



Original article

Feasibility of transumbilical single-port laparoscopic hysterectomy using conventional instruments



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ABSTRACT

Objectives: To report the surgical outcomes of transumbilical single-port laparoscopic hysterectomies for benign uterine diseases.

Materials and methods: This prospective observational study recruited patients with benign diseases and scheduled for laparoscopic hysterectomy from March 2010 to April 2011 to undergo transumbilical single-port laparoscopy, and recorded the surgical outcomes.

Results: A total of 56 patients were included, with mean (\pm standard error of the mean) age 46.5 ± 0.5 years and mean body mass index 23.5 ± 0.5 kg/m². Among these patients, 32 (57.1%) had a history of previous abdominal surgeries, whereas in 55 (98.2%) the procedures were completed with transumbilical single-port access and without any ancillary trocar. Mean surgical time was 121.1 ± 5.7 minutes. Mean intraoperative blood loss was 279.5 ± 38.4 mL. Mean uterine weight was 392.3 ± 34.2 g. The single additional trocar (1.8%) was needed for extensive enterolysis. Two patients (3.6%) needed blood transfusion. The median of postoperative hospital stay was 3 days. There were no major intraoperative or postoperative complications.

Conclusion: In the hands of experienced laparoscopists, transumbilical single-port laparoscopy is a safe and feasible method of hysterectomy for patients with benign uterine diseases.

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Introduction

Laparoscopy has now become a favored route for hysterectomy in patients of benign disease even with large uterus or in other difficult situations.^{1,2} Transumbilical single-port laparoscopic hysterectomy was first reported, without much attention, by Pelosi and Pelosi with bilateral salpingo-oophorectomy in 1991.³ Single-port accessed laparoscopy has experienced a recent resurgence,^{4,5} because of the enhanced design of instruments.⁶ Although the procedure is beneficial because of better cosmetic results, the feasibility of single-port laparoscopy in daily practice was frequently questioned because of the prominent drawbacks of

technical difficulties arising from instrument crowding, clashing, and loss of triangulation. In addition, the newly designed instruments could lead to increased surgical costs. Therefore, we conducted a study to test the feasibility and safety of transumbilical single-port access in performing hysterectomies in daily practice using conventional instruments.

Materials and methods

Patients

This study was performed by reviewing the records of patients in Chang Gung Memorial Hospital, Tao-Yuan, Taiwan who underwent transumbilical single-port laparoscopic hysterectomies. Patients who required hysterectomy with preoperative diagnosis of leiomyoma, adenomyosis, or other benign diseases from March 2010 to April 2011 were included. Patients with previous abdominal surgeries, suspect severe pelvic adhesion, large uteri, obesity,

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or nulliparity were not excluded from this study, but patients thought to have preoperative malignancy were excluded.

This study was reviewed and approved by the Human Investigation Review Board of Chang Gung Memorial Hospital. All patients undergoing surgical managements gave their written informed consent. All surgeries were performed by experienced gynecological endoscopists.

Surgical techniques

Under general anesthesia with endotracheal intubation, patients were placed in the Trendelenburg position with legs bandaged and supported in the stirrups. One indwelling 12-French Foley catheter was inserted. We established the single transumbilical port in our published method⁴; in brief, a 2-cm umbilical incision was done vertically layer by layer to enter the peritoneal cavity, then a small Alexis wound retractor (Applied Medical Resources Corp., Rancho Santa Margarita, CA, USA) was inserted with a disposable surgical glove draped around the rim.

After the establishment of pneumoperitoneum, a rigid, zero-degree, 5-mm or 10-mm laparoscope was introduced to overview the abdomen and pelvis. The hysterectomy was performed similar to the procedures in conventional laparoscopy-assisted vaginal hysterectomy using the LigaSure system (Valleylab Inc, Boulder, CO, USA) or PlasmaKinetic pulsed bipolar system (Gyrus Medical, Maple Grove, MN, USA) and conventional laparoscopic grasper.

Treatment protocol

We administered parenteral cefazolin preoperatively, and cefazolin and gentamicin postoperatively for 24 hours as prophylactic antibiotics. Nonsteroidal anti-inflammatory drugs were also routinely prescribed for 24 hours. No additional oral antibiotics were prescribed thereafter if patients were afebrile or without evidence of pelvic infection. The Foley catheter was removed after 24 hours. Patients were discharged, according to our national regulations, with an afebrile status for at least 24 hours, no evidence of surgical complications, good wound healing, and full recovery of gastrointestinal function with satisfactory oral intake and stool passages. Vaginal intercourse was prohibited for 2 months after surgery. Patients returned to clinic at 1 week and 6 weeks after the surgery for follow-up.

