Transvaginal hydrolaparoscopy as an outpatient procedure for infertility investigation

Stephan Gordts¹, Rudi Campo, Luk Rombauts and Ivo Brosens

Leuven Institute for Fertility and Embryology, Tiensevest 168, B-3000 Leuven, Belgium

To whom correspondence should be addressed

A new technique called transvaginal hydrolaparoscopy is described for the exploration of the tubo-ovarian structures in infertile patients without obvious pelvic pathology. It aims to be an acceptable alternative to diagnostic laparoscopy, a standard but not innocuous procedure which infrequently reveals pathology in the asymptomatic patient. Transvaginal hydrolaparoscopy copy is performed under local anaesthesia using a small diameter optic with the patient in the dorsal position. Cavity distension is achieved with normal saline. Transvaginal hydrolaparoscopy does not provide the familiar and panoramic view of the pelvis given by laparoscopy, but it does have several advantages. These include accurate and atraumatic inspection of adnexal structures without manipulation, with the opportunity to perform dye hydrotubation and salpingoscopy. The risks of a general anaesthetic are avoided, and there is less risk of trauma to major vessels. The high patient acceptability makes transvaginal hydrolaparoscopy suitable as an early stage procedure in the investigation of infertility and as a repeat or second look procedure. Minor operative procedures such as biopsy and adhesiolysis can also be performed. In patients with obvious pelvic pathology, diagnostic laparoscopy will obviously remain the procedure of choice. Transvaginal hydrolaparoscopy deserves full evaluation of its accuracy, risks and benefits before it can be accepted as a new first line technique in gynaecological practice.

Key words: infertility/laparoscopy/outpatient/transvaginal hydrolaparoscopy

Introduction

Diagnostic laparoscopy as a standard procedure in the investigation of infertility is frequently performed in healthy women without obvious pelvic pathology, resulting in normal findings or pathology of doubtful clinical significance (Forman et al., 1993). Unfortunately, laparoscopy is not innocuous and should be considered as a major surgical procedure (Querleu et al., 1993). For these reasons the procedure is frequently postponed in asymptomatic patients until a later stage in the investigation process, and repeat procedures to evaluate the evolution of disease or to check the effect of treatment are not considered routine clinical practice. Minilaparoscopy is likely to be more acceptable by avoiding general anaesthesia (Palter and Olive, 1996; Fishburne, 1997). However, the access from the umbilicus used in laparoscopy does not give the ideal angle for inspecting the tubo-ovarian structures. To expose the full ovarian surface and fossa ovarica several steps are required such as Trendelenburg position, distension by CO₂ pneumoperitoneum, insertion of a second trocar and manipulation of bowel and adnexae. The CO₂ pneumoperitoneum provokes the patient’s discomfort and the acidosis is potentially harmful to the patient and, where intra-Fallopian transfer procedures are involved, to gametes and embryos. Concern has also been expressed that growth and spread of tumour cells may be accelerated by laparoscopy with air or CO₂ (Volz et al., 1996; Jacobi et al., 1997). Finally, structures such as fimbriae and avascular adhesions are easier to inspect by hydroflotation than with a pneumoperitoneum (Nezhat et al., 1995; Brosens, 1996). The use of saline as the distension medium in diagnostic laparoscopy is attractive but impracticable with the patient in the Trendelenburg position.

Culdoscopy was abandoned in the 1970s as laparoscopy provided a panoramic view of the pelvis and was shown to be superior for tubal sterilization (McCann and Cole, 1978). Difficulties and complications of culdoscopic sterilization were, however, associated with visualization and exteriorization of the tube. The advantages of culdoscopy in infertility were stressed in the French and English literature (Palmer, 1974; Diamond, 1978). While the technology of laparoscopy was continuously improved the technique of culdoscopy did not advance after the 1960s. Dorsal decubitus (Palmer, 1974; Mintz, 1987), hydroflotation (Odent, 1973) and miculidioscopy (van Lith et al., 1979) were suggested but received no further attention.

