

Laparoendoscopic Single-Site Surgery for Management of Ovarian Endometriomas

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ABSTRACT

Background and Objectives: To compare our initial experience in laparoscopic surgery for ovarian endometriomas performed through an umbilical incision using a single 3-channel port and flexible laparoscopic instrumentation versus traditional laparoscopy.

Methods: This study was conducted in 3 tertiary care referral centers. Since September 2009, we have performed laparoendoscopic single-site surgery in 24 patients diagnosed with ovarian endometriomas. A control group of patients with similar diagnoses who underwent traditional operative laparoscopy during the same period was included (n = 28). In the laparoendoscopic single-site surgery group, a multichannel port was inserted into the peritoneum through a 1.5- to 2.0-cm umbilical incision.

Results: Patients in the laparoendoscopic single-site surgery group were significantly older ($P = .04$) and had a higher body mass index ($P = .005$). Both groups were comparable regarding history of abdominal surgery, lateral pelvic side wall involvement, and cul-de-sac involvement. After we controlled for age and body mass index, the size of the resected endometriomas, duration of surgery, and amount of operative blood loss were comparable in both groups. When required, an additional 5-mm port was inserted in the right or left lower quadrant in the laparoendoscopic single-site surgery group to allow the use of a third instrument for additional tissue retraction or

manipulation (10 of 24 patients, 41.6%). However, adhesiolysis was performed more frequently in the conventional laparoscopy group. The duration of hospital stay was <24 hours in both groups. No intraoperative complications were encountered. All incisions healed and were cosmetically satisfactory.

Conclusion: The laparoendoscopic single-site surgery technique is a reasonable initial approach for the treatment of endometriomas. In our experience, an additional side port is usually needed to treat pelvic side wall and cul-de-sac endometriosis that often accompanies endometriomas.

Key Words: LESS, Endometrioma, Ovarian cystectomy, Laparoscopy.

INTRODUCTION

Endometriosis is the presence of the endometrium with glands and stroma outside the endometrial cavity. It usually presents with chronic pelvic pain and infertility. The disease is likely to be polygenic and multifactorial, but the exact pathogenic mechanisms are still not entirely clear. Endometriosis is usually pelvic; however, extrapelvic disease is not uncommon. The ovaries are usually involved, with varying sizes of cystic lesions filled with altered blood called endometriomas.

Surgical resection of large endometriomas is usually required to relieve pain. Advanced laparoscopic surgery or laparotomy is often used as the surgical approach. Gonadal sparing resection of endometriomas is the gold standard taking into account meticulous dissection to prevent recurrence and to avoid destruction of the ovarian cortex. Current evidence supports the use of the laparoscopic approach given its inherent merits.¹⁻⁴

Laparoendoscopic single-site surgery (LESS) is a novel, minimally invasive approach in which the entire surgery is performed through a single incision. Recent studies have shown that the LESS procedure is safe and feasible for a wide variety of procedures including cholecystectomy, appendectomy, nephrectomy, and hemicolectomy.⁵⁻⁹ In

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addition, it has been used successfully in a wide variety of benign and malignant gynecologic conditions.^{10–19} Moreover, it has been shown in a case series that LESS for benign adnexal disease is feasible in patients with or without previous surgery.¹¹ Some of the previously mentioned studies confirmed that LESS is associated with better cosmetic results, a decreased hospital stay after surgery, and a decreased need for postoperative pain medication compared with conventional laparoscopy. However, the use of LESS technology for the treatment of endometriomas has not been previously reported.

The objective of our study is to compare our initial experience in performing laparoscopic surgery for the treatment of ovarian endometriomas through an umbilical incision using a single 3-channel port versus traditional laparoscopy.

MATERIALS AND METHODS

This retrospective study was approved by our respective institutional review boards. It was performed at the University Hospitals/Cleveland Clinic, in Cleveland, Ohio, and the Greater Baltimore Medical Center in Baltimore, Maryland. Women who underwent surgical intervention by LESS or conventional operative laparoscopy for ovarian endometriomas between September 2009 and September 2011 were included. The decision to use LESS or conventional operative laparoscopy was made according to the preference of the attending gynecologist. For LESS, all surgical steps were performed through a transumbilical single port with or without insertion of additional ports or any extraumbilical instruments.

