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Fundamentals of the Robotic Assisted Laparoscopic Single Port System and Utility in Minor Gynecologic Surgery

John R. Wagner

Abstract

This chapter will introduce the single port robotic system. Topics include an introduction to the robotic single site port, the trocars, and the single site instruments. Step-by-step instruction is provided on how to create the umbilical incision and properly insert the single site port and trocars. The advantages and disadvantages of single port robotic surgery compared to multiple port robotic surgery and laparoscopic single site surgery are reviewed. Surgical tips and tricks are provided throughout each section to maximize efficiency, minimize complications, and overcome inherent limitations of the robotic single site system. The utility of the robotic single site platform for performing minor gynecologic surgery is discussed. Finally, a simple method for umbilical closure is described.

Keywords: robotic assisted laparoscopic, gynecologic surgery, umbilical incision, umbilical closure

1. Introduction

This chapter will introduce the single port robotic system. Topics include an introduction to the robotic single site port, the trocars, and the single site instruments. Step-by-step instruction is provided on how to create the umbilical incision and properly insert the single site port and trocars. The advantages and disadvantages of single port robotic surgery compared to multiple port robotic surgery and laparoscopic single site surgery are reviewed. Surgical tips and tricks are provided throughout each section to maximize efficiency, minimize complications, and overcome the inherent limitations of the robotic single site system. The utility of the robotic single site platform for performing minor gynecologic surgery is discussed in detail. Finally, a simple method for umbilical closure is described.

2. Advantages of robotic single site surgery

Single site surgery, whether laparoscopic or robotic, offers several advantages over traditional multiple port surgery. The anatomy of the umbilicus is unique. It is the only part of the anterior abdominal wall where the skin and peritoneum are

located directly adjacent to each other, without intervening fat and muscle. As a result, the umbilicus provides easy access to the abdomen, even in morbidly obese patients. Furthermore, the stalk of the umbilicus is composed primarily of fibrotic scar tissue with minimal vascularity. Consequently, most umbilical incisions are relatively bloodless [1]. In addition, single site surgery obviously eliminates the risks associated with the placement of accessory trocars, including bleeding, flank hematomas, incisional hernias, and visceral injury. The lack of additional trocars also contributes to less post-operative pain [2, 3].

The most obvious advantage of single site surgery, however, is cosmesis. Even a 2-3 cm incision can be hidden in the umbilicus, and it often becomes virtually invisible as it heals [4]. The poor vascularity of the umbilicus also minimizes the risk for a postoperative hematoma and virtually eliminates the risk for keloid formation [5].

The most functional advantage of single site surgery is using the umbilical incision for specimen retrieval. The lack of intervening muscle and fat provides easy access to the surgical specimen. Specimen retrieval is easy, and any morcellation required is readily accomplished by bringing the specimen bag up through the umbilical incision [6].

Robotic single site surgery offers advantages over traditional laparoscopic single site surgery. The 3-D binocular vision provided by the robotic platform allows for better depth perception and facilitates more precise surgical movements. Although the only wristed instrument is the robotic needle driver, this is also a significant advantage over all “straight stick” laparoscopic instruments. The binocular vision and wristed needle driver greatly facilitate intracorporeal suturing and knot tying. The needle driver can also be employed as a grasper and its dexterity can improve exposure for adhesiolysis or facilitate the excision of an ovarian cyst. Finally, the robotic single site platform is more ergonomic and intuitive. Intra-abdominally, the surgeon’s right hand controls the right sided instrument and the left hand controls

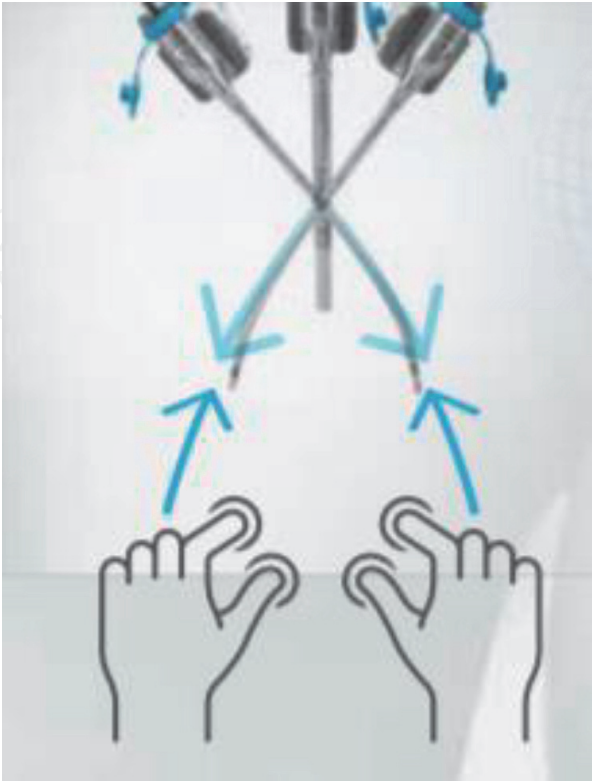


Figure 1.
Surgeon’s right hand controls the right instrument intra abdominally and vice versa.

the left-sided instrument, even though, externally, these instruments and trocars are located on the opposite side (**Figure 1**).

3. Disadvantages of robotic single site surgery

Compared to traditional multiple port robotic surgery, there are some disadvantages to the single site robotic system. The robotic single site instruments are relatively primitive. There are no advanced energy instruments such as the harmonic scalpel or bipolar transection tools built into the robotic single site system. The only unipolar tool available is the hook; the scissors do not have any unipolar power capability. In addition, the required semi-rigid flexibility of the robotic single site instruments leads to a relatively weak grasping force. This is most readily apparent when attempting to suture with the needle driver or when trying to hold tissue on tension. Furthermore, even though the needle driver is wristed, it has less range of motion than traditional robotic instruments.

