

Transvaginal salpingo-oophorectomy with gasless laparoscopy — an optional pure natural orifice transluminal endoscopic surgery

Tingting Liu^{ID}, Yinghan Chen^{ID}, Xinyou Wang^{ID}

Shengjing Hospital of China Medical University, Shenyang, China

ABSTRACT

Objectives: To establish the appropriate technique for salpingo-oophorectomy via transvaginal natural orifice transluminal endoscopic surgery (NOTES), under gasless laparoscopy.

Material and methods: Ten patients with clinical indication underwent gasless laparoscopic transvaginal salpingo-oophorectomy with concurrent vaginal hysterectomy. An abdominal-wall lifting device was used after removal of the uterus, and the adnexa was removed trans-vaginally by gasless laparoscopy. The perioperative clinical data, such as operative duration, volume of blood loss, morbidity, intraoperative and postoperative complications, and length of hospital stay, were retrospectively analyzed.

Results: All procedures were successfully done, without any intraoperative or major postoperative complications, and no additional transabdominal ports were required. The salpingo-oophorectomy part of the procedure was completed in approximately 11–40 minutes, with minimal blood loss. All of the patients were discharged, scar-free, 2–4 days after surgery.

Conclusions: Transvaginal NOTES with gasless laparoscopy is a feasible and safe surgical technique in cases involving difficult vaginal salpingo-oophorectomy, which avoids conversion to an abdominal route.

Key words: Transvaginal salpingo-oophorectomy; gasless laparoscopy; natural orifice transluminal endoscopic surgery (NOTES)

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INTRODUCTION

Vaginal hysterectomy is the least invasive of all hysterectomy techniques. It is the preferred route of hysterectomy for benign gynecologic disease [1]. However, salpingo-oophorectomy at the time of vaginal hysterectomy is necessary in some cases, such as for postmenopausal women with atypical endometrial hyperplasia, adnexal mass, or a history of breast cancer. A successful vaginal salpingo-oophorectomy requires appropriate lighting, exposure, and preparation of the operative field at the time of surgery [2]. However, salpingo-oophorectomy at the time of vaginal hysterectomy can occasionally be technically challenging because the ovaries lie above the pelvis and are not readily accessible as a result of local adhesions, difficult visualization, or a less elastic ligament [3, 4]. Even highly skilled vaginal surgeon will occasionally have to convert to an abdominal approach to complete the procedure.

If salpingo-oophorectomy cannot be safely completed vaginally despite using the traditional suture ligation tech-

nique or a vessel-sealing device, a transvaginal natural orifice transluminal endoscopic surgery (NOTES) approach can be considered instead of converting to an abdominal route [5–7]. The technique can not only avoid abdominal incision, but also provide excellent access to the target organ and clear visualization of the pelvic cavity. Some investigators have applied transvaginal NOTES in salpingo-oophorectomy following a vaginal hysterectomy [3].

The main limitation of the transvaginal NOTES approach seems to be related to the conflict between instruments, which could be minimized with proper endoscope selection [8, 9]. In addition, devices used to establish and maintain pneumoperitoneum may aggravate the inconvenience of transvaginal operations. Based on our prophase studies [10], we successfully performed transvaginal salpingo-oophorectomy by a simple abdominal wall-lifting instrument under gasless laparoscopy. The technology may reduce the conflict of external instruments and improve operative efficiency. In this study, we aimed to describe the new procedure and

Corresponding author:

Yinghan Chen
Shengjing Hospital of China Medical University, Shenyang, China
e-mail: yinghanchen@163.com

investigate the safety, feasibility, and effectiveness of this surgical procedure.

MATERIAL AND METHODS

Clinical data

Ten patients underwent transvaginal salpingo-oophorectomy with gasless laparoscopy during vaginal hysterectomy at Shengjing Hospital of China Medical University between March 2017 and December 2018. The patients' characteristics are shown in Table 1. The patients' mean age was 61.7 years (range, 49–72 years). The contraindications to vaginal hysterectomy and subsequent vaginal adnexectomy with gasless laparoscopy are presented in Table 2. All patients provided a written informed consent for surgery. The patients were advised that transvaginal laparoscopic surgery would be performed if operative difficulties were encountered during the operation. All patients consented to possible transvaginal salpingo-oophorectomy with gasless laparoscopy. The study was approved by an institutional review board, and patient confidentiality was always maintained.

