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Original Article

Evaluation of general characteristics of adolescent girls who had ovarian cystectomy (1-year single center experience)

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ABSTRACT

Objective: To evaluate the general characteristics and outcomes of adolescent girls who underwent ovarian cystectomy at our center over a one-year period, emphasizing the importance of conservative surgical approaches and ovarian preservation in this demographic.

Materials and Methods: This retrospective study included 15 adolescent girls who underwent ovarian cyst surgery at our clinic from March 2023 to March 2024. We collected data on age at menarche, menstrual patterns, family history, and preoperative measurements such as height, weight, and various tumor and hormonal markers. Imaging studies before surgery were reviewed.

Results: The median age of the patients was approximately 14.8 years. Most patients presented with abdominal pain, and imaging showed a mix of simple and complex cystic structures. Pathology results revealed a predominance of simple cysts, with a few cases of paratubal serous cysts, endometriomas, serous cyst adenomas, and one juvenile granulosa cell tumor. Surgical treatment was generally indicated by large cyst size, symptoms of torsion, or suspicion of malignancy.

Conclusions: Our findings highlight the varied presentations and surgical needs of adolescent girls with ovarian cysts. Emphasizing conservative surgical strategies that prioritize ovarian preservation is crucial in this age group due to the low malignancy rates and significant potential for future reproductive health implications. The outcomes underscore the necessity for careful preoperative evaluation and tailored surgical approaches based on individual patient characteristics and cyst features.

Keywords: adolescent girls, ovarian cystectomy, ovarian cyst, surgery

INTRODUCTION

It is estimated that pediatric ovarian lesions occur at a remarkable rate of 2–5 cases per 100,000 girls per year.[1–3] These lesions are extremely rare but cover a wide spectrum of pathology, from functional benign ovarian cysts to ovarian torsion and from benign tumors to highly aggressive neoplasms. Functional ovarian lesions (FOL), such as follicular and corpus luteum cysts, are the most common abnormalities in both adults and children, representing approximately 45% of all ovarian pathologies.[4] The clinical appearance of patients with adnexal masses varies depending on the underlying cause. The majority of diagnosed patients present with pelvic or lower abdominal pain, often due to torsion of the adnexa or hemorrhage into

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the lesion.[5] Ovarian cyst treatment varies depending on the cyst type, size, and imaging findings (ranging from surveillance to surgery).[6] Laparoscopic cystectomy is a treatment method that has become the gold standard in the surgical treatment of persistent adnexal masses due to the presence of ovarian cysts and potential risks of rupture or malignancy.[7] In our study, we aimed to present the general characteristics of adolescent girls who had cystectomy for various reasons and applied to our outpatient clinic within the last year.

MATERIAL AND METHOD

We included in our study 15 adolescent girls who underwent ovarian cyst surgery for various reasons and applied to our polyclinic between March 2023 and March 2024. Ages at first menarche, menstrual patterns, and family history of cystectomy were questioned and recorded. A single trained nurse carried out height and weight measurements. Tumor marker and hormone test results were noted from the patients' files (Luteinizing hormone (LH), Follicular stimulating hormone (FSH), estradiol (E2), total testosterone (TT), thyroid stimulating hormone (TSH), free T4 (fT4), glucose, insulin, chorioembryonic antigen (CEA), beta-human chorionic gonadotropin (beta HCG), lactate dehydrogenase (LDH), alpha-fetoprotein (AFP), C-125) Additionally, 17OH progesterone, Dehydroepiandreosterone-sulfate (DHEA-S), ACTH and cortisol hormones were examined in 3 patients with hirsutism. Preoperative imaging and abdominal/pelvic USG were recorded from the patient's files. Approval for the study was received from the Ethics Committee Unit of Selçuk University Faculty of Medicine (Protocol No:2024/242).

Statistical analysis

The study was descriptive, and descriptive statistics for the variables were presented as mean ± standard deviation, frequency (n), and percentage (%).

RESULTS

General characteristics of the patients are given in Table 1. The median age of our patients was 14.8 ± 1.15 years. The mean SD of the patient's body weight was 0.5± 1.35, and the body mass index SD was 0.63± 1.36. Obesity was detected in only one patient with a body mass index (BMI) SD of 2.65, but this patient had a regular cycle and did not have hirsutism. The mean age at menarche was 12.3± 1.13 years, but one patient had an early age at menarche at 9.8 years, and all the others had menarche older than 11 years.

