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Gynecological laparoscopic surgeries in the era of COVID-19 pandemic: a prospective study

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Objective
The novel coronavirus pandemic led to the suspension of elective surgeries and the diversion of resources and manpower towards pandemic control. However, gynecological emergencies and malignancies must be addressed despite the restricted resources and the need for protective measures against COVID-19. This study aimed to determine the types of gynecological surgeries performed, difficulties encountered, and their outcomes in the setting of the pandemic.

Methods
We performed a prospective cohort study over 6 months at a single tertiary center, including 60 women with gynecological complaints, categorized as emergencies and semi-emergencies, who underwent further surgery. Their surgical outcomes were measured through various parameters.

Results
We found that 68.3% were emergency cases, while the rest were classified as semi-emergencies. Fibroid and adenomyosis with failed medical management (48.3%), followed by cervical intraepithelial neoplasia (10%), and malignancies (10%) accounted for the semi-emergency cases, while ruptured ectopic pregnancies (13.3%) and torsion and ovarian cysts (18.4%) comprised the emergency cases. The decision to incision time between emergency and semi-emergency cases varied widely due to the safety prerequisites during the pandemic, ranging from 1 hour in emergency cases to 48 hours in semi-emergency cases. In addition, we studied the ease of preoperative preparation, patient satisfaction, and the average number of personnel available to run the operation theaters at these times. No serious perioperative adverse events were observed in the present study.

Conclusion
In conclusion, gynecological surgeries could continue to be safely performed with all precautions in place against COVID-19 infection and related morbidities.

Keywords: COVID-19; Gynecologic surgical procedures; Coronavirus; Laparoscopy

Introduction

The novel coronavirus disease (COVID-19) was announced as a pandemic by the World Health Organization (WHO) on March 11, 2020 [1]. A joint statement issued by American Association of Gynecologic Laparoscopists (AAGL), American College of Obstetricians & Gynaecologists (ACOG), and other organizations advised the suspension of elective surgery, shifting the focus to emergency and cancer surgery [2]. The ongoing pandemic is a public health crisis that requires the diversion of resources and healthcare workers towards

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critical care. Even though elective procedures have been deferred in view of the pandemic, situations requiring urgent gynecological or obstetric surgical interventions must still be performed, and decisions should be made on a patient-by-patient basis.

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) belongs to the genus Betacoronavirus and is transmitted between individuals through viral shedding, mainly spread through respiratory droplets or direct contact, independent of clinical manifestations. They may also be transmitted through aerosols [3]. COVID-positive patients may have viral particles in their body cavity that may be disseminated through the surgical smoke generated by surgical instruments [4]. Aerosols generated in an operation theater during surgery may have the virus or viral particles that are viable for at least 3 hours and over days on surfaces [5]. There are no data directly pinpointing the risk of direct surgical exposure in infecting the surgical team [6].

Gynecological emergencies and malignancies, if deferred, may have serious consequences and should not be delayed. Instead, algorithms should be created, and a case-by-case approach should be undertaken. This study aimed to determine the types of gynecological surgeries performed during the COVID-19 pandemic over 6 months in our institution and measure the surgical outcomes in terms of various parameters affected by the ongoing pandemic to improve the management of gynecological emergencies and malignancies during this period.

Material and methods

This was a single-center prospective cohort study conducted over 6 months in a single unit in the Division of Minimally Invasive Gynecological Surgery of the Department of Obstetrics and Gynecology. Ethical approval for the study was obtained from the Institute Ethics Committee before the commencement of the study (IEC-890/04.09.2020). A purposive sample of all patients fulfilling the inclusion and exclusion criteria and were operated by the division within the period of 6 months were included in the study. Informed and written consent for participation in the study was obtained from all participants. We included all patients who visited the emergency or outpatient department with gynecological complaints requiring surgery and all gynecological malignancies requiring semi-emergency surgery. Obstetric emergencies other than ectopic pregnancies were excluded. All women who visited the hospital with gynecological complaints underwent a questionnaire-based COVID screening followed by history taking and examination by the resident on call. Urgent blood investigations and imaging were performed, followed by conservative or surgical management. After providing symptomatic treatment and resuscitation, if the vitals were stable, surgery was performed after COVID testing (reverse transcriptase polymerase chain reaction [RTPCR]). Meanwhile, if these were unstable, the patient was taken up for immediate surgery in a separate COVID-suspect operation theater after performing a rapid antigen test, taking all precautions required for positive patients.

