ORIGINAL ARTICLE

Oman Medical Journal [2016], Vol. 31, No. 3: 217–222

Comparison of Adnexal Mass in Women Undergoing Mass Excision During the Antepartum Period and Cesarean Section

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ARTICLE INFO

Article history:
Received: 23 May 2015
Accepted: 16 December 2015

Online:
DOI 10.5001/omj.2016.41

Keywords:
Cardiotocography; Adnexal Diseases; Cesarean Section; Pregnant Women.

ABSTRACT

Objectives: The frequency of adnexal masses in pregnant women ranges from 0.1% to 4%. Selecting the right approach to manage the subsequent intervention remains one of the most controversial challenges among gynecologists. Our aim in this cross-sectional study was to clarify the clinical-pathological differences among the adnexal masses that are excised during either the antepartum period or cesarean section (CS). ***Methods***: In this study, we assessed 11,000 pregnancy cases referred to the Qaem Hospital in the Mashhad University of Medical Sciences, Iran, between 2010 and 2014. In total, 53 pregnant women with adnexal masses (other than non-gynecological mass and ectopic pregnancy) were selected for further investigation. We divided patients into two groups (group A and group B). Patients of group A had a diagnosed tumor that was excised antepartum while patients in group B had a mass taken out during CS. We then assembled data based on maternal age, parity, gestational age, surgery type, delivery mode, size and location of the tumor, complications, presentations, histopathological diagnosis, and ultrasonography findings for further analysis. ***Results:*** The major proportion of masses (62.3%) were excised during CS whereas the remainder (37.7%) were removed antepartum. The mean size of the detected tumor for benign and malignant cases was 10.0 cm and 13.8 cm in group A, and 8.0 cm and 9.3 cm in group B, respectively. There was a statistically significant difference observed between patients in the two groups regarding the benign/malignant status of the mass ($p = 0.008$), its size ($p = 0.019$) and simplicity/complexity ($p = 0.004$). ***Conclusions:*** The rate of malignant tumors was considerably higher in women who had antepartum mass excision compared to those with mass resection during CS. Also, tumors were larger (and more complex) in patients in group A compared to group B.

The adnexa of the uterus are the structures most closely related, structurally and functionally, to the uterus such as ovaries, fallopian tubes, and supporting tissues. Both benign and malignant masses may develop in the adnexal tissues of women at almost any age. These masses either present symptomatically or remaining silent. Some might be detected incidentally whereas some may regress unexpectedly. Surgery is an inevitable option immediately after diagnosis in most situations.[1] Previous studies reported the occurrence of adnexal masses during the antepartum period from 1 in 25 to 1 in 8000 cases. In addition, the frequency of adnexal mass in pregnant women is 0.1–4%.[2] Such variation in figures makes it difficult to define the clinically significant masses.[2–5] Ultrasound (US) remains the leading established tool to diagnose the early stages of mass development antepartum. Follicular and corpus luteum cysts are the most common adnexal masses. Most of these masses spontaneously disappear up to week 16 of antepartum while malignancy can be seen in 1–8% of cases.[6]

Taking an appropriate action to manage a malignant adnexal mass before childbirth, for example by removing them during the second trimester, is considered of utmost importance. Since the majority of detected adnexal mass are benign, intervention is not necessary in such cases. In fact, practitioners try to avoid unnecessary surgical interventions before childbirth by distinguishing between benign and malignant tumors.[7,8]

Research has been conducted to discover an effective method to detect, analyze, and deal with

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adnexal masses during the antepartum period. However, only a limited number of studies compared antepartum mass excision and during cesarean section (CS). This motivated us to plan a cross-sectional study to compare and contrast adnexal mass in women experiencing a mass resection during the antepartum period and CS. We assessed results primarily in terms of clinical symptoms, US findings, and histopathology of the resected adnexal mass.

METHODS

In this cross-sectional study, 11,000 pregnant women were reviewed who were referred to the Obstetrics and Gynecology department, in Qaem Hospital, between 2010 and 2014. The hospital is affiliated with the Mashhad University of Medical Sciences (MUMS) and is a tertiary referral center for all nearby states.

