

5 mm mini-incision laparoendoscopic single-site surgery of total hysterectomy: a report of five cases and literature review

J.L. Liu¹, J.M. Chen^{1,*}, Y.F. Zheng¹, X.W. Zhang¹, R.X. Shi¹

¹Department of Obstetrics and Gynecology, The Affiliated Changzhou No. 2 People's Hospital of Nanjing Medical University, Changzhou, Jiangsu 213000 (P.R. China)

Summary

Objective: To investigate the feasibility and safety of 5 mm mini-incision laparoendoscopic single-site surgery of total hysterectomy. **Study design:** A retrospective analysis was made to the clinical data of 5 patients who underwent 5 mm mini-incision single-site laparoscopic hysterectomy at the Department of Obstetrics and Gynecology, the Affiliated Changzhou No.2 People's Hospital of Nanjing Medical University. Five patients were 40-52 years old between April 2018 and May 2018. Three of them diagnosed with cervical intraepithelial neoplasia grade III (CINIII); one of them diagnosed with endometrial atypical hyperplasia; One of them diagnosed with cervical cancer (Ia1 phase). Laparoscopic single-site hysterectomy was performed through a 5 mm mini-incision. **Results:** Five 5 mm mini-incision laparoendoscopic single-site operations were success and not changed to open abdomen operation. The mean operative time was (153 ± 34.02) minutes, in which the puncture establishes a part of the surgical path for 5-10 minutes, and the umbilical reconstruction part was 3-5 minutes; mean estimated blood loss was (60 ± 30.82) milliliters; The median temperature was 37.2 (36.5-37.5) °C on the first day after surgery; Postoperative anal exhaust time was 1.0-1.5 days and The length of hospital stay was 6-7 days. All the umbilical wounds healed well and the surgical scar was seen hardly after the operation. There were no umbilical hernia and other serious complications. **Conclusion:** 5 mm mini-incision laparoendoscopic single-site surgery of total hysterectomy may be safe and effective under the premise of mature laparoscopic technique.

Key words: Mini-incision; Laparoendoscopic single-site surgery; Total hysterectomy.

Introduction

Total hysterectomy is a most common procedure in obstetrics and gynaecology. The main surgical methods include abdominal total hysterectomy, transvaginal hysterectomy and laparoscopic total hysterectomy. Conventional abdominal total hysterectomy has large trauma and obvious postoperative scar, so more and more patients prefer minimally invasive and aesthetic Laparoscopic surgery or vaginal surgery.

With the development of gynecological laparoscopic surgery, laparoendoscopic single-site surgery (LESS) has gradually become a new hotspot in minimally invasive surgery under the guidance of minimally invasive and "scar-free" concept. In addition to the advantages of reducing postoperative pain and promoting postoperative rehabilitation, LESS also brings more humane care to patients, due to it can reduce or conceal surgical scars and meet women's beauty needs [1-6].

Minimizing surgical incisions and minimizing surgical trauma is the goal for minimally invasive surgeons struggle constantly. The author succeeded in finishing 5 cases of 5 mm mini-incision laparoendoscopic single-site surgery of total hysterectomy and obtained good results on the basis of the previous experience of laparoendoscopic single-site gynecological surgery between April 2018 to May 2018.

Materials and Methods

Study design

1) Basic information: 5 patients were 40 to 52 years old in this group, with a median age of 48 years old. They were already married and have children and have no birth requirements. Three patients diagnosed with cervical intraepithelial neoplasia grade III (CINIII); one case diagnosed with endometrial atypical hyperplasia; the other one diagnosed with cervical cancer (Ia1 phase). 3 patients with CINIII and 1 patient with cervical cancer (stage Ia1) underwent 5 mm mini-incision laparoendoscopic single-site surgery of total hysterectomy + bilateral salpingectomy, and another patient with endometrial atypical hyperplasia underwent 5 mm mini-incision laparoendoscopic single-site surgery of total hysterectomy + bilateral attachment resection. Five patients gave informed consent and agreed to participate in the study.

2) Case selection criteria: Patients aged < 60 years old; uniform body and weight within standard range; patient had stable vital signs and normal cardiopulmonary function; the uterus was smaller than 10 weeks of gestation; they have no previous history of pelvic surgery.

