
CASE SERIES

Transvaginal Natural Orifice Transluminal Endoscopic Surgery for Hysterectomy in Women with Posterior Cul-de-sac Obliteration: A series of seven cases

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ABSTRACT

Objectives: To describe the initial experience and surgical outcomes of the vaginal natural orifice transluminal endoscopic surgery (vNOTES) for hysterectomy (vNOTESH) in women with posterior cul de sac obliteration.

Case series: From December 2019 to February 2021, seven women who had indications of hysterectomy with or without a salpingo-oophorectomy at Bangkok Hospital Udon, Udonthani Province, Thailand, were recruited. All women had evidence of severe pelvic adhesion. Pelvic and recto-vaginal examinations revealed a fixed uterus with posterior cul de sac obliteration. In this type of women a wound retractor was placed within the vaginal flaps, and creation of pneumovagina, followed by an anterior colpotomy and serial steps of adhesiolysis and hysterectomy using an endoscope and endoscopic instruments.

Results: Application of a wound retractor and the anterior colpotomy were successfully done in all cases. The operation was converted to Total laparoscopic hysterectomy (TLH) in one woman because of severe adhesion. The median age and Body Mass Index (BMI) of the remaining six women were 44 years (range of 41-49), and 25.1 kg/m² (range of 22-32.5), respectively. The median operative time and estimated blood loss (EBL) were 161 min (range of 116-215) and 350 ml (range of 150-800), respectively. One woman received a blood transfusion. There were no perioperative complications.

Conclusion: This case series demonstrated that the vNOTESH in women with posterior cul de sac obliteration is challenging, but feasible by a skillful surgeon. However, it was an initial experience; a study with a larger population should be conducted to evaluate the feasibility and safety.

Keywords: hysterectomy, pelvic adhesion, posterior cul de sac obliteration, surgical outcomes, vNOTES.

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การผ่าตัดมดลูกผ่านกล้องทางช่องคลอดในสตรีที่มีพังผืดหนาแน่นที่ cul de sac ด้านหลัง: รายงานผู้ป่วย 7 ราย

วัชรดา อักษร, คัดนางค์ สร้อยมงคล, สุภรณ์ ชะนะสะแบง, ปิยธิดา สุจริตพงษ์, เสวก วีระเกียรติ

บทคัดย่อ

วัตถุประสงค์: เพื่อนำเสนอประสบการณ์เบื้องต้นและผลการผ่าตัดมดลูกผ่านกล้องทางช่องคลอดในสตรีที่มีพังผืดหนาแน่นที่ cul de sac ด้านหลัง

รายงานผู้ป่วย: เป็นการศึกษาแบบย้อนหลังด้วยการทบทวนเวชระเบียนนิโรคีโตนิกของสตรีที่มีพังผืดหนาแน่นที่ cul de sac ด้านหลัง ที่ได้รับการผ่าตัดมดลูกผ่านกล้องทางช่องคลอด ตั้งแต่ ธันวาคม 2562- กุมภาพันธ์ 2564 จำนวน 7 ราย ในโรงพยาบาลกรุงเทพอุดร จังหวัดอุดรธานี สตรีเหล่านี้มีประวัติที่บ่งว่ามีพังผืดรุนแรงในอุ้งเชิงกราน มดลูกติดแน่นทางด้านหลัง จากการตรวจภายในร่วมกับการตรวจทางทวารหนัก เทคนิคการผ่าตัดในสตรีกลุ่มนี้ จะวางตัวถ่างแผลขนาดเล็กภายในเยื่อช่องคลอดที่ลอกออกจากปากมดลูก สร้างภาวะขยายช่องคลอดด้วยก๊าซตามด้วยการเปิดช่องเข้าสู่ช่องท้องทางด้านหน้าของช่องคลอด เลาะพังผืด และผ่าตัดมดลูก