Following a consultation with gynecology oncologist, 53 subjects with adnexal mass (other than non-gynecological mass and ectopic pregnancy) undergoing excision either antepartum or during CS were selected. Indications for surgery included the detection of an adnexal mass with a suspicion for malignancy (as reported by a radiologist), persisting clinical symptoms, and persistent suspicion mass during the antepartum and CS.

We collected data on maternal age, parity, gestational age at diagnosis and surgery, surgery descriptions, neonatal data, the size and location of the tumor, complications associated with adnexal mass, clinical presentations and histopathological diagnosis of adnexal mass, surgery type, and US findings.

Patients were divided into two general categories (group A and group B) to determine any statistical relationships among different factors. Group A whose adnexal masses were resected in antepartum and group B who had their tumor removed during CS. We used SPSS Statistics (SPSS Statistics Inc., Chicago, US) version 16 for statistical analysis. In four patients, malignant tumors were individually excised at weeks 12, 27, 27, and 29 of gestation, respectively. Chemotherapy was subsequently carried out both before and after CS. Because the adnexal masses of these four patients were resected before the cesarean, the patients were labeled as group A in our study. We reported tumors as either benign, malignant, or borderline based on their pathology reports. The latter were merged into the malignant group. Furthermore, those women who had their adnexal mass removed in the antepartum period were compared to those who underwent mass excision during CS. We used four factors for such a comparison: benignity or malignancy type, tumor size, simplicity or complexity, and clinical symptoms (if present).

RESULTS

Our patients had an average age of 28.3±5.2 years and 2.0±1.0 parity. The average gestational age associated with diagnosis, surgery, and delivery time was 18, 21, and 37 weeks, respectively. The mean mass size detected was 9.4±5.3 cm (11.5±4.8 cm for group A and 8.1±5.0 cm for group B). In 37.7% of patients (n = 20), masses were excised during the antepartum period while the remaining 62.3% of patients (n = 33) had the mass excised during CS. The average diameter of tumors identified as the benign, malignant, and borderline were 8.6±5.0, 13.3±5.0, and 9.0±4.2 cm, respectively. Our results revealed the dominance of right-sided adnexal mass (n = 23), closely followed by left-sided lesions (n = 21). Bilateral adnexal mass was seen in nine patients.

Table 1: Pathologic findings and sizes of adnexal masses for all patients in both groups (n = 53).

Mass type	Pathologic diagnosis	n (%)	Size, cm
Benign mass	Mucinous adenoma	12 (22.6)	10.3
	Mature cystic teratoma	11 (20.8)	6.5
	Serous cystadenoma	10 (18.9)	8.2
	Paratubal cyst	5 (9.4)	4.4
	Luteal cyst	4 (7.5)	15.0
Malignant mass	Primitive neuroectodermal tumor	2 (3.8)	8.0
	Krukenberg tumor	1 (1.9)	10.0
	Dysgerminoma	2 (3.8)	15.0
	Malignant mixed tumor	1 (1.9)	20.0
	Mucinous adenocarcinoma	1 (1.9)	20.0
	Clear cell carcinoma	1 (1.9)	10.0
	Immature teratoma	1 (1.9)	14.0
Borderline tumors	Borderline mucinous tumor	1 (1.9)	12.0
	Borderline serous tumor	1 (1.9)	6.0

Table 2: Adnexal mass characterization, surgery type and pathology reports in groups A and B with respect to their clinical symptoms (n = 53).

Characteristics, n (%)		Antepartum period, n=20		Cesarean section, n=33	
		Asymptomatic	Symptomatic	Asymptomatic	Symptomatic
Number		6 (11.3)	14 (26.4)	31 (58.5)	2 (3.8)
Size, cm		11.7	11.4	7.9	15.0
Pathological outcomes	Benign	5 (9.4)	7 (13.2)	28 (52.8)	2 (3.8)
	Malignant	1 (1.9)	6 (11.3)	2 (3.8)	0 (0.00)
	Borderline	0 (0.00)	1 (1.9)	1 (1.9)	0 (0.00)
Surgery	Cystectomy	4 (7.5)	7 (13.2)	25 (47.2)	1 (1.9)
	USO	2 (3.8)	4 (7.5)	5 (9.4)	1 (1.9)
	BSO	0 (0.00)	3 (5.7)	1 (1.9)	0 (0.00)

USO: unilateral salpingo-oophorectomy; BSO: bilateral salpingo-oophorectomy.

