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Short communication

A novel modification of two-port laparoscopic ovarian cystectomy using a needlescopic instrument: One surgeon's initial experience

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ABSTRACT

Background: Laparoendoscopic single-site surgery (LESS) is challenging even for an experienced laparoscopic surgeon. With the increasing application of LESS for ovarian cystectomy, there is an urgent need to improve and modify the surgical techniques.

Method: We propose a modification of LESS with needlescopic surgery (LESS plus one puncture) as a way of improving the esthetic result and postoperative quality of life of the patient while causing less stress for the surgeon.

Result: We retrospectively reviewed the medical records of the first 30 consecutive patients who underwent two-port surgery for teratoma resection.

Conclusion: LESS plus one puncture for ovarian cystectomy appears as safe and feasible as conventional laparoscopic surgery and can allow for an almost “scarless” cosmetic result.

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Introduction

Laparoscopic surgery for benign gynecological diseases has become a standard surgical procedure all over the world. At present, various techniques have been developed to further minimize the invasiveness of laparoscopic surgery, such as single incision laparoscopic surgery¹ and robotic surgery² in the gynecologic fields.

In laparoendoscopic single-site surgery (LESS), a 2-cm vertical incision is made within the umbilicus. The size of the incision is more suitable for withdrawing the adnexal tumor compared with conventional laparoscopic surgery, in which the specimen is extracted from the 1-cm incision in the umbilicus. We consider that this will also decrease the stress for surgeons because of the reduction in withdrawal time. However, during LESS we encounter some technical difficulties such as conflict among instruments or

lack of sufficient manipulation angle between instruments, which can potentially compromise the quality and safety of the operation.^{3,4}

We consider LESS to be especially suitable for young females as it improves the esthetic outcome, and ovarian cystectomy is the most frequently performed operation in young women. Therefore, we made it our goal to perform LESS for ovarian cystectomy without any compromise compared to conventional laparoscopic surgery. However, Song et al.⁵ reported that the oophorectomy procedure has a learning process that is distinct from the cystectomy procedure. In LESS, all instruments are in-line, which causes crowding of instruments and lack of viewing angles. It also leads to low grasping power.⁵ Therefore, we decided that by adding the needlescopic instrument to LESS, it is possible to maintain a safety standard equivalent to that of conventional laparoscopic surgery without losing the cosmetic benefits of LESS. Here, we present our initial experience with 30 patients who underwent two-port laparoscopic surgery using a needlescopic instrument for ovarian cystectomy limited to teratoma, and assess the safety and feasibility of the procedure.

Conflicts of interest: The authors declare no conflicts of interest.

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Materials and methods

We retrospectively reviewed the medical records of the first 30 consecutive patients who underwent two-port surgery for teratoma resection at Kawasaki Municipal Ida hospital, Kawasaki City, Japan, between November 2011 and May 2012. Our retrospective chart review was approved by the Institutional Review Board. All procedures were performed by a single laparoscopic surgeon (S.A.).

We analyzed each patient's age, body mass index, and the size of the tumor based on magnetic resonance imaging findings. We also investigated operative time, withdrawal time of tumor, estimated blood loss, lengths of hospital stay, and presence of rupture of tumor. All patients suspected of having malignancy based on magnetic resonance imaging were excluded from this study. Prior to the procedures, all patients were fully informed of the characteristics of this surgical procedure and the possibility of requiring conversion to conventional laparoscopic surgery if required.

Two-port laparoscopic ovarian cystectomy using a needlescopic instrument was performed with the patient under general endotracheal anesthesia and epidural catheter insertion. They were placed in a low Trendelenburg position using a lithotomy positioning device with an intermittent pneumatic compression device. The patients' arms were placed at their sides to secure the surgeon's working space. The bladder was emptied with an indwelling Foley catheter. All patients were preoperatively given 1 g of cephazolin intravenously.

The surgeon stood at the opposite side of the ovarian cyst. A 2-cm vertical incision was made within the umbilicus with the open Hasson technique to gain access to the abdominal cavity. Surgical procedure was performed with a single trocar (LAPPROTECTOR and EZ ACCESS; Hakko Medical Co., Nagano, Japan) inserted in the umbilicus. EZ ACCESS is a silicon rubber cap that is designed for the LAPPROTECTOR to create a tight seal, and was originally introduced for LESS. As the EZ ACCESS device has no fixed channel, surgeons can select the best trocar placement to maintain maximum trocar separation for each surgery. This new device consists of three components: the introducer, the fixing valve, and the trocar itself. A rigid 30°, 5-mm laparoscope (Karl Storz GmbH, Tuttlingen, Germany) was introduced, and the entire abdominal cavity was inspected. After pelvic and abdominal exploration, the adnexa were mobilized to perform the stripping technique for the excision of the cysts. An incision was made through the cortex and enucleated cyst from the ovary with blunt and sharp dissection. During the procedure, a separate 2-mm stab incision was made medial to the anterior–superior iliac spine of the tumor side, which is low enough to be covered with pubic hair, and a Mini-Lap Alligator grasper (Mini-Lap Technologies Inc., Stryker Dobbs Ferry, NY, USA) was inserted (Figure 1A). This instrument grasped the cortex, and this gave better retraction that resulted in a better surgical procedure (Figure 1B). The enucleated ovarian teratoma was put into a retrieval bag (EZ Purse; Hakko, Japan) and removed through the EZ ACCESS after draining the cystic contents and cutting the tumor tissue into small pieces in the retrieval bag.

