Giant Ovarian Cysts Treated by Single-Port Laparoscopic Surgery: A Case Series

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Research article

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Abstract

Background:

Ovarian cysts are very common diseases of female reproductive system. Giant ovarian cysts refer to the tumors with diameters greater than 10 cm. In recent years, due to the development of clinical diagnosis, imaging modalities and the improvement of patients' cognition of the diseases, the occurrence of giant ovarian cysts become rare. The purpose of this study was to show a new operation method of single-port laparoscopy to treat giant ovarian cysts.

Methods:

We report a case series of 5 patients with giant ovarian cysts who underwent single-port laparoscopic surgery in gynecology department, Shengjing Hospital of China Medical University between June 2020 and March 2021. The inclusion criteria were ovarian cysts at least 20 cm in diameters, and cases which the tumor might be malignant were excluded.

Results:

The patients' mean age was 26.2years. The most common clinical presentation was progressive abdominal distension. Median size of the cysts at imaging was 39.2 cm (range 21–63 cm). All patients underwent single-port laparoscopic surgery, and none of them converted to laparotomy. On final pathological reports, two cysts were serous cystadenomas, and three were mucinous cystadenomas. All patients recovered well and discharged on time.

Conclusion:

Giant ovarian cysts can be treated by single-port laparoscopic surgery. In addition to the well-known advantages of laparoscopic surgery (e.g., small pelvic interference, fast postoperative recovery), it can also play the role of perfect cosmetic results, which has more advantages for young women.

Background

Female pelvic cysts mostly come from the ovary with asymptomatic when they are small. The symptoms appears when they reach enormous dimensions. Giant ovarian cysts (GOCs) are tumors larger than 10 cm in diameters or those cysts reaching above the umbilicus[1]. Progressive abdominal distension, nonspecific diffuse abdominal pain and organ compression (constipation, vomiting and frequent urination) are the main clinical symptoms of ovarian cysts[2–4]. Most giant ovarian cysts are treated by surgery. Surgical indications include a rapidly growing or symptomatic cyst, and when its malignant potential cannot be excluded[5]. In the past, exploratory laparotomy was the most common surgical method, which had the advantage of minimizing the risk of intraperitoneal implantation caused by cell overflow in case of unexpected malignant transformation of tumor. However, some giant ovarian cysts filled the abdominal cavity and superior reaching the xiphoid process. The abdominal incision as long as tens of centimeters caused great trouble to patients, especially young women. In recent years, minimally invasive surgery has been widely used in the field of gynecology. Laparoscopy is the choice for most benign ovarian cysts, but the size of the cysts may be a limiting factor. Giant ovarian cysts increase the complexity and difficulty of laparoscopic surgery. How to avoid the leakage of cyst fluid has become a challenge[6]. We report a case of giant ovarian cyst treated by single-port laparoscopy. This method tries to ensure the oncologic safety while treating the disease. The aim of this study is to introduce a new, minimally invasive and effective surgical approach for the treatment of giant ovarian cysts.

Materials And Methods

Four female patients with giant ovarian cyst who underwent single-port laparoscopic surgery between June 2020 and March 2021 were included from gynecology department, Shengjing Hospital of China Medical University. The study was approved by the China Medical University Research Ethics Committee. The inclusion criteria: ▯All patients were diagnosed as giant abdominal cysts by pelvic ultrasound, MRI or CT-scan before operation(Fig. 1A-D). ▯The patients had signed the informed consent.▯The umbilicus was normal. Exclusion criteria: ▯Conversion to open surgery or other surgical methods.▯Malignant transformation of cysts.▯Severe medical system diseases which could not endure laparoscopic surgery. Four patients were confirmed by preoperative imaging (ultrasound, MRI or CT-scan) with giant abdominal masses at least 20 cm, mainly cystic, without obvious solid components, showing no sign of malignancy. Blood tumor markers (CA125,

HE4, CA199 and CEA) were detected for each patient. The patients with complications were consulted in relevant departments to exclude surgical contraindications. The operations were performed by experienced gynecologists. Data was collected with operative time, intra- and post-operative complications, intracystic liquid volume, conversion to laparotomy and the length of postoperative stay. 30 days after operation, the satisfaction of patients with abdominal scar was recorded.

