

Characteristics and surgical intervention of ovarian torsion in pregnant compared with nonpregnant women

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Abstract

The aim of our study was to compare the clinical and surgical characteristics of pregnant and nonpregnant women with surgically verified ovarian torsion, as well as the differences among 3 trimesters during pregnancy.

We conducted a retrospective study of patients diagnosed with surgically proven ovarian torsion in our hospital from January 2012 to June 2018. The clinical characteristics, surgical procedure, pathologic outcomes, and trimesters of pregnancy were analyzed.

Thirty-three pregnant and 72 nonpregnant patients diagnosed with surgically proven ovarian torsion were assessed during the study period. The most common presenting symptom in both groups was abdominal pain (90.2% and 99.0%, respectively). The median time from admission to surgery was shorter in pregnant patients than nonpregnant patients (5.3 compared with 47.7 hours, $P < .001$). Pregnant patients had a higher number of twists than nonpregnant patients (median of 2 compared with 1, $P < .01$). Benign cyst was the most common cyst causing ovarian torsion in both groups, and luteum cyst was more common in the pregnant group. The mean size of ovarian cyst in pregnant patients was much smaller in the third trimester than the first and the second trimesters (6.6 ± 2.0 , 8.4 ± 2.1 and 8.1 ± 1.5 cm, respectively; $P = .097$). Cystectomy performed in the third trimester was more frequent compared with the other 2 trimesters (77.8%, 26.7%, and 22.2%, respectively; $P = .021$).

Abdominal pain is the most common feature of ovarian torsion. Clinical presentation of ovarian torsion is relatively similar between pregnant and nonpregnant women, and among different trimesters. The tumor size was smaller in the third trimester of pregnancy than the other 2 trimesters of pregnancy. Cystectomy performed in pregnant patients is more during the third trimester compared with the other 2 trimesters.

Abbreviations: ED = emergency department, No. of twists = number of twists.

Keywords: ovarian torsion, pregnancy, surgical procedure, trimester

1. Introduction

Ovarian torsion, which is the fifth most common gynecologic emergency with a prevalence of 2.7%,^[1–3] refers to partial or complete rotation of the ovary and a portion of fallopian tube along its supplying vascular pedicle.^[4] Although ovarian torsion is rare, a missed diagnosis can lead to ovarian necrosis,

subsequent infertility, and spontaneous abortion, so once ovarian torsion is diagnosed, early surgical intervention is not delayed.

This article attempts to investigate and compare the clinical characteristics, surgical procedure, and pathologic outcomes of women with ovarian torsion between pregnant and nonpregnant women. In addition, previous literature reported surgical treat-

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XX and MP contributed equally to this work

Availability of data and materials: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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The authors report no conflicts of interest.

All data generated or analyzed during this study are included in this published article [and its supplementary information files].

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Table 1
Demographic and clinical characteristics of study subjects with ovarian torsion.

Characteristics	Pregnant group n=33 (31.4%)	Nonpregnant group n=72 (68.6%)	P
Age, Mean±SD (range), y	26.8±5.3 (17–39)	30.2±14.5 (7–69)	.199
Previous abdominal surgery, N (%)	6 (18.2)	13 (18.2)	1.000
Past torsion, N (%)	1 (3.0)	0	.314
Primiparous, N (%)	23 (69.7)	40 (55.6)	.145
Abdominal pain, N (%)	31 (93.9)	64 (88.9)	.500
Nausea and vomiting, N (%)	10 (30.3)	32 (44.4)	.202
Fever (>37.5°C), N (%)	0	5 (6.9)	.322
White blood cell count, Mean±SD, cells/mL	11090±2620	8400±3100	<.001
Time from symptom onset to gynecologic ED admission, Median (range), h	12 (0–336)	48 (0–5040)	.162
Time from admission to surgery, median (range), h	5.3 (2–50)	47.3 (11–292)	<.001
Affected side			.532
Left, N (%)	16 (48.5)	30 (41.7)	
Right, N (%)	17 (51.5)	42 (58.3)	
Size, mean±SD, cm	7.8±2.0	9.2±3.5	.031
No. of twists, median (range)	2 (0.5–4)	1 (0.3–4)	.008
Recurrent torsion, N (%)	0	0	

ED = emergency department.

ment of ovarian torsion mainly focused on first trimester of pregnancy,^[5,6] and we also compare differences among 3 trimesters.

