

Position Statement



Robot assisted surgery during the COVID-19 pandemic, especially for gynecological cancer: a statement of the Society of European Robotic Gynaecological Surgery (SERGS)

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Disclaimer

These recommendations are subject to changes according to the developments of the pandemic and the measures that will be advised or required by national and international policy makers.

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ABSTRACT

All surgery performed in an epicenter of the coronavirus disease 2019 (COVID-19) pandemic, irrespective of the known or suspected severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) status of the patient, should be regarded as high risk and protection of the surgical team at the bedside should be at the highest level. Robot assisted surgery (RAS) may help to reduce hospital stay for patients that urgently need complex-oncological-surgery, thus making room for COVID-19 patients. In comparison to open or conventional laparoscopic surgery, RAS potentially reduces not only contamination with body fluids and surgical gasses of the surgical area but also the number of directly exposed medical staff. A prerequisite is that general surgical precautions under COVID-19 circumstances must be taken, with the addition of prevention of gas leakage:

- Use highest protection level III for bedside assistant, but level II for console surgeon.
- Reduce the number of staff at the operation room.
- Ensure safe and effective gas evacuation.
- Reduce the intra-abdominal pressure to 8 mmHg or below.
- Minimize electrocautery power and avoid use of ultrasonic sealing devices.
- Surgeons should avoid contact outside theater (both in and out of the hospital).

Keywords: Robot Assisted Surgery; COVID-19; Personal Protective Equipment

INTRODUCTION

Since and immediately at the onset of the coronavirus disease 2019 (COVID-19) pandemic, guidelines have been published on proper and safe surgery for both the health care providers and the patients [1-3]. The major surgical societies have issued guidelines specifically or also addressing the place of minimal invasive surgery in these challenging times [4-12].

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Changes in the existing policies around laparoscopic surgery are dictated on one hand by the extreme stress on the health care system in general and particularly on the facilities for surgery. Sudden and immense influx of COVID-19 patients requires prioritization of the use of means, operating rooms and intensive care beds for COVID-19 patients, resulting in suspension of any elective surgery in hospitals catering the affected areas [13]. On the other hand, a putative or proven infection with this virus poses hitherto unknown risks for both the surgical patients and the surgical teams.

Most of the recommendations that are being made are authority based and at best generated by panel review (e.g., EAU Robotic Urology Section) [8]. They may also be somewhat contradictory through different interpretations of data or opinions (e.g., Royal College of Obstetricians and Gynaecologists/British Society for Gynaecological Endoscopy vs. Royal College of Surgeons) [10,14].

Next to various national societies, both The Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) and the European Society for Gynaecological Endoscopy (ESGE) have issued extensive recommendations on the use of laparoscopy in general [9,11]. Therefore, this statement will specifically focus on robot assisted surgery (RAS).

This statement is written to guide surgeons under extreme circumstances within a hospital system where priority is first and for all given to patients needing immediate care, in particular to COVID-19 patients. However, it cannot replace the personal responsibility of each individual surgeon and institution. It is assumed that we follow the general recommendation to suspend all elective procedures, so consequently this statement regards only emergency surgeries that cannot be delayed or surgeries that if significantly delayed could cause significant harm, such as for cancer [5]. From the list of such cases that were identified by the American College of Surgeons the following might be treated by RAS [6].

Emergency surgeries

- Rupture tubal-ovarian abscess
- Tubal-ovarian abscess not responding to conservative therapy
- Emergency cerclage

Surgeries that cannot be significantly delayed

- Cancer or suspected cancer
- Cerclage of the cervix

PRO'S AND CON'S OF RAS

There is consensus that laparoscopic operations are aerosol generating procedures. At first British Intercollegiate General Surgery Guidance on COVID-19 specifically recommended that 'laparoscopy should generally not be used' because of aerosol contamination with the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which has been rephrased to 'consider laparoscopy only in selected individual cases' the following day [14]. Publications cited state that there are no data or actually question whether there would be contamination [11,15]. These latter and other recommendations therefore just advise to carefully consider whether we should use or avoid laparoscopic surgery [9,10]. As a matter of fact, laparoscopy might even protect against viral exposure through smoke, provided that CO₂ and smoke are filtered and extracted,

