Cosmetic Surgery—Use of 3mm Ports and Reduced-Port Techniques for Gynecologic Surgery

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INTRODUCTION

As laparoscopy replaces open surgery as the preferred treatment in most patients across disciplines, skin cosmesis has become a focus of innovation for surgeons. With advances made in laparoscopy, patients are more frequently requesting a minimally invasive approach and aspiring to a cosmetic result following surgery. During the late 20th century, laparoscopic surgery was heralded for its reduction in operative trauma, both via small incisions as well as potential for gentler tissue handling mediated by smaller instruments. The next step in decreasing the invasiveness of laparoscopy is by decreasing the number and size of operating ports and instruments while maintaining patient care. Advances in fiberoptic technology, as well as instrument dexterity and proficiency, has allowed surgeons to use smaller caliber instruments and improved light sources. This has, in turn, resulted in minimized tissue trauma, wound complications, postoperative scarring, and improved cosmesis.1

Opinions regarding cosmesis vary. A study by Goebel demonstrated that the majority of patients may prefer a minilaparotomy to laparoscopy.2 Furthermore, patients may prefer not to have
robustive surgery secondary to incision-site appearance in spite of the comparative improvement in time to discharge, decrease in opiate medications, and decreased time to work.3,4 To achieve improved cosmetic appearance, laparoscopy has moved toward smaller incisions via mini-laparoscopy as well as single-site robotics and laparoscopy and vaginal natural orifice transluminal endoscopic surgery (vNOTES).

The benefits of decreased port size would theoretically lead to decreased incision-related morbidity (specifically postoperative hernia formation, port-site bleeding, and infection). Additionally, a smaller port site may be associated with decreased pain, thought to be secondary to an attenuated stress response to surgery. Patient selection is a critical component of performing cosmetic laparoscopy as a patient’s previous history may denote that they require additional port sites. Examples include patients with severe endometriosis or enlarged fibroid uterus. A physician’s lack of comfort with performing reduced-port laparoscopy and mini-laparoscopy, as well as the learning curve associated with mastering these techniques, does affect whether these cases are performed. Despite the data supporting the use of mini-laparoscopy, it has failed to become adopted into mainstream practice. Performance of laparoscopic surgeons has been shown to decrease when using early mini-laparoscopic instruments compared with traditional instruments.5 Furthermore, surgeons have less difficulty learning robotic skills than laparoscopic skills which may impact a surgeon’s willingness to master these techniques.5 The novelty of these approaches may be overcome by educating providers and ensuring surgical proctors are proficient in these procedures so they can supplement the surgeon’s skillset.

### SINGLE-PORT LAPAROSCOPY

Single-port laparoscopic surgery has been identified via various terminology, including “laproendoscopic single-site surgery” (LESS), “single-incision laparoscopic surgery” (SILS), and “embryonic natural-orifice transluminal endoscopic surgery”. Single-port laparoscopy involves development of a 2–3cm incision, usually at the umbilicus, in order to place a wound retraction device through which three or four ports are inserted. There are numerous methods for performing single-port laparoscopy, including use of a wound retractor and a surgical glove, versus use of a GelPOINT® Mini (Applied Medical Resources Corporation, Rancho Santa Margarita, California), an SILS™ port (Covidien, Mansfield, Massachusetts), TriPort (Advanced Surgical Concepts, Ltd., Bray, Ireland), AirSeal® ports (SurgiQuest, Inc., Orange, Connecticut) or an S-Portal® (Karl Storz, El Segundo, California). The use of a surgical glove is considered the most economic method, although it makes for difficult organ retrieval and can cause evacuation of pneumoperitoneum in case of a glove leak.

The difficulty of single-port laparoscopy lies in instrument crowding and difficulty with triangulating instruments. The instruments and scope must be moved in concert with each other to allow access to different parts of the abdomen. Five- or 10mm cameras are typically used for single-port laparoscopy, with bariatric instruments or bariatric scopes utilized to avoid crowding. An additional alternative is to employ a deflectable-tip ENDOEYE video laparoscope (Olympus America, Center Valley, Pennsylvania), although this is costly as it is not compatible with other video platforms. Salpingectomies, ovarian cystectomies, hysterectomies, and gynecologic malignancies have been resected via single-site laparoscopy.

Figure 1. Orientation of two 5mm ports through the umbilicus.
75 women randomized to traditional hysterectomy or mini-laparoscopy found no statistically significant differences in estimated blood loss (EBL), pain scores, or narcotic administration, and there was no statistically significant decrease in hemoglobin. An 18% decrease in cost associated with mini-laparoscopic cholecystectomies performed in the outpatient setting compared to their conventional laparoscopic counterparts demonstrated the cost efficacy of mini-laparoscopy. Furthermore, with decreased sized port sites, suturing of the skin is not required, eliminating foreign suture material. Steri-strips or a topic adhesive can be used to reapproximate the incisions, avoiding potential suture-related complications.

Current use of mini-laparoscopy instruments has been hindered by poor shaft strength and small end-effector size. Complaints regarding the difficulty of performing ideal tissue retraction are often related to the small end-size of instruments. This has been addressed through improvement in instrumentation ability and hardness. An additional alternative includes systems such as the Percuvance™ (Teleflex Inc, Wayne, Pennsylvania), which introduced a 2.9mm shaft with interchangeable 5mm end effectors, that can minimize abdominal wall trauma while allowing for 5mm traditional laparoscopic end-effect. The development of a 3mm scope with a high definition camera has allowed for improved visualization, no longer requiring a 5–10mm scope. Furthermore, the development of reusable ports and instruments within mini-laparoscopy confers improved ability to decrease cost (such as with the 2.7mm system from SLIMpac™ Mini–Laparoscopy system, Blue Endo, Overland Park, Kansas). Additional 3mm instruments include energy devices such as the 3mm bipolar RoB™ (Karl Storz, El Segundo, California) forceps, needle holders, knot pushers, and suction tubing.

