

# Transumbilical Retrieval of Surgical Specimens Through a Multichannel Port

Sang Wook Yi, MD, PhD, Da Hye Ju, MD, PhD, Sang Soo Lee, MD, PhD,  
Woo Seok Sohn, MD, PhD

## ABSTRACT

**Background:** Laparoscopic surgery is often used to excise adnexal masses; however, the retrieval of specimens such as large cystic masses through conventional 5- or 10-mm ports is difficult and time-consuming. We compared outcomes between conventional laparoscopic surgery for adnexal masses and transumbilical specimen retrieval through a multichannel port during single- or 2-port laparoscopy.

**Methods:** A total of 341 patients who underwent laparoscopic surgery for adnexal masses from November 2006 to December 2010 were included. The patients were divided into 2 groups: group I consisted of 249 patients who underwent conventional laparoscopy, and group II consisted of 92 patients who underwent single- or 2-port laparoscopy using a multichannel port. The clinical characteristics and operative outcomes of the 2 groups were compared.

**Results:** The mean operation time was  $51.8 \pm 21.5$  minutes in group I and  $57.2 \pm 23.9$  minutes in group II. The mean specimen retrieval time was longer in group I ( $2.9 \pm 4.0$  minutes) than in group II ( $2.2 \pm 1.8$  minutes). Endoscopic bag rupture during specimen retrieval occurred in 11 patients in group I and in no patients in group II.

**Conclusions:** The transumbilical retrieval of surgical specimens through a multichannel port with a wound retractor was safe and did not result in leakage of the cystic contents. This technique reduced the specimen retrieval time, especially for large masses. However, the mean operation time was not shortened with this procedure,

because of the learning period and the time required to prepare the umbilical multichannel port.

**Key Words:** Multichannel port, Transumbilical retrieval, Laparoscopic surgery, Adnexa.

## INTRODUCTION

Laparoscopic surgery is widely performed by gynecologic surgeons and serves as the gold standard for the surgical treatment of benign adnexal masses. Laparoscopic procedures are associated with shorter hospital stays, reduced bleeding, and less postoperative pain than laparotomy. However, it is difficult and time-consuming to retrieve surgical specimens, especially large masses, through a conventional 5- or 10-mm port during a conventional laparoscopic surgery. The retrieval of adnexal masses from the abdominal cavity during laparoscopic surgery is therefore challenging. Conventional laparoscopic surgery routinely uses 3 or 4 ports in the abdominal wall. This multiple-puncture technique may decrease patient satisfaction with the cosmetic results. In a randomized trial comparing laparoscopic and minilaparotomy cholecystectomy, no difference was noted in cosmetic satisfaction.<sup>1</sup> Wound cosmesis and satisfaction scores were better in the laparoscopic single-site access group than in the conventional 3-port appendectomy group in a double-blinded randomized controlled trial.<sup>2</sup> Trocar use may also increase trocar-associated complications, such as bleeding, hernias, and wound infections, including cosmetic satisfaction.<sup>3</sup> The extraction of large surgical specimens through larger incisions in the lower lateral abdominal wall has cosmetic drawbacks and may injure the inferior epigastric vessels.<sup>4</sup>

The use of a multichannel port in a 2-port total laparoscopic hysterectomy has been previously reported.<sup>5</sup> The multichannel port technique has also been used in adnexal surgery.<sup>6</sup> Because the specimen can be easily and rapidly removed through a multichannel port in the umbilicus during adnexal surgery, enlargement of an ancillary port for specimen removal is not necessary. Here, we present our technique for the transumbilical retrieval of

Department of Obstetrics and Gynecology, Gangneung Asan Hospital, University of Ulsan College of Medicine, Gangneung, Gangwon, Korea (all authors).

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Address correspondence to: Sang Wook Yi, MD, PhD, Department of Obstetrics and Gynecology, Gangneung Asan Hospital, University of Ulsan College of Medicine, 415, Bangdong-ri, Sacheon-myeon, Gangneung-si, Gangwon-do, 210-711, Korea, Tel: +82-33-610-3294, Fax: +82-33-644-3295, E-mail: buzzmi@chol.com.

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surgical specimens through a multichannel port in the umbilicus with a wound retractor during single- or 2-port laparoscopic surgery for adnexal masses. In addition, we compared the feasibility and surgical outcomes of this technique with those of conventional laparoscopic surgery.

