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Single-access laparoscopic approach in the surgical treatment of endometrial cancer: A single-institution experience and review of literature

Giacomo Corrado, Giuseppe Cutillo, Giulia Pomati,[1] Emanuela Mancini, Ermelinda Baiocco, Lodovico Patrizi,[1] Maria Saltari,[1] Francesco Barletta,[2] Fabiola Patani,[1] and Enrico Vizza

Department of Surgical Oncology, Gynecologic Oncology Unit, "Regina Elena" National Cancer Institute, Rome, Italy

[1]Department of Surgery, Section of Gynaecology and Obstetrics, Tor Vergata University, Rome, Italy

[2]Department of Surgery, Gynecology and Obstetrics Unit, San Giovanni Hospital, Rome, Italy

Address for Correspondence: Dr. Giacomo Corrado, Department of Surgical Oncology, Gynecologic Oncology Unit, National Cancer Institute "Regina Elena" - IFO, Via Elio Chianesi 53 - 00144, Rome, Italy. E-mail: giacomo.corrado@alice.it

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Abstract

BACKGROUND:

The aim of this study was to assess the surgical and oncological outcome for the management of endometrial cancer (EC) by laparoendoscopic single-site surgery (LESS).

PATIENTS AND METHODS:

We performed a retrospective chart review of patients who underwent a LESS for EC. All the patients were treated by the same surgical team between July 2009 and June 2013 at the Gynaecologic Oncologic Unit, Regina Elena National Cancer Institute, Rome, Italy.

RESULTS:

A total of 50 women were included, with a median age of 45 years (range, 39-84 years) and a median body mass index (BMI) of 21.8 kg/m^2 (range, 19-48 kg/m^2). Median operative time was 100 min (range, 50-240 min), median blood loss was 90 mL (range, 10-300 mL) and median hospital stay was 3 days (range, 2-9 days). The median number of pelvic lymph nodes retrieved was 14 (range, 5-20). No intraoperative complications occurred, but there were 4 postoperative complications. Two patients required a laparoscopic conversion. The median follow-up was 36 months (range, 16-62 months) and no recurrence occurred.

CONCLUSION:

Our report showed that the LESS approach in the treatment of early EC can be a safe and reliable technique in terms of surgical and oncological outcomes.

Keywords: Endometrial cancer (EC), laparoendoscopic single-site surgery (LESS), minimally invasive surgery

INTRODUCTION

Over the last few decades, minimally invasive surgery has been widely applied, particularly in gynaecology, where laparoscopic surgery has assumed an increasingly central role. Data regarding minimally invasive surgery have shown more benefits compared to abdominal surgery in terms of surgical outcomes, cost, quality of life, reduced morbidity, shorter hospital stay and a rapid return to daily activities.[1] Moreover, recent advances in laparoscopic instruments and techniques have allowed completion of a great number of complex surgical procedures including in gynaecologic oncology surgery.

Recently, the laparoscopic approach has been revised and laparoendoscopic single-site surgery (LESS) has been introduced. The term 'single-site' describes the use of a single small skin incision instead of the multiple accesses created in conventional laparoscopy.[2] The LESS port is a multichannel port that allows the insertion of up to three instruments.

According to many authors, reducing number of ports on the abdominal wall may improve the cosmetic results and decrease postoperative pain and complications such as hernias, infection and nerve injuries.[3] The first application of LESS was a tubal sterilisation in 1969,[4] while the first hysterectomy with salpingo-oophorectomy was performed in 1991.[5] Thereafter, LESS became effective, safe and feasible for performing complex surgical procedures in gynaecology and urology and in abdominal surgery.[6,7,8,9,10]

The aim of this study was to assess the surgical and oncological outcome in the management of endometrial cancer (EC) by LESS.

PATIENTS AND METHODS

Study design and data collection

All patients diagnosed with clinical International Federation of Gynecology and Obstetrics (FIGO) stage I–II EC, both endometrioid and non-endometrioid, and confirmed at the definitive histological examination, who underwent LESS were included.

