

Benefits, Drawbacks and Precautions of Performing Laparoscopy and Laparotomy in Management of Benign Adnexal Masses in Pregnant Women; A Comparative Study

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Abstract

Surgical management strategies of benign ovarian cysts diagnosed during pregnancy include cyst resection, ovarian excision, or salpingo-oophrectomy but the best surgical procedure is still controversial. Using laparoscopic assisted methods has been extensively used in management of many gynecologic related diseases in non-pregnant women. Previously, performing laparoscopic surgeries for management of benign ovarian cysts during pregnancy was limited to only case reports, case series and retrospective studies.

Aim of the study was to compare between laparoscopic and conventional open surgery for management of benign adnexal cysts in pregnant women, regarding; pregnancy outcome, benefits and drawbacks on mother and fetus, operative and perioperative details.

Patients and methods

We included 80 pregnant females with benign ovarian cysts who were eligible for the study, splitting them in to 2 cohorts each group contain 40 patients the first cohort underwent laparoscopic excision of the ovarian cyst and the second cohort underwent conventional laparotomy for management of the ovarian cysts.

Results

We found statistically significant differences between both studied groups regarding the overall costs of the operation as; anesthesia, surgery, and materials costs and in comparison with laparotomy, the laparoscopy related costs associated were higher ($p < 0.001$). We found that duration of post-operative hospital staying was shorter in laparoscopy group than laparotomy group ($p < 0.001$). The rate and duration of antibiotic prophylaxis was lower in laparoscopy group than laparotomy group ($p < 0.001$). The rate of wound healing was higher in the laparoscopy group. The postoperative fever rate and degree of maximum temperature was less in laparoscopy group than laparotomy group ($p = 0.005$).

Conclusion

We concluded that performing laparoscopic assisted surgical procedure for excision of benign ovarian cystic masses in pregnant women lead to less blood loss, shorter hospitalization better wound healing with no increased risks of fetal or maternal complications than laparotomy. Although laparoscopy has higher costs but it was more accepted by the patients as it is minimally invasive.

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Introduction

The incidence of occurrence of benign adnexal masses encountered during pregnancy is increase and they are most probably benign; the commonest subtype is corpus luteum cyst that mostly disappeared before the 2nd trimester in ninety percent of cases, after which come the serous cysts and benign cystic teratoma that are the most common histopathologically diagnosed subtypes. The incidence of ovarian malignancy encountered during pregnancy is very rare; about 1 in 25,000 pregnancies. Ovarian tumors diagnosis and its related patients morbidity during pregnancy is increasing, this is due to refinement and availability of accurate diagnostic procedures in addition to increased incidence of performing assisted reproductive techniques. There are many hazards for many mothers and fetus of any surgical interventions during pregnancy particularly in emergencies as fetal death and premature labor. But if pregnant women are complaining of acute pelvic pain due to the presence of adnexal masses larger than six cm in size, surgical excision is highly needed [1-4]. With progression of pregnancy ovarian cysts became more liable to; cyst torsion, leakage or rupture that inversely affected both mother and fetus [5]. Generally speaking surgical management strategies of benign ovarian cysts diagnosed during pregnancy include cyst resection, ovarian excision, or salpingo-but the best surgical procedure is still controversial. Since the 1990s, using laparoscopic assisted methods has been extensively used in management of many gynecologic related diseases in non-pregnant women. Nowadays, laparoscopy was found to be a safe, simple and effective procedure which can be used during pregnancy, with few drawbacks and many benefits as; less postoperative pain, less amount of analgesic use and shorter time of hospitalization [6-8]. But there are still fears about performing minimally invasive surgeries during pregnancy due to limited surgical manipulations, higher liability of perforation of gravid uterus and higher risks of hypercarbia. Previously, performing laparoscopic surgeries for management

of benign ovarian cysts during pregnancy was limited to only case reports, case series and retrospective studies. In the current study we aimed to compare between laparoscopic and conventional open surgery for management of benign adnexal cysts in pregnant women, regarding; pregnancy outcome, benefits and drawbacks on mother and fetus, operative and perioperative details [9-11].

Patients and methods

Patients

We have evaluating all pregnant females that underwent laparoscopic assisted excision or laparotomy for management of benign ovarian cysts who were admitted to Department of Obstetrics and Gynecology, Zagazig University Hospitals in the period between September 2014 and September 2019. After taking a written consent of inclusion in the study we were sure of the presence of complete medical files of the patients the benign nature of the tumor was confirmed clinically, radiologically and pathologically.

