

# Single Incision Laparoscopic Ventral Hernia Repair

Curtis E. Bower, MD, Katie M. Love, MD

## ABSTRACT

**Background and Objectives:** Laparoscopic ventral hernia repair (LVH) requires several skin incisions for trocar placement. We have developed a single incision approach to LVH repair. The technique was introduced in clinical practice to any consenting patients who were candidates for a standard multi-port laparoscopic hernia repair. A consecutive series of patients was then followed to evaluate feasibility.

**Methods:** Over an 8-month period, 14 patients (9 females, 5 males) underwent LVH repair by an academic surgeon. One of 2 access methods was used in each patient through a single 1.5-cm to 2-cm skin incision. One technique utilized two 5-mm ports with a temporarily placed 11-mm port for mesh insertion. The second technique utilized the SILS port (Covidien, Norwalk, CT). Standard or roticulating laparoscopic instruments were used with both techniques.

**Results:** Range (mean) BMI: 23 to 59 (38), Age: 26 to 73 years (53), Duration: 37 to 87 minutes (57), Defect size: 1cm to 8cm (2), 3 with Swiss-cheese defect hernias. The procedure was successfully performed in all patients. No conversions to a multiple-port approach or to an open procedure were necessary. There were no mortalities, major complications, or recurrences during the mean follow-up period of 4 weeks.

**Conclusion:** Single incision ventral hernia repair is technically feasible, effective, and reproducible. The technique is easy to master, and safe for any patient who is a candidate for laparoscopic ventral hernia repair. Further

data collection with long-term follow-up will be needed to ensure equivalent outcomes. There will be demand for this approach by patients for cosmetic reasons, and it may serve as a bridge to natural orifice techniques.

**Key Words:** Ventral hernia, Laparoscopy.

## INTRODUCTION

Single access minimally invasive surgery (SAMIS) is quickly being adopted for many abdominal procedures across the United States. Common applications include laparoscopic cholecystectomy and laparoscopic appendectomy. Many other procedures are being performed using this technique as well, including laparoscopic adjustable gastric banding, partial colectomy, and fundoplication.<sup>1</sup> SAMIS can be defined as performing a standard laparoscopic procedure using a single small incision that can either have multiple ports placed through it (usually 2 to 4), or a specifically designed port that allows placement of multiple trocars or instruments directly through it while maintaining pneumoperitoneum. SAMIS is an umbrella term that describes the many different techniques used to perform these ultraminimally invasive operations. Typically, a transumbilical approach is used for these procedures, but not all techniques utilize such an incision.

During the development of our single access MIS program, we created a very simple and straightforward technique for performing single incision laparoscopic ventral hernia repairs. The technique is easily taught, easily learned, and uses the same instruments and ports already available for those that perform laparoscopic incisional hernia repairs. There are reports of inguinal hernia repairs using the single incision approach.<sup>2</sup>

## MATERIALS AND METHODS

### Patient Selection

The best patients on whom to learn this technique are patients with midline, relatively small- to moderate-sized defects. Umbilical or periumbilical hernias not amenable

East Carolina University Vein Clinic and Department of General and Minimally Invasive Surgery, East Carolina University Brody School of Medicine, Greenville, North Carolina, USA (Dr Bower).

Department of Surgery, East Carolina University Brody School of Medicine, Pitt County Memorial Hospital, Greenville, North Carolina, USA (Dr Love).

Curtis Bower, MD, is a proctor/preceptor for Covidien.

Address correspondence to: Curtis Bower, MD, ECU Department of Surgery, 600 Moye Blvd., Greenville, NC 27834, USA. Telephone: (252) 744-4251, E-mail: bowerc@ecu.edu

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to simple closure due to the size of the defect or for suspicion of multiple defects are ideal. Patients with Swiss-cheese type defects are also excellent candidates. Since adhesions are variable in reoperative laparoscopic exploration, prior surgical history is not a contraindication to this approach. Off-midline defects are approachable via contralateral access. Morbid obesity is not a contraindication, but certainly does make this procedure more difficult. For the first few experiences, a BMI of 35 or less would be prudent. Morbid obesity makes it difficult to place and use the SILS port, often requiring a larger incision. It also makes it more challenging to close the fascia at the port site. Patients with very large defects or who are not candidates for a standard multiport laparoscopic hernia repair should not be considered for this approach.