Table 1 summarizes the size of adnexal mass based on pathological results. The frequency of simple and complex masses were 54.7% and 34.0% on US finding, respectively. US examinations failed to diagnose 11.3% of masses, which were later found during CS. Symptomatic adnexal masses occurred in 30.2% of cases; the rest were asymptomatic. About 79% of ovarian mass were benign, 17% were malignant, and only 4% fell in the borderline group.

The majority of infants (90.9%) delivered at full-term with nine live-born children from mothers with malignant masses. Preterm CS was a result of obstetric complications. The mean Apgar score was normal for all cases except one that reported in a low range (around 5–6).

Of the total 11,000 pregnant women, 4250 had a CS. Of these, 33 had an ovarian mass (around 0.8%). The prevalence of malignant adnexal mass during CS was around 9% (n = 3). The prevalence of malignant adnexal mass during routine CS was around 0.07% (i.e., three patients out of the 4250 who had a CS).

Tumors were excised during the antepartum period for 20 patients in group A, and during CS for 33 patients in group B. Twelve women (60.0%) had benign masses in group A (specifically, five mucinous adenomas, four mature cystic teratomas, two serous cystadenomas, and one paratubal cyst), seven women (35.0%) had malignant masses (specifically, one Krukenberg tumor, one dysgerminoma, one malignant mixed tumor, one immature teratoma, one mucinous adenocarcinoma, and two primitive neuroectodermal tumors (PNETs)), and one woman (5.0%) was diagnosed with borderline mucinous tumor. In group B, there were 30 cases with benign mass (seven mature cystic teratomas, seven mucinous adenomas, eight serous cystadenomas, four luteal cysts, and four paratubal cysts). There were two cases with malignant mass (one dysgerminoma, and one clear cell carcinoma) and one women diagnosed with a borderline serous tumor.

Table 3: Comparison of clinical-pathological data of women with mass resection in groups A and B.

		Antepartum period n=20	Cesarean section n=33	*p*-value
Benign:malignant ratio		1.5	10	0.008
Size, cm	Benign	10.0	8.0	0.019
	Malignant and borderline	13.8	9.3	
Ultrasound findings	Complex	15	13	0.004
	Simple	5	14	
Clinical symptoms	Yes	14	2	<0.0001
	No	6	31	

In twenty patients in group A, 55.0% underwent cystectomy while 15.0% and 30.0% had bilateral salpingo-oophorectomy (BSO) and unilateral salpingo-oophorectomy (USO), respectively. A similar trend was observed for patients in group B, with 78.8% undergoing cystectomy and 18.2% and 3.0% undergoing USO and BSO, respectively [Table 2].

Clinical symptoms, such as "feeling heavy in the abdomen or abdominal pain" were reported in 70% of patients in group A. Asymptomatic patients in group A (30.0%) underwent surgery due to having a suspicion of malignancy, based on either US or clinical findings. Adnexal torsion occurred in 21% of patients of this group.

The majority of patients who had their tumors excised during CS had no clinical indications (around 94.0%) leaving only 6.0% with clinical

Table 4: The characteristics of patients with malignant pathology.