Surgical procedure

The patients received standardized preoperative nursing preparation and general anesthesia. Single-port laparoscopic surgery was performed using the following techniques. After partial eversion of the umbilicus, a 2-3cm longitudinal incision was made at the umbilicus(Figure 2A). The umbilical incision was lifted, the skin and subcutaneous tissue were incised layer by layer, and the peritoneum was incised after confirming that there was no intestinal adhesion below the incision. The disposable incision protection sleeve (Lookmed, Jiangsu, China) was placed in the incision, the inner ring was placed in the abdominal cavity, and the outer ring was left to the abdominal wall to form a single-port laparoscopic approach platform（Figure 2B）. A giant cyst appeared under the incision and was liquid in the visual field. In order to prevent the adverse effects of sudden drop of abdominal pressure on patients, we used a syringe needle connected with a suction device to suck out the liquid in the cyst slowly（Figure 2C）. If the cyst divided into several septums, we suck out the liquid in one septum and then used the instruments to lift the wall of the cyst to prevent the leakage of the liquid in the cyst. We changed another septum and continued to suck out the liquid to reduce the pressure of the cyst. When the liquid was sucked out completely, we used silk thread to ligate the incision and returned the cyst to the abdominal cavity（Figure 2D）.

A sterile glove was connected with the outer ring. The thumb of the glove was cut, and 10mm trocar (Dike, Guangzhou, China) was placed as the access of a scope and laparoscopic instruments. In order to prevent air leakage and loosening at the joint, No. 7 silk thread was used to fix and tie tightly, and the 5mm (Dike, Guangzhou, China) trocars were inserted into the other two fingers as the instrument port. This is a self-made simple laparoscopic single-port (Fig. 3A). The advantage is that it can save the cost for the patients without affecting the operation.

Carbon dioxide was injected at a pressure of 13 mm Hg and a rigid 30° 5-mm laparoscope was inserted (Karl Storz, tutlingen, Germany). 30° laparoscope is a better choice because it provides a wide field of vision. Then the standard laparoscopic surgery was performed. Giant ovarian cysts were removed from the umbilicus using endopouch specimen retrieval bag (Wellead, Guangzhou, China) (Fig. 3B, C).

Results

The study consisted of 4 female patients and data are shown in Table 1. The mean age of the operated patients was 26.2 years (range, 19–34 years). The most common symptom was progressive abdominal distension(patients 1,2,4 and 5),several of which were accompanied by abdominal pain(patients 1,2 and 5). No obvious abdominal distension occurred in patient 3, mainly due to palpation of abdominal mass. All patients were diagnosed by imaging, ultrasound, MRI or CT-scans. Median size of the cyst at imaging was 39.2 cm (range 21–63 cm), while the maximum was 63.0 cm with the superiors reach the sword (patients 2). In particular, there were many comorbidities in patient 2. Hypertension occurred 17 years ago. Now oral antihypertensive drugs are used to control blood pressure, and the blood pressure is controlled at 130 / 80mmHg.In 2014, she suffered from cerebral thrombosis. The specific location is unknown. She felt numb on the right side of the body at the time of onset, which was improved after conservative treatment and now she is hemiplegic at the right limb. We consulted the anesthesiology department, cardiology department and neurology department before operation to evaluate the safety of operation and eliminate the operation contraindications. Based on the patient's age and personal will, we decided to perform single-port laparoscopic exploration after discussion.

Table 1
Patient's data.

Patient	Age	Cyst size(cm)	Operative time(min)	Fluid volume in cyst(ml)	Intra-op. blood loss(ml)	Post-op. stay (d)	Conversion to laparotomy	Histology	Post-op. complications	Satisfactin with abdominal scar
1	23	32	100	7000	20	5	No	Serous cystadenoma	No	Yes
2	34	63	75	16000	20	5	No	Mucinous cystadenoma	No	Yes
3	19	21	37	3500	10	5	No	Mucinous cystadenoma	No	Yes
4	25	23	82	4000	50	4	No	Serous cystadenoma	No	Yes
5	30	57	132	13000	30	6	No	Mucinous cystadenoma	No	Yes
Mean	26.2	39.2	85.2	8700	26	5	-	-	-	-

