

# Laparoscopic management of ovarian benign masses

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## Summary

**Purpose:** To determine whether the presence of normal ovarian tissue could assist in the diagnosis of large benign ovarian neoplasms in young females and in choosing the laparoscopic treatment. **Materials and Methods:** A prospective study of 25 patients treated surgically for a cystic ovarian neoplasm measuring diameter more than ten cm or volume more than 500 ml and having normal ovarian tissue or ovarian crescent sign (OCS). Ultrasonography was performed at six weeks, then at three, six, nine, and 12 months postoperatively. **Results:** The mean age of patients was  $15.3 \pm 3.6$  years, ranging between 6.5 and 19 years. The mean preoperative volume of the ovarian neoplasm was  $1,686 \pm 1,380$  cm<sup>3</sup>, ranging between 550 and 6,000 cm<sup>3</sup>. The presence of OCS was visualized by ultrasonography in all 25 patients and serum tumor markers were negative in 22. No borderline tumors or malignancies were identified. There was a statistically significant difference between the volume of the affected ovary and the contralateral ovary during the first six weeks follow-up, but without significant difference after three months. **Conclusions:** Postoperative ultrasound revealed that the affected ovary resumed its normal volume within three months after surgery, despite the thinned appearance of the ovarian cortex present on ultrasound as the OCS. Laparoscopic ovarian preservation should be the preferred surgical approach for adolescents to ensure the conservation of the entire ovarian tissue.

**Key words:** Ovarian cysts; Cystectomy; Pelvic ultrasound; Laparoscopy; Adolescents.

## Introduction

Laparoscopic treatment of large ovarian cystic neoplasms in young females is a challenge for pediatric gynecologists and pediatric general surgeons. The standard surgical staging is performed when the lesion is highly suspicious of malignancy, but malignant tumors are rare in this population [1]. The use of minimally invasive techniques was reported, but with limited results in preserving ovarian tissue [2, 3]. Even by laparotomy, the ultimate goal is to preserve the tube and the ovary whenever possible, and to maximize the future reproductive potential of these patients [4]. The presence of normal ovarian tissue or the ovarian crescent sign (OCS) depends on whether healthy tissue could be seen adjacent to the tumor within the affected ovary. It seems that the value of the OCS in large cystic ovarian neoplasms within young female population remains poorly defined.

The purposes of this study were: to determine the presence of the OCS, to describe the authors' experience of laparoscopic tumorectomy for ovarian neoplasms measuring more than ten cm or more than 500 cm<sup>3</sup>, to document pathologic findings, and to evaluate the postoperative volume of the preserved ovary after removal of the large persistent ovarian neoplasm in pediatric and adolescent population.

## Materials and Methods

The study was approved by the Institutional Ethics Committee of the Mother and Child Health Institute of Serbia. It was a prospective study of the patients treated by laparoscopic surgery for cystic ovarian tumors measuring more than ten cm or more than 500 cm<sup>3</sup>, at the Department of Pediatric and Adolescent Gynecology of the present institution, between June 2006 and January 2012. The preoperative assessment included a complete physical examination, lab analyses, ultrasonography, magnetic resonance imaging (MRI) of abdomen and pelvis and chest X-ray for each patient. Ultrasonographic reports included length, width, and thickness of the neoplasm and of the ovarian crescent sign presence (Figure 1). To eliminate bias, the OCS in all patients was assessed independently by three examiners, two gynecologists, and a radiologist (ZBS, MD, and BL) and their findings did not differ in any of the 33 patients. Ovarian volume was calculated according to the formula (length x height x width x 0.523). Laparoscopic procedure was performed by a single surgeon (ZBS) using a uniform technique, which is given in detail. Postoperative ultrasonography was scheduled to measure the volume of the preserved ovary. Data were collected on demographic characteristics, preoperative evaluation, ultrasonographic and MRI reports, pathology results, hospital course, and complications. Patients were excluded if there was a high suspicion of malignancy based on physical exam, ultrasonographic, and MRI findings. Data were expressed as the mean  $\pm$  SD. The paired Student's t-test was used to compare the groups. A  $p < 0.05$  was considered statistically significant.

