Single Port Laparoscopic Hysterectomy through a 12mm incision created by a Bladeless Trocar: A Novel Technique

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Precis: Single Port Hysterectomy can be performed safely through a 12mm bladeless incision via this novel technique. Decreasing port size is continually pushing the limits of minimally invasive surgery for enhanced patient outcomes.

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ABSTRACT

Study Objective: The aim of this study is to report the technique used by one surgeon performing a laparoscopic hysterectomy performed through a single 12mm bladeless incision. With the exception of pure vaginal hysterectomy we believe this technique is the least invasive technique published thus far to date where the hysterectomy is performed entirely abdominally.
Design: Retrospective Analysis of Charts and Technique
Setting: One private Hospital in the Southwest US
Patients: 6 patients receiving single port hysterectomy between 2013 and 2014
Intervention: Single Port Laparoscopic Hysterectomy was performed with our ultra-minimally invasive technique, using a Covidien(C) 12mm bladeless laparoscopic trocar followed by an Olympus(C) TriPort device and Olypus(C) articulating 5mm laparoscope without in any way stretching or extending the 12mm port. Other novel aspects of our technique include placement of the single port at the bottom of the umbilicus regardless of patient BMI, the usage of intra-abdominal marcaine to help with postoperative pain and vaginal repair of colpotomy.
Measurements and Main Results: Laparoscopic Single Port Hysterectomy was performed on all six patients with a mean operating time of 57 minutes. All cases were completed without the need for additional ports, conversion to laparotomy, extension of the 12mm incision or any component of traditional vaginal hysterectomy. Average blood loss was 117cc. Our complication rate was zero in this limited study of 6 patients.
Conclusion: Although our sample size is extremely small, we believe it is critical to publish this important technique so that other laparoscopic surgeons who are also testing the limits of minimally invasive surgery can be aware of the success of this technique.
Keywords: Minimally Invasive Surgery, Laparoendoscopic single-site surgery (LESS), minimally invasive hysterectomy, single port hysterectomy.

Introduction

Single port laparoscopic surgery is becoming increasingly popular in general surgery and gynecologic surgery. As a predictable evolution of minimally invasive surgery, the instruments, trocars and incisions need to become increasingly smaller and fewer as we aim to perfect a surgical artform with as little pain, recovery time, and risk to the patient as possible. As part of this natural evolution of minimally invasive surgery many surgeons now perform single port procedures, and in gynecologic surgery several authors have published on minimally invasive single port hysterectomy. (2-3) Several authors have described using single port sites varying from 18mm to 30mm to fit multiple instruments into the abdominal cavity. Most authors have used the umbilicus as the site for entry into the abdominal cavity for two reasons. First, the bottom of the umbilicus is generally closer to the underlying fascia then the surrounding areas. Second, depending on the specific anatomy of the patient the umbilicus is general a very cosmetic area for a scar which can range from cosmetically acceptable to completely invisible, a factor that can be critical for satisfaction in female patients. (8-9) As we have already reduced the number of surgical sites to one, the natural progression from the perspective of the authors of this study is to reduce the size of that single port. Much literature has been published regarding the possibility of umbilical hernia following laparoscopic surgery. Several authors have noted that in circumstances where the fascia is not closed or not closed correctly that there is a greater incidence of umbilical hernia in laparoscopic sites that are large than 12mm, (12,17) and in laparoscopic sites that are created by a sharp bladed entry into the abdominal cavity as opposed to a blunt entry that stretches the fascia instead of cutting. (19) Further data has been extrapolated by some authors to suggest that port sites of bladeless trocars of 12mm or less do not require fascial closure. The authors of this article are moved by the significance of this data, however they do indeed close the fascia for bladeless 12mm laparoscopic trocar ports as a precaution for patient safety. Nonetheless the author feels 12mm is a very minimally invasive port size to use, and as it is large enough to accommodate the three 5mm laparoscopic instruments required to perform the hysterectomy, it is the size chosen by the author. Some would consider a pure vaginal hysterectomy to be a less invasive procedure. Many surgeons, even skilled vaginal surgeons are hesitant to perform purely vaginal hysterectomies on patients with prior abdominal surgeries or other risk factors because of the blind nature of vaginal hysterectomy and inability to visualize the major pedicles the entire case. The authors of this study agree with this assessment and would prefer to visualize the abdominal cavity at time of hysterectomy. This technique as described represents a repeatable, ultra-minimally invasive technique at performing hysterectomy with a single bladeless port of 12mm size. The authors hope that publishing this technique can help other minimally invasive surgeons who may be considering similar technique improvements.

