

# Comparative analysis of the anaesthesia management of gynecological operations between the normal period and COVID-19 pandemic

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## ABSTRACT

**Aim:** In the novel coronavirus (2019-nCoV/SARS-CoV-2) disease 2019 (COVID-19) pandemic period, one of the major objectives of the anaesthesia team was providing quality care for patients whose procedures cannot (or can no longer) be postponed while limiting the risk of contamination of these patients and healthcare professionals. The aim of this study is to analyse and document the changes in anaesthesia management of gynecological operations in accordance with this objective during the pandemic period.

**Material and Method:** A retrospective observational study was conducted on patients who had gynecological operation from 01.09.2019 to 31.12.2020. Anaesthetic management of gynecological operations corresponding to the pandemic process (After Pandemic Group) were compared with anaesthetic management of gynecological operations from the before the pandemic process (Before Pandemic Group). Anaesthesia records of the patients were examined. The following parameters are recorded: Surgery type, indication of the surgery, urgency of the surgery and anaesthesia method performed, airway management of the patients, used medications for the anaesthesia management.

**Results:** There was an increment in the percentage of operations performed with regional anaesthesia after the start of the pandemic. There was a statistically significant decrement in the percentage of operations performed with laparoscopic technique after the start of the pandemic. There was an increment in the percentage of operations with oncological or suspected oncological indications after the start of the pandemic; there was no difference in the percentage of urgent surgeries while there was a decrement in the percentage of operations with elective indications.

**Conclusion:** By taking alterations and fluctuations in community prevalence into consideration, decisions about cancellation of surgeries must be made dynamically. Possibility of COVID-19 infection must be considered in every patient. In anaesthesia management, regional anaesthesia methods may be considered in appropriate cases. Proper PPE must be used if airway manipulations are needed.

**Keywords:** COVID-19, gynecological operations, anaesthesia management

## INTRODUCTION

The novel coronavirus (2019-nCoV/SARS-CoV-2) disease 2019 (COVID-19) began in Wuhan, China, at the end of 2019 and spread rapidly across the country and worldwide, which was declared to be a pandemic by the World Health Organization (WHO) (1). The virus, has been identified in respiratory tract specimens one to two days before the onset of symptoms (2), and mainly spread through respiratory droplets or direct contact. It may also be transmitted through aerosols with prolonged exposure to high concentrations of aerosol in an enclosed environment (3). Aerosol generating procedures (AGPs), involve intubation, extubation, chest tube insertion,

bronchoscopy, gastrointestinal endoscopy, laparoscopy, and the use of energy devices such as electrocautery, are associated with an increased risk of infection to the healthcare professionals (4). Anaesthesia practise, based on its nature, is obliged to either perform or exist together with the teams performing most of these procedures. This situation puts healthcare professionals working in anaesthesia and criticalcare departments and anaesthesia units in an elevated risk of COVID-19 exposure (5,6). In this pandemic period, one of the major objectives of the anaesthesia team was providing quality care for patients whose procedures can not (or can no longer) be postponed

while limiting the risk of contamination of these patients and healthcare professionals. For this purpose, there had been some changes in anaesthesia practise. There is not adequate information to evaluate the effects of the COVID-19 pandemic on anaesthesia management of gynecologic operations. The aim of this study is to analyse and document the changes in anaesthesia management of gynecological operations in accordance with this objective during the pandemic period.

## MATERIAL AND METHOD

A retrospective observational study was conducted on patients who had gynecological operation from 01.09.2019 to 31.12.2020 comparatively, in Ankara City Hospital as a pandemic hospital, after ethical approval was taken from both local ethics committee (Ankara City Hospital-E1-1-21-1732-14.04.2021, and the Ministry of Health (2021-03-09T23\_29\_08). That is, anaesthetic management of gynecological operations after the beginning of the the pandemic period (After Pandemic Group) was compared with anaesthetic management of gynecological operations before the pandemic period (Before Pandemic Group) .

