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Original Article

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Ovarian tumors: Incidence, histological type of lesions and treatment in pediatric age group

Guzy jajnika: Częstość występowania, typ histologiczny i leczenie zmian w grupie pediatrycznej

Authors' Contribution:
A Study Design
B Data Collection
C Statistical Analysis
D Data Interpretation
E Manuscript Preparation
F Literature Search
G Funds Collection

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Summary

Background: The aim of this study was to evaluate the incidence and histological type of lesions affecting the ovaries and to analyze employed methods of invasive treatment.

Materials & Methods: Medical records of patients who were treated surgically for ovarian tumors in the years 2015 -2019 were reviewed. The study group was comprised of 31 female patients.

Results: During 5 years time, there were 31 girls in the age from 3 months to 17 years hospitalized in the department. The mean age was 11 years. Histopathological examination was performed in all of these cases. 12 patients were diagnosed with malignant lesion, 19 with benign lesion. The most commonly diagnosed malignant tumors were a dysgerminoma and a mixed germ cell tumor. In the group of benign lesions, the most frequent tumor type was mature teratoma. The first occurring symptom was abdominal pain. Some of the lesions were diagnosed accidentally during ultrasonography. The diagnostics was expanded depending on the size of the tumor, staging and clinical condition of the patient. All the patients were treated surgically, 16 of them underwent laparoscopic surgery. Torsion of the ovary or oviduct was observed in 3 cases. Chemotherapy was introduced in 8 cases as complementary treatment.

Conclusions: The most commonly diagnosed tumor was mature teratoma. Ultrasonography is the most frequent method of the ovaries' examination. Ovarian lesions are characterized by non-specific clinical symptoms, which is associated with prevalent incidental detection during ultrasonography.

Keywords: adolescence, child, classic surgery, laparoscopic surgery, ovary, neoplasm

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INTRODUCTION

Incidence of ovarian tumors in girls amounts to approximately 2.6 in 100 000 every year [1]. About half of lesions in the ovaries is diagnosed as carcinomas, the incidence of malignant tumors ranges between 16-55%. In case of the ovarian tumor occurrence before the menarche, the risk of its malignancy comes to 50% [9]. Malignant ovarian tumors constitute around 1% of all childhood cancers [4, 18]. Malignant tumor morbidity increases with age [3, 16].

Detection and diagnosis of ovarian tumors is difficult because of non-specific and often poor symptoms. Most commonly occurring symptoms are abdominal pain, growing abdominal circumference, precocious puberty or menarche, menstrual cycle disorders [21]. Asymptomatic or oligosymptomatic tumors are usually accidentally diagnosed during physical examination or abdominal ultrasonography.

There are several methods used in surgical treatment of ovarian tumors in children and adolescents, such as classic laparotomy or laparoscopy. However, applying less invasive techniques in the event of malignant lesions remains controversial. Nevertheless, as malignant tumors rarely occur in children, the tendency to increase the use of laparoscopic method has been noticed. This method of treatment also enables preservation of fertility, which is one of the main post-operative concerns [12, 21].

This study aimed at clinicopathological analysis of patients with ovarian tumors treated surgically in the Department of Pediatric Surgery, Traumatology and Urology in the years 2015-2019.

MATERIAL AND METHODS

The study was a retrospective chart review of 31 girls aged from 3 months to 17 years who, between January 2015 and December 2019, underwent surgical treatment of ovarian tumors (solid or cystic) in the Department of Pediatric Surgery, Traumatology and Urology in the Karol Jonscher Hospital of Poznan University of Medical Sciences, Poland. Medical charts were analyzed for the following data: age at surgery, symptoms, localization of the tumors and imaging studies. Factors such as: the type of surgical approach, operative procedure, postoperative complications, postoperative histopathological diagnosis and type of chemotherapy (if applied) were also analyzed. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

RESULTS

The mean age of patients at surgery was 10 years and 9 months. Malignant tumors were diagnosed in 12 cases (38.7%), in the other 19 patients (61.3%) the lesions were benign (Table 1). Mature teratoma was the most common lesion, it was diagnosed in 12 cases which accounts for 39% of all the diagnoses.

The right ovary was affected in 13 cases (42%), the left in 14 cases (45%) and in the other 4 cases (13%) the lesions were bilateral (malignant in 2 patients, benign in 2 patients). In three cases, neoplastic lesion was accompanied by torsion of the adnexa.

Two patients with malignant tumors had metastatic disease. The patient diagnosed with yolk sac tumor presented metastases in omentum maius and in the right lung, and the patient with sex cord stromal tumor had bilateral lung metastases.

