

Laparoscopic Ovarian Cystectomy: Extraperitoneal Method

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A laparoscopic method for resecting benign ovarian cysts has been devised and involves excising the cyst wall extraperitoneally after aspirating the cystic fluid. In this report, the technique and clinical results are described and mini-laparotomy which is used in this technique is discussed. A total of 104 patients were treated by this method. The diagnosis was simple cyst in 46, dermoid cyst in 33, and chocolate cyst in 25. The method was successful in 90 patients (87%). The remaining 14 (14%) were converted to open surgery, 9 because of severe adhesions. The remaining 5 patients had various complications: malignancy, bladder injury, dermoid content too solid to aspirate, and bleeding. We found endometrioid adenocarcinoma in 1 patient whose chocolate cyst could be removed completely.

In 13 patients laparoscopic surgery was performed. Mini-laparotomy was performed in 13 patients, 3 with huge cysts, 2 with emergency surgery for pedicular torsion, 1 with chronic bronchiectasia, and 7 women with pregnancies. Six with chocolate cysts and severe adhesions were treated by the ethanol fixation method. The total number of ovarian tumors resected surgically was 184; 48 of these patients required open surgery.

Our extraperitoneal method was devised to replace laparotomy with a safe, easy, less invasive, and highly reliable procedure. With the addition of mini-laparo-

tomies and other methods, it is possible to choose from several procedures for the resection of ovarian cysts.

Compared to laparotomy, laparoscopically assisted surgery is a less invasive technique based on a new concept. It has recently been applied to various diseases in many fields.^{1,2} Striking progress has been made in the improvement and development not only of the technique itself but also of the apparatus and equipment used; further rapid development has followed along with a corresponding rise in popularity.

Semm et al.³ have already developed laparoscopically assisted surgery for various

gynecological diseases. We have devised an original technique⁴⁻⁶ for extraperitoneal ovarian cystectomy (Figs. 1, 2) for benign ovarian cysts. This technique is now widely used in other institutions as well.⁷

In this report we describe the method by which the cyst wall is drawn out of the abdominal cavity after the cystic fluid has been aspirated under laparoscopy. We discuss the indications, limits, particular points and merits of this technique, and the cautions to be kept in mind. We also review mini-laparotomy and other methods which may be used in future laparoscopically assisted surgery.

INDICATIONS AND CONDITIONS

Patients who should be treated surgically for benign ovarian tumors are those with simple cysts, para-ovarian cysts, dermoid cysts, and chocolate cysts. Those excluded had tumors suspected of being malignant on the basis of clinical examination, tumor markers, and MRI findings. Anesthesia by endotracheal intubation and laparoscopy must be feasible in all patients. With regard to respiration management, it should be noted here that our technique can be used even in those over 80 years of age. However, special attention should be paid to patients who have had repeated operations, who are extremely obese, or who may have severe adhesions. In some cases other methods, such as intraperitoneal surgery^{3,8} and/or ethanolic fixation,⁹ are sometimes more appropriate than our method.

PRE-AND PERIOPERATIVE DIFFICULTIES AND CRITERIA FOR APPLICATION OF THE METHOD

The subjects were classified into three groups, as shown in Table 1, according to the surgical difficulty estimated preoperatively and the criteria for application.

(Group I: Easy) The cystic fluid is aqueous. There are no obvious adhesions. The cyst extends to the midpoint between the umbilicus and the pubic region. Surgery is relatively easy in such cases.

(Group II: Difficult) These patients probably have adhesions and/or chocolate cysts, dermoid cysts containing fluid difficult to

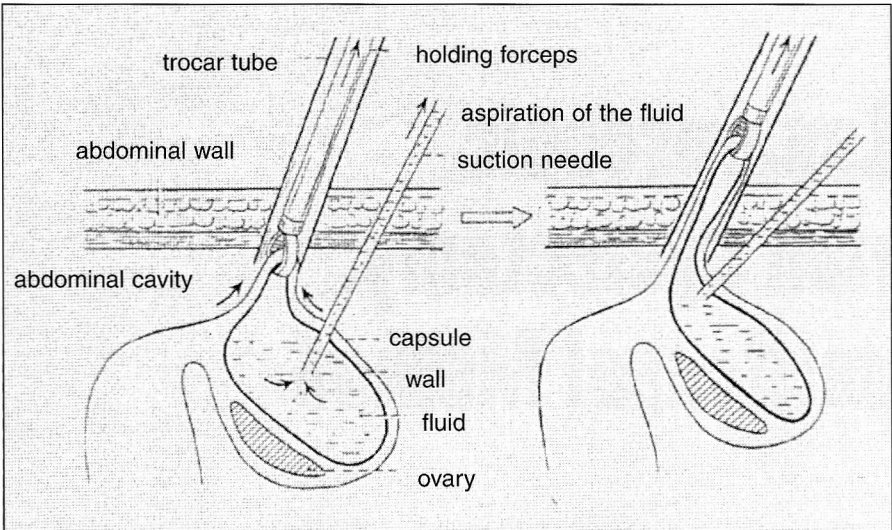


Figure 1. Diagram of extraperitoneal ovarian cystectomy with the use of a laparoscope.

