

Evaluation of Patients with Adnexal Masses in the Middle and Late Adolescent Age Group in a Tertiary Care Center

Üçüncü Basamak Bir Merkezde Orta ve Geç Adölesan Yaş Grubundaki Adneksiyel Kitleli Hastaların Değerlendirilmesi

© Hale Çetin Arslan¹, © Kadir Arslan²

¹University of Health Sciences Türkiye, Kanuni Sultan Süleyman Training and Research Hospital, Clinic of Obstetrics and Gynecology, İstanbul, Türkiye

²University of Health Sciences Türkiye, Kanuni Sultan Süleyman Training and Research Hospital, Clinic of Anesthesiology and Reanimation, İstanbul, Türkiye

Abstract

Objectives: Although adnexal masses are an essential reason for gynecological surgeries in adolescents, early diagnosis and treatment are essential for preserving fertility. This study aimed to analyze the clinical features, treatment management, and histopathological results of patients with adnexal masses in a tertiary care center in the middle and late adolescent age group.

Materials and Methods: Adolescent patients with adnexal masses were evaluated retrospectively between January 2015 and December 2019. Patients were classified as middle (15-17 years) and late (18-21 years) adolescents. Patients' complaints, diagnoses, mass diameters and locations, treatment methods, surgery characteristics, and histopathological results were compared.

Results: A total of 141 patients in the middle adolescence (n=20) and late adolescence groups (n=121) were included in the study. Abdominal pain (70.9%), abdominal distension (11.3%), and menstrual disorders (7.1%) were the most common symptoms in the entire population. It was determined that 51.9% of the masses were benign neoplastic tumors, and 1.9% were malignant tumors. Surgery was not considered in 24.8% of the patients. Of the operated adolescents, 65% underwent laparoscopy, and 95.3% (n=101) underwent ovarian-preserving surgery. The most common histopathological diagnoses were benign serous cysts (18.9%), mature cystic teratoma (18.9%), and hemorrhagic cysts (17%). The laparoscopic surgery rate was significantly higher in the late adolescent group (p=0.024). The operated patients' average mass size was significantly higher (p<0.001).

Conclusion: The malignancy rate is low in patients with early and late adolescent adnexal masses. In the management of these patients, minimally invasive methods and ovarian protective interventions are essential in preserving fertility.

Keywords: Adnexal neoplasm, adolescent, fertility, laparoscopy, ovarian cancer

Öz

Amaç: Adneksiyel kitleler, adölesanlardaki jinekolojik cerrahilerin önemli bir sebebi olmakla birlikte erken tanı ve tedavi fertilitenin korunması açısından önemlidir. Bu çalışmanın amacı, üçüncü basamak bir merkezdeki orta ve geç adölesan adneksiyel kitleli hastaların klinik özelliklerini ve sonuçlarını analiz etmektir.

Gereç ve Yöntem: Ocak 2015 ile Aralık 2019 tarihleri arasında adneksiyel kitle nedeniyle takip edilen adölesan hastalar retrospektif olarak değerlendirildi. Hastaların şikayetleri, tanıları, kitle çapları ve yerleşimleri, tedavi yöntemleri, operasyonların özellikleri ve histopatolojik sonuçlar karşılaştırıldı.

Bulgular: Orta adölesan (n=20) ve geç adölesan grupta (n=121) toplam 141 hasta çalışmaya dahil edildi. Tüm popülasyonda karın ağrısı (%70,9), karında şişlik (%11,3) ve menstrüel bozukluklar (%7,1) en sık semptomlar idi. Kitlelerin %51,9'unun benign neoplastik tümör ve %1,9'unun malign

Address for Correspondence/Yazışma Adresi: Kadir Arslan

University of Health Sciences Türkiye, Kanuni Sultan Süleyman Training and Research Hospital, Clinic of Anesthesiology and Reanimation, İstanbul, Türkiye

E-mail: kadir.arslan@sbu.edu.tr ORCID ID: orcid.org/0000-0003-4061-0746

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tümör olduğu saptandı. Hastaların %24,8'inde operasyon düşünülmedi. Opere edilen adölesanların %65'ine laparoskopi, %95,3'üne (n=101) over koruyucu cerrahi uygulandı. En sık histopatolojik tanılar benign seröz kist (%18,9) ve matür kistik teratom (%18,9) ve hemorajik kist (%17) idi. Geç adölesan grupta laparoskopik cerrahi oranı anlamlı olarak yüksek saptandı ($p=0,024$). Opere edilen hastaların kitle boyutları anlamlı olarak yüksek saptandı ($p<0,001$).