From the hospital records, all the patients who had gynecological operations at the determined period were identified. As our hospital has begun to provide service since September 2019, the operation records has been kept from that date. Anaesthesia records of the patients were examined. The following parameters are recorded: Surgery type, indication of the surgery, urgency of the surgery and anaesthesia method performed, airway management of the patients, used medications for the anaesthesia management

Also, the indications for surgery was grouped as Group 1 (Surgery indications-Group 1): Oncological or suspected oncological indications (adnexial mass, ovarian carcinoma, endometrial carcinoma, cervical carcinoma, high grade cervical intraepithelial neoplasia, vulvar carcinoma, postmenopausal bleeding, endometrial hyperplasia) Group 2 (Surgery indications-Group 2): Morbidities with increment bleeding but not urgent (myoma uteri, endometrial polyps, menometrorrhagia) Group 3 (Surgery indications -Group 3): Urgent surgeries (extra uterine pregnancy; ovarian cyste rupture/torsion, tubo ovarian abscess; wound infection debridement; postoperative bleeding or complications requiring surgery, molar pregnancy termination) Group 4 (Surgery indications -Group 4): Indications for pelvic organ prolapse ( uterine prolapse, cystocele, rectocele etc.). Group 5 (Surgery indications - Group 5): Indications for endometriosis and ovarian cysts. Group 6 (Surgery indications -Group 6): Fertility/infertility related indications (tube ligation, lost intrauterine device, uterine septum resection)

Statistical analyses were performed using SPSS Software (Version 21.0, SPSS Inc., IL, USA). Categorical data are expresses as counts and percentages. Chi-square test was used for qualitative data. Z test and post hoc tests for the chi-square independence test was used to detect the different group.  $p < 0.05$  was considered significant.

## RESULTS

The total number of gynecological and gynecologic oncological operations between the period 01.09.2019 to 31.12.2020 was 2973; of which 1683 (56.6%) were before and 1290 (43.4%) were after covid 19 pandemic period.

There was an increment in the percentage of operations performed with regional anaesthesia while there was a decrement in the percentage of operations performed with general anaesthesia after the start of the pandemic. (Table 1)

<b>Table 1.</b> The indications, anaesthesia type, laparoscopy and emergency situation of operations before and after start of pandemic			
	<b>Before pandemic group n(%)</b>	<b>After pandemic group n(%)</b>	<b>p</b>
<b>Surgery indications</b>			<b>&lt;0.001*</b>
Group1	519 (30.8)*	553 (42.5)*	
Group2	559 (33.2)*	374 (29.0)*	
Group3	169 (10.0)	158 (12.2)	
Group4	209 (12.4)	115 (8.9)	
Group5	153 (9.1)*	54 (4.2)*	
Group6	74 (4.4)*	36 (2.8)*	
Total	1683 (100)	1290 (100)	
<b>Anaesthesia and airway management method</b>			<b>&lt;0.001*</b>
GA-EI	1067 (63.4)*	876 (67.9)*	
GA-LMA	404 (24.0)*	30 (2.3)*	
RA-CSE/Epidural	69 (4.1)*	75 (5.8)*	
RA- Spinal	116 (6.9)*	292 (22.6)*	
MAC	27 (1.6)	17 (1.3)	
Total	1683 (100)	1290 (100)	
<b>Anaesthesia type</b>			<b>p&lt;0.001</b>
GA	1498 (89.0)	923 (71.6)	
RA	185 (11.0)	367 (28.4)	
Total	1683 (100)	1290 (100)	
<b>Surgery method types</b>			<b>p&lt;0.001</b>
Laparoscopic	364 (21.6)	193 (15.0)	
Non-laparoscopic	1391 (78.4)	1097 (85.0)	
Total	1683 (100)	1290 (100)	
<b>Emergency of surgery</b>			<b>p=0.134</b>
Emergency	127 (7.5)	117 (9.1)	
Non-emergency	1556 (92.5)	1173 (90.9)	
Total	1683 (100)	1290 (100)	

Chi-square test was used for detecting the difference between surgery indications, anaesthesia and airway management method, anaesthesia type, surgery method types and emergency of surgery before and after pandemic period. Z test and post hoc tests for the chi-square independence test was used to detect the different group in surgery indications, anaesthesia and airway management method before and after pandemic period.  $p < 0.001$  for the parameters indicated with \* GA-EI: General anaesthesia, endotracheal intubation for airway management, GA-LMA: General anaesthesia, LMA for airway management; RA-CSE/Epidural: Regional anaesthesia with combined spinal-epidural or only epidural technique; RA-Spinal: Regional anaesthesia with intrathecal technique; MAC: Monitorised anaesthesia care

The number and the percentage of operations grouped according to the surgical indications and start of pandemic period are shown in **Table 1** and **Graphic 1**. There was an increment in the percentage of operations with Surgery indications -Group 1 after the start of the pandemic (30.8 % to 42.5%); while there was a decrement in percentage of operations with Surgery indications -Group 2, Surgery indications -Group 4, Surgery indications -Group 5 and Surgery indications -Group 6. There was no difference in the percentage of operations with Surgery indications -Group 3 before and after start of the pandemic.

