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Fetal Abdominal Cysts: Prenatal Diagnosis and Management

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Abstract

Objective: Fetal intra-abdominal cystic masses are quite rare entities and their differential diagnosis is particularly perplexing. These masses encompass many different pathological cysts originating from almost every organ in the abdomen. In female fetuses, ovarian cysts are the primary cause. In our study, we investigated the techniques used in diagnosis, accuracy of methods and management strategies, and tried to summarize postnatal outcomes.

Materials and methods: A total of 29 cases were evaluated retrospectively by reviewing their ultrasonography (USG) results, magnetic resonance imaging (MRI) scans, interventions in perinatal period, postnatal follow up and surgical outcomes.

Results: Twenty nine (25 female 4 male) cases were included in the study. Mean gestational week at diagnosis was 30,0 ± 6,4 for ovarian cysts and 24,7 ± 7,5 for non-ovarian cysts. Mean diameter of cysts was 41,7 ± 25,4 mm. 17 cysts (56%) were of ovarian origin, 6 (20,7%) were mesenteric cysts, 3 of them (10.3%) originated from kidneys and 3 (10.3%) of the cysts turned out to be choledochal-subhepatic cysts. In postnatal period, 8 cases required surgery which was ovarian and mesenteric cysts. In two incidences, gonads had to be removed. In differential diagnosis of masses, diagnostic accuracy of USG was calculated as 72,4% while that of MRI was 87.5%.

Conclusion: Fetal abdominal cysts are seen more frequently in female fetuses and recognized relatively later during the pregnancy. Aspiration of the cysts in masses with larger diameters may be useful in reducing frequency of complications leading to gonad losses. Most common non-ovarian cysts are mesenteric cysts which also cause complications and require surgical interventions. Both USG and MRI are highly accurate imaging techniques in cases with adnexial masses. They have roughly the same accuracy in differential diagnosis of fetal abdominal cystic lesions.

Keywords: Fetal abdominal cysts; Diagnosis; Management; Fetal MRI

Background

Fetal intraabdominal cysts are rare entities and differential diagnosis is difficult [1,2]. The concept of abdominal cyst encompasses many cystic lesions developing from abdominal structures and representing distinct pathologies. In differential diagnosis ovarian cysts, enteric duplication cysts, mesenteric cysts, meconium pseudocysts and choledochal cysts should be considered apart from cysts with renal origin. Adrenal cysts, splenic cysts, hydrocolpos, urachal cysts and chylous ascites are seen less frequently [1,3,4].

When categorized according to fetal sex, most frequent abdominal cysts in female fetuses are ovarian cysts [5,6]. In some autopsy studies performed on newborns, incidence of ovarian cysts was as high as 30% [4,6,7]. Several hormonal causes such as immature hypothalamo-pituitary-ovarian axis (HPOA), fetal gonadotropins, maternal estrogen and placental human chorionic gonadotropin (hCG) are involved in the pathogenesis of abdominal cysts in female fetuses [1,7]. Most of the ovarian cysts originate from follicular epithelium but theca-lutein and corpus luteum cysts may also be encountered.

First line diagnostic tool is Ultrasonography (USG), however more advanced imaging techniques such as magnetic resonance imaging (MRI) may prove useful in management process [1,2,8]. Due to more widespread usage of USG in the antenatal follow up period, the incidence of ovarian cysts increased. Addition of MRI as a diagnostic tool significantly improved diagnosis and management

Monitorization is essential in the management of the cases. In most

of the fetuses, cyst dimensions are small and they regress spontaneously. Nevertheless, prognosis and therapy of these lesions are quite variable. Some rare complications such as ovarian torsion may require surgical intervention [9,10].

As mentioned before, there is not sufficient data in literature concerning the diagnosis and management of fetal abdominal cysts. Furthermore, evaluation of available information has not led to a general consensus on the optimal approach to these cases. In this study, we reviewed the medical records of cases followed in our obstetrics and perinatology outpatient clinics and investigated the diagnostic work up, follow up and treatment. Intrapartum and postpartum outcomes of fetuses with abdominal cysts were evaluated. We also assessed the role of USG and MRI studies in this process.