Table 1. Characteristics of the women who underwent transvaginal salpingo-oophorectomy with gasless laparoscopy

No.	Age	Gynecological condition
1	69	Postmenopause with uterine prolapse
2	67	Postmenopause with uterine prolapse and hydrosalpinx
3	55	Simple hyperplasia of endometrium with a history of breast cancer
4	52	Complex hyperplasia of endometrium with a history of breast cancer
5	66	Atypical hyperplasia of endometrium
6	60	Atypical hyperplasia of endometrium with pelvic adhesions
7	72	Postmenopause with simple serous ovarian cyst
8	62	Postmenopause with ovarian teratoma
9	49	Symptomatic leiomyomata with tubo-ovarian cyst
10	65	Postmenopause with leiomyomata

Table 2. Contraindications to transvaginal salpingo-oophorectomy with gasless laparoscopy

1. Morbid obesity. Body mass index was greater than 35 kg/m ²
2. A suspicion of malignancy. Ovarian mass was solid or had a solid component
3. History of severe endometriosis or pelvic inflammatory disease
4. Prior open abdominal surgery (more than twice)
5. Severe pelvic adhesions
6. Frozen section was not available
7. Severe medical comorbidities and/or coagulation disorders

Preoperative preparation

All of the patients underwent routine preoperative mechanical and chemical bowel preparation and also received a single dose of prophylactic intravenous antibiotics just before the procedure. Under general endotracheal anesthesia, all patients were placed in the lithotomy position.

Surgical procedure

The uterus was removed using Heaney's technique [11]. In all cases, an effort was made to remove the ovaries vaginally after vaginal hysterectomy. When it was difficult to safely extract or access the adnexa as a result of adhesions, minimal descent, or inadequate exposure after a careful evaluation, transvaginal NOTES was performed under gasless laparoscopy.

An Alexis wound retractor was placed in the vagina. The inner ring was placed through the vagina past the vaginal cuff. The outer ring rested on the perineum (Fig. 1A). There were no umbilical or abdominal ports applied. We used towel forceps as an abdominal wall-lifting device (Fig. 1B). One clamp was placed at the point of the adnexa surface projection on the abdominal wall to establish the operating space, and the other clamp was placed under laparoscopic observation to facilitate gasless surgery, if necessary.

Without using a cannula, a 10 mm endoscope with a 30-degree lens and conventional laparoscopic instruments were directly introduced through the vaginal port. Adhesions were dissected in a similar fashion as conventional laparoscopy when necessary. A vessel-sealing device was

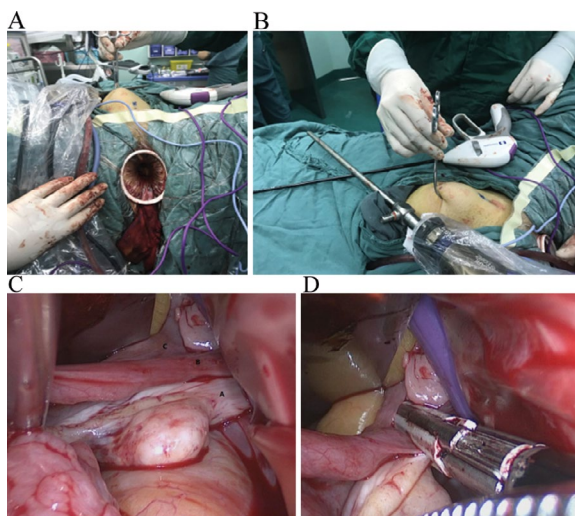


Figure 1. Surgical procedure (A) Alexis wound retractor resting past the vaginal cuff and on the perineum; (B) Towel forceps were used as an abdominal wall-lifting device at the point of adnexa surface projection on the abdominal wall without an abdominal port; (C) Left adnexa from the view of transvaginal laparoscopy; A, Proper ligament of ovary; B, isthmus of fallopian tube; C, infundibulopelvic ligament; (D) Resection of the left adnexa through transvaginal gasless laparoscopy

used to electrocauterize and seal and cut the infundibulopelvic ligament and complete the salpingo-oophorectomy under direct visualization (Fig. 1C, D). The specimens were extracted through the vaginal port. After hemostasis was confirmed, the single port was taken out, and the vaginal cuff was sutured by hand in a routine method.

Postoperative management and follow-up

The patients received routine anti-inflammatory therapy for 3 days and rehydration therapy for 1 day after operation. The patients were placed on a semiliquid diet and were allowed to ambulate on postoperative day 1. The vaginal pack was removed 24 hours postoperatively. Patients were followed up during postoperative weeks 1 and 8. Gynecological examinations and pelvic ultrasound were performed.

Observation indicators

Operating time, estimated blood loss, intraoperative complications, postoperative complications, and postoperative hospital stay were recorded. Operating time was defined as the salpingo-oophorectomy procedure time which was started from the placement of the vaginal port and ended when the closure of the vaginal cuff was completed. Pathologic examinations of all salpingo-oophorectomy specimens were recorded.

RESULTS

Until now, only ten patients have taken pure NOTES transvaginal salpingo-oophorectomy with gasless laparoscopy. All the surgical procedures were performed successfully, no additional transabdominal ports were required. The salpingo-oophorectomy procedure time was recorded from the placement of the vaginal port until the closure of the vaginal cuff was completed. The mean operating time was 22.2 minutes (ranging from 11 minutes to 40 minutes), and the blood loss was limited. There were no complications, including intraoperative or major postoperative complications. Postoperative analgesia was routinely administered after vaginal hysterectomy; administration of additional medications was not required. All patients were placed on a semiliquid diet 1 day after the surgery and then to a soft diet after 2 to 3 days. The average postoperative hospital stay was 2.5 days (range, 2–4 days). Pathologic examination of all salpingo-oophorectomy specimens revealed benign results.