Surgical Technique

After induction of general anesthesia and endotracheal intubation, patient positioning in Allen stirrups, and insertion of a Foley catheter and an orogastric tube, abdominal access was gained by a modified open Hasson technique with a vertical 1.8- to 2.0-cm infraumbilical incision. The rectus fascia was sharply incised, and a single-access multichannel port (Covidien, Mansfield, Massachusetts) was inserted in the peritoneal cavity. Pneumoperitoneum was attained with the pressure set at 15 to 20 mm Hg. A 5-mm, 0° lens laparoscope with a flexible tip (EndoEYE; Olympus Surgical, Orangeburg, New York) or a 30° bariatric-length rigid laparoscope was used. Articulating graspers (Covidien) were helpful in providing efficient retraction to optimize surgical exposure.

Pelvic side wall adhesions were released from the lateral pelvic wall with laparoscopic endoshears. Lysis of peri-

ovarian adhesions was performed in a similar fashion when needed. The ureters were identified at the pelvic brim and followed toward the true pelvis in all cases. In 3 of 10 patients (30%) in the LESS group and 5 of 14 patients (36%) in the conventional laparoscopy group, the pelvic side wall peritoneum was opened and the ureter was identified and isolated along the medial leaflet of the peritoneum. Subsequently, the deep infiltrating lesions were dissected and excised. In 5 of 15 patients (33%) in the LESS group and 8 of 21 patients (38%) in the conventional laparoscopy group, the deep infiltrating lesions in the cul-de-sac were dissected and excised.

In 1 patient in the LESS group and 3 patients in the conventional group, the cul-de-sac was obliterated; consequently, sharp dissection of the cul-de-sac was performed with scissors while a sponge stick was distending the rectum to create the pouch of Douglas. We confirmed that the rectum was intact by performing an underwater leak test. Endometriotic lesions implanted on the bladder surface were also removed in a similar fashion in 1 patient in the LESS group and 2 patients in the conventional group. Superficial lesions were cauterized in both groups.

Endometriomas were unilateral in all but 1 patient in the LESS group and 3 patients in the conventional group. Ovarian cystectomy was started by grasping the utero-ovarian ligament to stabilize the ovary. The antimesenteric border of the ovary was then incised using the endoshears (**Figure 1**). Subsequently, the cyst wall was identified, and bidirectional dissection of the surrounding ovarian cortex was performed using a combination of blunt and sharp techniques, traction and countertraction, and electrocoagulation. The endometriomas ruptured during dissection in virtually all patients in both groups. Once the endometrioma was excised, the bed was carefully inspected and bleeding areas were secured with cautery. The cyst bed was left open for spontaneous healing. Of note, we needed an additional 5-mm right or left lower quadrant port to complete the extensive dissection in 10 of 24 patients (41.6%) in the LESS group, including all patients with lateral pelvic side wall dissection and cul-de-sac dissection, as well as 1 patient with bilateral endometriomas.

The excised peritoneal tissue and endometriomas were placed in 5- to 12-mm Endo-catch bags and removed through the multichannel port after detachment of all the trocars from the abdomen. At the end of all the procedures, we closed the fascia of the umbilical incision with No. 0 Vicryl (Ethicon, Somerville, New Jersey) in a running fashion and then closed the skin of the umbilicus