## Procedure

### Instrumentation

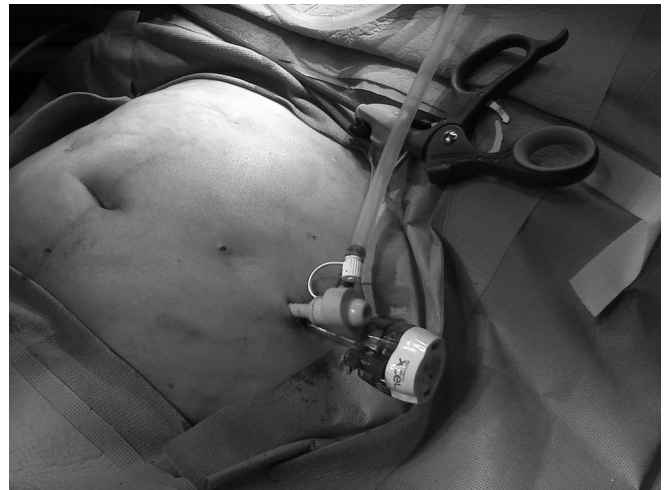
Standard straight instruments are used. If there is a significant amount of adhesiolysis to perform, a bipolar sealing device and roticulating graspers improve efficiency. A 5-mm laparoscope with a 30-degree angle works well. Flex tip scopes are helpful but not mandatory. Either a single access MIS multi-instrument port or standard 5-mm/11-mm ports are needed.

This SILS technique is identical to our standard approach, except for the use of a single incision that typically consists of one 11-mm port and one or two 5-mm ports, depending on the number of adhesions encountered.

Patients are placed supine with arms tucked. Foley catheter is not needed as these cases typically take less than an hour. A wide skin preparation is performed and the abdomen draped. We use a Veress needle in the left upper quadrant to insufflate the abdomen. The insufflation of the abdomen with the Veress needle facilitates the dissection through the muscle layers and makes gaining access to the peritoneal cavity easier. This step can certainly be omitted based on surgeon preference.

There are 2 options for access. One is to use a single access port. For our single port cases, we use the SILS port (Covidien, Norwalk CT), which requires a 2-cm transverse incision in the anterior axillary line on the abdomen. A muscle splitting technique is used to gain access to the peritoneum and the port is placed. Alternatively, a 2-port technique can be used, whereby an optical trocar with a zero-degree scope down the shaft is used to gain access to the abdomen. Once this port is placed, and upon visual inspection, the defect is confirmed amenable to repair by

this technique, the incision can be extended slightly to 18mm. A second, shorter/lower profile 5-mm port is placed adjacent to the first through a separate fascial defect (**Figure 1**). This technique requires one of the 5-mm ports to be exchanged for an 11-mm port for mesh introduction (**Figure 2**). On replacement of the 5-mm port, there can be an air leak, requiring placement of a towel clamp or other occlusive technique. An advantage we found with the SILS port is there are 3 working ports that can make adhesiolysis easier by allowing placement of a grasper and a dissector. In our experience, it also eliminated the gas leak created by the port exchange. The disadvantage of the SILS port is that it leaves a 2-cm fascial



**Figure 1.** Two-port SAMIS technique. Using a short port and a standard port reduces port conflict and clashing.

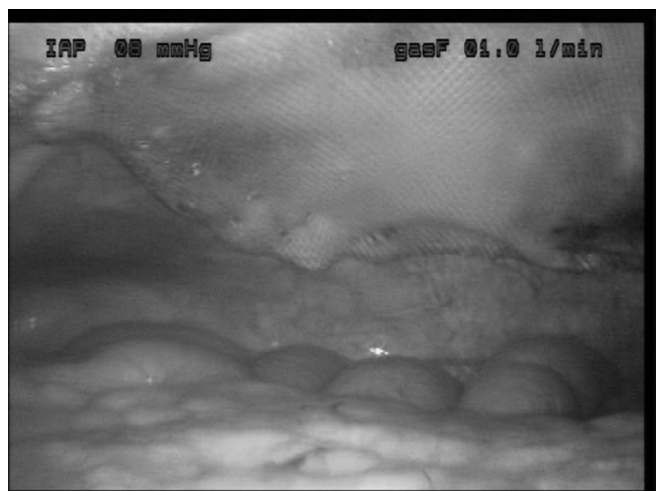


**Figure 2.** After exchanging a 5-mm port for an 11-mm, the mesh is inserted.

defect requiring closure, whereas the 2-port technique will not necessarily require fascial stitches if a dilating trocar is used. Cost of the port and a discussion of the advantages and disadvantages of the wide variety of ports currently on the market are beyond the scope of this description.