Laboratory results of the patients are given in Table 1. In the results, no hormonal disorders or pathological findings were detected. According to the Ferriman Gallwey score, only three patients were diagnosed with mild/moderate hirsutism, and ACTH, 17OHP, and DHEA-S tests were performed, but the results were normal. In one patient who was obese, the Homo IR value was borderline high at 3.9, but the values of the other patients were normal. Cyst sizes could not be evaluated because two patients were admitted to our hospital with the clinic of acute abdomen (cyst rupture). However, in the preoperative imaging of the other 13 patients, the mean long axis of the cyst was 75± 55 mm. In preoperative USG imaging, septate cyst structure was observed in 4 patients, and the presence of a solid component was observed in 2 patients, while the cyst morphology of the other patients was pure cystic.

While 2 (13.3 %) patients were diagnosed incidentally through imaging performed for other reasons, 2 (13.3 %) patients presented with acute abdomen due to ovarian torsion; the complaints of all 11 (73.3%) patients were abdominal pain. Patients with incidentally detected cysts were operated on because their cyst sizes were large (80 mm and 100 mm), and there was no resolution within one month of follow-up.

According to the pathology results, simple cysts were observed in 7 (46.6 %) patients, paratubal serous cysts in 4 (26.6 %) patients, endometrioma in 2 (13.3 %) patients, serous cyst adenoma in 1 patient, and juvenile granulosa cell tumor in 1 (6.6 %) patient (Table 2). There was no family history of ovarian cystectomy in the patients.

DISCUSSION

In this study, we present 15 patients who applied to our outpatient clinic for ovarian cystectomy for 1 year. Although most were simple cysts, granulosa cell tumors and cystadenoma were detected in the ovaries of 2 of our patients. Although the reason for admission mainly was abdominal pain, acute abdominal clinic due to cyst rupture was observed in 2 (13.3 %) patients.

Ovarian cysts are common during adolescence but rare during pre-adolescence.[8] The common cause of cyst formation during the pubertal period is dysfunctional ovulation: maturing follicles fail to ovulate and remain simple ovarian cysts. These follicular cysts develop in the first half of the menstrual cycle and resolve in the second half. They are fluid-filled and can grow to enormous sizes under hormonal stimulation. Persistence of the corpus luteum formed from the ruptured follicle may also cause functional ovarian cysts. These cysts can grow up to 10 cm, be filled with fluid and/or blood, and may rupture during menstruation, causing bleeding. During the prepubertal period, follicular ovarian cysts might develop in response to

Table 1. General characteristics of the patients

								Percentiles	
	N	Missing	Mean	Median	SD	Minimum	Maximum	25th	75th
Age (month)	15	0	177.733	183	21.063	144	204	162.000	192.000
Weight	15	0	59.367	55.000	10.776	47.000	80.400	51.350	68.500
Weight (SD)	15	0	0.549	0.440	1.350	-1.130	3.040	-0.465	1.550
Height	15	0	160.520	161.500	6.956	147.900	170.000	156.150	165.850
Height (SD)	15	0	-0.015	0.140	1.155	-2.370	1.980	-0.890	0.695
BMI	15	0	22.900	21.200	4.157	18.300	32.700	20.250	24.650
BMI (SD)	15	0	0.632	0.550	1.363	-1.090	3.040	-0.550	1.650
Menarche age	15	0	148.000	148	13.670	118	168	144.000	156.000
LH mIU/ml	15	0	10.724	9.670	6.481	1.530	24.600	6.420	13.950
FSH mIU/ml	15	0	5.371	5.100	2.300	1.120	9.830	3.825	6.880
LH/FSH	15	0	2.292	1.680	1.662	0.590	6.740	1.175	3.140
E2 pg/ml	15	0	79.300	65.300	64.672	11.400	275.000	42.200	90.700
T. testosterone ng/dl	15	0	25.613	30.200	11.999	8.650	47.600	14.300	33.950
TSH mIU/ml	15	0	1.783	1.500	0.843	0.800	3.200	1.070	2.455
F t4 ng/dl	15	0	1.199	1.190	0.164	0.930	1.620	1.095	1.280
Beta HCG mIU/ml	15	0	0.200	0.200	0.000	0.200	0.200	0.200	0.200
AFP ng/ml	15	0	1.529	1.160	0.854	0.900	3.260	0.920	1.590
CEA ng/ml	15	0	0.937	0.770	0.494	0.400	2.170	0.565	1.235
CA-125 U/ml	15	0	23.771	16.600	20.010	2.100	81.300	13.100	33.150
LDH U/L	15	0	172.067	173	30.767	135	260	152.500	181.000
Glukoz mg/dl	15	0	89.067	88	11.139	78	109	79.000	95.500
Insulin mIU/ml	15	0	13.550	6.170	16.355	3.900	65.000	5.100	13.400
Homo IR	15	0	3.201	1.470	4.248	0.840	17.000	1.000	3.295
ACTH pg/ml	3	12	18.033	19.000	6.504	11.100	24.000	15.050	21.500
Cortizol mcg/dl	3	12	7.233	7.000	0.777	6.600	8.100	6.800	7.550
DHEAS mcg/dl	3	12	174.667	182	24.826	147	195	164.500	188.500
17OHP ng/ml	3	12	0.977	1.030	0.225	0.730	1.170	0.880	1.100
preop cyst long axis (mm)	13	2	75.154	66	55.287	35	247	44.000	76.000