Four of the five patients presented with a normal blood tumor markers. One patient presented with an elevated CA125 of 70.78 (normal range 0–35mIU/ml) and CA-724 of 8.94(normal range 0–6.9 mIU/ml) (patient 3). In the postoperative reexamination, the blood tumor markers returned to normal gradually. All patients underwent single-port laparoscopic surgery, no one converted to laparotomy. Intraoperative suction of intracapsular fluid range 3500-16000ml (Fig. 3D). Four patients underwent unilateral adnexectomy, and one patient an ovarian cystectomy(Fig. 3E). We had a cosmetic suture of the single-port laparoscopic incision in patients' navel (Fig. 3F). The average operative time was 85.2min (range 37–132min). There was no extravasation of cyst fluid and no decompression syndrome happened due to gradual reduction of cyst pressure. Mean blood loss was 26ml (range 10–50ml). The average hospitalization time after operation was 5days, such operative method did not increase the Post-operative stay. All patients recovered well, and no complications related to the operation occurred. On final pathological reports, two cysts were serous cystadenomas, and three were mucinous cystadenomas. There was no borderline tumor or epithelial ovarian cancer in any of the ovarian cysts operated, but one case reported active cell proliferation, which should be reexamined. All the patients were satisfied with the abdominal scar after 30 days after operation.

Discussion

Female pelvic cysts are very common gynecological diseases in women, most of which come from ovary. The clinical manifestations appear when the cysts reach enormous dimensions. Giant ovarian cysts (GOCs) are tumors larger than 10 cm in diameters[1]. Due to improved imaging techniques, giant abdominal cyst has become increasingly rare. The patients can present with rare complications such as torsion, intestine obstruction, hydronephrosis in addition to causing non-specific abdominal distension, pain, nausea and vomiting and changes in defecation habits[7–10]. As the nonspecific clinical manifestations of giant ovarian cysts, the differential diagnoses include the giant cysts from other intra-abdominal organs (e.g. gastrointestinal, urological, or lymphatic)[11].

The treatment of ovarian cysts depends on the patient's age, the size of the cyst, and its histopathological feature. Excision of the intact cysts for histology is the gold standard[12].Most giant ovarian cysts are benign and are treated by surgical excision generally either by cystectomy or salpingo-oophorectomy [13]. It is utmost important to exclude any possibility of malignant tumor before operation[14].In the past, resection of the cystic mass by exploratory laparotomy is the preferred management strategy[8]. But for laparotomy of benign giant cysts, the huge incision caused trouble to the patients (especially young patients). A study shows that with the development of advanced technology, it is feasible to use laparoscopic surgery to remove giant ovarian cysts on the basis of selecting suitable patients and laparoscopic experts[15]. Recently, laparoscopic-assisted excision of these giant cystic masses has been reported in several literatures[6, 16, 17]. How to avoid the leakage of cyst fluid has become a challenge in laparoscopic surgery for treating giant ovarian cysts.

In recent years, single-port laparoscopic surgery has become a hot spot as it uses the natural pores of the navel to hide the surgical incision and has the characteristics of perfect cosmetic results and fast postoperative recovery. In our study,we used single-port laparoscope to perform surgery on a slightly larger incision at the umbilicus, which exposed the visual field better and avoided the exudation of liquid in the giant cysts. In order to avoid the impact of sudden drop of intraperitoneal pressure on patients, we used the method previously described to

slowly reduce the fluid in the giant cyst. Facts had proved that this method is effective, these patients did not appear related discomfort symptoms. We use the wound protector-retractor to protect the incision and reduce the risk of cell spillage. The endopouch specimen retrieval bag was used to take out the specimen after resection of the diseased tissue, which reduced the potential risks of the leakage of cells and residual cystic fluid. These measures ensured the safety of the operation. Although giant ovarian cysts are larger than 10 cm in diameter, we still selected cysts larger than 20 cm in diameter for study, which are more rare in clinic. We analyzed the general information and surgical outcomes of these patients and found that single-port laparoscopic surgery did not increase the adverse prognosis of patients. On the contrary, minimally invasive surgery and perfect cosmetic results accelerated the recovery and satisfaction of patients.

Despite the advantages of single-port laparoscopic surgery, not all giant ovarian cysts are suitable for this type of surgery. We need to evaluate the patient's condition before operation rigorously, and it is very important to exclude any possible malignant tumors before operation. Single-port laparoscopic surgery is difficult to form an operation triangle as its limited operation space, relatively concentrated instruments and mutual interference which places high demands on the surgeon. It is necessary for us to improve the safety of surgery through more research.

Conclusion

In the treatment of giant ovarian cysts, it is safe and feasible to perform single-port laparoscopic surgery through screening of suitable patients strictly. This operation method has the same advantages of traditional laparoscopy, it ensures the safety of operation as most as possible and improves the cosmetic results perfectly, which are particularly important for young women.

