

Should we be examining the ovaries in pregnancy? Prevalence and natural history of adnexal pathology detected at first-trimester sonography

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KEYWORDS: first trimester; ovarian cyst; ovary; transvaginal sonography

ABSTRACT

Objective To assess the prevalence and natural history of ovarian pathology in pregnancy.

Methods Three thousand consecutive pregnant women presenting before 14 weeks' gestation at the early pregnancy unit at St George's Hospital, London, underwent ultrasound examination during which both ovaries were visualized. Women found to have a simple ovarian cyst with a minimum diameter ≥ 25 mm or a complex ovarian cyst of any size were included in the study. They were followed up with ultrasound scans every 4–6 weeks until either resolution of the ovarian cyst occurred, intervention was required or the pregnancy was concluded. If the cyst persisted at 20 weeks' gestation, these women were rescanned 6 weeks after conclusion of the pregnancy. Women were managed expectantly throughout their pregnancy.

Results One hundred and sixty one women with a total of 166 cysts were included for analysis. At presentation, 43.7% of the women were asymptomatic and 56.3% had pain and/or vaginal bleeding. The mean gestational age at presentation was 53 (range, 28–98) days, the mean maternal age was 30 (range, 17–42) years, and the mean ovarian cyst diameter was 48 (range, 12–115) mm. The first-trimester pregnancy diagnoses were 106 intrauterine pregnancies, 40 miscarriages, five ectopic pregnancies, three pregnancies of unknown location and seven terminations of pregnancy. The sonographic features of the ovarian cysts included: 117 simple and anechoic, 21 hemorrhagic, 16 with mixed echogenicity, seven with a ground-glass appearance, three solid/cystic with papillary projections and two with low-level echoes. One hundred and nineteen (71.7%) of the cysts resolved spontaneously and were presumed to be physiological, 40

(24.1%) persisted and seven (4.2%) required intervention, four of these as an emergency because of pain. There was one case of borderline malignancy and no cases of malignancy. Five (3.0%) of the cysts underwent torsion. Only 0.13% (4/3000) of all women who initially presented to our unit required acute intervention during their pregnancy.

Conclusions The majority of cysts detected in early pregnancy are physiological and resolve. Very few persist and intervention during the pregnancy is rarely indicated. The expectant management of ovarian cysts detected in the first trimester is safe and should be encouraged. Examining the ovaries in the first trimester is of limited value. Copyright © 2004 ISUOG. Published by John Wiley & Sons, Ltd.

INTRODUCTION

The incidence of adnexal pathology detected in the first trimester varies from 0.2% to 2.9%^{1,2}. In a previous cross-sectional study of some 2245 women scanned at the end of the first trimester, 1.2% of the total number of cysts detected persisted beyond 16 weeks and subsequently were surgically removed; there were no cases of malignancy¹. In a study of 55 278 women undergoing termination of pregnancy, there were two cases of ovarian malignancy². Expectant management of ovarian masses is advocated, at least until the pregnancy is beyond 14 weeks' gestation. When they are symptomatic, simple ovarian cysts diagnosed during pregnancy can be successfully and safely treated with ultrasound-guided cyst aspiration³. Adnexal masses can generally be classified accurately using transvaginal sonography^{1,4,5}. However, in the few cases when the nature of the cyst is in question,

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the risks to the pregnancy from intervention must be weighed against the risk of malignancy.

The natural history of ovarian cysts detected in the first trimester is unclear. We assessed the prevalence of adnexal pathology detected in the first trimester in women presenting at our early pregnancy unit, based at St George's Hospital, and followed up these masses longitudinally in order to observe their natural history. We comment on the benefit of examining the ovaries at the time of an ultrasound scan in the first trimester.

METHODS

This was a prospective observational longitudinal study of women attending the early pregnancy unit at St. George's Hospital, London, between 25th June 2001 and 27th July 2002, inclusive. The early pregnancy unit is a self-referral walk-in service based in this inner London teaching hospital that operates 6 days a week. All women up to 14 weeks' gestation had both ovaries visualized by transvaginal sonography using an Aloka SSD 900, 2000 or 4000 (Keymed Ltd, Southend, UK and Aloka Co. Ltd., Tokyo, Japan) ultrasound machine equipped with a 5-MHz probe. Those with a simple, anechoic cyst with a minimum diameter of ≥ 25 mm or those with a complex ovarian cyst of any size were included in the study and followed up by the same investigator (G.C.). All women gave their informed oral consent to participate in the study. Data recorded included the age of the women and length of gestation in days, the mean ovarian cyst diameter, the first-trimester pregnancy diagnosis, the sonographic appearance of the ovarian cysts and the presumed diagnosis based upon the sonographic appearance. Women were scanned every 4–6 weeks and managed expectantly until either resolution of the ovarian cyst occurred, intervention was required or the pregnancy concluded (i.e. miscarriage, termination of pregnancy or delivery at term). They underwent transvaginal scans until 14 weeks' gestation and transabdominal scans thereafter. Women requiring a scan post-pregnancy for a persistent ovarian cyst underwent a transvaginal scan. Resolution of the cyst was defined as the diameter of the ovarian cyst decreasing to < 22.5 mm (i.e. decreasing by at least 10%). Intervention was required if the ovarian cyst was causing symptoms of pain as a result of presumed sub-acute or acute torsion, or if the ovarian cyst was thought to be suspicious in nature on transvaginal sonography according to previously reported morphological criteria⁶. Women in whom the ovarian cyst persisted at 20 weeks had a repeat scan performed 6 weeks post-delivery. If the ovarian cyst was noted at the time of early pregnancy loss, the women were rescanned 6 weeks later.

