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Sentinel Lymph Node Mapping and Staging Surgery Via Gasless Transvaginal Natural Orifice Transluminal Endoscopic Surgery: A Case Report of an Endometrial Cancer Patient and Comorbid Rheumatic Heart Disease

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Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
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Patient: Female, 43-year-old
Final Diagnosis: The stage 1A endometrioid adenocarcinoma and RHD pathology, including the cardiac function of class II, severe MS, and pulmonary hypertension
Symptoms: Irregular vaginal bleeding for more than 1 month
Medication: —
Clinical Procedure: —
Specialty: Surgery

Objective: Unusual or unexpected effect of treatment

Background: Conventional laparoscopic surgery and transvaginal natural orifice transluminal endoscopic surgery (vNOTES) both use CO_2 pneumoperitoneum to expose the surgical space. However, CO_2 pneumoperitoneum is undoubtedly dangerous for patients with rheumatic heart disease (RHD) and can cause cardiopulmonary impairments. Therefore, we selected the sentinel lymph node (SLN) mapping strategy to guide the staging surgery via gasless vNOTES for an endometrial cancer (EC)-patient with comorbid RHD. Here, we discuss whether our selected surgical method was safe and feasible for this patient.

Case Report: A 43-year-old woman with a history of RHD, severe mitral regurgitation, and pulmonary hypertension for more than 30 years received diagnostic curettage for irregular vaginal bleeding for more than 1 month. Pathological examinations revealed the occurrence of highly differentiated intrauterine endometrioid adenocarcinoma. She was admitted to the gynecological ward of our hospital for further surgery. We performed EC staging surgery with SLN mapping via gasless vNOTES and adopted a series of effective measures to solve the intraoperative complications of surgical space exposure. Surgery was successful. The patient recovered well and was discharged 5 days after surgery. She has been followed up in the gynecological clinic for nearly 1 year. At the time of this report, she had good recovery, no recurrence and metastasis, and normal tumor markers.

Conclusions: For EC patients with comorbid RHD pathology, application of staging surgery with SLN mapping via gasless vNOTES was shown to be safe and feasible. This approach is expected to be highly effective for patients with contraindications to CO2 pneumoperitoneum laparoscopy.

Keywords: Case Reports • Endometrial Neoplasms • Natural Orifice Endoscopic Surgery • Rheumatic Heart Disease • Sentinel Lymph Node • Familial Primary Pulmonary Hypertension

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Background

Endometrial carcinoma (EC) is one of the most common forms of gynecological malignancies. Recent studies suggest the feasibility and safety of broadly applied transvaginal natural orifice transluminal endoscopic surgery (vNOTES) in staging EC surgery [1-3]. Lymphatic mapping to identify the sentinel lymph node (SLN) is an accurate, ingenious, and feasible approach that provides a good assessment of lymph node involvement in EC [4-6], thus avoiding unnecessary systematic lymphadenectomy in patients with negative nodes. It also sets a new standard of care for patients with breast cancer and melanoma. Hence, the combined application of vNOTES and SLN mapping makes EC staging surgery highly effective and minimally invasive and eliminates the lymph node removal-based therapeutic complexities in the staging of cancer in patients.

The carbon dioxide (CO_2)-induced pneumoperitoneum in laparoscopic surgery has been routinely practiced to improve the visualization of the abdominal cavity. However, proper caution should be exercised, as this procedure can cause cardiopulmonary injury, hemodynamic changes, anesthesia and postoperative complications, such as subcutaneous emphysema, hypercapnia, acidosis, hypoxemia, and arrhythmias, due to the rapid absorption of CO_2 from the peritoneum to the circulation. Especially in patients with cardiovascular diseases, such as rheumatic heart disease (RHD), pulmonary hypertension, mitral regurgitation, and arrhythmias, the risks of CO2 pneumoperitoneum and postoperative complications are significantly high and can even cause death. The gasless laparoscopic surgery, as an innovative alternative to the pneumoperitoneum-based laparoscopy, not only retains the advantages of a minimally invasive procedure but also removes the possibility of CO_2 toxicity-associated postoperative complications. In recent years, the importance of its clinical application has been broadly recognized by clinicians and medical scholars [7-9].