Diagnosis	Age, years	GA at diagnosis, weeks	GA at surgery, weeks	GA at delivery, weeks	Surgery type during pregnancy	Surgery type with cesarean	Mass size, cm	Stage	Chemo-therapy	Survival time of mothers, months
Borderline mucinous	22	19	23	38	USO	-	12	1a	-	30
Borderline serous	28	28	39	39	-	Cystectomy, Staging	6	1a	-	36
Mucinous adenocarcinoma	26	25	27	36	BSO	TAH optimal debulking	20	3	1C TC	10
Clear cell carcinoma	35	8	36	36	-	TAH + BSO Non-optimal	10	4	-	Died eight months after delivery
Dysgerminoma	27	32	38	38	-	USO Staging	12	1a	-	35
Dysgerminoma	32	23	29	38	USO	Staging	18	3	1C BEP	40
Malignant mix tumor	27	25	27	38	USO	Staging	20	3	2C EP	24
Immature teratoma	23	11	12	37	Cystectomy	Staging	14	1a Grade 2	3 C BEP	12
PNET	21	7	After abortion	15 IUFD[7]	Mass resection after abortion	TAH + BSO after chemotherapy	10	1	-	34
PNET	18	25	29	IUFD 30	BSO + bowel resection	-	6	3	-	15
Krukenberg tumor	37	16	17	36	BSO	-	10	4	Rejected	Died four months after delivery

GA: gestational age; TAH: total abdominal hysterectomy; C: cycles; TC: paclitaxel and carboplatin; BEP: bleomycin and etoposide and cisplatin; E: etoposide and cisplatin; IUFD: intrauterine fetal death; PNET: primitive neuroectodermal tumor.

symptoms. In addition, adnexal torsion was reported in 20% of patients in group A. Remarkably, < 20% of cases in group B had their mass excised during CS on an incidental basis. These tumors were not diagnosed using US.

Around 33.3% of pregnant women in group B underwent a CS due to adnexal mass while 48.4% underwent CS due to obstetric indications with an adnexal mass. Regarding the benign and malignant nature of tumors, a substantial 79.2% were reported benign, whereas malignant and borderline cases comprised 17.0% and 3.8%, respectively. Such descending orders were observed in both groups (60.0%, 35.0%, and 5.0% in group A and 90.9%, 6.1% and 3.0% in group B). There was a statistically significant difference between the two in the benign:malignant ratio ($Z = -2.66$, $p = 0.008$). Specifically, the mean size of benign and malignant tumors was 8.0 and 9.3 cm in group B, and 10.0 and 13.8 cm in group A. The comparison of the size of tumors indicated a significant difference between the two groups, $p = 0.019$ [Table 3].

US revealed 19 cases with simple (five in group A and 14 in Group B) masses and 28 with complex (15 in group A and 13 in group B) masses. However, US was inadequate to diagnose six subjects with adnexal masses. The Kruskal-Wallis test analysis showed a meaningful difference on simplicity:complexity ratios of the tumors in each group ($c^2 = 11.01$, $p = 0.004$). Moreover, a significant dissimilarity was observed in the manifestation of clinical symptoms between the two groups ($Z = -3.674$, $p < 0.0001$) [Table 3].

Intrauterine fetal death (IUFD) occurred in two patients. In one case, the mother visited the clinic when the fetus was already dead (preoperative stage)

and in the second case, the fetus was alive. However, after the surgery to remove the mass, the fetus died (postoperative case). Four women were treated with chemotherapy during pregnancy. The women were given either paclitaxel (AUC 5–6) and carboplatin (175 mg/m^2) for three hours every three weeks (one patient), bleomycin (30,000 IU) weekly for 12 weeks, etoposide (100 mg/m^2/d) for five days every three weeks, and cisplatin (20 mg/m^2/d) for five days every three weeks (two patients), etoposide (100 mg/m^2/d) for five days every three weeks and cisplatin (20 mg/m^2/d) for five days every three weeks (one patient) [Table 4].

DISCUSSION

We successfully elicited and analyzed demographic and clinical-pathological data for pregnant women with adnexal masses. By comparing such adnexal masses removed during both CS and antepartum, our observation showed clear distinctions among the tumor size, clinical symptoms, benign/malignant state, and US results. In particular, the rate of either complex or malignant tumors was higher in patients undergoing antepartum mass excision. US results also showed that the size of tumors was larger in women who underwent resection during the CS period compared to others.

Adnexal masses were detected in one per 207 pregnancies in our study. However, malignant and borderline masses were reported to occur in one out of 1000 cases. Such a high rate compared to other research can be explained because all patients were referred to the only existing oncology/gynecology center located in the North-East states of Iran.[9,10]

Of a total 53 pregnancies with adnexal masses, approximately 20.8% were diagnosed as malignant or borderline in nature. Kondi-Pafiti and his colleagues[9] reported findings consistent with ours (21.9%) whereas Sherard et al,[3] reported a slightly lower rate (13%). The mean gestational ages at the time of diagnosis and surgery were 18 and 21 weeks, respectively. This observation was similar to the study by Kumari et al,[11] but lower than the figures reported by Niroumanesh et al, [12] which indicated older gestational age.