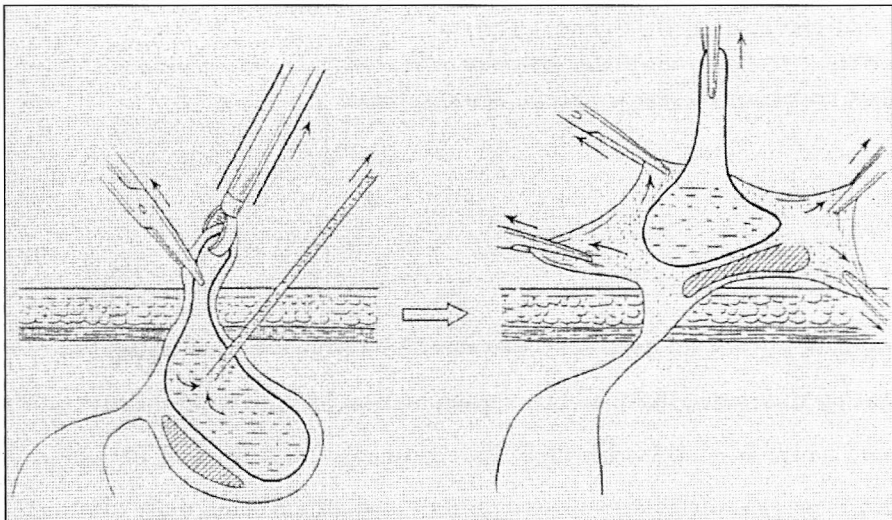


Figure 2. Extraperitoneal cystectomy as in open surgery.

Table 1. Preoperative difficulties and criteria for application of the method

	Grade I Easy	Grade II Difficult	Grade III Laparotomy
Possibility of adhesions	—	+ ~ ++	+++ malignancy or *pregnancy
Content	cystic fluid	dermoid or chocolate	solid tumor
MRI findings			
Surface	smooth	irregular	malignancy
Number of cysts	single cyst	2 or 3 cysts	multiple cysts
One or both sides	one side	both sides	—————
Size	under 500 mL	500–1,000 mL	*over 1,000 mL

*Pregnancy or *over 1,000 mL is indication for mini-laparotomy.

Table 2. Operative difficulties and criteria of laparoscopic findings

Observation of cyst	Grade I Easy	Grade II Difficult	Grade III Laparotomy
Surface	smooth	irregular	malignancy
Mobility	good	bad	fixed
Aspiration	easy	difficult	impossible

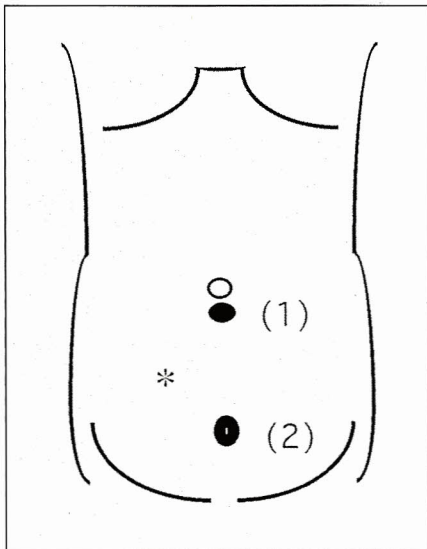


Figure 3. Positions of trocar puncture for ovarian cystectomy. (1) 10 mm for laparoscope; (2) 10 or 12 mm for manipulating forceps; (*) suction needle.

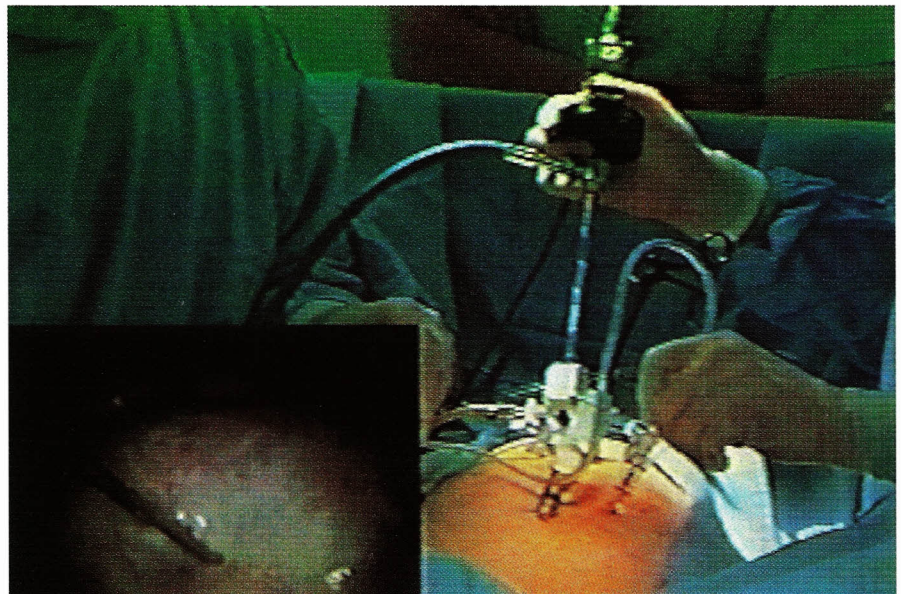


Figure 4. Aspiration of cystic fluid from ovarian cyst.

aspirate, cysts of both ovaries, and/or cysts large enough to reach the umbilicus.