Based on these innovative medical findings, the gynecological expert team of Chengdu Women's and Children's Central Hospital successfully completed the EC staging in a female patient with EC and comorbid RHD by SLN mapping-guided gasless vNOTES. Here, we present the case study of the patient.

Case Report

The patient was a 43-year-old woman, with a body-mass index (BMI) of 18.2 kg/m^2, who underwent a diagnostic dilatation and curettage on July 13, 2021, for irregular vaginal bleeding for more than 1 month. The preoperative pathological examinations revealed the occurrence of highly differentiated intrauterine endometrioid adenocarcinoma. She had RHD, including mitral stenosis and pulmonary hypertension, for more than 30 years, and was taking the oral medications digoxin, metoprolol, and spironolactone to control her high blood pressure and prevent heart failure. Also, the patient was successively treated with transabdominal left salpingectomy more than 20 years ago and right salpingectomy more than 10 years ago for ectopic pregnancies. The electrocardiogram showed atrial fibrillation, while the cardiac color Doppler ultrasound exhibited both left and right atrium enlargement, severe mitral stenosis, mild aortic and tricuspid valve regurgitations, arrhythmia, and normal left ventricular systolic function. The preliminary diagnosis indicated stage 1A endometrioid adenocarcinoma and RHD pathology, including the cardiac function of class II, severe mitral stenosis, and pulmonary hypertension.

On July 20, 2021, SLN mapping-guided EC staging surgery was performed under general anesthesia via gasless vNOTES. Prior to surgery, indocyanine green was injected into the cervix 15 min for SLN mapping before the surgery. Then, a vNOTES port (HangT Port; Beijing HangTian KaDi Technology R&D Institute, Beijing, China) was inserted through the vagina into the peritoneal cavity after opening the anterior and posterior vaginal vaults and dissecting the uterosacral and cardinal ligaments. The sealing cap of the port was not installed during the whole surgery (**Figure 1A, 1B**). The abdominal wall suspension device was placed 5 cm above the pubic symphysis to lift the abdominal wall, expanding the surgical space (**Figure 2A, 2B**). We explored the pelvic and abdominal cavity, peritoneum, diaphragm, and abdominal organs, and found no lesions. At the same time, 200 mL of peritoneal lavage fluid was taken. The port was used for hysterectomy and bilateral oophorectomy procedures. The retroperitoneal suspension needle was used to pull the peritoneum (**Figure 3A, 3B**), facilitating the SLN biopsy sample collection (**Figure 4A-4D**). The intraoperative pathological examination of the frozen section and peritoneal lavage fluid were negative. The 147-min-long surgery was completed, and the operative blood loss volume was 50 mL. The postoperative outcomes were satisfactory, without any postoperative symptoms of chest tightness, dyspnea, chest pain, or any other discomforts. The patient showed timely recovery and a relaxed feeling and was discharged 5 days after surgery. Postoperative pathological examinations in the uterus and bilateral ovaries revealed complex atypical endometrial hyperplasia, focal cancerous lesions, formation of highly differentiated EC, focal infiltration of superficial muscle wall (<0.1 cm), involvement of lower uterine mucosa, no definite vascular tumor thrombus and nerve invasion, no involvement of cervix, no bilateral parauterine carcinoma, and bilateral ovarian follicular cysts. Immunohistochemistry results showed 90% estrogen receptor-positive, 90% progesterone receptor-positive, partially p16 and vimentin-positive, 60% p53-positive (medium-range), and 40% Ki-67-positive cancer cells. All lymph nodes were negative for these markers. The patient received a long-term postoperative follow-up in the outpatient clinic.