2. Methods

This study retrospectively analyzed the discharge data from January 2012 to June 2018 in Fujian Provincial Maternity and Children's Hospital. All patients diagnosed with ovarian torsion on discharge or on surgical records with an *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)* code 620.5 were admitted for our analysis. A total of 105 patients diagnosed with surgically proven ovarian torsion were identified. The surgical types were laparotomy and laparoscopy. The surgical procedures were mostly detorsion with cystectomy or adnexectomy. Data obtained from patients' electronic medical records included clinical characteristics, surgical procedure, and pathologic outcomes.

Data analysis was performed with SPSS version 23 (IBM, New York, NY). All continuous variables were presented as mean±SD or median (range). All categorical variables were presented as numbers (percentage). Student *t* test and Mann–Whitney *U* test were applied for continuous variables with and without normal distribution between the groups. Fisher exact test was used for categorical variables. *P* values <.05 were considered to be statistically significant. The Ethics Committee approval was not required.

3. Results

A total of 105 patients aged 7 to 69 years who underwent surgery to treat ovarian torsion were identified during the study period. There were 33 pregnant women and 72 nonpregnant women, whose mean age were 26.8±5.3 and 30.2±14.5 years, respectively (*P*=.199). The demographic and clinical data are shown in Table 1. The most common presenting symptom in both groups was abdominal pain (90.2% in the pregnant women and 99.0% in nonpregnant women, respectively). The median time from admission to surgery was shorter in the pregnant patients than nonpregnant patients (5.3 compared with 47.7 hours,

P<.001). No differences were observed in 2 groups regarding age, surgical history, childbearing history, other symptoms (such as vomiting and fever) and the time from symptom onset to gynecologic ED (emergency department) admission. Laboratory studies revealed a slight elevation of white blood cell counts in both groups compared with (11090±2620 cells/mL in pregnant patients and 8400±3100 cells/mL in nonpregnant patients, respectively, *P*<.001). The rate of previous abdominal surgery was 18.2% in both groups. The common abdominal surgical history was tubal ligation, cesarean section, and appendectomy. The majority of torsions occurred on the right side (58.3% in pregnant patients and 51.5% in nonpregnant patients, respectively; *P*=.532). The mean size of ovarian cysts were larger in nonpregnant patients compared with pregnant patients (9.2±3.5 and 7.8±2.0 cm, respectively; *P*=.031). Pregnant patients had a higher number of twists than nonpregnant patients (median of 2 compared with 1, *P*<.01).

The surgical procedures used to treat ovarian torsion in study subjects are listed in Table 2. Laparoscopy performed in nonpregnant women was more compared with pregnant women (54.2% vs 15.2%, *P*<.001). Detorsion with cystectomy and adnexectomy were the 2 most common surgical procedures in both groups. Adnexectomy was more common in the pregnant group compared with nonpregnant group (60.6% vs 50%; *P*=.508). Detorsion alone was performed in only 1 nonpregnant

Table 2
Surgical procedures of study subjects with ovarian torsion.

Variable	Pregnant group n=33 (31.4%)	Nonpregnant group n=72 (68.6%)	P
Surgery type			<.001
Laparotomy, N (%)	28 (84.8)	33 (45.8)	
Laparoscopy, N (%)	5 (15.2)	39 (54.2)	
Surgical procedure			.508
Detorsion alone, N (%)	0	1 (1.4)	
Detorsion + cystectomy, N (%)	13 (39.4)	35 (48.6)	
Detorsion +Adnexectomy, N (%)	20 (60.6)	36 (50)	

Table 3
Pathological diagnosis of the ovarian cyst.

Variable	Pregnant group n=33 (31.4%)	Nonpregnant group n=33 (31.4%)
Benign cyst	12 (36.4)	28 (38.1)
Luteum cyst	10 (30.3)	3 (4.2)
Mature cystic teratoma	5 (5.2)	24 (33.3)
Serous cystadenoma	3 (9.1)	3 (4.2)
Mucinous cystadenoma	1 (3.0)	7 (9.7)
Endometrioma	2 (6.1)	1 (1.4%)
Fibrothecoma	0	4 (5.6)
Malignancy	0	1 (1.4%)

patient. No patient had recurrent episodes of ovarian torsion and developed thromboembolism during the study period.

Pathological outcomes are listed in Table 3. Benign cyst was the most common cyst causing ovarian torsion in both groups (36.4% and 38.1% in the pregnant group and nonpregnant group, respectively). However, mature cystic teratoma was more common in the nonpregnant group, whereas luteum cyst was more common in the pregnant group. The remaining pathologies were serous cystadenoma, mucinous cystadenoma, fibrothecoma, and endometrioma. In our case series, one ovarian malignancy was documented.