Informed consent was obtained from the patients and parents before surgery. Twenty-four hours prior to the procedure, careful aspiration of most of the cyst fluid was performed (using a spinal needle, Dahlhausen, size 186 x 1½). Under general endotracheal anesthesia, laparoscopic surgery was performed, using CO<sub>2</sub> distension of the abdominal wall. A ten-mm Optiview port was placed at the superior edge of the umbilicus to introduce the ten-

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mm laparoscope. Two other Optiview ports were placed laterally under direct vision: a ten-mm port on the left side and five-mm port on the right side at the level of anterior superior iliac spines.

Firstly, a peritoneal washing was obtained. A superficial linear incision was made along the antimesenteric border of the ovarian cyst, approximately three cm from the ipsilateral tube, parallel to it. Capsule was stripped from the ovarian stroma using two graspers for traction and counter-traction. Bipolar forceps were used to coagulate the bleeding vessels at the base of the capsule; two to five vessels were coagulated per tumor (median 3.3). Attempts were made to remove the whole ovarian neoplasm without opening it. Great care was taken to prevent spillage into abdominal cavity. The authors did not suture any part of the ovary. The excised tissue was placed in an endobag and removed from the body through the left port site or umbilicus. The whole preserved ovary remained as an empty sac within the abdomen. The abdomen was then copiously irrigated. The surgical wound was closed with subcutaneous sutures. Postoperative follow-up of ovarian volume was evaluated at six weeks and three months postoperatively, or more if required.

## Results

Thirty-three patients who underwent laparoscopic surgical management for adnexal cysts  $\geq$  ten cm or  $\geq$  500 cm<sup>3</sup> with preservation of the whole affected adnexa were observed. Eight of them with large paraovarian cysts were excluded from this study. The mean age of the remaining 25 patients at the time of surgery was a  $15.3 \pm 3.6$  years, ranging from 6.5 to 19 years, only one patient being under ten years of age. The mean preoperative size and volume of the ovarian neoplasm were  $15.0 \pm 3.2$  cm, (range 10 to 22), and  $1,686 \pm 1,380$  cm<sup>3</sup>, (range 550 to 6,000 cm<sup>3</sup>). The indications for the first ultrasound scan were recurrent abdominal pain or discomfort in 16 patients and abdominal swelling in nine patients, including two premenarchal. Preoperatively, all the ovarian neoplasms appeared to be cystic, unilateral masses, without evidence of multiple septations. The presence of normal ovarian tissue was documented for all neoplasms. Serum tumor markers CA-125, beta human chorionic gonadotropin ( $\beta$ hCG), alpha-fetoprotein (AFP), inhibin B, and lactate dehydrogenase, were negative in 22 patients. In three patients, the serum levels of CA-125 were elevated, measuring 45 and 60 U/l. Considering the benign appearance on ultrasonography and presence of the OCS, laparoscopy with tumorectomy was the standard surgical approach. The mean duration of the procedure was 65 min (range 45 to 120). The postoperative hospital stay was from one to four days. Histopathology revealed ten serous cystadenomas, six mucinous cystadenomas, eight mature cystic teratomas, and one endometriosis. No borderline tumors or malignancies were identified. Pelvic washing was negative in all patients. Postoperative ultrasonography measured the volume of both ovaries. At six weeks after surgery, the mean volume of 23 affected ovaries was  $17.6 \pm 8.0$  cm<sup>3</sup>, and three months after laparoscopy the mean ovarian volume decreased to  $8.0 \pm 1.3$  cm<sup>3</sup>, which is not significantly different from the mean volume of the contralateral ovary

Table 1. — Postoperative volume of 23 preserved ovaries during follow up period.

Time after	Affected ovaries Mean volume (range) cm <sup>3</sup>	Contralateral ovaries Mean volume (range) cm <sup>3</sup>	Significance
6 weeks	17.6 $\pm$ 8.0 (9.0-36.0)	6.5 $\pm$ 1.3 (2.0-8.1)	$p < 0.05$
3 months	8.0 $\pm$ 1.3 (6.0-10.0)	6.4 $\pm$ 1.4 (2.0-8.2)	$p < 0.258$



Figure 1. — Ultrasonographic appearance of normal ovarian tissue in cystadenoma measuring more than 6,000 ml (arrows).