A NOVEL TECHNIQUE FOR REDUCED PORT, COSMETIC BILATERAL SALPINGECTOMY

We have developed a novel method of performing a bilateral salpingectomy, utilizing two 5mm ports within the umbilicus as well as a 3mm suprapubic grasper. This technique can effectively provide a cosmetic result as the two 5mm port sites can be hidden within the umbilical folds upon closure and the 3mm suprapubic incision can be hidden within the patient’s pubic hairline. Ultimately, in the appropriate patient, this technique will yield an incisionless appearance, with a cosmetic surgical result under ideal circumstances.

We begin by creating a 5mm incision in the superior aspect of the umbilicus and introducing a 5mm port, through which we advance a 5mm 0-degree laparoscope. We then subsequently develop a 3mm incision in the inferior aspect of the umbilicus, through which we introduce our energy device, the articulating ENSEAL® (Ethicon, Inc., Bridgewater, New Jersey) device, and we visualize our entry through our inferior port (Fig. 1). We found the ENSEAL® device to be necessary to perform this technique in order to remain adjacent to the fallopian tube and ligate along the mesosalpinx, given its curved coaxial nature. We then advance a Weck® EFX Suture Passer (Teleflex Inc., Wayne Pennsylvania) (Fig. 2) through a suprapubic site; given that this is sharp in nature, it is able to create its own 3mm incision. When it becomes intracorporeal, the grasper portion of the suture passer can be opened and used to grasp the fimbriated portion of the fallopian tube. The ENSEAL® device is then articulated into the laterality of the tube currently being excised. The ENSEAL® can follow along the mesosalpinx inferior to the fallopian tube. The Weck® is rolled in a clockwise motion to effectively roll the fallopian tube around its shaft while continuing to provide the necessary traction to continue to excise the tube. Once at the medial portion of the isthmus, we can transect the tube with the ENSEAL® device and transect the fallopian tube with the ENSEAL® device and suture the mesosalpinx. The resulting cosmetic appearance is illustrated in Figures 3 and 4. This novel technique can provide a truly incisionless appearance.
then use a 5mm grasper through the superior umbilical 5mm port to remove the tube. The same procedure is followed on the contralateral side. Please see the adjoining video for greater detail as to how this procedure is performed.

There is a learning curve associated with utilization of two ports in such proximity to each other within the umbilicus. This technique is similar in nature to single-site laparoscopy, which requires triangulation of all instruments simultaneously. This involves moving the scope in concert with the ENSEAL® to allow the ENSEAL® to reach the pathology. According to the cost estimates for our hospital, the ENSEAL® is approximately $320–$355, two 5mm ports are $36, and a Weck® EFX Suture Passer is approximately $29. In total, the cost for the instrumentation is $420 at most. In addition to being a cosmetic alternative, this is also a cost-efficient approach, given that alternatives to this method would include at least one additional 5mm port (an additional $18) and a LigASure™ (MedTronic plc, Minneapolis, Minnesota) ($362–$546). Alternatives to the Weck® EFX Suture Passer include a Carter-Thomason® CloseSure System (CooperSurgical Inc., San Roman, California) ($164)—and the grasper portion of the suture passer is less durable than the Weck®—as well as a pediatric laparoscopic grasper. The pediatric laparoscopy instruments are more expensive, but unlike the Weck® and Carter-Thomason®, they are re-usable. An additional cosmetic means to performing a bilateral salpingectomy includes a single-site laparoscopic approach, which has been demonstrated through the use of a sterile glove in an economic approach or via the more costly GelPOINT® Mini ($375). Additionally, performing single-site laparoscopy requires a larger umbilical incision, which increases risk of wound complications, such as hernia formation or infection, and requires greater instrumentation for fascial closure. In contrast, our technique avoids this by creating two disparate 5mm incisions within the umbilicus, decreasing risk of wound-related complications and avoiding fascial closure. The cosmetic immediate postoperative results are demonstrated in Figure 3.

**Conclusion**

We aimed to demonstrate in this review that minimally invasive surgery is not limited to conventional laparoscopy or robotic-assisted laparoscopy but has now advanced to single-site laparoscopy and single-site robotic surgery, vaginal natural orifice transumbilical endoscopic surgery, and mini-laparoscopy. These techniques are not only as technically feasible as their mainstream counterparts, but they may also allow for lessened wound complications, similar or decreased cost, and improved cosmesis. As greater technological advances are made, it is reasonable for patients to desire improved cosmesis with maintained surgical quality and patient outcomes. In addition to our review of existing techniques, we also describe a novel, reduced-port cosmetic technique we have developed for performing bilateral salpingectomies, which can ultimately result in improved cosmesis. We argue that practitioners should employ these techniques in their practice given their equivocal clinical outcomes of conventional single port and microlaparoscopic cholecystectomy. [SLS 2013, 17(1): 30–45.]

**Authors’ Disclosures**

The authors have no conflicts of interest to disclose.