Once the ports are placed, the procedure continues in a standard fashion. Adhesiolysis is performed if necessary, and the hernia defect(s) are identified. Appropriate mesh is selected. Adequate overlap of the defect is defined as 5cm. The most common prosthetic we used was a 15x10-cm or 20x15-cm piece of coated polyester mesh (Parietex-Covidien, Norwalk, CT). These sizes only require 4 transfascial stay sutures. We have placed up to a 25-cm x 20-cm piece of mesh using this method. Once mesh is inserted, the pressure in the abdomen should be reduced to the lowest that can be tolerated, around 8mm Hg to 12mm Hg. A spinal needle helps to localize the ideal transfascial suture placement sites to center the mesh on the defect. A suture passer is then used to pull the suture through with the extracorporeal ends controlled by a clamp. Upward and outward traction is applied to this suture to stretch the mesh for placement of the next suture. The ipsilateral suture is placed last as it tends to be the most difficult one to access.

Once the transfascial sutures are secured, a row of absorbable tacks are placed every 1cm to 2cm to reinforce the perimeter of the mesh. Several tacks are placed around the hernia defect as well. These help keep the mesh secure against the abdominal wall to minimize seroma and to hasten incorporation (**Figure 3**). Once the mesh is secure, the abdomen is re-examined to make sure there



**Figure 3.** Internal view of mesh after placement.

were no injuries to any structures, then desufflated and the port(s) removed. The fascial defect is closed as needed. The skin is closed with suture and a skin adhesive. The transfascial suture sites are also closed with the skin adhesive.

Additional ports can be placed at any point as needed to complete the procedure. This makes the technique easy to adopt, since conversion to a multi-port technique is a quick and simple “bail-out.” It should also allow surgeons to be more aggressive in patient selection. The addition of ports should not be considered a failure.

## RESULTS

This technique has been performed on 14 patients (9 females, 5 males) during the first 8 months after introduction into practice. During our initial experience, we encountered no complications or recurrences in our brief follow-up. It has been performed on a wide variety of BMIs (range, 23 to 59) with a mean of 38. Age range is from 26 to 73 with a mean of 53. Procedure time ranges from 37 minutes to 87 minutes with a mean of 57. The majority are small defects, 2cm on average. Three were Swiss-cheese type defects with multiple small hernias. There were no conversions to multi-port or to an open technique.

## DISCUSSION

Laparoscopic ventral hernia repair over the last decade has become a standard approach to repair many types of ventral and incisional hernias. It has been shown to be safe and at least as effective as open hernia repair, but with generally fewer complications and recurrences.<sup>3</sup> A laparoscopic approach is also preferable to open repair in the morbidly obese patient.<sup>4</sup> In our experience, any defect >1cm to 2cm, especially in morbidly obese patients, has a better long-term outcome when mesh is used to repair the hernia. Additionally, we will frequently close the defect primarily using a suture passer. By adapting the technique slightly, we have maintained the same principals of the multiport approach but have managed to reduce the number of incisions made.

This study demonstrates that the technique is safe and feasible. The short follow-up period and number of patients do not allow for any conclusions regarding long-term results and recurrences to be made.

Costs of materials are certainly one aspect of any new technique that must be monitored. As we have previously demonstrated in SILS cholecystectomy, the technique can be introduced without adding additional costs.<sup>5</sup> This tech-

nique does not use any specialized instrumentation, other than in some cases using the SILS port. This is a relatively small expense compared to the overall cost of laparoscopic procedures, and the expectation is that overall costs will not be altered significantly. Further follow-up will be required to confirm this hypothesis with this technique.

Our technique is similar to that used by Podolsky et al.<sup>6</sup> There are several significant differences however. Their technique raises flaps around their incision to allow placement of individual trocars. We do not perform this step. Their method of securing the mesh to the abdominal wall is based only on tack placement, whereas we also place transfascial sutures. They also concluded the technique to be feasible and safe.

This technique is easy to adopt, because it generally does not require additional instrumentation or extra training. It is also a good introduction to and good practice for single access MIS techniques. The benefits are likely only minor; including some slightly improved cosmesis and possibly decreased pain. There are very few disadvantages. Cost should be approximately the same or even less, depending on what trocars are used. The total length of incision may only be slightly less with the SILS port technique or in some cases a little longer, relative to a multi-port technique. However, the incision is lateral and in one location. Perhaps the biggest advantage is to the surgeon in gaining confidence with the SAMIS techniques. These will continue to become more popular with patients, and will be used for an increasing variety of cases. The single incision cholecystectomy has accumulating data to support its safety and is quickly becoming adopted around the country.<sup>7</sup> These techniques are also a bridge to natural orifice surgery. The SAMIS procedures are performed through a

single aperture with slight modification of techniques and in some cases instrumentation. If the safety of creating an aperture in a hollow viscus and closing it can be proven, it then only becomes a matter of moving the access site from the umbilicus or abdominal wall to the natural orifice. Then again, if we become facile enough doing major laparoscopic procedures through the umbilicus, NOTES may become obsolete.

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