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Office Laparoscopy as a Screening Tool for Early Detection of Ovarian Cancer

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Abstract Laparoscopy is a safe and effective surgical procedure used in evaluating the peritoneal cavity. Laparoscopy, under local anesthesia, has been well documented in the literature. These studies support the concept that laparoscopy can be performed under local anesthesia. Several small studies have addressed the respiratory, cardiac, and hemodynamic changes observed using local anesthesia and suggest that, with proper monitoring, these procedures can be safely performed in an outpatient setting. Optical catheter systems now have diameters ranging from 0.25 mm to 2.5 cm. Image fibers 6 μm in diameter are combined in bundles. The catheter system produces a brighter though grainier picture than views produced by a xenon light source and a 5 mm laparoscope. An Adair Verres needle (18 gauge) is inserted through a 3 mm plastic introducer. The Adair Verres needle is removed and a gas extension tube is used to create a pneumoperitoneum with carbon dioxide. The optical catheter is placed through the extension tube. If a second site is required for biopsy or washings, a 3 mm port can be inserted under direct visualization. Miniature ultrasound transducers have now been developed as a means of imaging the internal structures of the ovary. These transducers, housed in #3.5–6.2 French catheters, can be passed through a laparoscope, adding a new dimension to laparoscopy. Although the technology of office laparoscopy as a means of detecting early ovarian cancer exists, it has limited applicability for screening the population at large. It may be more useful as secondary or tertiary testing in the work-up of patients suspected of having ovarian cancer.

Key words: Mini-laparoscopy, office laparoscopy, ovarian cancer screening

Laparoscopy has changed the practice of gynecology. Significant improvements in optical systems, illumination, video equipment, and operative instruments have resulted in expanding indications for this procedure. Many operative procedures are now being performed which were technically believed possible only with an open laparotomy. Currently, the vast majority of laparoscopic procedures are performed in operating rooms under general anesthesia, using standard optical laparoscopes (7–10 mm) [1]. At present, laparoscopy is used in the staging and assessment of response to therapy in patients with ovarian cancer.

Further technical developments have resulted in an optical catheter system with diameters that range from 0.25 mm to 2.5 cm without significant compromise of the image quality. The use of the optical catheter systems in the early diagnosis of ovarian cancer will be examined in this article.

MINI-LAPAROSCOPY AND THE OPTICAL CATHETER SYSTEM

Optical catheters range in diameter from 0.25 mm to 2.5 cm. Image fibers, 6 μm in diameter, are combined in bundles and used to conduct an image to a modular console that contains

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a video camera, light source, monitor, and lens selection device. The light source is powerful enough to provide illumination of the entire abdominal cavity. When compared to views of the abdomen produced by a xenon light source and a 5 mm laparoscope, the catheter system produces a brighter though slightly grainy picture.

The patients are sedated with narcotics and anxiolytics. One percent lidocaine is used to anesthetize the skin to the peritoneum with a small gauge needle. An Adair Verres needle (18 gauge) in a #12 French plastic angiocath (3 mm) is introduced into the peritoneal cavity through an incision which has been planned based on the previous surgical history of the patient. Once the Adair Verres needle has entered the peritoneal cavity, the needle is removed, a gas extension tube is connected to the sheath, and the optical catheter is inserted through this tubing. A diaphragm in the extension tubing prevents CO_2 leakage. A pneumoperitoneum is then created with CO_2, keeping the pressure less than 15 mm Hg. The patient is in the Trendelenberg position for this procedure. Ancillary 3 mm Surgiports can be placed, based on the laparoscopic findings. Three mm instruments (*e.g.*, grasping forceps, biopsy forceps, and scissors) are the operative instruments appropriate for use through this sheath. KTP and ND:YAG quartz fibers and handpiece fit through this 3 mm Surgiport.

Because of the risks associated with conscious sedation, the procedure should be performed using a peripheral intravenous catheter, supplemental oxygen, a cardiac monitor, and pulse oximeter, along with monitoring of blood pressure, respiratory rate, and heart rate. If analgesia is provided with meperidine (Demerol®) and diazepam (Valium®), the reversal agents naloxone (Narcan®) and flumazenil (Romazicon™) should be available to reverse the cardiac and respiratory effects of these drugs. Additionally, 0.6 mg atropine should be given intravenously to prevent a vagal response and bradycardia. It is strongly suggested that a person capable of managing an airway be present, such as an anesthesiologist or anesthetist. Early reports evaluating the safety of local anesthesia for laparoscopy revealed a 20% incidence of vagal reflexes (hypotension, bradycardia, nausea) and a 10% incidence of transient apnea, and 10% incidence of agitation [2,3].