The following measures were observed as a precaution during surgery:

- All surgeries were conducted by an experienced surgeon to ensure that all precautions were taken and to minimize the duration of surgery.
- Surgeons and personnel present in the operation theater were in the appropriate personal protective equipment (PPE) (Level 1).
- Disposable trocars were used, and the seals of trocars were properly checked for any leaks.
- Electrosurgical and ultrasonic devices were used in a low-power setting, and prolonged desiccation was avoided to minimize plume production.
- Laparoscopic suction was used to remove the surgical plume, and care was taken to prevent the spillage of pneumoperitoneum in the room. In addition, care was taken to avoid rapid desufflation or loss of pneumoperitoneum, particularly during instrument exchange and specimen removal.
- Surgery was conducted at a low intra-abdominal pressure (10-12 mmHg) as much as feasible.
- Before extracting the uterus through the vault, the pneumoperitoneum was desufflated with closed suction to allow the minimum escape of CO_2 through the vault.
- Care was taken to minimize blood/fluid droplet spray or spread.
- Smoke evacuation systems were used to remove the surgical plume and to desufflate the abdominal cavity inside the operating room.

Descriptive statistics, such as mean, median, and standard deviations, were calculated. Categorical variables are pre-

sented as frequency and percentage values.

Results

In our study, conducted over 6 months beginning in August 2020, a total of 60 patients underwent surgery. The baseline characteristics of the patients are presented in Table 1. The indications for surgery are shown in Table 2. Table 3 shows the different types of surgeries performed, mean surgical time and number of personnel scrubbed, and mean duration of hospital stay. Cases of ectopic pregnancy and torsion of adnexal cysts were classified as emergency cases, whereas cases of abnormal uterine bleeding (fibroid and adenomyosis) with failed medical management and malignant gynecological cases requiring surgical intervention were categorized into the semi-emergency group. Emergency cases accounted for 31.67% of cases, whereas semi-emergency cases accounted for 68.33%. Ovarian cysts and fallopian tubes with ectopic gestation were removed through central 10-mm ports using glove bags under the guidance of a 5-mm telescope inserted through the lateral port. All ports measuring ≥10 mm were closed using a vicryl port closure. All patients with gynecological emergencies were tested using the rapid antigen test kit and operated in a separate COVID-suspect operating room. Simultaneously, the RTPCR sample was sent, and the result was followed up later. All semi-emergency cases tested negative in the COVID RTPCR within 72 hours prior to the proposed surgery. The assessment of ease of preoperative

Table 1. Baseline characteristics

Characteristics	Value (%)
Age (yr)	
<50	85.7
≥50	14.3
Religion	
Hindu	91.4
Muslim	8.6
Comorbidity	
Hypertension	28.6
Malignancy	8.7
Diabetes	14.3
History of cardiovascular disease	2.9
History of respiratory disease	5.7

Table 2. Indications of gynaecological surgeries

Indication of surgery	Value
AUB-leiomyoma	24 (40)
AUB-adenomyosis	5 (8.33)
CIN III	6 (10)
Dermoid cyst	4 (6.7)
Malignancy (endometrial cancer)	6 (10)
Ruptured ectopic pregnancy	8 (13.3)
Twisted ovarian cyst	7 (11.7)

Values are presented as number (%).
AUB, abnormal uterine bleeding; CIN, cervical intraepithelial neoplasia.

Table 3. Types of surgeries and their characteristics

Type of surgery	Number of Surgeries	Surgical time (mean, min)	Number of personnel scrubbed (mean)	Mean duration of hospital stay
Total laparoscopic hysterectomy	21	95	4	3
Malignancy-peritoneal wash cytology with total laparoscopic hysterectomy with bilateral salpingooophorectomy with pelvic lymphadenectomy	6	135	5	5
Laparoscopic myomectomy	9	107	4	4
Laparoscopic salpingectomy	8	45	4	3
Hysteroscopic myomectomy	5	30	4	3
Laparoscopic cystectomy	8	50	4	3
Laparoscopic unliteral salpingooophorectomy (gangrenous ovary)	3	35	4	3

preparation during the pandemic using a 5-point Likert scale showed a mean value of 3, indicating a neutral level of ease. The mean 'decision to incision' time for emergency cases was 1 hour, whereas it was 48 hours for semi-emergency cases. Among the various types of surgeries performed (Table 2), the mean number of personnel scrubbed, including doctors and nursing staff, was 4. The minimum distance between the members of the surgical team was maintained at 1 month, which was appropriate as all procedures were performed laparoscopically. The number of operation theatre (OT) technicians was reduced to one, increasing the duration of surgery. With regard to ease of operability while using level 1 PPE, a mean Likert scale score of 3 was noted, suggesting a neutral level of ease. The duration of hospital stay in all 60 cases ranged from 48 to 72 hours, with laparoscopic salpingectomy cases having the shortest mean duration and laparoscopic myomectomy cases having the longest mean duration.