ผลการศึกษา: การวางตัวถ่างแผลขนาดเล็กภายในเยื่อช่องคลอดที่ลอกออกจากปากมดลูก สร้างภาวะขยายช่องคลอดด้วยก๊าซตามด้วยการเปิดช่องเข้าสู่ช่องท้องทางด้านหน้าของช่องคลอดสำเร็จทุกราย แต่สตรี 1 รายถูกต้องเปลี่ยนเป็นการผ่าตัดมดลูกผ่านกล้องทางหน้าท้อง เนื่องจากพบมีพังผืดรุนแรงระหว่างมดลูกกับลำไส้ตรงที่อาจมีภาวะแทรกซ้อนต่อลำไส้ตรงได้ สตรีที่เหลือ 6 รายมีค่ามัธยฐานของอายุและดัชนีมวลกายเท่ากับ 44 ปี (41-49) และ 25.1 กก./ม² (22-32.5) ระยะเวลาการผ่าตัดและปริมาณเลือดที่ออกเท่ากับ 161 นาที (116-215) และ 350 มล. (150-800) สตรี 1 รายได้รับเลือดระหว่างการผ่าตัด ไม่มีภาวะแทรกซ้อนทั้งระหว่างและหลังการผ่าตัด

สรุป: การศึกษานี้แสดงให้เห็นว่า การผ่าตัดมดลูกผ่านกล้องทางช่องคลอดสำหรับสตรีที่มีพังผืดหนาแน่นที่ cul de sac ด้านหลังสามารถประสบความสำเร็จได้ด้วยแพทย์ที่มีประสบการณ์ อย่างไรก็ตามควรมีการศึกษาที่มีจำนวนสตรีที่เข้าร่วมมากกว่าเพื่อประเมินความเป็นไปได้ ความปลอดภัยของการผ่าตัดชนิดนี้

คำสำคัญ: การผ่าตัดมดลูก, การผ่าตัดมดลูกผ่านกล้องทางช่องคลอด, ผลการผ่าตัด, พังผืดในอุ้งเชิงกราน, พังผืดหนาแน่น

Introduction

Transvaginal natural orifice transluminal endoscopic surgery hysterectomy (vNOTESH) has been performed for the last 10 years⁽¹⁻³⁾. After the first report from Taiwan⁽¹⁾, many studies done in Asia and Europe have been published⁽⁴⁻¹⁰⁾. The vNOTESH has some advantageous surgical outcomes including short operative time^(5, 6, 8), less post-operative pain^(5, 8), and shorter hospital stay^(5, 6) when compared to those of patients undergoing total laparoscopic hysterectomy (TLH)^(5, 7, 8). It has become more popular and practiced than before. A most recent report showed that there are many experts in many countries have practiced the vNOTESH⁽¹¹⁾.

There are two surgical phases in the vNOTESH procedure, vaginal and endoscopic. The vaginal phase is aimed to provide access to the peritoneal cavity. The procedure is done much like a conventional vaginal hysterectomy. The important step in this phase is an entry into the peritoneal cavity with performing colpotomy. A wound retractor is applied through the vagina into the peritoneal cavity to establish a pneumoperitoneum. Subsequently, the endoscopic phase is done to carry out hysterectomy step by step from sealing and cut the uterine vessels to the uterine pedicles using an endoscope and endoscopic instruments. Although there are some differences between institutes in the vaginal phase technique^(2, 3, 5, 8), the steps are the same almost everywhere. A posterior colpotomy is first done, followed by application of a wound retractor^(2, 3, 5, 8). Therefore, it is necessary that women undergoing vNOTESH have no pelvic adhesion or posterior cul de sac obliteration. In all publications of the vNOTESH, women with severe pelvic adhesion were not eligible^(2, 3, 5-8) for inclusion in such studies.

A study by Yantapant and Roekyindee⁽⁹⁾ showed a different method of performing the vaginal phase. In their work, after circumcising the cervix and dissecting the anterior and posterior

vaginal mucosae upward to the peritoneum, a wound retractor was applied between the mucosal flaps to establish a pneumovagina. Then, anterior and posterior colpotomies were done endoscopically⁽⁹⁾.

This technique gave our team an idea to perform the vNOTESH in women with posterior cul de sac obliteration. If an anterior colpotomy can be successfully done after applying the wound retractor, the pelvic organs and adhesion conditions can be assessed. Then, adhesiolysis and hysterectomy can be accomplished. To the best of our knowledge, the vNOTESH in women with posterior cul de sac obliteration has never been reported. Therefore, the aims of this work were firstly to describe the initial experience in the entry into the peritoneal cavity and performing hysterectomy, and secondly to report surgical outcomes of the vNOTESH in women with posterior cul de sac obliteration.