Data analysis

Age, body mass index (BMI), and uterine weight were considered continuous variables and presented as mean \pm standard error of the mean (SEM), whereas parity was considered a discrete variable and presented as median value and range. Descriptive statistics were performed using SPSS for Windows, version 17.0.0/2008 (IBM-SPSS, Inc., Chicago, IL, USA).

Results

From March 2010 to April 2011, a total of 56 patients who had benign diseases and required total hysterectomy were enrolled. The demographic backgrounds of patients are outlined in Table 1. Table 1 shows that 42.9% of patients had a history of abdominal surgeries, 14 patients had not experienced a vaginal delivery, and 8.9% patients had BMI ≥ 30 kg/m².

Surgery-related measurements are listed in Table 2. No intra- or postoperative complications occurred in our series. One 5-mm trocar was placed in one patient at the left lower quadrant of the abdomen because of extensive bowel adhesions resulting from severe endometriosis. In this case, the surgical time was not prolonged, there was no significant increase in blood loss, and the

Table 1
Patients' characteristics (N = 56).

Age (y)	46.5 \pm 0.5
Parity	2
Without vaginal delivery	14 (25.0)
BMI (kg/m ²)	23.5 \pm 0.5 (18.3–35.3)
≥ 30 kg/m ²	5 (8.9)
Previous abdominal surgery	32 (57.1)
C-section only	21 (37.5)
Laparotomy	4 (8.9)
Laparoscopy	2 (3.6)

Data are presented as n (%), mean \pm SEM, mean \pm SEM (range), or median. BMI = body mass index; SEM = standard error of the mean.

length of hospital stay was 3 days. The rate of addition of ancillary trocar in the current series was 1.8%. No patient was converted to conventional laparoscopy or laparotomy.

All patients were followed up at 1 week and at approximately 6 weeks after surgery. All patients had good healing of the umbilical wound (Fig. 1) and vaginal cuff, and returned to daily activities uneventfully.

Discussion

We found that hysterectomy is a suitable candidate for the start of single-port laparoscopy because hysterectomy only comprises procedures of uterine traction, coagulation, and cutting. Advanced techniques such as retroperitoneal dissection and suturing were rarely needed for laparoscopic hysterectomy. In the current series, single-port laparoscopic hysterectomies were smoothly performed in all patients, although we did not exclude patients with previous abdominal surgeries, possible severe pelvic adhesion, large uteri, obesity, or nulliparity which were all considered to be difficult situations for conventional laparoscopy.⁷ Single-port surgery increased surgical difficulty because of instrument crowding, loss of triangulation, and inline vision^{4,8,9}; however, surgical time was not significantly prolonged in the current series in comparison with the conventional results of laparoscopic-assisted vaginal hysterectomy.¹⁰

In the current series, we did not use curved or articulated instruments or laparoscope, but instead completed all the procedures with straight instruments as used in conventional laparoscopy, which offered evidence of the feasibility of the conventional straight instruments in the performance of single-port laparoscopy. Unlike during conventional laparoscopy in which the instruments are used to approach the uterus from one side, and hence difficulties could occur in managing the vessels on the opposite side; the instruments should be used to approach the uterine targets in single-port laparoscopy in the cephalic direction, which offers a balanced accessibility on both sides of the uterine vessels. Therefore, we noted in the current series that the use of conventional

Table 2
Surgical outcomes (N = 56).

Surgical time (min)	121.1 \pm 5.7
Estimated blood loss (mL)	279.5 \pm 38.4
Decrease of hemoglobin (g/dL)	-1.3 \pm 0.1
Blood transfusion	2 (1.8)
Uterine weight (g)	392.3 \pm 34.2
≥ 500 g	15 (26.8)
Ancillary trocar	1 (1.8)
Hospital stay (d)	2.8 \pm 0.2
Concomitant surgeries	
Enucleation	7 (5.7)
Salpingectomy	10 (8.1)
Salpingo-oophorectomy	7 (5.7)
Extensive adhesiolysis	51 (41.5)

Data are presented as n (%) or mean \pm SEM.