SD: Standard Deviation, BMI: Body mass index, LH: Luteinizing hormone, FSH: Follicle stimulating hormone, E2: Estradiol, TSH: thyroid stimulating hormone, Ft4: free T4, beta HCG: human gonadotropic gonadotropin, AFP: alpha fetoprotein, LDH: Lactate Dehydrogenase, ACTH: Adrenocorticotropin Hormone, CEA: Carcino embryogenic antigen, CA-125: carbohydrate antigen-125, DHEA-S: Dehydroepiandrosterone sulfate, 17OHP: 17-Hydroxyprogesterone.

stimulation caused by intermittent gonadotropin release from the developing pituitary.[9] None of our patients were in the prepubertal period.

The most common symptoms of functional ovarian cysts are menstrual irregularity due to anovulation (70%) and lower abdominal pain.[10] Similarly, the most common presenting complaint of our patients was abdominal pain at 73.3%.

Table 2. Histopathological findings of ovarian cyst materials

Histopathological findings	Counts	% of Total	Cumulative %
Simple cyst	7	46.7%	46.7%
Para tubal serous cyst	4	26.7%	73.3%
Endometrioma	2	13.3%	86.7%
Serous cystadenoma	1	6.7%	93.3%
Juvenile granulosa cell tumor	1	6.7%	100.0%

The ovaries can sometimes experience torsion, which initially disrupts venous and lymphatic circulation, causing ovarian obstruction, and may ultimately progress to arrest of arterial circulation and ovarian necrosis. Ovarian torsion is primarily related to an ovarian mass or cyst but can also occur in normal ovaries (idiopathic, 16% of cases).[11,12] The most apparent symptom of ovarian torsion is the acute onset of sharp right- or left-sided lower abdominal pain. Vomiting caused by the pain-induced vagal reflex is present in 73% of cases and typically occurs as soon as after the onset of pain.[13] It was stated in the files that two patients with torsion had severe sharp abdominal pain accompanied by vomiting.

Mixed solid and cystic component masses and completely solid masses seen in the ovary have a higher neoplasm and malignancy rate than simple cysts. The presence of solid ingredients has the highest predictive value for malignancy.[14] In two of our patients in whom adenoma and tumor were detected, the solid component image was tested by ultrasonography. In addition, the smallest cyst we detected in our patients was 35 mm. However, due to severe abdominal pain, septa formation in ultrasound imaging, and leveling within the cyst, the patient was taken to surgery, and pathology evaluation was reported as endometrioma.

Ultrasonography is the initial imaging modality of choice, and further imaging is usually unnecessary. It provides information about the nature of the mass (cystic or solid), its dimensions, its place of origin, and its relations with neighboring organs.[9] Simple cysts: They present as fluid-filled functional cysts, which are monocular, anechoic, thin, and smooth-walled. Hemorrhagic functional cysts seem complex and multilocular, with lace-like reticular inner echoes corresponding to thin fibrin strands and/or containing a solid clot inside. Doppler ultrasound typically shows peripheral blood flow (“ring of fire”) at the cyst border, but no passage is seen at the internal septation.[8] Septa formations were seen within the cyst in the preoperative ultrasound images of 3 patients with simple cysts and one with paratubal serous cysts. Additionally, the presence of a solid component was reported in a patient diagnosed with endometrioma.

Surveillance is recommended for both simple and hemorrhagic functional ovarian cysts. As a rule, both follicular and corpus luteum cysts dissolve.[15] Cysts up to 8 cm in size heal in an average of 4-5 weeks, while larger cysts may take up to 3 months to heal.[16] In girls diagnosed with ovarian cysts before puberty, puberty praecox should be excluded as the cause of the cyst.[15] Surgery is indicated in the presence of complications such as ovarian torsion or cyst rupture with persistent intra-abdominal bleeding, as well as in cases of concern for malignancy or failure to provide resolution during follow-up.[11,15]

There is no agreement on the timing of surgery for ovarian cysts in adolescents, but there are some recommendations. If a simple cyst less than 3 cm in diameter is identified (a large follicle), no further imaging is required. For cysts measuring 3–5 cm in diameter, a follow-up scan should be scheduled after three months to check for resolution. If the cyst is 5–7 cm in diameter, a surveillance ultrasound after three months or laparoscopic ovarian cystectomy if symptomatic should be offered. If a hemorrhagic cyst is identified, another scan should be conducted after 6–8 weeks to check for resolution.[17] In this study, patients were evaluated according to recommendations for surgical indications.