Sonuç: Erken ve geç dönem adölesan adneksiyel kitleli hastalarda malignite oranı düşüktür. Adölesan adneksiyel kitleli hastaların yönetiminde minimal invazif yöntemler ve over koruyucu müdahaleler fertilitenin korunmasında önemlidir.

Anahtar Kelimeler: Adneksiyel neoplasm, adölesan, fertilitite, laparoskopi, over kanseri

Introduction

Adolescence is defined as a period that begins with rapid biological and physical development, as well as sexual and psychosocial maturation, and in which the individual gains independence and social productivity. Adolescence is the transition period from childhood to adulthood. It is divided into periods such as early adolescence (10-14 years), middle adolescence (15-17 years), and late adolescence (18-21 years) according to developmental characteristics and health care needs (1). Adnexal masses may originate from the genital system, urinary, gastrointestinal tract, or retroperitoneal, depending on functional, congenital, inflammatory, and neoplastic processes. Although adnexal masses are rare in adolescents, they are the most common cause of gynecological surgery. Its incidence has been reported as 2.6 per 100 thousand (2). When planning the treatment of patients with adnexal masses, many factors such as age, menarche status, physical development, and malignant potential of the mass should be considered. Preserving the integrity of the ovarian tissue and other genital structures is extremely important for fertilization.

With the widespread use of ultrasonography (USG) in clinical practice, the frequency of detection of adnexal masses has increased. Most of these masses are simple cysts or corpus luteum cysts with a low potential for malignancy. The rarity of adnexal masses in adolescents, the low index of suspicion, and non-specific complaints can make diagnosis difficult (3-6). More information is needed regarding the histopathological structure of the existing mass for early diagnosis and management of adnexal masses in adolescents to protect fertilization and physiological development.

This study analyzes the clinical characteristics, treatment management, and histopathological results of patients with adnexal masses in a tertiary care center in middle and late adolescence.

Materials and Methods

This retrospective observational study was started by the principles of the Declaration of Helsinki after receiving approval from the University of Health Sciences Türkiye, Kanuni Sultan Süleyman Training and Research Hospital, Clinical Trials Review Board and Ethics Committee (date: 02.01.2023, approval no.:

KAEK/2022.12.242). The study included patients in the middle (15-17 years) and late (18-21 years) adolescent age group who were followed up for adnexal mass at the University of Health Sciences Türkiye, Kanuni Sultan Süleyman Training and Research Hospital between January 2015 and December 2019. Patients under 15 and over 21 were excluded from the study.

The patient's age, symptoms, USG findings (adnexal mass size and side), laboratory findings (CA-125 level), treatment management, need for urgent surgery, the surgical procedure applied in operated patients, and histopathological results of the mass were recorded.

Adnexal masses were classified as non-neoplastic, neoplastic benign, and neoplastic malignant according to histopathological results and analyzed between groups. Study data were accessed retrospectively through the hospital information system and patient files. The patients were divided into mid-adolescent and late-adolescent, according to age range, and the study data were compared between the groups. Patients with adolescent adnexal masses were also analyzed by classifying them into expectant and surgery groups according to the need for surgery.

The sample size was not determined in this retrospective descriptive study in which we evaluated adnexal masses in early and late adolescents. All patients who met the inclusion criteria during the five years were included in the study.

Statistical Analysis

SPSS 26.0 program (SPSS Inc., Chicago, USA) was used to analyze the data. Data are expressed as mean, standard deviation, number of patients, and percentage. The conformity of the variables to the normal distribution was evaluated analytically (Shapiro-Wilks test) and visually (histogram). Independent samples t-test was used to analyze quantitative data with normal distribution among the groups, and the Mann-Whitney U test was used to analyze quantitative variables that did not show normal distribution. The Pearson chi-square and Fisher's exact tests were used to evaluate qualitative data. The statistical significance level was accepted as $p<0.05$.

