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Editorial

Surgical Progress: Robots in Gynecologic Laparoscopy

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Robot-assisted laparoscopy (RAL) is a minimally invasive surgical approach that combines conventional laparoscopy (CL) with a robotic system (RS) such as the *da Vinci*®. RAL can help the surgeon overcome the limits of CL (bi-dimensional operating field vision, diminished tactile sensation, hand tremors) with the advantages of an ergonomic RS which improves dexterity and the operative field with a 3D camera, allowing the surgeon to simultaneously control the optics and the surgical instruments [1].

CL, compared with laparotomy, offers patients many benefits such as shorter hospital stay, less post-operative pain, decreased risk of infection, reduced blood loss and–transfusions, and faster post-operative recovery. RAL, compared with CL, results in better surgical performance but generally does not change the surgical outcomes such as operation time, estimated blood loss, and complication rates [1,2].

However, RAL has a conversion rate to laparotomy of 8.7%, which is significantly lower than the conversion rate of CL, estimated to be 25.8% [3,4]. The robotic-assisted system generally consists of a camera and three arms maneuvered by the surgeon with a console that can be located far from the patient. Ports are generally placed in a specific way: a supraumbilical endoscope port, along the midline, 10–20 cm above the target anatomy. After the camera port is placed, a pneumoperitoneum is created and a diagnostic laparoscopy is performed to check if there are any dangerous intrabdominal adhesions or anatomical abnormalities. The ancillary ports, where the robotic instruments are introduced, lay at the same level of the optic port, spaced from 8 to 10 cm apart. An additional port, placed by an assistant, can be also inserted in the upper quadrants. The patient is placed in the Trendelenburg position and the camera arm is docked to the optical port, following which instrument arms are placed on each trocar. The standard patient position for gynecological robotic procedures is the lithotomic one with variable degrees of Trendelenburg inclination starting from 25° to an "extreme" value of 45°, in order to achieve optimal target organ exposure. More pronounced degrees of Trendelenburg positioning place greater stress on the patient's organs and increase the potential for intraoperative complications and non-surgical adverse effects [5,6]. RAL is used to treat benign pathologies such as fibroids, endometriosis, ovarian cysts [7] pelvic organ prolapse [8]. This technique can be used to treat malignant pathologies such as endometrial, ovarian or uterine cervix cancer. The advantages of an RS are useful even in cases of high body mass index (BMI) and large uteri, although complication rates and operative time increase with the grade of obesity and uterine size [9,10].

In oncological gynecological surgery, RAL, in comparison to CL, brings better perioperative outcomes and at the same time, guarantees same or higher rates of progression-free survival [11]. RAL allows complex gynecological procedures, like radical hysterectomy which includes a large dissection of the retroperitoneum [12], to avoid damage to the pelvic nerves with the aim of performing an accurate resection, ensuring at the same time, complete excision of the tumor with negative margins. These complex oncological procedures, thanks to RS, can be performed by a single surgeon with the help of an inexperienced assistant. RAL has recently been widely recognized for the surgical treatment of early stage cervical and endometrial cancers [11,13–15]. RS may also be performed for the eradication of deeply infiltrative endometrial nodules. In addition, given the high need for the surgical treatment for urogynecological conditions, robotic colposacropexy is also a valuable choice. This surgery can provide the same long-term results as laparoscopic sacrocolpopexy but with the advantage of RS [8,13,16].

However, patients must be suitable for RAL due to the longer operative times compared to laparotomic or laparoscopic procedures and the steep Trendelenburg position, thus accurate pre-surgical planning and careful patient selection is mandatory. The most significant disadvantage of RAL is cost, as compared to CL and laparotomy. A financial analysis for robotic surgery is difficult to conduct due to multiple factors. The cost of instruments salaries, maintenance, and operators' usual surgical approach and hospital size (high or low surgery volume center) can raise or lower overall direct costs. The cost savings could be likely from a combination of shorter operative times and reduced length of stay. In fact, robotic surgery has been associates with shorter post-surgical hospitalization when compared to open surgery, although less significant when compared to laparoscopic surgery. The clinical benefits and the time saving may justify its widespread use and the economical effectiveness can be markedly improved by increasing the volume of robotic surgery [9,16–19].

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All authors designed the research study. DDG and RP performed the research. ADA provided help and advice on data retrival and analyzed the data. DDG and RP wrote the manuscript. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

Ethics Approval and Consent to Participate

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Conflict of Interest

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