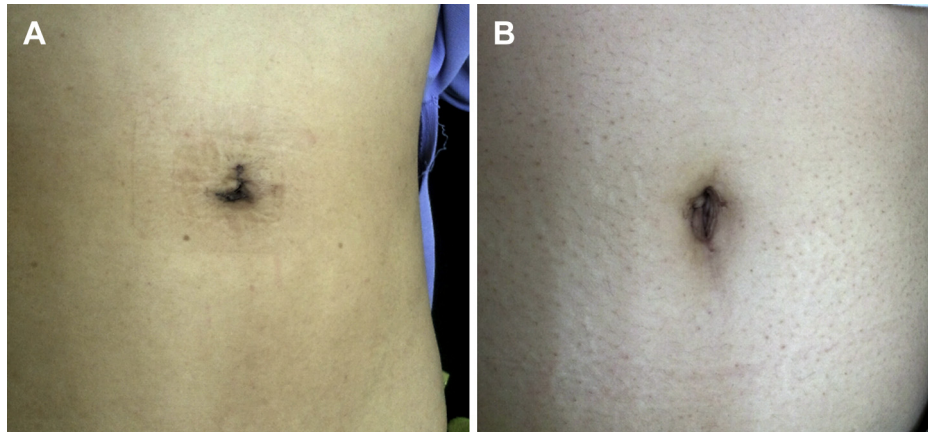


Fig. 1. Representative photos of the postoperative appearance of the umbilical wounds. (A) One week after the surgery. (B) Six weeks after the surgery.

straight instruments, which are unyielding to pressure and easier to handle, actually offered more benefits in manipulating the uterine vessels in a parallel direction of the uterus than the curved or articulated instruments. In addition, using the conventional straight instruments represents cost saving for the patients.

Because Asian women are usually not obese, only 8.9% of the patients in the current series had BMI ≥ 30 kg/m², with an extreme value of 35.3 kg/m². However, we found some unexpected advantages of single-port laparoscopy on obese patients. First, the method we used to establish the single port is relatively safer for obese patients than conventional laparoscopy. In conventional laparoscopy, the first trocar was inserted by blind puncture, which is more difficult to perform and hard to handle in an obese patient with thicker subcutaneous tissue, and hence is associated with higher risks or could cause complications. We used a type of open method to establish the portal in single-port laparoscopy. Second, the postoperative cosmetic advantages of single-port laparoscopy may be higher in obese patients, because the scar is usually located deep in the belly button in comparison with thin patients.

Regarding surgical quality and patient safety, an additional trocar may be needed in difficult situations, although it would usually be thought as a failure of single-port access. In the current series, there were 15 patients (26.8%) with uterine size >500 g whose hysterectomy was performed successfully with single-port laparoscopy minus an ancillary trocar. By contrast, the only patient who needed an ancillary trocar at left lower quadrant was a case of severe endometriosis that required extensive enterolysis. The uterus was not large (weighing only 150 g). We placed an additional trocar to reduce instrument clashing and increase the steadiness of handling, and hence to improve the maneuverability in a delicate surgery. Therefore, our experiences found that the degree of difficulty was not the result of uterine size but the degree and sites of adhesions.

According to other studies using the same manner of surgical port as ours, surgical outcomes including surgical time, blood loss, uterine weight, and length of hospital stay were similar, but there were three cases of failure in 24 patients.¹¹ However, even with an additional trocar, it is still worth noting that the surgery was minimally invasive, and the patients still had fewer abdominal wounds than with conventional laparoscopy and avoided laparotomy. Because the procedures in all the patients in our series were performed by experienced endoscopists, we believed the frequency of adding another trocar could be decreased when surgeons' experiences increased.⁹

We found several strategies to reduce the technical challenges of single-port laparoscopy. First, a well-trained assistant is invaluable.

A good surgical assistant knows how to handle the laparoscope to avoid instrument crashing, especially at the moment when delicate hemostasis and suture are needed. Second, a well-functioning uterine manipulator plays an important role in single-port laparoscopy. The manipulator could provide proper traction of the uterus to better expose the surgical field, so that it could substitute a lot of functions of assistant instruments in conventional laparoscopy, especially during hysterectomy. Third, the surgeon attempting single-port laparoscopy should have good technical bases and experience in conventional multiport laparoscopy, so that the learning curve can be shorter and technical difficulties overcome more quickly.

In conclusion, single-port laparoscopic hysterectomy is a safe and feasible method that can lead to improved cosmetics results when performed by experienced laparoscopists. The procedure is a good alternative for patients with benign diseases requiring hysterectomy.

Acknowledgments

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