3) Case exclusion: Patients with abnormal spine and pelvis, who were unable to adopt bladder lithotomy position; obesity patients with abdominal wall hypertrophy and puncture difficulty. Patients with severe pelvic adhesions



Figure 1. — (A) Lifting the umbilicus, cutting the skin through the umbilicus longitudinally to take a 5 mm incision. (B, C) Establishing a surgical access using a 40/50 surgical incision protector.

which were caused by endometriosis and previous history of pelvic and abdominal surgery; patients with a history of umbilical hernia; The uterus was larger than 10 weeks of gestation.

Surgical technique

1) preoperative preparation: Preoperative preparation include indwelling catheter, monitoring vital signs, excluding laparoscopic contraindications, cleansing umbilicus before surgery, disinfecting and scrubbing the vagina 3 days before surgery, starting fluid diet and bowel preparation 2 to 3 days before surgery, preparing standard laparoscopic instruments. The patients were placed in bladder lithotomy position and placed cup-type uterine manipulator.

2) Surgical approach platform: a 40/50 small abdominal retractor was used to connect 6.5 disposable surgical gloves as an access platform during the surgical operation. Cutting the thumb, middle finger and little finger of the glove and inserting 5 mm disposable plastic puncture trocar and pediatric surgical micro-puncture trocar respectively to construct instrument working channels.

3) Main surgical instruments and consumables: two pediatric surgery micro-puncture trocars, one 5 mm disposable plastic puncture trocar (easy to use ultrasonic scalpel), 30° pediatric surgical laparoscopic lens, pediatric surgical micro-endoscopic surgical instruments, conventional light source and pneumoperitoneum system. conventional laparoscopic surgery instruments such as scissors, separation forceps, ultrasonic scalpel, absorber, needle holder, bipolar electrocoagulation forceps and 5 mm ligasure. A 18th T-shaped drainage tube, one 1-0 absorbable inverted tooth suture (used to suture vaginal stump under laparoscope).

4) Establishment of surgical anesthesia, position and pathway: patients underwent general anesthesia with endotracheal intubation and bladder lithotomy position (head low 30 degrees). After routine disinfection and toweling, lifting the umbilicus and taking a longitudinal incision about 5 mm in the middle of the umbilicus to ensure that the surgical incision does not exceed the umbilical. Placing the disposable incision retractor into the incision to open the incision (Figure 1) to form a diameter about 10-15 mm of operating hole. Placing the disposable 6.5th glove on the incision retractor

and fixing it with silk suture. Cutting the small holes at the end of the finger of the glove and putting the trocar into them (5 mm disposable plastic puncture trocar was placed in the middle finger, pediatric surgical micro-puncture trocar was placed in the thumb and the little finger separately). filling with CO₂ gas to form a satisfactory pneumoperitoneum, so that the intra-abdominal pressure was maintained at 10-12 mmHg. The pediatric surgical micro-puncture trocar with glove thumb was used to place the laparoscopic lens and connect the pneumoperitone machine; the other two trocars on the side are used to place the operation pliers for the operation.

5) Surgical procedures: One-handed operation of the ultrasonic scalpel separates the adhesion and restores the anatomical position. cutting bilateral fallopian tubes or bilateral adnexa with an ultrasonic scalpel. The round ligament and proper ligament of ovary were separated by one-handed operation with Ligasure. opening the anterior and posterior lobes of the broad ligament and the uterine bladder to fold the peritoneum, and then pushing the bladder down with the ultrasonic scalpel. After the para-uterine tissue was treated and the blood vessels were naked. the left uterine arteries and veins were condensed by one hand with Ligasure. The contralateral side was treated with the same method. coagulating and cutting the bilateral cardinal ligament and partial uterosacral ligaments with the ultrasonic scalpel gradually. Then assistant makes vaginal fistula exposed with the Cup-type uterine manipulator. One-handed operation of the monopolar electrocoagulation hook cuts the vaginal vault and disconnects the uterus gradually. Then removing the whole uterus and bilateral fallopian tubes from the vagina. Washing and disinfect of vaginal stump with diluted iodophor repeatedly. Using the 1-0 absorbable line to suture the vaginal stump. Placing a “T” type drainage tube in the pelvic cavity, which was taken out from the vagina. The pelvic and abdominal cavity was flushed with normal saline adequately. After sucking the rinse solution with the suction device, the pelvic and abdominal cavity was examined for wounds and puncture holes without active bleeding. The bilateral ureters were normal and the peristalsis was normal. After checking the gauze and surgical instruments, take out

