Instruments and Techniques

Single Port Access Laparoscopic Adnexal Surgery

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ABSTRACT Study Objective: To estimate the feasibility, safety, and operative outcomes for the management of adnexal masses by single port access (SPA) laparoscopy with a wound retractor and a surgical glove.

Design: A prospective single-center study (Canadian Task Force classification III).

Setting: University hospital.

Patients: Twenty-four well selected patients with adnexal masses on imaging scans recruited from June 2008 through January 2009.

Interventions: Single port access laparoscopic adnexal surgery.

Measurements and Main Results: Single port access laparoscopic adnexal surgery was successfully completed in 22 of 24 patients. The median age of the patients was 45 years (range 23-63 years), and the median body mass index was 22 (range 18-29). The median tumor size was 5 cm (range 3-12 cm). The median operative time was 70 minutes (range 40-128 minutes). The estimated blood loss was minimal (range 10-100 mL). The postoperative course was uneventful in all patients. The median postoperative hospital stay was 1 day (range 1-3 days). No postoperative complications were observed at follow-up. The 2 failed cases were as follow: 1 required an additional trocar for adequate adhesiolysis, and the other a staging laparotomy because of the finding of a borderline ovarian malignancy on frozen section pathologic study.

Conclusion: The single port access laparoscopic adnexal surgery was safe and feasible and provided almost no visual scar.

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Three or 4 laparoscopic ports are traditionally required to complete a gynecologic surgical procedure. One is inserted through the infraumbilicus, and the others are usually inserted through the lateral abdominal wall muscles or supra-pubis [1]. These ports require small abdominal incisions ranging from 5 to 12 mm. Single port access (SPA) laparoscopic surgery has been reported for appendectomies, cholecystectomies, and several urology procedures [2-4]. However, the first SPA laparoscopic procedures were gynecologic procedures, namely, tubal ligation [5]. In addition, single port hysterectomy was also reported in the early 1990s [6,7].

The primary advantage of this approach is limiting the port incisions to 1 site, the umbilicus. Therefore the surgical scar can be hidden within the umbilicus, rendering the surgery virtually “scarless.”

Recently, a few devices specific for SPA have been developed (e.g., Uni-X Single Port Laparoscopy, Pnavel Systems, Cleveland, OH; TriPort or QuadPort, Advanced Surgical Concepts, Bray, Ireland). However, these instruments are not currently available to clinicians in South Korea. Here, we report our initial experience with 24 patients who underwent SPA laparoscopic surgery for adnexal masses with a detailed description of our technique with a wound retractor and a surgical glove.
Patients and Methods

Patients

Beginning June 25, 2008, SPA laparoscopic adnexal surgery was performed by a single gynecology surgeon (T.J. Kim) in 24 patients. Inclusion criteria were as follows: age < 70 years, an adnexal mass on ultrasonography or pelvic magnetic resonance image, and patients who consented to SPA procedures. Patients were excluded for adnexal tumors suspicious for malignancy, severe obesity (body mass index > 30 kg/m²), or patients who were at high risk for general anesthesia. Patient workup (history taking including previous surgery, routine preoperative studies including complete blood count, chemistry, electrolyte, prothrombin time/adjusted partial thromboplastin time, electrocardiography, and chest radiography, tumor marker such as CA 125) was done in all patients.

Initially, we performed an oophorectomy or salpingo-oophorectomy in patients with adnexal masses of less than 5 cm in diameter (5 patients). After the introduction of flexible instruments in November 2008, we extended the indications to patients with larger tumors or those requiring ovarian cystectomy (19 patients). This prospective data collection was approved by the Institutional Review Board of Samsung Medical Center, Korea. Median and range are used to describe non-normal data.

Operative Technique

The patient was placed in the dorsal lithotomy position. The surgeon stood on the left side of the patient. The patient’s left arm was tied to her body for the surgeon’s space. The first assistant stood on the right side of the patient to handle the scope. The second assistant, positioned between the legs of the patient, manipulated the uterine elevator. With the open Hasson technique, a 2-cm vertical incision was made within the umbilicus (Fig. 1A). If the patient had a previous scar around the umbilicus (e.g., tubal ligation scar), the previous scar was opened with scar revision. An extra small wound retractor (Alexis; Applied Medical, Rancho Santa Margarita, CA) was inserted into the wound opening transumbilically (Fig. 1B). The wound retractor was composed of a distal ring, a proximal ring, and a cylindrical connecting sleeve. Once it was fixed in the opening site, it laterally retracted the sides of the wound opening. This makes a small vertical incision a wider and rounder opening. A surgical glove with sheaths inserted into 3 fingers was draped around the rim of the wound retractor (Fig. 2A). The elastic nature of the glove enabled it to obtain a good purchase on the ring and achieve an airtight seal, which maintained the pneumoperitoneum. The multiple fingers of the glove functioned as a multiport for laparoscopic instruments and a camera.

