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Dilşad Demet Dereli, Baran Tokar, Nevbahar Akcar Degirmenci,

Sabiha Sahin, Surhan M. Arda, Huseyin İlhan

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ORIGINAL ARTICLE

Ovarian cysts and laparoscopy in children: Importance of late postoperative ultrasound examination in follow-up

Dilşad Demet Dereli, Baran Tokar, Nevbahar Akcar Degirmenci, Sabiha Sahin, Surhan M. Arda, Huseyin İlhan

Abstract:

Objective: The ultrasonography (USG) as a non-invasive method plays very important role in diagnosis and treatment of childhood ovarian cysts. In this prospective study, results of early and late postoperative USG follow-ups were evaluated in patients who had laparoscopic cystectomy for ovarian cyst.

Method: Forty patients having laparoscopy (45 operation) due to ovarian cysts were included into the study for a 5-year period. Preoperative clinical and USG findings and operation videos recorded during laparoscopic intervention were reviewed. The patients were invited to USG controls at postoperative 1, 3, 9-month, and 1-year and thereafter.

Results: The age range of patients was from 13 days to 18 years old. Postoperative USG controls showed that reoccurred cysts on the operated side were small and there was no indication for reoperation, but a second intervention was needed for the contralateral ovary in 5 patients. All these re-operated cases were determined in the late (≥ 1 year) USG control.

Conclusion: Laparoscopy is an effective treatment method for ovarian cysts. The reoperation may be needed depending on physical examination and USG findings. There is a risk of symptomatic and large cyst occurrence on the contralateral side. A long term postoperative USG follow up helps to determine these cysts.

Keywords: Child; ovarian cyst; laparoscopy; ultrasound
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Ovarian cyst is a rare pathology during childhood. It constitutes 1-2 % of the masses during this period. The most common ovarian pathology requiring surgery in the pediatric population is an ovarian cyst with or without subsequent torsion [1]. The indications of surgery include suspected ovarian torsion, complicated cyst rupture or severe abdominal pain result from extreme cyst growing and sustained functional disorder in children [2, 3]. Laparoscopic intervention of benign ovarian cysts in children is a minimal invasive method that shortens the hospital stay, provides a better cosmetic outcome and lower postoperative adhesion [4-6]. Ultrasonography (USG) is a well accepted diagnostic modality in ovarian cysts. In present study, we aimed to evaluate the clinic importance of early and late postoperative USG control of operated and contralateral ovaries on patients having laparoscopic intervention for benign ovarian cysts.

MATERIAL AND METHODS

Totally 40 patients who were referred to Pediatric Emergency or Pediatric Surgery departments were included. They had acute abdomen and ovarian cyst and were operated by laparoscopy in Pediatric Surgery during August 2005-August 2010. Forty-five laparoscopic ovarian surgeries were used as data. Preoperative clinical

and USG findings and operation videos recorded during laparoscopic intervention were reviewed. The patients were invited to USG controls at postoperative 1, 3, 9-month, and 1-year and thereafter. The size and structure of the cysts and recurrence were assessed by USG.

Dereli DD¹, Tokar B¹, Akcar-Degirmenci N², Sahin S³, Arda SM¹, İlhan H¹.

¹Department of Pediatric Surgery, Eskisehir Osmangazi University, Faculty of Medicine

²Department of Radiology, Eskisehir Osmangazi University, Faculty of Medicine

³Department of Pediatrics, Eskisehir Osmangazi University, Faculty of Medicine

Corresponding Author:

*Baran Tokar, Department of Pediatric Surgery, Eskisehir Osmangazi University, Faculty of Medicine, Eskisehir, Turkey
E-mail: barantokar@ogu.edu.tr

Additionally, the patients who had a diagnosis of mature cystic teratoma, paraovarian cysts and ovarian torsion determined during laparoscopic exploration were included into the study.

Statistical Analysis: The distribution of data was determined by using Shapiro Wilk's Test. Oneway Anova Test (PostHoc Test-Tukey HSD Test), Student's t-test and Pearson chi-squared test were used to compare data. To study the sensitivity and specificity, we benefited from crosstab between two categorical variables. The results were presented at 95 % confidence interval, $p < 0.05$ was considered statistically significant.

RESULTS

The mean age of patients was 12.1 ± 7 years old. The oldest patient was 18 years old and the youngest one was 13-days. Surgical intervention was performed for patients with an ovarian cyst larger than 50 mm in diameter. All patients had acute abdominal findings. In laparoscopy, ovarian cyst was enucleated and neighboring ovarian tissue was preserved. Follicle cyst was the most frequent pathology as found as 30.6%. There were concomitant paraovarian cysts and ovarian cysts in 4 patients. The ovarian pathology of those 4 patients was identified as follicle cyst.

Diagnostic accuracy of preoperative USG was 62.2%. One patient with paraovarian cyst torsion was identified as ovarian torsion. A right ovarian cyst was found by laparoscopic exploration in a patient who had a preoperative USG diagnosis of appendicitis. Three of 5 patients with mature cystic teratoma were diagnosed by USG, but magnetic resonance imaging (MRI) was needed for the diagnosis of the other 2 patients. Eight of 16 patients with ovarian torsion couldn't be diagnosed as torsion by USG. In these patients, preoperative diagnosis was ovarian cyst. The torsion was determined during laparoscopy. The sensitivity and positive predictive value of preoperative USG was found 67.1% and 90.3%, respectively (Table 1).

The ovarian cyst was determined as well as appendicitis in 3 of patients received laparoscopy due to acute abdomen. It was thought that the complaints of those patients were resulted from appendicitis.

