



Original Article

Transvaginal endoscopic surgery-assisted versus conventional laparoscopic adnexectomy (TVEA vs. CLA): A propensity-matched study and literature review

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ABSTRACT

Objective: Natural orifice transluminal endoscopic surgery (NOTES) may be useful in gynecologic endoscopic surgery. This study evaluated the efficacy, safety, and perioperative outcomes of combined NOTES and vaginal approach, transvaginal endoscopic surgery-assisted adnexectomy (TVEA), for the surgical treatment of presumed benign ovarian tumors.**Materials and methods:** Records were reviewed for 33 consecutive TVEA procedures performed between May 2011 and March 2014. Patient age, body mass index, parity, mass size, and mass bilaterality were used to select comparable patients who had undergone conventional laparoscopic adnexectomy (CLA). **Results:** A total of 236 patients were included in this study (203 CLAs and 33 TVEAs). No cases switched to abdominal laparotomy. Operating time and length of postoperative stay were significantly longer in the CLA group than in the TVEA group, while total hospital charges were higher in the TVEA group ($p < 0.001$). There was no difference in febrile morbidity between the two groups; while the estimated blood loss was higher in the TVEA group, the EBL was <30 mL in both groups.**Conclusion:** TVEA can be safely performed for benign and large ovarian tumors. In addition, TVEA offers superior operative efficiency compared to CLA.© 2017 Taiwan Association of Obstetrics & Gynecology. Publishing services by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

While ovarian tumors are common in women of all age groups, most are benign lesions identified during the reproductive years. Approximately 5%–10% of women require surgical treatment for adnexal masses [1]. Laparoscopy remains the gold standard for surgical investigation of presumed benign ovarian tumors [2]. However, laparoscopists face challenges including large tumor size, unexpected malignancy, specimen removal, and intraoperative spillage of tumor contents during surgery.

While transvaginal surgery has a long history, its use remains uncommon because of the limited field of vision. Although the reported advantages of pure transvaginal ovarian cystectomy

include shorter operating time and faster recovery [3,4], the restricted operative field is a challenge for surgeons. However, access via natural body orifices offers the potential for development of minimally invasive surgical techniques. Transvaginal extraction of ovarian tumors has very low risk of complications during transabdominal laparoscopic surgery. The method allows introduction of an endobag through the vagina wall while also minimizing intraabdominal spillage. The elastic distension of colpotomy incision makes removal of solid pathologies, such as teratomas or fibromas, faster and easier [5].

Natural orifice transluminal endoscopic surgery (NOTES) has attracted attention as a less invasive alternative to conventional laparoscopy. NOTES provides better cosmetic results, reduced postoperative pain, and less wound-related hernia formation [6]. Among the different NOTES approaches, the transvaginal route appears to be less complicated, permitting safe entry and simple closure. However, while general surgeons and urologists have

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extensively adopted transvaginal NOTES, few gynecologists have done so [7].

Gynecologist endoscopists at our tertiary referral medical center have used transvaginal NOTES for tubal sterilization, adnexal surgery, and hysterectomy since 2010 [8–10]. Recently, we reported successful transvaginal NOTES hysterectomy in 147 cases of non-prolapsed uteri [11]. Very few cases of adnexal procedures have been reported [8,12,13], and the safety, feasibility, and outcomes of transvaginal NOTES have not yet been established. The aim of the present study was to compare outcomes among patients who underwent transvaginal endoscopic surgery-assisted adnexectomy (TVEA) to those of patients who underwent conventional laparoscopic adnexectomy (CLA) for presumed benign ovarian masses. The outcomes included operative time, estimated blood loss, febrile morbidity, postoperative stay, and hospital charges.

Materials and methods

This study consisted of 33 women with ovarian masses (age range 40–79 years, mean 56.0 ± 8.3 years) clinically diagnosed as having a low probability of malignancy, who were scheduled to undergo TVEA performed by one of the authors (C.J.W) at Chang Gung Memorial Hospital at Linkou between May 2011 and March 2014. Two hundred and three women undergoing CLA, performed by the same surgeon (C.J.W), were also retrospectively studied to avoid specific clinical bias. Before TVEA, all patients underwent thorough clinical evaluation, including detailed medical histories and pelvic examinations. Sonography and computed tomography were used to assess mass characteristics. Low probability of malignancy was defined as the absence of ascites, absence of thick papillary projections, no reduced resistance index, no enlarged pelvic lymph nodes, and normal or only mildly elevated (<65 U/mL) serum cancer antigen 125 (CA125) concentrations. Exclusion criteria for TVEA included patients with history of abdominal–pelvic surgery with suspected severe adhesions, suspected severe endometriosis, and complete obliteration of the posterior Douglas pouch noted during pelvic examination. A history of cesarean section and nullipara were not considered contraindications for TVEA. Before the operation, the patients were informed of the risks and benefits of NOTES, including the potential need to switch to laparoscopy or laparotomy during the surgery and the risk of malignancy detected by frozen section. Written informed consent was obtained from all subjects. All women underwent bowel preparation on the morning of surgery. Intravenous cephalosporin prophylaxis was administered just before surgery.