We used a rigid 0-degree, 5-mm laparoscope and standard 5-mm laparoscope instruments during the early part of the study. Then we introduced flexible instruments (e.g., Roticulator, Covidien, Mansfield, MA; Cambridge Endoscopic De-

Fig. 1. A 2-cm vertical incision was made within the umbilicus (A). The extra-small wound retractor was transumbilically inserted into the wound opening (B).

Fig. 2. A surgical glove with 3 fingers was draped around the rim of the wound retractor (A). The skin was closed with skin adhesive, which provided a good cosmetic outcome and was convenient for the patient.

Adnexal specimens were extracted with an EndoPouch (Ethicon Endo-Surgery, Cincinnati, OH). It was very easy to extract the specimen through the umbilical wound through the wide opening provided by the wound retractor. The peritoneum and fascia were approximated and closed layer by layer with 2-0 Vicryl suture. To close the skin, we used skin adhesive, which provided a good cosmetic outcome and was convenient for the patient.

Results

SPA laparoscopic adnexal surgery was successfully completed in 22 of 24 patients. The 2 failed cases were as follows: 1 required an additional trocar in the right lower quadrant of the abdomen for adequate adhesiolysis, and the other a staging laparotomy immediately after successfully finishing SPA laparoscopic oophorectomy because of the finding of a borderline ovarian malignancy on frozen section pathologic study.
Table 1 shows the patient characteristics and operative outcomes. The median age of the patients was 45 years (range 23-63 years), and the median body mass index was 22 (range 18-29). The median tumor size was 5 cm (range 3-12 cm). The median time needed for the surgery was 70 minutes (range 40-128 minutes). The estimated blood loss, calculated as difference between the total amount of suction and irrigation, was minimal (range 10-100 mL). The postoperative course was uneventful for all patients. The median postoperative hospital stay was 1 day (range 1-3). One patient who underwent incidental appendectomy with the SPA procedure was discharged on postoperative day 3 after uneventful diet and gas passing. Three patients were discharged on postoperative day 2 because there was a change of routine postoperative discharge policy in all laparoscopic adnexal surgery, including SPA procedures in our hospital after January 2009. The others were routinely discharged on postoperative day 1. No postoperative complications were observed during median follow-up of 6 months (range 4-11 months).

Discussion

SPA laparoscopy was introduced to the field of gynecology for tubal sterilization about 4 decades ago [5]. However, SPA laparoscopic adnexal surgery did not gain widespread use because of the technical challenges associated with complex maneuvers intracorporeally for which there were no instruments available. Currently, with the availability of specialized instruments and multichannel ports, SPA laparoscopy has become a rapidly evolving field [8-10]. Because the uterine manipulator through the natural orifice, the vagina, provides adequate exposure of the adnexa, SPA laparoscopy is a promising technique in the field of gynecology.

SPA laparoscopy is referred to as embryonic natural orifice transumbilical endoscopic surgery (E-NOTES) [11]. Although natural orifice transluminal endoscopic surgery (NOTES), which leaves no abdominal scar, requires alterations of the surgical technique and currently has major barriers that limit its clinical application, E-NOTES can be performed with minimal modifications of the current standard laparoscopic technique. Moreover, E-NOTES can be easily converted to a multiport conventional laparoscopic procedure at any time during the operation. In 1 of our failed cases, there were severe adhesions between the left adnexa and bowel because of 2 previous cesarean deliveries and right salpingo-oophorectomy with myomectomy; in this case, we performed adhesiolysis successfully with the help of an additional trocar.