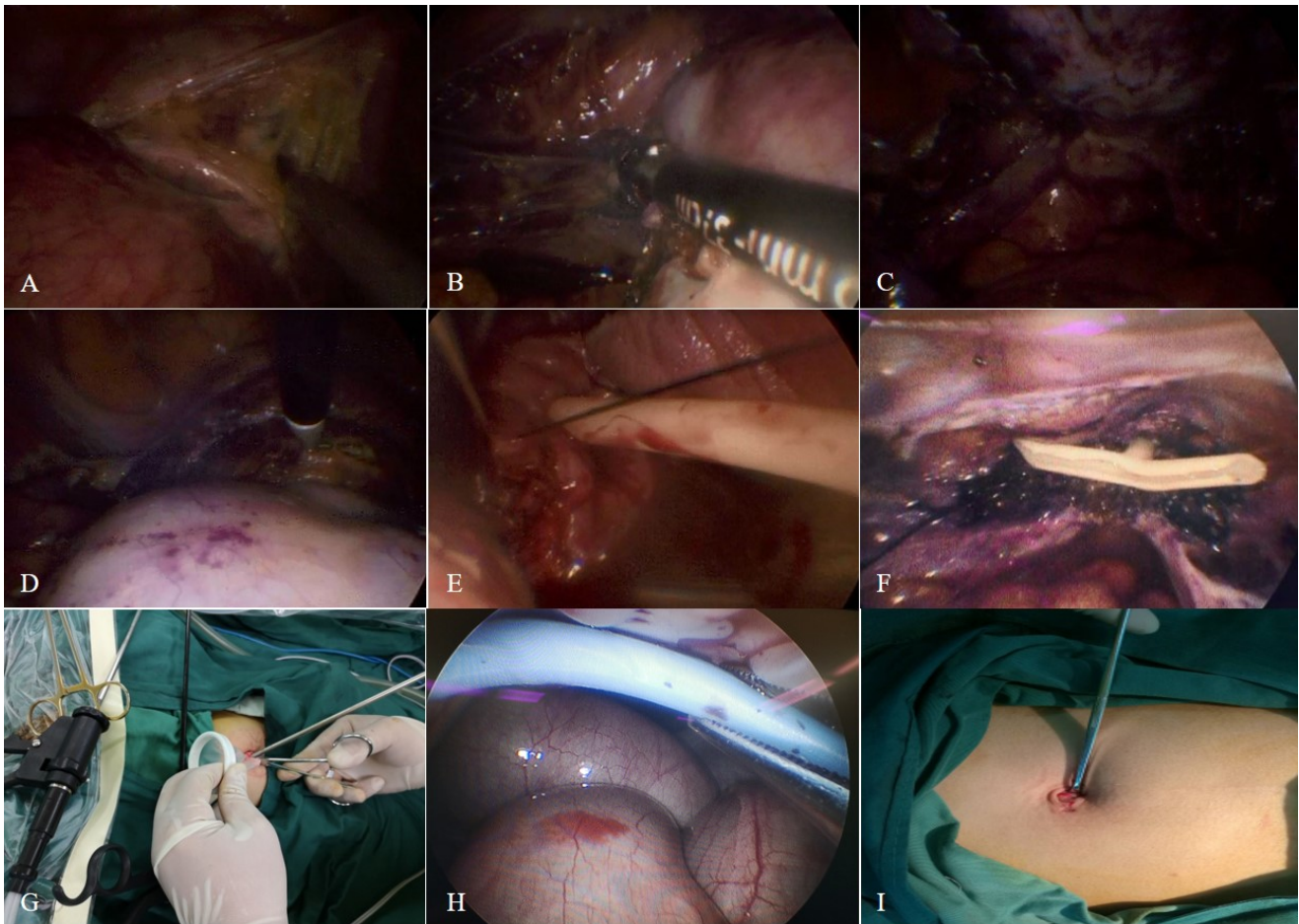


Figure 2. — (A) Ultrasound knife pushes the vesical peritoneal reflection. (B) One-handed 5 mm Ligasure for blood vessels near uterus. (C) Treatment of uterine sacral ligaments with bipolar electrocoagulation with one hand. (D) Cutting the vaginal wall with monopolar electrocoagulation hook with one hand. (E, F) Suture the stump of the vagina and Place T-shaped drainage tube through the vagina. (G, H) Take out the 40/50 surgical incision protector. (I) After the umbilical hole is formed, the shape of the umbilical wheel is not broken, and the wound is slightly hidden.

the incision protective sleeve under the guidance of the lens. Suturing the subcutaneous tissue of the umbilicus with 1-0 absorbable thread. Reshaping the umbilicus with the 4-0 absorbable line and pressing with gauze. End of procedure (The operation was shown in Figure 2).