Table 1. Risk comparison of robot assisted, conventional laparoscopic and open surgery under COVID-19 circumstances

Area of risk	Robot assisted surgery	Conventional laparoscopy	Open surgery
Aerosol	Intraabdominal dispersion, limited by filters or locks (no data on COVID-19 in aerosols and risk)	Intraabdominal dispersion, limited by filters or locks (no data on COVID-19 in aerosols and risk)	Less aerosol formation, unconfined dispersion, unfiltered (no data on COVID-19 in aerosols and risk)
Smoke	Confined, filtered	Confined, filtered	Maximal exposure
Blood, body fluids	Hardly if any blood loss, exposure at limited intervals	Hardly if any blood loss, exposure at limited intervals	More blood loss, continuous exposure
Abdominal pressure (mmHg)	<10	10–15	0
Perioperative cleaning of instruments	Large surface of robot, limited number of instruments, less blood contamination	Limited number of instruments, less blood contamination	Large number of instruments, heavy blood contamination
Staff	Typically 1 bedside staff, 1 console staff (remote)	Typically 3 bedside staff	Typically 3 bedside staff
Hospital stay	Short	Short	Longer

COVID-19, coronavirus disease 2019.

preferably using an integrated flow system with a continuous smoke evacuation through an Ultra Low Penetrating Air (ULPA) filter meeting the Association of periOperative Registered Nurses guidelines [8,16]. As ultrasonic sealing devices produce large amounts of smoke containing non-deactivated viral particles their use should be avoided [17].

Also, the added value of RAS to both the issue of gas leakage and of pulmonary stress is that CO₂ pressure can be minimized. Whereas pressure for optimal vision at conventional laparoscopy should be at between 10–15 mmHg, robotic vision remains stable and optimal up to 5 mmHg [18].

Against RAS could be held that pre- and postoperative decontamination of the platform — console and cart(s) — is troublesome and time consuming. On the other hand, less instruments are being used than at open surgery and these instruments will be less contaminated with blood, so easier to clean.

During a robotic procedure less operating staff is needed in the direct vicinity of the patient, as usually the scrub nurse could also assist the console surgeon, even when performing radical surgery. In any case all other staff, including trainees, should clear the theater before the intubation and operation is started.

A practical problem might arise if theaters suitable for and equipped with a robotic platform is requested as auxiliary intensive care units for COVID-19 patients. As with all dedicated theater spaces, careful considerations should be made which rooms can or should be prioritized for the treatment of COVID-19 patients.

Finally, a great advantage of using a robotic platform is the fact that in times of extreme shortage of hospital beds hospital stay can be minimized also for urgent patients that need (radical) complex procedures that might not or less be feasible with conventional laparoscopy.

In conclusion, RAS may help in minimizing the risk for contamination of healthcare providers and to make optimal use of residual resources (**Table 1**).

PREVENTIVE MEASURES

Although some recommendations distinguish between patients tested positive or negative for SARS-CoV-2, others don't and refer only to patients 'possibly or positively diagnosed

with COVID-19'. Depending on the resources available pre-operative testing may or may not be available. If patients are being tested, it should be noted that depending on the test used the false negative rate may vary between 15% and 25%, although in fact no hard data are currently available on this [19]. Furthermore, there seems to be a delay in relation to symptoms associated with COVID-19. For this reason, the Food and Drug Administration has advised that a negative result should 'not be used as the sole basis for patient management decisions' [20]. Additional criteria could be, asymptomatic for 7 days and not into contact with an COVID-19 patient within the last 14 days [21]. As it stands today, irrespective of the testing status of patients, all surgery should be regarded as high risk and strict preventive measures should be implemented at every operation [11].

For the above mentioned reasons pre-operative SARS-CoV-2 testing is not necessary to decide on protective measures. This may change with improved test specifications and improved availability for asymptomatic patients. Nevertheless, testing could be beneficial to determine the treatment strategy for the patient. If tested positive, postponement of the operation and alternative treatment should seriously be considered. Additional computed tomography of the chest could potentially rule out abnormalities suggestive for COVID-19 infection that would preclude any operation, but at the moment and especially in asymptomatic patients this examination is of limited value [22].