Materials and Methods

For this study, medical records of pregnant women followed

up between 1998-2013 at Istanbul University Cerrahpasa School of Medicine Department of Obstetrics and Gynecology outpatient clinics of obstetrics were reviewed retrospectively. Inclusion criteria for the study were term pregnancies without any fetal pathologies; normal weight and size for gestational age; absence of maternal systemic diseases; uneventful pregnancy follow up. Pregnancies which were terminated because of a fetus with a co-existing extraabdominal and/or chromosomal abnormality were excluded from the study. Perinatal and postnatal outcomes of 29 patients with fetal abdominal cysts were evaluated. Prior pregnancies, gestational week at diagnosis, prognosis of the abdominal mass throughout the pregnancy, dimensions, localization and nature of the masses were assessed together with MRI findings, results of perinatal inventions done for diagnosis and treatment and follow up process in postnatal period.

All sonographic examinations were performed by an experienced obstetrician. The ultrasound equipment used during the study was ATL 3000 and ATL 5000 (Advanced Technology Laboratories, Bothwell, WA, USA) machines with 5- or 3.5-MHz transducers. In 8 cases who were visualized with MRI for further evaluation, images were obtained with a 1.5 Tesla MRI device (Achieva, Philips Healthcare). The standardized MRI protocol consisted of 5 mm sagittal and coronal T1-weighted spin echo slices (TR, 400 ms; TE, 115 ms; matrix size, 512×512), and 5 mm axial T2-weighted fast spin echo slices (TR, 5040 ms; TE, 115 ms; matrix size, 512×512). The MRI examination was assessed independently by a radiologist experienced in fetal MR imaging. Statistical studies were performed with SPSS v20.0 software.

Results

Mean age of pregnant women enrolled in the study was 27,9 (range: 20-42). Mean gestational week at diagnosis was 27,0 (range 13-38). Mean gestational week at diagnosis was 30,0 ± 6,4 for ovarian cysts and 24,7 ± 7,5 for non-ovarian cysts. 25 (86,2%) fetuses were female and 4 (13,8%) were male. Mean diameter of cysts was 41,7 ± 25,4 mm. 17 cysts (56%) were of ovarian origin, 6 (20,7%) were mesenteric cysts, 3 of them (10.3%) originated from kidneys and 3 (10.3%) of the cysts turned out to be choledochal-subhepatic cysts. The clinical profiles of the study participants are given in (Table 1).

When all the cases with a prediagnosis of ovarian cysts were considered, 7 (41,2%) of these regressed spontaneously and in 10 (58,8%) of the cases the cyst persisted. In five (29,4%) cases, surgical intervention was the choice of therapeutic modality and 5 (29,4%) of them were followed uneventfully. Two of the mesenteric cysts (33,3%) were resorbed while 4 cases (66,7%) persisted and 3 of these required surgery. Two renal cystic masses regressed spontaneously and the third one was followed up without incidence. One of the choledochal/subhepatic cysts resolved spontaneously and other two were uncomplicated throughout follow up. In postnatal period, 8 cases required surgery which were ovarian and mesenteric cysts. In two incidences, gonads had to be removed. In differential diagnosis of masses, diagnostic accuracy of ultrasonography was calculated as 72,4% while that of MRI was 87.5%. Anatomical origins and postnatal follow up information on cysts are summarized in (Table 2).

Dimensions of cysts and perinatal outcomes of the cases are given in (Table 3). When all groups were assessed as a whole, mean dimension of the cysts which regressed spontaneously was 35,6 mm (min-max; 8-75 mm) and mean dimension of cysts which were followed up uneventfully was 40,8 mm (min-max; 13-105 mm). Mean dimension of complicated and surgically treated cysts was 52,5 mm (min-max; 30-120 mm). Although the difference between these values did not reach statistical significance, increasing cyst dimensions apparently resulted

in more complications during follow up and there were increasingly more surgical interventions with larger cyst sizes.

Out of 17 cases with a diagnosis of ovarian cyst, 2 had a torsioned ovary and 3 had hemorrhage. Other patients had uneventful progresses. Overall, mean dimension of cysts was 39,76 ± 13,40 mm. In 5 cases which required surgical intervention, mean dimension was 45,6 ± 14,9 mm. Ovarian torsion and gonad loss were seen in 2 patients and mean diameter of mases in these cases was 37,0 ± 4,24 mm.

The cyst content was aspirated in 3 (10,3%) cases and pathological examination revealed that two of the specimens were hemorrhagic material while the third one was a serous fluid. Afterwards, one hemorrhagic cyst required surgical intervention in postpartum period but the other two regressed spontaneously.