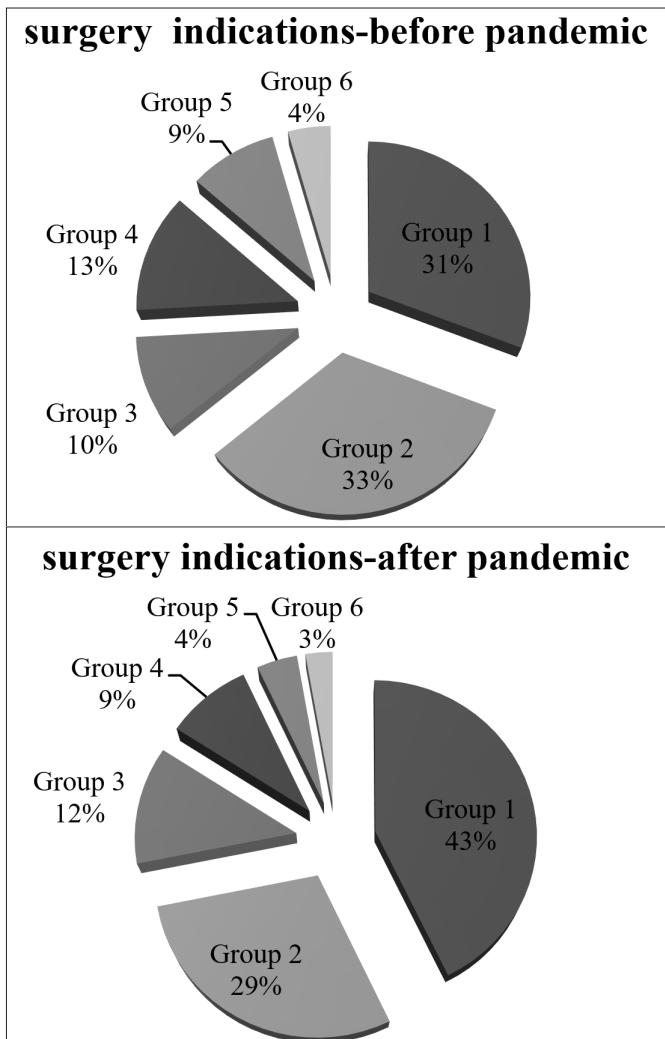
The number and percentage of operations grouped according to anaesthesia and airway management methods and start of the pandemic period are also shown in **Table 1** and **Graphic 2**. There was an increment in the percentage of patients who had general anaesthesia and airway management by endotracheal intubation (GA-EI), who had regional anaesthesia with spinal anaesthesia technique (RA-Spinal) and regional anaesthesia with combined spinal-epidural or only

epidural technique (RA-CSE/Epidual) after the start of the pandemic. There was a decrement in the percentage of patients who had general anaesthesia and airway management by supraglottic airway devices (GA-LMA) after the start of the pandemic. There was no difference in percentage of patients who had monitored anaesthesia care and sedo-analgesia(MAC). 85.4% of intubations were facilitated with non depolarising and 14.6 of intubations were facilitated with depolarising neuromuscular blocking agents after the start of the pandemic while 99% of intubations were facilitated with non depolarising neuromuscular blocking agents before the start of the pandemic