6) Postoperative observation and clinical treatment: patients returned to the ward safely. Monitoring the patient's vital signs closely. Paying attention to abdominal incision and the fluid volume by drainage. The patient was given oxygen at a low rate and immobilized for 4 to 6 hours. Patients were given anti-infection rehydration and symptomatic support treatment, and analgesics were given according to the patient's situation.

Results

5 patients in this group were operated successfully. No other channels were added and none were converted to open procedures during the operation. The adjacent organs such as ureter, bladder colon and rectum, as well as large blood

vessels and nerves were not damaged during the operation. The operation time was (153 ± 34.02) min, mean estimated blood loss was (60 ± 30.82) milliliters, the median temperature was $37.2 (36.5-37.5)$ °C on the first day after surgery, and the anus exhaust time was 1.0-1.5 days. the urinary function of the patient was restored after removing the catheter at 2-3 days after surgery and no case of urinary retention occurred. No need to use analgesics after surgery. All the surgical incisions were II/A healing and the scars were hidden. The patients were hospitalized for 6-7 days. No postoperative complications such as wound infection, incisional hernia, bladder dysfunction, subcutaneous emphysema, and venous thrombosis occurred in the patients. The patients recovered well and were satisfied with the treatment.

Discussion

In recent years, with the continuous improvement of laparoscopic techniques and the rapid development of surgical

instruments, laparoscopic surgery has been widely used in gynecological surgery. Laparoscopic hysterectomy is very common in obstetrics and gynecology [7-10], which have most grassroots hospitals been able to carry out skillfully. Endoscopic surgery has many advantages such as small incision, light postoperative pain, rapid recovery of the patient and good wound healing. Therefore, it is favored by patients in clinical practice. However, traditional laparoscopic hysterectomy often requires 3-4 puncture scars on the abdominal wall. For female patients, especially young patients, there is still a problem of aesthetic deterioration. In view of this, LESS surgery with better cosmetic results came into being. It was popular all over the country. However, it is necessary to clearly understand that compared with traditional laparoscopic surgery, LESS surgery is more minimally beautiful, but common LESS surgery often requires a 1.5-3.0 cm incision in the umbilicus, which may damage the umbilicus and leave traces of scars in the umbilicus more or less. At the same time, the complete incision and suture of the normal structure of the umbilicus may increase the incidence of umbilical incisional hernia. Based on the traditional LESS surgery, which is relatively destructive to the umbilical structure, if the incision is further reduced to keep the umbilical pore morphological structure be not destroyed, on the one hand, the cosmetic effect can be increased, on the other hand, the umbilical incisional hernia can be further reduced. Based on this concept, 5mm mini-incision laparoendoscopic single-site surgery of total hysterectomy was performed and completed successfully by the author, which achieved better cosmetic results and patient satisfaction. Our findings indicate that compared with the traditional LESS surgery, 5 mm mini-incision laparoendoscopic single-site surgery of total hysterectomy has the less operation bleeding during operation, the lighter postoperative pain, the faster intestinal function recovered and the higher patient's self-morphological satisfaction. These clinical indicators have preliminary indicated that 5 mm mini incision single-port laparoscopic hysterectomy may be safe and feasible for some patients with suitable conditions.

Because LESS is operated by a single site, there is a "chopstick effect", which is more difficult than traditional laparoscopic surgery [2]. When the hysterectomy is performed with a 5 mm mini incision, the operation space is more limited and the "chopstick effect" is bound to be more obvious. Therefore, the 5 mm mini incision single-port laparoscopic hysterectomy operation time must be further extended, the difficulty of surgery is further increased and the dependence on surgical equipment and surgical skills is greater [11-13]. Therefore, the implementation of mini incision LESS has higher requirements. It is better to prepared fully and well-trained to reduce the risk of surgery effectively and ensure the success of the operation.