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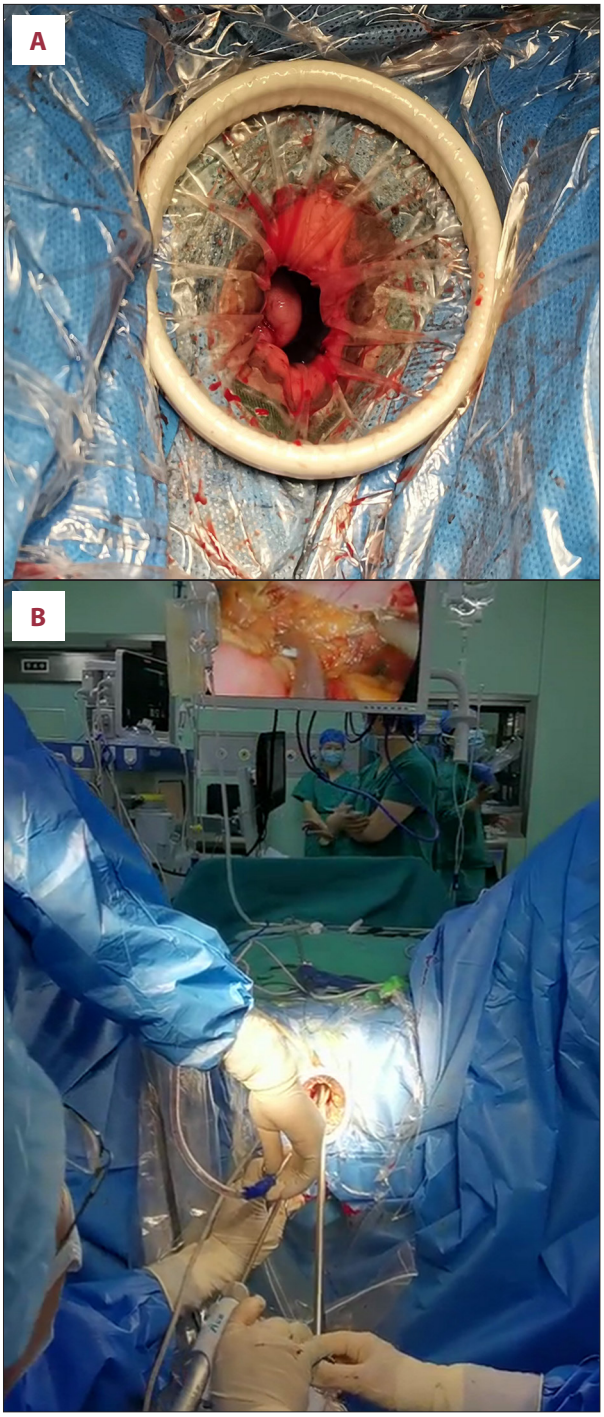

Figure 1. The transvaginal natural orifice transluminal endoscopic surgery (tvNOTES) operating platform. (**A**) The tvNOTES port was inserted through the vagina into the peritoneal cavity, but the sealing cap of the port was not installed. (**B**) Instruments were easy to access, and the assistant surgeon could assist the chief surgeon through the port directly. The monitor was placed in front of the chief surgeon.

