Single-Port Laparoscopic Management of Endometriosis

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Mohamed A. Bedaiwy and Leticia Cox

Endometriosis is a chronic gynecologic condition that often presents in patients during the reproductive years with complaints of pelvic pain or infertility or both. Diagnosis has been made easier as a result of the growing use of laparoscopy. The exact pathogenesis is not known. Surgical management is indicated in women who suffer severe disease and do not do well on medical therapy, the objective being to ablate all visible disease. There are currently four primary surgical options: laparotomy, laparoscopy, robotic-assisted laparoscopy, and laparoendoscopic single-port surgery (LESS). Laparoendoscopic single-port surgery is associated with better cosmetic results, shorter hospital stay, and less postoperative pain. This technique is reviewed here.

M.A. Bedaiwy, MD, PhD (✉)
Department of Obstetrics and Gynaecology,
The University of British Columbia,
D415A, 4500 Oak Street,
Vancouver, BC V6H 3V4, Canada
e-mail: bedaiwymmm@yahoo.com,
mohamed.bedaiwy@cw.bc.ca

L. Cox, MD
Department of Obstetrics and Gynecology,
University Hospitals Case Medical Center,
Case Western Reserve University,
Cleveland, OH 44106, USA
e-mail: leticia.cox@uhhospitals.org

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12.1 Introduction

Endometriosis is a chronic gynecologic condition defined by heterotopic implantation of endometrial glands and stroma [1]. Patients often present during the reproductive years with complaints of pelvic pain and infertility or both. The diagnosis requires direct visualization of endometriotic spots, and therefore laparoscopy or laparotomy is indicated for definitive diagnosis. Although the incidence appears to have increased in recent years, this is likely a reflection of the diagnosis having been made easier by the growing use of laparoscopy. Currently, the incidence is estimated to be 5–15 % of laparotomies and laparoscopies, 30 % in women with longstanding pelvic pain and 40 % in women with infertility [1]. The exact pathogenic mechanisms leading to this condition are not entirely clear. Proposed mechanisms include retrograde menstruation, lymphatic and vascular spread, mesothelial metaplasia, genetic predisposition, immunologic factors, and hormonal influences.

Endometriosis is usually pelvic in location, involving the left hemipelvis and ovary more commonly than the right. Endometriosis sites are summarized in Table 12.1. This is thought to be a result of the restriction of peritoneal fluid movement by the left-sided sigmoid colon. A cystic collection of endometriosis in the ovary is referred to as an endometrioma or chocolate cyst. Other commonly affected pelvic sites include the posterior cul-de-sac, the peritoneum, the uterovesical pouch, and the uterosacral round and broad ligaments. Less commonly the cervix, vagina, and vulva are involved. The rectosigmoid is involved in up to 15 % of cases, while the urinary tract is involved in 10 % of cases with small superficial bladder involvement being the most common. The topographic distribution of endometriosis is best assessed by the American Society for Reproductive Medicine (ASRM) classification despite its limitations (Fig. 12.1). To felicitate a standardized approach to examine the pelvis in endometriosis patients, it was recently proposed that the pelvis could be topographically divided into two midline zones (Zone I & II) and two paired (right and left) lateral zones (Zone III & IV). Zone I is the area between the two round ligaments from their origin at the uterine cornua to their insertion in the deep inguinal rings. Zone II is the area between the two uterosacral ligaments from their origin from the back of the uterus to their insertions in the sacrum posteriorly. Zone III is the area between the uterosacral ligament inferiorly and the entire length of the fallopian tube and the infundibulopelvic ligament superiorly. Zone IV is the triangular area lateral to the fallopian tube and the infundibulopelvic ligament and medial to the external iliac vessels up to the round ligament (Fig. 12.2) [2].

Table 12.1 Potential sites of endometriosis

Genital pelvic sites	Extragenital pelvic sites	Rare locations
Ovaries	Sigmoid colon	Umbilicus
Rectovaginal septum	Rectum	Small bowel
Anteroposterior cul-de-sac	Appendix	Lungs
Broad ligament	Bladder	Kidney
Cervix		Cesarean section/episiotomy scar
Vagina		Sciatic nerve
Fallopian tubes		Arms
		Nasal mucosa
		Spinal column
		Liver

Fig. 12.1 (**a, b**) American Society for Reproductive Medicine Endometriosis Classification assigned points according to the severity of endometriosis on the basis of size and depth of implants and severity of adhesions. Stage I (1–5 points): minimal disease; Stage II (6–15 points): mild disease; Stage III (16–40 points): moderate disease; Stage IV (>40 points): severe disease