Results

A total of 141 patients were included in the study: 20 (14.1%) in the middle adolescence group and 121 (85.9%) in the

late adolescence group. The mean age of the entire population was 19.5 ± 1.7 (15-21) years. While 24.8% (n=35) of the patients were followed up without surgery, surgery was performed in 75.2% (n=106). Laparoscopy was performed in 65.1% (n=69) of the operated patients, and laparotomy was performed in 34.9% (n=37). The rate of laparoscopic surgery in the late adolescence group was significantly higher than in the early adolescence group ($p=0.024$). While the average diameter of adnexal masses in the entire population was 5.8 ± 2.5 (range, 2-14) cm and the average carbohydrate antigen (CA)-125 level was 21 ± 14.6 (range, 4-90) U/mL, no significant difference was detected between the groups ($p=0.880$ and $p=0.578$, respectively). The most common complaints in adolescents with adnexal masses were abdominal pain (70.9%), abdominal swelling/palpable mass (11.3%), and menstrual irregularity (7.1%) and swelling (70.9%) (Table 1).

In patients with adnexal masses who underwent surgery, 51.9% (n=55) had benign neoplastic tumors, 46.2% (n=49) had non-neoplastic tumors, and 1.9% (n=2) had malignant tumors. One of the patients with malignant tumors was 17 years old (anaplastic large cell lymphoma), and the other was 20 years old (dysgerminoma). Both patients had abdominal pain, and a mass was detected on the left side. Unilateral salpingo-oophorectomy was performed in both patients. No significant difference in mass characteristics was observed between the groups ($p=0.069$). Although the rate of emergency surgery in

the late adolescent group was higher than in the mid-adolescent group, no significant difference was detected (63.3% vs. 36.7%, $p=0.052$). The most frequently performed surgical operations were cystectomy (57.5%), detorsion (26.4%), and cyst aspiration (10.4%). The operations performed were similar between the groups ($p=0.189$) (Tables 2 and 3).

When patients with adnexal masses were classified according to whether they had undergone surgery, their diameter was significantly higher in the surgery group (6.3 ± 2.6 vs. 4.2 ± 1.4 cm, $p<0.001$). Additionally, the complaint of abdominal pain was found to be significantly higher in patients who underwent surgery (84% vs. 31.4%, $p<0.001$) (Table 4).

Discussion

This study investigated patients with adnexal masses in the middle and late adolescence age group. It found that the majority of adnexal masses were benign neoplastic tumors (such as benign serous cysts and mature cystic teratoma) and non-neoplastic tumors (hemorrhagic cysts), and the rate of malignant tumors was low. It was determined that laparoscopic surgery was performed at a significantly higher rate in the late adolescent age group. In addition, ovarian-sparing surgery was performed at a rate as high as 95% in all adolescents.

Table 1: Clinical characteristics of patients

	Overall (n=141)	Middle adolescent (n=20)	Late adolescent (n=121)	p-value
Age (years)	19.5 ± 1.7 (15-21)	16.2 ± 0.9 (15-17)	20.1 ± 1.1 (18-21)	-
Clinical presentation				0.514
Abdominal pain	100 (70.9)	13 (65)	87 (71.9)	
Abdominal mass	16 (11.3)	4 (19)	12 (10)	
Dysmenorrhea	10 (7.1)	1 (5)	9 (7.4)	
Nausea/vomiting	9 (6.4)	2 (10)	7 (5.8)	
Incidental	6 (4.3)	1 (4.8)	5 (4.2)	
Tumor size (cm)	5.8 ± 2.5 (2-14)	5.4 ± 1.8 (3-9)	5.8 ± 2.7 (2-14)	0.880
Tumor size range				0.404
<5 cm	55 (39)	7 (35)	48 (39.7)	
5-10 cm	78 (55.3)	13 (65)	65 (53.7)	
>10 cm	8 (5.7)	0	8 (6.6)	
Expectant	35 (24.8)	4 (20)	31 (25.8)	0.507
Surgery	106 (75.2)	16 (80)	90 (74.3)	0.024
Laparoscopy	69 (65.1)	7 (41.2)	62 (69.7)	
Laparotomy	37 (34.9)	10 (58.8)	27 (30.3)	
CA-125 (U/mL)	21 ± 14.6 (4-90)	19.0 ± 12.3 (6-49)	21.4 ± 15.0 (4-90)	0.578
Side				0.913
Right	74 (52.5)	10 (50)	64 (52.9)	
Left	58 (41.1)	9 (45)	49 (40.5)	
Bilateral	9 (6.4)	1 (5)	8 (6.6)	

