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Original article

## Laparoscopic cystectomy in pregnancy, a viable solution – A 14 years series

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## ABSTRACT

**Study objective:** To evaluate the safety and maternal fetal outcome of laparoscopic surgery in the management of ovarian mass in pregnant women and the usage of analgesia in postoperative period.**Materials and methods:** This is a retrospective cross-sectional study which was carried out at department of O&G, Putrajaya Hospital. A total of 120 cases of ovarian mass in pregnancy between Jan 2000–December 2014 were evaluated. 115 patients had undergone laparoscopy cystectomy/salpingo-oophorectomy. Women's age, parity, gestational age, surgical technique, operative findings and time, estimated blood loss, postoperative hospital stay, post operative pain score, usage of analgesia, complications of surgery, outcome of the pregnancy and histopathology reports were evaluated.**Measurement and main results:** Outcome of the pregnancy and post operative pain score and usage of analgesic were evaluated. The mean gestational week at the time of surgery was 14 weeks 1 day ( $\pm 2$  weeks 1 day). The duration of surgery was 87.4 mins ( $\pm 34.8$  mins) with average blood loss of 110.3 ml ( $\pm 32.0$ ). Median size of ovarian cyst was 6 cm (IQR 2 cm). 2 cases converted to laparotomy. Only 2 cases were reported with second trimester loss which was diagnosed after 4 weeks and 10 weeks respectively. 5 women received tocolytic agent post operatively, all of them delivered at term.The mean length of hospitalization was 1.51 day ( $\pm 0.597$ ). The average gestational age of delivery was 37.78 ( $\pm 3.42$ ) mean birth weight 2.97 kg ( $\pm 0.65$  kg). There was one intrauterine growth restriction baby with birth weight of 1.89 kg at 35 weeks of gestation and another baby with bladder exstrophy with ambiguous genitalia which was not related to surgery. The mean of pain score was 1.5 ( $\pm 1.6$ ) over 10. 87.9% of the women had mild pain which only 64.6% require paracetamol or no analgesia.**Conclusion:** Majority of women with ovarian masses in pregnancy can be treated with ensured safety and reduced morbidity using the endoscopic approach.Copyright © 2017, The Asia-Pacific Association for Gynecologic Endoscopy and Minimally Invasive Therapy. Published by Elsevier Taiwan LLC. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## Background/introduction

While appendectomy and cholecystectomy are the most common surgical procedures performed during pregnancy, the most common gynecologic indication for surgery in a pregnant woman is adnexal pathology, which complicates about 2% of

pregnancy.<sup>1</sup> Most of these adnexal masses were discovered during the first trimester and were functional cysts that resolve spontaneously by the second trimester.<sup>2</sup> The incidence of malignancy is reported between 2% and 6% with persistent masses.<sup>3</sup>

The concern over the potential malignancy and risks which was associated with emergency surgery has led to the decision for elective removal of masses that persist after 12 weeks or are  $\geq 5$  cm in diameter. In the event that surgical intervention was indicated, various case reports support the use of laparoscopy in the management of adnexal masses in all trimester.

The conventional management of adnexal masses in pregnancy was via laparotomy. This involves a huge scar over the abdomen with increase postoperative pain and longer hospital stay. The surgical process will both physically and mentally traumatize most

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women. When these group of women were put in a situation where require a second laparotomy (which is a caesarean section) at the end of their pregnancy, they become more traumatized. This is not in line with our current practice that supports mother safety and mother friendly hospital policies.

Taking this into consideration, we should move away from this traumatizing approach and adapt to minimally invasive surgery (MIS) method. Laparoscopic ovarian cystectomy should be the standard surgical approach to manage benign ovarian cysts in pregnancy. MIS serves the same purpose as the conventional method but with added values of less pain and less emotional and tissue trauma, rapid recovery post operatively and decreases the burden of a big healing wound. MIS reduces postoperative adhesions which in turn reduces risk of intraoperative complications should the women require caesarean section for obstetric emergency.

Thus, evidence does show more advantages gained by the use of laparoscopic technique in treating ovarian masses in pregnancy especially when it is done by a more experienced and skillful surgeon. The common advantages includes lower morbidity, shorter length of hospital stay and reduce the need for long term medical certificate, decreased post operative pain and analgesic requirement, lesser adhesion formation, better cosmetic results, faster recovery and earlier return to normal activity and as functional member of a family. This indirectly reduces the overall cost of care and burden on the health system.

