

Prophylactic laparoscopic adnexal surgery with low-pressure CO₂ insufflation for ovarian cysts during the late first trimester or second trimester of pregnancy

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Summary

The current guidelines for endoscopic management do not contraindicate laparoscopic surgery in pregnant women; a few studies have reported on this, particularly in Japan. We aimed to evaluate the feasibility of prophylactic laparoscopic adnexal surgery during the late first trimester and second trimester for the prevention of adnexal torsion. We retrospectively reviewed eight patients who underwent laparoscopic surgery for ovarian cysts during the late first trimester or second trimester (April 2012–September 2016). The general protocol of laparoscopically-assisted cystectomy was adopted, with low-pressure CO₂ insufflation (8 mmHg). No complications were noted. Five women delivered; four delivered at term and one delivered preterm owing to premature membrane rupture. Pregnancy is ongoing in the remaining three women. Prophylactic laparoscopic adnexal surgery is safe and feasible for adnexal torsion prevention in women with ovarian cysts during the late first trimester or second trimester.

Key words: Adnexal disease; Insufflation; Pregnancy.

Introduction

Adnexal torsion was reported to occur in 14.84% of pregnant women who were followed-up after the detection of adnexal masses [1]. Thus, the guidelines for obstetric practice in Japan recommend that simple cysts > 10 cm in diameter and dermoid cysts > 6 cm in diameter should be indicated for surgery [2]. While randomized controlled trials have not been conducted to assess the safety and efficacy of laparoscopic surgery in pregnant women, the recommendations put forth by the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) allow laparoscopic surgery to be performed in any trimester [3]. In their nationwide multicenter study, Oelsner *et al.* (2003) also concluded that patients may undergo laparoscopic surgery safely during any trimester without an increased risk to the mother or infant [4]. Furthermore, in a study evaluating the long-term outcomes of laparoscopic surgery during pregnancy, Rizzo (2003) found no growth or developmental delay in the first 8 years of life among children born to mothers who had undergone laparoscopic surgery during pregnancy [5]. The Japan Society of Gynecologic and Obstetric Endoscopy and Minimally Invasive Therapy also recognizes laparoscopic adnexal surgery as a safe procedure during pregnancy [6]. In addition, a recent study reported that rupture or torsion was noted in 60% of women who experienced ovarian cysts in their first trimester of pregnancy [7].

In this context, our hospital adopted a prophylactic strategy that included performing laparoscopic adnexal surgery

during the late first trimester and second trimester for the prevention of adnexal torsion in women with ovarian tumors. With respect to the operative method, we adopted the general protocol of laparoscopically-assisted cystectomy. Additionally, we used CO₂ insufflation at a pressure of 8 mmHg, which is lower than the values reported in the SAGES guideline [3], to potentially minimize the risk of deep vein thrombosis or fetal acidosis. In the present report, we describe our experience with respect to the feasibility and outcomes of laparoscopic adnexal surgery during the late first trimester and second trimester. We expect that this information will be useful when managing ovarian cysts in pregnant non-obese Japanese women who may safely undergo laparoscopic surgery with low-pressure CO₂ insufflation during the late first trimester and second trimester.

Materials and Methods

After obtaining the approval of the Institutional Review Board of our hospital, we retrospectively reviewed the medical records of eight women who underwent laparoscopic surgery for ovarian cysts during the late first trimester or second trimester of pregnancy between April 2012 and September 2016. The requirement of obtaining informed consent from the patients was waived due to the retrospective nature of the study and because the patient identification information was blinded. Diagnosis was established using ultrasound. Theca lutein cysts and simple cysts were reassessed at 10–14 gestational weeks to detect a potential decrease in the cyst size. Cysts containing nodules with

Table 1. — Overview of the clinical and operative details of eight women who underwent laparoscopic adnexal surgery for ovarian cysts during the late first trimester and second trimester.

	Range	Mean	Standard deviation
Age at surgery (years)	26-37	32.1	4
Body mass index (kg/m ²)	17.6–25.9	20.9	7.6
Gravida status	0-2	0.38	0.48
Parity	0-1	0.38	0.48
Gestational week at time of surgery	12-16	13.4	1.4
Anesthesia time (min)	107–150	124.6	15.3
Operation time (min)	60–98	76.8	14.2
Bleeding (g)	≤ 20	3.75	6.96
Hospital stay (days)	6–8	7.4	0.7

blood flow or thick septations (> 3 mm) were not indicated for laparoscopic surgery [8]. Surgery was performed after gestational week 12, at which point progesterone production is expected to switch to the placenta [2, 8].