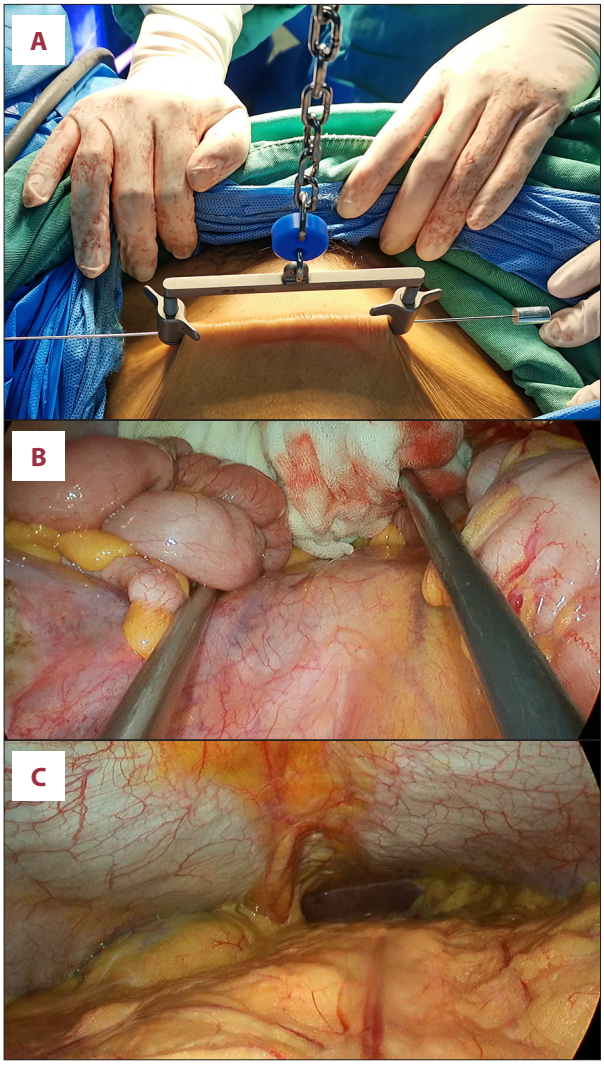

Figure 2. The abdominal wall suspension device setting. (**A**) The steel needle ran subcutaneously 5 cm above the pubic symphysis, the puncture length was about 10 cm, and both ends were fixed and suspended on the suspensory holder. (**B**) The pelvis was clearly exposed, and (**C**) the whole abdominal cavity could be thoroughly explored.

In the year after the surgery, the patient was followed up in the gynecological clinic every 3 months. She had no dyspnea, chest tightness, cough, expectoration, hematuria, bloody stool, vaginal bleeding, or other symptoms. The gynecological examination showed that the vaginal wound healed well. Regular enhanced pelvic and abdominal computed tomography scanning and tumor markers CA125 and HE4 examination showed no abnormalites. Due to the bilateral ovariectomy, the hormone level of the patient changed sharply. At first, she had obvious discomfort, such as hot flashes, but it was significantly relieved after 6 months. One year after surgery, it was recommended that the patient should have a gynecological outpatient examination every 6 months

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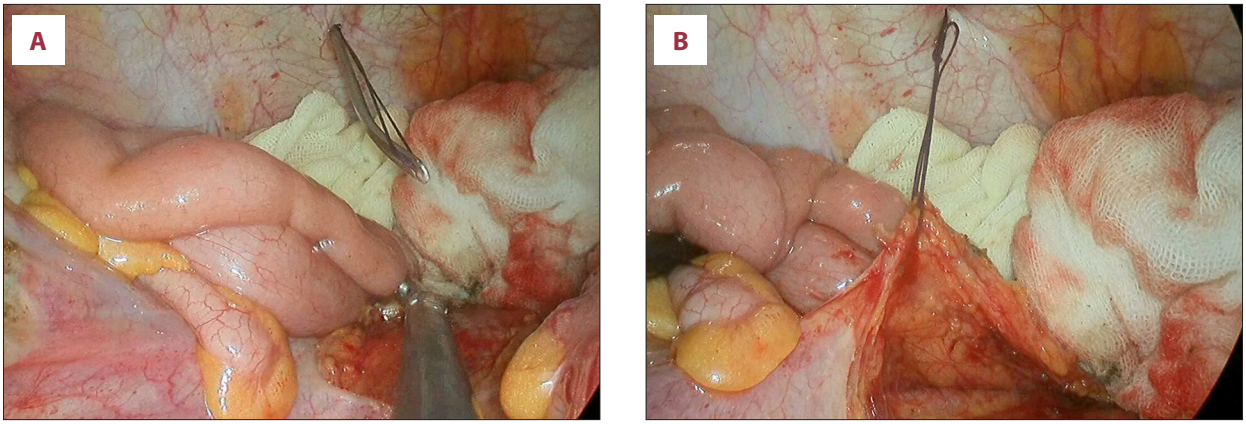

Figure 3. The retroperitoneum suspension needle setting. (**A**) The needle was passed through the abdominal wall and then to the retroperitoneum. (**B**) The exposed surgical field after retroperitoneum suspension.