## MATERIALS AND METHODS

From November 2006 to December 2010, 457 patients underwent laparoscopic surgery for adnexal masses at our teaching hospital in Korea. Patients were excluded from this study if they had malignancies or borderline malignancies, no surgical video was available for review (the video was lost or not recorded), or their procedures were converted to laparotomy. Cases with no surgical video available for review were excluded because these videos were required to determine the specimen retrieval time as well as the use and rupture of endoscopic bags. Three cases were excluded on the basis of conversion to laparotomy due to severe adhesion or a malignancy. In total, 113 cases were excluded per the exclusion criteria. Finally, 341 patients who met the inclusion criteria were retrospectively reviewed.

All patients provided written informed consent for treatment prior to surgery. Our institutional research ethics committee approved the study protocol (2010–059). The patients were divided into 2 nonrandomized groups: group I consisted of 249 patients who underwent conventional laparoscopic surgery, and group II consisted of 92 patients who underwent single- or 2-port laparoscopic surgery using a multichannel port. The medical records, including the intraoperative videos, were reviewed.

All patients in this study underwent preoperative ultrasonography and serum tumor marker (cancer antigen 125 [CA125] and cancer antigen 19–9 [CA19–9]) measurements. Most patients also underwent preoperative abdominopelvic computed tomography to screen for other abnormalities in the abdomen and pelvis. The adnexal mass size was defined as the largest diameter measured by preoperative ultrasonography or computed tomography.

Operative outcomes, including intraoperative complications, operation time, specimen retrieval time, change in hemoglobin concentration, postoperative hospital stay, and time to the first passage of gas, were compared between the 2 groups. The main outcome parameters in this study on the transumbilical retrieval of surgical specimens through a multichannel port included the specimen

extraction time, endoscopic bag rupture, intraoperative complications, and operation time.

The specimen extraction time was measured as the time interval from the introduction of the endoscopic bag into the peritoneal cavity or grasping of the surgical specimen with laparoscopic graspers for extraction until the completion of the extraction through the lateral abdominal trocar port or the multichannel umbilical port. Cases of endoscopic bag rupture during specimen extraction were recorded. The operation time was measured as the time interval from skin incision to skin closure. The change in hemoglobin concentration was recorded as the difference between the preoperative concentration and the concentration on postoperative day 2.

## Preoperative Preparation

Patients were admitted the day before surgery, and consent for treatment was obtained from all patients. The possibility of conversion to laparotomy in cases of severe adhesion, malignancy, or inadequate visualization of the operative field was explained. A Fleet enema was administered at 7 PM to evacuate the lower bowel. The laparoscopic procedure was performed under general anesthesia with endotracheal intubation and placement of an orogastric tube. Patients were placed in the lithotomy position with their arms at their sides to enable the use of a uterine manipulator or in the supine position if they were young with no histories of coitus. One dose of prophylactic antibiotics was administered before inducing anesthesia.

A Foley catheter was inserted into the urethra. A Kronner Manipujector uterine manipulator (Cooper Surgical, Trumbull, CT) was inserted into the vagina, except in young patients with no histories of coitus. The following surgical instruments were used during the procedure: 10-mm 0° laparoscope, bipolar forceps, atraumatic forceps, monopolar hook, toothed graspers, monopolar scissors, laparoscopic needle holder, and suction-irrigation system.

A small longitudinal skin incision was made in the umbilicus, and a Veress needle was inserted to establish a pneumoperitoneum. A 10-mm trocar was then placed in the supraumbilical area, and a 10-mm 0° laparoscope was inserted through the trocar. The pelvic anatomy was carefully inspected to determine whether conversion to laparotomy was necessary.

### Port Preparation for Conventional Laparoscopic Surgery

Ancillary 12-, 10-, or 5-mm trocars were inserted in the right iliac fossa and left iliac fossa under laparoscopic observation. Another ancillary trocar was inserted in the suprapubic area if necessary. In the conventional laparoscopy group, the ancillary port site on the lateral abdomen was extended to remove the surgical specimens, if necessary. The wound retractor was not used in the conventional laparoscopic group (group I).

