



## Case Report

## Two-phase laparoendoscopic single-site cervical ligament-sparing hysterectomy: A novel approach in difficult laparoscopic hysterectomy

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## ABSTRACT

**Objective:** To proposed a novel method for a difficult laparoscopic hysterectomy that spares the cervical ligaments and eliminates the cervical canal and transformation zone of the cervix.**Case report:** A 40-year-old women, gravida 3 para 3, who had had a cesarean delivery previously, was referred to the gynecology clinic due to adenomyosis with menorrhagia and severe anemia. Ultrasonography showed that the uterus was enlarged to 13.5 cm × 10.7 cm × 8.8 cm. After obtaining informed consent, a two-phase laparoendoscopic single-site (LESS) cervical ligaments-sparing hysterectomy was performed smoothly. The patient discharged on 4th day and resumed her sexual life less than 2 months after surgery.**Conclusion:** This novel minimal invasive method of hysterectomy makes difficulty laparoscopic hysterectomy easy and safe. Preservation of cervical ligaments retains stability in the pelvic floor and may reduce intraoperative complications and subsequent pelvic floor organ prolapse.Copyright © 2016, Taiwan Association of Obstetrics & Gynecology. Published by Elsevier Taiwan LLC. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## Introduction

Over 430,000 hysterectomies, the most commonly performed gynecological surgical procedure, are performed annually in the USA [1]. Nowadays, with rapid development of minimally invasive surgical procedures, a laparoscopic hysterectomy is the standard. However, in some cases, an enlarged uterus when approached laparoscopically is very difficult or even unsafe, especially in T-shaped uterus, in the presence of lateral or intraligamentary myomas, or when the uterus is fixed at the pelvis.

The incidence of vaginal vault prolapse (VVP) after a hysterectomy varies from 0.2% to 45% in the literature [2,3], of which 3.6 patients/1000 person-years of risk required surgical repair. Cumulative risk increases from 1% at 3 years after a hysterectomy to 5% at 15 years after a hysterectomy [4]. VVP negatively impacts the quality of life for women. During the current hysterectomy procedures, ligaments or fascia including pubocervical fascia, the transverse cervical ligament (cardinal), and uterosacral ligament

(suspend the rectovaginal septum) are transected. Experts have failed to reach a consensus on whether a hysterectomy with transection of cervical ligaments related to vault prolapse or other pelvic organ prolapse [5,6]. Paracolpium, a connective tissue in the cardinal ligament of the cervix, was observed to be ruptured in a study of cadaver with VVP [7], and it had been transected during hysterectomy.

Bladder and ureter injury are not unusual complications during a hysterectomy [8]; most occur before or during transection of the cervical ligaments [9], especially in cases of congenital abnormality such as duplicate ureters or severe adhesion at the uterovesical junction. Sometimes these injuries are almost unavoidable. Although a subtotal hysterectomy preserves the cervix and cervical ligaments, patients must worry about cervical neoplasia or cyclical vaginal discharge and/or bleeding after the surgery.

Herein, a new hysterectomy procedure that preserves the cervical ligaments was deployed for a case of difficult laparoscopic hysterectomy.

## Case Report

This 40 year-old woman, gravida 3 para 3, who had had previous cesarean delivery, was referred to the gynecologic clinic due to