All surgeries were performed with the patient under general anesthesia. Initial abdominal access was achieved via the umbilicus, using an open Hasson technique. The trocars were placed on either side of the abdomen, laterally to the rectus abdominis and 1–2 cm above the anterior superior iliac spines. Another trocar was placed immediately above the tumor. Insufflation with low-pressure CO₂ (8 mmHg) was applied, and the laparoscope was inserted at an angle of 30° to ensure optimal visualization of both ovaries in the patient in the late first trimester and second trimester. If a dermoid cyst was suspected, surgery was performed with laparoscopic assistance. The ovary was delivered via the trocar on the tumor side, and cystectomy was performed outside the abdominal cavity. After cystectomy and suturing, the ovary was reintegrated into the abdominal cavity. The laparoscope was then reinserted, and the pneumoperitoneum was reestablished for a final inspection, with evaluation of bleeding. After extensive washing with saline solution to remove potential cyst spillage and blood clots, the abdominal cavity was finally inspected for hemostasis and adjacent organ injury. The upper abdominal cavity was also inspected for residual cyst spillage that could cause chemical peritonitis. The drainage tube was typically placed at the Douglas pouch.

The following data were collected: age, gravida/para status, gestational age, cyst type, type of surgery, duration of hospitalization, cyst size, histopathology results, anesthesia time, operating time, and amount of bleeding. We used JMP for Windows, version 10.0.0 (SAS Institute Japan, Minato, Japan), for statistical analyses. The demographic variables are reported as the mean ± standard deviation.

Results

Between April 2012 and September 2016, surgery was originally scheduled for ten patients with ovarian cysts but was cancelled for two patients who exhibited a decrease in the cyst size during follow-up. The operation was suc-

cessfully completed in the remaining eight patients who had been scheduled for surgery.

An overview of the clinical and operative details is provided in Table 1, and the full description of the surgical methods and outcomes for each patient is provided in Table 2. Of the eight patients included in the study, seven underwent laparoscopically-assisted surgery and one underwent total laparoscopic surgery because the tumor was suspected to be a lutein cyst. The pathological diagnosis was dermoid cyst in seven patients and lutein cyst in one patient. In two patients, the drainage tube was removed; however, chemical peritonitis did not develop. In patient #6 we used only two trocars, as this setup seemed adequate. At the time of the surgery, adnexal torsion had already occurred in one patient.

The trocar for the laparoscope was placed at the navel level. In laparoscopically-assisted cystectomy, a 4-cm incision was created in the lower abdomen, on the side of the ovarian cyst; a 5-mm trocar was inserted on the opposite side if a 3rd trocar was needed. When performing total laparoscopic cystectomy, two 5-mm trocars were inserted on both sides of the lower abdomen.

Intraoperative or postoperative complications were not noted. Five women delivered, while pregnancy is ongoing in the other three women. Of the women who delivered, four delivered at term, while one delivered preterm owing to premature membrane rupture. This patient was the only patient who received tocolysis. Tumor recurrence was not noted after delivery. Complications were not noted in any of the delivered neonates.

Discussion

We found that prophylactic laparoscopic adnexal surgery for the prevention of adnexal torsion was safe and feasible during the late first trimester and second trimester of pregnancy. In non-obese patients, CO₂ insufflation at a pressure of 8 mmHg was sufficient and safe, particularly because this pressure is lower than the minimum value specified in the SAGES guideline [3].

Performing prophylactic laparoscopic adnexal surgery during the late first trimester or second trimester of pregnancy may be advantageous because the uterus is relatively

Table 2. — Clinical and operative details of women who underwent laparoscopic adnexal surgery for ovarian cysts during the late first trimester and second trimester.