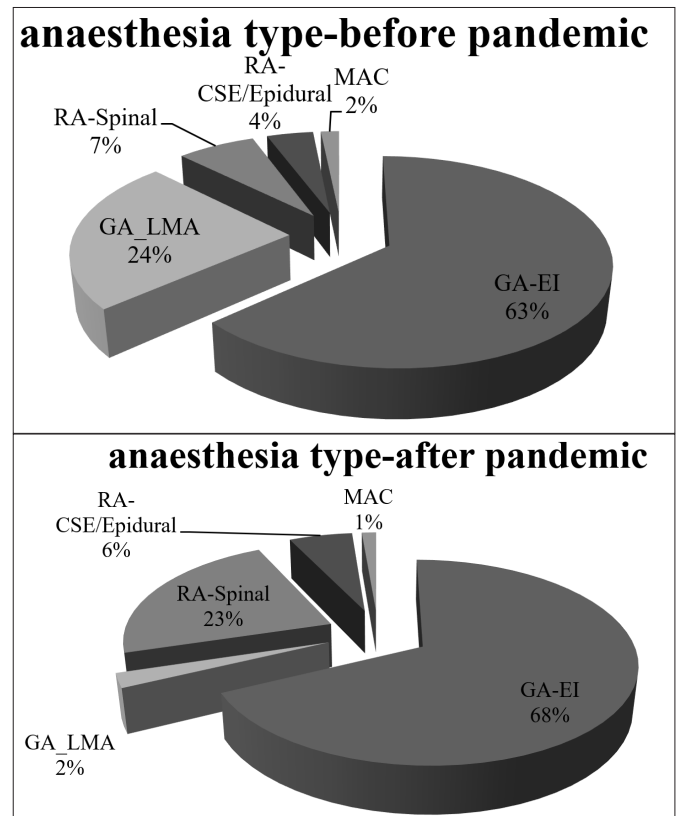
There was a decrement in the percentage of operations performed with laparoscopic technique while there was an increment in the percentage of operations performed with non laparoscopic technique after the start of the pandemic.(**Table 1**).

The percentage of emergency operations did not change before and after the start of the pandemic (**Table 1**)

The percentage of operations performed for extra uterine pregnancy, ovarian cyste rupture/torsion, tubo ovarian abscess and ovarian cysts with laparoscopic technique decreased after the start of pandemic when compared with the period before the start of the pandemic (**Table 2**)



**Graphic 1.** Surgery indications before and after the start of COVID-19 pandemic



**Graphic 2.** The percentage of operations grouped according to anaesthesia and airway management methods before and after the start of COVID-19 pandemic.

The anaesthesia and airway management method of operations classified according to operation site and surgery method before and after the start of pandemic is shown in **Table 3** and **Graphic 3**. There was an increment in the percentage of hysteroscopic operations performed with RA-Spinal after the start of the pandemic period. All the laparoscopic operations were performed with GA-EI before and after the start of the pandemic period. There was an increment in the percentage of vaginal operations performed with RA-Spinal and RA-CSE/Epidural after the start of the pandemic period. There was an increment in the percentage of abdominal operations performed with RA-Spinal after the start of the pandemic period.

**Table 2.** Some operations which could either be done laparoscopic or non laparoscopic technique

	Before pandemic group n (%)	After pandemic group n (%)	P
<b>Extra uterine pregnancy</b>			<0.001
Laparoscopic	70 (92.1)	45 (62.5)	
Non-laparoscopic	6 (7.9)	27 (37.5)	
Total	76 (100)	72 (100)	
<b>Ovarian cyste rupture/torsion, tubo ovarian abscess</b>			0.002
Laparoscopic	52 (66.7)	27 (41.5)	
Non-laparoscopic	26 (33.3)	38 (58.5)	
Total	88 (100)	65 (100)	
<b>Ovarian cysts</b>			0.008
Laparoscopic	109 (81.3)	25 (61.0)	
Non-laparoscopic	25 (18.7)	16 (39.0)	
Total	134 (100)	41 (100)	