Before surgery, all patients underwent a clinical and instrumental evaluation, including taking medical history, undergoing a physical examination, a vaginal-pelvic examination, a chest x-ray, an ultrasound scan and pelvic magnetic resonance imaging scan. An intraoperative histological examination was required during all the surgeries and a pelvic lymphadenectomy was performed only when risk factors (myometrial invasion more than 50%, high grading and non-endometrioid histotype) were detected. Para-aortic lymphadenectomy is not routinely performed unless pelvic lymph nodes are confirmed to have metastatic disease on frozen section evaluation in order to determine the field of postoperative radiation.

Informed consent for LESS was obtained from all patients in accordance with local and international legislation (Declaration of Helsinki).[11] All data were collected independently from an internal review board.

Patient characteristics were recorded, including age, body mass index (BMI), histotype, FIGO stage,[12] grading and prior abdominal surgery. Subsequently, the intraoperative parameters were recorded: Median skin incision, operative time, blood loss, transfusions, conversion rate and intraoperative complications. Operative time was calculated from the first skin incision to wound closure. Blood loss was evaluated by the difference in the total amounts of suction and irrigation fluids.

Postoperative parameters included early postoperative complications (in the first 30 days after surgery) and later postoperative complications (more than 30 days after surgery), type of adjuvant therapy (radiotherapy and/or chemotherapy), median follow-up in months, recurrence, time to recurrence and median follow-up.

Postoperative pain assessment was performed in all patients using a validated numeric rate score (NRS) and scored from 0 to 10 (0 = No pain and 10 = Agonising pain). NRS was recorded at regular intervals: T0

(end of surgery), T1 (after 1 h), T2 (after 6 h), T3 (after 12 h), every 24 h starting from the second postoperative day. Analgesic therapy with tramadol 100 mg plus ketorolac 60 mg by continuous infusion for the first 24 h after the end of surgery was administered. Paracetamol 1,000 mg was administered only on the patient's demand.

Adjuvant therapy was tailored to the pathologic findings at primary operation after multidisciplinary tumour board (gynaecologic oncology, pathology, radiation oncology, medical oncology) discussion. Treatment was based on the results of prospective randomised clinical trials and National Comprehensive Cancer Network Guidelines.[13] Follow-up was performed every 3-4 months with physical and gynaecological examination for the first 2 years, and then with a 6-month interval until 5 years.

Surgical technique

The patient was positioned in the dorsal lithotomic Trendelenburg position, with both legs supported by straps. No uterus manipulator devices were used, but the cervix was closed with a modified tenaculum called simple nebs arising incision landmark (SNAIL®, SNAIL is obtained by the modification of an instrument named Uterine Tenaculum Forceps, model Schroder, code 32-622-25 of Martin catalogue. Currently the SNAIL was patented but not yet marketed).[14] A medical-grade silicone balloon, named colpo-pneumo occluder (Cooper Surgical®, CooperSurgical, Inc., 95 Corporate Drive, Trumbull, CT 06611, USA) was also emplaced in the vagina in order to preserve an adequate pneumoperitoneum during colpotomy. By, using the Hasson technique, it was possible to place the Single-Incision Laparoscopic Surgery (SILS) port (Covidien®, 710 Medtronic Parkway, Minneapolis, USA) through a 2-2.5 cm umbilical incision [Figure 1a]. The SILS port is a multichannel port that allows the insertion of up to three instruments. After emplacing the CO_2 insufflation through one of the three available channels, it was possible to introduce a 5-wmm trocar for the insertion of a 30-degree laparoscope. In the remaining two channels, two 5-mm trocars were placed for the introduction of additional instruments, such as as Roticulator Endo Dissect or Mini-Shears or Grasp-All 5 mm (Covidien®) [Figure 1b]. A careful inspection of the entire abdominal cavity was performed as the first surgical step in order to identify any suspicious peritoneal lesions that would exclude the patient from having the procedure completed by LESS. After cauterising the fallopian tubes, the right round ligament was sectioned, entering into the retro-peritoneal space. Then, the ureter and uterine artery were visualised and adnexal resection was performed. Subsequently, vescicouterine, vascicovaginal and rectovaginal spaces were developed. In this way, it was possible to cauterise the uterine vessels. Finally, a sufficient margin of vagina was exposed, allowing its section. All patients underwent type A or B1 hysterectomy plus salpingo-oophorectomy (Querleu–Morrow classification).[15] In the end, the uterus and adnexa were extracted through the vagina and the vaginal cuff was sutured through the vagina, while the site of introduction of the port was closed and the fascia of the rectus muscles sutured using Vicryl 1/0 (Ethicon Endo Surgery, Somerville NJ). Pelvic lymphadenectomy was performed based on frozen section analysis according to the technique of Escobar *et al*.[16]