Patient designation	Type of surgery [†]	Gestational age [‡] of the fetus	Number of trocars	Drainage tube	Pathology	Cyst size (mm)	Complications
Patient 1	TLC	16w6d	3	1	Lutein	86	None
Patient 2	LAC	14w1d	3	0	Dermoid	90	None
Patient 3	LAC	12w2d	3	1	Dermoid	74	None
Patient 4	LAC	13w5d	3	1	Dermoid	62	None
Patient 5	LAC	15w1d	3	1	Dermoid	60	None
Patient 6	LAC	12w1d	2	0	Dermoid	80	None
Patient 7	LAC	13w0d	2	1	Dermoid	65	None
Patient 8	LAC	12w6d	2	0	Dermoid	64	None

[†]LAC: laparoscopically-assisted cystectomy; TLC: total laparoscopic cystectomy;

[‡]Gestational age is expressed in terms of the gestational weeks (w) and days (d) at the time of the surgery.

small, and it is, therefore, easier to perform surgery (even laparoscopic) in this patient population. Moreover, torsion had already occurred in one of our patients, which may have eventually caused acute abdomen later during the pregnancy, as the uterus increased in size. Performing surgery under these conditions would have been more difficult. Our proposed treatment strategy makes it possible to avoid emergent surgery that may require conversion to laparotomy owing to limitations associated with staffing, particularly at night or in smaller hospitals. When prophylactic surgery is performed during the late first trimester or second trimester of pregnancy, the patient can be managed using minimally invasive surgery. A previous study on the surgical intervention for maternal ovarian torsion reported that 60% of women delivered at term [9]. Although we described fewer cases, we found that 80% of the women delivered at term, suggesting that laparoscopic surgery performed during the late first trimester or second trimester may indeed be beneficial in terms of the obstetric outcome.

Adopting a laparoscopic approach provided additional advantages. Specifically, we obtained an optimal field of view of the upper abdominal cavity and could safely and directly remove residual cyst spillage, if necessary. In general, cyst spillage fluid can be removed easily and the condition can be treated more efficiently, if cyst spillage occurs during laparoscopy (rather than during laparotomy) because the pouch of Douglas is better exposed and peritoneal lavage is more effective, thus, ensuring minimal residual spillage [10]. In institutions not familiar with laparoscopic surgery, the surgeons typically avoid laparoscopy because of concerns associated with the risk of spillage. Moreover, in Japan, the distribution of professionals specialized in gynecologic laparoscopic surgery is highly uneven, and such specialists are typically not employed in community health-care centers. However, while previous studies have reported a cyst spillage rate of > 50% associated with laparoscopic management, no case of chemical peritonitis was reported with respect to laparotomy or laparoscopy [11, 12]. Moreover, with increasing skill and experience of the physicians, we were able to perform laparoscopically-assisted cystectomy using only two trocars in one of our patients.

The Japanese guidelines for obstetric management caution against using CO₂ insufflation owing to concerns regarding the risk of fetal acidosis [2]. However, animal studies do not indicate such risks [13]. Moreover, the SAGES guidelines recommend using CO₂ insufflation at a pressure of 10–15 mmHg, with monitoring of end-tidal CO₂ [3]. In our experience of surgery during the late first trimester and second trimester of pregnancy, low-pressure CO₂ insufflation (8 mmHg) was safe and sufficient for achieving an optimal field of view during surgery. It is possible that the lack of adverse events was related to the CO₂ pressure being lower than the minimum value recommended in the SAGES guidelines. A previous study recommended gasless laparoscopy in pregnant patients; however, this technique has not been widely adopted to date [14]. Laparoscopy with CO₂ insufflation is more widely used; we, therefore, used this technique.

The present study has several limitations. First, this was a retrospective study because the randomization of pregnant women is not ethically acceptable. Furthermore, as the procedure was newly introduced in our institute, we have described only a limited number of cases. Finally, we only performed this type of surgery in non-obese women, and obese women were not included in the study. Other reports on this topic also described a few cases of ovarian cyst management during pregnancy and did not evaluate the feasibility and efficacy of prophylactic surgery [15]. Meta-analyses and further studies with larger sample sizes and multi-center sampling are warranted to fully clarify the implications of our findings.

Conclusion

Despite the aforementioned limitations, our study clearly suggested that prophylactic laparoscopic adnexal surgery is safe and feasible for the prevention of adnexal torsion during the late first trimester and second trimester of pregnancy. In non-obese patients, CO₂ insufflation at a pressure of 8 mmHg is sufficient and safe.

Authors' Contributions

K.C designed the research study, performed research, analyzed the data. K.I made revise manuscript. T.K and K.T checked and rewrote manuscript. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

Ethics Approval and Consent to Participate

Ethical approval was obtained from the Institutional Review Board of Jichi Medical University, Saitama Medical Center (approval number: S16-037). The requirement of obtaining informed consent from the patients was waived due to the retrospective nature of the study and because the patient identification information was blinded.

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Conflict of Interest

The authors declare no conflict of interest.

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