Inclusion criteria

Pregnant women with benign ovarian cysts, clinical, radiological and histopathologically confirmed diagnosis.

Patient acceptance to be included in the study.

Patients with good general condition without comorbid condition.

Exclusion criteria

Pregnant females with complicated ovarian cysts needing emergent operations, patients clinically suspected to have borderline or malignant ovarian tumors were excluded to avoid misinterpretation of surgical and pregnancy outcomes by the presence of acute abdominal pain or malignant tumor.

We included 80 pregnant females with benign ovarian

cysts who were eligible for the study, splitting them in to 2 cohorts each group contain 40 patients the first cohort underwent laparoscopic excision of the ovarian cyst and the second cohort underwent conventional laparotomy for management of the ovarian cysts.

For pregnant patients who underwent laparoscopic assisted excision of the ovarian cyst we have informed them that there is a liability of converting laparoscopic surgery to open surgery in cases of certain operative situations.

Surgical procedures

Preoperative preparations included: complete physical examination, laboratory blood and biochemical tests, radiological evaluation as pelvic ultrasonography, in addition to electrocardiogram were performed. We have obtained a complete surgical history, marital history and allergy history. We have given included pregnant women antibiotic prophylaxis of I.V. cefotiam about 24 hours pre- and post-operatively in case of liability to infection.

Operative details

Laparotomy group

Patients were laid in the supine position. We have applied spinal-epidural anesthesia for laparotomic surgeries. We made an incision about 2 cm above the symphysis pubis or at site of previous scar in the abdomen. The incision length was about 6-10 cm, according to tumor size.

Laparoscopy group

Patients were laid in the lithotomy position.

We have applied general anesthesia for laparoscopic assisted surgeries. We made an incision about 2.5 cm for the hole of 1st puncture at the umbilicus or at a location between the umbilicus and cartilagoensiformis, according to uterine and tumor size.

We introduced a Trocar of about 10 mm in the abdominal cavity, placed the celiac lens into the abdomen and established CO2 pneumo-peritoneum and maintained intra-abdominal pressure at about

10-12 mmHg. Then, we have introduced 3 other Trocars in the abdominal cavity under continuous tips visualization. We have exposed the ovary carefully; we have completely separated and excised the ovarian tumor with, avoidance of the uterus. We have made an ovary suture instead of performing an electric coagulation for ensuring adequate hemostasis.

Postoperative patients' follow-up data

We have observed pregnant women post-operatively in the resuscitation room for about 2 hours, then we sent them back to the wards, observed their pulse, blood pressure and respiratory rate every 0.5 hour using ECG monitors until the first post-operative day. We monitored the fetal heartbeat post-operatively every eight hours. We performed the 1st post-operative ultrasonography about three days after the operation and the 2nd ultrasonography one day before they left the hospital. We followed included patients by telephone after leaving the hospital.

Surgical outcome

We recorded surgical time, intra-operative and post-operative blood loss, occurrence of postoperative urine retention, postoperative temperature, duration of administration of antibiotics prophylaxis, length of the incision, degree of wound healing, length of postoperative hospitalization time and costs.

Pregnancy outcomes

We recorded occurrence of fetal state, uterine contractions, and administration of prophylactic tocolytic therapy, fetal age at delivery, rate of performing caesarean delivery and rate of premature delivery.

Statistical analysis

We have used the SPSS 18.0 program (Chicago, IL, USA) for the statistical analyse of collected data. We used t test for continuous variables, and used chi square test or Fisher test was used for frequency data analysis. $P < .05$ was considered statistically significant.

