



## Applying single-incision laparoscopic surgery to gyn practice: What's involved

➔ New instrumentation and strategies have alleviated some of the challenges of performing laparoscopy through a single abdominal incision for a range of gynecologic procedures

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The benefits of minimally invasive surgery—including less pain, faster recovery, and improved cosmesis—are well known.<sup>1,2</sup> Standard laparotomy has been replaced by multiple-port operative laparoscopy for a great array of procedures, and advances in medical technology allow for a minimally invasive surgical approach even when a surgeon is faced with complex pathology.

Single-port laparoscopic surgery (SPLS) represents the latest advance in minimally invasive surgery. Using flexible endoscopes and articulating instruments, the surgeon can complete complex procedures through a single 2-cm incision in the abdomen. The incision is usually placed in

the umbilicus, where it is easily hidden.<sup>3-8</sup>

Since the first laparoscopic hysterectomy through a single incision was performed 20 years ago, SPLS has been used successfully to perform nephrectomy, prostatectomy, hemicolectomy, cholecystectomy, splenectomy, intussusception reduction, gastrostomy tube placement, thoracoscopic lung biopsy, thoracoscopic decortication, and appendectomy.<sup>4-7</sup>

In gynecology, SPLS has been used to perform oophorectomy, salpingectomy, bilateral tubal ligation, ovarian cystectomy, surgical treatment of ectopic pregnancy, and both total and partial hysterectomy.<sup>7-11</sup> At least two recent studies have concluded that SPLS is an acceptable way to treat many benign and malignant gynecologic conditions that are currently treated using multiport laparoscopy.<sup>3,11</sup>

This article outlines our approach to SPLS in the gynecologic patient and provides an overview of instrumentation, with the aim of allowing you to consider whether this approach might be feasible in your surgical practice, at your institution.

### Unique setup required

When SPLS is performed through the umbilicus, the instruments must be held closer

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*Dr. Atkin and Dr. Bhavsar report no financial relationships relevant to this article. Dr. Nimaroff serves as a speaker for Covidien and Olympus.*

to the midline and more cephalad than during conventional laparoscopy to permit adequate visualization and manipulation. For this reason, the surgeon needs to assume a position higher over the torso and thorax of the patient, and both of the patient's arms need to be tucked. Place the patient in a dorsal lithotomy position with a uterine manipulator in place to facilitate surgery—even when the uterus will be preserved and surgery involves only the adnexae.

With appropriate equipment and positioning, visualization and manipulation of anatomy are comparable to those of standard multiport laparoscopy.

### New instruments simplify SPLS

Innovative surgical instruments allow for appropriate hand positioning outside the abdomen and minimize the internal collision of instruments brought through a single midline incision (FIGURE 1). A variety of single-port options are available, each with a unique patented design and method of insertion. In fact, the development of ports with multiple instrument channels has revolutionized SPLS.

Before true single ports became available, it was necessary to place three 5-mm low-profile trocars in the fascia at three separate sites through a single skin incision. Pneumoperitoneum was established with a Veress needle, but the fascial incisions gradually merged with repeated cannula manipulation, producing air leaks.

Today, multiple-channel ports are placed using an open technique into a single skin and fascial incision. Trocars and instruments of varying size can be exchanged with ease without jeopardizing pneumoperitoneum.

Among the options:

- the SILS Port (Covidien) – a soft, flexible, three-channel port that allows for placement of blunt trocars ranging in size from 5 mm to 12 mm (FIGURE 2)
- the TriPort (Olympus America) – two flexible rings joined by a sleeve and multiple-channel port (FIGURE 3, page 30)
- GelPOINT Advanced Access Platform

**FIGURE 1** Setup



Desired triangulation of instruments in SPLS setup.

(Applied Medical) – a system constructed of synthetic gel material and consisting of a “GelSeal” cap, cannulas, and seals to accommodate 5-mm to 10-mm instrumentation (FIGURE 4, page 30).

We have found that all three devices allow for good range of motion while maintaining pneumoperitoneum.

(A recent article from Korea reports an inventive technique to perform single-incision laparoscopy using standard instrumentation: The authors fitted a self-retaining ring retractor with a surgical glove that had three of the fingers cut off and replaced by trocars.<sup>12</sup>)

**FIGURE 2** SILS Port



The SILS Port is a soft, flexible, three-channel port that allows for placement of blunt trocars ranging in size from 5 mm to 12 mm.

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**In SPLS, the surgeon needs to assume a position higher over the torso and thorax of the patient than in conventional laparoscopy, and both of the patient's arms need to be tucked**

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**FIGURE 3** TriPort



The TriPort system comprises two flexible rings joined by a sleeve and multiple-channel port.

### A flexible laparoscope improves visualization

The ability to visualize the operative field is vital to any surgery, including SPLS. Use of a flexible laparoscope facilitates uncompromised visualization of the entire pelvis (FIGURE 5). Outside the abdomen, the flexible camera can be held laterally and away from the midline to help reduce the clashing of instruments and hands.

If a flexible laparoscope is not available, a rigid 30-degree or 45-degree angled scope can be used, although visualization may be limited and adequate triangulation of instruments may be difficult to achieve.