Outcome measures

Women with ovarian cysts that resolved spontaneously were presumed to have physiological cysts. Simple and anechoic cysts that resolved were thought to be

corpora lutea, while those with a spider-web like internal matrix were classed as hemorrhagic corpora lutea; those with simple and anechoic ovarian cysts that persisted 6 weeks after the pregnancy concluded were classified as serous cystadenomas; those with ground-glass contents were classified as endometriomas; those with low-level echoes were classified as mucinous cystadenomas; those with mixed echogenicity were classified as dermoid cysts or mature cystic teratomas; those with both solid and cystic components with papillary projections without color Doppler flow were classified as borderline tumors. Histological confirmation of the nature of an ovarian cyst was obtained in 17 women. Morphological characterization and subjective assessment of ovarian masses were based upon the findings of previous studies^{6,7}.

RESULTS

In 182/3000 (6.1%) women an ovarian cyst was noted at the first-trimester ultrasound examination; 21 of these were lost to follow-up, so data from 161 (5.4%) women were included in the analysis. At presentation, 43.7% were asymptomatic, 22.8% had lower abdominal pain without vaginal bleeding, 16.8% had vaginal bleeding without lower abdominal pain, 8.4% had lower abdominal pain with vaginal bleeding and 8.4% had unilateral iliac fossa pain. The mean gestational age at presentation was 53 (range, 28–98) days, the mean maternal age was 30 (range, 17–42) years, and the mean ovarian cyst diameter was 48 (range, 12–115) mm. A total of 47.1% of cysts were right-sided and 52.9% were left-sided, 156 women had unilateral cysts and five had bilateral cysts.

The first-trimester pregnancy diagnoses were: 106 intrauterine pregnancies, 15 complete miscarriages, 10 incomplete miscarriages, nine missed miscarriages, six anembryonic pregnancies, seven termination of pregnancies, five ectopic pregnancies and three pregnancies of unknown location.

The 166 ovarian cysts had the following sonographic features: 117 simple/anechoic, 21 hemorrhagic, 16 with mixed echogenicity, seven with ground-glass contents, three solid/cystic with papillary projections and two with low-level echoes. The presumed cyst diagnoses based upon the ultrasound features were: 119 physiological, 19 serous cystadenomas, 16 benign cystic teratomas, seven endometriomas, three borderline tumors and two mucinous cystadenomas. One hundred and nineteen (71.7%) of the ovarian cysts resolved spontaneously, 40 (24.1%) persisted 6 weeks after the pregnancy concluded and seven (4.2%) required intervention; only four of these required acute intervention (Table 1). If complex ovarian cysts are excluded, 86.9% of simple or hemorrhagic ovarian cysts resolved spontaneously.

Four women required admission in the first trimester as a result of lower abdominal pain; two had hemorrhagic corpus lutea and two had presumed sub-acute torsion (Table 2.) These women were managed conservatively

Table 1 Details of women requiring operative intervention ($n = 7$)

Case	GA (weeks)	Indication for intervention	Treatment	Cyst size (mm)	Histology
1	14	Incidental	ERPC & laparoscopic RO cystectomy	52 × 50 × 60	Dermoid
2	40	Incidental	Em LSCS & RO cystectomy	80 × 28 × 40	Serous cystadenoma
3	40	Incidental	Em LSCS & RO cystectomy	48 × 50	Endometrioma
4	14	Suspicious mass	Laparotomy & RSO	108 × 91 × 62	Benign, infarcted
5	14	Suspicious mass	Laparotomy & LSO	110 × 55 × 70	Borderline mucinous
6	39	Pain	Em LSCS & RO cystectomy	76 × 46 × 75	Serous cystadenoma
7	14	Pain	TAS-guided needle aspiration	110 × 90 × 70	Serous cystadenoma

Em LSCS, emergency lower segment Cesarean section; ERPC, evacuation of retained products of conception; GA, gestational age at intervention; LSO, left salpingo-oophorectomy; RO, right ovary; RSO, right salpingo-oophorectomy; TAS, transabdominal sonography.