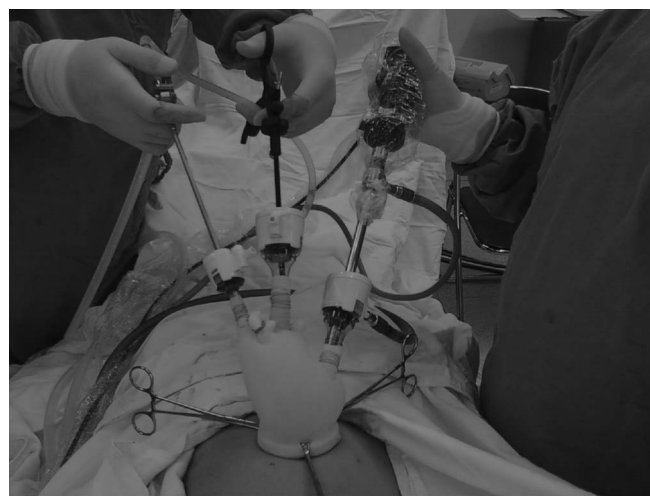
### Preparation of the Umbilical Multichannel Port

For the 2-port laparoscopic operations, an ancillary 5-mm trocar was placed in the left iliac fossa under laparoscopic observation. The umbilical trocar was removed, and the skin incision was extended to approximately 1.5 cm, which is wide enough to allow the passage of an index finger. The skin incision was extended to the upper and lower margins of the umbilicus to minimize abdominal scarring. An extrasmall Alexis wound retractor (Applied Medical, Rancho Santa Margarita, CA) was placed in the umbilical incision. Two 12-mm trocars were inserted into separate fingers of a No. 6 surgical glove and secured with rubber bands, and the other 3 fingers of the glove were tied together.

For the single-port laparoscopic procedures, 3 trocars (two 12-mm trocars and one 5-mm trocar) were inserted into separate fingers of a surgical glove and secured with rubber bands. The wrist portion of the glove covered the wound retractor, and 3 Babcock clamps were placed on the edges of the retractor to prevent carbon dioxide leakage (**Figure 1**). A 10-mm laparoscope and atraumatic forceps were inserted through the umbilical multichannel port.

### Adnexal Surgical Procedure

The pelvic masses were primarily ovarian cysts and tumors. The procedures performed included adnexectomy, cystectomy, and myomectomy for the case of a pedunculated subserosal myoma initially diagnosed as an adnexal mass. For the adnexectomies, the avascular triangular zone of the ipsilateral broad ligament, which is surrounded by the round ligament, infundibulopelvic ligament, and external iliac vessels, was coagulated with electro-surgical devices and penetrated to reach the infundibulopelvic ligament. The infundibulopelvic ligament was ligated with an extracorporeal, Vicryl-modified Roeder knot using Endoknot (Ethicon, Somerville, NJ). The ovarian ligament was ligated with Endoknot, and the infundibulopelvic ligament was then re-ligated with an Endoloop (Ethicon) after it was cut. The



**Figure 1.** Multichannel port in the umbilicus for single-port laparoscopic surgery. Three trocars were individually inserted into separate fingers of a surgical glove and secured with rubber bands. The wrist portion of the glove was positioned over the wound retractor.

ovarian ligament was re-ligated with an Endoloop, and the ovarian ligament was then cut for the adnexectomy. In the case of cystectomy, the cystic wall was dissected with electro-surgical devices, and bleeding was controlled.

In the conventional laparoscopy group (group I), the specimen was removed through the lateral port with or without an endoscopic bag. If necessary, the port site was extended for specimen retrieval. In the multichannel port group (group II), the specimen was removed with or without an endoscopic bag through an extrasmall Alexis wound retractor in the umbilical port (**Figure 2**). Large cystic masses were punctured and aspirated using a suction-irrigation system after exposing the cyst wall using a wound retractor. Then, the puncture site was sutured to avoid the leakage of the cystic contents. The collapsed masses were easily removed using the wound retractor. For the conventional laparoscopic procedures, large cystic masses were aspirated in the pelvic cavity if necessary and then excised. An endoscopic bag was used for specimen removal if necessary. Saline irrigation was performed after specimen retrieval. A drainage tube was placed through the left 5-mm port site if inflammation, adhesion, or hemorrhage was evident, and the abdominal wounds were sutured.

In the multichannel port group (group II), the upper and lower portions of the peritoneum and fascia in the umbilicus were sutured using 2.0 Vicryl when the wound retractor was inserted in the umbilical port. After removing the wound retractor, the 2 ligatures were ligated and re-ligated to each



**Figure 2.** Transumbilical retrieval of the surgical specimen through the wound retractor in the multichannel port using an endoscopic bag.

other to decrease the size of and conceal the umbilical wound. The subcutaneous layer and skin were sutured.

