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Pediatric Intraabdominal Cysts—A Case Series from a Single Tertiary Center Experience

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What is already known on this topic?

- *Pediatric intraabdominal cystic masses are diverse in their origin, location, and histology, and can cause various symptoms and complications depending on their size and impact on adjacent structures.*
- *Timely and accurate diagnosis of these cysts is essential for guiding appropriate management, which usually involves surgical resection of the cysts.*

What this study adds on this topic?

- *This study reveals a spectrum of cyst types, including lymphangioma, mucinous cystadenoma, paratubal cyst, low-grade mucinous neoplasm, mature cystic teratoma, duplication cyst, mesothelial cyst, pseudocyst, serous cystadenoma, and simple hepatic cyst.*

ABSTRACT

Objective: We aimed to analyze the clinical presentation, imaging, histopathology, and surgical management of pediatric intraabdominal cysts, which are relatively common but diverse lesions that pose diagnostic challenges.

Materials and Methods: We conducted a retrospective analysis of pediatric intraabdominal cysts from 2010 to 2021 in a single tertiary center. We collected data on demographics, symptoms, radiological findings, surgical approaches, and histopathological diagnoses and compared them with the current literature.

Results: A total of 36 cases were included. There were 30 females and 6 males, aged 1 to 16 years. Abdominal pain was the most common symptom, followed by tenderness and distention. Diarrhea and vomiting were also reported in some cases. The cysts varied in size, location, and origin and were diagnosed as lymphangioma, mucinous cystadenoma, paratubal cyst, low-grade mucinous neoplasm, mature cystic teratoma, duplication cyst, mesothelial cyst, pseudocyst, serous cystadenoma, and simple hepatic cyst. The surgical management depended on the type and location of the cysts and involved excision, oophorectomy, appendectomy, or resection.

Conclusion: Pediatric intraabdominal cysts are heterogeneous lesions that require timely diagnosis and surgical resection. They may present with various symptoms and complications, depending on their size and location. Radiological and histopathological evaluation is essential for accurate diagnosis and optimal treatment.

Keywords: Pediatric surgery, intraabdominal cyst, histopathology, review

INTRODUCTION

A cyst is defined as a closed cavity or sac containing liquid or semisolid material and lined by epithelial cells. In contrast, cyst-like structures are fluid-filled masses lacking this characteristic epithelial lining. The evaluation of pediatric cystic and cyst-like abdominal masses can present unique challenges, especially when these masses are exceptionally large and occupy a significant portion of the abdominal cavity. Such substantial masses often distort the normal anatomical landmarks, making it challenging to pinpoint their exact site of origin.[1-3] The incidence and prevalence of pediatric intraabdominal cysts vary depending on the type and location of the cysts, but they are generally considered relatively common (Table 1).[4,5]

Pediatric intraabdominal cysts can arise from various organs, such as the liver, pancreas, spleen, kidney, adrenal gland, ovary, and mesentery.[3,6] The clinical presentation of these cysts depends on their size, location, and complications, such as infection, rupture, hemorrhage, or compression of adjacent structures. Some cysts may be asymptomatic and incidentally discovered by imaging or physical examination, while others may cause abdominal pain,

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Table 1. A List of Cystic Intraabdominal Masses in Children

Liver	Gastrointestinal
Mesenchymal hamartoma	Mesenteric cyst/lymphangioma
Biloma	Enteric/duplication cyst
Parasitic cyst	Omental cyst
Biliary system	Meconium pseudocyst
Choledochal cyst	Genitourinary/ovary
Hydrops of gallbladder	Functional cyst
Spleen	Teratoma/dermoid
Congenital cyst	Cystadenoma
Pancreas	Hematocolpos
Congenital cyst	Urachal cyst
Pseudocyst	Miscellaneous
Cystadenoma	Abscess
Kidney/adrenal	Sacrococcygeal teratoma
Hydronephrosis	Cerebrospinal fluid pseudocyst
Multicystic dysplastic kidney	Necrotic or cystic changes in tumors (Wilms, neuroblastoma, etc.)
Multilocular cystic nephroma	
Adrenal hemorrhage	