Finally, the “working space” of the robotic single site system is limited compared to traditional robotic surgery. The trocar length is fixed, and the instruments cannot be retracted back any further than the tip of the trocars. This can make surgery more difficult in the setting of big pathology such as a large fibroid uterus or large ovarian cyst. In addition, in patients of short stature, the distance from the umbilicus to the pelvis is often smaller, and this can further compromise the functional workspace.

Access by the assistant surgeon can be compromised with the robotic single site system. Lateral movements can lead to repeated collisions (often coined “sword fighting”) between the instruments and camera both inside the abdomen and outside. The most unencumbered instrument movements by the assistant are those performed in an anterior to posterior direction — parallel to the camera. Despite these disadvantages, the robotic single site system can readily handle most gynecologic surgery. Various techniques for overcoming these disadvantages are discussed in the “Tips and Tricks” section of this chapter.

4. Abdominal entry

The initial step in any single site operation, whether robotic or laparoscopic, is the umbilical incision. Various incisions have been proposed, but the simplest, easiest, and most cosmetic approach is a midline vertical incision right through the center of the umbilicus. Local anesthesia (with or without epinephrine) is injected into the base of the umbilicus. Toothed forceps placed at the superior and inferior edges of the umbilicus are used to elevate the skin and an incision is made vertically through the center of the umbilicus. Allis clamps are then placed laterally and used to elevate the skin edges. With the edges elevated, the stalk of the umbilicus is palpated as a horizontal band of fascia in the center of the incision. Kocher clamps are then placed laterally on this fascia band, and the Allis clamps are removed. While elevating with the Kocher clamps, an incision is then made vertically in the fascia. The fascial incision is then sharply enlarged to allow the surgeon to bluntly enter the abdomen digitally. The skin and fascial incisions are then enlarged as needed. For robotic single site surgery, a 2-3 cm incision is required. This is slightly larger than what may be required for laparoscopic single site surgery, depending on the intended operation. The fascial incision should be extended vertically in both directions until it is slightly larger than the skin incision (**Figures 2–5**).



Figure 2.
Vertical umbilical skin incision.

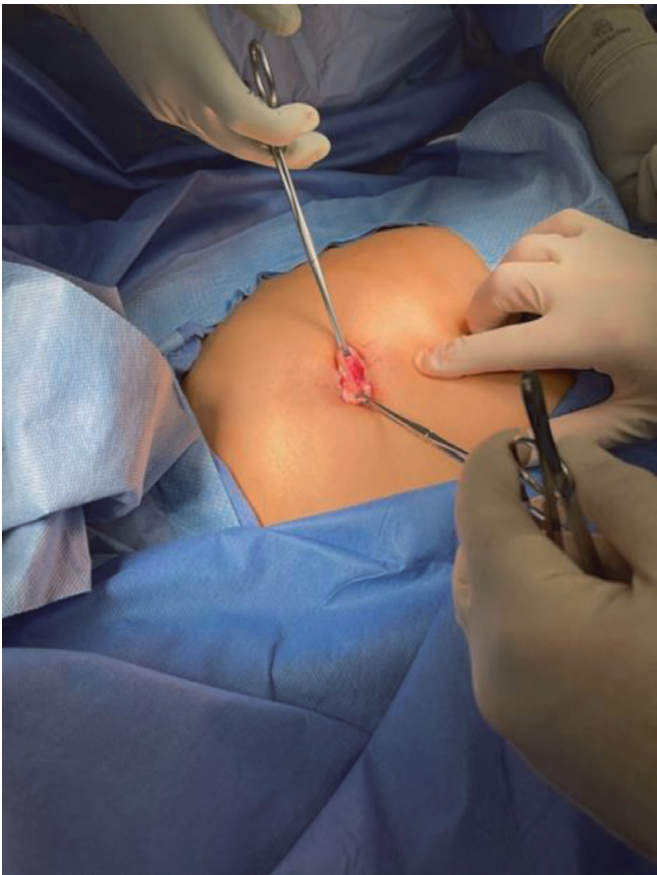


Figure 3.
Allis clamps placed bilaterally on the skin edges and gently elevated.

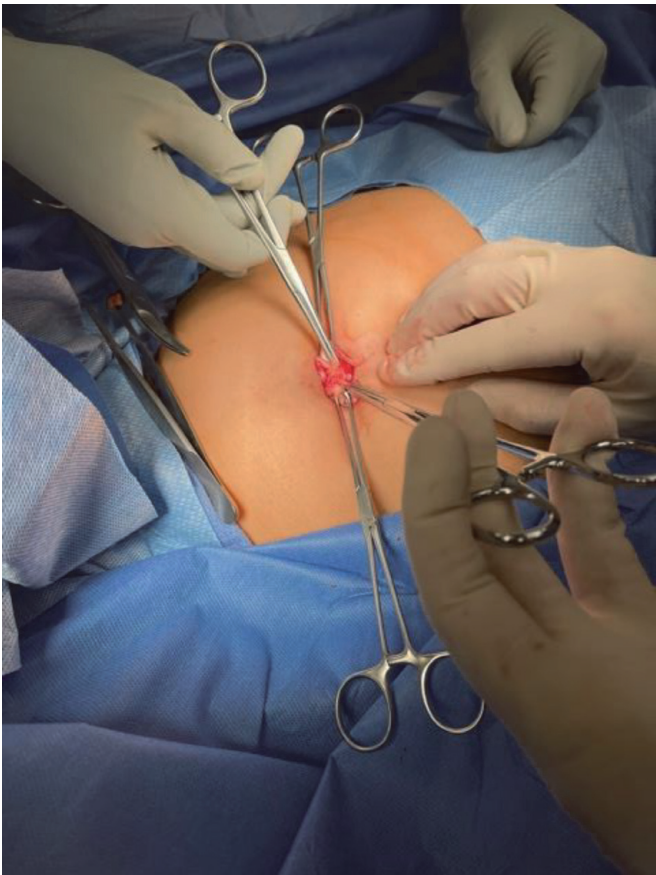


Figure 4.
Kocher clamps placed bilaterally on the umbilical stalk which appears as a horizontal fascial band in the incision.