$6.7 \pm 0.3$  cm<sup>3</sup> (Table 1). In one of the remaining two patients the affected ovary measured 52 cm<sup>3</sup> six weeks after operation and decreased its volume to nine cm<sup>3</sup> during the follow up period of six months (Figure 2). The last patient's affected ovary measured 110 cm<sup>3</sup> six weeks after laparoscopy, and its volume decreased during follow up period of three, six, nine, and 12 months to 60, 25, 11, and 5.6 cm<sup>3</sup>, respectively. No surgical complication or tumor relapse occurred. One patient developed fever and pain three days after surgery and was managed expectantly. Other postoperative complications were not registered.

## Discussion

Large cystic ovarian neoplasms with the presence of the 'ovarian crescent sign' are usually of benign nature [5, 6]. The initial reports showed that the OCS has the potential to become a simple and effective way of excluding ovarian malignancy in adults, as well as in pediatric and adolescent patients [5, 6]. The visualization of healthy ovarian tissue does not require a high level of ultrasound skills and could be successfully included into a routine ultrasonographic practice of all operators dealing with adnexal tumors in young patients. The present study shows that radiologists can identify OCS as accurately as gynecologists can. The absence of the OCS should be an indicator to refer the patient to a gynecologist specialized in practice with young fe-



Figure 2. — Ultrasonographic appearance of the ovary a) cystadenoma measuring more than 2,000 ml with the ovarian crescent sign (arrows) before surgery; b) 6 weeks after surgery; c) 6 months after surgery.

male population [6]. The only exception may be a large paraovarian cyst, because absence of the OCS around the cyst is expected. A multicentric study reported the OCS presence in 16% of adult ovarian neoplasms with borderline malignancy [7]. However, endoscopic conservative surgery was an acceptable option for women with borderline ovarian tumors who wished to preserve fertility [8]. In two patients of the present series, the serum level of CA-125 was slightly elevated, but in both patients OCS was visualized. Adding a single CA-125 measurement to the ultrasound imaging performed by an experienced examiner does not improve preoperative discrimination between benign and malignant adnexal masses in adult patients [9]. Ovarian cyst aspiration is not a standard procedure. Some authors described a technique of transabdominal drainage under ultrasonographic control or laparoscopic guided aspiration followed by laparoscopic excision of both ovarian and paraovarian cysts [10, 11]. In the present study, a cyst fluid aspiration 24 hours before laparoscopy was performed for two reasons – to decompress slowly and to give the normal ovarian tissue a chance to retract before cystectomy, and it could be performed because the risk of malignancy was minimal in the chosen population. The treatment of ovarian masses in young females depends on the specialty of the operator [12]. Some surgeons insisted on minimally invasive techniques, but the fear of cancer led them to perform eight ovariectomies or adnexectomies for large benign cystic masses [2]. Other operators successfully preserved all ovaries, through laparotomy or laparoscopy [4, 10]. All studies were limited by a small number of patients. Laparoscopic excision of ovarian cysts may be associated with damage to the ovarian reserve. Electrocoagulation after laparoscopic excision of ovarian cysts may cause reduction in ovarian reserve [13]. Some authors found that ovarian volume was significantly reduced after three months of la-

paroscopic cystectomy [14]. Reddy and Laufer reported that in nine adolescent patients, after laparotomy, cystectomy, and suturing, it took six weeks for the ovary to reduce to its normal volume [4]. The present authors used electrocoagulation very restrictively and found that after laparoscopic preservation (of whole) ovaries required three months to recover. Further prospective work will show whether the use of the OCS will improve the management of adolescent patients with large cystic adnexal masses.

## Conclusions

In the appropriately selected adolescent population, laparoscopic ovarian cystectomy for large ovarian neoplasm should be the preferred surgical approach. It is possible to preserve the whole ovary in most patients with large cystic neoplasms. After maximally conservative procedure, ovarian tissue requires three months to restore its normal volume.

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