Data are given as mean \pm standard deviation (range), number of patients and percentage

Table 2: Characteristics of patients undergoing surgery				
	Overall (n=106)	Middle adolescent (n=16)	Late adolescent (n=90)	p-value
Diagnosis				0.069
Benign neoplastic tumor	55 (51.9)	12 (70.6)	43 (48.3)	
Non-neoplastic tumor	49 (46.2)	4 (23.5)	45 (50.6)	
Malignant tumor	2 (1.9)	1 (5.9)	1 (1.1)	
Operation method				0.052
Emergency	63 (59.4)	6 (37.5)	57 (63.3)	
Elective	43 (40.6)	10 (62.5)	33 (36.7)	
Types of surgery				0.189
Cystectomy	61 (57.5)	11 (64.7)	50 (56.2)	
Detorsion	28 (26.4)	3 (17.6)	25 (28.1)	
Cyst aspiration	11 (10.4)	1 (6.3)	10 (11.1)	
Salpingo-oophorectomy	3 (2.8)	2 (12.5)	1 (1.1)	
Oophorectomy	2 (1.9)	0	2 (2.2)	
Abscess drainage	1 (0.9)	0	1 (1.1)	

Data are given as number of patients and percentage

Table 3: Histopathological results			
	Overall (n=106)	Middle adolescent (n=16)	Late adolescent (n=90)
Benign neoplastic tumor			
Benign serous cyst	20 (18.9)	4 (25)	16 (17.8)
Mature cystic teratoma	20 (18.9)	4 (25)	16 (17.8)
Serous cystadenoma	11 (10.4)	3 (18.8)	8 (8.9)
Serous cystadenofibroma	2 (1.9)	0	2 (2.2)
Mucinous cystadenofibroma	2 (1.9)	0	2 (2.2)
Non-neoplastic tumor			
Hemorrhagic cyst	18 (17)	2 (12.5)	16 (17.8)
Paratubal cyst	11 (10.4)	0	11 (12.2)
Endometrioma	7 (6.6)	0	7 (7.8)
Corpus luteum	7 (6.6)	2 (12.5)	5 (5.6)
Follicle cyst	3 (2.8)	0	3 (3.3)
Paraovarian cyst	1 (0.9)	0	1 (1.1)
Theca cell tm	1 (0.9)	0	1 (1.1)
Tubo-ovarian abscess	1 (0.9)	0	1 (1.1)
Malignant tumor			
Dysgerminoma	1 (0.9)	0	1 (1.1)
Anaplastic large cell lymphoma	1 (0.9)	1 (6.3)	1 (1.1)

Data are given as number of patients and percentage

Clinical signs and symptoms vary in adolescents with adnexal masses. Clinical symptoms such as abdominal pain or pelvic pain, a mass in the abdomen or pelvic area, menstrual irregularities, and nausea/vomiting may be observed. Sometimes, it can be diagnosed incidentally without causing any complaints. Additionally, since ovarian pathologies are rarely encountered in adolescents, non-specific symptoms such as acute abdominal pain may suggest more common pathologies such as acute appendicitis. For this reason, it may be difficult to diagnose patients. In the literature, the most common presenting complaint of adolescents with adnexal masses has been reported as abdominal pain (56-87%) (7,8). Other frequently reported

symptoms are abdominal swelling-palpable mass (6.7-10.2%), menstrual disorders (3-10.2%), and nausea/vomiting (3.4-4.7%) (7-9). In our study, consistent with the literature, the most common symptoms in the patients were abdominal pain (70%), abdominal swelling/palpable mass (11.3%), and menstrual disorders (7.1%). In addition, in this study, a significantly higher rate of abdominal pain complaints was detected in patients who underwent surgery compared to the observed patients.

