

Laparoscopy is the Gold Standard in Ovarian Pathologies in Childhood: Clinical Evaluation and Literature Review

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ABSTRACT

OBJECTIVE: Ovarian cysts and related torsions are the most common adnexial pathologies in childhood. Diagnostic laparoscopy is the gold standard approach for differential diagnosis. It is aimed to evaluate the data of patients who had surgery for ovarian pathology.

STUDY DESIGN: Fifty-three girls of ten years are included the study. Demographic data, medical history, physical examination, laboratory and radiologic investigations, surgical procedure, histopathology, complications and follow up periods are recorded.

RESULTS: The median age of children was 13. Excluding the patients who were diagnosed in intrauterine period (n=4), all of the patients had abdominal pain (92%). Laparoscopic cystectomy (56.7%), detorsion and cystectomy (16.9%) and oophorectomy (16.9%) were performed in patients with cysts. Diagnostic laparoscopy (3,8%) and laparoscopic detorsion (5.7%) were performed in patients without cyst. Dermoid cysts were found in three children and teratomas in two. Patients were discharged in postoperative second day.

CONCLUSION: Diagnostic laparoscopy is the gold standard approach for differential diagnosis. Laparoscopic approach should be chosen because of shorter hospital stay, shorter healing period, and better cosmetic results. Besides, less pelvic adhesions compared to laparotomy in laparoscopy is important for further fertility.

Keywords: Children, Cyst, Laparoscopy, Ovary, Torsion

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Introduction

Ovarian cysts and related torsions are the most common adnexial pathologies in childhood (1-3). Children with ovarian cysts can present with hormonal imbalance, cyst rupture, hemorrhage and torsion (4-6) Ovarian torsion is an emergency; it can be with or without a cyst. Besides, benign or malignant neoplasm can be found (2). Common complaint is pelvic or abdominal pain (4,7). Although ultrasonography and color Doppler ultrasonography may be useful for diagnosis (2,8,9), diagnostic laparoscopy is the gold standard approach for differential diagnosis (1). It is aimed to evaluate the data of patients who had surgery due to ovarian pathology in past ten years.

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Material and Method

The study was performed in adherence to the Declaration of Helsinki. A written informed consent was signed by the legal guardians of each child. The charts of patients with ovarian pathologies between January 2006 and May 2016 were retrospectively examined. Fifty-three girls were included for the study. Demographic data, medical history, physical examination, laboratory and radiologic investigations, complications, surgical procedure, histopathological evaluation and follow up periods were recorded.

Ultrasonography and color Doppler ultrasonography were performed to all children for diagnosis. Increase in diameter of ovary and cyst, peripherally located follicles or solid component of cysts were evaluated via ultrasonography. Blood flow was tested via color Doppler ultrasonography. The children were evaluated with medical history, physical examination, blood tests and radiologic imaging. Children with pain complaints for more than 48 hours and children in whom torsion cannot be excluded underwent surgery emergently. Children who had persistent cysts more than five cm diameter after one or two menstrual cycles and children who had cysts

with solid components underwent elective surgery. Children were located in supine position on the table. Nasogastric tube was placed to all children before the anesthesia by the aim of gastric decompression. Bladder was emptied before the procedure. All the patients were intubated. Umbilical 5-10 mm incision was made to place camera trocar with open technique. In children less than 10 kg; 3 mm working trocars were placed bilaterally in upper lateral side of rectus abdominis muscle and in children more than 10 kg, 5 mm trocars were placed bilaterally in lower lateral side of rectus abdominis muscle. If the cyst was so big that it crossed the umbilical line, camera trocar was placed in epigastrium and the working ports in upper quadrants. The table was in 30 degree Trendelenburg position and the monitor was placed caudally. Surgeon and camera-man positioned contralaterally to the lesion.

All the torsioned ovaries were detorsioned. The cysts were aspirated with a Veress or injector needle percutaneously. Cystic wall and fluid was extracted for histopathological examination. The cystectomy was performed with hook cautery or vascular sealing devices and the ovarian tissue was preserved. If the cyst was too big to remove from the umbilical trocar the cyst was aspirated percutaneously and removed from the umbilicus and laparoscopy assisted procedure was performed. Solid masses were removed via endobag through the umbilicus. Nasogastric tube was removed immediately after the surgery and the patients were fed postoperatively at sixth hour. Tumor marker tests were performed in children who had complicated cyst and solid masses. If the ovarian pathology was hormonally active, endocrinology consultation was requested.

