

*Full Length Research Paper*

# Laparoscopic surgery of ovarian tumors in children: Report of 4 cases and literature review

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**In this study, we evaluated the feasibility and curative effects of laparoscopic surgery of ovarian benign tumors in children. The clinical data of four children with ovarian tumors who underwent laparoscopic surgery in the Second People's Hospital of Shenzhen from January, 2008 to February, 2010 were retrospectively reviewed. Among these 4 children, laparoscopic ovarian cystectomy was performed in 3 cases and laparoscopic ovarian adnexectomy in one case. Mean operation time was  $61.25 \pm 32.24$  min, mean intraoperative loss of blood was 5 - 100 ml, and mean length of postoperative hospital stay was 3 - 5 days. No postoperative complications or tumor recurrence was observed within the follow-up periods from 6 - 24 months. Laparoscopic surgery is the preferred treatment for ovarian benign tumors in children due to its safety and effectiveness.**

**Key words:** Laparoscopic surgery, ovarian tumor, child.

## INTRODUCTION

Ovarian tumor is a common disease in childbearing or elder women, but they are very rarely reported in children (Amégbor et al., 2009; Morowitz et al., 2003). Although, ovarian cysts more commonly present during a women's reproductive years, cysts can also develop in the pediatric population. In the newborn population, cysts are the most common type of ovarian mass (Esposito et al., 1998). For the overall pediatric population, the reported incidence of abdominal cysts ranges from 0.1 to 0.2%, and many of these are ovarian in origin (Zampieri et al., 2008). In our department, ovarian tumors only account for 1.04% of all operated patients (4/3923). The low incidence and atypical symptoms of ovarian tumors in children easily lead to missed diagnosis and misdiagnosis, resulting in irreversible damage (Pomeranz and Sabnis, 2004). The curative effects of drug treatment of ovarian tumors are poor, and therefore ovarian masses are routinely treated by surgical resection once identified (Islam et al., 2008). Unfortunately, traditional open ovarian cystectomy has many disadvantages such as severe surgical trauma, which may bring severe mental

injury to children and significantly inhibit their healthy growth and development. Until now, reports on laparoscopic surgery of ovarian tumors in children have been rare. In this paper, we have reported 4 cases of childhood ovarian tumors treated with laparoscopic surgery, and reviewed related literature, to evaluate the feasibility and curative effects of laparoscopic surgery of ovarian tumors in children.

## PATIENTS AND METHODS

### General data and present history of patients

From January, 2008 to February, 2010, 4 children with ovarian tumors were treated with laparoscopic surgery in our hospital. In all these cases, there is no familial history of ovarian tumors. The detailed data of 4 children are listed in Table 1. Interestingly, abdominal pain was the chief complaint in cases 1, 2 and 3.

In case 1 recurrent attacks of left lower abdominal pain lasted 6 months, during which the patient was misdiagnosed with intestinal dysfunction in several hospitals, and symptomatic treatments were not effective. The subsequent B-type ultrasonography revealed a left ovarian teratoma.

Case 2 was an amateur Latin dancer, who suffered from right low abdominal pain when dancing for 12 months, and was diagnosed as "appendicitis" many times. Because of misdiagnosis, anti-inflammatory treatments were not effective. However, subsequent B-type ultrasonography revealed a right ovarian teratoma.

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**Table 1.** Detailed data of 4 children with ovarian tumors.

Case No.	Age (y)	Presenting symptom	Course of disease (m)	Menarche	History of lower abdomen operation	Auxiliary examination	Body height (cm)	Body weight (kg)
1	10	Left lower abdominal pain	6	No	No	B-type ultrasonography	130	28
2	9	Paroxysmal right lower abdominal pain	12	No	No	B-type ultrasonography	130	25
3	9	Repeated lower abdominal pain	12	No	Appendectomy	B-type ultrasonography	128	28
4	11	No or occasional abdominal pain	Not known	No	No	B-type ultrasonography	150	37

In case 3, the recurrent attacks of right lower abdominal pain lasted for more than one year, and an appendectomy was performed because of the diagnosis of appendicitis one year ago. However, the patient's right lower abdominal pain continued to recur after appendectomy, and she was then diagnosed as ankylenteron. The symptoms sometimes repeated and were alleviated when anti-inflammatory treatments were administered. However, during this course of anti-inflammatory treatment, the symptoms inversely gradually aggravated and accompanied by significantly elevated white blood cell count. B-type ultrasonography revealed a mass in pelvic cavity which was initially misdiagnosed as a "blood clot". Case 4 lived in a school away from her parents, and they noticed that her abdominal circumference had greatly increased when they visited her and brought a pair of trousers for her. They took her to hospital, and she was immediately admitted after a B-type ultrasonography revealed a huge ovarian cyst.

## Methods

### Preoperative preparation

Before operation, general anesthesia and endotracheal intubation were performed, followed by indwelling catheter and routine disinfection of abdominal skin.