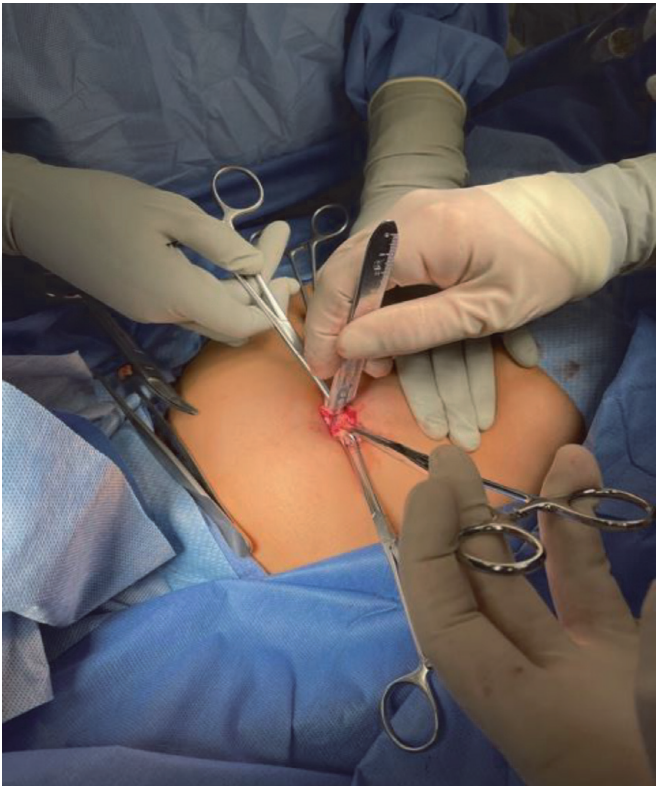


Figure 5.
Vertical fascial skin incision followed by blunt digital abdominal entry.

4.1 Tips and tricks

1. Aggressive incisions in the skin and fascia facilitate entry, and hesitant incisions complicate entry. The base and stalk of the umbilicus is composed of thick fibrotic scar tissue, thicker than any other part of the anterior abdominal wall. A number 15 scalpel is used, as bigger blades may not reach the base of the umbilicus, especially if it is anatomically smaller. Generally, the entire length of the number 15 blade is needed to achieve proper incision depth in both the skin and fascia.
2. Not infrequently a hernia is encountered in the umbilicus during initial entry. Virtually all of these are fat containing. Excision of any excess fat with unipolar cautery easily restores normal anatomy, and the operation then continues as planned. When an umbilical hernia is encountered upon entry, closure of the umbilicus at the end of surgery is done with either a permanent suture such as 0-Prolene or a significantly delayed absorbable suture such as 0-PDS.
3. Patients with a previous umbilical hernia repair require special attention. If mesh present, entry is accomplished by making an incision through the mesh just as it is performed for the fascial incision. During closure, the mesh is re-approximated with a permanent suture such as 0-Prolene
4. Periumbilical adhesions can also complicate surgical entry. When these are encountered, the fascia is elevated with Kocher clamps and the adhesions are lysed sharply under direct visualization as far as possible. Insertion of a laparoscopic single site port with a small intra-abdominal footprint (such as the Covidien SILS port or the Gel-Point Mini) then allows for further adhesiolysis laparoscopically under direct visualization. Once the adhesions are taken down, the robotic single site port can then be inserted without difficulty in the usual manner

5. The robotic single site system

The single site robotic system consists of three main components — the port, the individual instruments, and the various trocars.

5.1 The single site port

The robotic port is a flexible hourglass shaped device designed to sit in the umbilicus. It has a lip on each end. The inner lip is designed to sit in the peritoneal cavity and the outer lip above the skin. The port itself has four lumens for the various single site trocars and an insufflation channel with a plastic trocar embedded in it. An arrow is present on the exposed lip and the port should be oriented so that this arrow points towards the intended operative field. The two channels closest to the operative field are for the camera trocar and the assistant trocar (**Figures 6 and 7**). The two port channels furthest away from the operative field (or more cephalad in the case of gynecologic surgery) are for the single site trocars.

In preparation for port insertion, place a Kocher clamp laterally on each side of the incision, holding both the peritoneum and the fascia together. Lifting these clamps provides counter traction to facilitate port insertion and holding both the peritoneum and the fascia together prevents pre-peritoneal insertion of the port. Some surgeons alternatively prefer to use “S” shaped retractors to elevate the

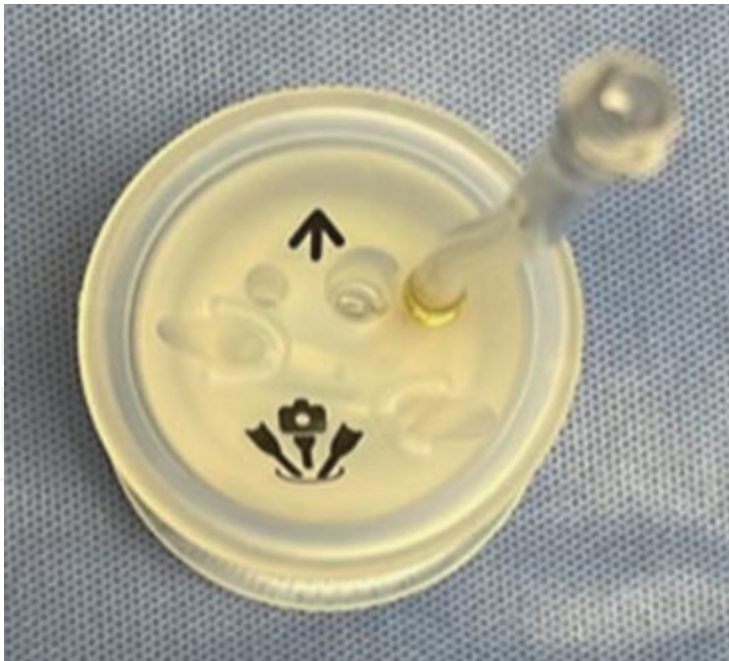


Figure 6.
Robotic port.

