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### ► To cite this version:

G. Chene, E. Nohuz, A. Mansoor, E. Cerruto, G. Lamblin, et al.. Easy way to perform salpingectomy by transvaginal natural orifice transluminal endoscopic surgery (vNOTES) (with video). *Journal of Gynecology Obstetrics and Human Reproduction*, 2021, 50, pp.102005 -. 10.1016/j.jogoh.2020.102005 . hal-03493135

**HAL Id: hal-03493135**

**<https://hal.science/hal-03493135v1>**

Submitted on 15 Dec 2022

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Easy way to perform salpingectomy by transvaginal natural orifice transluminal endoscopic surgery (vNOTES) (with video)

Short title: Salpingectomy and vNOTES

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**Conflict of interest:** none for all authors except for Dr J. Baekelandt who discloses consultancy for Applied Medical.

**Funding:** none

**Abstract:**

The transvaginal natural orifice transluminal endoscopic surgery (vNOTES) is a new minimally invasive and emerging technique. Feasibility and safety profiles of peritoneal access via transvaginal routes have been demonstrated especially for the adnexal surgery. In order to be reproducible and replicable with a standardized procedure, we propose the step-by-step video description of the vNOTES salpingectomy. The advantages of the vNOTES (low postoperative pain, faster postoperative recovery, scarless surgery) could lead to a promising alternative to conventional laparoscopic salpingectomy/adnexectomy.

**Keywords:** minimally invasive surgery; NOTES; vNOTES; minimal-access surgery; salpingectomy; laparoscopy

## **Introduction:**

The transvaginal natural orifice transluminal endoscopic surgery (vNOTES) is a new minimally invasive procedure (MIP) in which the vagina is used as a natural access to the peritoneal cavity and enables endoscopic surgery with conventional laparoscopic instruments. Several studies have demonstrated the feasibility and safety on vNOTES with many advantages leading to a day-care or ambulatory procedure: reduced immediate postoperative pain, faster postoperative recovery, better cosmetic results without skin scar, high patient satisfaction [1-11]. Some studies have also shown the superiority of vNOTES in comparison with the classical laparoscopic surgery in term of lower postoperative pain scores and the absence of trocar-site complications [10, 11].

However our aim is not to make a criticism of other MIP (laparoscopic and vaginal routes) [12]. It seems overall essential to promote all these techniques in comparison with laparotomy because of the well-known benefits and less morbidity of MIP.

vNOTES has been used in several benign gynecological diseases (adnexectomy, oophorectomy, salpingectomy, hysterectomy, ovarian cystectomy, myomectomy, sacrocolpopexy) and in few malignant procedures (pelvic lymphadenectomy and sentinel node biopsy) [1]. All these procedures need step-by-step technical description to allow their development and promotion.

The salpingectomy procedure is likely relevant with vNOTES because conventional vaginal route can not authorize exclusive salpingectomy without hysterectomy [13].

We propose the stepwise description of the vNOTES salpingectomy with two videos.



### **Surgical technique:**

The first video (video Part 1) clearly describes the insertion and removal of the transvaginal access platform via the posterior colpotomy in the following steps (see figure 1 and video Part 1):

- (1) Posterior colpotomy: under general anesthesia, after administration of 2g cefazolin (based on the guidelines for antibioprophylaxy of the French Society of Anesthesiology for hysterectomy [14]), the surgeon performed a 25-mm posterior colpotomy and opened the pouch of Douglas. The Breisky posterior vaginal retractor was inserted into the colpotomy.
  
- (2) Insertion of the small 7–cm Alexis® wound retractor (Applied medical, Rancho Santa Margarita, CA, USA): the inner ring was pushed into the peritoneal cavity along the Breisky retractor by squeezing the two sides together. The fingers of the surgeon controlled that the ring was completely in the peritoneal cavity. The Breisky retractor was removed. The outer ring was rolled inward twice.
  
- (3) Insertion of three trocars in the GelSeal Cap: the three trocars were inserted in the GelSeal cap in a triangular fashion.
  
- (4) The GelPOINT® system was positioned on the exterior ring
  
- (5) Introduction of the endoscope, the grasper and the bipolar device: with gas insufflation to 8 mm Hg, the endoscope and two laparoscopic instruments

could be introduced through the trocars. A 0° rigid endoscope may be easier to start the learning curve of vNOTES but after gaining some initial experience surgeons may switch to a 30° endoscope to obtain a wider range. (See Video Part. 2 for the vNOTES salpingectomy procedure)

- (6) Removal of the Alexis® wound retractor: the Gelseal cap was removed followed by the Alexis retractor (by pulling on the string and squeezing the inner ring).
- (7) Closure of the vaginal cuff with a reabsorbable synthetic braided suture (Vicryl® 2/0 suture). There is no evidence about the technique of vaginal closure. First, a Betadine® gauze should be inserted into the vagina. Then the colpotomy can be closed using three interrupted figure-of-eight Vicryl® 2/0 sutures [15] or with a continuous Vicryl® 2/0 suture (as shown in the video). There is no consensus about the peritoneum closure: it may be closed separately or incorporated in the vaginal suture.