The abdominal cavity was inspected for residual tumor contents and hemostasis. The EZ ACCESS was removed, and the umbilical fascia was closed using 2–0 delayed-absorbable sutures. The umbilical subcutaneous tissue was approximated with 4–0 delayed-absorbable sutures (Figure 1C). At the end of the procedure, blood loss during surgery was estimated by measuring the volume of intraoperative suction, then subtracting the volume of liquid used for intraperitoneal washing. The pelvis was irrigated with lactated Ringer's solution until all evidence of sebaceous material was removed.

For statistical tests, we used Kolmogorov–Smirnov test, and results were assessed with SPSS version 18.0 software (SPSS Inc.,

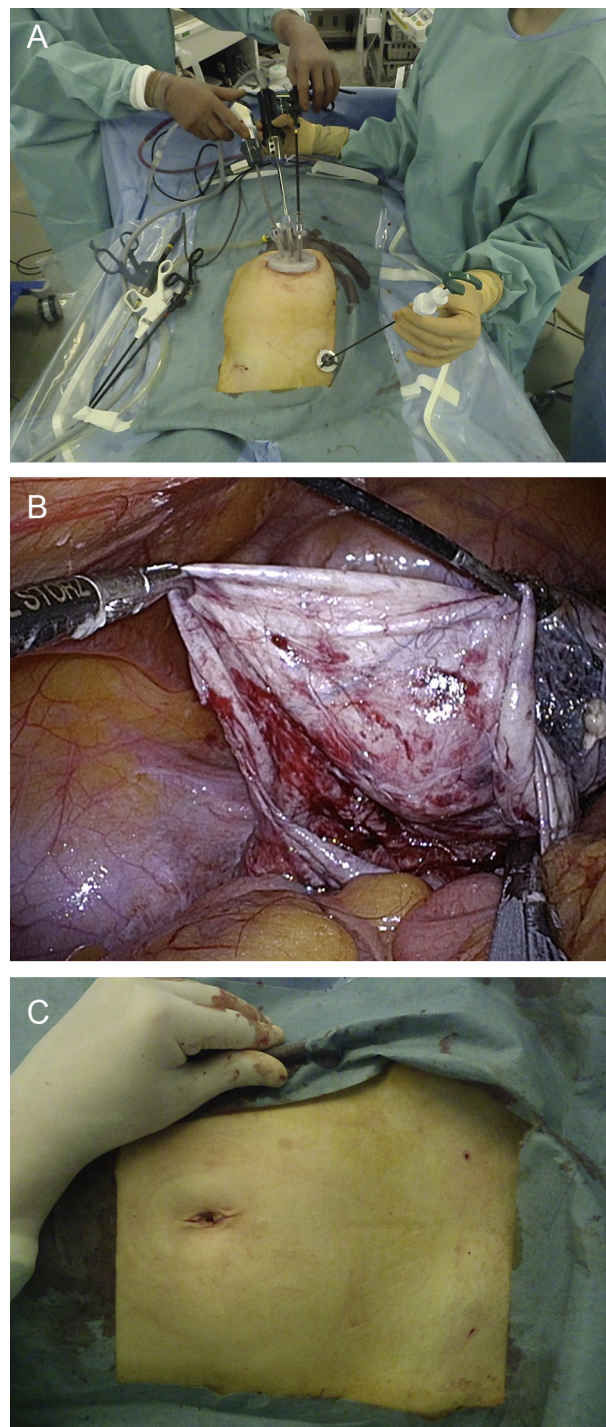


Figure 1. (A) Positioning of single-port systems and the needlescopic grasper. (B) The cortex of ovary is grasped by the needlescopic grasper, and this led to a better surgical procedure. (C) Postoperative photographs of skin incision in a patient who underwent bilateral cystectomy.

Chicago, IL, USA) and statistically analyzed. Because variables in the present study were not normally distributed, results are expressed as median.

Results

All patients successfully underwent two-port laparoscopic ovarian cystectomy without an additional skin incision or

conversion to conventional laparoscopy. There was no intraperitoneal adhesion in all cases. One patient had a history of laparotomy. The basic characteristics of the patients and surgical outcomes are shown in Tables 1 and 2, respectively. All patients ($n = 30$) were allowed to be discharged on postoperative Day 3, following our institutional policy for laparoscopic adnexal surgery postoperative care. Extension of hospitalization (>3 days) was attributed to personal reasons.