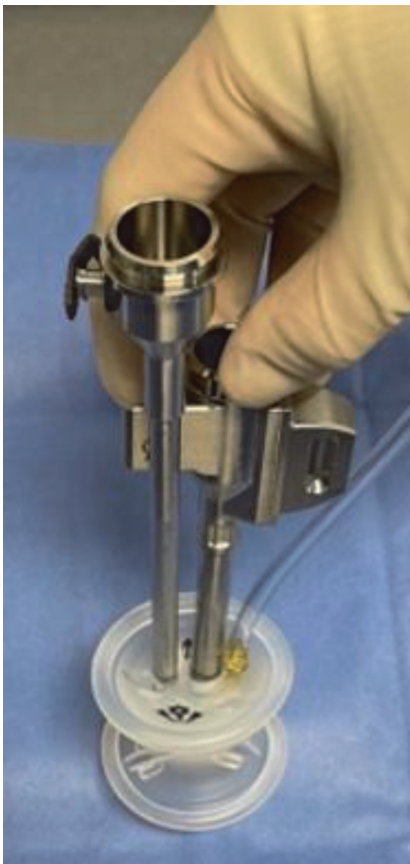


Figure 7.
Robotic port with the camera trocar and assistant trocar in place.

anterior abdominal wall instead of Kocher clamps; however, I have found this method less effective. Two long Kelly clamps are then placed on the port as shown (**Figure 7**). With the surgeon's non-dominant hand steadying the port, the dominant hand holds the inferiorly placed Kelly clamp and inserts the port into the



Figure 8.
Kocher clamps placed on robotic port to facilitate placement.

abdomen with a “C” shaped motion. It is important to assure that the leading edge of the port is in the abdominal cavity at this time. While applying constant pressure to hold the port in place with the surgeon’s non-dominant hand, the dominant hand then removes the inferior Kelly clamp and grabs the superior one. Final insertion of the port is then accomplished by pushing the second clamp in a vertical direction, essentially dragging the port into the umbilicus (**Figure 8A and B**). During insertion of the port, the assistant provides constant counter traction by elevating the anterior abdominal wall with the Kocher clamps. Once the port is in the umbilicus, the second clamp is then removed. Before the Kocher clamps are removed, digital pressure is applied to the center of the port to push the port as deeply into the umbilicus as possible. When properly placed, the inner lip of the port should be located in the abdominal cavity and the outer lip above the level of the skin. The port is then adjusted so that the arrow is pointed towards the operative field. This assures that, when the single site trocars are placed, they will be properly oriented to the surgical field. At this point the abdomen is inflated and the patient is placed in the Trendelenburg position.

5.2 Tips and tricks

1. Initial placement of the robotic port can be a challenge when the umbilicus is relatively deep, as it can be difficult to place the inner lip of the port past the peritoneum. To overcome this, it helps to place an extra small Alexis retractor in the umbilicus. Once the Alexis retractor is folded down, the depth of the umbilicus is reduced, and the peritoneum is pulled upward towards the skin. Using two Kocher clamps to elevate the fascia bilaterally, the robotic port can then be placed in the umbilicus inside the Alexis retractor. Some surgeons routinely use this technique to place the robotic single incision port (**Figures 9 and 10**).

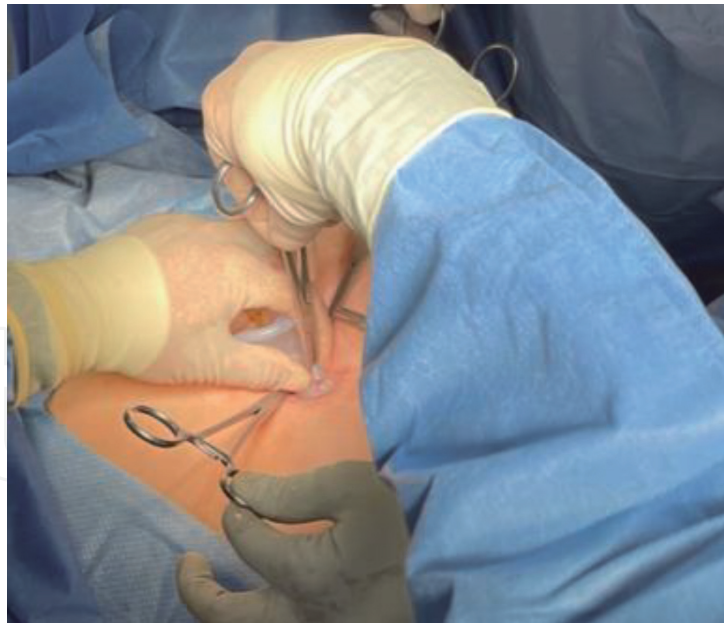


Figure 9.
Initial Kocher clamp slides the robotic port into the abdomen in a “C” shaped motion.