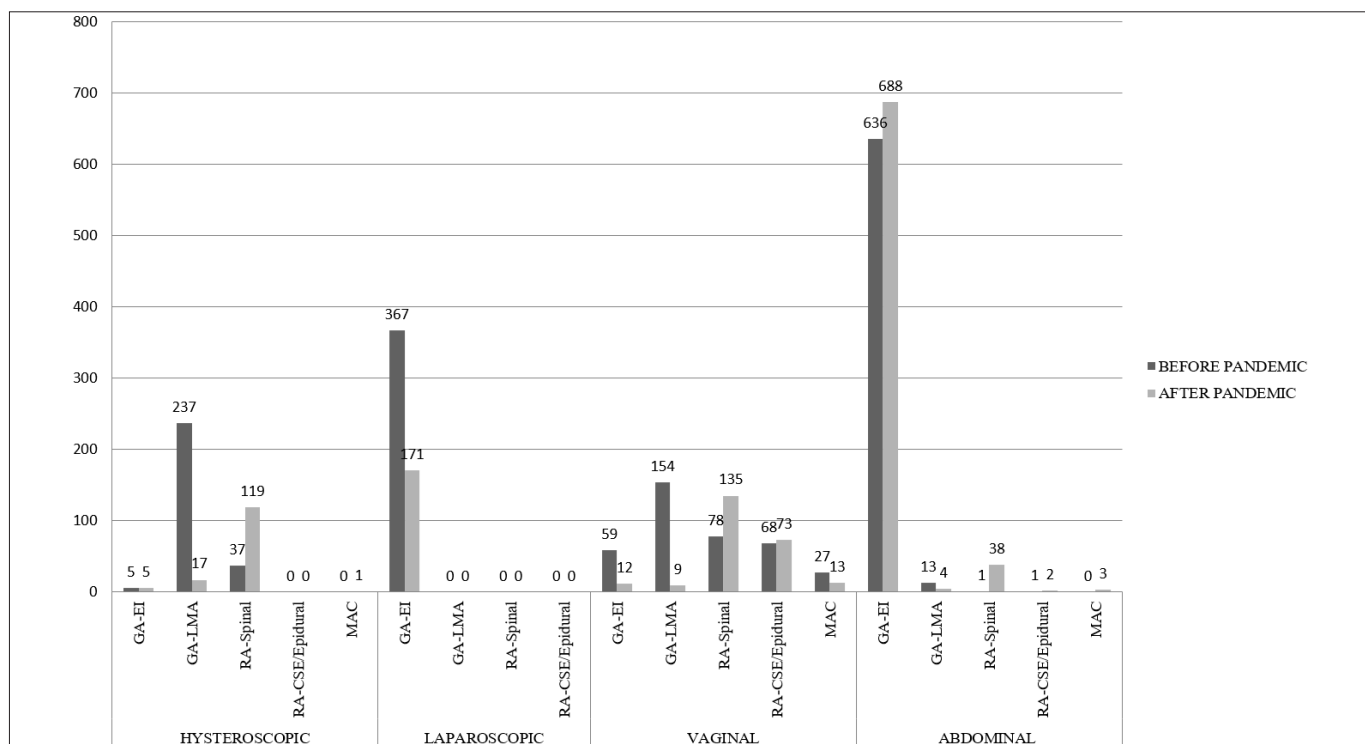
Chi-square test was used for detecting the difference between laparoscopic or non laparoscopic technique before and after pandemic period.

**Table 3.** The anaesthesia and airway management method of operations classified according to operation site and surgery method before and after start of pandemic.

	Before pandemic group n (%)	After pandemic group n (%)	P
<b>HYSTEROSCOPIC</b>			<0.001
GA-EI	5 (1.8)	5 (3.5)	
GA-LMA	237 (84.9)*	17 (12.0)*	
RA-Spinal	37 (13.3)*	119 (83.8)*	
RACSE/Epidural	-	-	
MAC	-	1 (0.7)	
<b>LAPAROSCOPIC</b>			<0.001
GA-EI	367 (100)	171 (100)	
GA-LMA	-	-	
RA-Spinal	-	-	
RA-CSE/Epidural	-	-	
<b>VAGINAL</b>			<0.001
GA-EI	59 (15.3)*	12 (5.0)*	
GA-LMA	154 (39.9)*	9 (3.7)*	
RA-Spinal	78 (20.2)*	135 (55.8)*	
RA-CSE/Epidural	68 (17.6)*	73 (30.2)*	
MAC	27 (7.0)	13 (5.4)	
<b>ABDOMINAL</b>			<0.001
GA-EI	636 (97.7)*	688 (93.6)*	
GA-LMA	13 (2.0)*	4 (0.5)*	
RA-Spinal	1 (0.2)*	38 (5.2)*	
RA-CSE/Epidural	1 (0.2)	2 (0.3)	
MAC	-	3 (0.4)	