Although the general opinion is that the treatment of ovarian lesions in children should be based on a minimally invasive approach depending on the patient’s age and ultrasound findings, there is no clear algorithm on when surgery should be performed.[18] Berger-Chen et al.[19] showed that in the approach to benign ovarian masses, in addition to patient characteristics, the characteristics of both the physician and the hospital strongly affect the decision on the treatment method of these patients. Since our hospital is a surgical center, cases from surrounding provinces with suspected surgical requirements are referred to our hospital. It can be speculated whether the decision to undergo surgery might have been made more quickly.

A study conducted by Seckin et al.[20] reported the rates of simple cysts in 40.5%, para ovarian/para tubal cysts in 25.3%, endometriomas in 11.4%, and malignancy in 1.3% of adolescent girls aged 12-18 years, which is very similar to our results.

The lack of a precise algorithm for deciding on surgery for adolescents with ovarian cysts makes management difficult. Although the exact duration is not clear for patients with ovarian cysts whose complaints have resolved, most authors recommend a waiting period of 3-6 months.[9] Similarly, another study showed that although most pediatric ovarian neoplasms are benign and can be treated with ovarian-sparing surgery (OSS), there is no consensus on the optimal surgical approach. In particular, younger patients, those presenting from the emergency department, and those treated by pediatric surgeons (compared to pediatric and adolescent gynecologists) were less likely to have OSS.[21]

Evaluation of serum tumor markers is recommended if malignancy is suspected regarding the nature of the cyst or before scheduled or urgent surgery. Although it is recommended to check some tumor markers for preoperative risk classification and surgical planning, especially in ovarian masses with high suspicion of malignancy, it has been stated that it would be more

appropriate to look at many markers together as a panel with no findings. Only one sign is meaningful.[22] In addition, although only 1% of simple cysts are reported to be malignant, some studies recommend evaluating tumor marker levels in persistent simple cysts.[23] We evaluated many tumor markers in our study, but we could not evaluate their sensitivity and specificity due to our limited number of patients and the majority of simple cysts.

Knaus et al.[24] showed that routine imaging did not provide significant results in detecting malignancy and recommended imaging based on evaluation in symptomatic cases in their study for postoperative follow-up of benign ovarian masses. We planned to evaluate our patients in 3-month periods in the first postoperative year according to the menstrual cycle and presence of complaints. No recurrent cysts were observed in any patient during the approximately 9-month postoperative follow-up.

The most important limitation of our study is the small sample size. This reduces the study's power and limits the generalizability of the data.

In conclusion, ovarian cysts are seen with high frequency in the pediatric age group. Since there are no standard protocols for managing ovarian cysts in this age group, patients are usually managed according to the knowledge and experience of an individual clinician and surgeon. The contribution of clinical expertise to the literature will undoubtedly alleviate management difficulties.

In addition, our experience in this field, combined with our hospital's easy access to surgery, will contribute to establishing management protocols.

Ethical approval

This study has been approved by the Selcuk University Faculty of Medicine Dean's Office Local Ethics Committee (approval date 07.05.2024, number 2024/242). Written informed consent was obtained from the participants.

Author contribution

Surgical and Medical Practices: FÖÇ, FÖS, MS, AFY ; Concept: FÖÇ, FB, MB; Design: FÖÇ, AFY; Data Collection or Processing: AFY FÖS MS Analysis or Interpretation: MKK, FÖÇ Literature Search: FÖÇ, MB, FB; Writing: FÖÇ. All authors reviewed the results and approved the final version of the article.

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Conflict of interest

The authors declare that there is no conflict of interest.