Preoperative clinical and demographic characteristics including age, body mass index (BMI), and parity were obtained. Similarly, operating time, mass size and bilaterality of the mass, estimated blood loss (EBL), postoperative stay, and any perioperative complications (fever, bowel injury, or genitourinary tract injury) were recorded. Total hospital charges (not including the costs covered by National Health Insurance) were obtained from hospital financial records. The study was approved by the Institutional Review Board of Chang Gung Memorial Hospital.

CLA technique

Patients were placed in the dorsolithotomy Trendelenburg position with both legs protected by elastic bandages, and a Foley catheter was inserted for constant urinary drainage. After induction of general anesthesia, intravenous cephalothin (1 g) was administered as prophylaxis. CLA was performed following procedures as described by Nezhat et al. [14]. In brief, laparoscopic examination of the pelvis and lower abdomen was performed to determine the accessibility of the surgical field. Three or four trocars were used

according to the pelvis complexity. A disposable laparoscopic grasper, scissors, and suction-irrigator were used to perform various procedures such as holding, cutting, exploring, and dissecting. After identification of the tumor, traction was placed on the infundibulopelvic ligament and utero-ovarian pedicle; the adnexal pedicles were secured and coagulated with the bipolar electrocautery (Elmed, Addison, IL, USA) and cut with scissors. After the tubo-ovarian pathology was detached from the uterus, the specimens were removed from the abdomen using either a disposable endobag to avoid contaminating the abdominal wall or a posterior colpotomy due to the hard properties or solid components of the mass.

TVEA technique

Patient preparation, positioning and anesthesia were the same as for CLA [14]. All operations were performed with a similar technique, as described previously [8,15]. In brief, a posterior colpotomy was created using traditional vaginal surgical techniques. The colpotomy incision was extended laterally by digital pressure.

A wound retractor (Alexis, Small; Applied Medical Resources Corp., Rancho Santa Margarita, CA, USA) was then inserted transvaginally (Fig. 1A). A surgical glove was attached to the outer ring of the wound retractor. One 10-mm and two 5-mm sheaths were inserted through cut edges of the thumb, middle, and little finger tips, respectively, and tied with elastic bandage to prevent desufflation of the pneumoperitoneum (Fig. 1B). Once the single-port device placement was completed, a 0-degree, 10-mm laparoscope attached to a video camera and conventional rigid straight laparoscopic instruments were inserted and the procedures initiated (Fig. 1C). The energy source was a 5-mm LigaSure vessel sealer (Covidien, Mansfield, MA) designed for laparoscopy.

On entering the pelvic cavity, the uterus, bilateral adnexa, and ovarian mass were identified. After the mass was pulled into the cul-de-sac, the procedure was similar to the CLA procedure. For masses larger than 7 cm, controlled drainage was performed to permit adnexectomy. Simultaneously, the glove was detached, leaving the wound retractor in place. Under direct vision, volume reduction was achieved by the insertion of a needle connected to a suction apparatus, secured with a purse-string suture to prevent fluid leakage. After decompression, the suction tubing was withdrawn and the purse-string suture was tied. The deflated mass was returned to the cul-de-sac, the glove was re-attached, and pneumoperitoneum was reestablished. Before extraction of surgical specimens, all vascular pedicles were inspected to ensure hemostasis (Fig. 1D). Finally, the glove, surgical specimens, and wound retractor were removed and the colpotomy incision was closed with 2-0 polyglycolic acid sutures (Monocryl; Ethicon Inc., Somerville, NJ, USA).

Statistical analysis

Continuous variables were compared using Student's *t*-tests, while categorical values were compared using Pearson's χ^2 analysis and Fisher's exact tests. Multiple logistic regression was used to estimate the likelihood of undergoing a TVEA procedure for all patients based on age, BMI, parity, mass size, and mass bilaterality. The logistic model produces a propensity score from zero to one based on the predicted probability of undergoing TVEA versus CLA, which was dependent on differences in patient demographic and pre-operative clinical characteristics [16]. These propensity scores were then used to measure selection bias. Patients with low scores undergoing CLA would have been unlikely to undergo a TVEA and therefore were excluded from the comparative analyses.

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