for alternative diagnosis while in the third trimester, guidelines are less clear.<sup>18</sup>

In our study, maternal and fetal outcomes were almost similar and approach to one another just as reported by Alkatary *et al* and Pederson *et al*.<sup>19</sup> Eom *et al* reported rate of conversion of laparoscopic to open appendicectomy to be 1%.<sup>20</sup> While in our study, no case was converted from laparoscopic to open appendicectomy. Prodromidou *et al*. reviewed 20 studies and reported that the length of stay of LA was shorter a day to that of OA.<sup>21</sup> Similarly in our study, hospital stay in LA group was shorter as compared to OA.

Postoperative histology of the removed appendices reported 4 cases of normal appendix in OA group however studies reported negative appendix during pregnancy between 20-45%.<sup>22</sup> Rate of negative appendicectomy as reported by Bhandari *et al*. came to be 21.4% in their pregnant patients.<sup>23</sup> While in present study only single patient presented in 1st trimester had a normal appendix.

## CONCLUSION

LA can be performed safely in all three trimesters of pregnancy provided surgeons are experienced. It is as safe as well an effective technique to treat acute appendicitis presented with pregnancy. It also provides shorter hospital stay. Therefore it can be performed as alternative to open surgery in pregnant patients.

**Conflict of Interest:** None.

## Author Contribution

KHK: Proposed and wrote the manuscript, WYK: statistical analysis, ZK: references, MS: data collection.

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