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Case report

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Transvaginal natural orifice transluminal endoscopic surgery (vNOTES) in gynecology: a case presentation and literature review

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Abstract

Natural orifice transluminal endoscopic surgery (NOTES) is an important innovation in the field of minimally invasive surgery. Transvaginal NOTES (vNOTES) have gained more popularity compared to other natural transluminal orifices such as the mouth, rectum and urinary tract. Since the introduction of vNOTES, many surgeons have developed this technique in various interventions in gynecological surgery. In this work, we present a case of tubal sterilization by vNOTES technique and we try to expose the current literature review concerning the application of vNOTES in gynecological surgery. Our results showed that vNOTES had been successfully performed in a series of surgical procedures, including salpingectomy, ovarian cystectomy, myomectomy, hysterectomy, lymphadenectomy and sacrocolpopexy. Advances in technology have improved the feasibility of vNOTES and when technical limitations are overcome, wide application of vNOTES is expected to increase. Other prospective and comparative studies are necessary to clarify the application of this new technique in gynecological surgery.

Introduction

Over the past decade, there has been a revolution in the availability of minimally invasive procedures in most surgical procedures [1]. Many attempts have been made to obtain significant benefits for patients. Transluminal endoscopic surgery (NOTES), which uses natural orifices, such as the mouth, vagina, urethra and rectum, allows access to the peritoneal cavity, was first described by Kalloo *et al*. in 2004 using a pig model [2]. Then, Reddy and Rao *et al*. performed the first transgastric appendectomy in humans using a flexible endoscope [3], which aroused worldwide interest in NOTES. The benefits of NOTES include: reduced post-operative pain, faster post-operative recovery and reduced post-operative wound infections, as well as exceptional cosmetic results [4]. In 2012, Ahn *et al*. demonstrated the feasibility and safety of vNOTES in gynecological surgeries and this study represented the basis for the evolution of vNOTES [5]. Following this, many authors have published their experiences of vNOTES in gynecological surgery. However, the novelty of the technique and its lack of surgical standardization are at the origin of a high heterogeneity between the different studies. In this work, we present a case of tubal sterilization and we try to expose the current literature concerning the application of vNOTES in gynecological surgery.

Patient and observation

Tubal sterilization using the vNOTES technique is one of the simple procedures performed in some centers that had experience in vNOTES surgery. We report a case of tubal sterilization by the vNOTES technique in our university training department. A 38-year-old patient, G3P3 (3 living children) with no specific medical or surgical history, who wanted to perform a tubal ligation. The technique of vNOTES and the necessary information are explained to the patient. We also explained the benefits of this technique and its esthetic results. The patient was convinced and was scheduled for the operation. Under general anesthesia, the patient was placed in gynecological position. A posterior transverse colpotomy (25 mm) was performed and we opened the peritoneum. Then, the vaginal system GelPOINT® Mini was introduced (Figure 1). Subsequently, we have performed an insufflation by vaginal route until 15mmHg and an harmonious pneumoperitoneum was obtained. The table setting was in Trendelenburg position. In the first step, an endoscope has been introduced; we explored the pelvis and located adnexae of the uterus with a grasping forceps. Then, we performed a bilateral tubal sterilization by using Filshie® clips system at 1 cm from the proximal end of the fallopian tube (Figure 1). Finally, we finished by externalization of instruments and closure of the vagina with Vicryl 0. We note that the patient had received a digestive preparation on the eve of the intervention with antibiotic prophylaxis. The operating time lasted 65 minutes and the patient

left the hospital after 24 hours with very good satisfaction.

Discussion

Many authors have published their experiences of vNOTES in gynecological surgery. However, the novelty of the technique and its lack of surgical standardization are at the origin of a high heterogeneity between the different studies. The principle of the technique is simple. Through a 25mm posterior colpotomy, the peritoneum is opened using scissors. A GelPOINT® Mini is inserted into the Pouch of Douglas. We made an insufflation of CO2 gas until the maximum intraperitoneal pressure is 15 mm Hg. An optic is inserted to inspect the peritoneal cavity. The table setting is in the Trendelenburg position. This colpotomy technique is widely used in vaginal prolapse surgery and for benign adnexal surgery. Its use has been reported as a secure approach [6]. Two variants of NOTES have been described according to the approach. Hybrid - NOTES, combines vaginal access with transabdominal assistance. NOTES pure, implies only transluminal access. The potential benefits of the vNOTES technique are [7]: reduce complications at the insertion site such as infections and hernias, increase patient satisfaction, reduce hospital stay, reduce post-operative pain and reduce the risk of hematoma and adhesions of the trocar wound. On the other hand, the main complications described with vNOTES are [8]: rectal wound, vascular wound, bladder wound, intra-abdominal abscess, urinary retention and dyspareunia. These studies have shown an overall complication rate of 9.8% and these complications are mainly related to the level and the learning curve of the surgeon. The contraindications for vNOTES are [9]: history of rectal surgery, suspected rectovaginal endometriosis, malignant tumor suspected, history of pelvic inflammatory disease and active infection of the lower genital tract. Regarding to antibiotic prophylaxis, it is recommended to administer parenteral cefazolin preoperatively, then cefazolin and gentamicin postoperatively for 1 day [10].