Abbreviations

GOCs
Giant ovarian cysts
MRI
Magnetic Resonance Imaging
CT
Computerized Tomography
CA125
Carbohydrate antigen-125
HE4
Human Epididymis Protein 4
CA199
Carbohydrate antigen-199
CEA
Carcinoembryonic antigen

Declarations

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AUTHOR CONTRIBUTIONS

Jiang LL conducted a thorough literature review and was the major contributor in writing the manuscript; Liu KR was responsible for reviewing and revising the article.

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AVAILABILITY OF DATA AND MATERIALS

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was approved by the China Medical University Research Ethics Committee.

CONSENT FOR PUBLICATION

Each author agrees to the publication of the present study.

COMPETING INTERESTS

The authors declare that they have no competing interests.

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Figures

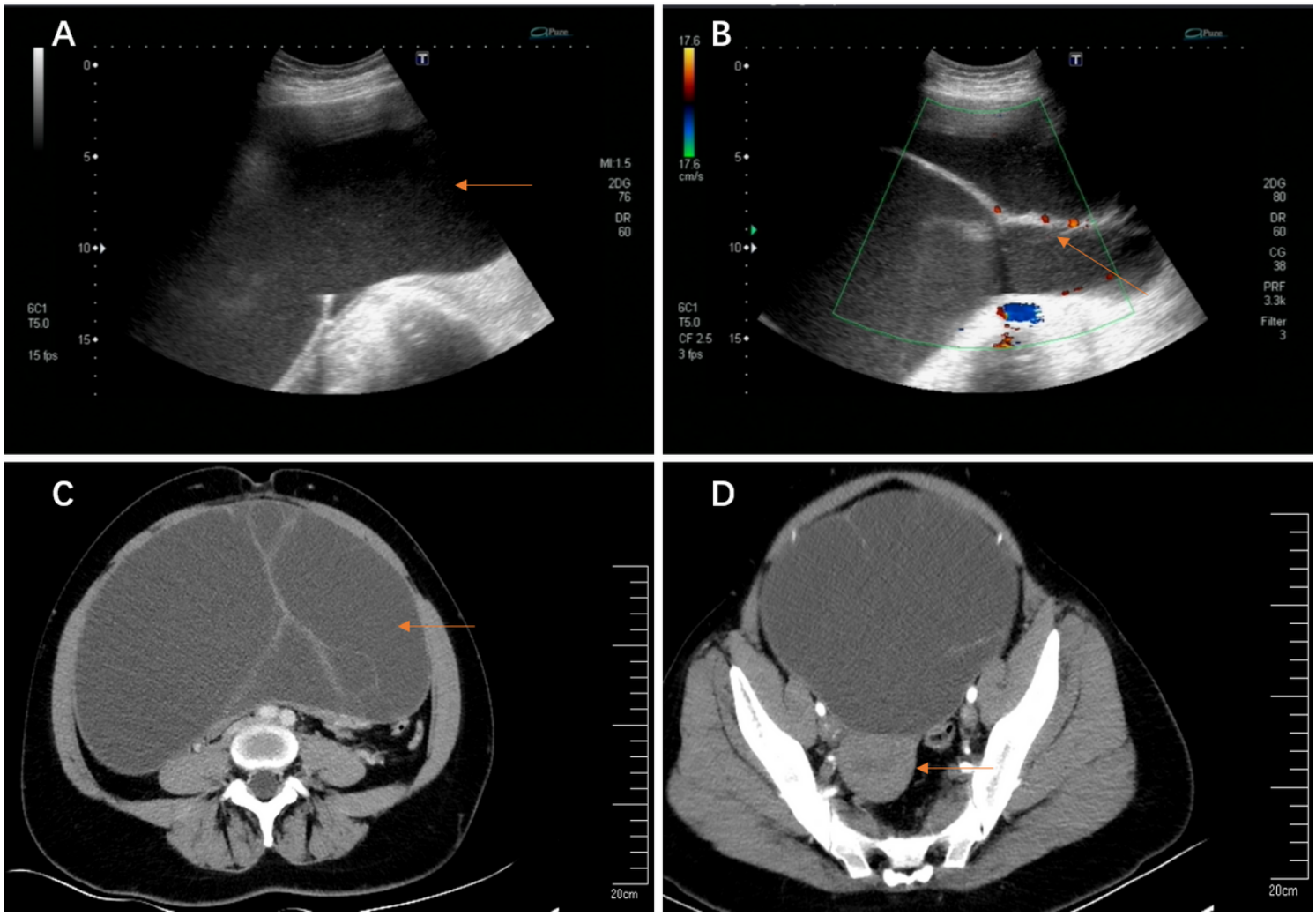

Figure 1

A and B：Transvaginal ultrasound imaging. A: A giant cyst in the abdominal and pelvic cavity (63.0cm x 44.0cm x 13.4 cm); B: The blood flow signal detected at the separation; (C and D) Abdomen enhanced CT imaging. C: A giant cyst with septums; D: The uterus was pushed to the back of the pelvis by a giant cyst.