Two patients with malignant tumors (the patient with yolk sac tumor and the patient with mixed germ cell tumor) were diagnosed with 46, XY gonadal dysgenesis.

Symptoms prior to surgical treatment were noted in 21 cases (68%), other cases were asymptomatic (32%). The most frequent symptom was abdominal pain, which occurred in 18 patients (58%). Other symptoms were: abdominal circumference increase (10%), palpable tumor (13%), weakness (6%), hirsutism (3%) and urinary dysfunction (3%).

Abdominal ultrasonography was performed in all 31cases. Thirteen patients (42%) underwent additional abdominal Computed Tomography, 6 patients had chest CT done, 3 patients had pelvic CT done, 3 patients had head CT done, 3 patients underwent abdominal X-Ray examination (RTG), 4 patients had chest RTG done, 2 patients had transrectal USG done, 2 patients had Magnetic Resonance Imaging scan done, 1 patient had doppler USG done, and 1 patient had cystoscopy done. All 6 chest CTs and all pelvic CTs were performed in cases of malignant tumors.

Open surgery technique was the method of choice in 15 cases (48.4%). Tumorectomy with preservation of ovarian tissue was performed in two cases, in the other 13 cases salpingo-oophorectomy was performed.
Laparoscopic method was used on 16 patients (51.6%): in 7 cases ovariectomy was performed, in 9 cases the surgery was limited to tumorectomy and the ovary was preserved– histopathological study showed the benign character of these lesions (table 2). In case of two malignant tumors treated with ovary-sparing surgery, the

Table 1. The incidence, average patient's age at the surgery and the age range of different morphological types of ovarian tumors in the study group

Histopathological diagnosis	Patients n (%)	Average age at surgery and age range [years]
Malignant tumor	12 (38.7)	10.8 (0.8-16)
dysgerminoma	3 (9.7)	8.67 (0.42-16)
yolk sac tumor	2 (6.5)	11.34 (9.5-13)
mixed germ cell tumor	3 (9.7)	11.5 (10-13)
sex cord stromal tumor	2 (6.5)	6.75 (5-13)
immature teratoma	2 (6.5)	13 (10-16)
Benign tumor	19 (61.3)	10.67 (0.34-17)
mature teratoma	12 (38.7)	10.84 (2-17)
serous cyst	6 (19.4)	9.75 (0.34-16)
angioma	1 (3.2)	14 (14)

Table 2. Method of surgery depending on lesion's morphological type

Lesion type	Ovary-sparing surgery		Salpingo-oophorectomy	
	laparoscopy	laparotomy	laparoscopy	laparotomy
benign	9	0	6	4
malignant	0	2	1	9
TOTAL	9	2	7	13

preoperative ultrasnography suggested benign character of these lesions. The histopathological examination of the surgical specimen revealed a malignant character of the removed tissue. However, reoperation was not performed due to radical resection with preserved healthy tissue margins and no sings of limphadenopathy.

Salpingo-oophorectomy was performed on 10 patients with benign tumor and on 10 patients with malignant tumor.

In order to resect the tumor, minilaparotomy was performed three times during the minimally invasive surgery. Reoperation was necessary in two cases: relaparotomy due to peritoneal haemorrhage, and laparoscopic revision of previously preserved ovary. The method of choice for malignant lesions was open surgery. There was only one case in which laparoscopic method was chosen. Post-operative complications occurred just in one case and were manifested by bleeding to the peritoneal cavity.

Eight patients (26%) underwent chemotherapy: VIP regimen (ciplatin, etoposide, ifosfamide) was instituted in 7 cases, while VBP (cisplatin, vinblastine, bleomycin) was instituted only in one case.

Malignant tumor peak incidence falls on 13 years of age, while benign tumor peak incidence stands at 16 years of age.

DISCUSSION

Etiology and histological malignancy of the lesions located in the area of the ovary are varied [17]. In literature, there have been significant differences concerning ovarian cancer morbidity and the percentage of malignant lesions. Finnish population's analysis estimates that the annual incidence of ovarian tumors is 2.2/100 000 patients in the age range from 0 to 5 years, while incidence of malignant tumors is 0.6/100 000 [18]. The Israeli study indicates that the incidence of malignant ovarian tumors is 0.52/100 000 patients in the age range 0-19 years [5].

These marked variations could be explained by differences in age groups and distinct specificity of lesions occurrence. According to Taskinen, the malignant tumor morbidity increases with age [16], which has also been observed in our study group (Fig. 1).