In view of the greater difficulty and limitations of the mini-incision LESS, so when the mini-incision LESS is applied to the hysterectomy, the author believes that the following points should be taken seriously: 1) In order to en-

sure the success of the operation and the safety of the patient, the surgeon should have rich experience in routine gynecologic LESS before performing a mini-incision single-hole laparoscopic hysterectomy. 2) Choosing the right case is the key to successful surgical completion, which is especially important for operators of early mini-incision LESS procedures. For the patients with hypertrophic abdominal and puncture difficultly or severe pelvic adhesions which were caused by the history of pelvic and abdominal surgery and endometriosis, etc, should be selected mini-incision LESS carefully [14, 15]. 3) Perfect preoperative preparation is very important for the final success of the operation. Perfecting relevant examination and eliminating surgical contraindications before surgery is the most basic requirement. 4) According to the specific circumstances of the operation, evaluate the feasibility of the mini-incision LESS operation. When the operation encounters difficulties, it is necessary to expand the incision in time for operation; if necessary, increasing the operation hole to the traditional porous Laparoscopic surgery or switching to open surgery to ensure patient safety. 5) Effective use of intelligent energy instruments and electrocoagulation and electric cutting combined instruments, which is more convenient and safer. Reducing equipment replacement effectively and improving surgical efficiency. 6) In order to reduce the effect of chopsticks effectively, we replace the traditional 10 mm laparoscopic lens with a smaller diameter laparoscopic, hysteroscopic or cystoscope lens to make room for operation. 7) In view of the limited operating space of the mini incision, the two-handed operation will inevitably interfere with each other, so we try to avoid the chopsticks effect effectively by one-handed operation. 8) Because 5 mm mini incision operating space is very limited, one-handed operation can only complete part of gynecological surgery. In order to further expand the indications for surgery, it is perhaps a development direction to develop a lengthened instrument with smaller diameter and appropriate hardness. 9) 5 mm mini-incision laparoendoscopic single-site surgery of total hysterectomy is obvious difficulty in operation, so the surgeon should have enough patience and be familiar with the pelvic anatomy. Especially when you are dealing with the uterine vessels, it should be handled in place to avoid bleeding. 10) Difficulty to take out the specimen: it is difficult to take out the uterine specimen in 5 mm mini-incision laparoendoscopic single-site surgery, especially the huge uterus. In order to solve this problem, we use transvaginal extraction. A number of studies have shown that transvaginal specimen extraction has the advantages of increasing the incision, less complications, safe operation, less bleeding, less postoperative pain, beautiful incision, and high patient satisfaction and so on, thus this promote the wider application of micro incision single hole laparoscopic technology, which is consistent with our research [16-18]. However, transvaginal sampling may have some disadvantages, such as postoperative pelvic infection, coital pain, decreased sexual sensitivity of patients and influence on fertility, but Stefano *et al.* [18].

did not find the occurrence of these complications through the retrospective analysis. It has been reported that the suture of vaginal stump after minimally invasive laparoscopic surgery may be split. To avoid this situation, we used the reverse needed suture to suture the vaginal stump. No split of vaginal stump has occurred since the follow-up of patients.

Conclusions

In conclusion, this study initially confirmed that 5 mm mini-incision laparoendoscopic single-site surgery of total hysterectomy is safe and feasible. However, the mini-incision LESS may require longer operative time and be more difficult to perform than the usual LESS surgery, thus it depends more on the surgeon's excellent surgical technique. The safety and efficacy of 5 mm mini-incision laparoendoscopic single-site surgery of total hysterectomy are further confirmed by prospective, randomized large-sample studies.

Ethics Approval and Consent to Participate

All subjects gave their informed consent for inclusion before they participated in the study. This study has been approved by the Medical Ethics Committee of Peking Union Medical College Hospital (ZS-1709).

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Conflict of Interest

The authors declare no conflict of interest.

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Corresponding Author:

JIMING CHEN, M.D., Ph.D.

Department of Obstetrics and Gynecology,

Yanghu District, the Affiliated Changzhou No.2 People's Hospital of Nanjing Medical University, No. 68

Gehu Middle Road, Wujin District, Changzhou City,

Jiangsu Province, 213000 (P. R. China)

e-mail: cjming@126.com