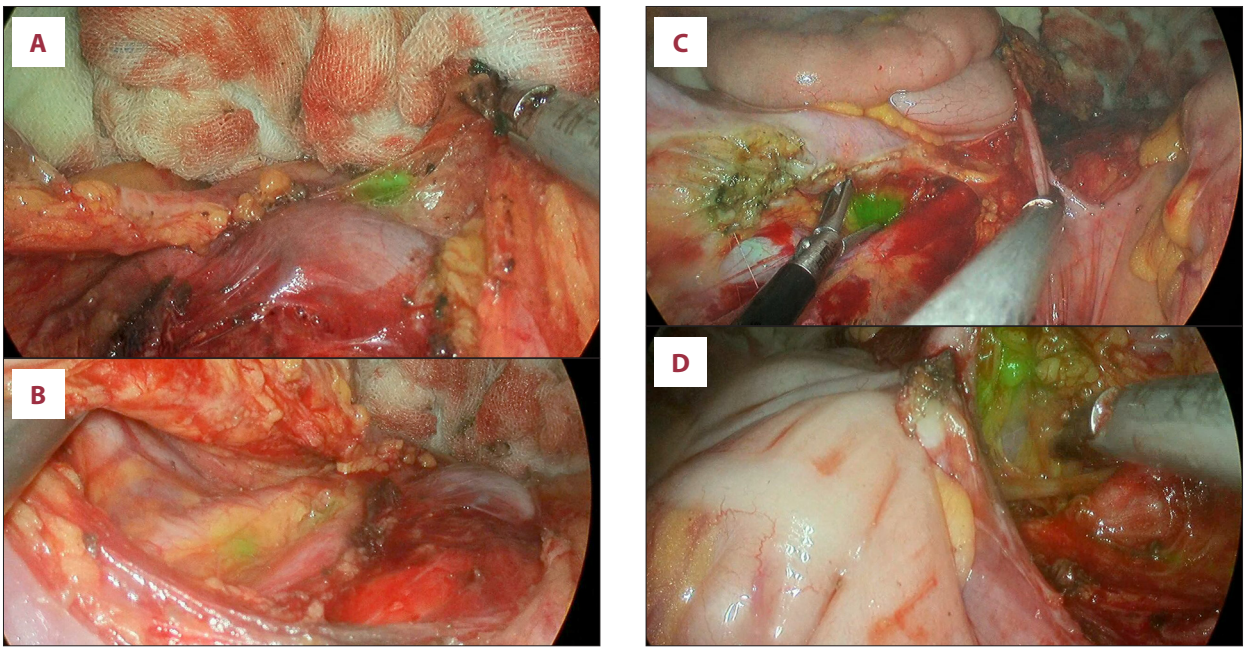

Figure 4. Bilateral pelvic and paraaortic sentinel lymph node (SLN) (shown by white arrow). (**A-D**) The SLN could be exposed and dissected.

Discussion

In 1996, Burke et al first reported the complex network of lymphatic draining to the uterus and performed intraabdominal lymphatic mapping in women with high-risk EC to investigate the lymphatic drainage of the uterine fundus in vivo [10]. LeBlanc et al reported on transvaginal and transperitoneal SLN biopsy and pelvic lymph node dissection in an elderly patient with obesity and EC [11]. Baekelandt first described the SLN removal procedure via vNOTES in a patient with EC who had not previously undergone any surgery or experienced bowel adhesions [5]. Oh et al found that transvaginal (tv)NOTES could be a feasible practice for treating patients with early stage EC and pelvic lymphadenectomy using traditional laparoscopic instruments [3]. Furthermore, a retrospective study showed that the tvNOTES procedure involving SLN mapping for EC could be achievable, with a shorter postoperative hospital stay, faster recovery, and better cosmetic results [4].

More than 39 million individuals are affected by RHD worldwide, with the highest prevalence in low-resource populations and constrained health systems [12]. The common complications of RHD include heart failure, atrial fibrillation, ischemic embolism, and infective endocarditis. Our patient also presented RHD symptoms, severe mitral stenosis, pulmonary hypertension, and atrial fibrillation. Under this situation, if CO_2 pneumoperitoneum had been used, it could have led to hemodynamic changes, hypercapnia-mediated cardiac