The aim of this study was to evaluate the performance of a new technique called transvaginal hydrolaparoscopy for the exploration of the tubo-ovarian structures in infertile patients without obvious pelvic pathology.

Materials and methods

Technique

A mild rectal laxative was self-administered by the patient the morning of the procedure. Transvaginal hydrolaparoscopy was performed with the patient in the dorsal decubitus position, positioned so that she could follow the procedure on a video screen. After disinfection with aqueous chlorhexidine solution the central part of the posterior fornix was infiltrated with 1–2 ml of 1% lidocaine with adrenaline 1:100 000. With a tenaculum placed on the posterior lip the cervix was lifted and the Veress needle was introduced ~1.5 cm below the cervix and
tested by deeper insertion for intraperitoneal location. Approximately 100 ml saline solution at 37°C diluted with 1% lidocaine in a concentration of 1/100 was instilled in the pouch of Douglas. Initially the insertion of a 3 mm blunt trocar was facilitated by a stab incision in the posterior fornix. A 2.7 mm diameter semirigid endoscope was used with an optical angle of 30° and a flow channel attached to a 3 CCD digital videocamera. The optic was introduced ~1 cm through the trocar sheath into the pouch of Douglas. With the 30° optical angle in the upwards position the posterior wall of the uterus was inspected. Subsequently, by rotation and deeper insertion of the scope the tubo-ovarian structures were seen. The saline irrigation was continued throughout the procedure to keep the bowel and tubo-ovarian structures afloat. At the end of the procedure this fluid, ~400 ml in total, was left in situ, and the instruments removed. The vaginal fornix was left to close spontaneously. When indicated, hysteroscopy was performed to check the uterine cavity. After the procedure patients were informed that some vaginal leakage or bleeding could occur and were advised not to use vaginal tampons and to abstain from intercourse for 6 days. Prophylactic antibiotics were prescribed for 3 days in the form of azithromycine 500 mg once daily.

Patient selection
The technique was explained to 28 patients attending an infertility clinic who had normal findings both on gynaecological examination and transvaginal ultrasound scan. Informed consent for the procedure was obtained in all cases. The investigation was performed no earlier than 7 days after the onset of menstruation. The purpose of the procedure was to exclude endometriosis and adhesions of the tubo-ovarian structures. In one patient the procedure was used as a second look procedure 6 months after reconstructive surgery for a right ovarian endometrioma. The first seven patients received a general anaesthetic and underwent the transvaginal hydrolaparoscopy immediately prior to a diagnostic laparoscopy by the same operator, in order to compare the results.

Results
For the first seven patients, the findings were similar at laparoscopy and at transvaginal hydrolaparoscopy, but transvaginal hydrolaparoscopy proved superior at detecting small filmy adhesions. In the group as a whole, access to the pouch of Douglas failed in three patients. The visualization was unilateral in three patients due to extensive adhesions which were confirmed later by laparoscopy. In the other patients the tubo-ovarian structures were clearly visualized on both sides. Moving the optic allowed inspection of the distal tubal segment, the ovarian surface and the fossa ovarica without grasping and manipulation of tissues. The fimbriae were inspected in their natural position underlying and embracing the ovary (Figure 1). By moving the optic the folds of the infundibulum were inspected. Tubal patency was tested at the end of the procedure by transcervical dye hydrotubation with methylene blue (Figures 2–3). Cannulation of the Fallopian tube with the 2.7 mm scope to inspect the ampullary mucosa (salpingoscopy) was also attempted successfully and proved to be painless (Figure 4).

Ovarian endometriosis, adhesions and small pedunculated fibromas were identified by moving the optic around the ovary (Figures 5–8). Filmy adhesion-like and fibrotic structures were detected on the ovarian surface while they were floating in saline (Figures 9 and 10). Tubo-ovarian adhesions were diagnosed in seven patients and endometriosis in four patients. None of these lesions had been detected by vaginal sonography.