(Group III: Indications for laparotomy) This group consists of patients with cysts suspected preoperatively of being malignant and those in whom severe adhesions are anticipated. In such cases, laparotomy is indicated from the beginning.

(Indications for mini-laparotomy) Mini-laparotomy is indicated when (1) the patient is pregnant, (2) the cyst is very large, or (3) general anesthesia and laparoscopy are contraindicated.

Finally the appropriate procedure is decided on the basis of the following laparoscopic findings, as shown in Table 2.

(Group I: Easy) No evidence of malignancy or adhesions; aspiration and surgery seem easy.

(Group II: Difficult) Presence of adhesions, aspiration of fluid is difficult, or cysts are bilateral. The skill of the surgeon in charge should influence the decision.

(Group III: Laparotomy) Malignancy is suspected preoperatively, severe adhesions are present, aspiration of fluid is difficult.

For these patients, laparotomy should be considered immediately.

APPARATUS AND INSTRUMENTS

(1) Surgical apparatus: trocars (12 mm, 10 mm; 5-mm converter, etc.), forceps (probe, clamping forceps, washing forceps, scissors, etc.), aspirating needle (pneumoperitoneal needle, 18G elaster needle, etc.), uterus probe, etc.

(2) Apparatus for electrocoagulation, for laparotomy, etc.

TECHNIQUE AND PROCEDURE

I. Laparoscopy and Trocar Puncture (Fig. 3)

First, a 10-mm laparoscope connected to a monitor is inserted near the umbilicus under anesthesia via endotracheal intubation. The surgical manipulation is guided by observation of the monitor. Next, a 10- or 12-mm trocar and cannula (attached to a 5-mm converter) are inserted by supra-

pubic puncture, and the cyst's surface, appearance, mobility and size are determined. At the same time, ascitic fluid is collected for diagnostic cytology. Generally, the abdominal wall is punctured in two places. If surgery is indicated, after the clamping forceps have been replaced, a suction needle is inserted directly through the abdominal wall. However, if there are complications with adhesions, additional punctures will be necessary for the detaching forceps. In our technique, as shown in Figure 3, the selection of the site of puncture is important for cosmetic considerations, since laparotomy may be needed later.

II. Aspiration of Fluid from Ovarian Cyst (Fig. 4)

The wall of the cyst distal to the ovarian parenchyma is carefully punctured for aspiration with a suction needle. The aspiration is continued while the wall around the puncture wound is held up. The aspirated fluid is examined cytologically.