### Statistical Analysis

Data are presented as the mean  $\pm$  SD unless otherwise stated. All statistical analyses were performed using SPSS version 13.0 for Windows (SPSS, Inc, Chicago, IL). Two-tailed Student *t* tests were used to analyze the differences between the groups. Correlations were analyzed by bivariate analysis to determine the Pearson correlation coefficient. *P* values  $<$  .05 were considered statistically significant.

## RESULTS

In total, 341 patients were included in the study, of whom 249 underwent conventional laparoscopic surgery and 92 underwent single- or 2-port laparoscopic surgery using a multichannel port. There were no significant differences in the clinical characteristics between the 2 groups, except for mass size and serum CA125 levels (**Table 1**). The mean mass size was smaller in group I than in group II ( $6.0 \pm 2.6$  vs  $7.1 \pm 3.9$  cm, *P* = .012), and the mean serum CA125 concentration was higher in group I than in group II ( $32.8 \pm 46.8$  vs  $22.4 \pm 17.7$  U/mL, *P* = .011). However, serum CA125 levels were not clinically significant, because cases with borderline malignancy or true malignancy were excluded from the study.

In group I, 158 patients (63.5%) had histories of previous abdominal operations. In group II, 51 patients (55.4%) had undergone abdominal operations. Two patients in the

study cohort had histories of hysterectomy; 1 patient in group I had undergone a total abdominal hysterectomy, and 1 patient in group II had a history of classical intrafascial supracerical hysterectomy.

No intraoperative complications were noted in either group. All surgical specimens were successfully retrieved from the peritoneal cavity. Endoscopic bags were used in 125 cases (50.2%) in group I and in 64 cases (69.6%) in group II. In group I, endoscopic bag rupture during specimen retrieval occurred in 11 cases. In group II, all specimens were successfully retrieved through the umbilical port without endoscopic bag rupture.

The mean operation time was significantly shorter in group I than in group II ( $51.8 \pm 21.5$  vs  $57.2 \pm 23.9$  minutes, *P* = .047 (**Table 2**). The mean specimen retrieval time was significantly longer in group I than in group II ( $2.9 \pm 4.0$  vs  $2.2 \pm 1.8$  minutes, *P* = .020). The longer operation time in group II was attributed to the learning period and the time required to prepare the multichannel port.

Mass size was correlated with operation time and specimen retrieval time in both groups (**Table 3**). In group II, mass size was also correlated with postoperative hospital stay.

There were no significant differences between groups I and II with regard to changes in hemoglobin concentration ( $2.1 \pm 1.1$  vs  $2.0 \pm 1.0$  g/dL), time to first passage of gas ( $34.4 \pm 14.7$  vs  $33.1 \pm 14.1$  hours), or postoperative hospital stay ( $4.1 \pm 1.3$  vs  $4.2 \pm 1.0$  days).

Given that the mean mass sizes in the study groups differed significantly and were correlated with operation time and specimen retrieval time, groups I and II were subdivided and analyzed according to mass size. In total, 158 cases in subgroup I-A and 67 cases in subgroup II-A were classified as having large adnexal masses ( $\geq 5$  cm). There was no significant difference in mean operation time between subgroups I-A and II-A. However, the mean mass size was significantly smaller in subgroup I-A than in subgroup II-A ( $7.4 \pm 2.2$  vs  $8.6 \pm 3.5$  cm, *P* = .001), and the mean specimen retrieval time was significantly longer in subgroup I-A than in subgroup II-A ( $3.5 \pm 4.7$  vs  $2.4 \pm 1.9$  min, *P* = .002).

In total, 91 cases in subgroup I-B and 25 cases in subgroup II-B were classified as having smaller adnexal masses ( $< 5$  cm). However, there were no significant differences with regard to mean mass size, operation time, and specimen retrieval time between subgroups I-B and II-B (*P*  $>$  .05).

The postoperative umbilical port wounds in group II were concealed. Despite the larger umbilical wound for the

**Table 1.**  
Clinical Characteristics of the Study Population

Clinical Characteristic ±	Group I (Conventional, n = 249)	Group II (Multichannel, n = 92)	P
Age, y	36.5 ± 12.3	34.0 ± 9.9	.053
Parity	1.4 ± 1.3	1.0 ± 1.1	.016*
Height, cm	158.7 ± 5.8	159.3 ± 5.1	.347
Weight, kg	57.3 ± 10.3	56.8 ± 9.5	.709
Mass size, cm	6.0 ± 2.6	7.1 ± 3.9	.012*
Serum CA125, U/mL	32.8 ± 46.8	22.4 ± 17.7	.011*

Data are expressed as mean ± SD.