**FIGURE 4** GelPOINT



The GelPOINT Advanced Access Platform is constructed of synthetic gel material and accommodates 5-mm to 10-mm instrumentation.

When using a rigid laparoscope, a light cord that inserts into the back of the camera is necessary; otherwise, a 90-degree light cord adapter can be purchased.

### Design enhancements facilitate coordination of instruments

One of the disadvantages of SPLS has been the restriction of movement that arises because of the close proximity of instruments and instrument handles. The latest designs have made articulation possible for tissue graspers, scissors, vessel sealers, and scopes.<sup>9,10</sup> The value of articulation is apparent inside the abdomen, where it allows perfect positioning of the area of dissection. Outside the abdomen, the handles can be arranged in an angled pattern to allow the surgeon and assistant to operate comfortably (FIGURE 1).

In a four-handed procedure, one hand is on the camera, one on the uterine manipulator, and the remaining two hands operate the articulating grasper, vessel sealer, or needle driver, depending on the task.

Standard straight instruments can also be used for portions of the procedure.

Dissection and hemostasis are achieved in a manner similar to that of conventional laparoscopy. Our instrument of choice is

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**FIGURE 5** Flexible-tip laparoscope

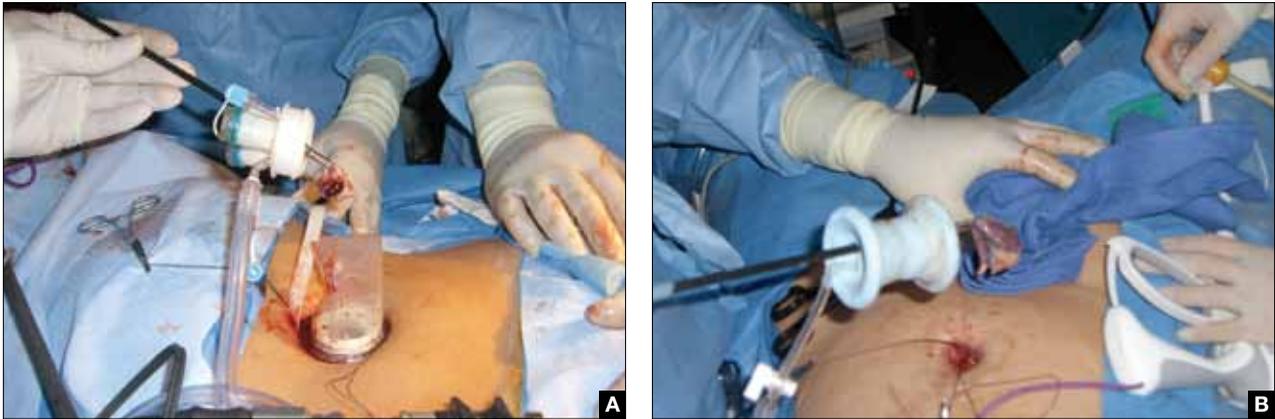


A flexible-tip laparoscope ensures good visualization of the surgical field.

FIGURE 4 image courtesy © 2011 Applied Medical Resources. All rights reserved.

### FAST TRACK

Use of a flexible laparoscope in SPLS facilitates uncompromised visualization of the entire pelvis

**FIGURE 6** Single-incision oophorectomy

An ovary and tube removed through a single incision using the A) TriPort and B) SILS Port systems.

an enhanced bipolar instrument, although harmonic and traditional bipolar energy can be used as well, depending on the preference of the surgeon.

The latest instruments are designed to dissect, cauterize, and cut, thereby decreasing the number of instrument exchanges necessary.

### With the right aids, suturing can be simplified

Suturing through a single port can be a challenge. When possible, closure of the vaginal cuff following a total laparoscopic or laparoscopic-assisted vaginal hysterectomy should be performed from below. When endoscopic suturing is required, standard suturing using both intracorporeal and extracorporeal methods is possible.

Suturing aids such as the Endo Stitch (Covidien) or Lapra-Ty (Ethicon) are helpful. One author recommends Quill bidirectional, self-retaining suture with barbs (Angiotech) to avoid the need for knot-tying.<sup>6</sup> (For more on self-retaining suture, see “Barbed suture, now in the toolbox of minimally invasive gynecology,” by Jon I. Einarsson, MD, MPH, and James A. Greenberg, MD, in the September 2009 issue at [obgmanagement.com](http://obgmanagement.com).)

The MiniLap (Stryker) is a 2.3-mm grasper that is inserted percutaneously directly through the abdominal wall without

an incision. It can be used to set the needle on the needle driver or manipulate tissue while suturing. The resulting skin incision is barely visible and does not require closure.

### Options are varied for specimen removal

Small specimens can be removed directly through a single-port system that has been opened, or they can be extracted after the system is removed, with rapid desufflation (FIGURE 6).

Compared with conventional laparoscopy, the larger incision associated with single-port surgery facilitates specimen removal. Larger or potentially malignant specimens can be placed into an EndoCatch bag (Covidien) inserted through the single-incision 10-mm cannula (FIGURE 7, page 36).