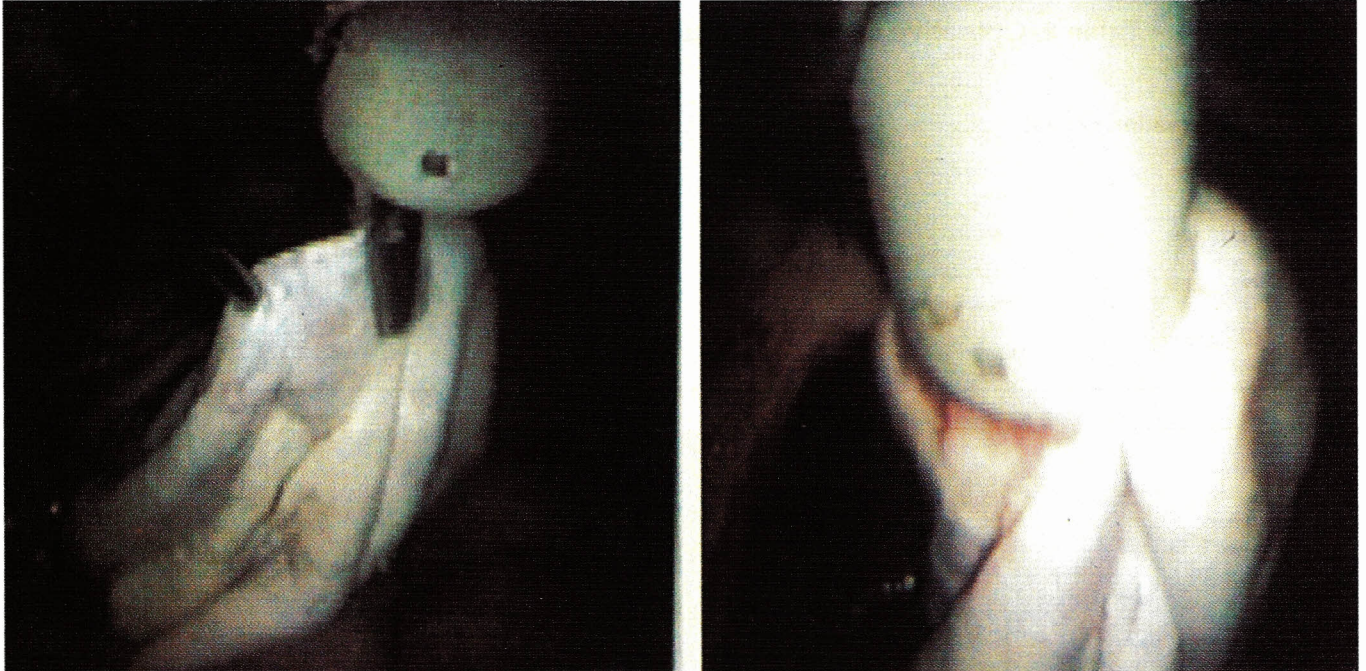


Figure 5. Holding and pulling shrinking cyst wall into trocar.

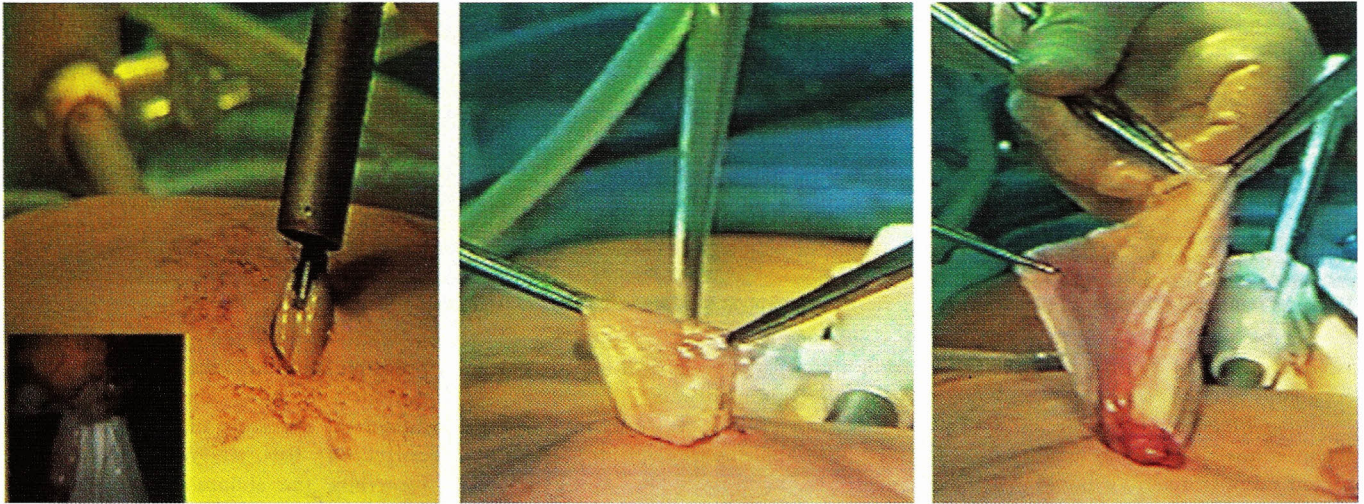


Figure 6. Extracting trocar holding cyst wall and pulling out of ovary.

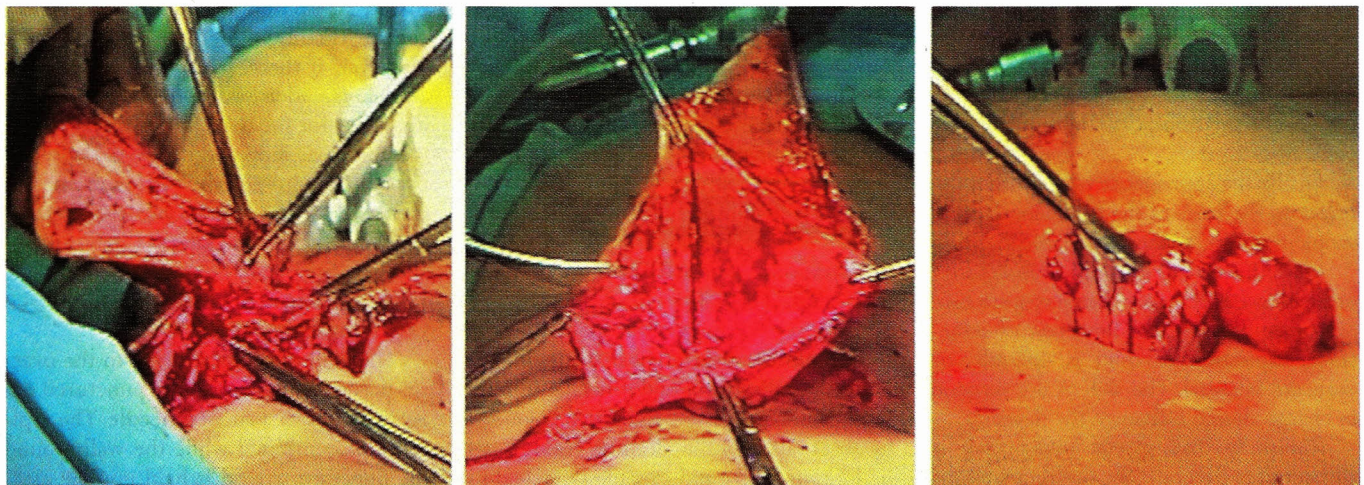


Figure 7. Extraperitoneal surgical manipulation by conventional method.