Results

Fifty-three girls of ten years were included the study. The ages of children varied between two days and eighteen years (median thirteen years). Four babies had prenatal diagnosis. Excluding the patients who were diagnosed in intrauterine period ($n=4$), all of the patients had abdominal pain ($n=49$, 92%). Seven children had recurrent or long-term abdominal pain (13%). Nausea and vomiting were accompanying to abdominal pain in 15 children (28%). Palpable mass was recorded in six children (11%). Leukocytosis ($>10 \times 10^9/L$) was found in nineteen children (35.8%). Tumor markers were evaluated in 13 patients, and no pathology was revealed. All of the patients had ultrasonography and color Doppler ultrasonography and four children had computed tomography imaging. Right ovarian pathology was revealed in 28 of the patients (52.8%), left in 23 (43.3%) and bilateral in two (3.7%) (Table 1). All procedures started laparoscopically. Cystectomy was performed in 30 children (56.7%), cystectomy and detorsion in nine (16.9%), oophorectomy in nine (16.9%), only detorsion in three (5.7%), and no pathology was detected in two (3.8%) (Table 2). Mini- laparotomy and oophorectomy was performed in a newborn with an ovarian cyst with calcifications and solid components.

Mean cyst diameter was 5.94 cm (1.5-19 cm). Two of them were giant cysts with a diameter of more than 15 cm. Histopathologic examination of contents revealed simple cysts in 22 children and hemorrhagic cysts in 19. Dermoid cysts were found in three children and teratomas in two. In four children, gross necrosis in ovary was found. No malignant cyst was found.

Ultrasonography was concordant with diagnostic laparoscopy in all of the children with cysts. In 14 torsion cases, ultrasonography revealed increase in size in eight children, cysts in two children and peripheral follicles in one child. Color Doppler ultrasonography showed no blood flow in four children (28.5%). In one child, torsion was seen in laparoscopy even though ultrasonography and color Doppler ultrasonography showed no signs of torsion. In one child with increase in size and one with no blood flow in color Doppler ultrasonography, laparoscopy was performed but no pathology was identified in laparoscopy.

Only in one child laparoscopic approach revealed suboptimal surgical access and laparotomy was performed, consequently. Children were discharged postoperative 1-7th days (mean 2 days). No other complications were seen. In follow up period, one child presented with ipsilateral ovarian cyst (>5 cm diameter) and underwent cystectomy.

Table 1: Demographic data, physical examination, laboratory values and pathological site of ovary

Age	2 days-18 years
Abdominal pain	49 (92%)
Nausea- vomiting	15 (28%)
Palpable mass	6 (11%)
Leukocytosis ($>10 \times 10^9/L$)	19 (35.8%)
Pathologic site	
Right	28 (52.83%)
Left	23 (43.3%)
Bilateral	2 (3.77%)

Table 2: Laparoscopic procedure in ovarian pathologies

Laparoscopic procedures	
Cystectomy	30 (56.7%)
Cystectomy+ Detorsion	9 (16.9%)
Oophrectomy	9 (16.9%)
Detorsion	3 (5.7%)
Diagnostic laparoscopy	2 (3.8%)

Discussion

The data of the girls who applied to our clinics with an ovarian pathology in ten years, were collected. The abdominal pain was determined to be an important clinical factor in ovarian pathologies. Although radiological imaging was useful in diagnosing a cyst or a mass, it can give false results if torsion

was present. Minimal invasive surgery seems superior for diagnosis and treatment.

Functional ovarian cysts are follicle and corpus luteum cysts and they make up 45% of all adnexial pathologies (6). It can be seen in fetal - neonatal period with hormone stimulation or in the perimenarchal period with dysfunctional ovulation (6). Patients with ovarian cysts can present to emergency with rupture of the cyst, hemorrhage or torsion (4-6). In fact, ovarian cyst ruptures and hemorrhages can be seen in ovarian cycle as a physiological state. Middle pain (Mittelschmerz) can be seen with follicle rupture during ovulation and peritoneal free fluid can cause pain. Hemorrhagic cyst is caused by the stretching of the ovarian capsule and the rupture of the cyst causing peritoneal irritation. It cannot be determined which cyst is pathological or physiological or caused by the hemorrhage of the cyst. However in adults, cysts, which have a diameter below 25 mm, are called a follicle and the bigger ones are called cysts. Physiological cysts can be specified as serous or mucinous cystic adenomas (4). They can present to emergency with an acute onset of abdominal pain, nausea, and vomiting. Adults, experienced in Mittelschmerz, know this pain and they can guess it will end in 48 hours. They can be followed up with simple analgesics (4). However kids are not familiar to this pain, because of this, differential diagnosis must be evaluated. In ultrasonography imaging, hemorrhagic cysts are reported as ovarian cyst with typical mixed, often bizarre, internal echoes suggestive of blood cloud. But in the setting of ovarian cyst rupture, normal ovaries but site specific tenderness and free fluid in the pouch of Douglas is reported (4).