The most common tumor type is teratoma and it was diagnosed in 45% of the study group. It was bilateral in two cases. Mature teratoma consists of differentiated tissue from embryonic layers. Immature teratoma may contain mature tissue and immature epithelial, or stromal tissue [5]. Immature teratoma is a rare, aggressive and usually unilateral type of teratoma, and it was observed in 2 of our patients. Yolk sac tumor, also known as the endodermal sinus tumor, is one of the most aggressive and frequent neoplasms in young children (usually under the age of 10 years) [5]. It can metasta-

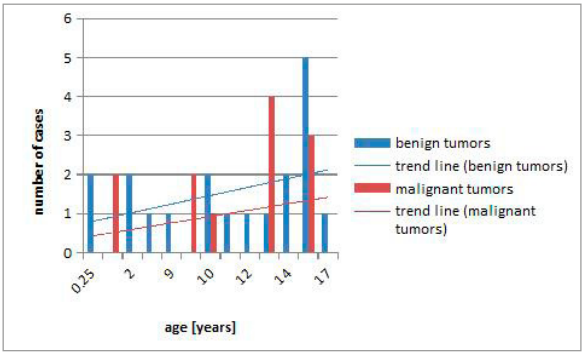

Fig. 1. Malignant and benign tumors incidence depending on age with trend lines

size to regional lymph nodes, liver, lung and brain. Other types of gonadal germ cell tumors are rare in pediatric population [5]. The presence of 46, XY karyotype and gonadal dysgenesis can cause a germ cell tumor to develop [11]. In our study, 2 of 12 patients with malignant neoplasm were carriers of this type of chromosomal aberration.

Non-specific symptoms markedly impede proper diagnosis of ovarian tumor. Patients' prevailing symptom was abdominal pain characterized as both chronic and acute, diffused and well-located. For this reason, despite their rare occurrence in children and adolescents, it is significant to consider ovarian tumors in differential diagnosis of abdominal pain. It is also very important to perform imaging studies and laboratory tests before the implementation of treatment. The most important values are β-hCG, AFP and CEA levels, and less frequently performed CA-125 (marker useful in epithelial cancer monitoring) [17]. It is important to monitor whether the AFP is within age-appropriate normal range, especially in the first 6 months of life [18].

Despite the fact that benign lesions are markedly more frequent than malignant tumors, laparoscopic approach in children with malicious lesions remains controversial. In 1.5% of the cases, malignant component was found in adnexal tumors treated with the use of laparoscopic method [11]. In our study, only one of the patients treated laparoscopically was diagnosed with malignant lesion. Surgical method is chosen individually [11]. Open surgery enables precise action in the area of the ovary and the oviduct, which eliminates the risk of rupturing the wall of the tumor and spillage of its contents to the abdominal cavity [10]. Minimally invasive method is beneficial in terms of controlling the peritoneal cavity and collecting tissue samples for cytological test without the need to perform expansive laparotomy. Cosmetic effect of both methods is also an issue of great matter, and relevantly better with laparoscopy. For this reason, there has been a tendency in pediatric surgery to increase the amount of minimally invasive procedures [8]. Ultrasonography is a basic and non-substitutable diagnostic method [20], and was performed in all our patients. Being performed before surgery, USG can contribute to the decision of the surgical management. Some studies have shown that USG can minimize the amount of benign lesions treated with open surgeries [2].

In the case of a suspected benign tumor, laparoscopic method was applied. In cases of high malignancy potential, surgeons performed laparotomy. The studies indicate that both methods are equally effective. The choice of surgical method is also dictated by the decision of preserving the uterine adnexa, in which event laparoscopic surgery is more frequent. Occasionally, in cases of tumors comprising teratoma, or those difficult to differentiate as malignant or benign, it is highly recommended to convert into open surgery and excise the entire lesion [9]. Studies also recommend performing ovary-sparing surgery in cases of benign, small-sized ovarian tumors and torsion of a low degree [7, 12, 13, 15].

Summarizing, in the pediatric population, benign ovarian lesions are markedly more common than the malignant tumors. Most of these lesions are classified as mature teratomas. Incidence of both malignant and benign lesions increases with age. Lesions in the area of the ovaries tend to give non-specific symptoms, or remain asymptomatic, which extremely impedes and delays diagnosis and proper treatment. Ultrasonography is the most common diagnostic imaging method in cases of ovarian lesions and it should be performed in all female patients complaining of abdominal pain. The decision on surgical treatment depends on potential malignancy of the lesion and on whether the uterine adnexa are about to be preserved or excised.