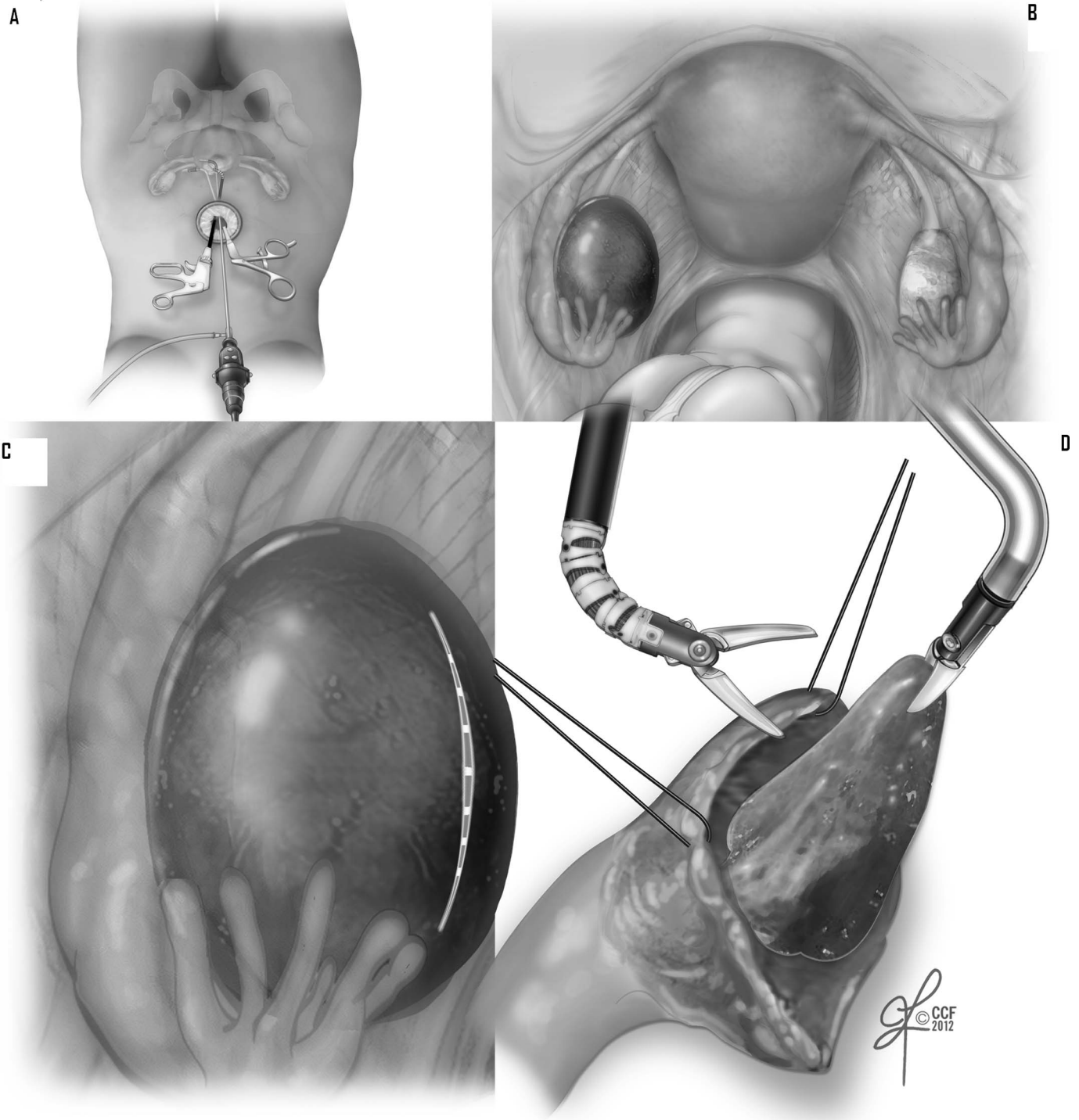


Figure 1. Laparoendoscopic single-site resection of endometrioma. (A) Outside view showing orientation of instruments. (B) Left-sided ovarian endometrioma. (C) Initial incision on mesenteric border of ovary. (D) Combined blunt and sharp dissection of cyst wall.

with No. 4–0 Vicryl in a subcuticular fashion. All incisions were injected with 0.5% Marcaine at the end of the case.

In the conventional laparoscopy group, three 5-mm ports were used in all cases: 1 umbilical port for the laparoscope and 2 accessory ports in the right and left lower quadrant as per the usual technique. A third port was inserted on the right of the left side as needed.²⁰ Patients in both groups underwent at least 1 postoperative visit 6 to 12 weeks after surgery and at least 1 additional postoperative visit 6 months after surgery. The incidence of postoperative umbilical complications in the LESS group including hernia formation and incisional cellulitis was recorded. Other perioperative and latent complications were also recorded.

Statistical Analysis

Patient demographic and clinical characteristics were compared between LESS cases and conventional laparoscopy cases by use of either the χ^2 test for frequency data or nonparametric Mann-Whitney *U* test. Surgical outcomes were compared between groups in a similar fashion.

RESULTS

All cases were performed successfully without conversion to laparotomy. However, an additional 5-mm port was inserted in the right or left lower quadrant in the LESS group to allow the use of a third instrument for additional

tissue retraction or manipulation in 10 of 24 patients (41.6%). Similarly, a third 5-mm trocar was used in the conventional laparoscopy group when needed (13 of 28 patients, 46%). Patients in the LESS group were significantly older ($P = .04$) and heavier ($P = .005$) than patients in the conventional laparoscopy group (**Table 1**). However, both groups were comparable regarding race and history of abdominal surgery. After we controlled for age and body mass index, the size of the resected endometriomas and amount of operative blood loss were comparable in both groups. More importantly, the duration of surgery was comparable for both techniques. Both groups were also comparable regarding lateral pelvic side wall involvement and cul-de-sac involvement. However, adhesiolysis was performed more frequently in the conventional laparoscopy group ($P < .001$). The duration of hospital stay was <24 hours in both groups. No intraoperative complications occurred. All incisions healed with no complications. Follow-up for up to 6 months after surgery showed unremarkable findings in all cases. The umbilical incision healed well in all patients. No incisional complications, including incisional hernias or wound complications, were encountered in either group.