Hemorrhagic cysts must be followed up closely and are expected to resolve in six weeks. Laparoscopic indications are defined as, hemodynamic compromise, diagnostic uncertainty or likelihood of torsion, no relief of symptoms within 48 hours of presentation, increasing hemoperitoneum on ultrasonography or falling hemoglobin concentration (2,4,6,7,10). Cystic teratomas form the biggest group in benign lesions (7). Malign lesions are seen as much as 1.1%. Templeman et al. reported 57.9% of the adnexial masses are in concordance with cysts. Other masses are reported as neoplasms but 75% of these are reported benign (11). In our study, in 41 of the patients (77.3%) cyst was determined. Hemorrhagic cyst was seen in almost half of them 46.3% (n=19). Patients in which ovarian torsion cannot be ruled out, who had a pain persisting longer than 48 hours, with a follow up for 1 or 2 menstrual cycles and had a cyst bigger than 5cm, and the patients who had pain symptoms were operated. None of the patients had malignant lesions.

Giant cysts, which are bigger than 15 cm in diameter, are commonly benign and functional. There may not be enough space for minimal invasive surgery in the abdomen in these cases. Drainage by ultrasonography, mini-laparotomy or laparoscopy guided aspiration is recommended (12). It is men-

tioned that, these cysts are settled in pelvis so that torsion is not a possible risk for these patients (12,13). In our cases, camera port was placed in epigastric area with Hasson technique and the working ports were placed in lateral sides of rectus abdominis muscle in upper abdomen. Veress or a suitable needle aspirated the cysts, percutaneously. After maintaining better exposure, cystectomy was performed. With this approach, cystic content was aspirated with camera control and the procedure was completed minimal invasively.

Ovarian torsion constitutes 2.7% of gynecological emergency situations. 14 Children commonly present with suddenly starting, continuous and non-specific abdominal pain (3,4,7,14,15). Delayed diagnosis or misdiagnosis may cause organ damage or lost (14). Blood tests may reveal leukocytosis but there is not a correlation between leukocytosis and necrosis (4,14). In our study, leukocytosis was found in 57% of the torsions. Ovarian torsion is rare among normal sized ovaries (6,8). In the study of Oltmann et al., torsioned ovaries were over 5 cm in 83% of patients (16). But in the childhood, the long ovarian pedicle is the common underlying reason of torsion. Longer fallopian tube, mesosalpinx or mesoovarium provides mobility and makes torsion easier (4,15,17,18). Torsion is rare among malignant pathologies and coincidental torsion rate is between 2-6% (2,7,17,18). It can be explained by adhesions to environmental tissues, which resulted from inflammation and fibrosis of malignancy (17-19). Left ovarian torsion is less common. It is thought that sigmoid colon prevents mobilization (9,13,16,17,18). In our cases, it was concordant with the literature with a rate of 29% left ovarian torsion.

It is known that ultrasonography and color Doppler ultrasonography are useful for diagnosis (2,9,14). Because of the edema, torsioned ovary may not be seen; or echogenic, hypoechoic mass or bigger ovary may be seen. Peripherally located follicles are seen (4,15,17,18,20). But the diagnosis rate is 13-50% with this view (3,17). Absence of blood flow and whirlpool sign is susceptible for torsion. But due to the dual arterial blood flow, seeing the arterial blood flow does not exclude the torsion (38-62%) (3,17,18,21). In the study with adult patients of Albayram et al., arterial and venous blood flow were not seen in 40% of the patients, venous blood flow was reduced and arterial blood flow was absent in 33%, both arterial and venous blood flow were reduced in 13%, arterial blood flow was reduced and venous blood flow were not seen in 7% of the patients (22). In Ben - Ami et al.'s study, in 67% of patients arterial and venous blood flow were not seen (23). In our study, increased size of ovary, cysts and peripherally located follicles were stated. Color Doppler ultrasonography only revealed absence of arterial blood flow in four of the children (28.5%). In one child, laparoscopy revealed torsion even though ultrasonography and color Doppler ultrasonography found no finding in favor of torsion. In one child with size increase and one with no blood flow in color Doppler ultrasonography, laparoscopy was performed but no pathology was