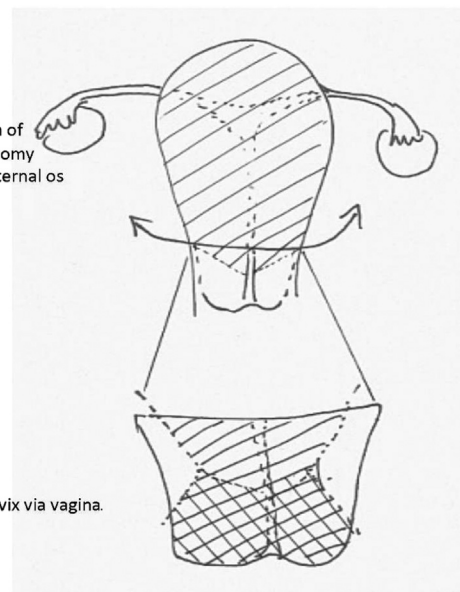
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adenomyosis with menorrhagia and severe anemia (hemoglobin 5.6 mg/dL). Ultrasonography and abdominal computed tomography revealed an enlarged uterus of 13.5 cm × 10.7 cm × 8.8 cm (Figures 1A and 1B). After informed consent was obtained, the novel approach two-phase laparoendoscopic single-site cervical ligament-sparing hysterectomy (LESS-CLSH) was performed smoothly. During surgery, moderate intra-abdominal adhesions were seen at the left adnexal and right lower abdomen. The single-port setting was described previously [10]. Briefly, a 2.5-cm vertical incision through the umbilicus was made and a retractor (Alexis; Applied Medical, Rancho Santa Margarita, CA, USA) was inserted. A home-made adaptor composed of a surgical glove and trocars was connected to the retractor. The fingers of the glove functioned as multiple ports for laparoscopic instruments and a camera. A rigid 5-mm 30° laparoscope (Karl Storz, Tuttlingen, Germany) was used. This method of total hysterectomy has two phases (Figure 2): (1) a laparoscopic approach for a supracervical hysterectomy and conization from the internal os of the cervix; and (2) wide excision of the cervix via the vagina. Phase 1 of the procedure is almost the same as the conventional laparoscopic supracervical hysterectomy. Briefly, the round, ovarian and broad ligaments are transected with Ligasure (Valleylab Inc., Boulder, CO, USA) and the peritoneum between the uterovesical junction is opened. The uterine artery at the bilateral side of the cervix is identified by slow dissection and it is transected after coagulation with Ligasure. A cutting LOOP (26183 MB; Karl Storz) is then used to loop the cervix at the supracervical level. After ensuring that no bowel or other organ is trapped in the loop, 70–80 W blending cutting energy is applied for electrocauterization. After transecting the body of the uterus, a hook (MH-615; Olympus, Tokyo, Japan) is used to mark the incision tract with electrocauterization in coagulation mode, and approximately 0.5–1 cm from the external surface of the cervix should be

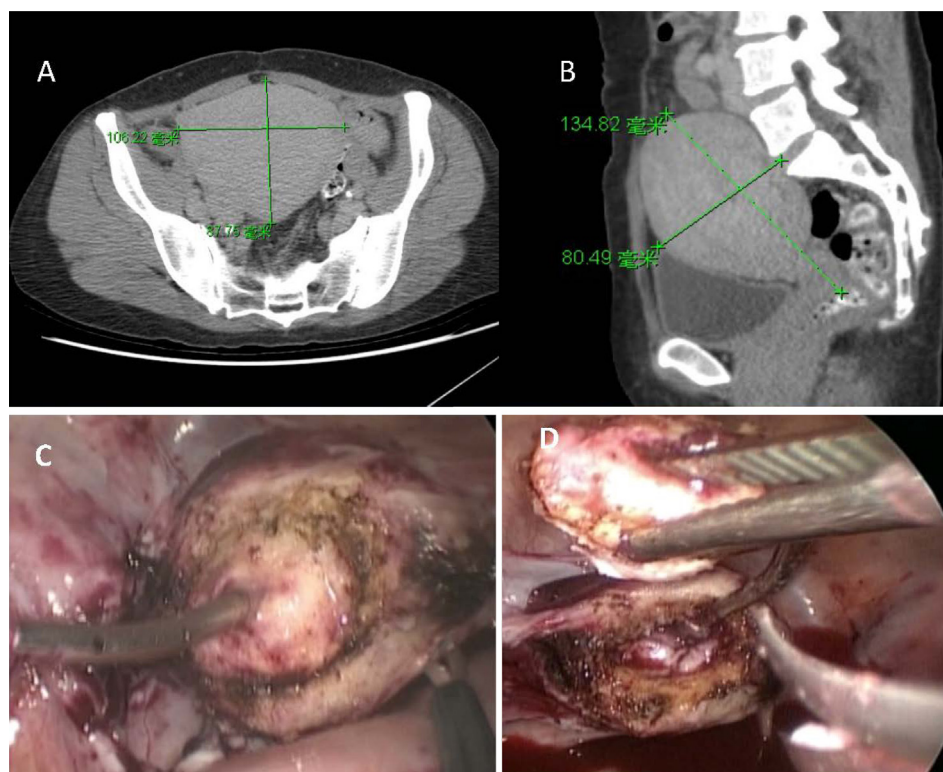
**Phase 1:**  
Laparoscopic approach of  
supracervical hysterectomy  
and conization from internal os  
of cervix.