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THE AMERICAN FERTILITY SOCIETY REVISED CLASSIFICATION OF ENDOMETRIOSIS

Patient's Name _____ Date _____

Stage I (Minimal) - 1-5
Stage II (Mild) - 6-15
Stage III (Moderate) - 16-40
Stage IV (Severe) - >40
Total _____

Laparoscopy _____ Laparotomy _____ Photography _____
Recommended Treatment _____
_____
Prognosis _____

PERITONEUM	ENDOMETRIOSIS	<1cm	1-5cm	>5cm
	Superficial	1	2	4
	Deep	2	4	6
OVARY	R Superficial	1	2	4
	Deep	4	16	20
	L Superficial	1	2	4
	Deep	4	16	20

POSTERIOR CULDESAC OBLITERATION	Partial	Complete
	4	40

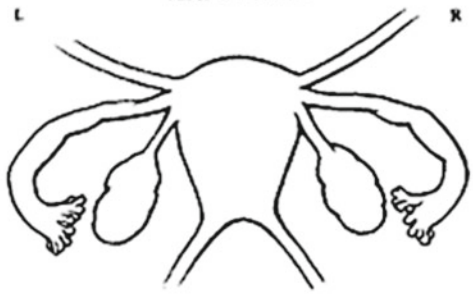
OVARY	ADHESIONS	<1/3 Enclosure	1/3-2/3 Enclosure	>2/3 Enclosure
	R Filmy	1	2	4
	Dense	4	8	16
	L Filmy	1	2	4
	Dense	4	8	16
TUBE	R Filmy	1	2	4
	Dense	4*	8*	16
	L Filmy	1	2	4
	Dense	4*	8*	16

*If the fimbriated end of the fallopian tube is completely enclosed, change the point assignment to 16.