Adnexal masses are rare in the adolescent age group. Due to irregular menstruation and frequent anovulation, most of these masses are non-neoplastic ovarian cysts, including follicular cysts, corpus luteum, and theca lutein cysts. Although

Table 4: Clinical characteristics of expectant and surgery groups			
	Expectant group (n=35)	Surgery group (n=106)	p-value
Age (years)	19.6±1.5 (16-21)	19.5±1.8 (15-21)	0.972
Clinical presentation			<0.001
Abdominal pain	11 (31.4)	89 (84)	
Abdominal mass	13 (37.1)	3 (2.8)	
Dysmenorrhea	10 (28.6)	0	
Nausea/vomiting	1 (2.9)	8 (7.5)	
Incidental	0	6 (5.7)	
Tumor size (cm)	4.2±1.4 (2-8)	6.3±2.6 (2-14)	<0.001
Tumor size range			<0.001
<5 cm	23 (65.7)	32 (30.2)	
5-10 cm	12 (34.3)	66 (62.3)	
>10 cm	0	8 (7.5)	
CA-125 (U/mL)	23±16 (6-75)	20.4±14.2 (4-90)	0.466
Side			0.963
Right	18 (51.4)	56 (52.8)	
Left	15 (42.9)	43 (40.6)	
Bilateral	2 (5.7)	7 (6.6)	

Data are given as mean ± standard deviation (range), number of patients and percentage

spontaneous resolution is often observed, surgical treatment is required in approximately 25% of cases due to persistence (10). USG is often sufficient for the diagnosis of follicular cysts. Benign neoplasms are more common than malignant neoplasms. The most common types of benign neoplasms include mature teratomas, mucinous and serous cystadenomas, and endometriomas (11). Sükür et al. (9) reported that 67% of adolescent adnexal masses were non-neoplastic tumors, and 20.3% were benign neoplastic tumors. The authors stated that the most common non-neoplastic tumors are follicular cysts and corpus luteum cysts, while benign neoplastic tumors are frequently detected as mature teratoma and cystadenoma. Kang et al. (8) reported that adnexal masses were more common on the right side; 53% were benign neoplastic, 35% were non-neoplastic, and 7 were malignant tumors. The authors stated that among non-neoplastic tumors, corpus luteum cysts are more frequently detected in the middle adolescence age group, and endometriosis is more frequently detected in the late adolescence age group. In addition, they emphasized that mature cystic teratoma in benign neoplastic tumors is detected more frequently in both middle and late adolescence. In our study, consistent with the literature, more than half of the adnexal masses (51.9%) were detected as benign neoplastic tumors and were localized on the right side. While follicular cysts were most frequently detected among non-neoplastic tumors, benign serous cysts and mature cystic teratoma were most frequently detected among benign neoplastic tumors.

Malignant ovarian tumors constitute only 0.9% of all childhood and adolescence malignancies (12). Unlike adults, approximately 80% of malignant ovarian tumors are germ cell tumors. Although USG images of germ cell tumors vary, they

can be distinguished from dermoid cysts due to the teeth, hair, and fatty tissues found within them. The second most common neoplastic tumors seen in adolescents are epithelial neoplasms, and their incidence increases with increasing age (13,14). The two most common types are serous and mucinous tumors. Kang et al. (8) reported that 7.8% of adnexal masses in children and adolescents were detected as malignant tumors (non-epithelial ovarian malignant neoplasms and borderline malignant tumors). Studies from tertiary centers in Türkiye reported that malignant tumors were detected in 0.9-11.8% of patients with adolescent adnexal masses (7,9,15). In our study, consistent with the literature, malignant tumors were detected in 1.9% (n=2) of patients with adolescent adnexal masses (dysgerminoma and anaplastic large cell lymphoma).

Various methods are used to diagnose adnexal masses and determine treatment. Most masses are detected using USG, the first-line imaging test (10,16). USG is a valuable diagnostic tool in distinguishing adnexal masses due to its easy accessibility, cost-effectiveness, and high diagnostic accuracy. USG findings can also provide helpful information about whether the patient needs surgery or conservative treatment (17). In addition, USG can enable continuous imaging and follow-up of relatively small ovarian masses without surgical treatment (18). The literature has stated that most simple cysts, whose size is 5-7 cm on USG, decrease in size or improve during follow-up (19). Kang et al. (8) reported that patients with adnexal masses who underwent surgery (50%) had larger tumors than those who were followed up without surgery (50%), neoplastic features were detected on USG, and in addition, the USG diagnosis was consistent with the histopathological diagnosis.