In this study, we will review the adaptation of this miraculous technique in dealing with ovarian masses in pregnancy.

### Purposes/aims

1. To evaluate the safety (maternal fetal outcome) of laparoscopic surgery in the management of ovarian masses in pregnant women.
2. Usage of analgesia in postoperative period

### Materials and methods

A cross sectional study with descriptive analysis of retrospective data collected from the electronic medical records from Hospital Putrajaya Database of all women who underwent cystectomy during pregnancy between Jan 2000–December 2014. All pregnant women with preoperative diagnosis of benign adnexal mass who had undergone laparoscopic approaches where intraoperative finding was confirmed were included. The surgery was done in the second trimester unless there was indication otherwise.<sup>4</sup> Most of the women were referred from primary care for ovarian mass in pregnancy which was detected during dating scan. They will be following up fortnightly until they reached second trimester and another scan will be done during admission. Emergency surgery was indicated for any women presented with acute abdomen with suspicion of adnexal torsion or rupture.

The clinical data of women who underwent laparoscopic cystectomy were retrospectively analyzed. The recorded data consist of woman demographic information and clinical characteristics including age, estimation of blood loss (EBL), and duration of surgery, complications and length of hospital stay. Data gathered is stored using Microsoft excel 2010.

Continuous data will be summarized as mean  $\pm$  standard deviation (SD), and categorical data as number and percentage. Statistical analyses will be performed using SPSS version 20.0 (SPSS Inc., Chicago, IL).

There were no different on the technique performed compared with the non pregnant women such as general anesthesia,

positioning, pneumoperitoneum, irrigation, antibiotic prophylaxis, analgesia and no cervical manipulation done.

An ultrasound scan was done to map the origin and size of the mass. After induction of general anesthesia with endotracheal intubation, woman was placed at a Lloyd Davies position and a metal urinary catheter was inserted to empty the bladder. The uterine fundus was palpated and a Veress needle was inserted through the Palmer's point (2–3 cm inferior to the middle of the last rib) which was preferred for midline scar.

Aspiration was done with a syringe through the veress needle which should not yield any blood, faeces or gas. This was followed by infusion of 10 cc sterile water, which would not be able to be aspirated back. This together with confirmatory "hanging drop test" (where the water level should have dropped on the veress needle) were performed in all cases.

Inflation was aimed to reach a pressure of 14–16 mmHg with high flow setting 25–30 L/min flow. Average of 300–500 L carbon dioxide was insufflated. The 5 mm laparoscope was inserted through the umbilicus, and ancillary 5 mm trocars were inserted under direct vision. Placements of these trocars were decided according to the presence of adhesions as well as the size and location of the uterus and ovarian cyst.

Systemic inspection of the entire abdomen, including ovarian cyst, contralateral ovary, peritoneal cavity, paracolic gutter, liver surface, under surface of the diaphragm, bowel surface and omentum were conducted.

Preventive technique was taken to avoid spillage and to clean up the pelvis after surgery if it did occur. Irrigation with copious amounts of fluid was done to remove particles of cyst contents, especially in the case of ruptured teratoma.

Postoperative analgesia was established mainly by acetaminophen  $\pm$  diclofenac suppository, tramadol or pethidine which was given as needed. Antibiotic prophylaxis was given in all cases. An ultrasound was performed in all cases before and after the procedure to assess fetal viability.<sup>17</sup> Women's age, parity, gestational age, surgical technique and operative findings were reviewed. Operative time, estimated blood loss, postoperative hospital stay and duration of medical certificate given were recorded. Complications of surgery, outcome of the pregnancy and histopathology reports were also evaluated.

The study is approved by the medical review and ethics committee (MREC), Ministry of Health Malaysia with identification number NMRR-15-1023-24426. The data obtained from the woman medical record is confidential and will be used only for academic purpose and publication, without revealing the women's identity.