RESULTS

Between July 2009 and June 2013, 50 women underwent laparoendoscopic single-site hysterectomy with or without pelvic lymphadenectomy for the treatment of EC at the Gynecological Oncology Unit at the Regina Elena National Cancer Institute, Rome, Italy. Table 1 shows the clinical characteristics of the study population. Median age was 45 years (range, 39-84 years) and median BMI was 21.8 kg/m^2 (range, 19-48 kg/m^2). In 15 patients (29.7%), previous abdominal surgical procedures were found.

Table 2 shows the surgical characteristics of the study population. Port placement, taking a median time of 1.5 min (range, 1-3 min), was successfully performed in all cases without accidental port removal. Median operative time was 100 min (range, 50-240 min) and median blood loss was 90 mL (range, 10-300 mL). Pelvic lymphadenectomy was performed in 6 patients, and the median numbers of pelvic lymph nodes retrieved was 14 (range, 5-20). No metastatic disease was identified in pelvic lymph nodes. No intraoperative complications occurred, but there were 4 postoperative complications: A vaginal cuff dehiscence, an umbilical wound infection and a lymphorrhoea and bladder fistula with the vagina in the same patient who underwent hysterectomy plus pelvic lymphadenectomy on the 13th postoperative day. All

procedures were successfully completed but there were 2 patients who required a laparoscopic conversion due to extensive adhesions from previous surgery. Median hospital stay was 3 days (range, 2-9 days).

It was strongly influenced by the prolonged hospital stay of a patient who had a length of stay of 9 days due to an umbilical wound infection. In fact, without this patient, the median length of stay was 2 days. All patients had a good cosmetic result [Figure 2] and postoperative pain control. Regarding this last point, the median NRS at T0 was 3.5 (range, 1-5), at T1 was 2 (range, 1-4), at T2 was 1.5 (range, 1-3), and at T3 and during patient discharge was 0.5 (range, 0-1).

Adjuvant therapy was performed in 10 patients [Table 3]: 9 patients underwent to radiotherapy (6 patients FIGO stage IB G3 and 3 FIGO stage II) and only 1 underwent radio-chemotherapy (FIGO stage IIIA). The median follow-up was 36 months (range, 16-62 months) and only 1 patient died due to the occurrence of a new cancer after 11 months from surgery.

DISCUSSION

Our report shows that LESS could be a safe and reliable technique in terms of surgical and oncological outcomes in patients with EC.

During the last decade, minimally invasive surgery has been widely introduced in the management of the gynaecological malignant disease. Even though the role of LESS in gynaecological oncology is well established, it is in constant development. In particular, over the last few years, published studies have shown the excellent application of the LESS in the treatment of early-stage EC. Our results are similar to those reported in the literature, except for a few aspects. We reported a lower median operative time but slightly greater blood loss. Undoubtedly, any previous abdominal surgery could limit the application and render the performance of this surgery difficult. Moreover, surgery in our cases was performed by a surgeon with extensive skill and experience in laparoscopic surgery, which makes the application of LESS easier.