### Artificial pneumoperitoneum

The pressure of artificial pneumoperitoneum was set at 10 mmHg. A 10 mm trocar was fixed at the umbilical region for endoscope, and then the position of patient was changed to head-down supine position for 15°. Subsequently, a 10

mm trocar and a 5 mm trocar were placed at bilateral McBurney points for instrument manipulation. Due to previous misdiagnosis in case 3, both manipulating trocars were first placed at left lower abdomen for surgical exploration of gastrointestinal diseases, and thus a 5 mm trocar was additionally placed at right lower abdomen by gynecologists for the removal of ovarian tumor. However, there were 3 trocars in the other 3 operations.

### Operative procedures

In case 1 and 2, after the mass at the left ovary had been verified by laparoscopic exploration, and ovarian cystectomy was immediately performed. Meanwhile, we observed that the contralateral ovary was smaller, with normal appearance. Therefore, surgical exploration of the contralateral ovary was not performed. In case 3, because of 540° torsion of the right ovarian cyst and followed by the ovarian necrosis and the contralateral ovary looked smaller and normal. Right adnexectomy was performed in this case. In case 4, because the ovarian cyst was huge, a 5 mm skin incision on the right lower abdomen near the McBurney point was performed, and then a pneumoperitoneum needle was inserted into the ovarian cyst at the incision. A total amount of 1800 ml brown liquid was drained through the needle. Subsequently, 3 trocars were placed at their corresponding sites, respectively, and a 6 U hypophysisin solution was injected into the wall of ovarian cyst. After the tumor had obviously become ischemic, we noticed that the contralateral ovary had normal shape and size, then the capsule wall of ovarian cyst was gradually removed. The uncovered ovarian tissues were then sutured with 2 - 0 absorbable suture. The ovarian cyst walls were cut into fraction and taken out. All tissue

specimens were examined by frozen and paraffin pathology, as listed in Table 2. In case 1 and 2, the postoperative pathological diagnosis was benign teratoma. In case 3 was benign ovarian cyst and in case 4 were serous cystadenoma accompanied with hemorrhage.

### Postoperative treatments

After the operations, antibiotics were administered to prevent infection for 3 days in 4 children; 6 h after each operation, the Foley catheter was removed. No urinary retention was observed, and all patients then began eating. All patients discharged 3 - 5 days after operation.

## RESULTS

Due to preoperative misdiagnosis in case 3, a right adnexectomy was immediately performed after intraoperative exploration revealed that 540° torsion of the right ovarian cyst accompanied by tissue necrosis. All 4 children with ovarian tumors underwent successful laparoscopic surgery. The detailed operation data are listed in Table 2. Their symptoms gradually disappeared after laparoscopic surgery. No postoperative complications or tumor recurrence was observed within a follow-up period of 6 - 31 months. It shows that laparoscopic treatment for benign ovarian tumor is safe and effective; however, more follow-up should be kept on about reoccurrence.

**Table 2.** Laparoscopic surgery data of 4 children.

Case No.	Size of tumor (cm)	Operation name	Operation time (min)	Intraoperative loss of blood (ml)	Postoperative pathological diagnosis	Follow-up period (m)
1	5×4	Tumor resection	40	5	(Left) Benign teratoma	31
2	4×3	Tumor resection	30	5	(Right) Benign teratoma	13
3	13×5	Right adnexectomy	75	10	(Right) Ovarian cyst	6
4	23×18	Tumor resection	100	100	(Right) Serous cystadenoma accompanied with hemorrhage	6

## DISCUSSION

### Ovarian tumors in children

Ovarian tumors in children younger than 15 years old are very rare, only accounting for 0.2 - 0.3%. In particular, ovarian tumors are rarer in children younger than 11 years old (Brookfield et al., 2009). In the 26-month period from January, 2008 to February, 2010, a total of 3923 cases of gynecological operations were performed in our hospital (the Second People's Hospital of Shenzhen), and only 8 cases (0.2%) of them were younger than 15 years, including 4 cases (0.1%) younger than 11 years. Due to the features of childhood development, the symptoms usually appeared in the abdomen rather than the pelvic cavity. Thus, a typical symptoms and low incidence of ovarian tumors in children easily led to misdiagnosis at initial diagnosis (Pomeranz and Sabnis, 2004). Islam et al. (2008) reported that 55% (27/49) of children with ovarian tumors visited his clinic because of abdominal pain or abdominal mass. The majority was treated with open surgery, with only 12% being treated with minimally invasive surgery. As mentioned above, childhood ovarian tumors are rare, and thus ovarian tumors are easily neglected in children. A

previous study (Alotaibi et al., 2010) revealed that the majority of ovarian tumors in children to be benign. However, there is malignant ovarian tumor in children, so the pre-operative diagnosis is very important. If the tumor is benign, laparoscopic surgery is preferred; otherwise, open surgery is more to be used. As a result, B-type ultrasonography played important roles not only in the early diagnosis of ovarian tumors but also in the differential diagnosis of benign and malignant tumors. The imaging manifestation of most mature ovarian tumor was cystic, which was significantly different from the imaging manifestation of malignant germ cell tumors. But there were no significant differences in the size, intracapsular fat and calcification of imaging manifestations between mature ovarian tumor and malignant germ cell tumors (Skiadas et al., 2004). Ovarian masses often present symptomatic abdominal complaints that can mimic other diseases, in particular, appendicitis (Pomeranz and Sabnis, 2004). Ovarian tumors must be considered in the differential diagnosis of young girls with abdominal pain, mass, or other non-specific symptoms. Further, B-type ultrasonography or other imaging examinations should be performed as early as possible to rule out ovarian tumors, avoiding the missed diagnosis and misdiagnosis of ovarian

tumors.