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overloading, pulmonary hypertension, and impaired cardiopulmonary functions. In gynecology, gasless laparoscopy has been used to remove leiomyomas [13] and in various minimally invasive procedures using an intraabdominal fan retractor [14]. In 2019, Yang reported a new surgical technique for hysterectomy using a robotic isobaric (gasless) vNOTES platform in 13 patients with benign uterine diseases. The right-angle retractor and weighted vaginal retractor were used to lift the pelvic cavity and vaginal wall to create a transvaginal operative space [9]. Pellegrino et al reportedly first applied the LaparoTenser device in patients with uterine and cervical cancers and demonstrated the feasibility and safety of this technique in oncologic and minimally invasive isobaric surgeries, suggesting its considerable role in high-risk patients for whom CO_2 laparoscopy is contraindicated [15]. The option of performing gasless surgery is of particularly special interest to avoid the detrimental effects of pneumoperitoneum in these high-risk patients.

To the best of our knowledge, the gasless vNOTES staging surgery of EC guided by SLN mapping has not been reported to date. This is the first case report describing the surgical experiences in such a scenario. The first problem to be solved for our patient was to expose an adequate surgical space. Most importantly, the patient could not be adjusted to the surgical head-low and hip-high position as regularly done for other patients, which made the procedure more difficult to perform. We adopted the following measures to solve this problem. First, we installed an abdominal wall suspension device at an appropriate position (**Figure 2A**), so that the whole abdominal and pelvic cavities could be explored (**Figure 2B, 2C**). Second, we used the retroperitoneal suspension needle combined with a modified trocar to assist the exposure, which was an effective and practical solution (**Figure 3A, 3B**). This method has been widely used in laparoscopic paraaortic lymphadenectomy in our hospital [16]. Third, without the port sealing cover, the surgeon was able to adjust the camera and surgical instruments to easily access the vaginal tube through the port to assist the chief surgeon in doing the cavity exposure (**Figure 1A, 1B**). The mutual interference between surgical instruments was largely alleviated, which made the gasless vNOTES more advantageous over the CO_2 pneumoperitoneum vNOTES; however, more clinical applications are needed to further validate this methodology. Fourth, we used a gauze piece to block the intestinal tube. Since the gasless vNOTES platform did not need to connect the sealing cap, the gauze piece was easily moved back and forth (**Figures 3A, 3B, 4B**). This study patient was at early stage (1A) EC, and SLNs in the pelvic and paraaortic locations were diagnosed (**Figure 4A-4D**). These measures allowed us to well expose the SLN and surgically remove them. Moreover, intraoperative pathological examination of the frozen section and postoperative pathological super staging were both negative. The use of SLN biopsy instead of full lymphadenectomy helped avoid the adverse effects, resulting in a safer and faster surgical intervention, which was crucial for this high-risk patient.

This case was an exploration attempt. Although we had taken a series of measures to solve the most significant problem of surgical field exposure, we acknowledge that we still had some limitations in dealing with this case. First, this patient, who had comorbid RHD, should not have had excessive trendelenburg positioning, which increased the difficulty of exposure of the operation field and the risk of intestinal and bladder injury. Second, although the retroperitoneum suspension needle setting invented by us solved the problem of exposure of paraaortic lymph nodes, the direction of the vNOTES surgical instruments were parallel to that of the abdominal aorta, and the resection of paraaortic lymph nodes were relatively difficult, which required the skills and experience of the surgeons. Third, the vNOTES surgical operation is more difficult than laparoscopic surgery because the vNOTES surgical approach is different, the spatial orientation of the same anatomical structure is different, and the field of vision is smaller and more limited; it is also more difficult if systematic lymph node dissection is required. Therefore, gasless vNOTES is only applicable to sentinel lymph node follow-up resection for EC patients with stage I/II without any high-risk factors, but not for EC patients and patients with advanced disease who need comprehensive lymph node dissection and avoidance of severe abdominal adhesion.

Conclusions

In conclusion, we successfully selected a surgical procedure that was minimally invasive, safe, and achievable for this patient with EC and comorbid RHD. We effectively solved the problem of difficult exposure by considering a series of measures, such as the use of an abdominal wall suspension device, silk thread pulling of the peritoneum, gauze piece blocked intestinal tube, and instrument assistance by the assistant surgeon, which are worthy of reference for similar patients. The primary lessons from this case report are that we need to make a good assessment before surgery. Factors to be assessed include the staging and high-risk factors of EC, whether there is serious pelvic organ adhesion, and the surgical skills of the operator, which will affect the selection of the surgical methods and the successful implementation of the operation.