In a review of literature on laparoendoscopic single-site hysterectomy with or without pelvic lymphadenectomy for the treatment of EC between 2009 and 2014, 432 cases were included. [17,18,19,20,21,22,23,24,25,26,27,28] The operating time was 35-342 min, blood loss was 0-700 mL, pelvic and para-aortic lymph nodes removed were 2-43 and 2-28, respectively, while hospital stay was 1-6 days. The number of conversions reported was 21 (4.8%), with intraoperative and postoperative complications of 22 (5%) and 14 (3.2%), respectively [Table 4].

Fagotti *et al*.[24] reported the widest series of early EC treated with LESS described in the literature. Among the 100 cases, total hysterectomy and bilateral salpingo-oopherectomy were performed, while pelvic and para-aortic lymphadenectomy in 48 and 27 patients, respectively. The median number of pelvic and para-aortic lymph nodes was 16 and 7, respectively, similar to those reported in studies utilising traditional laparoscopy. Two patients undergoing lymphadenectomy required conversion, and 4 intraoperative and 4 postoperative complications occurred overall. Overall, LESS entailed good results in terms of surgical outcomes, postoperative pain and cosmetics. Moreover, operative time seemed to decrease with surgeon's experience, increasing the number of performed surgeries. Furthermore, Escobar *et al*. in 2010[16] described single-port laparoscopic pelvic and para-aortic lymphadenectomy in 21 patients. The median number of pelvic and para-aortic lymph nodes retrieved was 14 and 6, respectively, and all procedures were successfully completed with only one conversion to traditional laparoscopy.

In literature, oncological outcomes are not often investigated, and we actually report a higher median follow-up. In fact, with a median follow-up of 36 months (range, 16-62 months), we had only 1 patient die due to the occurrence of a new cancer 11 months after surgery. Our oncological outcome results suggest that LESS in EC is generally a safe approach.

Given the important role of minimally invasive surgery in gynaecological surgery, several studies have compared the perioperative outcomes of LESS with other, different minimally invasive techniques. Escobar *et al*.[21] compared LESS, conventional laparoscopic and robotic surgery in the treatment of EC, but no differences were found in terms of operative time, blood loss, hospital stay and complication rates.

Subsequently, another study compared LESS and robotic surgery,[23] showing that LESS had a shorter operative time (122 min vs 175 min) and lower blood loss (50 mL vs 80 mL) than robotic surgery. Furthermore, a case-control study[26] compared SILS (38 patients) and robotic single-port surgery (19 patients), showing no clinical relevant differences. In 2012, Fanfani *et al*.,[22,25] compared LESS and mini-laparoscopic surgery in a series of patients, including cases with malignant disease, and did not find any significant differences in terms of surgical outcomes except for operative time, which was longer in LESS groups.

LESS is widely applied in gynaecological surgery with the same absolute contraindications of conventional laparoscopy: Metastatic disease, heart or pulmonary disease, and severe abdominal adhesions. Moreover, the surgeon should have advanced skills in laparoscopic and single-port surgery. Obesity and previous abdominal surgery should no longer be considered absolute limits in the performance of LESS. One of the most important technical challenges is the instrument crowding due to the restricted space available to make necessary movements. This problem can be overcome by crossing the instruments or utilising the gel point. Indeed, this device allows placing the instruments in the desired angulations. The lack of triangulation is another important problem that can be easily overcome by applying articulating and flexible instruments or curved instruments. However, extensive experience in laparoscopic surgery might be enough to overcome the challenges in single-port surgery.

The latest innovation in minimally invasive surgery is the introduction of the robotic system da Vinci (Intuitive Surgical Inc®, 1266 Kifer Road, Building 101 Sunnyvale, CA).[29] The combination of robot and single port offers new advantages as well as in allowing many challenges to be overcome in single-port surgery. Despite being an expensive surgical technique, robotic surgery improves the triangulation of instruments and it has a shorter learning curve. The robotic single port could be a promising new surgical approach, including in morbidly obese women. In a recent study,[30] robotic surgery was confirmed to be a good surgical approach in the treatment of EC in obese women. The application of the da Vinci robotic system in gynaecological surgery may make single-site surgery feasible and safe for many including morbidly obese women.

