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Short communication

# Subtotal hysterectomy by natural orifice transluminal endoscopic surgery

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ABSTRACT

*Study objective:* To introduce the innovative surgical procedure of treating benign uterine pathology with subtotal hysterectomy by natural orifice transluminal endoscopic surgery (NOTES).
*Design:* Prospective observational study.
*Setting:* Tertiary referral medical center.
*Methods:* From June 2014 to May 2016, three patients with benign uterine diseases who were eligible for laparoscopic subtotal hysterectomy were recruited to undergo transvaginal NOTES at a tertiary referral medical center. Intraoperative and postoperative surgical outcomes were measured.
*Results:* Subtotal hysterectomy by transvaginal NOTES was successfully completed in all patients without any conversion to conventional laparoscopy. The operative time was $144 \pm 4.5$ (138–149) minutes with an average estimated blood loss of $133 \pm 62$ (50–200) mL. None of the patients required an intraoperative blood transfusion. The mean specimen weight was $140 \pm 59$ (56–188) g. The final histology reports were uterine leiomyoma and adenomyosis in these three cases. There were no intraoperative or postoperative complications. No case required intraoperative or postoperative blood transfusion. No cases were converted to traditional laparoscopy or laparotomy.
*Conclusion:* Our preliminary results showed the safety and feasibility of subtotal hysterectomy by transvaginal NOTES in selected patients. It is one of the most minimally invasive surgeries and results in invisible scars.

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## Introduction

Natural orifice transluminal endoscopic surgery (NOTES) is a novel concept of using the natural orifices of the human body as surgical channels.[1] For gynecologic surgeons, transvaginal access is the most familiar and useful approach. We developed the technique of transvaginal NOTES using the Lagiport kit (Lagis Enterprise Co., Ltd., Taichung, Taiwan; Figure 1) in 2012 and demonstrated that transvaginal NOTES can be performed in surgeries such as adnexal procedures,[2,3] total hysterectomies,[4,5] myomectomy,[6] and endometrial cancers.[7]

However, subtotal hysterectomy is rarely discussed in the literature of NOTES. The purpose of this study was to demonstrate the surgical procedure step by step, to prove the feasibility in selected patients, and to explore the possible limitations of subtotal hysterectomy performed using transvaginal NOTES in the daily practice for benign gynecologic disease in our initial experience.

## Materials and methods

All patients who underwent surgical management provided written informed consent. Experienced gynecologic endoscopists performed all surgeries.

Conflicts of interest: All contributing authors declare no conflicts of interest.

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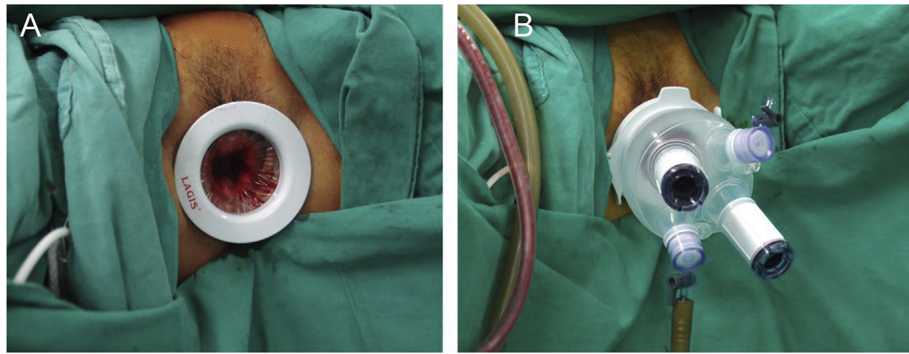


**Figure 1.** (A) A Lagiport kit multiple instrument access port (Lagis Enterprise Co., Ltd., Taichung, Taiwan) was inserted into vagina with its inner rim fixed against the posterior wall of the uteri and posterior *cul-de-sac*. (B) The insufflating tube was connected to one of the cannulas to establish pneumoperitoneum.

