

# Minimally Invasive Surgery in O&G

## Diagnostic and Therapeutic Applications

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**One of the** most significant transformations within the history of surgery has been the paradigmatic shift from open surgery to the realm of operative video-laparoscopy, an approach that truly captured all that minimally invasive surgery was meant to mean.

In the last 20 years, gynaecological laparoscopy has evolved from a limited surgical procedure used only for diagnosis to become a major surgical tool used to treat a multitude of gynaecological indications. Through a few small abdominal wounds and the use of specialised laparoscopic instruments, the laparoscopic surgeons are able to achieve the traditional surgical goals that were usually accomplished by open laparotomy.

Combining advanced technology with patient care has also allowed minimally invasive surgeons to do more with less. Patients who undergo minimally invasive surgery enjoy the numerous advantages of laparoscopy over laparotomy, such as reduced postoperative pain, smaller surgical scars, shorter hospital stay, and faster return to normal activities.

We can truly hail the advancement of operative video-laparoscopy as a "revolutionary" change to surgery in this century as the development of anaesthesia was in the last century.

### The History of Laparoscopy

Laparoscopy was first discovered by Dr George Kelling, who performed

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his procedure, *koelioskopie*, on the dogs. Subsequently, numerous great surgeons such as Dr Hans Christian Jacobeus, Dr Bertram M. Bernheim, and Dr Janos Veress and others, contributed to the development of this surgical approach. In the early part of the century, laparoscopy was limited to diagnostic procedures, used by a few surgeons and with substantial complications. It was not until the 1970s that operative laparoscopy was initiated and tubal ligations for contraception using laparoscopy were performed in women.

The development of solid state video camera and optic fibre technology in the 1980s further transformed this surgical approach into our modern operative video-laparoscopy. With that, operative laparoscopy approach was extended to complicated gynaecological procedures including hysterectomy, adnexal surgery and uterine myomectomy. Today, laparoscopic surgery has become an essential part of surgical treatment for gynaecological diseases, including gynaecological cancers. The

21<sup>st</sup> century looks set to further extrapolate this great surgical discovery into the realms of robotic surgery and single-port technology.

### What Can We Do with Laparoscopy Nowadays?

Traditionally, the use of laparoscopy in gynaecology had been mainly limited to diagnostic purposes in chronic pelvic pain and infertility procedures. Thereafter, its use widened to include various forms of sterilisation. Nowadays, laparoscopy is the gold standard in the diagnosis and treatment of ectopic pregnancy. With its increasing popularity, laparoscopy has also become the treatment of choice for endometriosis, ovarian cysts and fibroids.

#### Diagnostic laparoscopy

Frequently, surgeons need to assess the pelvis for acute or chronic pain, infertility, ectopic pregnancy, ovarian cysts, or other pelvic pathology. Laparoscopy is an excellent approach to achieve the diagnosis. The use of optics and electronic visualisation equipment has

provided highly-magnified images of surgical anatomy and pathology that make subsequent surgery more precise and accurate.

#### **Tubal sterilisation**

Laparoscopic tubal ligation has been shown to be highly effective in preventing pregnancy. Instead of making a large abdominal incision, laparoscopy has allowed the surgeon to tie the fallopian tube via small "keyholes" in the abdomen. Laparoscopy has transformed tubal sterilisation into a highly cost-effective procedure that has had great impact in the lives of many women.

#### **Treatment of endometriosis**

Treatment of endometriosis may be potentially complicated with involvement of the surrounding organs such as bowels and bladder. Laparoscopy provides superior magnified images of the disease and facilitates haemostasis. This is especially critical in the treatment

of endometriosis, as it helps the surgeon to completely resect or ablate the disease. Laparoscopic treatment of endometriosis has been shown to improve fertility and decrease pelvic pain in multiple well-designed studies.

#### **Treatment of ectopic pregnancy**

Laparoscopy is the gold standard treatment for ectopic pregnancy. Besides helping the surgeon to clinch the diagnosis, treatment can also be instituted in the same setting. A salpingostomy or salpingectomy may be performed to remove the embryo and gestational sac.