Case Series

cases

From December 2019 to February 2021, seven women presenting indications for hysterectomy with or without a salpingo-oophorectomy at Bangkok Hospital Udon, Udonthani Province, Thailand, were included. All women showed evidence of severe pelvic adhesion, such as a history of pelvic surgery, previous or present pelvic inflammatory disease (PID), or peritoneal and ovarian endometriosis. Pelvic and recto-vaginal examinations revealed a fixed uterus with posterior cul de sac obliteration, but no recto-vaginal mass. The posterior cul de sac obliteration was defined when the anterior rectal wall sticks to the posterior vagina, the posterior upper part of the cervix and the lower segment of the uterus leading to no space of the rectouterine pouch. None of them were virgins. Before the operation, each woman was counseled regarding the surgical procedure, the risks of bleeding during the

operation that may necessitate receiving a blood transfusion, intra- and post-operative complications and a potential conversion to TLH. Written informed consent form was obtained from all women before the surgery. The following data were reported: age, body mass index (BMI), parenthood, the number and type of deliveries, indications for hysterectomy, previous diseases and surgeries, number of conversions to TLH, operative time, estimated blood loss (EBL), number of patients who received blood transfusion, intra- and post-operative complications, post-operative pain assessed with visual analogue scales (VAS), weight of specimens, and the final pathological diagnosis. The study was approved by the Bangkok Hospital Headquarters Institutional Review Board (BHQ-IRB) (COA. 2021-43).

Surgical technique

All hysterectomies were done by the same surgeon (SW). The surgeries were performed under general anesthesia with endotracheal intubation. Each woman was placed in the lithotomy position with both legs supported by elastic bandages. A Foley catheter was indwelled. After 20 ml of 1% xylocaine with 1:200,000 epinephrine was injected into the submucosal space around the cervix, circumcising the cervix, and dissecting the anterior and posterior vaginal mucosae upward to the anterior and posterior peritonea were done. Both cardinal ligaments were sealed and cut using a Curved Large Jaw Open Sealer LigaSure™ system (Covidien, Mansfield, MA, USA). Allis forceps were used to grasp on each of 4 sides of the vaginal flaps. Then the inner ring of a wound retractor (6 cm in diameter, Lagis Enterprise Co., Ltd., Taichung, Taiwan) was applied within the vaginal flaps. The outer rim was covered with a silicone cap. A pneumovagina was established with a pressure of 12 mm Hg. A 10 mm, 3-D

laparoscope (Endoeye Flex HD 3D, Olympus Corporation, Japan) was used through one trocar and two endoscopic instruments through another pair of trocars. Fig. 1 shows a process of surgery in woman with adenomyosis and peritoneal endometriosis. An anterior colpotomy was done (Fig. 1A). Then both uterine vessels were dissected, sealed and cut. In cases where the uterine vessels could not be clearly identified, the sealing and cutting were done as close to the uterine surface as possible. A larger wound retractor (8 cm in diameter) was applied in the peritoneal cavity to widen the visual and surgical fields (Fig. 1B). After surveillance of the reproductive organs and assessment of adhesion, an adhesiolysis and hysterectomy were meticulously done. Firstly, the tissue within the broad ligament was separated from the corpus with a blunt dissection technique (Fig. 1C). The process was alternated with sealing and cutting of the anterior broad ligament from the lower to the upper parts of the uterine corpus (Fig. 1D). After the posterior broad ligament was exposed, sealing and cutting the ligament were done (Fig. 1E), followed by sealing and cutting the proximal part of the fallopian tube, the ovarian and round ligaments (Fig. 1 F). An identical procedure was on the other side of the uterus (Fig. 1G). After separation of the adnexa from the corpus, adhesion between the uterus and the rectum could be identified (Fig. 1H). Sealing and cutting the uterosacral ligaments were done (Fig. 1I). Subsequently, with traction of the corpus upward, adhesiolysis of the corpus from the rectum was done using a sharp dissection technique to complete the hysterectomy (Fig. 1J). An energy sealing device LigaSure™ (Covidien, Mansfield, MA, USA) was used for sealing and cutting of all ligaments and vessels. Bipolar coagulation was occasionally used for hemostasis on bleeding points.