In perinatal follow up, only 8 of 29 patients had an MRI and when compared with usg results, 2 patients had conflicting results. When postnatal definitive diagnoses were compared, mri results led the clinician to correct diagnosis in 7 cases out of 8 (87,5%) and usg was successful in 21 of 29 (72,4%) patients.

Discussion

In our study, most of the cystic lesions (n=25; 86,2%) were

Age (year)	27,93 ± 5,50	
Gravidity (n)	1,72 ± 1,09	
Gestational age at diagnosis (week)	27,82 ± 7,28	
	Ovarian cysts	Others
	30 ± 6,4	24,7 ± 7,5
Size at prenatal diagnosis (mm)	41,72 ± 25,46	
Fetal sex	Female	Male
	n: 25 / 86.2%	n: 4 / 13,8%
Origin of the mass	Ovarian cysts	n:17 / 58,6%
	Mesenteric cysts	n: 6 / 20,7%
	Renal cysts	n: 3 / 10,3%
	Choledochal/Subhepatic cysts	n: 3 / 10,3%

Table 1: The clinical profiles of the study subjects.

		Postnatal Outcomes			
		Spontaneous Regression	Asymptomatic Observation	Surgery	Total
Origin of mass	Ovarian cysts	n: 7 24,1%	n: 5 17,2%	n: 5 17,2%	n: 17 58,6%
	Mesenteric cysts	n: 2 6,9%	n:1 3,4%	n: 3 10,3%	n: 6 20,7%
	Renal cysts	n: 2 6,9%	n: 1 3,4%	n: 0	n: 3 10,3%
	Choledochal Cysts	n: 1 3,4%	n: 2 6,9%	n: 0	n: 3 10,3%
	Total	n: 12 41,3%	n: 9 31,2%	n: 8 27,5%	n: 29 100,0%

Table 2: Anatomical origins of the masses and subsequent postnatal managements.

	N	Mean Diameter (mm)	Minimum (mm)	Maximum (mm)
Spontaneous Regression	12	35,61	8,00	75,00
Surgery	8	52,50	30,00	120,00
Asymptomatic Observation	9	40,87	13,00	105,00
Total	29	41,72	8,00	120,00

Table 3: Dimensions of cysts and perinatal outcomes.

encountered in female fetuses. Therefore, the majority of the lesions turned out to be ovarian cysts (n=17; 56,8%). The incidence of fetal ovarian cysts is uncertain but has been estimated to be 1 in 2.625 pregnancies [11]. The increased use of routine USG caused earlier detection of fetal ovarian cysts.

Bagolan et al. reported a spontaneous resorption ratio of 5% for fetal ovarian cysts. In antenatal period, we observed spontaneous resorption in 13 (38,6%) cases among fetal ovarian cysts under 5 cm [12]. The difference might be due to the number of cases involved in both studies and developing imaging techniques allowing the detection of smaller cysts which would have been thought to have regressed completely in former studies.

In general, the risks of adnexial torsion and other complications increase proportionately to cyst dimensions. In the study conducted by Bagolan et al. the ratio of oophorectomies in fetal ovarian cysts over 5 cm was 85% and the ratio of cysts that regressed spontaneously was 15% [12]. The researchers recommend the aspiration of cysts if the cyst dimension exceeds 5 cm or a weekly enlargement of 1 cm is detected in follow-up. In our study, three cysts which had a mean diameter of 74,0 ± 26,8 mm were aspirated to prevent complications. The content was hemorrhagic in two cysts and serous in the third one.

Following aspiration procedure, the cyst with serous content disappeared completely while postpartum cystectomy was performed for one of the cysts with hemorrhagic content. As a result, in our study, in accordance with Bagolan et al.'s work, cyst aspiration in cysts > 5 cm effectively prevented serious complications leading to the loss of gonads. Only one cyst regressed spontaneously without any intervention although it was larger than 5 cm (actual size: 63 mm). Some other studies argue that, contrary to Bagolan et al.'s findings, postnatal period should be preferred rather than prenatal period for cyst aspiration procedures for reasons of safety and efficacy [13,14].

In our study, there were no cyst aspirations performed in postnatal period. Instead, curative surgical interventions were preferred in cases when necessary.