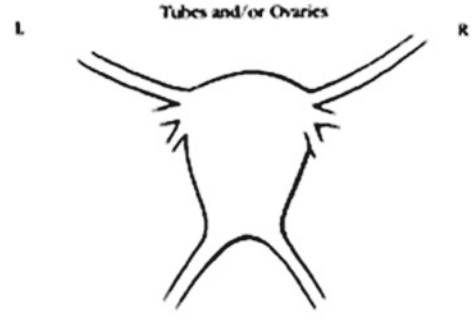
Additional Endometriosis: _____

Associated Pathology: _____

To Be Used with Normal Tubes and Ovaries



To Be Used with Abnormal Tubes and/or Ovaries



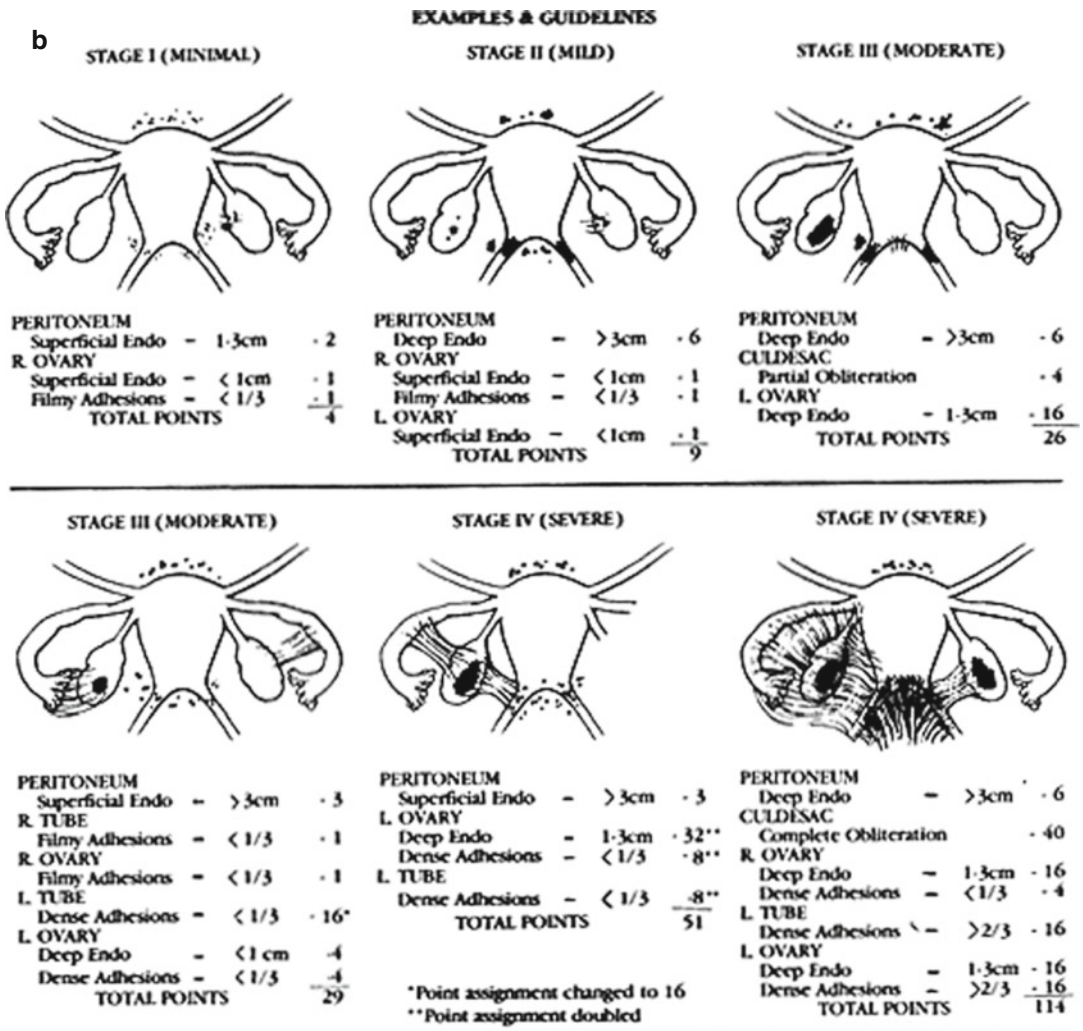


Fig. 12.1 (continued)

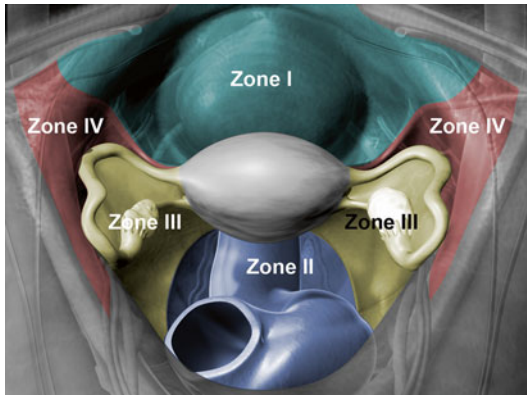


Fig. 12.2 A color-coded illustration of the anatomical boundaries and the contents of all pelvic zones. Zone I: Midline anterior abdominal cavity limited by the round ligaments bilaterally. Zone II: Midline posterior zone of the abdominal cavity limited by the uterosacral ligaments bilaterally. Zone III: Lateral pelvic side walls limited by the uterosacral ligament and the adnexae and infundibulopelvic ligamentsone IV: Pelvic side wall limited by the round ligament, adnexae and infundibular ligament, and external iliac vessels

12.2 Surgical Management of Endometriosis

Surgery may be indicated in women who suffer severe disease, do not respond to medical therapy, or desire fertility. The indications for surgical intervention are summarized in Table 12.2. Endometriosis can be challenging to manage surgically because of the peculiarities of the disease. Because it is adhesive, widespread, infiltrative, and recurrent, the objective of surgical management is to safely resect or ablate all visible disease. To date there are four primary surgical options. Traditional laparotomy is associated with longer recovery and hospital stay but may be necessary for advanced disease with extensive adhesions or involvement of the ureter, bladder, uterine arteries, and/or bowel. Laparoscopy is an alternative minimally invasive approach that has been shown to be equally effective in resecting endometriomas. Robotic-assisted laparoscopy is another new modality that has been reported.

Most recently, laparoendoscopic single-port surgery (LESS) has emerged as a minimally invasive approach. Compared to traditional laparoscopy, it is associated with better cosmetic results, a shorter hospital stay, and less postoperative pain. It has been used extensively for a wide variety of gynecologic indications. More recently, LESS was used in an attempt to treat endometriosis requiring a single incision [3–6].