Results

Demographic results of the study

There were no statistically significant differences

between both studied groups regarding patients age, tumor size (as fined by ultrasound), gestational time at the time of surgery or pre-operative

Variables	Total	Surgical techniques		
		Laparoscopy	Laparotomy	P
	N=80 (%)	N=40 (%)	N=40 (%)	
Age groups:				
<30 years old	50 (33.3)	28 (60)	22 (40)	0.439
>30 years old	30 (66.7)	12 (45)	18 (55)	
Previous surgical history:				
Absent	65 (50)	30 (66.7)	35 (33.3)	0.068
Present	15 (50)	10 (33.3)	5 (66.7)	
Size of tumor (cm) by ultrasound				
< 8 cm	60(75)	30 (55.6)	30 (44.4)	0.311
≥ 8 - 15 cm	20 (25)	10 (47.6)	10(52.4)	
Gestational age at operation:				
1ST trimester	20 (20)	8 (66.7)	12 (33.3)	0.041
2nd trimester	50 (60)	35 (44.4)	15 (55.6)	
3rd trimester	10 (20)	2 (50)	8 (50)	
Symptoms:				
Absent	40 (20)	30 (66.7)	10 (33.3)	0.641
Abdominal pain	30 (60)	8 (44.4)	22 (55.6)	
Vaginal bleeding or discharge	10 (20)	2 (50)	8 (50)	
Site:				
Left	35 (36.7)	20 (36.4)	15 (63.6)	0.47
Right	25 (43.3)	15 (61.5)	10 (38.5)	
Bilateral	20 (20)	3 (50)	17 (50)	
Histopathological subtype:				
Mature cystic teratoma	40 (23.3)	20 (42.9)	20 (57.1)	0.991
Endometriotic cyst	10 (13.4)	6 (50)	4 (50)	
Serous cystadenoma	15 (20)	10 (50)	5 (50)	
Mucinous cystadenoma	8 (23.3)	4 (57.1)	4 (42.9)	
others	7 (20)	4 (50)	3 (50)	
Surgical method:				
Salpingo-oophrectomy	35 (33.3)	5 (50)	5 (50)	0.958
oophrectomy	20 (20)	3 (50)	3 (50)	
cystectomy	15 (16.7)	2 (40)	3 (60)	
others	10 (30)	5 (55.6)	4 (44.4)	
Margin status:				
Free	16 (86.7)	13 (50)	13 (50)	1
Invaded	4 (13.3)	2 (50)	2 (50)	
Operation time:				
Mean ± SD	58.5±25.5	50.5±20.5	55.5±25.5	0.09
Estimated blood loss (ml)				
Mean ± SD	59.6 ± 32.45	52.6 ± 45.45	49.6 ± 42.45	0.07

∞ Chi square test #Independent sample t test

Table 1: Correlations between Laparoscopy and Laparotomy for Excision of Benign Ovarian Masses in Pregnant Women Regarding Demographic and Pathological Parameters.

Histopathological results of excised ovarian cysts in both groups

We found that the most commonly diagnosed subtypes were; mature cystic teratoma, endometriotic cysts, serous cystadenoma and mucinous cystadenoma. We found no statistically significant differences between both groups regarding histopathological subtypes.

Surgical patients' outcomes and costs

We found statistically significant differences between both studied groups regarding the overall costs of the operation as; anesthesia, surgery, and materials costs and in comparison with laparotomy, the laparoscopy related costs associated were higher ($p < 0.001$).

We found that duration of post-operative hospital staying was shorter in laparoscopy group than laparotomy group ($p < 0.001$) and the patients were more satisfied with that. The rate and duration of antibiotic prophylaxis was lower in laparoscopy group than laparotomy group ($p < 0.001$). The rate of wound healing was higher in the laparoscopy group. The postoperative fever rate and degree of maximum temperature was less in laparoscopy group than laparotomy group ($p = 0.005$). We found no statistically significant differences between both included groups regarding; post-operative blood loss, overall surgical time, occurrence of postoperative urine retention, gestational age at time of delivery, rate of preterm delivery, rates of performing caesarian delivery, weight of the newborn, duration of administration of prophylactic tocolytic therapy or postoperative uterine contraction occurrence.

Variables	Total	Surgical techniques		P
		Laparoscopy	Laparotomy	
	N=80 (%)	N=40 (%)	N=40 (%)	
Postoperative complication				
Absent	65 (80)	35 (45.8)	30 (54.2)	0.651
Present	15 (20)	5 (66.7)	10 (33.3)	
Postoperative wound infection:				
Absent	68 (60)	38 (27.8)	30 (72.2)	0.008*
Present	12 (40)	2 (83.3)	10 (16.7)	
Postoperative blood transfusion:				
Absent	71 (60)	39 (27.8)	33 (72.2)	1
Present	9 (40)	2 (83.3)	7 (16.7)	
Antibiotic prophylaxis				
No	70 (60)	38 (27.8)	32 (72.2)	1
Yes	10 (40)	2 (83.3)	8 (16.7)	
Postop hospital stay (days)				
Mean ± SD	5.37 ± 1.54	2.07 ± 1.84	5.07 ± 1.84	0.005
Delivery time				
Full term	45 (36.7)	30 (36.4)	15 (63.6)	0.02
Preterm	25 (43.3)	10 (61.5)	15 (38.5)	
Spontaneous abortion	10 (20)	0 (0)	10 (50)	

Table 2: Correlations between Laparoscopy and Laparotomy for Excision of Benign Ovarian Masses in Pregnant Women Regarding Postoperative Findings and Patient Outcome.