Table 2 shows the results of postoperative USG performed at 1, 3, 9 and 12- months and thereafter. The diameter of incipient ovarian cysts on the operated and contralateral sides was followed closely. No cyst recurrence was observed with a diameter above 40 mm on ipsilateral ovary. Only 1 patient was identified with 37 mm cyst during 1-year control and she was referred to pediatric endocrinology department. During 1-year and thereafter controls, cyst occurrence above 50 mm was determined only on contralateral ovary of 5 patients (Table 2).

Table 1. The correlation of preoperative ultrasound and exploration findings

Preoperative USG	Diagnosis			Total
	Ovarian cyst	Mature cystic teratoma	Paraovarian cyst*	
Accurate diagnose	25	3	0	28 (%62.2)
Undiagnosed	8	2	7	17 (%37.8)
Total	33	5	7	45

* The patients with both ovarian and paraovarian cysts

Reoperation was performed for symptomatic cysts which were above 50 mm in diameter. Three patients having cysts with diameter between 30 to 50 mm in contralateral ovary were directed to pediatric endocrinology department.

The incidence of cyst appearance below or above 30 mm in diameter on USG for the contralateral ovary within postoperative 9 months and before and one year and thereafter was also compared. There was a statistically significant difference between USGs findings within postoperative up to 9 months group (1, 3 and 9 months controls) and one year and thereafter group ($p < 0.01$) (Table 3). There were significant number of patients who had a cyst bigger than 30 mm on the contralateral side in postoperative first year USG controls.

DISCUSSION

Today, frequently USG and rarely MRI and computed tomography (CT) are used for the diagnosis and the management of ovarian pathologies. The location, size and extent of ovarian cysts can be determined with high accuracy by ultrasound which is a non-operative and non-invasive technique [7, 8]. Also it can detect whether there are any concomitant pathology. MRI and CT are likely to be preferred for ovarian cysts suspected for malignancy rather than benign cysts.

The management of ovarian cyst depends on the cyst size and symptoms. The simple cysts smaller than 2 cm in diameter are regarded as normal and no intervention is needed. Non symptomatic cysts larger than 2 cm in diameter can be followed by USG. In our study, surgical intervention was performed for patients with ovarian cyst larger than 5 cm in diameter. All patients had symptoms such as abdominal pain, nausea, vomiting and menstrual irregularity. Symptomatic, hormonally active and large

cysts with malignancy characteristics should also be intervened [9].

In our study, there was a significant difference between the dispersion of cysts which are diagnosed correctly and undiagnosed or misdiagnosed with USG. Preoperative diagnosis was correct by USG in 62.2% of our patients. Cases with large paraovarian cysts preoperatively were misinterpreted as ovarian cyst. There is a probability of finding ovarian cyst during laparoscopy in patients who had preoperative USG diagnosis of acute abdomen or appendicitis. In a study performed from 1991 to 2007, appendectomy was performed additionally during ovarian cyst surgery for 24 of 155 patients [2]. Ten of them were reported as abnormal on histology. USG may not be

sufficient for the diagnosis of mature cystic teratoma. In this study, 3 of 5 patients with mature cystic teratoma had suspicion of mature cystic teratoma according to USG but additionally MRI was performed in 2 of them because no clear diagnosis was obtained by USG. Preoperative USG could not identify ovarian torsion in 8 of 16 patients who had torsion confirmed during exploration. For USG, the sensitivity was 67.1% and positive predictive value was 90.3% in our study. Although indication for laparoscopic exploration of ovarian cysts should be based on anamnesis, physical examination and USG, because of that sensitivity rate, we may suggest that laparoscopic exploration could be preferred at the stage of diagnosis and management for the assessment of suspected cases.

Table 2. Postoperative USG data showing the distribution of cyst diameter at the ipsilateral and contralateral sides.

Cyst Diameter (mm)	1-month		3-month		9-month		≥ 1-year	
	Ips.*	Contr.**	Ips.	Contr.	Ips.	Contr.	Ips.	Contr.
0-10	14	17	7	9	8	15	11	14
10-20	12	9	2	7	2	4	3	4
20-30	-	-	1	2	2	2	2	1
30-40	-	-	-	-	-	1	1	1
40-50	-	-	-	-	-	-	-	2
≥50	-	-	-	-	-	-	-	5
Total	26	36	10	18	12	22	17	27

* Ips., ipsilateral; ** Contr., contralateral.

Table 3. The distribution of cysts according to diameter below or above 30 mm in contralateral ovary on postoperative USG

	Within first 9 months*	≥ 1 year	Total
<30 mm	64	19	83
> 30 mm	1	8	9
Total	65	27	92

* Including postoperative USG control of first, third and ninth months; $\chi^2=17.05$, $p<0.001$

The diameter of cysts reoccurred on operated ovary was often measured between 0-10 mm at the postoperative USG controls. While comparing early or late-term postoperative USGs, it was seen that there was no diameter increment and no new cyst occurrence and any other

pathology needed reoperation on the operated side. These results suggest that the likelihood of cyst recurrence that would need surgery at the operated side is lower during early and late postoperative follow up. There is a possibility of recurrence depending on the surgical technique and pathology.

In this study, although we found no cyst recurrence at the operated side, new cysts above 50 mm developed at the contralateral ovary after first year of surgery in 5 patients. During the postoperative 1-year and thereafter controls of contralateral ovary, the cyst occurrence above 30 mm was significant in late-term controls compared to controls before 9 months. This may suggest that USG controls of bilateral ovary should be performed even after postoperative first year of intervention. Contralateral ovary has a risk of a large cyst occurrence and laparoscopic re-exploration might be needed for contralateral side depending on anamnesis, physical examination and USG findings.

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