Table 12.2 Indications for surgical management of endometriosis

Severe incapacitating symptoms with significant functional impairment
Advanced disease with distortion of pelvic organs
Failure of expectant or medical management
Noncompliance with or intolerance to medical treatment
Endometriosis emergencies
Ruptured or torsed endometrioma
Obstructive uropathy
Bowel obstruction

12.3 LESS Technique for Endometriosis Resection

The LESS technique for the surgical resection of endometriosis was described by Bedaiwy and coworkers [7]. Briefly, after induction of general anesthesia and endotracheal intubation, the patient is placed in Allen stirrups, a Foley catheter and an orogastric tube are inserted, and abdominal access is attained using a modified open Hasson technique with a vertical 1.8–2.0 cm infraumbilical incision. The rectus fascia is sharply incised, and a single access multichannel SILS port (Covidien, Mansfield, MA) is inserted in the peritoneal cavity. Pneumoperitoneum was attained with the pressure set at 15–20 mmHg. A 5-mm, 0° lens laparoscope with a flexible tip—the Endoeye (Olympus Surgical, Orangeburg, NY)—or a 30° bariatric length rigid scope is used. Articulating graspers (Covidien, Mansfield, MA) are helpful in providing efficient retraction to optimize surgical exposure.

Pelvic side wall adhesions are released from the lateral pelvic wall using laparoscopic endoshears. Lysis of periovarian adhesions is performed in a similar fashion when needed. The ureters are identified at the pelvic brim and followed toward the true pelvis. The pelvic side wall peritoneum is opened, and the ureter is identified and isolated along the medial leaflet of the peritoneum. Subsequently, the deep infiltrating lesions are dissected and excised. Similarly, the deep infiltrating lesions in the cul-de-sac are dissected and excised.

If the cul-de-sac is obliterated, its sharp dissection with scissors while a sponge stick is distending the rectum creates the pouch of Douglas. The rectum is confirmed to be intact by performing an underwater leak test. Endometriosis implanted on the bladder surface is also removed in a similar fashion.

Endometriomas, whether unilateral or bilateral, are managed following the principle of excision of the cyst wall in its entirety. Ovarian cystectomy is started by grasping the utero-ovarian ligament to stabilize the ovary. The antimesenteric border of the ovary is then incised using endoshears (Fig. 12.3). Subsequently, the cyst wall is identified and bidirectional dissection of the surrounding ovarian cortex is completed using a combination of blunt and sharp technique, traction and countertraction, and electrocoagulation. Endometriomas usually rupture during dissection in virtually all patients. Once the endometrioma is excised, the bed is then carefully inspected, and bleeding areas are secured with a cautery. The cyst bed is left open for spontaneous healing.

The excised peritoneal tissue/endometrioma is placed in 5–12 mm Endo Catch (Covidien) bags and removed through the multichannel port after detaching all the trocars from the abdomen. At the end of all procedures, the fascia of the umbilical incision is closed with 0 Vicryl absorbable sutures (polyglactin 910; Ethicon Inc., Somerville, NJ) in a running fashion and then the skin of the umbilicus is closed with 4–0 Vicryl absorbable sutures in a subcuticular fashion. All incisions are injected with 0.5 % bupivacaine hydrochloride at the end of the procedure.