\*P < .05 indicates statistical significance.

**Table 2.**  
Operative Outcomes of the Study Population

Operative Outcome	Group I (Conventional, n = 249)	Group II (Multichannel, n = 92)	P
Operation time, min	51.8 ± 21.5	57.2 ± 23.9	.047*
Mass extraction time, min	2.9 ± 4.0	2.2 ± 1.8	.020*
Hemoglobin change, g/dL	2.1 ± 1.1	2.0 ± 1.0	.249
First passage of gas, h	34.4 ± 14.7	33.1 ± 14.1	.460
Postoperative hospital stay, d	4.1 ± 1.3	4.2 ± 1.0	.599

Data are expressed as mean ± SD.

\*P < .05 indicates statistical significance.

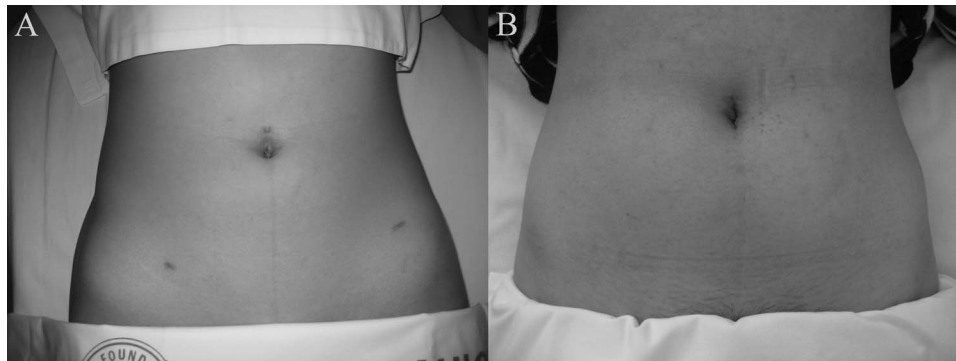
**Table 3.**  
Correlations Between Mass Size and Operative Variables

Group	Operation Time	Mass Extraction Time	Hemoglobin Change	First Passage of Gas	Postoperative Hospital Stay
I (conventional)					
Mass size					
Person correlation coefficient	0.217*	0.166*	0.123	0.112	0.094
P	.001	.009	.052	.077	.141
II (multichannel)					
Mass size					
Person correlation coefficient	0.461*	0.291*	0.182	0.059	0.256*
P	.000	.005	.083	.578	.014

\*Correlations with P values < .05 are statistically significant (2 tailed).

multichannel port in group II, the postoperative scar was minimal and cosmetically acceptable because it was concealed in the umbilicus, unlike the iliac fossa scar from the conventional laparoscopic surgery in group I (**Figure 3**).

With regard to postoperative complications, fever (n = 4), postoperative ileus (n = 1), trocar bleeding (n = 1), and voiding difficulty (n = 1) were observed in group I. Fever (n = 2) was observed in group II. No trocar site



**Figure 3.** Representative abdominal wound scars at 2 mo postoperation for groups I (A) and II (B).

hernias or wound abscesses were observed in either study group.

## DISCUSSION

Exploratory laparotomy has been the standard surgical treatment for the removal of pelvic masses. Laparotomy is traditionally performed, especially for large pelvic masses, despite developments in laparoscopy and surgical instruments. For large pelvic masses, laparotomy is generally preferred over laparoscopic surgery given the possibility of malignancy and the limited surgical field.

Currently, laparoscopic surgery is commonly used in gynecologic procedures and is the gold standard surgical treatment for benign adnexal masses. Numerous studies have demonstrated the use of laparoscopic surgery for removing benign adnexal masses.<sup>7–10</sup> The laparoscopic management of dermoid cysts is safe and cost effective, and this technique provides patients with the benefits of a shorter hospital stay and recovery time compared with laparotomy.<sup>11</sup> In a previously reported study of patients who underwent laparoscopic surgery for large adnexal masses, laparoscopic management was successful in 174 of 186 cases (93.5%).<sup>12</sup> The reasons for conversion to laparotomy included anticipated technical difficulty and malignancy. The authors suggested that most large adnexal masses could be resected laparoscopically if the surgeon possessed appropriate expertise in laparoscopic surgery, the frozen section was immediately examined by an expert for critical decision making, and the patient was prepared to undergo adequate cancer surgery if indicated.