Discussion

Detailed prospective comparative studies about performing laparoscopy versus laparotomy in pregnant females diagnosed with benign ovarian cysts were limited. As the main priority is avoidance. The main consideration in laparoscopy was that it requires a big amount of carbon dioxide for pneumoperitoneum. Increasing intra-abdominal pressure might decrease uterine blood flow and reduce maternal venous return which could lead to intrauterine fetal hypoxia, additionally trans-peritoneal absorption of carbon dioxide lead to fetal acidosis [12].

In the present study we showed that performing laparoscopic assisted surgical excision of benign adnexal masses during pregnancy have a better surgical outcomes and patients convenience than laparotomy, similarly showed that pregnancy outcomes in laparoscopic group has lower risks of premature labor, shorter duration of hospital staying and lower amount of blood loss in comparison to laparotomy group with open surgery [1, 5, 4, 13]. Moreover they found no statistically significant differences between both included groups regarding; post-operative blood loss, overall surgical time, occurrence of postoperative urine retention, gestational age at time of delivery, rate of preterm delivery, rates of performing caesarian delivery, weight of the newborn, duration of administration of prophylactic tocolytic therapy or postoperative uterine contraction occurrence which is near previous researchers [4, 5, 13]. We showed that laparoscopy has many advantages than laparotomy as reduced antibiotics usage and the less risk of postoperative infection that is more beneficial for mother and fetus that was similar to [1].

Although laparoscopy group encountered a shorter duration of post-operative hospitalization and less analgesic utilization, but due to higher costs of surgical procedures and instruments in laparoscopic assisted surgeries made its costs higher than those of laparotomy. Previous studies showed that spontaneous abortion rate was not different between both laparotomy and laparoscopy patients [4, 6]. These results were in line with our results. Showed that laparoscopy was not associated with increased abortion rates in comparison with laparotomy [14]. Moreover we detected no adverse effects on fetus in case of reaching a maximum pressure pneumoperitoneum of 12 mmHg and the time of less than 30 min similar to results of [1].

Another concern about using laparoscopic assisted surgery

during pregnancy is risk of enlarged uterus injury [15]. We encountered results similar to, that if we placed the initial port using the open method we could decrease liability of perforation of gravid uterus [6]. In our results we found no statistical significance in risks of fetal loss in those underwent laparoscopic surgery and open surgery similarly [16].

Showed that laparoscopy was related to decreased intra-operative blood loss due to better visualization of deep vasculature and shorter duration of hospital stay [17]. Regarding the time of performing the laparoscopic assisted excision of benign ovarian cysts we showed that the 2nd trimester was the best and safest time for performing the operation as the uterine sensitivity is lower, the size of the uterus gives a sufficient space for performing surgery, in addition to the amount of secreted progesterone by the placenta adequately maintains the pregnancy which is near results of [1, 18].

Moreover it was found that during the 1st trimester, great majority of ovarian cysts disappeared and performing any surgical manipulations during this trimester is associated with a higher risk of abortion also huge size of the uterus during third trimester hinder any surgical manipulations and lead to high liability of fetal and material drawbacks [5].

Using anesthesia during the period of pregnancy was found to be safe and feasible taking appropriate precautions [5]. In the present study as the anesthesia was made and adequately monitored by an experienced anesthetist, none of patients included in the study have any complications.

Conclusion

We concluded that performing laparoscopic assisted surgical procedure for excision of benign ovarian cystic masses in pregnant women has many advantages and few drawbacks taking the suitable sufficient precautions. Laparoscopy lead to less blood loss, shorter hospitalization better wound healing with no increased risks of fetal or maternal complications. Although laparoscopy has higher costs but it was more accepted by the patients as it is minimally invasive.

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