The practice of vNOTES in gynecological surgery has expanded in the last few years: salpingectomy, cystectomy, tubal sterilization, evaluating tubal permeability, ovarian drilling, hysterectomy, myomectomy, sacrocolpopexy, and lymphadenectomy (pelvic and retroperitoneal). Lee *et al*. reported the first series of cases of pure vNOTES for adnexae in 2012. Ten patients underwent vNOTES: tubal sterilization (three cases), salpingectomy for ectopic pregnancy (three cases) and ovarian cystectomy (four cases). The vNOTES procedure failed in one patient because a misdiagnosed peritoneal mucinous tumor was located in front of the uterus and was inaccessible using the transvaginal approach, leading to later conversion to conventional laparoscopy. They found that the transvaginal NOTES, compared to the transumbilical single incision laparoscopic surgery (SILS), offered greater space and reduced incidence of instrument shock during handling. The vaginal myomectomy is technically difficult. To date, only two studies with 9 cases reported concerning the application of vNOTES in the uterine fibroid. In 2012, Su *et al*. reported a vNOTES hysterectomy by posterior colpotomy in 16 patients with benign uterine diseases. The follow-up at 2 and 6 months postoperatively showed: good vaginal scarring, no dyspareunia and without post-coital bleeding. In 2014, Lee *et al*. reported the largest sample (137 patients) of hysterectomies and the results were satisfactory. Recently, a study reported 23 successful cases of sacrocolpopexy by vNOTES, with a marked improvement in anatomical prolapse and quality of life. Concerning malignant pathologies, it is unclear the use of vNOTES in malignant tumors. To date, only two studies have reported the use of vNOTES in gynecological cancers. In 2014, Lee *et al*. reported vNOTES in the treatment of three early-stage endometrial cancers. In 2016, Leblanc *et al*. reported a case of endometrial cancer with intermediate risk in an elderly person using the combination of vNOTES and the sentinel node technique. They considered that the vNOTES strategy filled the gaps in a pure vaginal approach with the conventional laparoscopic procedure and seemed to be

interested in early endometrial cancer. However, prospective randomized controlled trials should be conducted to assess the true clinical feasibility, safety and most importantly, the long-term survival outcomes of this approach.

Conclusion

Based on current reports, we knew that surgical procedures like oophorectomy, salpingectomy, myomectomy and hysterectomy could be supplemented with vNOTES by the majority of surgeons who have adequate experience. However, for complex procedures such as tumor staging surgery, lymphadenectomy and sacrocolpopexy, patients should be selected with caution. Although vNOTES represents one of the most significant innovations in minimally invasive surgery since its advent, randomized controlled trials are still needed to refine techniques, verify safety and document efficacy.

Competing interests

The authors declare no competing interests.

Authors' contributions

All the authors have read and agreed to the final manuscript.

Figure

Figure 1: A) introduction of the vaginal system GelPOINT® Mini; B) introduction of the endoscope and grasping forceps; C) representing tubal sterilization by Filshie® clips system

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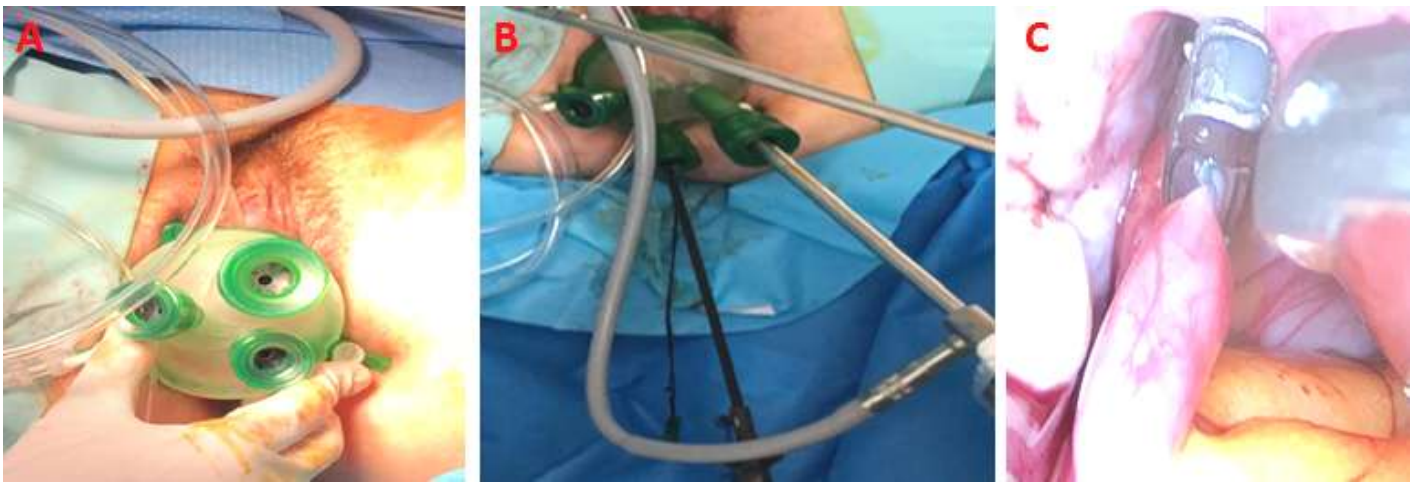

Figure 1: A) introduction of the vaginal system GelPOINT® Mini; B) introduction of the endoscope and grasping forceps; C) representing tubal sterilization by Filshie® clips system