Because ovarian cysts often occur during adolescence and the reproductive years, numerous gynecologists have attempted ovarian cystectomies to preserve ovarian function. Ovarian cystectomy tends to increase the incidence of intraoperative cyst rupture, and the spillage of material

from benign cystic masses can result in chemical peritonitis or pseudomyxoma peritonei. However, Mage et al<sup>13</sup> did not observe any cases of pseudomyxoma peritonei after the laparoscopic treatment of mucinous cystadenomas, and Hessami et al<sup>14</sup> suggested that intraoperative spillage from dermoid cysts is not necessarily associated with morbidity provided that a vigorous lavage is performed. Some surgeons perform cyst enucleation in a bag to reduce spillage and operation time.<sup>15</sup> We performed adnexectomy and cystectomy with minimal leakage of the cystic contents by using endoscopic bags or immediately closing the puncture site after cyst aspiration. After removing the mass, we also performed pelvic cavity lavage with a large volume of normal saline.

Many gynecologic procedures are currently performed via laparoscopic surgery rather than laparotomy. However, the retrieval of resected surgical specimens remains challenging. Particular authors previously reported performing 3-port conventional laparoscopic procedures on 2 patients with huge pelvic masses that were retrieved by extending the left iliac fossa port.<sup>16,17</sup> It is difficult and time-consuming to remove large surgical specimens through conventional 5- and 10-mm ports. In conventional laparoscopic surgery, the lateral port site was extended to approximately 2.5 cm, the wall of the cystic mass was exposed through the incision, the mass was aspirated through the port site, and the cyst puncture site was sutured to prevent leakage of the cystic contents into the pelvic cavity. After retrieving the cyst through the incision, a 12-mm trocar was inserted through the port site, and the extended incision was closed with full-layer Vicryl 1.0 suture to maintain the pneumoperitoneum. The main disadvantage of this technique is that the left iliac fossa scar is relatively large, thereby affecting the cosmetic outcome. The extension of the umbilical port results in a less visible scar and minimal abdominal wall scarring compared with extending the lateral ancillary

port. Therefore, the use of a multichannel port with a wound retractor is advantageous in terms of retrieving surgical specimens, especially for large, benign pelvic masses. Despite the relatively increased size of the multichannel port compared with the ports for conventional laparoscopy, the multichannel port technique offers the benefit of cosmetic satisfaction. However, the extended lateral port used in conventional laparoscopy to remove large pelvic masses carries certain risks for trocar site problems and increased postoperative pain without any cosmetic effects. The greatest advantage of retrieving specimens through a multichannel port is that virtually every type of laparoscopic procedure for adnexal surgery can be performed without extending the port sites solely for specimen retrieval and without leakage of the cystic contents after endoscopic pouch rupture. Recently, laparoscopically assisted extracorporeal cystectomy and adnexectomy of large adnexal masses have been performed without leakage of the cystic contents.<sup>18,19</sup>

Specimen retrieval through the umbilical port is likely to reduce the incisional hernia rate given that umbilical port wounds are less likely to develop hernias than lateral ancillary port wounds, unless the umbilical wound is extended for specimen retrieval.<sup>20</sup> Ghezzi et al<sup>21</sup> routinely retrieved specimens through the umbilical port in a series of 1,116 laparoscopic surgical procedures on women. These authors suggested several potential benefits associated with specimen retrieval through the umbilical incision. First, the smaller ancillary port size could lead to a shorter postoperative stay with less postoperative pain and fewer analgesics. Second, specimen retrieval through the umbilical incision results in a scarless or nearly scarless procedure, such as occurs with the previously described technique for salpingectomy in tubal pregnancies. Laparoendoscopic single-site surgery has recently been introduced in response to the trend toward minimally invasive procedures. In laparoendoscopic single-site surgery, the incision size of the trocar site tends to be larger than that for conventional laparoscopy. In addition to a large incision size, various factors also contribute to trocar site herniation, including removal of the ports prior to complete deflation of the peritoneal cavity, inadequate closure of the port site incisions, and a large incision at the port site.<sup>3</sup> For these reasons, the extended trocar site in the multichannel port should be adequately repaired to prevent trocar-associated complications.