#### **Treatment of ovarian pathology**

Ovarian pathology such as cysts, torsion or mass can be effectively managed using laparoscopy. Laparoscopic cystectomy, adnexectomy or de-torsion can be performed via laparoscopic approach with excellent surgical outcomes.

#### **Treatment of fibroids**

Uterine fibroids are benign tumours on the muscular wall of the uterus, commonly found in women of reproductive age. Uterine fibroids may be associated with painful and distressing symptoms, including heavy menstrual periods, abdominal cramping, and even infertility. Nowadays, laparoscopy is effectively employed in both myomectomy and hysterectomy, with a much quicker recovery for the patients.

#### **Others**

With increasing experience in laparoscopy, minimal access surgery is now being conducted for more complicated gynaecological procedures such as gynaecological cancers, urinary incontinence, microsurgery for fertility and pelvic organ prolapse. The most telling of these developments has been the use of laparoscopic access for pelvic and para-aortic lymphadenectomy and radical hysterectomy for gynaecological malignancy.



The laparoscopy team from the Department of Obstetrics & Gynaecology, National University Hospital, from left to right: Dr Ng Ying Woo; Dr Anupriya Agarwal; Dr Fong Yoke Fai; Dr Stephen Chew

## What's New?

Progress in medicine often follows innovation and improvement in technology. For laparoscopic surgery, it is becoming a technically easier and less invasive procedure. Despite several advantages of laparoscopic surgery, weaknesses of conventional laparoscopy – such as the limited mobility of straight laparoscopic instruments, poor quality two-dimensional imaging, less cosmesis associated with multiple incisions and a steep learning curve for surgeons – still remain.

Recently, two approaches have been introduced into the arenas of minimally invasive surgery, aiming to alleviate these weaknesses. They are the robotic surgery platform and single-port laparoscopic surgery (SPLS).

Robotic surgery has many advantages such as 3-dimensional view, wrist-like motion of the robotic arm and improved ergonomics for the surgeon, allowing him or her greater precision and the ability to tackle more complex cases. Scientific data has also demonstrated the feasibility of robotic surgery in gynaecological oncology. In the near future, we will see greater miniaturisation of the robot as it integrates into mainstream surgery. Cost reduction in robotic surgery will kick in as the demand increases.

While SPLS has several benefits including reduced postoperative pain, and better cosmetic results as compared to conventional laparoscopy, technical difficulties and limitation of the laparoscopic instruments are the current barriers to its further development. An increasing number of clinical trials indicate the feasibility of using SPLS in gynaecological surgery, however, further studies are needed to demonstrate its potential benefits over the conventional laparoscopy.

In the next few years, we will probably be witnessing these two

innovations taking the lead in the development of minimally invasive surgery, thereby improving the quality of care for our patients.

## Conclusion

Neither the use of minimal access nor technical feasibility is an indication for surgical intervention. A surgical procedure is undertaken solely to benefit the patient. Hence, there is also a need to increase public awareness and education on laparoscopic procedures, so that the advantages of laparoscopy and its potential benefits can be fully realised.

Both robotic surgery and SPLS are currently in their infancy stage, and greater strides in the existing technology are needed if this technology is to become a commonplace for the general gynaecologist. Nevertheless, we are seeing a growing body of literature demonstrating the feasibility of these approaches with several added advantages. As the technology advances, we will eventually arrive at our promises offered to our patients of being truly "minimally invasive". 

### The Gynae-Endoscopic Surgical Team at the National University Hospital, Singapore

Our team at the National University Hospital (NUH) has continually strived for excellence in the field of minimally invasive surgery. Besides offering expertise in the traditional laparoscopic surgical treatment of ectopic pregnancy, fibroids, ovarian cyst and endometriosis, we were the first in the region to perform SPLS in 2009. We have also worked with our oncology colleagues (A/Prof Jeffrey Low, Dr Joseph Ng) under the umbrella of the GRACES (Gynaecological Robotic Assisted Cancer and Endoscopic Surgery) project, to perform the first robotic-assisted surgery for endometrial cancer and cervical cancer in the region. These minimally invasive approaches are accomplishing traditional surgical goals with less pain, faster recovery and lower wound complication rates. Our team is committed to excellent patient care through research, education and clinical expertise.



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