**Phase 2:**  
Wide excision of cervix via vagina.



**Figure 2.** Schema of the two phases of laparoendoscopic single-site cervical ligaments-sparing hysterectomy. Phase 1: laparoscopic approach for supracervical hysterectomy and conization from the internal os of the cervix. Phase 2: wide excision of the cervix via the vagina.

left (Figure 1C). Conization of the endocervix in this case was done using hook and scissor laparoscopically (Lagis, Taichung, Taiwan; Figure 1D). A piece of Surgicel (Ethicon, Somerville, NJ, USA) was placed into the hole of the endocervix after conization for hemostasis and as a guide for the wide excision in Phase 2. The transected



**Figure 1.** Abdominal computed tomography shows an enlarged uterus sized 13.5 cm × 10.7 cm × 8.8 cm. (A) Coronal view; (B) sagittal view; (C, D) laparoscopic approach for conization from the internal os of the cervix.



uterus was removed via the umbilical wound by manual morcellation using a cold knife (Figure 3). In Phase 2, wide excision of the exocervix via the vagina was performed. The incision tract was marked with coagulation mode in vertical spindle shape (Figure 4A). Cutting started at 12 o'clock in the direction of the exocervix; the cut was not perpendicular but about 70–80° towards the endocervix until the Surgicel was found (Figures 4B and 4). The wound of the residual cervical stump was closed in two



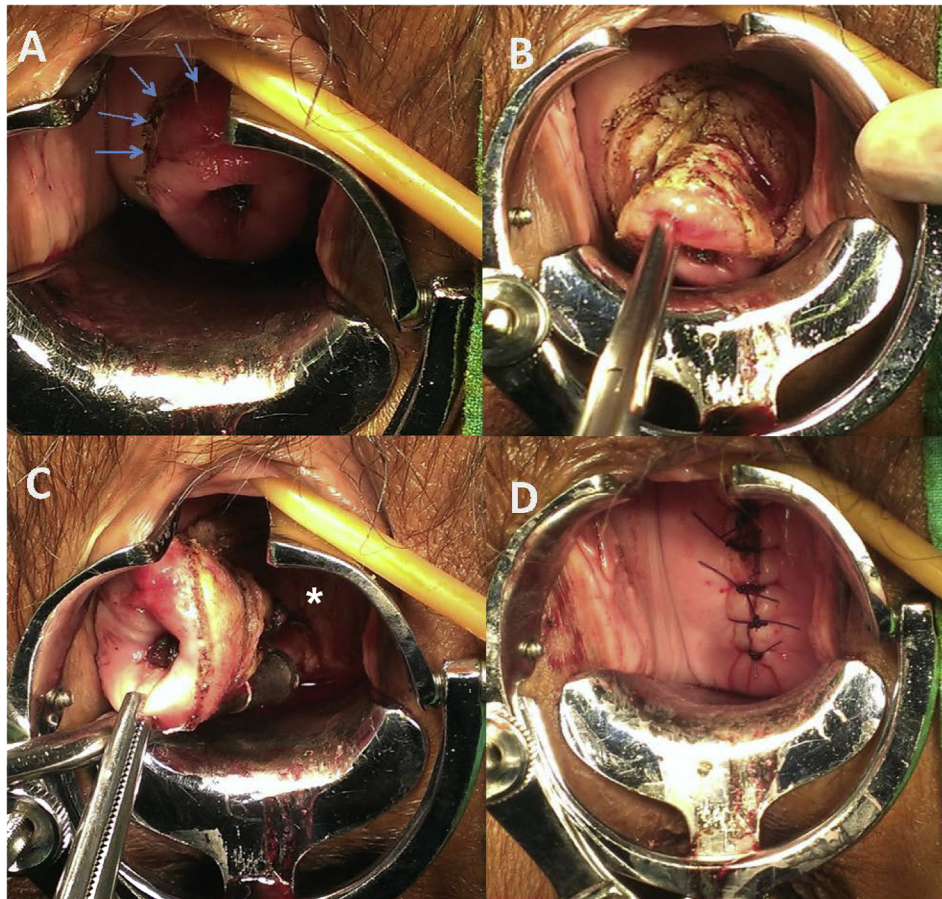
**Figure 3.** Manual morcellation of the body of the uterus was performed to remove the tissue through the single incision site at umbilicus. Figure shows using a cold knife cut of the body of the uterus as peeling an apple skin.