It was also found that 7.5% of all subjects had an adnexal torsion. This percentage was similar to the figures reported by Schmeler et al,[2] (6.8%) and Goh et al,[13] (8.5%) but less than the study by Koo et al, (11.7%).[14] A study conducted by Leiserowitz[15] showed that the risk of torsion and rupture was decreased because of the increasing emergence of asymptomatic ovarian tumors, without any associated complications during the antepartum period.

The size of benign and malignant tumors were 8.6±6.4 cm and 12.6±5.2 cm, respectively (borderline cases have been combined into both groups, with most defined as malignant tumors, and only less than 10% as benign cases). Our finding is close to that of Schmeler and her colleagues.[2] Patients in group A had a larger tumor size (11.5±4.9 cm vs. 8.1±5.0 cm) and higher in their incidence of malignancy, compared to patients in group B. Koo et al,[14] concluded that masses with a diameter greater than 15 cm are 12 times more likely to become malignant compared to those smaller than 6 cm. According to a similar study conducted, 65% and 35% of malignant masses were diagnosed during the antepartum period and cesarean section, respectively.[12] Their finding agrees with our analytical results.

Baser et al,[16] observed that 0.3% of CS were associated with ovarian mass while the prevalence of malignant adnexal mass during CS with an ovarian mass was around 2.0%. In fact, the rate we observed in our study was higher than Baser and his colleagues reported. In our study, 0.8% of CS were associated with ovarian mass. However, the incidence of malignant adnexal mass during CS was 9%. This difference might be a result of using different sampling methods. As noted earlier, all patients were selected from an oncology-gynecology center, and the number of patients with adnexal mass referring to our center is likely to be higher than other health care centers.

The most common benign adnexal mass observed in our study was mucinous cystadenoma, closely followed by mature cystic teratoma and serous cystadenoma. This observation is similar to previous studies.[3,16,17]

Han et al,[18] supported the individualization of treatment as part of antenatal care, which is determined by tumor type and gestational age at the time of diagnosis. They also showed that it does not increase the complication of pregnancy. Among those with malignant tumors who were managed individually, two cases were shown to be of PNET type, whose pregnancies terminated in fetal death. PNET was seldom reported the in antepartum

period, and only limited knowledge in this respect exists.[19]

Grimm et al,[20] identified that epithelial ovarian cancer (EOC) in the antepartum period is often diagnosed at early stages while concurrent pregnancy does not influence its growth rate. The standard treatment for EOC is radical cytoreductive surgery and subsequent systemic chemotherapy if needed. However, during the first trimester, chemotherapy and radical surgery should be avoided as it may lead to miscarriage or fetal anomalies. Our study confirmed that neither maternal nor fetal complications associated with adnexal mass increased in pregnant patients with benign mass.

One of the most common malignant tumors during the antepartum period were reported to be epithelial tumors.[21,22] However, in our study it was germ cell tumors. This discrepancy is possibly rooted in the younger age of our study group.

We emphasize again that our hospital exclusively operates as the only referral center for the high-risk and cancerous patients in the East and North regions of Iran, with a population of around ten million people. This impacts the incidence rate reported by us. Our study has not reflected women with adnexal masses who refused surgery or referred to other health care centers.

CONCLUSION

Our study confirmed that the rate of malignant tumors in pregnant women was considerably higher in those who had antepartum mass excision. Also, such tumors were larger, more symptomatic, and more complex. Our finding confirms that consulting with an oncologist gynecologist in the antepartum stage can help accurate detection of these tumors; hence, a successful surgical excision can be performed at the right time. We strongly recommend that all pregnant women are told about the importance of consultations with specialists in the earlier stages of their pregnancy.

Disclosure

The authors declared no conflicts of interest. No funding was received for this study.

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