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Department and Institution Where Work Was Done

This work was done at the Department of Obstetrics and Gynecology, Chengdu Women's and Children's Central Hospital, School of Medicine, University of Electronic Science and Technology of China, Chengdu, Sichuan, PR China.

Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

References:

1. Li CB, Hua KQ. Transvaginal natural orifice transluminal endoscopic surgery (vNOTES) in gynecologic surgeries: A systematic review. Asian J Surg. 2020;43(1):44-51
2. Xu L, Wang Y, Wang N, et al. A novel transvaginal natural orifice transluminal endoscopic approach for ectopic pregnancy surgery with intra-abdominal adhesion. J Minim Invasive Gynecol. 2020;27(6):1239-40
3. Oh SH, Park SJ, Lee EJ, et al. Pelvic lymphadenectomy by vaginal natural orifice transluminal endoscopic surgery (vNOTES) for early-stage endometrial cancer. Gynecol Oncol. 2019;153(1):211-12
4. Wang Y, Deng L, Tang S, et al. vNOTES hysterectomy with sentinel lymph node mapping for endometrial cancer: Description of technique and perioperative outcomes. J Minim Invasive Gynecol. 2021;28(6):1254-61
5. Baekelandt JF. New retroperitoneal transvaginal natural orifice transluminal endoscopic surgery approach to sentinel node for endometrial cancer: A demonstration video. J Minim Invasive Gynecol. 2019; 26(7):1231-32
6. Lin H, Ding Z, Kota VG, et al. Sentinel lymph node mapping in endometrial cancer: A systematic review and meta-analysis. Oncotarget. 2017;8(28):46601-10
7. Kim MJ, Nam KH, Lee SG, et al. Yonsei experience of 5000 gasless transaxillary robotic thyroidectomies. World J Surg. 2018;42(2):393-401
8. Ciravolo G, Donarini P, Rampinelli F, et al. Laparoscopic access with optical gasless trocar: A single-center experience of 7431 procedures. J Minim Invasive Gynecol. 2020;27(2):535-40
9. Yang YS. Robotic natural orifice transluminal endoscopic surgery (NOTES) hysterectomy as a scarless and gasless surgery. Surg Endosc. 2020;34(1):492-500
10. Burke TW, Levenback C, Tornos C, et al. Intraabdominal lymphatic mapping to direct selective pelvic and paraaortic lymphadenectomy in women with high risk endometrial cancer: results of a pilot study. Gynecol Oncol. 1996;62(2):169-73
11. Leblanc E, Narducci F, Bresson L, et al. Fluorescence-assisted sentinel (SND) and pelvic node dissections by single-port Transvaginal laparoscopic surgery, for the management of an endometrial carcinoma (EC) in an elderly obese patient. Gynecol Oncol. 2016;143:686-87
12. Beaton A, Zühlke L, Mwangi J, Taubert KA. Rheumatic heart disease and COVID-19. Eur Heart J. 2020;41(42):4085-86
13. Damiani A, Melgrati L, Marziali M, Sesti F. Gasless laparoscopic myomectomy. Indications, surgical technique and advantages of a new procedure for removing uterine leiomyomas. Reprod Med. 2003;48(10):792-98
14. Akira S, Abe T, Igarashi K, et al. Gasless laparoscopic surgery using a new intra-abdominal fan retractor system: An experience of 500 cases. J Nippon Med Sch. 2005;72:213-16
15. Pellegrino A, Damiani GR, Tartagni M, et al. Isobaric laparoscopy using LaparoTenser system in surgical gynecologic oncology. J Minim Invasive Gynecol. 2013;20(5):686-90
16. Lin Y, He L, Mei Y. A new technique of laparoscopic para-aortic lymphadenectomy optimizes perioperative outcome. J Gynecol Oncol. 2021;32(1):e2

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