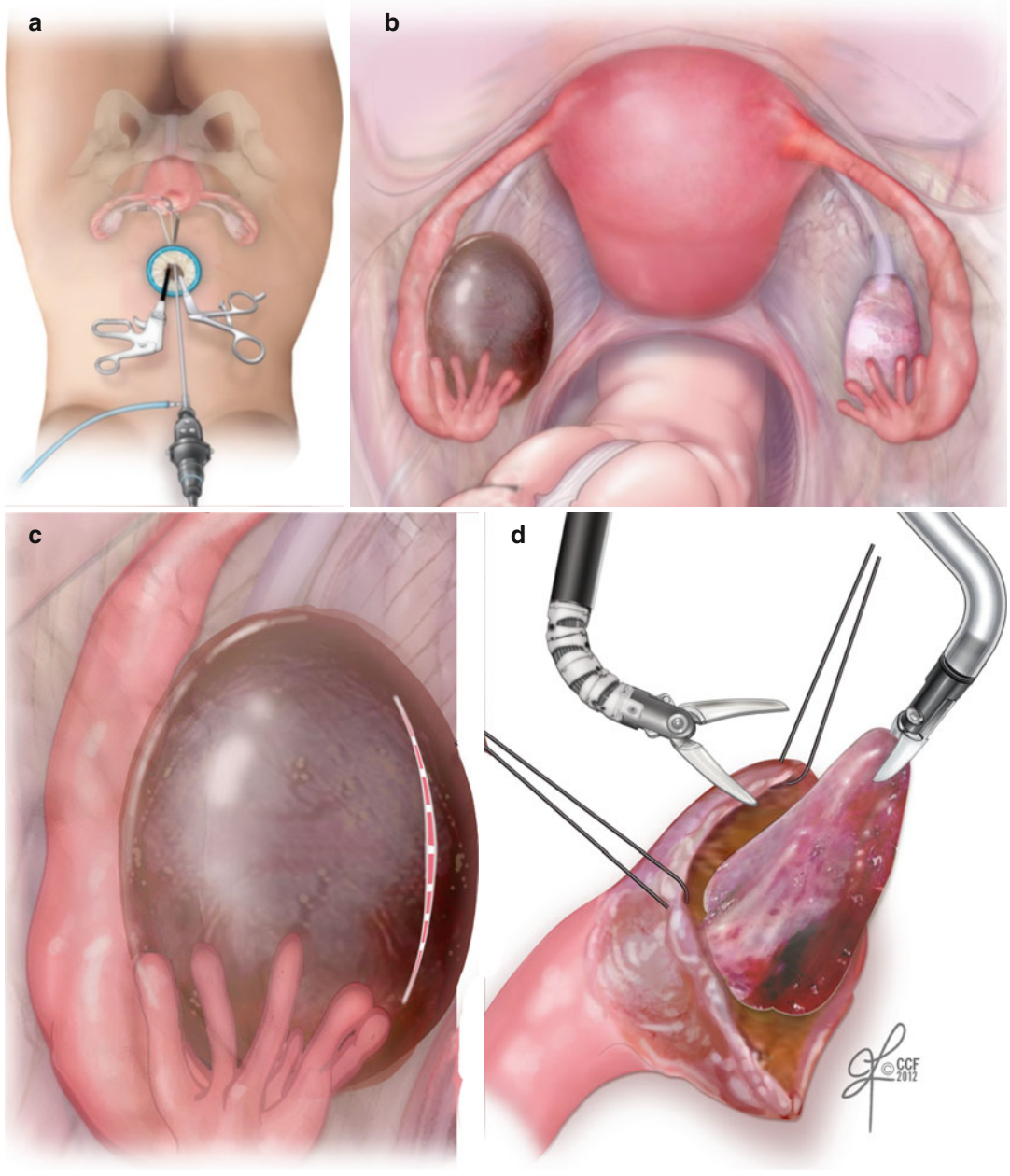


Fig. 12.3 Laparoendoscopic single-site resection of endometriomas. (**a**) An outside view showing the orientation of the instruments. (**b**) Left-sided ovarian endometrioma. (**c**) The initial incision on the mesenteric border of the ovary. (**d**) The combined blunt and sharp dissection of the cyst wall

12.4 The Outcome of LESS Technique for Endometriosis Resection

Data about the use of LESS for the management of endometriosis are limited. In a retrospective study Bedaiwy and colleagues demonstrated that LESS is a feasible initial surgical approach to treating unilateral endometriomas [7]. This study, however, did highlight a need to use an additional side port in 41 % of patients, particularly those with cul-de-sac disease, lateral pelvic side wall disease, or bilateral endometriomas. This could be explained by the adhesive and the deep infiltrating nature of the disease. In addition, surgical dissection of endometriosis and dissection of ovarian cysts require ergonomically challenging movements of surgical instruments. This is not offered by the currently available instruments for LESS.

When compared to conventional laparoscopy, this study [7] showed that the operative time and blood loss for this single-port series was similar to those of a matched series treated laparoscopically.

Overall, minimally invasive approaches have been shown to be safe and associated with shorter hospital stays, reduced postoperative pain, speedy recovery, and reduced surgical wound morbidity compared to open surgery [8–10]. The 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 one randomized, controlled trial, is significantly less postoperative pain compared to conventional laparoscopy. This is particularly important in endometrioma patients, whose most common presentation is chronic pelvic pain [5, 6], However, in a recent randomized trial comparing LESS with conventional laparoscopy, Hoyer-Sorensen and colleagues reported similar postoperative pain perception in both groups, with more shoulder pain in the LESS group [11]. This was also shown in a retrospective control study [12]. A potential benefit of the LESS approach is the ability to retrieve specimens after cystectomy via the umbilical incision even without the use of Endo Catch.

Conclusion

Currently, the LESS technique for surgical management of endometriosis should be considered experimental. It 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 endometriosis, particularly when gonadal preservation is attempted or deeply infiltrating endometriosis is evident. The benefit of LESS surgery in endometriosis should be substantiated in a prospective randomized controlled trial.

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