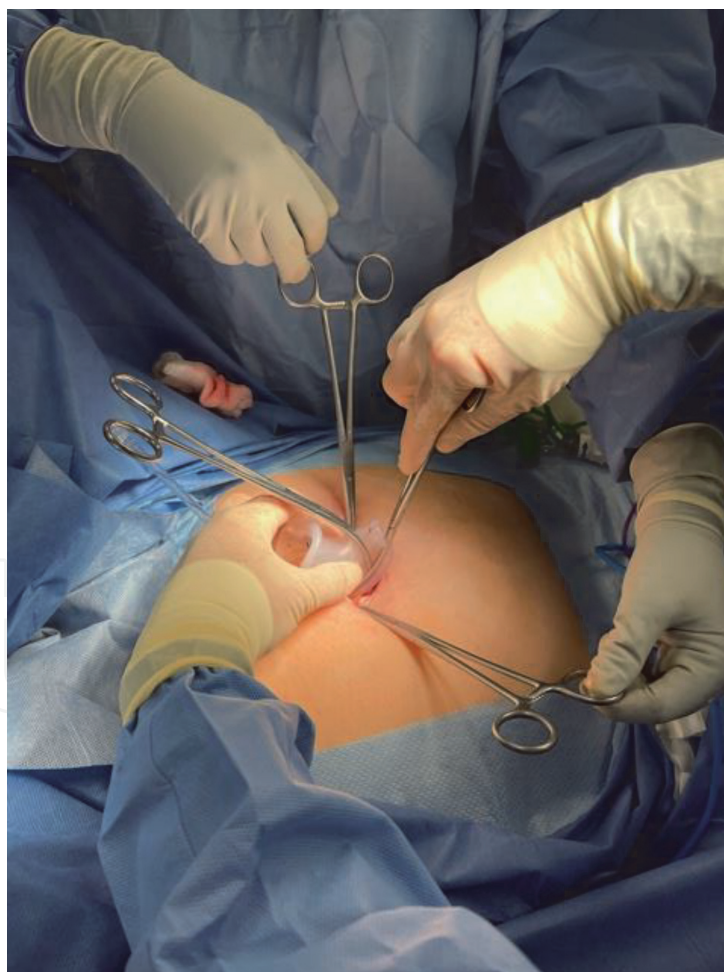


Figure 10.
Second Kocher clamp drags the port completely into the umbilicus after removing the first clamp.

2. The robotic single site port is relatively fragile. Excessive force will cause it to tear which can lead to difficulty maintaining an adequate pneumoperitoneum during surgery. If difficulty is encountered with insertion, enlarge the skin and fascial incisions by a millimeter or two and re-attempt port placement.

3. The key to easy port placement is to make sure that the tip of the second Kelly clamp is intra-peritoneal once the first Kelly clamp is removed. This allows the second Kelly clamp to pull the port into the abdomen rather than to push it in. Pushing it in often leads to tearing of the port. To maintain the proper location of the second Kelly clamp while removing the first one, the operator's non-dominant hand needs to maintain firm and constant pressure holding the port in place. If the port slips out even slightly, the tip of the second Kelly will not be intraperitoneal.

6. The trocars

The camera trocar is straight and 8 mm in diameter. It is placed through the vertical middle channel between the plastic insufflation tube and the assistant trocar channel. The assistant trocars are also straight and either 5 mm or 10 mm in diameter. Either one can be placed through the vertical assistant channel adjacent to the camera trocar. The 5 mm single site trocars are curved and come in two sizes — one shorter and one longer. They are placed through the remaining channels on the robotic port. These channels traverse the port diagonally, so that the right trocar emerges on the left side intra-abdominally, and vice versa. Once placed, the trocars criss cross each other in the port (**Figure 11**). All trocars are inserted until the thin black line on the trocars reaches the external edge of the port. All of the trocars have a blunt obturator to assist with insertion through the robotic port.

The trocars are inserted after the robotic port has been placed in the umbilicus, the abdomen insufflated, and the patient placed in Trendelenburg position. The

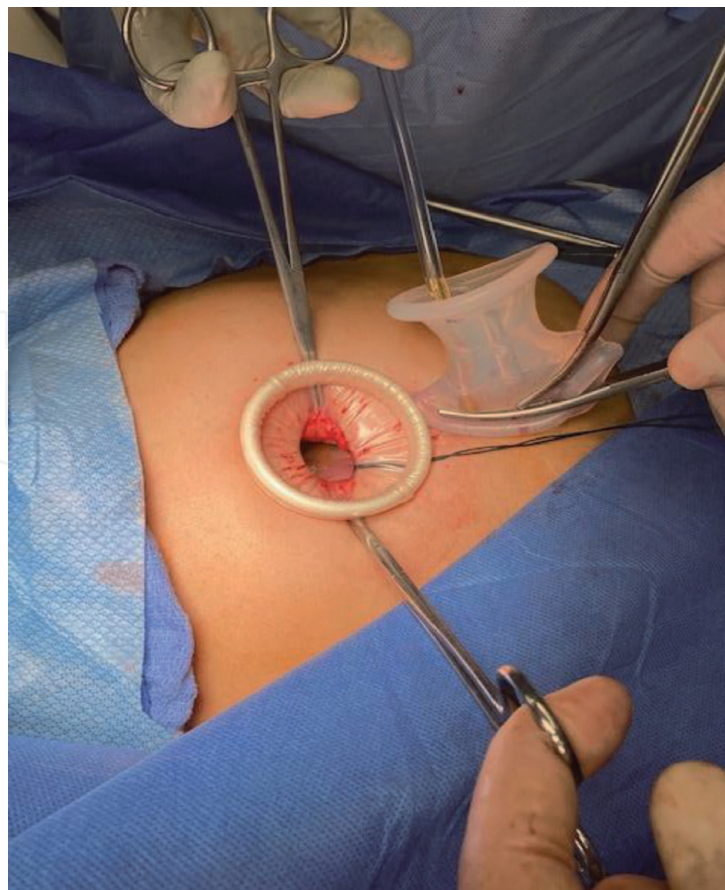


Figure 11.
With the Alexis retractor secured to the umbilicus, and Kocher clamps attached to the fascia, the robotic port is inserted in the usual manner.

camera trocar is introduced first. With the surgeon and assistant stabilizing the robotic port in the umbilicus, the trocar is placed through the appropriate channel in a direction parallel to the long axis of the port. Unlike multi-port robotic surgery, the robot is docked at this point, the camera trocar is attached to the appropriate robotic arm, and targeting is performed. Docking at this stage facilitates placement of the additional trocars.