*Adapted from: Wootton-Gorges, SL, Thomas, KB, Harned, RK et al Giant cystic abdominal masses in children. Pediatr Radiol 35, 1277–1288 (2005). https://doi.org/10.1007/s00247-005-1559-7.

distension, mass effect, or organ dysfunction.[6] The histopathological features of these cysts vary according to their origin and etiology, but they contain a lining of epithelial cells with variable degrees of inflammation, fibrosis, calcification, or hemorrhage.[5]

The aim of this study was to analyze the clinicopathological characteristics of pediatric intraabdominal cystic masses in a large tertiary care center.

MATERIALS AND METHODS

Patients and Clinical Information

We presented a case series including all intraabdominal cystic lesions (e.g., adnexal cysts, mesenteric cysts, cystic appendiceal lesions) that were sent to the surgical pathology department from the pediatric surgery department at the Batman Training and Research Hospital between January 2010 and December 2021 in a retrospective study. Age, sex, and clinical information including presenting symptoms and physical examination were retrieved from the hospital records. The cases without sufficient clinical information or with physiological cysts that were unrelated to the patient presentation were excluded. This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of Batman Training and Research Hospital (date: April 25, 2022/ Number: 304). In this retrospective analysis of cases, informed consent was obtained from all participants or their legal guardians at the time of the original surgical procedures. The consent process included a clear explanation of the surgical interventions, the possibility of future retrospective research analysis, and the voluntary nature of participation in this study.

Radiological Information

The radiological features of the cystic lesions were recorded from ultrasound (USG), computed tomography (CT), or magnetic resonance imaging (MRI) reports, depending on the availability and indications.

Pathological Information

The histopathological data of the cases was obtained and recorded from the hospital information system.

Surgical Management

The surgical approach and technique for the removal of the cystic lesions was determined by the pediatric surgeons based on the location, size, and suspected diagnosis of the lesions.

Statistical Analysis

Descriptive statistics were performed using the Statistical Package for Social Sciences (SPSS) Statistics 22.0 package program (IBM Corp., Armonk, New York, USA). Categorical variables were presented as numbers (percentages) of cases in each category. Continuous variables were presented as means ± standard deviations or median (interquartile ranges), depending on the distribution of the data.

RESULTS

Patients and Clinical Information

Using the hospital information system, a total of 71 cases with a diagnosis of pediatric intraabdominal cyst were identified. Nine cases were excluded due to their coincidental discovery during appendectomy, and 26 cases were excluded due to lack of clinical information and the presence of physiological cysts that were unrelated to the patient presentation. Thirty-six cases were included in the analysis. The demographic, clinical, radiological, pathological, and surgical data of all cases were listed in Table 2. The cohort consisted of 30 (83.3%) females and 6 (16.7%) males, with ages ranging from 1 to 16 years (mean = 11.4 ± 4.76 years). Abdominal pain was the predominant symptom (n= 28), often accompanied by tenderness and distention. Diarrhea and vomiting were also observed in 3 cases.

Radiological Information

Radiological evaluation, including USG, CT, and MRI, revealed diverse cystic lesions in various intraabdominal locations. Among 36 lesions, 21 (58.3%) were ovarian, 5 (13.9%) were mesenteric, 3 (8.3%) were paratubal, 3 (8.3%) were appendiceal, 2 (5.6%) were small intestinal, 1 (2.8%) was hepatic, and 1 (2.8%) was intraabdominal in origin. These lesions ranged in size from 10 to 370 mm.

Pathological Information

Histopathological analysis of the excised cysts revealed a spectrum of diagnoses, including 9 serous cystadenomas (25%), 3 mature cystic teratomas (8.3%), 2 follicle cysts (5.6%), 1 corpus luteum cyst (2.8%), 1 simple cyst (2.8%), 1 pseudocyst (2.8%), and 4 bilateral ovarian cysts (11.1%); 3 lymphangiomas (8.3%), 1 foregut cyst (2.8%), 1 mesothelial cyst in the mesentery (2.8%); 3 paratubal cysts (8.3%); 3 low-grade mucinous neoplasms in the appendix (8.3%); 1 duplication cyst (2.8%) and 1 pseudocyst (2.8%) in the small intestine; 1 urachal cyst (2.8%), and 1 simple hepatic cyst (2.8%).