Our specially designed “single port platform,” which consists of a wound retractor and a surgical glove, is feasible for SPA laparoscopic adnexal surgery. We experienced several advantages with this simple design: (1) with the open Hasson technique, Veres needle injury can be avoided, (2) a 2-cm incision makes it easier to close the fascia within the umbilicus versus a 1.2-cm incision for the conventional trocar approach, (3) specimen extraction through a larger wound is easier, (4) there is a good cosmetic outcome. We also believe there are potential advantages as follows: (5) an umbilical port avoids penetrating any muscle, thereby lessening postoperative pain, and (6) it may prevent subcutaneous emphysema, as well as port site infection and bleeding, because of the tamponade effect of the 2 flanges of the wound retractor.

There is no evidence of a difference in postoperative pain with the SPA procedure as compared with traditional laparoscopy. We believe postoperative pain with this method is a very important issue. Therefore we are currently conducting a retrospective case (SPA group)-control (conventional group) study and prospective outcome study to evaluate whether postoperative pain relief exists with this method. Port site complication in SPA surgery is also an interesting factor. However, there is no evidence of decreased port-site infection and bleeding compared with traditional laparoscopy. We believe the risk of trocar site bleeding and infection would be low because of a tamponade effect by the wound retractor during the surgery. Port site problem in SPA surgery is another important theme to be studied.

There are several disadvantages to the SPA surgery. With parallel insertion of laparoscopic instruments and a camera, the range of motion is limited, and clashing of the instruments is frequent. SPA laparoscopy requires...
significant coordination between the operator and the assistant who holds the camera. The use of flexible instruments has overcome these problems to some degree; however, they cause another problem. That is, it is difficult to deliver power to the tip of the flexible instrument. Therefore it is more difficult to dissect hard tissue, such as endometriosis, with flexible instruments. Intraabdominal smoke is another problem because there is no separate venting channel in SPA laparoscopy.

Although the cosmetic benefits are apparent, patient attitudes about scar-free surgery, which usually requires a longer operation time, have not been quantified. The incremental benefit is not likely to be as great as the difference between a laparotomy and conventional laparoscopic surgery. Nevertheless, the role of SPA laparoscopic adnexal surgery might continue to expand with improved instruments and scope systems.

This report shows our initial experience with SPA laparoscopic adnexal surgery in 24 patients using a wound retractor and a surgical glove. The SPA laparoscopic adnexal surgery was safe and feasible and provided almost no visual scar.

Table 1
Patient characteristics and operative outcomes

<table>
<thead>
<tr>
<th>Age, median (range)</th>
<th>45 (23-63)</th>
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</thead>
<tbody>
<tr>
<td>BMI, median (range)</td>
<td>22 (18-29)</td>
</tr>
<tr>
<td>% of previous abdominal surgery</td>
<td>50% (12/24)</td>
</tr>
<tr>
<td>Tumor size (cm), median (range)</td>
<td>5 (3-12)</td>
</tr>
<tr>
<td>Operation for adnexal diseases</td>
<td></td>
</tr>
<tr>
<td>USO</td>
<td>11</td>
</tr>
<tr>
<td>BSO</td>
<td>2</td>
</tr>
<tr>
<td>Cystectomy</td>
<td>11</td>
</tr>
<tr>
<td>% of additional adhesiolysis</td>
<td>38% (9/24)</td>
</tr>
<tr>
<td>Pathologic study</td>
<td></td>
</tr>
<tr>
<td>Endometrioma</td>
<td>5</td>
</tr>
<tr>
<td>Mature cystic teratoma</td>
<td>5</td>
</tr>
<tr>
<td>Serous/mucinous ovarian tumor</td>
<td>9</td>
</tr>
<tr>
<td>Borderline mucinous ovarian tumor*</td>
<td>1</td>
</tr>
<tr>
<td>Other benign cysts</td>
<td>4</td>
</tr>
<tr>
<td>Estimated blood loss (mL), median (range)</td>
<td>10 (10-100)</td>
</tr>
<tr>
<td>Operative time, minutes (range)</td>
<td>70 (40-128)</td>
</tr>
<tr>
<td>Postoperative hospital stay, day (range)</td>
<td>1 (1-3)</td>
</tr>
</tbody>
</table>

BMI = Body mass index; USO = unilateral salpingo-oophorectomy; BSO = bilateral salpingo-oophorectomy.
* This case underwent staging operation of abdominal total hysterectomy, contralateral salpingo-oophorectomy, omentectomy, and pelvic lymph-node dissection. Therefore we excluded this case from the analysis of operative time, blood loss, and hospital stay.

References