ETHICAL CONSIDERATIONS

Ethical issues (including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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REFERENCES

[1] Al Jama F.E., Al Ghamdi A.A., Gasim T., Al Dakhiel S.A., Rahman J., Rahman M.S.: Ovarian tumors in children and adolescents – a clinical study of 52 patients in a university hospital. J. Pediatr. Adolesc. Gynecol., 2011; 24: 25–28

[2] Amies Oelschlager A., Gow K.W., Morse C.B., Lara-Torre E.: Management of large ovarian neoplasms in pediatric and adolescent females. J. Pediatr. Adolesc. Gynecol., 2016; 29: 88–94

[3] Brookfield K.F., Cheung M.C., Koniaris L.G., Sola J.E., Fischer A.C.: A population-based analysis of 1037 malignant ovarian tumors in the pediatric population. J. Surg. Res., 2009; 156: 45–49

[4] Brown M.F., Hebra A., McGeehin K., Ross A.J.3rd: Ovarian masses in children: A review of 91 cases of malignant and benign masses. J. Pediatr. Surg., 1993; 28: 930–933

[5] Cecchetto G.: Gonadal germ cell tumors in children and adolescents. J. Indian Assoc. Pediatr. Surg., 2014; 19: 189–194

[6] Chybicka A., Sawicz-Birkowska K., Adamkiewicz-Drożyńska E.M.: Onkologia i hematologia dziecięca. Guzy germinalne. Wydawnictwo Lekarskie PZWL, Warszawa 2008

[7] Cribb B., Vishwanath N., Upadhyay V.: Paediatric ovarian lesions – the experience at Starship Children's Hospital, New Zealand. N. Z. Med. J., 2014; 127: 41–51

[8] Djukic M., Stankovic Z., Vasiljevic M., Savic D., Lukac B., Djuricic S.: Laparoscopic management of ovarian benign masses. Clin. Exp. Obstet. Gynecol., 2014; 41: 296–299

[9] Kunpalin Y., Triratanachat S., Tantbirojn P.: Proportion of ovarian cancers in overall ovarian masses in Thailand. Asian Pac. J. Cancer Prev., 2014; 15: 7929–7934

[10] Matsushita H., Watanabe K., Yokoi T., Wakatsuki A.: Unexpected ovarian malignancy following laparoscopic excision of adnexal masses. Hum. Reprod., 2014; 29: 1912–1917

[11] Menczer J., Sadetzki S., Murad H., Barda G., Andreev H., Barchana M.: Childhood and adolescent ovarian malignant tumors in Israel. A nationwide study. Acta Obstet. Gynecol. Scand., 1999; 78: 813–817

[12] Oue T., Uehara S., Sasaki T., Nose S., Saka R., Yamanaka H., Ueno T., Tazuke Y., Okuyama H.: Treatment and ovarian preservation in children with ovarian tumors. J. Pediatr. Surg., 2015; 50: 2116–2118

[13] Özcan R., Kuruoğlu S., Dervişoğlu S., Eliçevik M., Emir H., Büyükünal C.: Ovary-sparing surgery for teratomas in children. Pediatr. Surg. Int., 2013; 29: 233–237

[14] Rogers E.M., Casadiego Cubides G., Lacy J., Gerstle J.T., Kives S., Allen L.: Preoperative risk stratification of adnexal masses: Can we predict the optimal surgical management? J. Pediatr. Adolesc. Gynecol., 2014; 27: 125–128

[15] Spinelli C., Pucci V., Strambi S., Piccolo R.L., Martin A., Messineo A.: Treatment of ovarian lesions in children and adolescents: A retrospective study of 130 cases. Pediatr. Hematol. Oncol., 2015; 32: 199–206

[16] Taskinen S., Fagerholm R., Lohi J., Taskinen M.: Pediatric ovarian neoplastic tumors: Incidence, age at presentation, tumor markers and outcome. Acta Obstet. Gynecol. Scand., 2015; 94: 425–429

[17] Terenziani M., Spinelli M., Jankovic M., Bardi E., Hjorth L., Haupt R., Michel G., Byrne J.: Practices of pediatric oncology and hematology providers regarding fertility issues: A European survey. Pediatr. Blood Cancer, 2014; 61: 2054–2058

[18] Von Allmen D.: Malignant lesions of the ovary in childhood. Semin. Pediatr. Surg., 2005; 14: 100–105

[19] Walczewska M., Mocarska A., Burdan F., Janczarek M., Żelazowska-Cieślińska I., Starosławska E.: Diagnosis of benign ovarian lesions using imaging techniques. Pol. Merkur. Lek., 2015; 38: 55–60

[20] Yousef Y., Pucci V., Emil S.: The relationship between intra-operative rupture and recurrence of pediatric ovarian neoplasms: Preliminary observations. J. Pediatr. Adolesc. Gynecol., 2016; 29: 111–116

[21] Zhang M., Jiang W., Li G., Xu C.: Ovarian masses in children and adolescents – an analysis of 521 clinical cases. J. Pediatr. Adolesc. Gynecol., 2014; 27: e73–e77

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