Surgical Management

The surgical management varied according to the cyst type and location. Excision was the primary approach, with

Table 2. A Retrospective Review of 36 Pediatric Intraabdominal Cysts

Case no	Age	Sex	Presentation	Physical Examination	Radiology	Location	Diameter (mm)	Histopathological diagnosis	Surgery
1	4	Female	Abdominal pain	Unremarkable	USG and MRI: Multiloculated cystic lesion in the upper left quadrant of the abdomen	Mesentery	39	Lymphangioma	Excision
2	9	Female	Abdominal pain	Tenderness	USG: A mesenteric cyst adjacent to the left kidney and spleen	Mesentery	50	Lymphangioma	Excision
3	3	Male	Abdominal pain	Distention	USG: A cystic lesion compatible with a mesenteric cyst located adjacent to the liver and in the pelvic region	Mesentery	130	Lymphangioma	Excision
4	16	Female	Abdominal pain	Pain, rebound tenderness	CT: A multicystic lesion in the right ovary; a cystic lesion in the left ovary	Ovary	R: 80 L: 40	R: Mucinous cystadenoma L: Follicle cyst	Excision
5	16	Female	Abdominal pain	Unremarkable	USG: A hemorrhagic cyst in the left ovary	Adnexa	R: 6 L: 20	R: Paratubal cyst L: Corpus luteum cyst, Paratubal cyst	Excision
6	12	Female	N/A	N/A	N/A	Ovary	R: 30 L: 20	R: Hemorrhagic corpus luteum cyst L: Serous cytadenoma	Excision
7	16	Female	Abdominal pain	Distention	USG and CT: Suspicion of left ovarian torsion	Ovary	R: 55 L: 21	L: Mature cystic teratoma (dermoid cyst) R: Corpus luteum	Oopherectomy
8	13	Female	Abdominal pain	Distention	USG: Right ovarian cyst	Ovary	15	Simple cyst	Excision
9	1	Female	N/A	N/A	N/A	Small intestine	50	Duplication cyst	Resection
10	14	Female	Abdominal pain	Pain, rebound tenderness	CT: Findings of appendicitis	Appendix	80	Low-grade mucinous neoplasm	Appendectomy
11	10	Male	Abdominal pain	Pain, rebound tenderness	USG: Findings of appendicitis	Appendix	40	Low-grade mucinous neoplasm	Appendectomy
12	13	Female	Abdominal pain	Pain, rebound tenderness	USG: A hemorrhagic cyst in the right ovary	Ovary	55	Follicle cyst	Excision
13	15	Female	Abdominal pain	Pain, rebound tenderness	USG: A cyst in the left ovary	Ovary	55	Follicle cyst	Excision
14	1	Female	Abdominal pain and vomiting	Distention	USG: a cystic lesion characterized by septations. Primary differentials include a liver hydatid cyst or a mesenteric cyst	Mesentery	160	Foregut cyst	Resection
15	14	Female	N/A	N/A	USG: Fishnet appearance in the right ovary, displaying fine echogenic septations within a cystic structure and minimal adjacent fluid. Consideration of a hemorrhagic cyst	Ovary	61	Corpus luteum cyst	Excision
16	10	Female	Abdominal pain	Pain, rebound tenderness	CT: Compatible with a teratoma in the right ovary	Ovary	60	Mature cystic teratoma	Oopherectomy
17	16	Female	N/A	N/A	N/A	Ovary	60	Mature cystic teratoma	Oopherectomy
18	12	Female	Abdominal pain	Unremarkable	USG: A cystic lesion and torsion in the right ovary	Ovary	100	Mature cystic teratoma	Oopherectomy
19	2	Female	N/A	N/A	N/A	Fallopian tube	15	Paratubal cyst	Excision