The comparisons of clinical characteristics and surgical treatment among different trimester are summarized in Table 4. Ovarian torsion occurred most commonly in the first trimester (15/33, 45.4%), whereas it may occur in the second and the third trimester (27.3% in both groups). No differences were observed in age, surgical history, presenting symptom, time from symptom onset to gynecologic ED admission, time from admission to surgery, affected side, No. of twists (number of twists), and

surgical type among 3 groups. The mean size of ovarian cysts in pregnant patients was more smaller in the third trimester than the first and the second trimesters (6.6 ± 2.0 , 8.4 ± 2.1 and 8.1 ± 1.5 cm, respectively; $P = .097$), but this difference did not reach statistical significance. Ovarian torsion occurring in primiparous women during the third trimester of pregnancy was more common compared with the first and the second trimesters (100%, 73.3%, and 33.3%, respectively; $P = .008$). Cystectomy performed in pregnant patients in the third trimester was more common compared with the other 2 trimesters (77.8%, 26.7%, and 22.2%, respectively; $P = .021$).

4. Discussion

Comparison of ovarian torsion between pregnant and nonpregnant women had been described in a few studies. Hasson et al.^[7] presented a case series of ovarian torsion with 41 pregnant women and 77 nonpregnant women, and in that study they found the presentation of ovarian torsion was similar in 2 groups. A case series of 262 women with ovarian torsion, in which 98 were pregnant and 198 were nonpregnant, was published by Ginath et al.^[8] They conclude that recurrence of ovarian torsion occurred more frequently in pregnant women. We also compared the differences between pregnant and nonpregnant women with ovarian torsion, and our results agree with those of the published data. However, we further compare the differences among 3 trimesters.

Ovarian torsion can affect females of any age, but mainly occurs in women of reproductive age.^[3,9] In our study, median age was 26 years; our findings coincided with those reports. At the rate of 69.7% of pregnant patients and 55.6% of nonpregnant patients with ovarian torsion in our study were found to be primiparous women. Previous pelvic surgeries place

Table 4
Clinical characteristics and surgical treatment of study subjects with ovarian torsion by pregnant trimester status.

Variable	First trimester (<12 wk) n=15 (45.4%)	Second trimester (12–28 wk) n=9 (27.3%)	Third trimester (≥28 wk) n=9 (27.3%)	P
Generational age, Mean ± SD, wk	8.3 ± 1.8	17.1 ± 3.8	35.4 ± 3.0	
Age, mean ± SD, y	26.5 ± 5.4	27.1 ± 6.7	26.9 ± 4.0	.953
Previous abdominal surgery, N (%)	3 (20)	2 (22.2)	2 (22.2)	.805
Primiparous, N (%)	11 (73.3)	3 (33.3)	9 (100)	.008
Abdominal pain, N (%)	15 (100)	9 (100)	7 (77.8)	.805
Nausea and vomiting, N (%)	7 (46.7)	1 (11.1)	2 (22.2)	.153
Fever (>37.5°C), N (%)	0	1 (11.1)	1 (11.1)	.412
White blood cell count, mean ± SD, cells/mL	11890 ± 2730	9410 ± 1410	11420 ± 2830	.082
Time from symptom onset to gynecologic ED admission, Median (range), h	12 (4–24)	12 (3–168)	9 (0–336)	.913
Time from admission to surgery, Median (range), h	5.3 (2–50)	4.5 (2–50)	6.3 (2–39)	.982
Affected side				.431
Left, N (%)	4 (26.7)	1 (11.1)	4 (44.4)	
Right, N (%)	9 (60)	3 (33.3)	5 (55.6)	
Size, mean ± SD, cm	8.4 ± 2.1	8.1 ± 1.5	6.6 ± 2.0	.097
No. of twists, Median (range)	2 (0.5–3)	2 (1–4)	2 (0.5–4)	.442
Surgery type				.195
Laparotomy, N (%)	11 (73.3)	8 (88.9)	9 (100)	
Laparoscopy, N (%)	4 (26.7)	1 (11.1)	0	
Surgical procedure				.021
Detorsion alone, N (%)	0	0	0	
Detorsion + cystectomy, N (%)	4 (26.7)	2 (22.2)	7 (77.8)	
Detorsion + adnexectomy, N (%)	11 (73.3)	7 (77.8)	2 (22.2)	

ED = emergency department.

patients at higher risk of ovarian torsion. Houry et al^[10] described a series of 87 patients with ovarian torsion, 40% of whom had a history of pelvic surgery, more than half of which was tubal ligation.