The whole procedure lasted between 20 and 40 min. It was tolerated surprisingly well by all patients without any form of analgesia or sedation, and none of the explorations had to be interrupted for pain or discomfort. One patient developed pain at the end of the procedure from haemorrhage at the puncture site. No other complications occurred in this small series. All patients expressed their satisfaction at being able to watch the procedure on the video screen, and none objected to having it repeated if indicated.

Discussion
Our study has demonstrated the ease of performing transvaginal hydrolaparoscopy in an outpatient setting. The failure in three patients was largely due to initial technical problems. In one case, excessive injection of local anaesthetic at the puncture site caused dissociation of the peritoneum from the posterior fornix. Access to the pouch of Douglas is now performed as a culdocentesis technique with a sharp Veress needle. These results can be compared to a 4% failure rate for classical culdoscopy (Riva et al., 1961; Hall, 1967). Transvaginal hydrolaparoscopy is less traumatic than diagnostic laparoscopy as transabdominal insertion of the Veress needle and trocars, manipulation of organs, and drying and acidosis of tissues are avoided. Hydrofloatation allows inspection of the tubo-ovarian structures in their natural position without manipulation, and easy detection of the presence and extent of adhesions. Detection of adhesions is of major importance as they are markers for pelvic inflammatory disease (PID), progressive endometriosis and surgical trauma. Post-inflammatory peritubal adhesions are associated with ampullary mucosal adhesions in 20% of cases rising to 57% where there is distal tubal occlusion (Heylen et al., 1995; Marana et al., 1995). Fredricsson (1974) found that culdoscopy detects more cases of ovarian endometriosis than laparoscopy. The most frequent site for endometriosis is the caudal pole of the ovary which is visualized at transvaginal hydrolaparoscopy without manipulation, avoiding disruption of early adhesion formations. In this small series transvaginal hydrolaparoscopy revealed ovarian lesions including haemorrhagic endometriosis, adhesions and fibroma which were not detected at vaginal sonography.

The procedure was remarkably well tolerated by the patients, suggesting that transvaginal hydrolaparoscopy is likely to be a more suitable outpatient procedure than minilaparoscopy. Discomfort during minilaparoscopy is caused by the CO₂ pneumoperitoneum, Trendelenburg position, insertion of an additional trocar, manipulation to remove the bowel from the pelvis and lifting the adnexa to expose the full ovary and fossa ovarica. The pouch of Douglas approach allows atraumatic and full inspection of the ovary, fimbriae and fossa ovarica by moving the optic and without grasping or manipulation of the organs. The movements of the scope in the pelvis were painless. The ease of performing transvaginal hydrolaparoscopy opens the possibility of repeat procedures to evaluate the evolution of endometriosis. In addition, the procedure is atraumatic,
Transvaginal hydrolaparoscopy for infertility investigation

Figure 1. Floating and distended fimbriae embracing the ovary.

Figure 2. Spilling after transcervical injection of methylene blue.

Figure 3. The optic is introduced in the infundibulum distended by methylene blue showing normal mucosal folds.

Figure 4. The optic is introduced without manipulation into the distal ampullary segment and salpingoscopy shows normal folds.

Transvaginal hydrolaparoscopy avoids destruction of early adhesions by manipulation and does not cause peritoneal acidosis.