(*Continued*)

Table 2. A Retrospective Review of 36 Pediatric Intraabdominal Cysts (*Continued*)

Case no	Age	Sex	Presentation	Physical Examination	Radiology	Location	Diameter (mm)	Histopathological diagnosis	Surgery
20	14	Male	Abdominal pain	Tenderness	CT: a mesenteric cyst behind the bladder	Mesentery	35	Mesothelial cyst	Excision
21	10	Male	Abdominal pain	Pain, rebound tenderness	N/A	Appendix	60	Low-grade mucinous neoplasm	Appendectomy
22	13	Female	Abdominal pain	Tenderness	USG: mesenteric lymphadenopathy and fluid accumulation in the pelvic region.	Fallopian tube	10	Paratubal cyst	Excision
23	13	Female	Abdominal pain	Pain, rebound tenderness	Septated cyst in the right adnexal region	Fallopian tube	65	Paratubal cyst	Excision
24	15	Female	Abdominal pain	Pain, rebound tenderness	N/A	Paraovarian	.	Pseudocyst, possibly peritoneal	Excision
25	1	Male	Diarrhea	Tenderness	USG: Invagination and a cystic formation	Ileum	30	Pseudocyst	Excision
26	14	Female	Abdominal pain	Pain, rebound tenderness	MRI: Right ovarian cyst	Ovary	100	Serous cystadenoma	Excision
27	12	Female	Abdominal pain	Pain, rebound tenderness	USG: Left ovarian cyst	Adnexa	110	Serous cystadenoma	Oophorectomy
28	15	Female	Abdominal pain	N/A	N/A	Ovary	120	Serous cystadenoma	Salpingo-oophorectomy
29	15	Female	N/A	N/A	N/A	Ovary	N/A	Serous cystadenoma	Excision
30	14	Female	Abdominal pain and vomiting	Distention	USG: Widespread intraabdominal free fluid. CT: A cyst, presumably originating from the right ovary	Ovary	150	Serous cystadenoma	Excision
31	11	Female	Abdominal pain	Pain, rebound tenderness	USG ve CT: A multicystic lesion in the midline. Focal hemorrhagic areas are present (Left ovarian torsion?)	Ovary	90	Serous cystadenoma	Excision
32	15	Female	Abdominal pain	Pain, rebound tenderness	USG: Normal. CT: Enlargement of the right ovary	Ovary	20	Serous cystadenoma	Cyst excision+ appendectomy
33	15	Female	Abdominal pain	Distention	USG and MRI: A large mesenteric cyst, lymphangioma, or an ovarian cyst (right)	Ovary	160	Serous cystadenoma	Excision
34	16	Female	Abdominal bloating	Distention	USG: Unremarkable	Ovary	370	Serous cystadenoma	Salpingo-oophorectomy
35	13	Female	Abdominal pain	Unremarkable	A large cyst in the liver, hydatid cyst?	Liver	100	Simple hepatic cyst	Excision
36	8	Male	Abdominal pain and vomiting	Pain, rebound tenderness	USG: Findings of acute appendicitis. In addition, a cystic lesion compatible with a urachal cyst	Midline of the lower abdomen	20	Urachal cyst	Excision

CT, Computed tomography; L, Left; MRI, Magnetic resonance imaging; N/A, Not available; R, Right; USG, Ultrasonography.

oophorectomies, appendectomies, and resection being performed as needed.

DISCUSSION

Pediatric intraabdominal cystic masses present diagnostic challenges due to their diverse locations and histological characteristics.[6] In our study, we identified 36 cases, with ovarian lesions being the most common (58.3%), followed by mesenteric (13.9%), paratubal (8.3%), and appendiceal (8.3%) cysts. Radiological evaluations, including USG, CT, and MRI, played a crucial role in characterizing these cysts, showcasing varied features depending on histopathological diagnoses. Notably, the preferred treatment for pediatric cystic masses was excision, with surgical approaches tailored to the cyst type and location.