III. Drawing the Cyst Wall Out of the Abdominal Cavity

As shown in Figure 5, the shrinking cyst wall is held, and all of it is pulled into the 10- or 12-mm trocar and cannula. At this time, pneumoperitoneal CO₂ gas should be removed as completely as possible. As shown in Figure 6, the trocar is removed carefully as the forceps, grasping the cyst wall, is pulled out of the abdominal cavity. The remaining cystic fluid is then aspirated completely. In this way, the entire cyst wall comes out smoothly.

IV. Extraperitoneal Surgical Manipulation

As shown in Figure 7, this method can be used not only to resect benign ovarian cysts as noted above but also to enucleate ovarian cysts as well as to perform oophorectomy, adnectomy, or manipulation of the Fallopian tubes. This technical

approach can be modified to treat various types of ovarian cysts (Fig. 8).

V. Returning the Repaired Ovary to the Abdominal Cavity

At this time, pneumoperitoneum is re-instituted. When the intraperitoneal pressure rises, the repaired ovary returns spontaneously to the abdominal cavity without difficulty (Fig. 9). When needed, a trocar cannula may be reinserted for intraperitoneal observation and washing, contralateral ovarian cystectomy, insertion of a drain, or suturing of the peritoneum and fascia. The abdominal wall is appropriately sutured or stapled to complete the surgery. Figure 10 shows the healing of the operative wounds after our procedure.

small as possible, and only spinal anesthesia is required. The operative field is approached through an incision about 2 cm long, which is kept open with a few small retractors. Under direct vision, the cyst wall is drawn out after the fluid has been aspirated. The procedure is the same as that of laparoscope-aided surgery. Figure 11 shows the findings in a patient with torsion of an ovarian cyst weighing 1,040 g—too large to be removed by laparoscopic surgery.

INDICATIONS FOR OPEN SURGERY

(1) The cyst might rupture during aspiration; (2) malignancy is suspected; (3) adhesions might cause injury to an organ; (4) aspiration of the fluid is impossible; (5) a situation develops which demands laparotomy. Under any of these circumstances, it is necessary to shift quickly to conventional open surgery.

MINI-LAPAROTOMY

In mini-laparotomy the incision is as

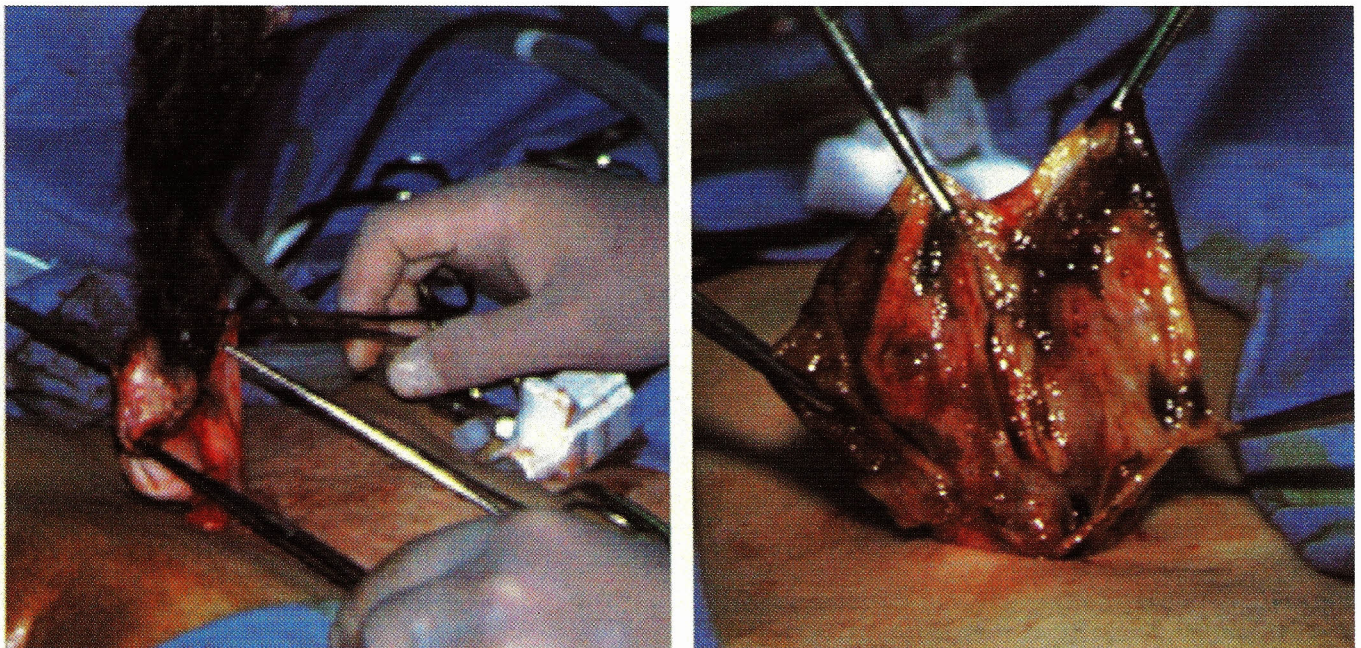


Figure 8. This technique applicable to dermoid cyst and chocolate cyst.