Materials and Methods

Patients

For the purposes of chosing candidates for this we chose patients requiring hysterctomy for any benign indication. We excluded patients with uteruses enlarged by fibroids or severe adenomyosis. This technique may be useful in these cases, however we chose to exclude these cases from our initial cases as to not complicate the technique in its infancy.

Materials

For the actual multi-instrument port, we chose the Olympus(C) Triport(C) device because of its inherent ability to adust to the size of the fascial opening without any rigid tubing. We believe this saves millimeters of operating space that can translate in some circumstances into a much easier operating scenario with less struggling and instrument collision. Also because this device has no tubing or foam pre-set width, it is the only device we are aware of that is actual optomized for usage in a 12mm port. Finally as the device relies on a stretched tube of plastic to hold the pneumoperitoneum, we believe this device is idea at keeping the port size to a true 12mm, and not to artifically increase the size of the port. To divide the major ligaments and arteries at time of hysterectomy, we use the Covidien(C) Ligasure(C) bipolar cautery device set to three bars of coagulating current. Lastly, for manipulation of the uterus and to setup the vaginal vault for colpotomy we use the Surgical Principles(C) Colpotomizer with McCartney tube attachment. The actual colpotomy is made with an “L” shaped extension on a hand held bovie device. Our authors prefer hand held “Bovie” style instruments to those controlled by foot pedals at time of colpotomy.

Operative Technique

After extensive informed consent is obtained from the patient regarding the risks, benefits and alternatives of operative intervention, the patient is taken to the operating room where she is prepped and draped in normal manner for an abdominal and vaginal procedure following the initiation of general endotracheal anesthesia. . A weighted speculum is placed in the patient's vagina. The patient's cervix is grasped with a sharp toothed tenaculum patient's cervix is pulled forward. A Colpotomizer uterine manipulator is then installed in the patient's vagina along with a McCartney tube in order to manipulate the uterus and cervix during the procedure. The balloon inside the Colpotomizer is insufflated to approximately 25 mL in order to manipulate the Colpotomizer in uterus during the procedure. Following this, the surgeon changes his gloves and attention is turned to the abdominal portion of the procedure. A small incision is made at the bottom of the patient's umbilicus. We choose the bottom of the patient's umbilicus as the place to make the incision because this will be closest place in an obese woman's abdomen to the fascia. We are usually able to palpate the fascia through the patient's umbilicus at