DISCUSSION

This study shows that the LESS approach using specially designed instruments can be successfully used to treat

Table 1.
Characteristics and Surgical Outcomes of Treatment Groups

	Conventional (n = 28)	LESS (n = 24)	<i>P</i> Value ^a
Age [median (minimum-maximum)] (y)	33.5 (19–45)	28.5 (13–41)	.040
BMI ^b [median (minimum-maximum)]	24.4 (17.6–64.2)	29.0 (22.3–42.0)	.005
Race			.865
White	21 (75%)	19 (79.2%)	
African American	5 (17.8%)	3 (12.5%)	
Other	2 (7.2%)	2 (8.3%)	
Prior laparoscopic surgery	3 (10.7%)	1 (4.2%)	.612
Procedure time [median (minimum-maximum)] (min)	95.0 (27–167)	82.0 (23–192)	.214
Lysis of adhesions	23 (82.1%)	4 (16.7%)	<.001
Estimated blood loss [median (minimum-maximum)] (mL)	25.0 (5–200)	37.5 (0–300)	.479
Largest endometrioma size [median (minimum-maximum)] (cm)	6.8 (2–11)	5.8 (2–9)	.340
Cul-de-sac involvement	21 (75%)	15 (62.5%)	.378
Lateral pelvic side wall involvement	14 (50%)	10 (41.7%)	.588

^aMann-Whitney *U* test or χ^2 test for frequency data.

^bBMI = body mass index.

endometriomas in appropriately selected cases. The operative time and blood loss for this single-port series were similar to a matched series treated laparoscopically. The lack of complications and the need to convert to traditional laparotomy in this study is consistent with the complication rate for traditional laparoscopy. However, in patients with associated cul-de-sac disease, lateral pelvic side wall disease, or bilateral endometriomas, it may be necessary to use 1 additional side port.

Overall, minimally invasive approaches have been shown to be safe and associated with a shorter hospital stay, reduced postoperative pain, speedier recovery, and reduced surgical wound morbidity compared with open surgery.^{21–23} LESS technology is a recent modification of laparoscopic surgery that has several potential merits. One of the benefits that has been shown in several studies including a randomized controlled trial is significantly less postoperative pain compared with conventional laparoscopy. This is particularly important in endometrioma patients whose most common presentation is chronic pelvic pain.^{24,25} However, Hoyer-Sorensen et al,²⁶ in a randomized trial comparing LESS with conventional laparoscopy, recently reported similar postoperative pain perception in both groups, with more shoulder pain in the LESS group. This was also shown in a retrospective case-control study.²⁷ A potential benefit of the LESS approach is the ability to retrieve specimens after cystectomy through the umbilical incision even without the use of endobags.

LESS has been attempted for a wide variety of indications in gynecologic surgery. Fagotti et al²⁸ showed the feasibility of LESS enucleation of large ovarian cysts with ovarian sparing. Similarly, Escobar et al²⁹ showed that LESS is feasible and safe for the performance of risk-reducing salpingo-oophorectomy in women with a *BRCA* gene mutation. These results were substantiated by a recent study that concluded that LESS for benign adnexal disease is feasible and safe compared with traditional laparoscopy.²⁰ Moreover, the long-term outcome—the risk of umbilical hernia—was found to be low (2.4%) and was lower (0.5%) in patients without significant comorbidities.³⁰

All the previously mentioned studies addressed benign adnexal pathology excluding endometriosis. One patient with endometriosis in the study by Escobar et al¹¹ required an additional port to aid in the dissection of the lateral pelvic side wall. In our study a side port was required in 41.6% of patients. This could be explained by the adhesive and deeply infiltrating nature of the disease. In addition, surgical dissection of endometriomas and dissection of ovarian cysts require ergonomically challenging move-

ments of the surgical instruments. This is not ideally offered by the currently available instruments for LESS.

Although this study is the first to compare the LESS approach with conventional laparoscopy in the treatment of ovarian endometriomas, our study is limited by its retrospective nature. In addition, the surgical approach was based on the discretion of the surgeon.

In conclusion, the LESS technique is a reasonable initial approach for the treatment of endometriomas. In our experience, an additional side port is usually needed to treat pelvic side wall and cul-de-sac endometriosis that often accompanies endometriomas. Therefore reduced-port laparoscopy may be more feasible for the performance of ovarian cystectomy and resection of endometriomas, particularly when gonadal preservation is attempted or deeply infiltrating endometriosis is evident.

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