In total laparoscopic hysterectomy or laparoscopic-assisted vaginal hysterectomy, the uterus is removed through the vagina. In supracervical hysterectomy, a small uterus can be removed through the cul-de-sac or directly through the single incision after placement in a bag.

When morcellation is required, the instrument can be placed through the cul-de-sac, cervix, or a single port. The morcellator can be placed directly through the SPLS port while utilizing the flexible scope in an angled direction (looking back toward the

### FAST TRACK

**When possible, closure of the vaginal cuff following total laparoscopic or laparoscopic-assisted vaginal hysterectomy should be performed from below**



**FIGURE 7** Specimen removal



In this case, the specimen was placed in a 10-mm EndoCatch bag and removed through the 10-mm cannula of the SILS Port.

morcellator) for complete visualization (note: Covidien does not recommend this usage).

Transcervical tissue morcellation has also been described. In this approach, the cervix is dilated once the uterine body has been amputated, and the tissue morcellator is inserted through the cervix while the surgeon maintains visualization from above.<sup>6,13</sup>

### How to master the technique

Many patients desire SPLS for its superior cosmetic outcome, but the approach may not always be appropriate. Depending on the procedure and characteristics of the patient (TABLE), multiple-port laparoscopy may be a better option. When a surgeon first attempts SPLS, we recommend that it be limited to the treatment of adnexal pathology only.

By using the techniques described in this article and selecting patients carefully,

### In your early SPLS cases, look for these patient characteristics

- Low body mass index
- No history of abdominal or pelvic surgery
- Adnexal surgery
- Uterine size smaller than 12 weeks

the surgeon can develop expertise in SPLS.<sup>11,14</sup> During the learning process, the use of additional ports or Mini-Lap instruments (Stryker) can reduce the challenges of more difficult procedures and should be considered without reservation, as should the use of articulating accessory instruments and flexible or angled laparoscopes.

Although the clinical benefits of SPLS have yet to be determined, the cosmetic advantage of a single, hidden, umbilical incision likely increases patient satisfaction.

Clearly, the goal of SPLS is to use technology in a way that offers all of the benefits of traditional multiport laparoscopy without any of the limitations. Further study is required to determine whether SPLS meets this standard and, more important, whether it has any advantages over conventional techniques.

### References

1. Medeiros LR, Rosa DD, Bozzerri MC, et al. Laparoscopy versus laparotomy for benign ovarian tumour. *Cochrane Database Syst Rev.* 2009;(2):CD004751.
2. Chapron C, Fauconnier A, Goffinet F, Breart G, Dubuisson JB. Laparoscopic surgery is not inherently dangerous for patients presenting with benign gynecological pathology. Results of a metaanalysis. *Hum Reprod.* 2002;17(5):1334-1342.
3. Fader AN, Escobar PF. Laparoendoscopic single-site surgery (LESS) in gynecologic oncology: technique and initial report. *Gynecol Oncol.* 2009;114(2):157-161.
4. Pelosi MA, Pelosi MA 3rd. Laparoscopic hysterectomy with bilateral salpingo-oophorectomy using a single umbilical puncture. *N J Med.* 1991;88(1):721-726.
5. Curcillo PG, King SA, Podolsky ER, Rottman SJ. Single port access (SPA) minimal access surgery through a single incision. *Surg Technol Int.* 2009;18:19-25.
6. Romanelli JR, Earle DB. Single-port laparoscopic surgery: an overview. *Surg Endosc.* 2009;23(7):1419-1427.
7. Ponsky TA. Single port laparoscopic cholecystectomy in adults and children: tools and techniques. *J Am Coll Surg.* 2009;209(5):e1-6.
8. Kim YW. Single port transumbilical myomectomy and ovarian cystectomy. *J Minim Invasive Gynecol.* 2009;16(6 suppl):S74.
9. Ghezzi F, Cromi A, Fasola M, Bolis P. One-trocar salpingectomy for the treatment of tubal pregnancy: a "marionette-like" technique. *BJOG.* 2005;112(10):1417-1419.
10. Lim MC, Kim TJ, Kang S, Bae DS, Park SY, Seo SS. Embryonic natural orifice transumbilical endoscopic surgery (E-NOTES) for adnexal tumors. *Surg Endosc.* 2009;23(11):2445-2449.
11. Escobar PF, Starks DC, Fader AN, et al. Single-port risk-reducing salpingo-oophorectomy with and without hysterectomy: surgical outcomes and learning curve analysis. *Gynecol Oncol.* 2010;119(1):43-47.
12. Jeon HG, Jeong W, Oh CK, et al. Initial experience with 50 laparoendoscopic single site surgeries using a homemade, single port device at a single center. *J Urol.* 2010;183(5):1866-1871.
13. Yoon G, Kim TJ, Lee YY, et al. Single port access subtotal hysterectomy with transcervical morcellation: a pilot study. *J Minim Invasive Gynecol.* 2010;17(1):78-81.
14. Ghomi A, Littman P, Prasad A, et al. Assessing the learning curve for laparoscopic supracervical hysterectomy. *JLS.* 2007;11(2):190-194.



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