Considering the trend toward minimally invasive surgery, conventional laparoscopic surgery with multiple trocar sites may adversely affect postoperative wound scarring. Because multiple punctures create multiple postoperative

scars, patients may be less satisfied with the cosmetic results.<sup>2</sup> For these reasons, some surgeons perform single-port ovarian cystectomy, salpingectomy, hysterectomy, and supracervical hysterectomy.<sup>22–24</sup> We used an extrasmall Alexis wound retractor at the multichannel port during the single- or 2-port laparoscopic procedures. The retractor was placed in the umbilical incision, the wrist portion of a No. 6 rubber glove was placed over the retractor, and 2 trocars were placed in separate fingers of the glove. Three Babcock clamps were placed on the edges of the retractor to prevent carbon dioxide leakage in response to movement of the laparoscope and other instruments and to maintain the pneumoperitoneum. In our series, a huge ovarian mass (>40 cm) in a 17-year-old girl was easily removed through the umbilical port with the retractor, thereby reducing the operation time. This technique can potentially be widely used in adnexal surgery, including in patients with large ovarian cysts. The main disadvantages of the technique are that it is somewhat time-consuming and that the laparoscopic instruments in the umbilical port have a limited range of motion. In addition, this technique requires the use of a wound retractor and is of limited use in certain cases of malignancy and extreme obesity.

In this study, the operation time was longer in group II compared with group I given the learning curve in the earlier cases. In addition, the specimen retrieval time was not shorter in cases with smaller masses. In cases with large masses ( $\geq 5$  cm), the mean operation time did not differ significantly between subgroups I-A and II-A, because of the shorter specimen retrieval time in subgroup II-A. These findings indicated that laparoscopic surgery using a multichannel port was beneficial for patients with large masses. The operation times in the early cases in group II reflect a learning period after the introduction of the multichannel port technique in November 2006. This explains why the operation time was not reduced in patients with smaller masses in group II and why the overall operation time was longer in group II even though the specimen retrieval time was shorter in this group. Specimen retrieval through a multichannel port is particularly useful for large adnexal masses, and we hypothesize that the operation time for this procedure will shorten with improvements in surgical skill, instruments, and teamwork among the operating room personnel.

The mean postoperative hospital stays for groups I and II were  $4.1 \pm 1.3$  and  $4.2 \pm 1.0$  days, respectively. These stays were relatively longer than those reported for cases in hospitals in other countries. In Korea, it is difficult to reduce postoperative hospital stays, because of the rela-

tively low medical expenses and patient anxiety regarding short hospital stays. For these reasons, the mean postoperative hospital stays of these study groups were longer in the absence of other postoperative complications.

The main advantage of this multichannel port technique is the improved cosmetic outcome compared with conventional laparoscopic surgery. Despite the larger umbilical wounds associated with the multichannel port in group II, the postoperative scar was minimal and cosmetically acceptable because it was concealed in the umbilicus, unlike the iliac fossa scar from conventional laparoscopic surgery in group I. Retrieving surgical specimens through a multichannel umbilical port with a wound retractor appeared to be safe and resulted in good cosmetic outcomes, especially in patients with large benign pelvic masses. This technique can be used for most adnexal surgical procedures, including those for large benign cystic masses. In addition, this technique resulted in the shorter specimen retrieval time, reduced leakage of cystic contents due to pouch rupture, and minimal abdominal wall scarring.

## CONCLUSIONS

The transumbilical retrieval of surgical specimens through a multichannel port with a wound retractor during laparoscopic surgery was safe and did not result in leakage of the cystic contents. Although the mean total operation time was significantly shorter in the conventional laparoscopy group, the mean specimen retrieval time was significantly longer in the conventional laparoscopy group compared with the multichannel port group. However, in cases with large masses ( $\geq 5$  cm), the mean operation time did not differ significantly between groups I and II, because of the reduced specimen retrieval time in group II. Thus, this procedure potentially reduced the specimen extraction time, especially in patients with large masses, compared with conventional laparoscopic surgery.

This technique is also cosmetically desirable because it creates a less prominent scar than conventional laparoscopic surgery without postoperative complications, such as trocar site infection and herniation. With improvements in surgical techniques, instruments, and teamwork among operating room personnel, this technique could reduce the operation time for laparoscopic surgery for adnexal masses.

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