For benign ovarian tumors, ovarian-preserving operations should be performed whenever feasible (Cass et al., 2001).

### Treatment of ovarian tumors in children

Drug therapy is not usually effective for ovarian tumors in children, so timely surgical therapy should be given once ovarian tumors have been verified (Cass et al., 2001). Due to large activity amount in children, delayed treatment of ovarian tumors can easily lead to ovarian tumor torsion and necrosis, resulting in irreversible damage and/or life-long regret (Oltmann et al., 2010). Of 92 cases of ovarian torsion in patients aged from 6 months to 19 years old reported by Savic et al. (2008), 14 children had not yet had their menarche, and therefore they usually had no specific clinical symptoms. Because all ovarian tumors in children are prone to torsion, adnexectomy should be immediately performed once ovarian tumors have been verified (Anders and Powell, 2010). Although some surgeons still elect to approach this surgery in the open fashion, the laparoscopic approach is a safe and effective alternative. Laparoscopic surgery of ovarian

tumors in children has many advantages such as minimal trauma, rapid recovery and no obvious abdominal scar, which are all conducive to the postoperative healthy growth of children. However, the small body size and poor operation tolerance of children requires rigorous anesthetic and surgical preparation. The important aspects are thus summarized.

### Preoperative evaluation

Compared with healthy adults, the smaller and thinner body of children means a shorter distance between two manipulating trocars, leading to smaller laparoscopic operation space and more difficulties in laparoscopic operation. Therefore, to ensure the patient's safety as much as possible, only experienced doctors should be chosen to perform the surgery. Further, it is also necessary and important to perform careful preoperative evaluation and discussion with anesthetists.

### Laparoscopic surgical procedures

Due to the specificity of children's systematic circulation, the conventional pneumoperitoneum pressure of 13 - 14 mmHg was deemed inappropriate and dangerous in children. In this study, pneumoperitoneum pressure was set at 10 mmHg. This pressure that allows successful completion of laparoscopic surgery has minimal interference on the child's circulation and therefore ensures the safety of the operation (Tsylin et al., 2007).

We decided that a 10 mm trocar should be placed in the left lower abdomen, and 10 mm grasping forceps be manipulated through this trocar. The performing surgeon should be cautious and gentle when grasping tissues to avoid tissue injury. Further, low-power bipolar coagulation (output power: 15 W) was chosen to avoid the irreversible damage of residual ovarian tissues which can be caused by excessive coagulation intensity.

Meanwhile, due to the features of a smaller pelvic cavity and lower pneumoperitoneum pressure in laparoscopic surgery, a 30° endoscope was preferred.

A solution of 6u hypophysin and an equal volume of normal saline solution was routinely muscularly injected, with the tumour then being immediately removed after obvious vasoconstriction. This helps avoid unnecessary tissue injury due to excessive intraoperative coagulation and thus retain normal ovarian tissues as much as possible.

Regardless of the size of ovarian tumors, the incision was performed along the longitudinal axis of the ovary opposite to the hilum of the ovary. This was done to help retain residual ovarian tissues as much as possible. After the operation, patients had a rest in bed for 6 h, after which the Foley catheter was removed and the patients were able to take food and have out-of-bed activity.

Further, it was important and necessary to administer

antibiotics for a short term for infection prevention.

### Perioperative complications

Thus far, there have been no reports of postoperative complications such as ureter and intestinal canal iatrogenic injury after laparoscopic ovarian removal and adnexectomy in children. Laparoscopy is becoming the favored approach by most pediatric surgeons for the treatment of ovarian cysts. All surgical procedures for ovarian cysts should spare ovary function as much as is technically possible (Mayer et al., 2009). The laparoscopic approach to the simple benign ovarian cyst is safe and effective in all pediatric age groups (Shapiro et al., 2009).

However, due to the special features of development in children, surgeons must be careful to avoid ureter and intestinal canal iatrogenic injury during operation. In particular, it is safer to remove ovarian tumors after ureters have been isolated from surrounding tissues. Further, selection of appropriate electric coagulation forceps, appropriate electric power and skilled laparoscopic procedures could effectively reduce intraoperative complications. In this study, laparoscopic surgery of ovarian tumors was successfully performed in 4 children, and their symptoms and signs gradually disappeared. No postoperative complications or tumor recurrence was observed within the follow-up period. Thus, laparoscopic surgery should become a preferred treatment for ovarian tumors in children due to its safety and effective advantages. This conviction should be verified by long-term follow-up with a larger sample size.

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