### Results

Putrajaya Hospital started operating in the year 2000 has been performing laparoscopy surgery in almost all gynecology cases starting from 2001 till now. Since 2001 till 2014 out of 734 cases, 120 were ovarian cyst in pregnancy. A total of 113 cases (94.2%) of ovarian cyst in pregnancy had undergone laparoscopy cystectomy and 2 cases (1.7%) were salpingo-oophorectomy. Demographic characteristics of the patients were shown in Table 1. There were 5 cases (4.2%) were managed via laparotomy in which two cases were converted from laparoscopy. The mean gestational week at the time of surgery was 14 weeks 1 day ( $\pm 2$  weeks 1 day). The duration of surgery was 87.4 mins ( $\pm 34.8$  mins) with average blood loss of 110.3 ml ( $\pm 32.0$  ml). Median size of ovarian cyst was 6 cm (IQR 2 cm).

Only two cases were reported with second trimester miscarriage which is diagnosed after 4 weeks and 10 weeks respectively (Table 2). Five women was tocolysed post operatively, fortunately all of them delivered at term.

**Table 1**  
Demographics of women who underwent Laparoscopic cystectomy.

Variables	n (%)	Mean (SD)
Age		28.7 ( $\pm$ 3.99)
Race:		
Malay	107 (93)	
Chinese	2 (1.7)	
Indian	5 (4.3)	
Others	1 (0.9)	
Parity:		
0	71 (61.7)	
1	19 (16.5)	
2	17 (14.8)	
3	5 (4.3)	
4	2 (1.7)	
5	1 (0.9)	
BMI		
<20	24 (20.9)	24.2 ( $\pm$ 5.67)
20–24.9	48 (41.7)	
25–30	29 (25.2)	
>30	14 (12.3)	
Gestational age at surgery (wk)		
1st trimester	6 (5.2)	14 weeks 1 day ( $\pm$ 2 weeks 1 day)
2nd trimester	109 (94.8)	
3rd trimester	0	

**Table 2**  
Complications that arised post operatively.

Complication post operatively	No. of women (%)
Per vaginal bleeding/contraction	2 (1.7)
Miscarriage	2 (1.7)
Surgical site infection	3 (2.6)
Premature contraction	2 (1.7)
Visceral injuries	0

7 cases were reported as torsion of ovarian cysts (6.1%). Fortunately all of them delivered at term. 64.7% (n = 75) of the cases did not require pain relief or only using paracetamol. Four (3.5%) cases was complicated by preterm deliveries < 34 weeks of gestation which ranging between 26 weeks of gestation until 33 weeks of gestation. Upon review, all surgeries were uncomplicated post operatively.

The mean length of hospitalization was 1.51 day ( $\pm$ 0.597). Of the 115 whom underwent laparoscopic surgery, 60% (n = 69) women had a normal vaginal delivery at term. 26.1% (n = 30) women have delivered via caesarean section. 14 (12.2%) women were loss in follow up (Table 3). There were 5 (4.3%) cases which had recurrent ovarian cyst after cystectomy. 1 woman had recurrent ovarian cyst in subsequent pregnancy after 2 years in which laparoscopic cystectomy was performed again.

Histopathological examination showed benign cystic teratoma in 28 (24.3%) cases, lutein cyst in 22 (19.1%) cases, endometriotic cyst in 31 cases (27.0%) whereas 33 cases have other types of tumor. One woman has immature cystic teratoma which was referred to gynecologic oncology for completion of surgery post partum (Table 4).

The average gestational age of delivery was 37.78 weeks ( $\pm$ 3.42) with mean birth weight of 2.97 kg ( $\pm$ 0.65 kg). There was 1 IUGR baby with birth weight of 1.89 kg at 35 weeks of gestation and another baby with bladder exstrophy with ambiguous genitalia. 80.2% of the babies born with Apgar score of 9/10/10. The rest was at lower Apgar score due to intrapartum event but improved to score of 10 at 10 min. Only one baby was delivered as fresh still birth due to abruptio placenta.

The mean of pain score was 1.5 over 10. 87.9% of the women had mild pain which only 64.6% require acetaminophen or no analgesia (Tables 5 and 6).

## Discussion

In our unit a total of 72,859 deliveries were recorded between year 2000 until 2014. The prevalence of ovarian cyst in pregnancy was 16 per 10,000 deliveries with incidence rate of 1.1 per 10,000 deliveries per year.