Three small series (Table I) have been reported using mini-laparoscopy in an ambulatory or hospital setting. Using optical catheters from Medical Dynamics (Englewood, CO), Dorsey [4] reported on 15 patients who underwent diagnostic laparoscopy in a hospital setting. He reports that these patients tolerated the procedure well and had no complications. However, the series is reported in a review article on mini-laparoscopy and fiber-optic lasers and the data is not presented in enough detail to critically evaluate it. The first detailed report of office mini-laparoscopy under local anesthesia was reported by Childers and colleagues [1] in 1992. They describe using an optical catheter system by Medical Dynamics (Englewood, CO) on seven patients with intraperitoneal carcinomatosis. The procedure was well-tolerated with no reported complications. They felt this procedure offered a simple, safe, effective technique to evaluate and diagnose intraperitoneal malignancies. In the third series, Risquez and associates [5] used the optical catheter system to evaluate 30 patients. The patients tended to be young, with a mean age of 32.5 years, and with a clinical suspicion of benign disease. They report that the patients tolerated the procedure well. They note the intra-

TABLE I. Mini-laparoscopy

Author	Number of Patients	Site	Complications
Dorsey [4]	15	Hospital	None
Childers [1]	7	Office	None
Risquez [5]	30	Not stated	Shoulder pain, nausea

peritoneal pressure must be less than 15 mm Hg when using carbon dioxide to create a pneumoperitoneum to avoid causing pain. They comment that the light intensity, focal length, and resolution are inferior to large diameter laparoscopes, but the image quality allowed for adequate visualization for diagnostic purposes.

The complications from laparoscopy using standard operating scopes with diameters ≥ 7 mm are listed in Table II. The three series reported to date have insufficient numbers of patients to accurately assess the morbidity from the optical catheters. It can be assumed that mini-laparoscopy may result in similar complications. However, due to the small size of the catheter, the complications may not be clinically significant. Experience at our institution with the insertion of intraperitoneal catheters (#14 French) through a percutaneous blinded approach was well tolerated [6]. Although we reported perforations of bladder and bowel, no medical or surgical intervention was required due to the small size of the needle.

In 1988, Tolino [7] reported on 176 patients with adnexal masses who underwent laparoscopy following a pre-operative work-up consisting of a pelvic examination, pelvic ultrasound, barium enema, and tumor markers. Based on this pre-operative information, the authors compared their pre-operative diagnosis with that following laparoscopy and biopsy. They correctly identified all of the benign ovarian masses. However, in their pre-operative assessment, they missed 10 patients with ovarian cancer (5.68%) who were correctly diagnosed at the time of laparoscopy. Mage and colleagues [8] detected nine ovarian cancers at the time of laparoscopy in a study of 481 patients. However, 2/9 (22%) required incision and biopsy of the ovarian cyst to detect the ovarian cancers; whereas the other seven were diagnosed by gross inspection alone. In the series reported by Nezhat and associates [9], four ovarian cancers were diagnosed, but only one was apparent by gross inspection.

The false-positive rate in these series is also quite high, likely reflecting the authors' decision to intervene with laparotomy in the event of a suspicion of a malignancy (Table III). Interestingly, the initial report by Mage [8] and later updated by Canis [10] reveals a decreasing false-positive rate with the passage of time and increase in experience. From these series, it is apparent that gross inspection by laparoscopy does not have sufficient sensitivity or specificity to detect ovarian cancer. A biopsy or removal of the ovary is usually required. The prognostic impli-

TABLE II. Complications of Peritoneoscopy [12]

Element of Procedure	Complication
Establishing pneumoperitoneum	Perforation of vessel or viscus
	Emphysema
	Subcutaneous
	Omentum
	CO_2 embolism
	Local hematoma
	Bradycardia
	Infection
Insertion of peritoneoscope and examination	Perforation of vessel or viscus
	Infection
	Vagal reaction
Biopsy	Excessive hemorrhage
	Perforation of viscus
	Pneumothorax
	Bile peritonitis
	Tumor implant at trochar site

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TABLE III. Laparoscopic Diagnosis of Ovarian Cancer

Author	Number of patients	False-Positive Rate
Mage [8]	n = 481	52.6%
Nezhat [9]	n = 1,011	50.0%
Canis [10]	n = 757	41.3%

cations of rupturing an early ovarian cancer through biopsy or puncture of an ovarian cyst remains controversial and unresolved.

SONOGRAPHICALLY GUIDED LAPAROSCOPY

In 1993, Goldberg and colleagues [11] reported using miniature ultrasound transducers (12.5 MHz) housed in #9 French catheters passed through a laparoscope to image a variety of normal and abnormal structures. These transducers allow imaging of the internal structures of the ovary and fallopian tube. The catheters incorporate a miniaturized transducer at the distal end of the catheter shaft connected to a drive cable which runs the length of the catheter. Catheter sizes range from #3.5–6.2 French with transducer frequencies of 12.5–30.0 MHz. Three variables that impact on image quality include transducer frequency, transducer aperture, and gland system dynamic range. With the advent of this technology, it is now technically possible to evaluate the internal structures of the ovary without rupture of the cyst or biopsy of the ovary. The ultrasound beam penetrates 2–3 cm, allowing intraoperative evaluation of the ovarian parenchyma.

CONCLUSION

Three preliminary reports of 52 patients suggest that mini-laparoscopy can be successfully performed under local anesthesia in an outpatient or ambulatory setting with appropriate monitoring. These small diameter catheters reduce the size of the abdominal incision, local pain, and tissue damage. The complication rate is anticipated to be less than that of currently used operating laparoscopes. However, evaluating mini-laparoscopic morbidity requires a significantly larger number of patients.

For high-risk patients (*e.g.*, family history of ovarian cancer, elevated tumor markers, abnormal transvaginal sonogram), mini-laparoscopy may provide a minimally invasive alternative to laparotomy in the early diagnosis of ovarian cancer.

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