Abdominal pain is the most common presentation in both groups. The longest time from symptom onset to gynecologic emergency department admission was 5040 hours in our series. Sasaki et al^[11] noted the abdominal pain may be constant or intermittent as the result of the fact that the ovary could torse and then detorse with changes in activity. Demographic feature and other relevant presentation were similar. The time from admission to surgery in pregnant women was shorter than in nonpregnant women, as similar to findings of a previous study.^[9] We propose that pregnant women seek medical care sooner because they are more apprehensive to spontaneous abortion and premature labor. Although white blood cell counts of pregnant patients were significantly elevated in our series, like other,^[8] we propose the difference is not clinically significant, as leukocyte counts slightly increase during pregnancy.

Similar to previous studies, ovarian torsion happens more frequently in the right ovary than left.^[12] The fact that the hypermobility of the cecum and ileum on the right side compared with the proximity of the relatively fixed sigmoid colonare was proposed mechanism for this tendency.^[13] As to the size of ovarian cyst which was lager in nonpregnant patients compared with pregnant patients in our study, the speculation is that relatively small space during pregnancy limits the mobility of larger ovarian cyst. In present study, the number of twists in pregnant group was higher. The effects of hormones during pregnancy may have a role in the pelvic ligament weakness.

Conservative management of ovarian torsion by laparoscopy was first reported in 1990.^[14] Nowadays laparoscopy has become more frequently performed during pregnancy^[15]; however, in our present study, laparotomy was the most common treatment in pregnant group, whereas laparoscopy was performed in only 15.2% of pregnant women and 54.2% of nonpregnant women. The rates were far more lower than the rate of 88% in pregnant women and 96% in nonpregnant women reported by Hasson et al.^[7] However, these rates were comparable to the rate of 15.87% in pregnant women and higher than the rate of 24.55% in nonpregnant women reported by Bassi et al.^[16] In that study, 1366 women diagnosed with ovarian torsion among 8,532,163 pregnant women from 2003 to 2011 were analyzed. This discrepancy in incidence may be explained by the fact of fear of excessive uterine manipulation and differences in laparoscopic surgery skills to deal with reduced visual space.

Hasson et al^[7] performed detorsion only for 45% of pregnant women and 42.8% of nonpregnant women, with 19.5% of pregnant women and 9.1% of nonpregnant women experiencing a recurrent episode. Pansky et al^[17] found detorsion only may predispose to recurrent torsion of normal adnexa. For fear of the risk of recurrence, detorsion alone was performed only in 1 nonpregnant women in our study. No one had recurrent episode of ovarian torsion. Some surgeons assume that longer surgical time compromises maternal and fetal outcome. Daykanet al^[18] noted adnexal detorsion with additional surgical procedures did not appear to increase fetal or maternal complication rates.

A review of the literature showed that that most of the cysts in ovarian torsion were benign cystic teratoma.^[19] Luteum cyst was more frequently in pregnant women, whereas mature cystic teratoma was more common in nonpregnant women. Oltmann et al^[20] reported a 1.8% malignancy rate occurred in patients

with ovarian torsion. This rate was higher than in our present study with 0.9% malignancy rate.

Ovarian torsion occurs more frequently in the first trimester, but can occur in the second and third trimesters as well.^[21] Our results did not differ from previous reports. We also found that the symptoms were very similar among three trimesters. Most of the pregnant women were primiparous in the first and the third trimesters; however, only 33.3% of pregnant women were primiparous in the second trimester. The third trimester of pregnancy showed a smaller tumor size than the first and the second trimesters. This maybe explained by the hypermobility of the ovarian tumor decreased with an enlarged uterus. Conservative operation was performed mostly during the third trimester of pregnancy in our study, probably as the concern of wellbeing of fetus decreasing, pregnant women may instead prefer to proceed with more conservative surgical treatment.

This study has several limitations, the major one being its retrospective design and relatively small number of patients. Another limiting factor is that we concentrated on cases with proven ovarian torsion. However, a prospective study is difficult to conduct because of the low incidence of ovarian torsion.

5. Conclusions

In conclusion, abdominal pain is the most common feature of ovarian torsion. Clinical presentation of ovarian torsion is relatively similar in different groups by pregnancy status or pregnant trimester status. Pregnant patients had a higher number of twists compared with nonpregnant patients. The third trimester of pregnancy showed a smaller tumor size than the first and the second trimesters. During pregnancy conservative surgery is more in the third trimester than the other 2 trimesters.

Author contributions

WFW, MP and XX conceived and designed the study; WFW, ZHW, YLX and MP collected and analyzed the data of this study; WFW wrote the manuscript; XX and MP reviewed and edited the manuscript. All authors read and approved the final manuscript.

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