To place the 5 mm curved single site trocars, the laparoscope is placed in the 30 degree up position and oriented 90 degrees from the pelvis towards the right lower quadrant of the abdomen. The intra-abdominal right sided trocar is placed first (from the left side of the patient). Using one hand to stabilize the port, the surgeon's other hand inserts the trocar through the port in a direction perpendicular to the long axis of the patient, from left to right. Once through the port and within the abdomen, the laparoscope can then visualize the tip of the trocar with the obturator in it. Under continuous laparoscopic visualization, the 5 mm trocar is then turned and advanced towards the pelvis until the thin black line on the trocar shaft reaches the robotic port. After placing the left-sided trocar into the right intra-abdominal space, the laparoscope is turned 180 degrees and oriented to visualize the left lower quadrant of the abdomen. The right-sided trocar is then placed into the left lower abdominal region using the same technique. The robotic arms are then docked to the curved trocars. Keeping the laparoscope in the 30 degree up position the assistant trocar is then placed parallel to the camera trocar.

6.1 Tips and tricks

1. Lubricating the trocars makes insertion easier. Surgilube lubricating jelly helps. However, in my experience, coating the trocars and obturator tip with a little blood and grease from the umbilical incision works best and makes trocar insertion very smooth.
2. When attaching the robotic arms to the trocars, it helps to visualize the operative field with both trocars visible on the monitor. This orients the trocars for easy docking.

7. The instruments

The robotic single site instruments are all 5 mm, semi-rigid, and flexible. The semi-rigid nature of the instruments allows them to effectively manipulate tissue. The flexibility allows them to be inserted through the curved single site trocars. However, that flexibility comes at a price — the grasping power of the instruments is significantly weaker than standard robotic instruments. This makes it harder to hold tissue on tension, and it makes needles in the needle driver more likely to pivot with any lateral tension. Another drawback is that the only instruments with electrical energy are the unipolar hook and the bipolar forceps. The scissors have no electrical power. The robotic single site instruments currently available are

- 5 mm Maryland Dissector
- 5 mm Hem-o-Lok ML Clip Applier
- 5 mm Suction Irrigator

- 5 mm Cadiere Grasper
- 5 mm Curved Scissors
- 5 mm Fundus Grasper
- 5 mm Crocodile Grasper
- 5 mm Maryland Bipolar Forceps
- 5 mm Curved Needle Driver
- 5 mm Permanent Cautery Hook
- 5 mm Fenestrated Bipolar Forceps
- 5 mm Wristed Needle Driver

While this appears to be a wide array of instruments, in reality, most single site surgery is performed primarily with the bipolar forceps, unipolar hook, and wristed needle driver. The bipolar forceps functions as a grasper. As a result, unless extra tension is needed for traction, most of the other graspers will be used infrequently. Without unipolar power, the scissors become less valuable. The scissors are probably most useful only when operating near bowel or other situations where unipolar energy may pose an unnecessary risk.

The unipolar hook is an instrument relatively unfamiliar to gynecologic surgeons. As a result, there is a learning curve associated with its use. However, most experienced surgeons readily adapt to it without much difficulty.

7.1 Tips and tricks

1. When transecting tissue with the hook, constant tension is required. Otherwise, the hook will tend to over-cauterize the tissue and stick to it. This not only makes the surgery look awkward but tends to cause bleeding from the tissue when the hook is pulled free.

8. General tips and tricks

As discussed previously, there are some inherent disadvantages in the robotic single site system. The purpose of this section is to offer some practical advice to help overcome these limitations

1. Performing surgery with the robotic laparoscope in the 30 degree up position (as opposed not 30 degree down) dramatically increases the ability of the surgical assistant to aid in the operation. Thirty degree up places the robotic laparoscope in a more vertical position. This provides easy access to the abdominal cavity via the assistant trocar. In this position, when the assistant places an instrument, it presents to the surgeon right between the single site trocars in the middle of the operative field. The major advantage of this positioning is that it allows introduction of advanced energy into the operative field in a functional manner (**Figure 12**).

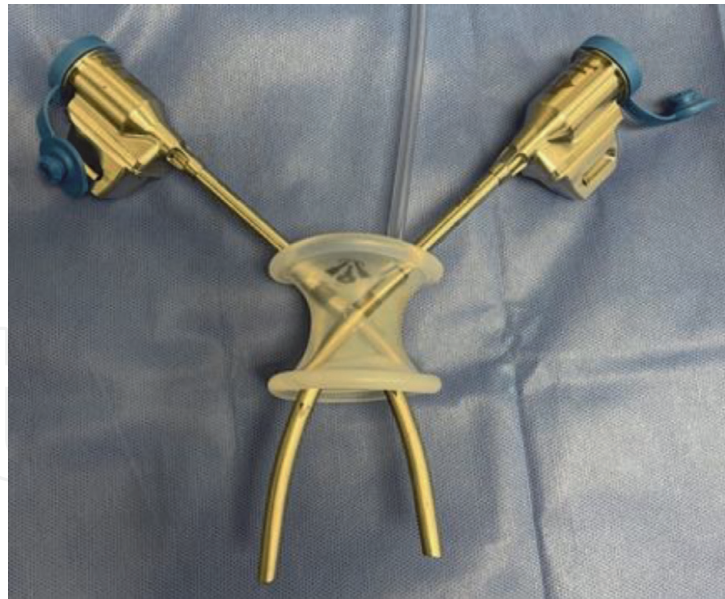


Figure 12.
Single site trocars cross within the robotic port.