Table 2 Details of women admitted in the first trimester and managed conservatively ($n = 4$)

GA (weeks)	Treatment	Cyst size (mm)	Diagnosis	Outcome
5	Analgesia	49 × 49 × 49	Hemorrhagic corpus luteum	Resolution
10+	Analgesia	74 × 75 × 51	Presumed sub-acute torsion of corpus luteum	Resolution
9+	Analgesia	69 × 41	Presumed sub-acute torsion of corpus luteum	Resolution
7+	Analgesia	44 × 46 × 43	Hemorrhagic corpus luteum	Resolution

GA, gestational age at presentation.

with observation and analgesia. Their ovarian cysts resolved spontaneously and their pain resolved.

In total, 5/166 (3.0%) of the ovarian cysts underwent presumed ovarian torsion. Three of these were in the first trimester; two were managed conservatively and one was managed with transabdominal aspiration of the ovarian cyst at 14 weeks' gestation. The latter underwent a laparoscopic ovarian cystectomy post-delivery and histology confirmed a serous cystadenoma. One case was thought to be a borderline malignant tumor on transvaginal sonography, but laparotomy and right salpingo-oophorectomy at 14 weeks' gestation confirmed a hemorrhagic necrotic benign ovarian cyst that had undergone torsion. The final case occurred at 39 weeks' gestation and the woman underwent an emergency lower segment Cesarean section and right ovarian cystectomy. She was found to have a viable right ovary and histology confirmed a benign serous cystadenoma. In these cases, the mean ovarian cyst diameters were 90, 87 and 66 mm, respectively (Table 1, Cases 4, 6 and 7).

Forty-one women required a transabdominal ultrasound examination at 20 weeks' gestation; in 13 (31.7%) of these cases the ovarian cyst resolved and in 28 (68.3%) the cyst persisted. Of the 28 women who required a repeat scan 6 weeks post-delivery due to persistence of the cyst at 20 weeks, in six (21.4%) it had resolved spontaneously, three (10.7%) had undergone ovarian cystectomy at the time of Cesarean section (Table 1) and in 19 (67.9%) the cyst persisted. Of the eleven serous cystadenomas, at the time of writing seven had been confirmed histologically; two of the six mature cystic teratomas had been confirmed; one of the two mucinous cystadenomas had been confirmed; one of the three endometriomas had been confirmed.

DISCUSSION

In the first trimester of pregnancy, ovarian cysts are often functional and generally resolve without complications. After 16 weeks' gestation the prevalence of ovarian cysts is reported to be between 0.5% and 3.0%⁸. In our study the prevalence of ovarian cysts beyond 16 weeks' gestation was 0.9%, which is in keeping with these previous reports.

In keeping with published literature^{8,9}, our data showed that the majority (71.9%) of ovarian cysts detected at the time of a first-trimester ultrasound examination resolved spontaneously and therefore these were assumed to be physiological in nature. These resolving cysts were classified as cystic or hemorrhagic corpus lutea based on their appearance on gray-scale ultrasound. Interestingly, of the ovarian cysts that persisted at 20 weeks' gestation, 78.6% were present at the 6-week postnatal scan, and all of these were pathological.

There have been reports assessing the prevalence of adnexal pathology at the end of the first trimester (2.9%)¹ or during the second and third trimesters (4.1%)¹⁰. Our study differs in that, to our knowledge, this is the first longitudinal study that has assessed the prevalence of adnexal pathology in an early pregnancy population and then observed the natural history of that pathology through the pregnancy. The mean gestational age at the time of diagnosis was 53 days (7 weeks and 4 days).

Zanetta *et al.*⁹ in a recent cross-sectional study assessed the prevalence of ovarian cysts at various stages of pregnancy, i.e. in the first, second and third trimesters. Only 1.2% (79/6636) of the women had an ovarian cyst with a maximum diameter > 30 mm. This figure is significantly lower than was our prevalence of 5.4%, probably a reflection of different population groups. The

earlier in gestation a scan is performed, the more ovarian cysts, and in particular functional corpora lutea, will be detected.

Borgfeldt and Andolf¹¹ investigated the rate of occurrence of adnexal pathology in premenopausal women aged 25–40 years. They defined an adnexal lesion as either a simple cyst with a largest diameter of at least 25 mm or a complex cyst of any size. Adnexal lesions were found in 7.8% of the women¹¹. These criteria were the basis for the inclusion criteria in our study.