Ovarian mass in pregnancy require surgical intervention. This is to avoid ovarian accidents and to rule out malignancy. Simple adnexal masses are liable to torsion during pregnancy which reported in less than 1% of the women with masses greater than 4 cm.<sup>5</sup> In our study 7 women (6.1%) had torsion of ovarian cyst fortunately all cases were done laparoscopically which was recommended by Nichols and Julian.<sup>6</sup>

Managing ovarian cyst in pregnancy remains a dilemma for an obstetrician and woman. For almost all obstetricians laparoscopic surgery for an ovarian cyst is like venturing into the uncharted waters, which they do not want to indulge. The fear of uncontrolled bleeding from the gravid uterus during traumatic insufflation and trocar insertions, or too much manipulations of the uterus if laparoscopic approach was used, may lead to increase risk miscarriage after the surgery. The fear of the effect of too much exposure to carbon dioxide volume or pressure to the fetus, increasing risk of miscarriages were all unfounded and without support of any clinical data. This has been demonstrated in study conducted by Affleck et al and Rollins et al.<sup>7,8</sup> All these “myths” has remained a significant obstacle not only internationally but to our own local practice. Many obstetricians had become skeptical and had taken a step back of not going into progression, in surgical treatment of an ovarian cyst in pregnant mother. Most gynecologists were more comfortable in doing laparotomy in such cases. Laparotomy wound were big and painful and more susceptible to infection. Therefore it was very traumatic to a woman to undergo healing at the same time have to cope with the progressing pregnancy.

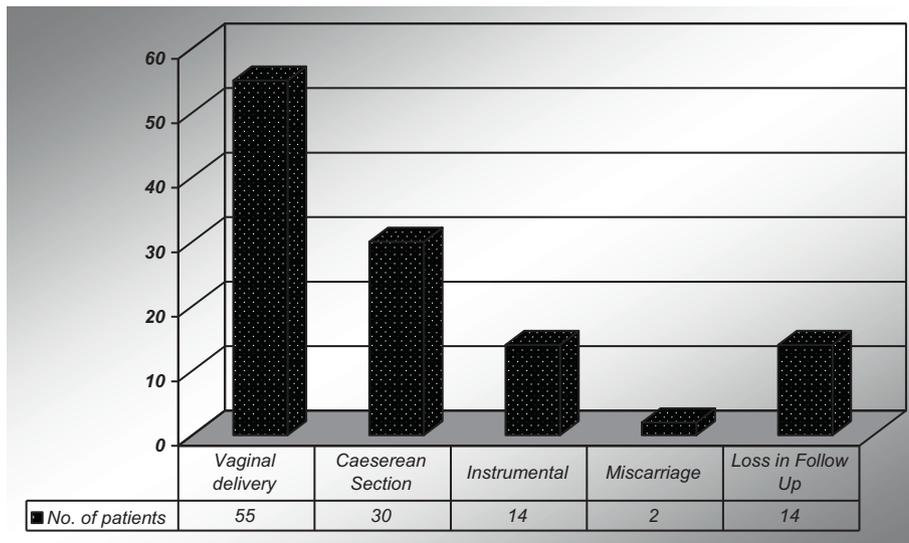
The other concern was that there was a possibility of 30–40% of laparotomy (pfannenstiel) scar inflicted on the patient if delivery were to be of caesarean section. Therefore events such as this would be very traumatic and psychologically stressful for the pregnant mother.

As surgical technology develops, and safer instruments were produced there should be a shift towards more less aggressive and painful procedures in child bearing period.