layers: 5/8 curved Vicryl (Ethicon) was used for closing stroma of the cervix continuously; and 1-0 Monocryl (Ethicon) was used to close the cervical mucosa layer in an interrupted manner (Figure 4D).

The two-phase LESS-CLSH, adhesiolysis, and bilateral salpingectomy, which were done smoothly, took 140 minutes and estimated blood loss was 450 mL. The visual analog pain scores at 0 hours, 24 hours, and on 4th day after surgery were 8, 5, and 3, respectively. The patient was discharged on postoperative Day 4. On follow up, she recovered very well, no granulation was found on the *cervical cuff* and she felt comfortable on having sex before the end of the 2<sup>nd</sup> postoperative month. The chart review of this case report was approved by the Research Ethics Committee of Hualien Tzu Chi General Hospital (IRB103-151-B).

## Discussion

This novel approach for a hysterectomy has two modifications when compared with the procedures in a conventional laparoscopic assisted vaginal hysterectomy. First, to preserve the cervical ligaments, the entire hysterectomy process was divided into two phases: laparoscopic supracervical hysterectomy plus conization of the endocervix and a wide excision of the exocervix via the vagina. Second, a single incision site was used to remove the large uterine body because this technique is easy, fast, and safe [11]. These modifications make LESS-CLSH easy and safe to perform in difficult situations, such as a large T-shaped uterus or with myomas located



**Figure 4.** Wide excision of the cervix in Phase 2. (A) Start at 12 o'clock relative to the upper lip of cervix, mark the incision tract (blue arrow) with coagulation in a spindle shape; (B) cut into the upper part of cervix at an angle about 70–80° relative to the cervical axis until the Surgicel (star) is seen; (C) cut in the lower part of the cervix using the same method that was used for the upper part; (D) close the cervical cuff vertically in two layers.

at the lateral uterine wall. LESS-CLSH is beneficial, especially for patients who are virgins or have no parity, compared with laparoscopic assisted vaginal hysterectomy. In some cases, laparoscopic total hysterectomy is risky to perform, especially when the cervical ligaments are transected, regardless of whether this is done translaparoscopically or transvaginally. Removal of a large uterus via the vagina is even more difficult and time consuming. Manual morcellation via the umbilicus port is safer, faster, and easier for removal.

The incidence of invasive cervical adenocarcinoma and its variants has increased dramatically over the past few decades, especially in young women; this cell type accounts for approximately 24% of all invasive cervical cancers in Norway [12]. Wide excision of the cervix facilitates excision of most of the exocervix and eliminates potential cervical neoplasia; however, if conization of the endocervix was not performed, adenocarcinoma arising from the endocervical gland is a concern. Patients who received this method of hysterectomy do not need to worry about cervical neoplasia and vaginal bleeding occurring due to vaginal cuff granulations or their menstrual cycle.

Other advantages also accompany LESS-CLSH. First, preserving cervical ligaments will preserve the skeletal structure of the pelvic floor, no vaginal vault prolapse will occur and this procedure can hopefully prevent the occurrence of other pelvic organ prolapse (POP) such as cystocele or enterocele. Two potential mechanisms of hysterectomy may relate to POP in some circumstances. Sacrificing the cervical ligaments causes pelvic floor instability. Beside, during transection of cervical ligaments in hysterectomy, injury to vessels that supply the fascia and muscles of the pelvic floor may occur, resulting in ischemia or partial necrosis of the pelvic floor's structures, further increasing the risk of subsequent POP. Preservation of the blood supply from the ascending uterine artery can keep the residual cervical stump viable and maintain good support for the pelvic floor. In addition, because cervical ligaments are not transected, injury to the ureter, bladder, or bowel will be rare or theoretically impossible. Second, because the cervix is the central of all cervical ligaments in the pelvic floor, the residual *cervical cuff* in this approach may act as a good anchoring base during a future sacrocolpopexy. Finally, the speed at which patients can return to sexual life after the proposed hysterectomy procedures is typically shortened because the pelvic floor or vaginal cuff has not experienced trauma with the propose method.