identified. Magnetic resonance imaging and computed tomography can also be performed and expanded adnexia, peripheral cystic lesions, pelvic masses, vascular congestion signs, peritoneal fluid, tubal thickening and uterine deviation can sign torsion (4,8,15,17). But in our clinic, computed tomography is not first choice due to the side effects. It is only performed in four children with radiologist's advice. Three cysts and one teratoma were revealed in these children, which were concordant with laparoscopy and histopathological diagnosis.

Ovaries are supplied in a dual arterial system. Because of this, venous system is affected first in the setting of torsion and congestion, edema, discolorization, ischemia and necrosis develop. Black-bluish color change, size and edema can be misleading. The situation is reversible because complete arterial obstruction does not generally happen (4,8,14,17,24). Avoiding oophorectomy is accepted widely. Ovarian function return in 88-100%.⁸ In the older papers, because of the thromboembolic risks, oophorectomy was suggested without detorsion when black bluish adnex was seen. But in the current studies, this ratio is reported to be no more than 0.02% (3,4,15,17,25,26) and so that fertility can be protected (2,5,7,17,18). Torsioned ovary is detorsioned. If secondary torsion develops, an attempt to the cyst must be made. This is necessary to get a histopathological sample and for avoidance of torsion.¹⁵ Without oophorectomy, malignancy can be overlooked (17,26). In the case of identifying solid or heterogenic mass, frozen biopsy can be taken to rule out malignancy (17). After the detorsion cases without oophorectomy, follow-up of the ovary dimensions until it becomes normal or atrophic, is necessary to avoid overlooking of malignancies (4,17). It is recommended to repeat the ultrasonography after 1-8 weeks and tumor markers if necessary (4,17). In our routine, we repeat ultrasonography after one or five menstrual cycles. Oophorectomy was performed in four of sixteen torsion cases. Control ultrasonography examination revealed normal size and normal ovarian tissue in seven children among the others. In two children, residual ovarian tissue was seen and these children were followed for ovarian atrophy. Three children were out of follow up.

Though uncommon, ovarian torsions may repeat. The incidence is reported as 2-11% (18,27,28). Although most of the authors find it unnecessary, some of them advocate oophorectomy because of this (3,4,8). In the case of ipsilateral or contralateral repeating, oophorectomy is widely accepted (17).

In the retrospective study of Spinelli et al, 137 lesions in 130 children are reported to be 46.7% functional lesion, 43.1% as benign neoplasm, 3.7% malign, 6.6% normal ovarian torsion. Oophorectomy was conducted in 56 children out of 130 (40.9%) (2). In our study, oophorectomy was performed in 16.9% and protective approach took place whenever possible.

Definitive diagnosis is made surgically and histopatholog-

ically in ovarian pathologies (17). In a study, pediatric surgeons and obstetricians were compared in 1151 patients less than 18 years of age diagnosed with ovarian torsion. Eightyone percent of the patients were intervened by pediatric surgeons. Twentyseven percent of pediatric surgeons managed laparoscopically compared to 17% by the obstetricians. All of our cases started laparoscopically but in one patient mini-laparotomy was performed. In the same study, 38% of the pediatric surgeons performed oophorectomy compared to 27% by the obstetricians (26). Dermoid cysts and teratoma was found in five of our cases. Oophorectomy was performed in only four cases, which was thought to be necrosis due to torsion. Our total oophorectomy rate was 16.9% but when the solid masses excluded, the rate reduces to 7.5%.

Laparoscopic surgery is started to be used by the obstetricians earlier compared to pediatric surgeons but with the advance of the technology it is also widely accepted by pediatric surgeons (1). Diagnostic laparoscopy is the gold standard in children and it is also valuable in differential diagnosis. Laparoscopically performed conservative surgery is associated with less hospital stay, less blood loss, less postoperative pain, shorter recovery period, faster return to normal activity and superior cosmetic result. Compared to laparotomy, it is associated with less pelvic adhesions, which preserves fertility better.

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