Ovarian pathologies in children, a relatively rare occurrence, demonstrated a frequency of 2.6 per 100 000, with malignant tumors constituting merely 1% of childhood cancers.[7,8] In our series, ovarian cysts accounted for 58.3% of intraabdominal cystic lesions in children, aligning with literature on their prevalence in specific age groups.[9] Radiologically, USG played a crucial role, and the differential diagnosis encompassed various entities.[10] We found that the most frequent histopathological diagnosis was serous cystadenoma (9 cases, 42.9%), followed by mature cystic teratoma (3 cases, 14.3%), and follicle cyst (2 cases, 9.5%). These findings are consistent with previous studies that reported mature cystic teratoma, follicle cyst, and serous cystadenoma as the most common benign ovarian tumors in children and adolescents.[11,12] The management of ovarian cysts depends on the age, symptoms, size, and appearance of the cyst, as well as the risk of malignancy and torsion. Our findings support ovarian cyst excision as the preferred surgical approach for benign cysts, emphasizing the importance of preserving ovarian function.[13]

Mucinous neoplasms of the appendix, a heterogeneous group of appendiceal epithelial neoplasms, can obstruct the appendix lumen while producing excess mucin, leading to appendiceal mucocele formation. These lesions are rare, found in approximately 0.2-0.7% of pathology specimens following appendectomy.[14,15] Alemayehu et al[16] reported no mucinous neoplasms among 3602 children over a 16-year period. Similarly, Pai et al[17] described 116 cases of appendiceal mucinous neoplasms over approximately 30 years, with only 2 patients under 20 years of age. In our series, we encountered 3 cases that, initially diagnosed as appendicitis, were ultimately identified as low-grade mucinous neoplasms. Awareness of these findings is crucial, considering the commonality of laparoscopic appendectomy in pediatric surgery.[16]

Mesenteric cysts are uncommon lesions that are named according to the cell type of the inner layer of the cyst, including lymphatic, mesothelial, enteric, urogenital origin, or nonpancreatic pseudocysts.[18] In our series, histopathological examination of the mesenteric cysts revealed 3 lymphangiomas, 1 foregut cyst, and 1 mesothelial cyst in symptomatic patients. The clinical presentation varies primarily based on cyst location and size, with emerging complications such as enlargement, intracystic hemorrhage, torsion, infection, or rupture serving as common indications for surgical excision.[19]

We encountered other rare entities in our study including a duplication cyst and a pseudocyst in the small intestine, a urachal cyst, and a simple hepatic cyst. These cases demonstrated the importance of considering diverse differential diagnoses and tailoring surgical approaches based on cyst characteristics.

While interpreting our findings, it is important to acknowledge the limitations of our single-center retrospective design, potential selection bias, and the variability in radiological techniques and surgical management decisions. Standardized surgical protocols and long-term follow-up data are essential for a comprehensive assessment of outcomes and recurrence rates.

In summary, our study provides valuable insights into the spectrum of pediatric intraabdominal cystic masses, emphasizing the importance of tailored surgical approaches based on individual patient characteristics. Further research and multicenter studies are warranted to enhance the understanding and management of these diverse entities in the pediatric population.

Pediatric intraabdominal cystic masses are diagnostically challenging due to their varied presentations and locations. Timely and accurate diagnosis, aided by radiological imaging and histopathological evaluation, is crucial for guiding appropriate management. While surgical excision is generally the preferred treatment option, the specific approach may vary depending on the clinical context and patient characteristics. Understanding the diversity of these cystic lesions, their clinical manifestations, and potential complications is essential for delivering optimal care to pediatric patients. Further research and collaborative efforts are needed to refine diagnostic and therapeutic strategies for these rare conditions.

Availability of Data and Materials: All data generated or analyzed during this study is included in this published article.

Ethics Committee Approval: This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of Batman Training and Research Hospital (date: April 25, 2022/Number: 304).

Informed Consent: In this retrospective analysis of cases, informed consent was obtained from all participants or their legal guardians at the time of the original surgical procedures. The consent process included a clear explanation of the surgical interventions, the possibility of future retrospective research analysis, and the voluntary nature of participation in this study.

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