2. For instance, when performing a single site hysterectomy, I routinely utilize the 30 degree up positioning for most of the surgery. After isolating the uterine vessels, I grasp them with the single site instruments distally and proximally. My assistant can then easily secure the pedicle with a Ligasure device brought through the assistant trocar. The 30 degree up positioning also allows more freedom of movement for the assistant to manipulate tissue laterally and assist the surgeon.
3. The most obvious tip for facilitating the performance of single site robotic surgery is to add an 8 mm accessory robotic trocar laterally to the umbilicus. The colloquial term for this would be “single site plus one.” A right-handed surgeon would likely place this on the patient’s right side; the opposite placement is preferred for left-handed surgeons. All regular wristed robotic instruments are then potentially available to be placed through this port, including the Vessel Sealer, unipolar scissors, single tooth tenaculum, or needle drivers with (more wristing capability and more grasping power). Adding an 8 mm plus one port is a great way to get started with single site surgery.
4. Despite the fact that most single-site robotic gynecologic surgery is performed with the shorter curved trocars, one of the biggest difficulties to contend with is that the workspace is still limited. The trocars are fixed in length, and the instruments cannot be retracted back past the trocar tips. However, this limitation can be overcome with several strategies. First, it helps to pull the tissue to be operated on into the pelvis. This is somewhat counter-intuitive to the normal pelvic surgeon. In general, we tend to elevate tissue or push the pelvic organs cephalad with a vaginal manipulator. Retracting the tissue inferiorly pulls it into the workspace of the single site instruments. Second, a small advantage can be gained by pulling the single site trocars back slightly so that the black line on the trocar is 1-2 cm above the robotic port. This technique can be helpful with larger pathology or if access is needed to the pelvic brim or sacral promontory.
5. Passing sutures and needles can only be done through the 10 mm assistant trocar. 10 mm needles tend to easily pass into the abdomen through the port.

However, retrieval can be difficult and frustrating. Often the needle can get caught in the trocar tip, become dislodged from the grasper holding it, and fall back into the abdominal cavity. One solution is to anchor the used needles into the peritoneum in the midline of the anterior abdominal wall. Multiple needles can be stored in this manner. When the procedure is completed, the needles can be placed in a laparoscopic bag. Once the robotic port is removed, the bag can be retrieved through the umbilicus with the needles in it.

6. Make the umbilical incision as small as possible to allow placement of the robotic port. Too large an incision increases the risk for air leakage around the port and can lead to difficulty maintaining an adequate pneumoperitoneum during surgery. When creating the incision, keep in mind that it can always be made bigger, but it cannot be made smaller. If a 10 mm assistant trocar is not needed during the surgery, an 8 mm AirSeal trocar with a 5 mm channel (specifically made for robotic single site surgery) can be inserted through the robotic port. The AirSeal trocar will maintain the pneumoperitoneum even with significant leakage of gas.
7. When operating laterally the workspace can also be limited. Angling the camera away from the horizontal axis towards the lateral pelvis can overcome the obstacle. When the camera is angled, it allows for greater lateral movement of the single site instruments. Such a strategy helps access areas such as the pelvic brim or the base of the infundibulopelvic ligament.
8. Cauterizing a vascular pedicle such as the infundibulopelvic ligament can take longer due to the weaker grasping power of the bipolar forceps. When bipolar cautery is engaged, bubbling can be seen around the forceps. The pedicle is adequately cauterized when the bubbling recedes. Cautery should continue until this is seen, and only then should the pedicle be cut.
9. Most gynecologic surgery is performed using the shorter 5 mm curved trocars. However, the longer trocars can assist with suturing deep in the pelvis, particularly the vaginal cuff. The semi-rigid nature of the single site instruments can make it difficult to drive a needle through relatively tough tissue. The instruments tend to bend when tension is applied, and this weakens the force that can be applied to the needle in order to drive it through tissue. Exchanging the shorter 5 mm trocar for the longer one minimizes the bending of the needle driver when force is applied. This increases the driving force that can be applied to the needle to drive it through tissue.

9. Closure of the umbilicus

Once the port is removed, the fascia and peritoneum are closed with a single running non-locking 0 Vicryl suture. With the fascia closed, flaps are created bilaterally by undermining the skin on either side of the incision until all tension is released. This assures that the umbilicus will appear symmetric when finally closed. Several millimeters of skin are then trimmed on either side along the entire length of the vertical incision. More skin is trimmed from the center of the incision and less inferiorly or superiorly. Trimming of the skin improves blood flow to the edges. Given the generally poor blood flow to the umbilicus, freshening the edges improves healing. Additionally, trimming the skin makes the size of the incision smaller when it is ultimately closed; it tends to pull the incision into the umbilicus.