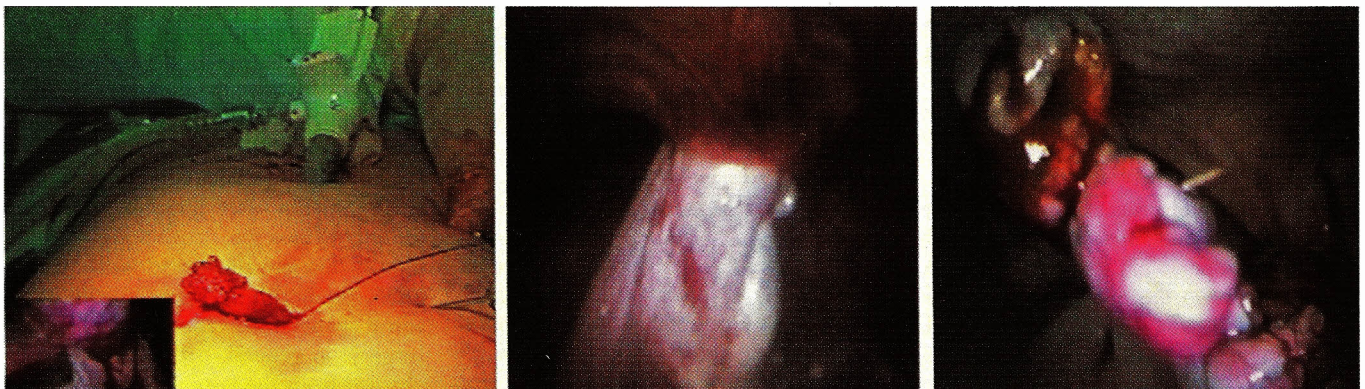


Figure 9. Returning ovary to abdominal cavity with intraperitoneal gas pressure.

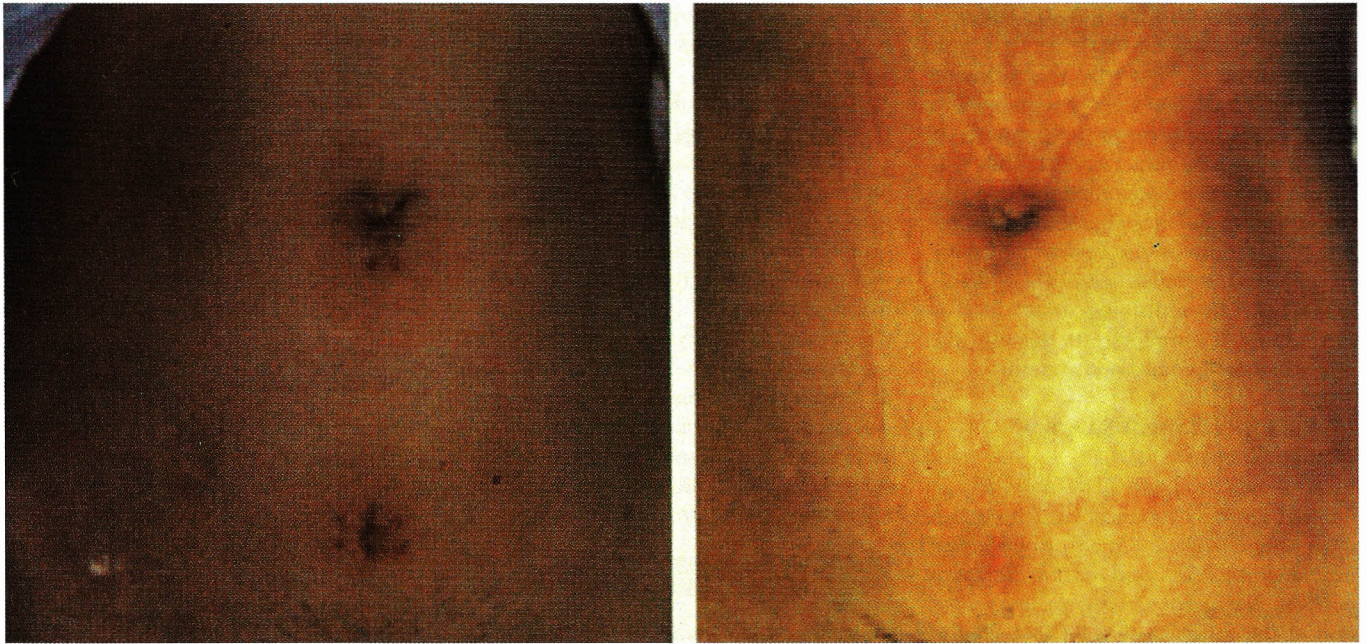


Figure 10. Healing of postoperative scars with the technique.