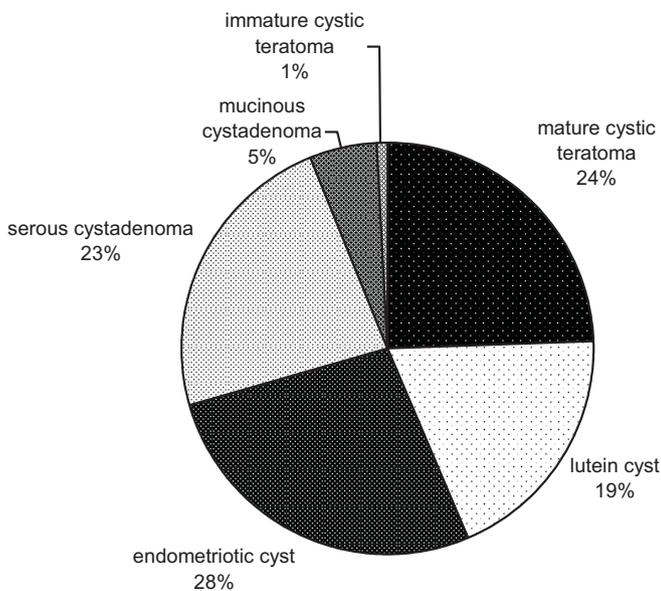
We hereby demonstrate the safety and feasibility of minimal invasive procedures of ovarian mass in pregnancy. We have demonstrated that this minimally invasive approach will help child bearing women and does not affect the pregnancy. The risk-benefit balance of the unborn child and mother's safety with an ovarian mass, complications would be very much easier to weigh, if the surgical approach is through minimally invasive procedure. Women's fear, anxiety and trauma to undergo an operation while the fetus was still inside the uterus would be easily reassured. We have demonstrated that this approach was safe and feasible for both parties as shown from our data.<sup>9</sup> Inferring to our updated statistics till 2014, we had shown that we had saved 26.1% (n = 30) of the women from another laparotomy i.e. caesarean section as laparoscopic cystectomy had been performed previously during early pregnancy. In a rare occasion, we had also encountered a mother who had an ovarian mass in both her first and second pregnancy which reoccurs within 2 years. We had to perform both cystectomies using laparoscopic approach in both occasions. She delivered vaginally for both pregnancies. With laparoscopy, she has avoided the trauma of 2 laparotomies during her child bearing period.

Although laparoscopy requires longer learning curves, industrial players have developed training tools to overcome this matter. The

**Table 3**  
Outcome of pregnancy.



**Table 4**  
Histopathological examination.



development of 3 Dimensional laparoscopic system has resulted in excellent spatial orientation and improved the depth of perception. This has also helped the visual-hand coordination in handling laparoscopic instruments. This would ensure shorter surgery, more careful dissection and avoidance of possible leak or spillage from the pathology.

**Table 5**  
Pain score post operatively.

Pain score	No. of cases	Percentage
Mild (pain score 0–3)	101	87.9
Moderate (pain score 4–6)	13	11.2
Severe (pain score 7–10)	1	0.9

Even though spillage occurs, the likelihood it is harmful is about 0.8% as demonstrated in our observation, only one patient had malignant tumor out of 120 cases which no spillage occurred intraoperatively and was referred to gynecologic oncology for completion of surgery and staging post natally. Benign pathology predominates in this review such as luteinizing cysts (19.1%), benign cystic teratomas (24.3%), and endometriotic cyst (27%). This is consistent with the etiologies of ovarian masses which were accepted by the medical fraternity.

Laparoscopic surgery demonstrates acceptable operative time. The duration of surgery was 87.4 mins ( $\pm 34.8$  mins) with average blood loss of 110.3 ml ( $\pm 32.0$ ) were similar to laparotomy. In Akira et al<sup>10</sup> blood loss was significantly less in the laparoscopy group. There were 2 cases which were converted to laparotomy due to difficulties in manipulation and uncontrollable hemorrhage. Conversion to laparotomy usually increases operating time however this is unavoidable in certain circumstances.

The mean hospital stay post operatively was 1.51 days. The short duration of hospital stay was deemed adequate for the women to recover and also for monitoring as only two women was admitted for longer period for threatened miscarriage post operatively.

From our study, it was shown that there is only one baby with abnormalities i.e. bladder exstrophy with ambiguous genitalia which was not related to surgery. Therefore it was safe to perform laparoscopy surgery in pregnant women. This dispelled the unfounded fear of carbon dioxide insufflation during procedure.

Post operative pain score and analgesia used was included as an objective in this study as this will change the perception and willingness for a woman to undergo cystectomy. About 87.9% of the women had mild pain which only 64.6% require paracetamol or no

**Table 6**  
Analgesics used post operatively.

Analgesia used post operatively	No. of cases	Percentage
No Analgesia	51	44.3
Acetaminophen	23	20.0
Tramadol	13	11.3
Pethidine	19	16.5
NSAIDS	9	7.8

analgesia. Therefore the usage of narcotics or NSAIDs would mostly be unnecessary in laparoscopic surgery. Therefore fetuses will be less expose to NSAIDs or narcotics for pain relieve and this will reduce the potential unknown teratogenicity effect of narcotics to the fetus as recommended by FDA.<sup>11–16</sup> Laparoscopic surgery has proven to be better than laparotomy in early post-operative recovery; faster wound healing and pain free (pain score of 0–3).