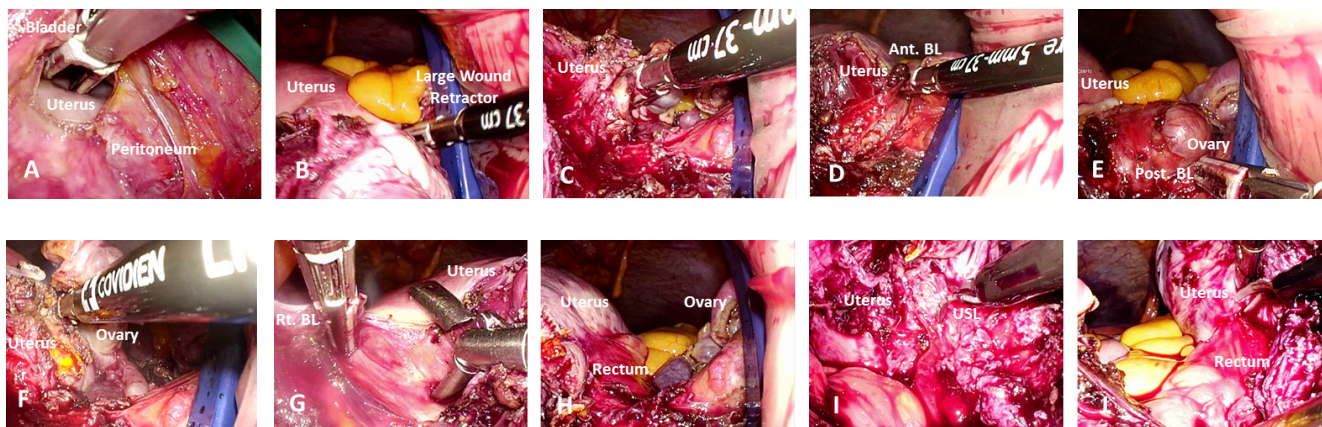


Fig. 1. Procedure of vNOTESH in women with posterior cul de sac obliteration.

Fig. 1A: Anterior colpotomy was performed.

Fig. 1B: A larger wound retractor was placed instead of the small one to widen the visual and surgical fields.

Fig. 1C: The tissue within the broad ligament was separated from the corpus with a blunt dissection technique.

Fig. 1D: The anterior broad ligament was sealed and cut. Ant. BL: Anterior broad ligament.

Fig. 1E: Sealing and cutting the posterior broad ligament were done to expose the adnexum. Post. BL: Posterior broad ligament.

Fig. 1F: Sealing and cutting the proximal part of the fallopian tube, the ovarian and round ligaments were done.

Fig. 1G: Sealing and cutting the broad ligament of the opposite side were performed similarly.

Fig. 1H: After sealing and cutting the broad ligament, and the pedicle, the adhesion between the uterus and the rectum could be seen clearly.

Fig. 1I: The uterosacral ligaments were cut. USL: uterosacral ligament.

Fig. 1J: Adhesiolysis between the uterus and the rectum was finally done to remove the uterus.

In woman with diagnosis of chronic pelvic inflammation, adhesion between the corpus and other structures was not so dense (Fig. 2A), and was filmy in some areas (Fig. 2B). Adhesiolysis could be performed easily with the energy sealing device and scissors. A bilateral salpingectomy (BS) was routinely carried out. If necessary, a unilateral or bilateral salpingo-oophorectomy was carried out instead. Finally, surveillance and hemostasis of the stumps of ovarian ligaments or the infundibulopelvic ligaments were done. After removal of the wound retractor and the specimens, hemostasis of the stumps of the uterine vessels, as well as the

cardinal and uterosacral ligaments was also done. Then, the vaginal vaults were approximated with no. 2/0 coated polyglactin suture.

Pre- and post-operative protocols were quite similar for all women. A prophylactic antibiotic, 2 g of cefazolin, was given before starting the operation, unless the woman had an allergy to this drug. In this case, 600 mg of clindamycin was used instead. Another dose of these medicines was administered 6-8 h later. A dose of 40 mg parecoxib was routinely prescribed during the operation with a second dose 12 h later. An intravenous injection of 25 mg of pethidine or 50 mg of tramadol every

6 h was added within 24 h, if necessary. Additionally, 25 mg of diclofenac was administered orally three times daily. Intravenous fluid and the Foley

catheter were both removed around 24 h after the surgery. The patients were discharged 48 h after admission.

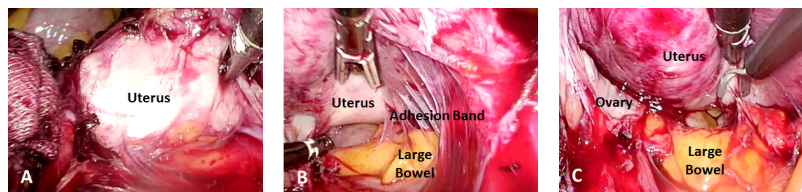


Fig. 2. Adhesion and adhesiolysis in woman with diagnosis of chronic pelvic inflammation.