Pathologic diagnoses were confirmed as mature cystic teratoma in all cases. During a mean follow-up period of 16.5 ± 3.52 months (range 1–13 months), no patients had evidence of recurrence. During the same period, there were no wound infections, periumbilical hematomas, or incisional hernias among our patients. Spillage of the contents of the cyst did not induce granulomatous peritonitis. No other postoperative complications were observed. No cases were lost to follow-up. Although the level of satisfaction was not evaluated, all patients were highly satisfied with the cosmetic results.

Discussion

We have described a new surgical technique for transumbilical single-port access in patients with ovarian teratoma. Prior to adding one needlescopic grasper, we selected parallel traction (proximal–distal axis) to perform a classic stripping ovarian cystectomy by LESS. However, we often experienced difficulty in performing cystectomy compared with adnexectomy as it required more frequent triangulation action and more powerful grasping. Hence, we introduced the new technique using a 2-mm needlescopic grasper. By adding one needlescopic grasper, we were able to achieve similar results to those of conventional laparoscopic procedure while improving cosmetic results. We believe this to be paramount for a successful two-port laparoscopic surgery. The needlescopic surgical device has a diameter of 2–3 mm, and because of its small size it can be introduced with minimal scarring and discomfort. The main difference between a standard 5-mm port and a new 2-mm port is that the scar from the 2-mm is almost invisible.

Compared with other studies, we have achieved a shorter operating time with a quick learning curve.^{5–7} The use of needlescopic grasper may increase the surgical ergonomics as it standardizes the instrument placement during operation. In addition, owing to the surgeon's increasing experience with this procedure toward the end of the study period, the surgeon may have adapted to this new surgical procedure. Although it accounts for only a small proportion of the entire procedure, the reduction in the length of time to withdraw cysts from the abdominal cavity may contribute to the shorter operating time. We consider that intraoperative stress for surgeons just prior to the end of operation is significantly reduced with this approach.

Our cases were limited to teratoma because teratoma accounted for most benign ovarian tumors in the reproductive age. In one study of ovarian masses that were surgically excised, teratoma represented 62% of all ovarian neoplasms in women younger than

Table 2

Surgical outcomes of LESS plus one puncture.

Operative time (min)	46.4 (26–106)
Withdrawal time (sec)	36.0 (10–45)
Estimated blood loss (mL)	20.5 (0–200)
Frequency of postoperative analgesia (diclofenac sodium)	
0	4 (13.3%)
1	7 (23.3%)
2	12 (40%)
3	7 (23.3%)
WBC count at POD 3 (cells/ μ L)	6430 (3800–7940)
CRP concentration at POD 3 (mg/dL)	1.28 (0.24–3.96)
Postoperative hospital stay (d)	3.1 (3–4)
Rupture during operation	7 (23.3%)

Data are presented as the median (range) or n (%).

CRP = C-reactive protein; LESS = laparoendoscopic single-site surgery; POD = postoperative day; WBC = white blood cell.

40 years.⁸ Additionally, cystectomy of teratoma was readily achieved in identifying the correct plane between the cyst wall and the ovarian parenchyma. However, there is a risk of intraperitoneal spillage of the cyst contents that can potentially result in chemical peritonitis. If this happened, the pelvis was irrigated with a large amount of warm saline after cystectomy and any remaining cyst contents were removed using the standard instruments through the umbilicus.

The extent of damage to ovarian reserve associated with conventional laparoscopic excision of endometriomas was studied by Ragni and coauthors.⁹ They reported that laparoscopic excision of endometriomas is associated with a quantitative, but not a qualitative, damage to ovarian reserve.⁹ Hence, it should be noted that the excision of endometriomas implies the removal of ovarian tissue, with potential reduction in follicular reserve. We excluded endometriomas in this study because we consider that the two-port surgery has disadvantage in performing excision of endometriomas compared with conventional laparoscopic surgery in technical points.

Fader and Escobar¹⁰ reported a retrospective study of 13 LESS patients. They demonstrated that LESS, although challenging, was feasible in patients of variable body mass index (range 20–37), and obesity was not a contraindication to the performance of LESS in their series. However, our case series did not include obese patients. It is unclear whether two-port surgery is feasible for obese patients in this report.

In conclusion, the needlescopic surgical device in addition to LESS enables a cosmetic result similar to that offered by LESS while providing a wider working space and therefore safety similar to conventional laparoscopy. The needlescopic grasper will surely play a prominent role in gynecologic surgery. Although at present, LESS has not yet become a standard surgical technique in gynecologic surgery, we consider that two-port surgery using a needlescopic instrument for ovarian cystectomy will no doubt change the future of gynecologic surgery, and will possibly become a standard procedure.

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Table 1
Patient characteristics.

Patients (n)	30
Age (y)	31.5 (25–42)
Body mass index	20.44 (17.2–23.12)
History of abdominal surgery	2 (6.7%)
Tumor size (cm)	5.62 (2.4–8.0)
Laterality (right/left/bilateral)	14/4/12

Data are presented as the median (range) or n (%).

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