CONCLUSION

In conclusion, LESS is a safe and feasible surgical approach in the treatment of EC. Moreover, LESS improves surgical outcomes and cosmetic results and reduces postoperative pain. Further studies are needed to define the long-term outcomes, the disease-free survival and overall survival. Robotic single-port surgery is a potential area of development, but it is still not clear whether the benefits of robotic surgery will justify the high costs of this new approach.

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Nil.

Conflicts of Interest

The authors report no conflicts of interest. The authors are responsible for the content and writing of the paper.

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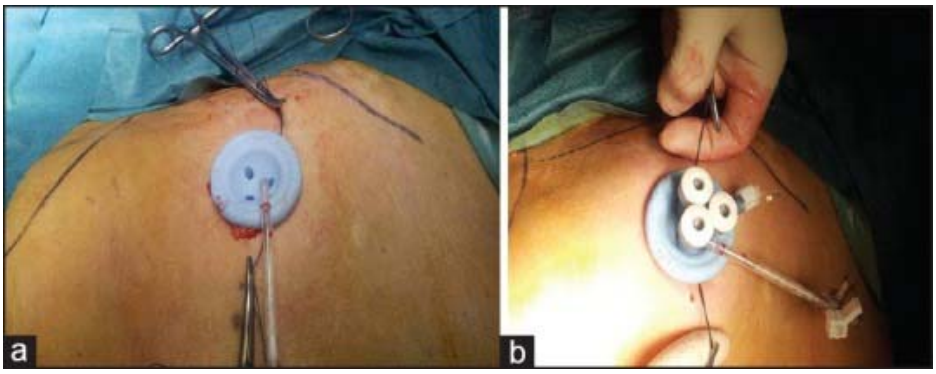
Figures and Tables

Figure 1



(a) LESS device inserted into the umbilicus (b) LESS device with three 5-mm trocars

Table 1

Clinical characteristics

Characteristics	Patients (*N* = 50)
Median age (years)	45 (39-84)
Median BMI (kg/m²)	21.8 (19-48)
Previous abdominal surgery (%)	29.7
Histology	
Adenocarcinoma	49
Clear cell	1
Class of surgery	
Class A	46
Class B_1	4
FIGO stage	
IA	35
IB	11
II	3
IIIA	1
Grading	
G1	18
G2	26
G3	6