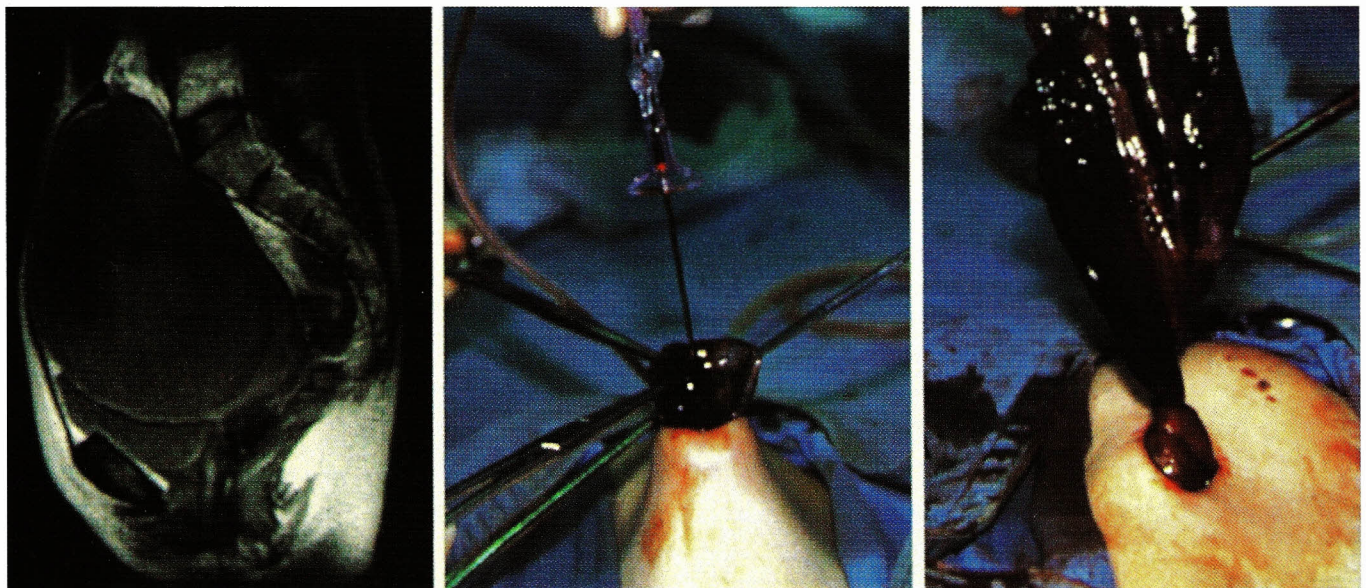


Figure 11. Mini-laparotomy to remove a large ovarian cyst and torsion.

SURGICAL RESULTS AND POSTOPERATIVE COURSE

I. Results According to Type of Ovarian Cyst (Table 3)

Of the 46 simple cysts (serous, mucinous and para-ovarian), 42 (91%) were removed completely successfully with this technique. Of the 33 dermoid cysts, 30 (91%) were operable. Of the 25 chocolate cysts, 18 (72%) were removed successfully. Seven of the 13 women who wanted to have children became pregnant. In 14 patients (14%), a shift to laparotomy became necessary, and 9 had severe adhe-

sions to the large or small intestines; there was 1 with cystic fluid which could not be aspirated, 1 with an injury to the bladder wall, 2 with malignancy, and 1 with uncontrollable bleeding.

II. Some Details of Successful Surgery with Our Technique (Table 4)

The ages of the 90 operable patients ranged from 18 to 81 years (mean: 39 years). The cysts weighed 30 to 1,350 g (mean; 306 g). The operating time was 20 to 100 min (mean: 60 min). Bleeding was minimal.

III. Some Patients Treated with Mini-Laparotomy

The procedure was performed in six patients with massive cysts and in seven pregnant women.

IV. Postoperative Course

On the day after surgery, the patients are able to pass gas. Patients are allowed a regular diet and allowed to walk. In April 1994, the health insurance system issued some provisions about laparoscopic surgery; in general, patients may be discharged from the hospital after about the fourth postoperative day if the cytological

Table 3. Pre- and postoperative diagnosis of ovarian cysts and surgical results with the technique

Preoperative diagnosis	Postoperative histologic diagnosis	Operable cases	Shifted to laparotomy
Simple cyst	simple or serous cyst: 31 mucinous cyst: 13 endometrioid adenocarcinoma: 2	42/46(91%) 2: malignancy	2: adhesion, 1: bladder injury 0
Dermoid cyst	dermoid cyst: 33	30/33(91%)	2: adhesion 1: too solid to aspirate
Chocolate cyst	chocolate cyst: 24 endometrioid adenocarcinoma: 1	18/25(72%)	5: adhesion 1: bleeding
Total	104	90/104(87%)	14/104(13%) 7.31.1991~9.30.1994

Table 4. Some details of succeeded surgery with the technique

Preoperative diagnosis	Operable cases	Age in years (mean)	Volume of content (mean)	Operation time (mean)
Simple cyst	42	18-81 (43)	60-2,300 g (479)	20-90 min (53)
Dermoid cyst	30	24-65 (38)	30-485 g (173)	35-95 min (61)
Chocolate cyst	18	26-43 (33)	50-820 g (173)	40-100 min (73)
Total	90	18-81 (39)	30-1,350 g (306)	20-100 min (60)

7.31.1991~9.30.1994

examination shows no malignant cells. In the future, if provisions allow, the duration of hospitalization will be shortened.