Personal protective management is quintessential in surgery under high risk circumstances. From the Chinese experience it is advised to use level III protection when the staff performs surgery for confirmed or suspected patients, because of the risk of contact with body fluids, blood or respiratory secretions [23]. Availability of adequate personal protection equipment (PPE) is a prerequisite for surgery under COVID-19 circumstances. At RAS surgeon and assistant are divided between console and bedside so they do not all need to have maximal level III protection [8,23]. The console surgeon may use level II protection, equivalent to the protection recommended for those working in an isolation ward area (including intensive care unit) (**Table 2**).

It should be noted that medical protective masks are apparently often ineffective because users have not received essential training and instruction about the proper use [24]. In addition, as splash proof protection is needed it can be considered to combine a non-splash proof respirator with a conventional splash-proof surgical mask, although this might not be to manufacturers' recommendations [25,26].

Table 2. Personal protective equipment for robot assisted surgery team

Surgical team member	Protection level	Protective equipment
Bedside assistant	Level III	<ul style="list-style-type: none"> • Disposable surgical cap • Medical protective mask (FFP3) + goggles/visor, but preferably: full face respiratory protective device or powered air-purifying respirator • Work uniform • Disposable medical protective uniform • Disposable latex gloves
Console surgeon	Level II	<ul style="list-style-type: none"> • Disposable surgical cap • Medical protective mask (FFP3) • Goggles/visor • Work uniform • Disposable medical protective uniform • Disposable latex gloves

Table 3. Measures during robot assisted surgery to prevent gas, aerosol and smoke leakage

Description
<ul style="list-style-type: none"> • All surgery during the COVID-19 pandemic should be regarded as high-risk, and therefore no pre-operative testing of patients will be needed. • During laparoscopic surgery take steps to minimize CO₂ release. • Close the taps of ports before inserting them to avoid escape of gas during insertion. • Attach a CO₂ (ULPA) filter or water lock to one of the ports for smoke evacuation. Do not open the tap of any ports unless they are attached to a CO₂ filter or being used to deliver the gas. • Minimize introduction and removal of instruments through the ports as much as possible. For introduction of material (such as bags, meshes) or specimen retrieval (such as biopsies), deflate the abdomen with a suction device before entering or removing the material into or from the abdomen or use an air-lock system. Re-insert the port before turning CO₂ on again. • At the end of the procedure turn CO₂ off, deflate the abdomen with a suction device and via the port with CO₂ filter, before removal of the ports. • Avoid the use of ultrasonic sealing and use lowest possible electrocautery power. If possible use electrothermal bipolar vessel sealing. • Minimize sudden gas dispersal during total laparoscopic hysterectomy when the specimen is removed, deflate the abdomen with a suction device before removal the uterus through the vagina.
COVID-19, coronavirus disease 2019; ULPA, Ultra Low Penetrating Air.

Fecal-oral contamination with SARS-CoV-2 has been reported [27]. Thus, it is important to prevent dispersion and contamination with feces. For this very reason it has been advised to perform bowel surgery as much as possible intra-abdominally [3]. Although in gynecological RAS opening of the bowel will be rare, even in oncologic surgery, this can be handled adequately and even more safely by RAS than in open surgery.

An important measure, also recommended by SAGES and intuitively effective to assure continuous availability of healthy staff, is to keep surgical staff out of the hospital and to advise self-isolation at home when they are not needed [11,24]. Surgical staff in these times should not participate in ward rounds or see out-patients.

Protective measures also include prevention of CO₂ and smoke escape freely from either trocars or body orifices by measures that are recommended in general for laparoscopy by the ESGE and modified for RAS (Table 3) [9].

CONCLUSION

If all high level precautions are being taken, including sufficient PPE and prevention of CO₂, aerosol and smoke escape RAS may offer a safe surgical alternative protecting both the surgical patient, the surgical team as well as the COVID-19 patients that need resources, in particular beds otherwise reserved for those surgical patients.

Evidently, if these stringent but necessary precautions cannot all be taken, e.g., by lack of equipment it should be considered whether open surgery would be safer or whether indeed surgery would be feasible at all under the circumstances.

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