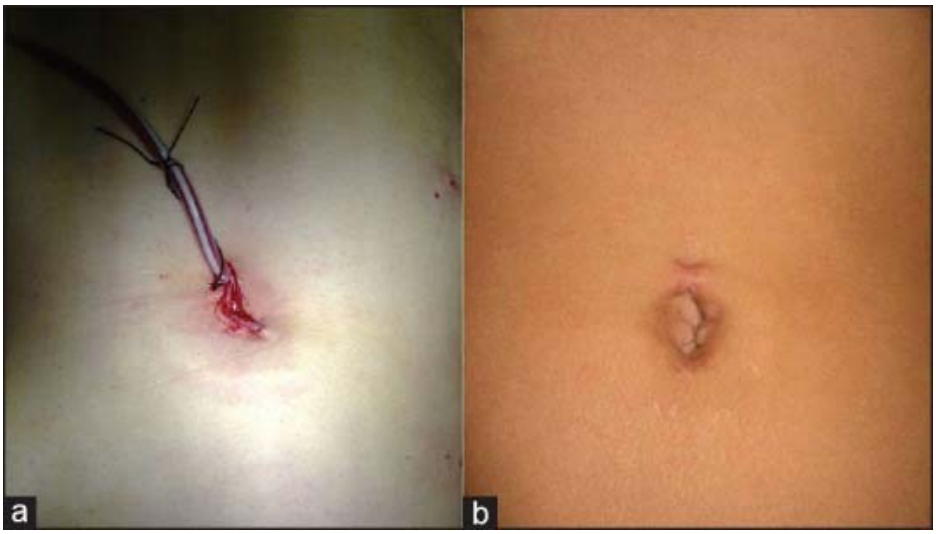
BMI: Body mass index

Table 2

Surgical outcomes

Characteristics	Patients (*N* = 50)
Median skin and fascial incision (cm)	2.2 (2.00-2.5)
Median time positioning port (min)	1.5 (1-3)
Median operative time (min)	100 (50-240)
Median blood loss (mL)	90 (10-300)
Median pelvic lymph nodes (*n*)	14 (5-20)
Major intraoperative complications	0
Major postoperative complications	4
Blood transfusion	0
Conversion to laparotomy	0
Conversion to laparoscopy	2
Re-operation	0
Median hospital stay (days)	3 (2-9)

Figure 2



(a) Umbilical appearance at the end of surgery (b) Umbilical appearance 6 months after surgery

Table 3

Oncological outcomes

Adjuvant therapy	Patients (*N* = 50)
None	40
Radiotherapy	9
Radiotherapy+chemotherapy	1
Median follow-up (month)	36 (16-62)
NED	49
AWD	0
DOD	0
DOOD	1

NED: No evidence of disease, AWD: Alive with disease, DOD: Dead of disease, DOOD: Dead of other disease

Table 4

Literature review of LESS procedure in only EC

Authors	Year	Type of study	N° paz	FIGO stage	Median OT (min)	Median EBL (mL)	IC	PC	Median HS (days)	CR	Median lymph nodes (*n*)	Oncological outcomes (FU months)
Fader[17]	2009	R	1	IB	105 (35-175)	NR	0	0	1	0	NR	NR
Fader[18]	2010	R	15	IA-IB	132	100 (10-500)	0	1	1 (0-6)	3	9 (2-7)	NR
Escobar[16]	2010	P	14	IA-IB	120 (60-185)	0-100	0	0	NR	1	PL=14 (7-19) PAO=6 (2-14)	NR
Boruta[19]	2011	R	5	IA-IB	243 (197-289)	50 (25-100)	0	0	1 (1-2)	0	PL=14 (10-43) PAO=13 (7-20)	NR
Fanfani[20]	2012	P	20	IA	105 (85-185)	20 (10-180)	0	0	1 (1-2)	0	NR	NR
Escobar[21]	2012	R	30	I-II	155 (56-210)	100 (70-200)	1	0	1,2 (0-3)	1	PL=16 (11-21) PAO=11 (1-12)	NR
Fanfani[22]	2012	R	16	IA-IB	105 (75-125)	30 (10-80)	1	0	1 (1-3)	1	NR	NR
Fagotti[23]	2012	R	75	IA-IIIC1	122 (45-220)	50 (10-500)	3	3	1 (1-4)	3	PL=17 (10-20)	NR
Fagotti[24]	2012	R	100	I-III	129 (45-321)	70 (10-500)	4	4	1 (1-4)	2	PL=16 (1-33) PAO=7 (2-28)	NR
Fanfani[25]	2013	P	13	IA-IB	120 (55-165)	30 (10-200)	0	0	2 (2-4)	2	NR	NR
Fagotti[26]	2013	R	38	I-II	107 (40-140)	30 (10-300)	0	0	NR	0	NR	NR
Park[27]	2014	P	37	IA-IB	183 +/−50	194+/−149	1	0	5 +/−1.8	0	PL=24.6 +/−0.49 PAO=4.9+/−2.5	NR
Fanfani[28]	2014	R	68	IA-IB	115 (48-342)	50 (0-700)	12	6	2 (0-6)	8	15 (8-18)	NR
Our study	2015	R	50	I-IIIA	100 (50-240)	90 (10-300)	0	4	3 (2-9)	2	14 (5-20)	49 NED (36)

R: Retrospective, P: Prospective, OT: Operative time, EBL: Hematic blood loss, PL: Pelvic lymph nodes, PAO: Para-aortic lymph nodes, BOT: Borderline ovarian tumour, IC: Intraoperative complications, PC: Postoperative complications, NR: No reported