the time we make the facial incision. We then re-examine the incision for to palpate the fascia. The incision is approximately 1 cm in total size. We then place a
Veress needle and guide the Veress needle down into the incision using the surgeon's finger that is directly on the fasica. Careful attention must be paid to avoid placing the needle through the surgeon's glove. Our surgeons are usually able to palpate the fascia quite clearly using their fingers
through the incision. The Veress needle is then pushed right up against the fascia
after guiding it almost directly to that level with the surgeon's finger, and then it is gently
pushed through the fascia until the two “pops” are heard as the Veress needle entered the fascia and peritoneum respectively. We then use a saline injection test, saline withdrawal test and saline drop test the position of the Veress needle. If all of these tests tell us that the Veress needle is in good position in the abdominal cavity, we proceed to insufflate the abdominal cavity to a pressure of 15 mmHg. Following the insufflation we remove the Veress needle and in the position the Veress needle previously occupied, we place a 12-mm Covidien(C) bladeless trocar. We then place the 5-mm Olympus(C) articulating laparoscope through this trocar port and visualized the abdominal cavity. This shows us that we have entered the abdominal cavity successfully using the 12-mm port. At this point,
we install the Olympus(C) SILS single incision laparoscopy Triport system through the
patient's umbilicus. This is done by using the introducer in order to place the internal ring of the device into the abdominal cavity and then pulling the plastic sheets of the ring out through the 12-mm incision. We then install the port in the 12-mm by pulling the plastic sheet tightly so the final ring of the device uses the entire 12-mm incision, but we are careful not to extend the 12-mm incision in the patient's umbilicus because we do not want to increase the possibility of an umbilical hernia or unnecessarily increase the patient's recovery time for surgery. Following this, we placed the 5-mm Olympus(C) articulating camera through the center port of the SILS device and we then utilized a 5-mm LigaSure bipolar coagulation device as well as a 5-mm Endo tenaculum in order to manipulate the uterus as to perform a hysterectomy. First, we remove the uterus by incising first the fallopian tube, then the round ligament, then the uterine artery, then the uterosacral ligament and then the cardinal ligament of the uterus on each side. The LigaSure bipolar coagulation device is used in order to
perform this all while visualizing with the laparoscope. We keep our incision line snug against the uterus to prevent injury to lateral structures. The Colpotomizer McCartney tube is utilized at this point in order to visualize the uterus and to manipulate the uterus during the procedure. Following this disection, the uterus will be connected to the patient only by the vaginal cuff. At this point, the McCartney tube is pushed deep into the patient so that the plastic ring of the McCartney tube
could be easily visualized. We then used a 5-mm Bovie device with an “L” shaped extender set to 40 watts of coagulating current, in order to divide the vaginal vault in a circumferential pattern all the way

around the McCartney tube. Following this, the uterus is free in the abdominal cavity. We then remove the McCartney tube and the Colpotomizer device after we attached two sharp tooth tenaculums to the uterus in order to remove it through the vagina. The uterus is able to be removed through the vagina or morcellated vaginally at this point. Following this, we sewed the vaginal cuff shut from the vaginal approach. We believe this is superior than the adominal approach because of data of decreased rates of dehiscence in vaginal approaches to closure. (7) We use a speculum as well as #0 Vicryl on a CT needle. This is done in a running locked pattern in order to close the cuff. We then test the cuff with a physical examination and be sure the cuff is found to be intact. Following this, we change our gloves and gown and rescrub into the procedure. From the laparoscopic perspective, the The abdominal cavity is then investigated and the vaginal cuff and all pedicles are examined for hemostasis. We remove the port and inspected the 12-mm umbilical port before closeing the fascia with #0 Vicryl on a UR-6 needle the skin is then closed with surgical glue. It is out practice to perform cystoscopy routinely to look for urine jets following hysterectomy to be sure a urologic injury has not ocurred.

Results and Statistical Analysis

Thusfar our technique has been successful. Consideration is given that adhesions, a large uterus, or intraoperative complications could lead to the necessity to convert to a traditional mulitport laparoscopic procedure.

Discussion

Our goal is to enhance the minimally invasive approach to hysterectomy to the limits of the technology available to us today. This involves a providing a procedure that is continually less and less invasive, by decreasing the number of ports, decreasing the size of the port incisions, and as a function of changing the port incision size changing from a bladed entry to a blunt entry when possible also deccreases the invasive nature of the surgery. This is secondary to the stretching action a blunt or bladeless port creates on the fascia which presumable has some natural elastic ability to to close to some extent, as opposed to a sharp entry which would presumably leave a static incision of the same size it was originally created at until it heals. Since the authors have years of experience with 12-mm bladeless incisions, we feel they are an extremely cosmetic and safe surgical entry. Anecdotally, the authors have never had a 12-mm or smaller bladeless incision at the bottom of the umbilicus result in any type of herniation, despite performing thousands of laparoscopic procedures. This was the impetus behind desiring to perform a laparoscopic hysterectomy through this incision. All authors agree that suture closure either by surgical device or manual suturing is safe and reasonable at time of wound closure.

Disclosure of Interest

Neither of the Authors (GJ Marchand and KM Sainz) have any commercial or financial interest in the products described in this article.

Neither hold any stock, positions or employment with any of the companies manufacturing any of the products described in this study.

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