Fig. 2A: Adhesion at the lateral side of the corpus was not so dense.

Fig. 2B: Filmy adhesion between the uterus and the rectum was seen.

Fig. 2C: Adhesiolysis could be performed using the energy sealing device and scissors.

Results

Table 1 shows clinical characteristics of these seven women. Their median age and BMI were 44 years (range of 41-49), and 25.1 kg/m² (range of 22 - 32.5), respectively. Two women were nulliparous.

The indications for the operation were adenomyosis in four women, adenomyosis with submucous myoma in one woman, adenomyosis with an ovarian tumor in one woman, and an ovarian tumor in one woman.

Table 1. Women characteristics.

Case no.	Age	BMI	Parity	Normal delivery	Cesarean section	Indications
1	47	22.3	1	0	1	Adenomyosis
2	49	24.0	0	0	0	Adenomyosis
3	41	32.5	2	2	0	Adenomyosis
4	42	25.8	2	2	0	Left ovarian tumor
5	46	22.0	3	3	0	Adenomyosis, submucous myoma
6	42	26.7	1	0	1	Adenomyosis, Right ovarian tumor
7	44	25.1	0	0	0	Adenomyosis

BMI: body mass index

The application of the wound retractor, the pneumovagina creation and performing the anterior colpotomy were successful in all cases. However, in one woman (case no. 6) after the broad ligaments and the uterine pedicles were sealed and cut, a so severe adhesion that it was difficult to discriminate between the uterine corpus and the rectum was found. Considering the risk of the rectal injury, a conversion to

TLH was done for this woman. The surgical outcomes of the remaining six women are shown in Table 2. The median of operative time and EBL were 161 min (range of 116-215) and 350 ml (range of 150-800), respectively. One woman received a blood transfusion. The median of VAS assessed at 6, 24 and 48 h after surgery were 3 (range of 2-4), 3 (range of 2-3), and 2 (range of 0-2), respectively. The median weight of specimens was

151.5 g (range of 130.5-332 g). The final pathological diagnosis was adenomyosis in five women. Of these five women, four had the added diagnosis of peritoneal endometriosis with severe pelvic adhesion. One had

chronic PID with pelvic adhesion. The final diagnosis of the other woman was a tubo ovarian abscess. There were no perioperative complications. The vaginal stumps revealed good healing in all cases.

Table 2. Surgical outcomes and final diagnosis.

Case no.	Previous disease and surgery	Operative time (min)	EBL (ml)	VAS after 6, 24, 48h	Weight of specimens (g)	Final diagnosis
1	Ovarian Endometrioma, Cystectomy	215	700	3, 3, 2	189.5	Adenomyosis, Peritoneal endometriosis
2	No	158	200	2, 2, 2	131	Adenomyosis, Peritoneal endometriosis
3	Ruptured appendicitis, appendectomy Tubal resection	182	400	3, 3, 0	170	Chronic PID with adhesion, Adenomyosis
4	No	160	300	3, 2, 1	130.5	Tubo-ovarian abscess
5	No	162	800	3, 3, 2	332	Adenomyosis, sub. myoma, Peritoneal endometriosis
7	No	116	150	4, 3, 2	133	Adenomyosis, endometrioma, Peritoneal endometriosis

EBL: estimated blood loss, VAS: visual analogue scale, 6, 24 and 48 h after surgery, PID: pelvic inflammatory disease, Sub. myoma: submucous myoma

Discussion

The vNOTESH is a safe and feasible procedure in experienced hands. It has advantages over the laparoscopic hysterectomy in terms of a shorter operative time, less postoperative pain and a shorter hospital stay^(5, 7, 8). Moreover, it has no risk of trocar related complications and no abdominal scarring results, promoting woman satisfaction⁽¹²⁾. Technically, in the vNOTESH, a colpotomy has to be done to enter the peritoneal cavity to establish a pneumoperitoneum. Therefore, severe pelvic adhesion including posterior cul de sac obliteration and rectovaginal mass presents a contraindication. Nevertheless, some authors^(13, 14) have recently reported using the vNOTESH in patients with suspected pelvic adhesion. Nulens et al⁽¹⁴⁾ reported

successfully performing the vNOTESH in eleven women with history of vNOTES adnexectomy or vNOTES cystectomy. The current case series indicates that performing the vNOTESH in women with posterior cul de sac obliteration is possible. Additionally, the operation in the women with this type of severe adhesion has never been reported to the best of our knowledge.