We visualized both ovaries in all women. This figure is higher than in a published study in which 95% of pregnant women in the first trimester had both their ovaries visualized using transvaginal sonography¹². Although this may be attributable to the quality of scanning in our unit, it highlights the ease with which premenopausal ovaries can be visualized in early pregnancy.

Because complications of abdominal surgery are increased in pregnancy, the surgical management of ovarian cysts in pregnancy has been reconsidered¹³. Historically, pregnant women with persistent adnexal masses underwent elective removal of the masses in the second trimester¹⁴; this is no longer acceptable practice in asymptomatic women, as surgical intervention, either as an emergency or after 24 weeks' gestation, is associated with a poorer obstetric outcome¹⁵. Complications include spontaneous miscarriage or preterm premature rupture of membranes¹³.

Expectant management of women with ovarian cysts diagnosed in the first trimester should be encouraged. Although there are no randomized clinical trials to determine the optimal management of an adnexal mass in pregnancy, our experience suggests that expectant management is safe and without serious adverse outcome for mother or fetus. Ethically it would be difficult to justify randomizing women to intervention for persistent adnexal masses. We adopted an expectant management approach to our population, and our data and those of others suggest that it is safe, decreases the number of unnecessary surgical interventions and is not associated with an adverse outcome⁹.

Ovarian torsion is difficult to diagnose in pregnancy. The rate of torsion decreases as the gestational age increases. As our study population was recruited in the first trimester, it is not surprising that our rate of torsion (3%) is higher than that in the published literature (1%)⁵. This relatively high rate of torsion may also be explained by the inclusion of unconfirmed cases. Three out of five of these presumed torsions occurred in the first 14 weeks of pregnancy. Two were managed conservatively and the other required transabdominal aspiration of the ovarian cyst at 14 weeks' gestation.

Aspiration of simple ovarian cysts during pregnancy is safe and may prevent the need for surgical intervention; in some cases this will be the definitive treatment³. Neither anesthesia nor analgesia are required for such intervention. Ultrasound-guided aspiration for the relief of pain generated by simple ovarian cysts in non-pregnant women can be performed either transvaginally

or transabdominally depending on the location of the cyst¹⁶. After 14 weeks' gestation, the uterus is an abdominal organ and as a result the ovaries are more easily targeted transabdominally. In the one case in this study in which transabdominal aspiration of a simple ovarian cyst achieved pain relief, the woman underwent a laparoscopic ovarian cystectomy for ongoing pain after delivery. Subsequent histology confirmed a benign serous cystadenoma. Fine-needle aspiration is not appropriate if the cyst has any suspicious morphological features.

The frequency of ovarian cancer in pregnancy is reported to be between 1 in 15 000 and 1 in 32 000 pregnancies⁸. Therefore it is not surprising that there were no cases of malignancy in our study group of 3000 women. Those women with ovarian cysts that have ultrasound features suggestive of malignancy should be referred for a gynecological oncology investigation with a view to considering intervention after 14 weeks' gestation.

Our growing understanding of the natural history of borderline ovarian tumors has allowed us to be more conservative in their surgical management, preserving fertility in many young women¹⁷. However, the natural history of such tumors is still unclear. In our study, three women were thought to have borderline lesions. This was based on the sonographic appearance and the presence of papillary projections that were non-vascular on color Doppler. Only one of these was confirmed histologically; the others were a benign cystic teratoma and a benign hemorrhagic ovarian cyst that had undergone torsion. This highlights the difficulty in classifying some ovarian masses and it is well accepted that 10% of adnexal masses are extremely difficult to classify⁷. Despite the fact that the borderline lesions in this study were managed surgically, there is evidence to suggest that expectant management of such ovarian cysts is an option. In a recent study, this approach to such lesions was shown to be safe. Three women with ovarian cysts suggestive of borderline change were managed expectantly and after the pregnancy they underwent surgery⁷. Their staging was not compromised by such management; all three tumors were Stage 1a at laparotomy and subsequent histological assessment.

In conclusion, this longitudinal study has demonstrated that the majority of ovarian cysts detected in the first trimester resolve spontaneously. Our data support the view that the expectant management of women with ovarian cysts detected in early pregnancy is safe and that surgical intervention in pregnancy can be avoided in nearly all cases.

As only 0.13% of women with an ovarian cyst required acute intervention during pregnancy, we conclude that examining the ovaries at the time of a first-trimester scan is of limited value. Those women requiring intervention will present with pain, whilst prior knowledge of the presence of a cyst may only increase anxiety even though the risk of complication is very low. If an apparently non-malignant ovarian cyst is noted at the time of a first-trimester ultrasound examination, the woman should be offered a follow-up scan 6 weeks after the pregnancy has concluded.

Ultrasound scans in the first trimester, whilst unavoidably demonstrating the ovaries in most cases, should not be termed inadequate if the ovaries are not visualized or commented upon.

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