Obviously, the technique has limitations when compared to laparoscopy. The view at transvaginal hydrolaparoscopy is limited and restricted to the posterior part of the true pelvis and the gynaecologist is more familiar with the panoramic view of the pelvic structures as seen at laparotomy or laparoscopy. It is worth asking whether inspection of the entire abdomen and anterior pelvis is necessary in infertility and, in the absence of tubo-ovarian pathology, whether anything can be gained from abdominal inspection beyond what can be seen with transvaginal hydrolaparoscopy. The range of interventions which can be performed alongside transvaginal hydrolaparoscopy is more limited than with laparoscopy; however, minor operative procedures such as biopsy and adhesiolysis can still be performed. In addition, the ampullary segment is in the axis of the endoscope and, with minimal manipulation the infundibulum can be exposed and the ampulla cannulated. Preliminary attempts to perform vaginal salpingoscopy were successful. Inspection of the ampullary mucosa has been shown to be more accurate in selecting patients for surgery and assessing the risk of tubal pregnancy in PID than a combination of hysterosalpingography and laparoscopy (Brosens, 1996; De Bruyne et al., 1997). There are also potential therapeutic applications such as gamete intra-Fallopian transfer and zygote intra-Fallopian transfer. Transvaginal hydrolaparoscopy, however, is not a substitute for laparoscopy but can be proposed as a first line procedure in the early stages of infertility investigation, saving a diagnostic laparoscopy in many patients and avoiding delay in the detection of pathology.

The major contraindication is obstruction of the pouch of Douglas by the rectum or a prolapsed tumour, which are routinely excluded by bimanual examination and transvaginal ultrasound. The intraperitoneal location of the Veress needle is controlled by free deeper insertion and, in case of doubt, by the vacuum test and the injection and aspiration of normal saline. Complications of culdoscopy are estimated at 2% and include bleeding at the puncture site, inadvertent puncture of the posterior wall of the uterus, parametrium and ovarian cyst, rectum perforation and peritonitis (Riva et al., 1961; Billingsley...
Figure 5. Superficial, blue–black endometriotic lesion on the ovary.

Figure 6. Endometriotic lesion on the caudal–anterior pole of the ovary and the opposing fossa ovarica (top).

Figure 7. Vascularized adhesions between ovary and fossa ovarica.

Figure 8. Pedunculated ovarian fibroma.

Figure 9. Filmy, free ovarian adhesions are seen at hydrofлотation.

Figure 10. Proliferations on the ovarian surface.
et al., 1963). Severe and life-threatening complications have been very rare (Copenhaver, 1970). Rectum perforation is usually extraperitoneal and is treated conservatively with antibiotics without major consequences. Transvaginal ovum retrieval procedures carry a low risk of infection, which is estimated at 0.4% whether or not vaginal disinfection is performed. However, one has to be aware of the risk of infection particularly in patients with sequelae of PID, aiming to diagnose the complication accurately and intervene promptly (Dicker et al., 1993; Roest et al., 1996). Culpocentesis in Third World countries is accepted as a safe procedure for the diagnosis of ectopic pregnancy (Falfoul et al., 1991).

Patient, physician and health care managers all stand to benefit from the use of transvaginal hydrolaparoscopy in infertility care. Hysteroscopy can be performed with the same optic as the transvaginal hydrolaparoscopy, and additional equipment for pneumoperitoneum is not required. The entire procedure including hysteroscopy and dye hydrodilation is easily performed in less than one hour and, with the application of local anaesthesia, no extra time is needed for the recovery of the patient. The cost and complexity of the pelvic endoscopic exploration in infertility are therefore greatly reduced.

Our pilot study has shown that transvaginal hydrolaparoscopy allows atraumatic and detailed exploration of the tubo-ovarian structures in infertile patients without obvious pelvic pathology. The procedure can be combined with hysteroscopy and dye hydrodilation and has the potential of offering the patient a complete and early exploration of the reproductive tract in a painless, safe and cost-effective way. Further studies are in progress to evaluate the acceptability, accuracy, risks and benefits in comparison with minilaparoscopy.

Acknowledgements
The authors wish to thank Kris Meyhi, Ann Van Hove and Marie-Rose Puttemans for clinical and secretarial assistance.

References


Received on September 5, 1997; accepted on October 3, 1997

Transvaginal hydrolaparoscopy for infertility investigation