### *Patients*

From June 2014 to June 2016, patients indicated for laparoscopic hysterectomy were offered laparoscopic subtotal hysterectomy as an alternative option if there was no contraindication to preserve the cervix. After the possible consequences of subtotal hysterectomy were explained, only three patients requested to undergo laparoscopic subtotal hysterectomy. Patients scheduled for laparoscopic subtotal hysterectomy in Chang Gung Memorial Hospital, Tao-Yuan, Taiwan were prospectively included to undergo transvaginal NOTES. Conditions such as obesity (body mass index >30 kg/m$^2$), those who never had vaginal deliveries, those who needed concomitant adnexal surgeries, and those with a history of previous cesarean deliveries or abdominal surgeries were not considered contraindications. However, virgin patients, and those suspected to have severe pelvic adhesions from prior abdominal surgeries, tubo-ovarian abscesses, or endometriosis were excluded.

### *Surgical techniques*

Under general anesthesia with endotracheal intubation, patients were placed in Trendelenburg position with legs bandaged and supported in the stirrups. A Foley catheter was indwelled. The surgical procedures were as follows,

1. Posterior colpotomy. With tractions on uterine cervix by two teneculums, the operation began with a 2- to 3-cm incision of the posterior fornix.
2. Establishment of the vaginal channel for endoscopic surgery. A Lagiport kit multiple instrument access port was inserted into the vagina with its inner rim fixed against the posterior wall of uteri and posterior *cul-de-sac* (Figure 1). We used a 10-mm, 0° endoscope (Karl Storz GmbH & Co. KG, Tuttlingen, Germany), and a 5-mm bipolar LigaSure system (Covidien Company, Boulder, CO, USA) designed for laparoscopy as the energy source to complete the procedure.
3. Endoscopic management of the uterus. After we established adequate pneumoperitoneum and inserted the endoscope to explore the pelvis, the uterine isthmus was identified. Then, posterior and anterior broad ligaments at the level of isthmus were opened by a monopolar scissor. The remaining structures going upward from the isthmic level, including broad ligaments, round ligaments, ovarian ligaments and Fallopian tubes, were then sealed and cut using LigaSure (Figure 2). If any adnexal lesions were found, concomitant surgery such as enucleation, salpingectomy, or salpingo-oophorectomy was performed whenever appropriate. Then the uterus was inverted vaginally, and the uterus was amputated at the level of isthmus. Repair of the cervical stump and hemostasis were performed vaginally using conventional instruments. Then, the Lagiport was draped again, and the endoscope was reintroduced for hemostasis and to look over the whole pelvis and abdomen.
4. Procedure completion. Finally, the Lagiport was removed again, and the vaginal wound was closed using a 2–0 Vicryl suture.

### *Postoperative care*

Prophylactic antibiotics with preoperative cefazolin, and postoperative cefazolin and gentamicin for were administered for 1 day. Nonsteroidal anti-inflammatory drugs were also routinely prescribed after the operation. Patients were discharged, per our national regulations, with an afebrile status for at least 24 hours, without evidence of surgical complications.

## Results

The three patients were 43 years old, 45 years old, and 49 years old. They underwent subtotal hysterectomy via NOTES approach for the treatment of benign uterine pathologies, including myoma and adenomyosis. All of them were multiparous. One patient had a cesarean section twice only, and the others had vaginal deliveries. All of them denied having a history of hypertension, diabetes mellitus, or heart diseases. Except for cesarean section, one of them had previous laparoscopic myomectomy, and the others denied having an abdominal surgical history. Two patients had a history of pelvic inflammatory disease that required inpatient antibiotic treatment, but pelvic examination showed nonsignificant findings for suspicious pelvic adhesion. The demographic data, as well as intraoperative and postoperative surgical outcomes are established in Tables 1 and 2. Subtotal hysterectomy by transvaginal NOTES was successfully completed in all patients without any conversion to conventional laparoscopy. The operative time was $144 \pm 4.5$ (138–149) minutes with an average blood loss of $133 \pm 62$ (50–200) mL. No patients required an intraoperative blood transfusion. The mean specimen weight was $140 \pm 59$ (56–188) g. In the laboratory data survey on the 1$^{st}$ postoperative day, the hemoglobin level change was $-1.1 \pm 0.94$ g/dL on average. The postoperative hospital stay was $2.33 \pm 0.47$ (2–3) days. The final histology reports were uterine leiomyoma in two cases and adenomyosis in one case. There were no intraoperative or postoperative complications.

After a follow-up of up to 3 months after the operation, all patients showed good healing of the vaginal wound with normal voiding and sexual functions.

## Discussion

In recent years, new techniques of minimally invasive surgery have been developed not only for better surgical outcomes but also

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