Chi-square test and Z test and post hoc tests for the chi-square independence test was used to detect the different group in anaesthesia and airway management method before and after pandemic period classified according to operation site and surgery method. p<0.001 for the parameters indicated with \*

GA-EI: General anaesthesia, endotracheal intubation for airway management, GA-LMA: General anaesthesia, LMA for airway management; RA-CSE/Epidural: Regional anaesthesia with combined spinal-epidural or only epidural technique; RA-Spinal: Regional anaesthesia with intrathecal technique; MAC: Monitorised anaesthesia care



**Graphic 3.** The anaesthesia type of operations classified according to operation site before and after start of COVID-19 pandemic

## DISCUSSION

In the context of the COVID-19 pandemic, the resumption of surgical activity is subject to several major limitations. The first case of Covid-19 in Turkey was detected on March 10, 2020; soon after this, our hospital was converted to a 'pandemic hospital'. During the period between March 15, 2020 and the end of May 2020, Ministry of Health has issued regulations on the need to postpone elective surgical procedures as much as possible. During this period, elective cases were delayed and only emergency and cancer surgeries were performed. Also operating room and postoperative follow-up procedures, were updated for pandemic conditions. The main rationale for this measure was minimizing the redundance in health institutions and reducing the burden on health personnel, managing the change in hospitalisation capacities. During the period between June 2020 and end of September 2020 elective surgical procedures for elective cases had been resumed. During the period between October 2020 and December 2020 elective surgical procedures not totally postponed but limited to decreased numbers.

Similarly, elective surgical procedures has been ceased in most of countries. In the UK, it is announced by NHS in March that all non-urgent elective surgery would be suspended for at least 3 months. (7). The same decision was taken in Washington, regarding non-urgent medical procedures in order to reserve critical equipment for COVID-19 healthcare professionals (8). Many countries have recently resumed elective cases by early summer 2020, in response to dramatic reductions in medical care unrelated to COVID-19.

According to a global predictive modeling in May 2020 CovidSurg Collaborative (9), 28 404 603 operations will have been canceled or postponed worldwide during the peak 12 weeks of disruption due to COVID-19. During the COVID-19 pandemic, Oui L et al (3), classified each operation into 3 types according to urgency, as emergency surgery, "time-limited" surgery, and elective surgery. They defined emergency surgery as life-threatening circumstances requiring immediate surgical treatment such as ectopic pregnancy, ovarian torsion, uncontrollable uterine bleeding from cancer, pelvic mass causing severe symptoms; time-limited surgery as procedures whose time can be delayed, but should not be delayed for too long, for example, operations on malignant tumors; and elective surgery as neither emergency nor time-limited for example, excision of pelvic masses without high suspicion of malignancy, hysterectomy for benign diseases.

Our surgery indications were consistent with this classification. There was an increment in percentage of operations with oncological or suspected oncological

indications after the start of pandemic; there was no difference in the percentage of urgent surgeries while there was a decrement in the percentage of operations with elective indications. Keles et al, reported to perform surgeries for major gynecologic operations including malignant cases and associated this situation with being a non-pandemic speciality hospital (10). Cancer patients are vulnerable to COVID-19 and also, their oncologic outcome is based on the type and timing of treatment (11). Hospitals, are postponing or canceling clinic visits and treatment to protect cancer patients from COVID-19, according to cancer acuity (12). This results in stress and anxiety in patients. According to conducted a survey, patients were found to be more fearful of cancer progression (70.9%) than developing COVID-19. Many patients had a high level of anxiety that COVID-19 pandemic would lead to a change of planned cancer treatment (13).

For providing quality care for patients while limiting the risk of contamination of these patients and healthcare professionals, a thorough preoperative examination and epidemiologic investigation is essential for all surgical patients to assess suspected COVID-19 patients. The European Society for Gynaecological Endoscopy recommendations highlight the importance of screening for SARS-CoV-2 before gynaecological procedures (14). Especially in non-emergency situations this seems to be a very logical approach. In our institution, preoperative the reverse transcriptase – polymerase chain reaction (RT-PCR) testing for screening COVID 19 for patients schuled for surgery were not performed until the end of May 2020. After June 2020, RT-PCR testing were performed for all the patients whether or not having any symptoms before 48-72 hours from the surgery. Owing to reported false negative rates of 47-70% for RT-PCR tests (15), still all cases were presumed to be potential COVID-19 positive and FFP2/N95 respirators were brought into use of all anaesthesia and surgical team for all operations after June 2020. Access to personal protective equipment (PPE) for health professionals is an important concern while providing anaesthesia because of the high risk of COVID-19 transmission of anaesthesia team as mentioned in above sections. Applying RT\_PCR testing to patients for screening of Sars-Cov-2 and using PPE, lead to a safer setting for patients and anaesthesia and surgery team in our institution.