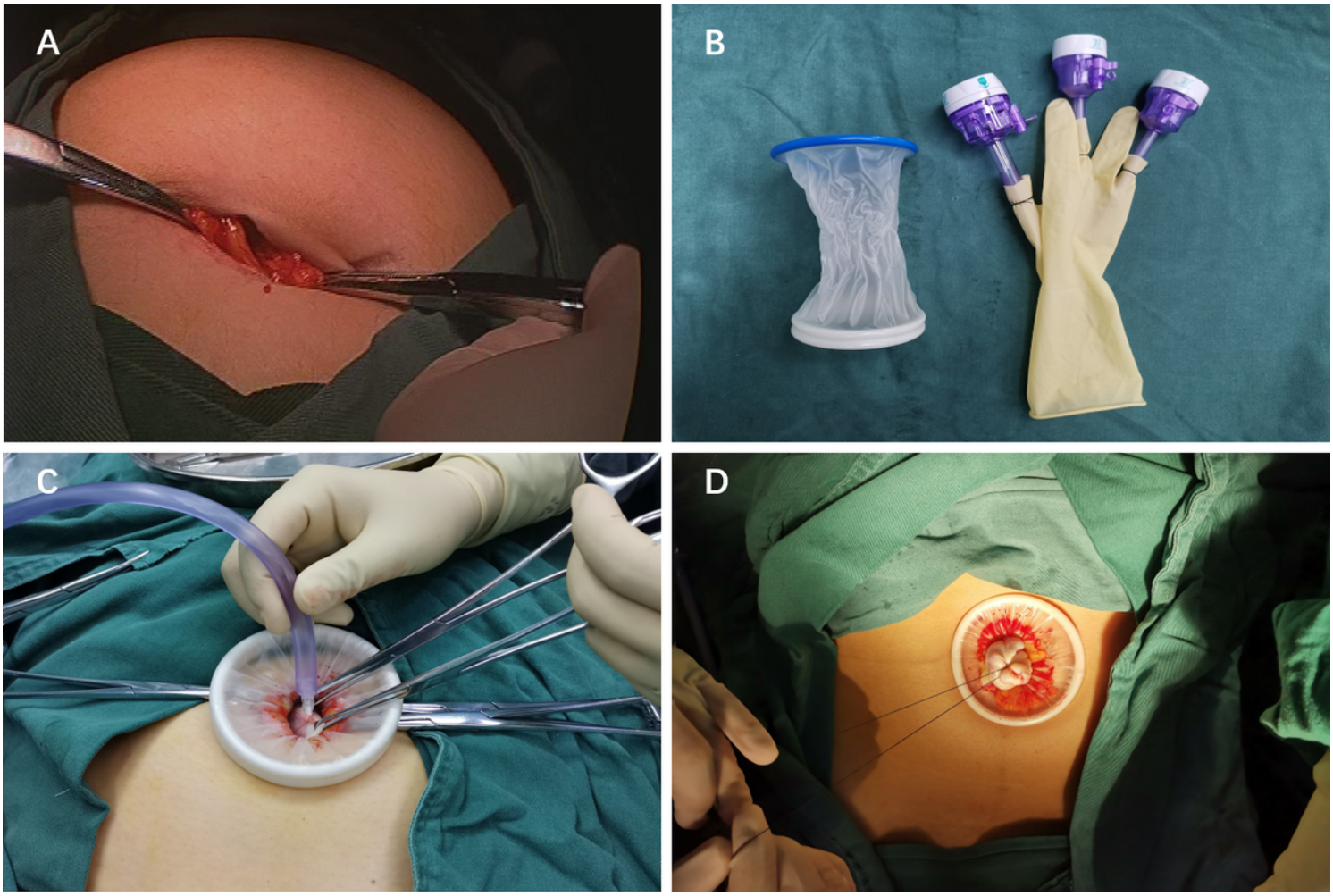

Figure 2

(A) The 2-3cm longitudinal incision was made at the umbilicus. (B) Single-port laparoscopic approach connection instrument. (C) A syringe needle connected with a suction device to suck out the liquid in the cyst. (D) Ligate the incision in order to avoid the leakage of cyst fluid.