The second video (See video Part 2) clearly describes the vNOTES salpingectomy in the following steps:

- (1) Inspection of the abdominal and pelvic cavity with gas insufflation to 8 mmHg and 20° Trendelenburg position. Both ovaries and the contralateral tube are normal.
- (2) Left salpingectomy was performed through the endoscope from the fimbria to the uterine cornua after the identification of the left ureter. Salpingectomy was

undergone with conventional laparoscopic instruments (grasper, bipolar device and scissors). Contrary to laparoscopic procedures, there were only two instruments used during the vNOTES procedure. The surgeon has to apply medial traction to the tube with the grasper before coagulating and cutting the mesosalpinx.

- (3) Same vNOTES technic for the right salpingectomy. In this case, there was an easy tubal adhesiolysis
- (4) Tips and tricks: visceral protection could be done with a compress in the finger of a glove
- (5) Peritoneal washing and hemostasis control at the end of the procedure
- (6) Removal of the specimens (fallopian tubes and the compress)

### **Discussion and conclusion:**

vNOTES is an emerging and promising minimally invasive approach for the adnexal surgery. We've made a review of the literature about vNOTES salpingectomy (see table 1) [2-9]: there were 57 published cases. Main indications were ectopic pregnancy. Of note, all cases including those with haemoperitoneum due to rupture were successfully possible without any complications. Ahn *et al* [9] studied the learning curve and demonstrated a decreased operative time after 5 vNOTES procedures. In the prospective study comparing vNOTES salpingectomy to conventional laparoscopic salpingectomy, Xu *et al* [7] demonstrated a slightly higher operative time (respectively, 53.33 $\pm$ 7.27 min vs 49.17  $\pm$  10.45 min p=0.3), a

statistically lower immediate postoperative pain score (respectively, 2.22 +/-0.65 vs 2.75 +/-0.72 p=0.02) and a statistically higher global satisfaction because of the absence of abdominal scar in the vNOTES group (p=0.03). Other studies with larger cohorts are of course needed to better validate this new surgical technique [15]. vNOTES should not be performed in case of virginity, history of pelvic inflammatory disease, severe endometriosis with complete obliteration of the cul-de-sac of Douglas (importance of the pre-operative ultrasonography and bimanual pelvic examination). There are also three main technical difficulties: first, the installation of the Alexis® wound retractor because the inner ring is not so easy to push into the peritoneal cavity. Respect to the standardized protocol (as described here) is needed and workshops with training and high-definition simulation tools (see figure 2) are also required before testing and trying vNOTES. Second, the vNOTES procedure is performed in the anatomical opposite way by comparison with the conventional laparoscopy and it may be disturbing at the beginning of the learning curve. Last, there are only three trocars (the endoscope and two instruments). The fallopian tube should be tented up medially to take away from the sigmoid colon. Other tips and tricks may be the use of compress before electrosurgically sealing and cutting the tube (as shown in the video Part 2).

Concerning the morbidity, the largest complication series with 1000 benign vNOTES procedures in a single center has been recently published [16]: in the 270 non-hysterectomy cases (so with single colpotomy), the complication rate was 0.4%(only 0.4% cystitis). There was no intraoperative and no clavien-Dindo grade 3 or 4 complications.

It seems that there is no sexual impairment after vNOTES. This has been shown after ovarian cystectomy [17]: only 5% of patients reported temporary dyspareunia 1

month after the surgery but none had permanent dyspareunia. In a review about sexual dysfunction after transvaginal cholecystectomy [18], the risk of dyspareunia appeared minimal.

Concerning sexual intercourse, there is no evidence, we can advise 4 to 6 weeks post-operatively.

The standardization of the technique should lead to reproducible procedure and make easier vNOTES salpingectomy/adnexectomy.

**Conflict of interest:** none for all authors except for Dr J. Baekelandt who discloses consultancy for Applied Medical.

**Funding:** none

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**Legend:**

**Table 1:** vNOTES Salpingectomy in the literature.

N= number of patients

\*the longer operative time (50 min) was present in a case of ruptured ectopic pregnancy (haemoperitoneum of 144mL)