In postpartum follow-up, mean diameter of 5 ovarian cysts which required surgery was 45,6 ± 14,9 mm and in two cases which eventually ended in adnexial torsion and gonad loss, mean diameter was 37, 0 ± 4,2 mm. Out of 13 cases with cysts > 5 cm, 2 (15,3%) cysts were operated because of adnexial torsion and oopheroctomy was performed. This ratio was higher in Bagolan et al.'s study, which was calculated as 31%. In ovarian cysts smaller than 5 cm, 3 were aspirated in intrauterine period and one regressed spontaneously hence there were no complications leading to gonad loss. Again in the same study, researchers reported that in cases which did not undergo any surgical intervention, the ratio of oophorectomy was 85% and spontaneous regression was 15% [12].

This may imply that, aspiration was the influential factor on the small number of surgical interventions done for the cysts above 5 cm in our study. However, as mentioned before, the appropriate timing for aspiration (prenatal vs. postnatal) is controversial.

Non-ovarian abdominal cysts were diagnosed relatively earlier (non-ovarian vs. ovarian: 24,7 ± 7,5 weeks vs. 30,0 ± 6,4 weeks). A sound explanation for this is that these cysts usually have a functional origin, secondary to maternal hormonal stimulation that occurs later in pregnancy. Our findings are in line with findings of Catania et al., who detected fetal ovarian cysts relatively later in pregnancy compared with other intraabdominal lesions [15].

We found that mesenteric cysts are the most common type of non-ovarian cysts and these cysts have the highest rate of complications, which is in line with Ozyuncu et al.'s findings. As these lesions have a lower ratio of spontaneous regression, they require surgical intervention more frequently in postnatal period [16].

Choledochal/subhepatic cysts either regress in prenatal period or persist without symptoms. However, these patients should be followed longer, since the risks of cholangitis and hepatic insufficiency are significantly high [15].

Choledochal cysts are reported 4 times more frequently in female fetuses. In our study, this ratio was 2 to 1 due to low sample size [17].

In our study, two lesions which were considered as renal cystic lesions in prenatal period were not visualized postnatally. These lesions might have regressed spontaneously or they might have been mistakenly diagnosed as renal cysts which actually were physiologic or pathologic structures which were neighboring kidneys [18].

Antenatal USG has high sensitivity in detection of intraabdominal lesions, but it has limited success in differential diagnosis of these masses [19,20,11,12]. Ozyuncu et al. reported that ultrasonography had a positive predictive of value of 75% in differential diagnosis [16].

In our study, accurate results were obtained in 21 of 29 cases (72,4%) with USG. In ovarian cysts, USG performed better (n-13; 81%), but in cysts originating from gastrointestinal and urinary systems, accuracy of USG is lower (n=4; 57,1% and n=2; 50%, respectively). The findings on choledochal/subhepatic lesions were similar in prenatal and postnatal periods and these results are not in line with the reports in literature [21].

MRI regained superiority in elaborating equivocal sonographic findings and establish a differential diagnosis after the introduction of ultra-high-speed magnetic resonance imaging technique [22-24]. MRI contributes to investigation of neurological pathologies, thoracal abnormalities and fetal gastrointestinal anomalies. Furthermore, MRI can be used to evaluate the relationship between the cyst and the biliary tract, gallbladder, and liver [25].

Fetal abdominal cysts are seen more frequently in female fetuses and diagnosed relatively later in pregnancy. These cases require close attention since a probable torsion might lead to a secondary gonad loss. In larger cysts, cyst aspiration is a feasible technique to avoid complications which may cause gonad loss. The risks of serious complications are higher in large cysts, however smaller cysts may be complicated as well.

Our study has certain limitations such as having a retrospective design, a small sample size, lack of MRI confirmation in all of the cases who were diagnosed with fetal intraabdominal cysts in ultrasound examination. On the other hand, this study is distinctive in the sense that fetal abdominal cysts of diverse origins were evaluated together, various diagnostic tools were used conjointly, prenatal invasive techniques were utilized and surgical results were presented together with postnatal follow up data.

Mesenteric cysts are the most common type of non-ovarian abdominal masses and also the most frequently complicating ones thus requiring surgical intervention. Choledocal cysts need longer follow-up since the risk of cholangitis and hepatic insufficiency increase in these newborns. Furthermore, MRI and USG perform similarly well in diagnosis and differential diagnosis of abdominal cysts.

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