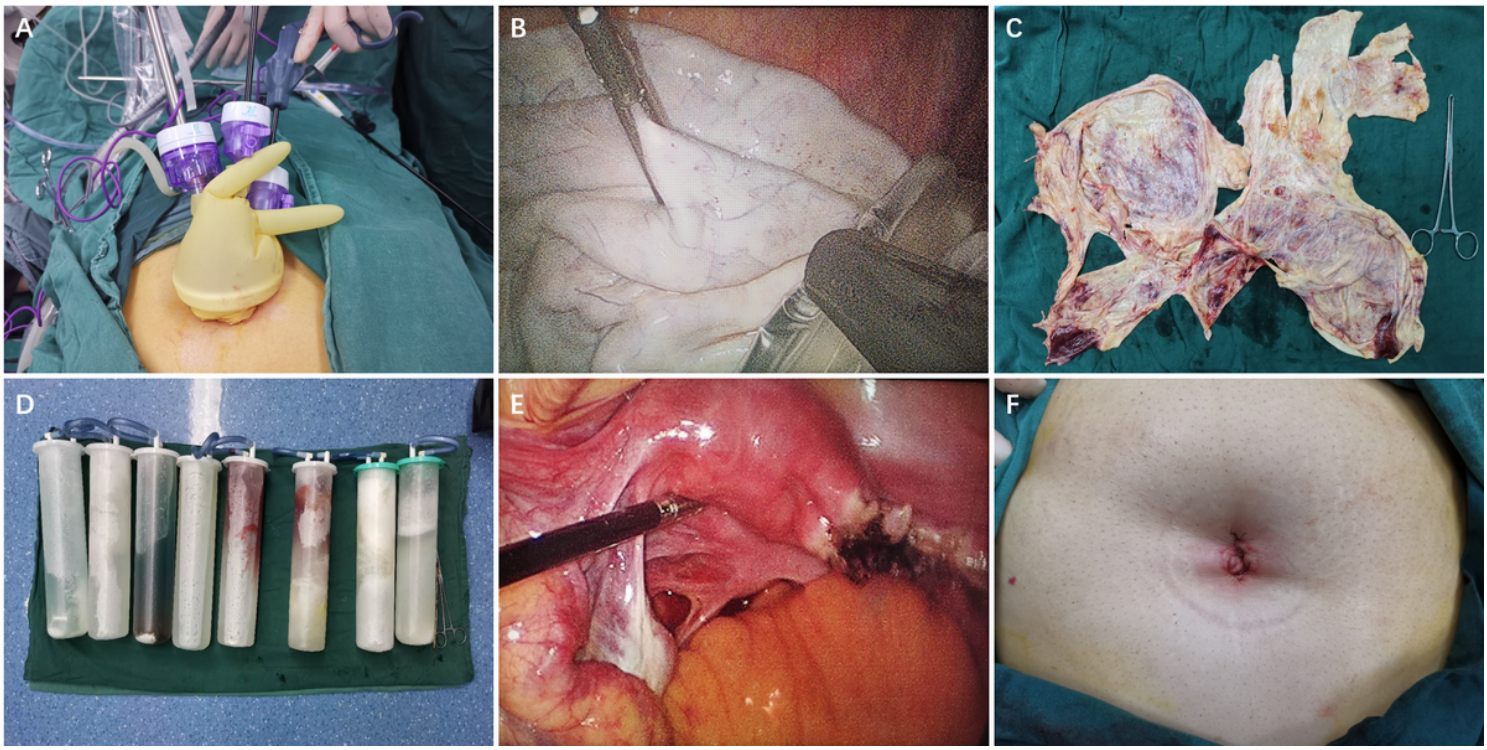

Figure 3

(A) The instruments enter the abdominal cavity through single-port laparoscopic access.□B□The excised tissue was put into endopouch specimen retrieval bag under laparoscope.(C) The wall of a giant cyst removed through the navel.(D) Intraoperative suction of intracapsular fluid.(E) Unilateral salpingo-oophorectomy by laparoscope.(F) A cosmetic suture of the single-port laparoscopic incision in patients' navel.