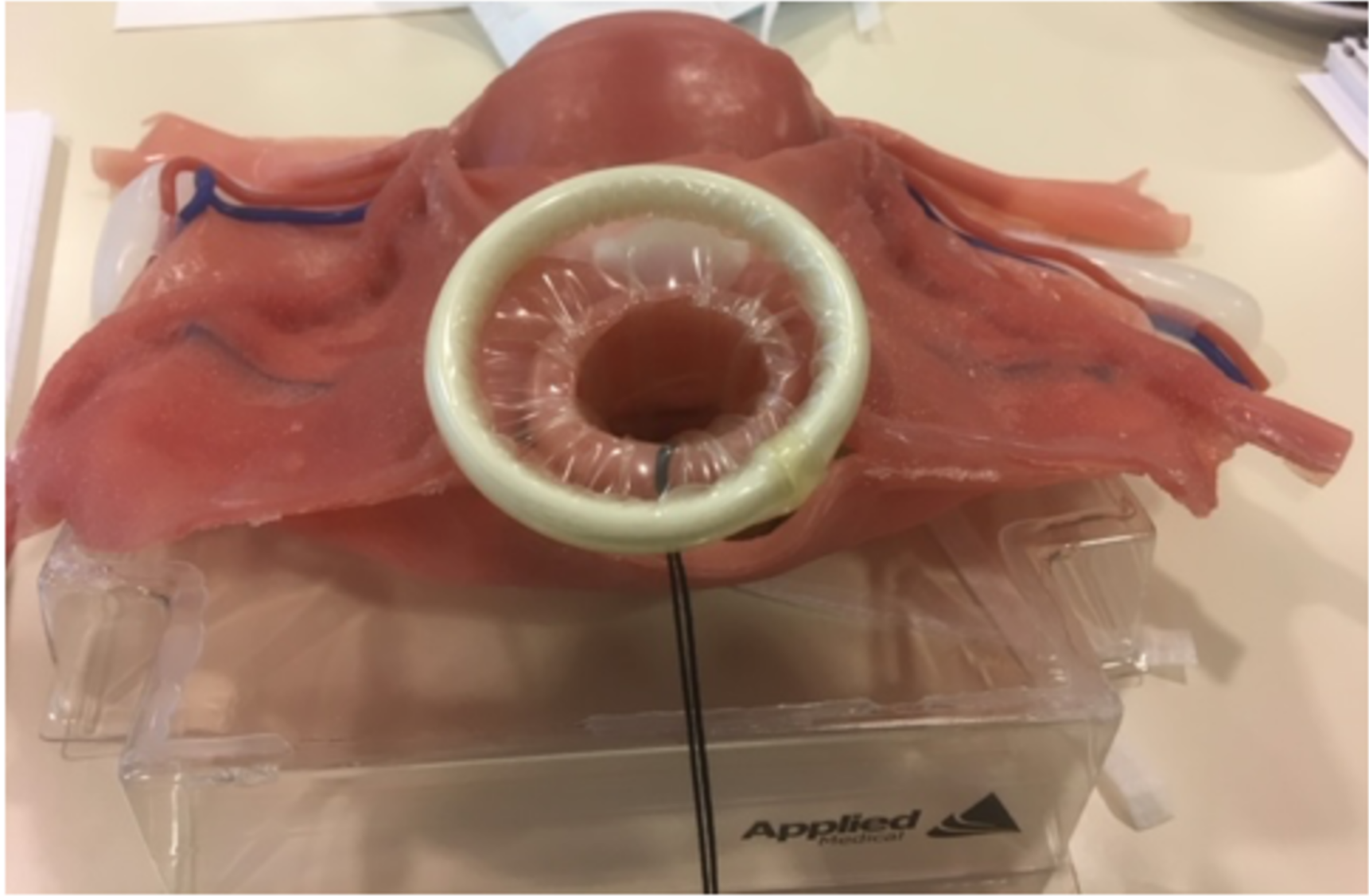
\*\*Operative time was longer in case of ectopic pregnancy, especially one of them because of the concomitant management of 2000mL haemoperitoneum (116 min)

\*\*\*Operative time decreased compared with the first 5 vNOTES cases (55-70)

**Figure 1:** the GelPoint® V-Path transvaginal access platform for vNOTES (Applied medical, Rancho Santa Margarita, CA, USA)

**Figure 2:** the high-definition simulator for vNOTES (Applied medical, Rancho Santa Margarita, CA, USA)





Authors	Year	N	Indication	Operative time (minutes)	complications
Ozceltik G <i>et al.</i> [2]	2020	1	Ectopic pregnancy	38	None
Ozceltik G <i>et al.</i> [3]	2020	1	Tubal stump pregnancy	36	None
Chen X <i>et al.</i> [4]	2019	12	Ectopic pregnancy	47.5 (40-70)	None
Baekelandt J <i>et al.</i> [5]	2017	12	Ectopic pregnancy		None
Sarah VP <i>et al.</i> [6]	2015	5	Ectopic pregnancy	33 (20-50)*	None
Xu B <i>et al.</i> [7]	2014	18	Ectopic pregnancy	53.33 +/-7.27	None
Lee CL <i>et al.</i> [8]	2012	6	3 tubal sterilizations 3 ectopic pregnancies	(18-30) for the sterilizations (62-116)** for the ectopic pregnancies	None
Ahn KH <i>et al.</i> [9]	2012	2	Ectopic pregnancy	(50-65)***	None

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