All patients were seen on postoperative weeks 1 and 8 and scheduled for follow-up visits. No one required narcotic pain medications after hospital discharge. Only a few outpatients had postoperative complications, including one vaginal cuff granulation tissue repair 2 months after surgery. No febrile episodes or vaginal cuff infections were reported. All of the sexually active patients returned to normal sexual activity after the surgery.

DISCUSSION

Transvaginal NOTES may be valuable when vaginal salpingo-oophorectomy is too difficult to perform [2, 12]. The salpingo-oophorectomy can then be completed under direct visualization using conventional laparoscopic instruments through the vaginal port. Here, we applied the novel approach when ovarian descent was absent or adhesions were discovered intraoperatively following concurrent transvaginal hysterectomy. Using this technique, conversion to an abdominal approach was prevented, achieving clear visualization and excellent cosmetic results [7, 13]. In addition, transvaginal NOTES provides ideal aesthetic effects, can reduce wound complications, shorter hospital stay, with good psychological effects, since there was no trauma is inflicted on the body surface [8, 14]. In our initial series, the pure NOTES transvaginal salpingo-oophorectomy proved the feasibility and safety.

However, only a narrow manipulation space is available, which is the main inherent obstacle to performing pure transvaginal NOTES surgery [9, 15]. Most of the surgical instruments can cause crowding, and frequent collisions are also noted extracorporeally [16]. In conventional pneumoperitoneum, the devices were used to establish and maintain pneumoperitoneum and to reduce the operative space in the vagina, which aggravated the inconvenience. On the basis of our previous animal experiments and preliminary study [10], we developed transvaginal salpingo-oophorectomy using a simple abdominal under gasless laparoscopy wall-lifting instrument, in an attempt to overcome the space obstacle. The novel approach creates more operational space and minimizes conflict between instruments given the lack of need for a pneumoperitoneum device, trocars, or other special instruments in the gasless operation.

The vaginal-incision gas leak is another inherent limitation of pure transvaginal NOTES due to a floppy and weak vaginal cuff. The gas leak of vaginal incision affects the outcomes of pure transvaginal NOTES performed under conventional pneumoperitoneum seriously [17]. The self-constructed vaginal glove port with wound retractor or a commercial port for laparoendoscopic single-site surgery alleviate gas leaks to some extent [3, 18]. However, surgeons typically must choose a medium-sized retractor to avoid excessive traction on the vaginal cuff. Thus, the situation of gas leak inevitably exists. In this study, the abdominal lifting device without pneumoperitoneum was sufficient to provide adequate visibility to perform pure transvaginal salpingo-oophorectomy. Thus, we were able to eliminate concerns about gas leaks and fluently operate without worrying about the effects of intraperitoneal pressure.

Positive-pressure pneumoperitoneum was more optimal than abdominal wall lift technique for operative field and workspace due to the “tenting” effect [19]. However, the technique we used actually showed us satisfactory

exposure and an easy access approach for pure NOTES salpingo-oophorectomy. Two factors may account for this finding. The position of the target organ (the adnexa) is near the operation pathway (the vagina), and this procedure is relatively simple. In addition, two towel forceps are used in our technique to form a parallel double-line suspension, which made it possible to provide adequate and flexible exposure in the pelvis. The first clamp is placed at the point of the adnexa surface projection on the abdominal wall; the second one is placed under laparoscopic observation to make the exposure as wide as possible, which would provide enough space. The surgical assistant adjusts the force and angle of the lifting clamps during the operation to expose the view. Meanwhile, only the appropriate patients should be included for this technique (not including those with morbid obesity or severe adhesions). Careful preoperative evaluation of each patient is very important.

Gasless laparoscopy has other advantages as well. It avoids the occurrence of complications of carbon dioxide pneumoperitoneum, such as subcutaneous or mediastinal emphysema, hypercapnia, air embolism, cardiopulmonary dysfunction, and hemodynamic changes [20]. Since most patients who agree to undergo salpingo-oophorectomy are older postmenopausal women [21], the gasless method is more significant. In addition, there is no need to use a classic commercialized abdominal wall-lifting system, expensive special port, and trocar [22]. Our lifting method is simple, convenient, time saving, and cost-effective.

Although salpingo-oophorectomy via transvaginal NOTES with gasless laparoscopy has the aforementioned advantages. It is technically difficult to perform, mainly due to an unfamiliar and disoriented transvaginal view compared with a traditional abdominal laparoscopic view. Severe adhesions, severe local inflammation, or morbid obesity still remain the technical bottlenecks of this novel approach [23]. We are aware that this is a preliminary work and more practice and experience in this field is required. In addition, the novel approach must be further investigated and validated to assure safety and efficacy.

In this study of ten consecutive patients, we performed gasless laparoscopy for transvaginal salpingo-oophorectomy for the first time and achieved the desired results. The need to convert to an abdominal route could be avoided with this technique; hence, this technique may be a simple minimal-access surgical option when these areas are not easily accessible at the time of vaginal hysterectomy. Additional studies must be performed to validate the safety and efficacy of the new surgical technique.

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