As a conclusion, minimally invasive technique (laparoscopy) must become the mainstay surgical approach in managing ovarian masses in pregnancy. Being in the 21st century, inflicting pain, trauma, anxiety and potential disastrous and depressive complications to pregnant women should never be in any health care provider mind at all. Over the years we have shown the safety and feasibility of using laparoscopic approach for ovarian mass in pregnancy.

There were some limitations in our study. First, there is no data on group which opted for conservative observation throughout pregnancy which may or may not reduce the rate of unnecessary surgery done. Second, no patient in our study was operated in third trimester whereby the effect of laparoscopy on post operative outcomes still unknown.

We strongly recommend that laparoscopic approach is used for benign ovarian mass in pregnancy and more data can be obtained in the future.

## References

1. Bozzo M, Buscaglia M, Ferrazzi E. The management of persistent adnexal masses in pregnancy. *Am J Obstet Gynecol.* 1979;177:981–982.
2. Koo YJ, Park JY, Kim DY, et al. Laparoscopic versus open surgery for adnexal tumor in pregnant women. *Gynecol Minim Invasive Ther.* 2013;2:57–60.
3. Sherard 3rd GB, Hodson CA, Williams HJ, Semer DA, Hadi HA, Tait DL. Adnexal masses and pregnancy: a 12-year experience. *Am J Obstet Gynecol.* 2003;189:358–362. discussion 362–353.
4. McKellar DP, Anderson CT, Boynton CJ, Peoples JB. Cholecystectomy during pregnancy without fetal loss. *Surg Gynecol Obstet.* 1992;174:465–468.
5. Nair U. Acute abdominal and abdominal pain in pregnancy. *Curr Obstet Gynaecol.* 2005;15:359–3673.
6. Nichols DH, Julian PJ. Torsion of the adnexa. *Clin Obstet Gynecol.* 1985;28:375–380.
7. Affleck DG, Handrahan DL, Egger MJ, Price RR. The laparoscopic management of appendicitis and cholelithiasis during pregnancy. *Am J Surg.* 1999;178:523–529.
8. Rollins MD, Chan KJ, Price RR. Laparoscopy for appendicitis and cholelithiasis during pregnancy: a new standard of care. *Surg Endosc.* 2004;18:237–241.
9. Ramli Roszaman, Ghazali Hazim Wan, Omar Mohd Jamil, Zainudin Ahmad Murad. Laparoscopic cystectomy in pregnancy: An 8 year series. *Int Med J.* December 2009;16(4):279–282.
10. Shigeo Akira, Atsuko Yamanaka, Tamaki Ishihara. Toshiyuki Takeshita, and Tsutomu Araki, Gasless laparoscopic ovarian cystectomy during pregnancy: Comparison with laparotomy.
11. Nakhai-Pour HR, Broy P, Sheehy O, Bérard A. Use of nonaspirin nonsteroidal anti-inflammatory drugs during pregnancy and the risk of spontaneous abortion. *CMAJ.* 2011;183:1713–1720.
12. Nielsen GL, Sørensen HT, Larsen H, Pedersen L. Risk of adverse birth outcome and miscarriage in pregnant users of non-steroidal anti-inflammatory drugs: Population based observational study and case-control study. *BMJ.* 2001;322:266–270.
13. Nielsen GL, Skriver MV, Pedersen L, Sørensen HT. Danish group reanalyses miscarriage in NSAID users. *BMJ.* 2004;328:109.
14. Li DK, Liu L, Odouli R. Exposure to non-steroidal anti-inflammatory drugs during pregnancy and risk of miscarriage: Population based cohort study. *BMJ.* 2003;327:368.
15. Edwards DR, Aldridge T, Baird DD, Funk MJ, Savitz DA, Hartmann KE. Periconceptional over-the-counter nonsteroidal anti-inflammatory drug exposure and risk for spontaneous abortion. *Obstet Gynecol.* 2012;120:113–122.
16. Yazdy MM, Mitchell AA, Tinker SC, Parker SE, Werler MM. Periconceptional use of opioids and the risk of neural tube defects. *Obstet Gynecol.* 2013;122:838–844.
17. Broussard CS, Rasmussen SA, Reefhuis J, et al. Maternal treatment with opioid analgesics and risk for birth defects. *Am J Obstet Gynecol.* 2011;204, 314.e1-11.