In addition to USG, computed tomography (CT) or magnetic resonance imaging (MRI) can also help diagnose malignant ovarian tumors. Additional information, such as the nature of the adnexal mass and metastatic involvement of pelvic and para-aortic lymph nodes, can be determined by CT or MRI. In our study, USG was used as the first method in diagnosis in all patients with adnexal masses. Computed tomography or MRI are auxiliary imaging methods when malignancy is suspected. Surgery was not performed in 24.8% of the patients, and they were followed up. Consistent with the literature, the mass sizes of the patients in the surgery group were significantly higher than in the follow-up group. Although many tumor markers such as human α -fetoprotein, β -hCG, CA-125, CA-19-9, and carcinoembryonic antigen are used in the follow-up of malignant ovarian tumors, their levels have been reported to be expected in approximately 50% of malignant tumors (20). In their same study, Kang et al. (8) reported that serum tumor markers were at normal levels in 44% of patients with adnexal masses. Therefore, normal serum tumor marker levels cannot exclude malignancy. In our study, CA-125 levels were analyzed as a tumor marker. Consistent with the literature, the CA-125 level was average in one of the patients with malignant neoplasm (middle adolescent group, diagnosed with anaplastic large cell lymphoma). In contrast, the CA-125 level was high in the other group (late adolescent group diagnosed with dysgerminoma). No significant difference was detected between middle and late adolescence age groups.

The standard treatment for benign ovarian tumors that are not considered malignant is ovarian-sparing surgery (21). A conservative approach should be applied as much as possible in order to preserve fertilization. Cystectomy and detorsion of the torsioned mass are usually performed using minimally invasive surgical methods (laparoscopic or robotic surgery). Ovarian-sparing surgery has been reported to have a low recurrence rate and high clinical success (22). Kang et al. (8) reported that 87% of patients with adnexal masses underwent ovarian-sparing surgery, and no patient required laparotomy. Pekcan et al. (15) reported that 94% of adolescents with adnexal masses underwent laparoscopy, and 1% of the patients underwent laparotomy. Dağdeviren et al. (7) reported that 67% of the patients underwent laparoscopy, and 28% underwent laparotomy after laparoscopy. The authors also emphasized that torsion was detected in 1/3 of the patients, and successful treatment was achieved with detorsion except for one of the patients. In our study, laparoscopy was performed in 65% of the patients who underwent surgery, while no patients underwent laparotomy after laparoscopy. Ovarian-sparing surgery was performed in 95.3% (101/106) of the operated patients. The fact that the pediatric surgery clinic decides on laparoscopy or laparotomy in some patients in the middle adolescence age group is influential

in determining the lower rates of laparoscopic surgery in patients in the middle adolescence age group compared to the literature. However, our ovarian-preserving surgery rates were found to be similar to the literature.

Study Limitations

The study has some limitations. First, it is a single-center and retrospective study. Second, tumor markers other than CA-125 in adolescents with adnexal masses were not analyzed. Third, it could not be determined to what extent auxiliary methods such as CT and MRI, which were used in diagnosing all patients other than USG, were used in the diagnosis.

Conclusion

In conclusion, patients with adnexal masses in the early and late adolescence age group often experience abdominal pain, abdominal distension, and menstrual disorders. Most of these patients have benign neoplastic tumors and non-neoplastic tumors, but malignant tumors are rare. Recognizing rare adnexal masses in adolescent patients, monitoring them with conservative treatment when appropriate, and planning ovarian-preserving surgeries with minimally invasive methods when necessary are essential in preserving fertility.

Ethics

Ethics Committee Approval: The study was started by the principles of the Declaration of Helsinki after receiving approval from the University of Health Sciences Türkiye, Kanuni Sultan Süleyman Training and Research Hospital, Clinical Trials Review Board and Ethics Committee (date: 02.01.2023, approval no.: KAEK/2022.12.242).

Informed Consent: Consent was not obtained since it was a retrospective study.

Footnotes

Authorship Contributions

Surgical and Medical Practices: H.Ç.A., Concept: H.Ç.A., K.A., Design: H.Ç.A., K.A., Data Collection and/or Processing: H.Ç.A., K.A., Analysis and/or Interpretation: H.Ç.A., K.A., Literature Search: H.Ç.A., K.A., Writing: H.Ç.A., K.A.

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References

1. Behrman RE. Adolescent Gynecology. In: Behrman RE, Kliegman RM, editor. Nelson Essential for Pediatrics. 4th Edition. PA: WB Saunders; 2002. p. 259-260.