The causative factor of the posterior cul de sac obliteration is inflammation in the area of pouch of Douglas leading to adhesion of the posterior surfaces of the cervix and the corpus with the anterior surface of the rectum. The most common causes of the inflammation are peritoneal endometriosis, and pelvic inflammatory disease (PID)⁽¹⁵⁾. There were the similar

causes, the peritoneal endometriosis in 5 women and the PID in two in the current report.

To diagnose the posterior cul de sac obliteration in the current report, a pelvic examination and recto-vaginal examination were only used. A magnetic resonance imaging (MRI) or computed tomography (CT) scan was not added. The CT scan has been used to diagnose the adhesion of anterior abdominal wall with the uterus in one woman undergoing the vNOTESH⁽¹⁶⁾. The MRI has been used to identify the posterior cul de sac obliteration with accuracy rates of 56.6-92%^(17, 18). Interestingly, pelvic examination and recto-vaginal examination also have quite high accuracy rate, especially by laparoscopic experts in the diagnosis of posterior cul de sac obliteration⁽¹⁹⁾. Therefore, these examinations were enough to assess the obliteration with the definition as described. The posterior cul de sac obliteration was found in all women in the current report. In addition, one author only used these pelvic examinations with criteria to define the posterior cul de sac obliteration in women undergoing a vaginal hysterectomy⁽²⁰⁾. On the other hand, these two examinations were used to exclude women with posterior cul de sac obliteration with high accuracy rate in all previous publications of vNOTESH^(1, 5-8, 21, 22). Only one out of 137 women was false negative of the obliteration in one study⁽²²⁾.

The vagina phase is the first crucial step for success in the vNOTESH. The technique used in this series to access the peritoneal cavity is not difficult. Placing a small wound retractor within the vaginal flaps before the anterior colpotomy is a modification of the work of Yantapant and Roekyindee and it has a key role in the procedure. With this technique the anterior colpotomy could be done successfully in all cases in the current report. It appears to be a useful application to access into the peritoneal cavity in women with posterior cul de sac obliteration. This means that women with posterior cul de sac obliteration should no longer be an absolute contraindication of the vNOTESH. Furthermore, when the larger wound retractor was used instead of the smaller one, surveillance of the pelvic organs and pelvic adhesion, with the subsequent

operation were more feasible.

In the endoscopic phase, the procedure of the hysterectomy in women with severe pelvic adhesion is a painstaking one which is more difficult than those without adhesion. The uterine vessels, the broad ligaments and the uterine pedicles can serially be performed easily in women without adhesion. By contrast, the procedure including the sealing and cutting of all vessels and ligaments, and the adhesiolysis has to be performed with caution of organ injury in women with severe adhesion. Furthermore, it is possible that the operation in this phase may not be successful. A conversion to TLH is needed if there is risk of organ injury which was found in one woman with severe pelvic adhesion in the current study.

The operative time and EBL seemed to be high in the current report. It had twice the operative duration⁽⁸⁾ and three times the EBL than for women with no adhesion⁽⁹⁾. Adhesiolysis requires extreme caution to avoid injury to other organs. Therefore, more time was required with a much greater blood loss from the raw surfaces. However, the surgical outcomes for these six women were satisfactory. There were no both intra- and post-operative complications. Furthermore, the postoperative VAS pain scores were quite low and might not be different from those with no pelvic adhesion^(5, 8).

A limitation in this current report was that it was a retrospective study with a small number of women included. However, 7 women are not too small and proper for a case series report aiming to describe the technique of the vNOTESH in difficult and specific cases. In fact, a case series report should have more than four or five subjects included according to Abu-Zidan et al⁽²³⁾ and Esene et al⁽²⁴⁾. And there were some examples of case series reports in which 6 patients were included^(25, 26). Nevertheless, a prospective study with a larger population and more aspects of surgical outcomes should be conducted as a future study.

Conclusion

This seven-case series demonstrated that the vNOTESH in women with posterior cul de sac obliteration was challenging, but feasible by a skillful

surgeon. The technique that application of a wound retractor before a colpotomy was a key step of successful procedure of the vNOTESH in this type of women. Nevertheless, it was the initial experience, a study with more population is needed to refine the technique and to verify safety.

Potential conflicts of interest

The authors declare no conflicts of interest.

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