This method is very suitable for women with benign uterine diseases and for those who do not need to preserve their fertility. However, this method has a limitation because it is not suitable for uteruses with myoma of the cervix or myoma at the lower lateral uterine wall. Looping of the cervix for transection during Phase 1 is

difficult and unsafe, unless myomectomy has been performed before the cervical transection and the surgeon has ensured that the ascending branch of uterine artery was fully ligated before transection.

In conclusion, this novel hysterectomy method is easy and safe to perform for a patient with a large uterus. Preservation of the cervical ligaments retains stability of the pelvic floor and hopefully reduces intraoperative complications and subsequent pelvic organ prolapse.

## Conflicts of interest

The authors have no conflicts of interest relevant to this article.

## Acknowledgments

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## References

- [1] Wright JD, Herzog TJ, Tsui J, Ananth CV, Lewin SN, Lu YS, et al. Nationwide trends in the performance of inpatient hysterectomy in the United States. *Obstet Gynecol* 2013;122:233–41.
- [2] Symmonds RE, Williams TJ, Lee RA, Webb MJ. Posthysterectomy enterocele and vaginal vault prolapse. *Am J Obstet Gynecol* 1981;140:852–9.
- [3] Valaitis SR, Stanton SL. Sacrocolpopexy: a retrospective study of a clinician's experience. *Br J Obstet Gynaecol* 1994;101:518–22.
- [4] Flynn BJ, Webster GD. Surgical management of the apical vaginal defect. *Curr Opin Urol* 2002;12:353–8.
- [5] Greer WJ, Richter HE, Wheeler TL, Varner RE, Szychowski JM, Kuppermann M, et al. Long-term outcomes of the total or supracervical hysterectomy (TOSH) trial. *Female Pelvic Med Reconstr Surg* 2010;16:49–57.
- [6] Persson P, Brynhildsen J, Kjølhede P. Hysterectomy Multicentre Study Group in South-East Sweden. Pelvic organ prolapse after subtotal and total hysterectomy: a long-term follow-up of an open randomised controlled multicentre study. *BJOG* 2013;120:1556–65.
- [7] DeLancey JO. Anatomic aspects of vaginal eversion after hysterectomy. *Am J Obstet Gynecol* 1992;166:1717–24. discussion 24–8.
- [8] Manoucheri E, Cohen SL, Sandberg EM, Kibel AS, Einarsson J. Ureteral injury in laparoscopic gynecologic surgery. *Rev Obstet Gynecol* 2012;5:106–11.
- [9] Selzman AA, Spirnak JP. Iatrogenic ureteral injuries: a 20-year experience in treating 165 injuries. *J Urol* 1996;155:878–81.
- [10] Lee YY, Kim TJ, Kim CJ, Kang H, Choi CH, Lee JW, et al. Single-port access laparoscopic-assisted vaginal hysterectomy: a novel method with a wound retractor and a glove. *J Minim Invasive Gynecol* 2009;16:450–3.
- [11] Serur E, Lakhi N. Laparoscopic hysterectomy with manual morcellation of the uterus: an original technique that permits the safe and quick removal of a large uterus. *Am J Obstet Gynecol* 2011;204. 566 e1–2.
- [12] Alfken GC, Thoresen SO, Kristensen GB, Skovlund E, Abeler VM. Histopathologic subtyping of cervical adenocarcinoma reveals increasing incidence rates of endometrioid tumors in all age groups: a population based study with review of all nonsquamous cervical carcinomas in Norway from 1966 to 1970, 1976 to 1980, and 1986 to 1990. *Cancer* 2000;89:1291–9.