2. Spinelli C, Strambi S, Liloia C, et al. Update on the surgical management of ovarian neoplasms in children and adolescents: analysis on 32 cases. *Gynecol Endocrinol.* 2016;32:787-791.
3. Oelsner G, Shashar D. Adnexal torsion. *Clin Obstet Gynecol.* 2006;49:459-463.
4. Kirkham YA, Lacy JA, Kives S, et al. Characteristics and management of adnexal masses in a canadian pediatric and adolescent population. *J Obstet Gynaecol Can.* 2011;33:935-943.
5. Cartault A, Caula-Legriel S, Baunin C, et al. Ovarian masses in adolescent girls. *Endocr Dev.* 2012;22:194-207.
6. Liu H, Wang X, Lu D, et al. Ovarian masses in children and adolescents in China: analysis of 203 cases. *J Ovarian Res.* 2013;6:47.
7. Dağdeviren H, Cengiz H, Kanawati A, et al. Clinical and pathological investigation of adnexal masses in adolescents who underwent surgery in a tertiary center. *J Clin Exp Invest.* 2015;6:96-101.
8. Kang GG, So KA, Hwang JY, et al. Ultrasonographic diagnosis and surgical outcomes of adnexal masses in children and adolescents. *Sci Rep.* 2022;12:3949.
9. Sükür YE, Seval MM, Ozmen B. Adolesan Adneksiyel Kitlelerinde Cerrahi; 7 Yılda Tedavi Edilen 59 Hastanın Sonuçları. *J Ankara Univ Fac Med.* 2016;69:233-237.
10. Deligeoroglou E, Eleftheriades M, Shiadoes V, et al. Ovarian masses during adolescence: Clinical, ultrasonographic and pathological findings, serum tumor markers, and endocrinological profile. *Gynecol Endocrinol.* 2004;19:1-8.
11. Amies Oelschlager AM, Gow KW, Morse CB, et al. Management of Large Ovarian Neoplasms in Pediatric and Adolescent Females. *J Pediatr Adolesc Gynecol.* 2016;29:88-94.
12. Al Jama FE, Al Ghamdi AA, Gasim T, et al. Ovarian tumors in children and adolescents—a clinical study of 52 patients in a university hospital. *J Pediatr Adolesc Gynecol.* 2011;24:25-28.
13. Gupta B, Guleria K, Suneja A, et al. Adolescent ovarian masses: A retrospective analysis. *J Obstet Gynaecol.* 2016;36:515-517.
14. Pfeifer SM, Gosman GG. Evaluation of adnexal masses in adolescents. *Pediatr Clin North Am.* 1999;46:573-592.
15. Pekcan MK, Tokmak A, Ağlamış O, et al. Adolesan yaş grubunda adneksiyel kitle nedeniyle opere edilen hastaların analizi: 104 hastalık tek merkez deneyimi. *Pam Med J.* 2018;11:127-130.
16. How JA, Marino JL, Grover SR, et al. Surgically Managed Ovarian Masses at the Royal Children's Hospital, Melbourne -19 Year Experience. *J Pediatr Surg.* 2019;54:1913-1920.
17. Kim MJ, Kim HM, Seong WJ. The predicting factors for indication of surgery in patients with hemoperitoneum caused by corpus luteum cyst rupture. *Sci Rep.* 2021;17;11:17766.
18. Smorgick N, Maymon R. Assessment of adnexal masses using ultrasound: a practical review. *Int J Womens Health.* 2014;6:857-863.
19. Reddy J, Laufer MR. Advantage of conservative surgical management of large ovarian neoplasms in adolescents. *Fertil Steril.* 2009;91:1941-1944.
20. Van Heerden J, Tjalma WA. The multidisciplinary approach to ovarian tumours in children and adolescents. *Eur J Obstet Gynecol Reprod Biol.* 2019;243:103-110.
21. Chan SH, Lara-Torre E. Surgical considerations and challenges in the pediatric and adolescent gynecologic patient. *Best Pract Res Clin Obstet Gynaecol.* 2018;48:128-136.
22. Braungart S, CCLG Surgeons Collaborators, Craigie RJ, et al. Operative management of pediatric ovarian tumors and the challenge of fertility-preservation: Results from the UK CCLG Surgeons Cancer Group Nationwide Study. *J Pediatr Surg.* 2020;55:2425-2429.