The base of the umbilicus is then recreated. One or two 2-0 Vicryl sutures on a non-cutting needle are then used to tack the middle of each half of the incision to the fascia. A non-cutting needle is used to avoid inadvertently cutting the fascial

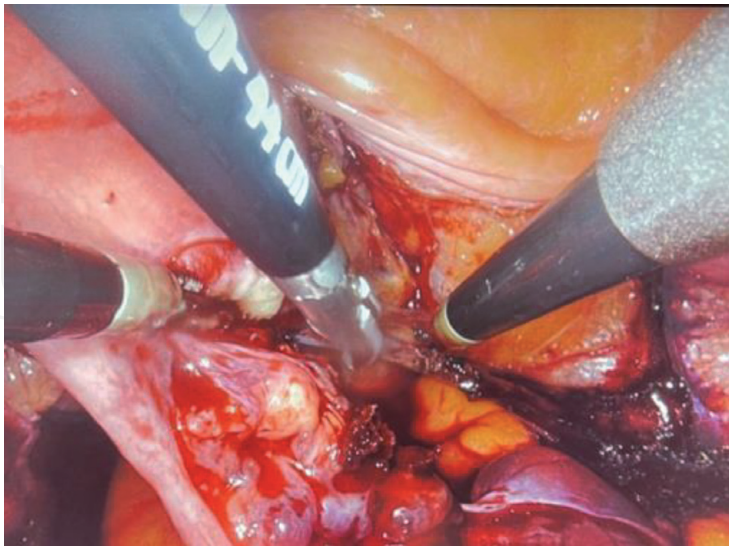


Figure 13.
With the laparoscope in the 30 degree up position, the surgeon's assistant has easy access to the operative field. When the assistant places an instrument, it presents directly between both single site trocars.



Figure 14.
Skin flaps are created bilaterally by sharply detaching the skin from the fascia until no tension remains.



Figure 15.
Redundant skin.



Figure 16.
Redundant skin is trimmed.



Figure 17.
The skin of both sides of the incision is secured to the fascia with one or two absorbable sutures.

stitch. A deep bite is taken in the fascia to assure that the skin is securely attached. Interrupted inverted 3–0 Vicryl sutures on a cutting needle are then placed in the inferior and superior poles of the incision to reapproximate the skin. Care is taken to include a significant amount of subcutaneous fat with these sutures in order to bulk up the tissue at both poles of the incision (**Figures 13–17**).

A small amount of packing is placed in the umbilicus, and an eye patch trimmed to a 2–3 cm circle is placed over the packing. A medium Tegaderm patch is then placed over the trimmed eye patch. Using a small needle and a 10 ml syringe with reverse suction, the air under the Tegaderm is removed creating a negative pressure dressing. The needle should be placed through the Tegaderm and skin adjacent to the dressing not through the center over the eye patch, otherwise the negative pressure will not be maintained.

10. The utility of the single site robotic system for minor gynecologic surgery

Minor gynecologic surgery generally encompasses surgery on the adnexa and excision of pelvic endometriosis. The single site robotic approach for minor gynecologic surgery offers advantages over both traditional multi-port laparoscopic and robotic surgery. Compared to traditional multi-port surgery, the single site approach is more cosmetic, decreases postoperative pain, and removes the risk of trocar related complications.

In addition, with traditional multi-port laparoscopic or robotic surgery, specimen removal from the abdomen can be challenging. Often one of the incisions needs to be enlarged in order to extract the tissue, resulting in the potential for

increased post-operative pain and other wound complications. By contrast, single site robotic surgery provides easy access through the umbilicus for specimen retrieval and morcellation if necessary.

Compared to laparoscopic surgery, both single site and multi-port, the 3D binocular vision and the intuitive ergonomics of the robotic single site platform offer significant advantages. The 3D vision improves dexterity and makes complex ergonomic tasks easier. In addition, the manipulation of tissue is more intuitive with the single site system. This results in more fluid surgical movements and less sword fighting. Finally, although only the single site needle driver is wristed, this compares favorably to laparoscopic instruments that are all uniformly non-wristed.

When contemplating whether to employ the single site robotic approach, consider several factors. First, how difficult is the expected operation. Depending on the surgeon's experience and familiarity with single site surgery, more complex operations may necessitate a multi-port approach. Second, how skilled is the individual surgeon in performing laparoscopic single site surgery. Single site surgery, whether robotic or laparoscopic, virtually always benefits the patient. If a particular surgeon is skilled in laparoscopic single site surgery, this may be a more appropriate technique to use. For an experienced single site surgeon, the laparoscopic approach can be more efficient and can be performed with a slightly smaller umbilical incision.

Ovarian cystectomy is arguably the operation uniquely suited to the robotic single site system. Stripping of an ovarian cyst and suturing the ovary are ergonomically difficult with the laparoscopic single site approach. Multi-port approaches, whether laparoscopic or robotic, may facilitate performing the cystectomy, but they increase the risk for postoperative complications. With the robotic single site approach, the cyst can be easily opened and decompressed. The cyst lining is easily stripped using a grasper and wristed needle driver. Specimen retrieval is easily accomplished through the umbilicus.

For the same reasons, excision of pelvic endometriosis is an operation often well suited to the robotic single site approach. To excise endometriotic implants or explore the pelvic sidewall, significant dexterity is often required. The surgical site is often in a tight space with minimal mobility to the tissue. This creates difficulties even for the experienced laparoscopic single site surgeon.

When first starting to perform robotic single site surgery, the option of adding an additional 8 mm accessory trocar can increase the comfort level of the surgeon. The additional trocar makes all wristed robotic instruments potentially available to assist in the surgery. Eventually, with experience, the extra trocar will become less necessary. Adding the additional trocar mitigates but does not cancel out the benefits of the single site approach. One extra trocar is still better for the patient than 2 or 3 additional ones.

11. Conclusion

The robotic single site system provides a unique surgical approach that can be easily adopted and utilized for gynecologic surgery. It expands the opportunities to perform single surgery beyond just the laparoscopic approach. The single site approach, whether laparoscopic or robotic, virtually always benefits the patient. For the individual surgeon, especially one not particularly comfortable with laparoscopic single site surgery, the robotic single site system can facilitate the transition to single incision surgery as the primary approach to many gynecologic operations. However, even the experienced single site laparoscopic surgeon will find instances where the robotic single site approach is more advantageous.

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