REFERENCES

1. Cass DL, Hawkins E, Brandt ML, et al. Surgery for ovarian masses in infants, children, and adolescents: 102 consecutive patients treated in a 15-year period. J Pediatr Surg. 2001;36:693-9. [Crossref]
2. Pienkowski C, Tauber MT, Beladj N, et al. How to manage a symptomatic ovarian follicular cyst in a female child? Arch Pediatr. 1994;1(10):903-7.
3. Schultz KAP, Ness KK, Nagarajan R, Steiner ME. Adnexal masses in infancy and childhood. Clin Obstet Gynecol. 2006;49:464-79. [Crossref]
4. Spinelli C, Mucci N, Di Giacomo M, Pistolesi F, Cei M, Vergnani S. Evaluation, management and outcome of paediatric ovarian lesions: 67 consecutive patients surgically treated in 7 year period. Rev de Cir Infantil. 2008;18(3):35-42.
5. Deligeoroglou E, Eleftheriades M, Shiadoes V, et al. Ovarian masses during adolescence: clinical, ultrasonographic and pathologic findings, serum tumor markers and endocrinological profile. Gynecol Endocrinol. 2004;19:1-8. [Crossref]
6. Gadducci A, Giuliani D, Cosio S, Lissoni A, Ferrero AM, Landoni F. Clinical outcome of patients with malignant tumors associated with mature cystic teratomas of the ovary: a retrospective multicenter Italian study. Anticancer Res. 2019;39:2513-7. [Crossref]
7. Mansouri G, Safinataj M, Shahesmaeili A, Allahqoli L, Salehiniya H, Alkatout I. Effect of laparoscopic cystectomy on ovarian reserve in patients with ovarian cyst. Front Endocrinol (Lausanne). 2022;13:964229. [Crossref]
8. Sultan C, editor. Pediatric and adolescent gynecology: evidence-based clinical practice. 7th vol. Karger; 2004. [Crossref]
9. Mentessidou A, Mirilas P. Surgical disorders in pediatric and adolescent gynecology: adnexal abnormalities. Int J Gynaecol Obstet. 2023;161:702-10. [Crossref]
10. Kanizsai B, Orley J, Szigetvári I, Doszpod J. Ovarian cysts in children and adolescents: their occurrence, behavior, and management. J Pediatr Adolesc Gynecol. 1998;11:85-8. [Crossref]
11. Holcomb GW, Murphy PJ, Ostlie DJ. Ashcraft's pediatric surgery. 6th ed. Saunders Elsevier; 2014.
12. Dasgupta R, Renaud E, Goldin AB, et al. Ovarian torsion in pediatric and adolescent patients: a systematic review. J Pediatr Surg. 2018;53:1387-91. [Crossref]
13. Kokoska ER, Keller MS, Weber TR. Acute ovarian torsion in children. Am J Surg. 2000;180:462-5. [Crossref]
14. Oltmann SC, Garcia N, Barber R, Huang R, Hicks B, Fischer A. Can we preoperatively risk stratify ovarian masses for malignancy? J Pediatr Surg. 2010;45:130-4. [Crossref]
15. Brandt ML, Helmrath MA. Ovarian cysts in infants and children. Semin Pediatr Surg. 2005;14:78-85. [Crossref]

16. Magrina JF, Cornella JL. Office management of ovarian cysts. Mayo Clin Proc. 1997;72:653-6. **[Crossref]**

17. Ritchie J, O'Mahony F, Garden A. Guideline for management of ovarian cysts in children and adolescents. British Society for Paediatric and Adolescent Gynaecology; 2017.

18. Tessiatore P, Guanà R, Mussa A, et al. When to operate on ovarian cysts in children? J Pediatr Endocrinol Metab. 2012;25:427-33. **[Crossref]**

19. Berger-Chen S, Herzog TJ, Lewin SN, et al. Access to conservative surgical therapy for adolescents with benign ovarian masses. Obstet Gynecol. 2012;119:270-5. **[Crossref]**

20. Seckin B, Ozdener T, Tapisiz OL, Batioğlu S. Laparoscopic treatment of ovarian cysts in adolescents and young adults. J Pediatr Adolesc Gynecol. 2011;24:300-3. **[Crossref]**

21. Gonzalez DO, Cooper JN, Aldrink JH, et al. Variability in surgical management of benign ovarian neoplasms in children. J Pediatr Surg. 2017;52:944-50. **[Crossref]**

22. Lawrence AE, Fallat ME, Hewitt G, et al. Understanding the value of tumor markers in pediatric ovarian neoplasms. J Pediatr Surg. 2020;55:122-5. **[Crossref]**

23. Valentin L, Ameye L, Franchi D, et al. Risk of malignancy in unilocular cysts: a study of 1148 adnexal masses classified as unilocular cysts at transvaginal ultrasound and review of the literature. Ultrasound Obstet Gynecol. 2013;41:80-9. **[Crossref]**

24. Knaus ME, Lawrence AE, Onwuka AJ, et al. Recommendations for postoperative surveillance of pediatric benign ovarian neoplasms. J Pediatr Adolesc Gynecol. 2021;34:666-72. **[Crossref]**