DISCUSSION

Striking progress has been made in endoscopic surgery since 1990.^{1,2} In fields other than gynecology, the feasibility of endoscopic surgery has been enlarged to include cholecystectomy, appendectomy, hernioplasty, resection-anastomosis of the digestive tract (stomach and colon) with the use of laparoscopy, resection of bullae through a thoracoscope, and even nephrectomy. Thus endoscopic surgery has been established as a new technique of less invasive surgery.

In today's society, which values "quality of life," "minimally invasive surgery," which not only causes less surgical injury but is also superior cosmetically, has become almost routine. Cholecystectomy via laparoscopy has spread widely and has become established as the standard surgical procedure, superior to conventional laparotomy.

Surgery through a laparoscope consists mainly of two methods, intracorporeal and

extracorporeal. For ovarian cystectomy, the intracorporeal method^{3,8} has already been employed. The authors recently devised an extracorporeal technique^{4,6} to prevent, as much as possible, the leakage of cystic fluid into the abdominal cavity, and to remove the cyst wall, completely preserving the ovary. In the present report, we have introduced this technique, having found it to be easy, safe and reliable, with the potential of improvements in the future.

The advantages of the technique are the following: (1) the same manipulation as in laparotomy is possible; (2) it is an easy procedure which needs no special equipment; (3) it is "total biopsy" so it provides a pathological diagnosis; (4) there is less potential for recurrence; (5) it is cosmetically superior; (6) there is minimal invasiveness.

The important point and problems are the following: (1) how smoothly the cystic fluid can be aspirated; (2) to what extent adhesions can be detached; (3) how smoothly the cyst wall can be drawn out of the abdominal cavity; (4) how easily the restored ovary can be returned to the abdominal cavity.

Mage et al.¹⁰ have described a method similar to ours, but our method is more like "laparoscopic surgery" in which the shrinking cyst wall is drawn directly out of the abdominal cavity through the laparoscope. Mage's method is so-called "mini-laparotomy," in which the cystic fluid is first aspirated under laparoscopy and the shrunken cyst wall is extracted with forceps directly through an incision 2 to 3 cm long above the pubic bone. The great difference between our procedures is in the drawing of the cyst wall out of the abdominal cavity.

As shown in Table 5, we used our method in 18% (5/28) of ovarian cysts in 1991, 70% (28/40) in 1992, 73% (41/56) in 1993 and 72% (43/60) in 1994. It is speculated that about 70% to 75% of ovarian cysts could be resected by laparoscopic surgery, and about 5% might need mini-laparotomy. Eventually 75% to 80% of ovarian tumors could probably be removed by less invasive surgery.

However, in choosing the most appropriate procedure for each patient, the surgeon should not be overly concerned about the degree of invasiveness of a technique. As things often do not go as

Table 5. Surgical approaches to ovarian cysts with various methods

Year	Laparoscopic surgery		Mini-laparotomy (chocolate cyst)	*Ethanol method (malignancy)	Open laparotomy
	Total (extra- and intra-)	(pregnancy et al)			
1991	5+0(18%)	0	0	23(82%) (malignant:3)	28
1992	28+0(70%) (malignant:2)	5(13%)	0	7(18%) (malignant:4)	40
1993	41+0(73%)	7(13%)	3(5%)	5(9%) (malignant:2)	56
1994	30+13(72%) (malignant:1)	1(2%)	3(5%)	13(22%) (malignant:12)	60
Total	104+13(64%) (malignant:3)	13(7%)	6 (3%)	48(26%) (malignant:21)	184

*Ethanol method: aspiration of contents and infusion of ethanol into the cyst

7.31.1991~9.30.1994

planned, the surgeon must be ready to switch quickly to a more effective procedure. Pressure on the surgeon due to enthusiasm for laparoscopic surgery must be tempered with reason. The realities of a given situation should be faced and preconceptions avoided. It should always be recognized that laparoscopically assisted surgery is basically different from conventional laparotomy. Surgeons must be well trained in the basic manipulations of the laparoscope and in concomitant surgical management. The principle that top priority must be placed on safety is universal in all surgery.

It is important to describe preoperatively to the patient the surgical method to be used and to obtain informed consent after full explanation. To improve further the results of laparoscopic surgery over

those of laparotomy, we must upgrade our surgical apparatus, equipment, and technique to attain still greater safety and reliability. **STI**

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