In the context of COVID-19 pandemic, choosing regional anaesthesia for appropriate operations is seems to be more advantageous. General anaesthesia exposes to the risk of contamination during periods of upper airway management (16). According to a systematic review that analyzed the transmission risk of acute respiratory infections to healthcare workers for aerosol-generating procedures, the odds ratio of tracheal

intubation have been reported to be 6.6 (17). Peripheral and central regional anaesthesia techniques reported to have a favourable risk/benefit ratio (18) and allow for the maintenance of patient protection measures (mask use) and decreased caregiver exposure during anaesthesia and surgical procedures (19). The American Society of Regional Anesthesia and Pain Medicine and European Society of Regional Anesthesia and Pain Therapy (20) have made practice recommendations on neuraxial anaesthesia and during the COVID-19 pandemic. In their joint statement, regional anaesthesia is not contraindicated for COVID-19-positive patients and should be preferred for providing anaesthesia care wherever possible. The choice of anaesthesia method in our institution was consistent with the recommendations about regional anaesthesia. There was a statistically significant increment in the percentage of operations performed with regional anaesthesia (11% to 28%,  $p < 0.001$ ) after the start of the pandemic. Many gynecological procedures can be performed under regional anaesthesia without intubation or supraglottic airway device insertion, minimising the hazard to the operating team. In our institution, there was a decrement in the percentage of hysteroscopic operations performed with GA-LMA and increment in the percentage of hysteroscopic operations performed with RA-Spinal after the start of the pandemic period. Although there is no adequate literature about safety of supraglottic airway devices, they seem to be more insecure in context of COVID-19 transmission because of the possible continuous leakage from the airway.

There is no consensus in the literature regarding whether laparoscopy or laparotomy is superior under pandemic conditions. In laparoscopic surgery, the technique-pneumoperitoneum brings about the risk of aerosol exposure to the operating team (14). Aerosol exposure is reported to occur during the release of CO<sub>2</sub> which occurs mostly during the procedures involving ports and removal of pneumoperitoneum at the end of surgery. Risks of smoke inhalation to operation room staff during laparoscopic surgery has also been documented (21).

Abstaining general anaesthesia can not be carried out for laparoscopic surgery but certain emergency gynaecological procedures such as ruptured ectopic pregnancy or ovarian torsion can be performed via minilaparotomy under regional anaesthesia. In our institution, the percentage of operations performed for extra uterine pregnancy, ovarian cyste rupture/torsion, tubo ovarian abscess and ovarian cysts with laparoscopic technique had decreased after the start of pandemic when compared with the period before the start of the pandemic. Addition to this, total percentage of laparoscopic operations had also decreased after the start of COVID-19 pandemic.

## CONCLUSION

By taking alterations and fluctuations in community prevalence into consideration, decisions about cancellation of surgeries must be made dynamically. It is a great challenge to make the arrangements between the need to maintain surgical treatment and the risk to patients who may experience worse outcomes if they contract COVID-19. Possibility of COVID-19 infection must be considered in every patient. In anaesthesia management, regional anaesthesia methods may be considered in appropriate cases. Proper PPE must be used if airway manipulations are needed

## ETHICAL DEVCLARATIONS

**Ethics Committee Approval:** After ethical approval was taken from both local ethics committee (Ankara City Hospital-E1-1-21-1732-14.04.2021, and the Ministry of Health (2021-03-09T23\_29\_08).

**Informed Consent:** All patients signed the free and informed consent form.

**Referee Evaluation Process:** Externally peer-reviewed.

**Conflict of Interest Statement:** The authors have no conflicts of interest to declare.

**Financial Disclosure:** The authors declared that this study has received no financial support.

**Author Contributions:** All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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