The perioperative complications are shown in Table 4. No patient had a history of postoperative respiratory distress, intensive care unit (ICU) stay, or COVID infection detected within 2 weeks of surgery. Among the hospital staff involved in handling patients in the operating room (OR) and wards, 3 doctors, 1 nursing staff, and 1 OT technician were infected with COVID-19 during our study period, but the source of infection is unknown. On the final assessment of patient satisfaction, the mean Likert score was 4, suggesting that most patients were "very satisfied" with the treatment provided. All procedures were performed laparoscopically. The mean hospital stay was 3.5 days. No ICU admissions were required after surgery for any perioperative complications. Nine patients (all semi-emergencies) tested positive for COVID-19 during the initial preoperative workup, and these surgeries were deferred until they tested negative. None of the patients developed symptoms related to COVID-19 or yielded positive results in the postoperative period.

Table 4. Perioperative complications

Peri operative parameter	Frequency
Post-operative fever	6 (10)
Blood product transfusion	5 (8.3)
ICU stay and mechanical ventilation	0
Exposure to COVID positive patients	1 (1.7)
COVID infection within 2 weeks of surgery	0

Values are presented as number (%).
ICU, intensive care unit.

Discussion

Surgery is the cornerstone in the management of most gynecological disorders. However, the ongoing pandemic has resulted in the diversion of healthcare workers and resources towards crisis management and critical care. Simultaneously, women also present with gynecological emergencies or malignancies for which surgical management cannot be deferred. The European Society for Gynaecological Endoscopy (ESGE) recommends that hospitals should have alternative arrangements for women with gynecological emergencies and gynecological cancers [7].

Many hospitals in our country have been designated as exclusive COVID care centers, and others have also exceeded their capacities and exhausted their resources catering to the health needs caused by this pandemic, thereby forcing them to cancel their surgical activities. Our institution is the top healthcare center in the country, and despite the constraints caused by the pandemic, gynecological surgeries with curative intent and malignancy surgeries are being performed without compromising on COVID care. At our center, 50% of doctors from the clinical departments were tasked to cater to COVID-positive patients exclusively. As such, our department is currently functioning at half of its original capacity. Due to these constraints and to reduce the manpower in the OR to promote social distancing, the number of operation slots provided to all surgical disciplines has been reduced considerably. In an analysis of the impact of the COVID pandemic on malignancies, Sud et al. [8] reported a notable interruption in cancer treatment and stated that a 3-6-months postponement in cancer surgery might lead to an attributable death ratio of 4,755/10,760.

As observed in our study, malignancies contributed to 6% of gynecological surgeries. This is much less than the malignancies operated on pre-COVID due to the presentation of women in later stages of the disease, rendering it inoperable and delayed in approaching healthcare facilities for gynecological complaints. However, both malignancies operated in our study were early-stage corpus uteri malignancies, and surgery was performed with curative intent.

Benign gynecological pathologies, particularly fibroid

uterus, may cause abnormal uterine bleeding unresponsive to medical management or pressure symptoms due to mass effect, contributing to the majority of out patient department attendance. In our study, 74% of the operated cases were categorized as semi-emergency cases, including benign gynecological pathologies requiring surgical solutions. Strong et al. [9] highlighted the increased physical and mental morbidity caused by delayed surgeries for benign pathologies. Undue delay of surgery in these cases could also negate the possibility of adopting a laparoscopic surgical approach.

The laparoscopic approach was the preferred mode of surgery in our study. ESGE [7] also recommends the same for gynecological emergencies and cancer due to the quicker postoperative recovery and shorter hospital stay, which reduces stress on hospital resources compared to open surgeries. Given the COVID-19 pandemic, the risk of exposure to the operating team due to possible blood viremia in patients is a concern. It is believed that laparoscopic surgeries help contain surgical plumes and body fluids within a closed space, thereby decreasing exposure to the operating team [7]. Kimmig et al. [10] stated that minimally invasive approaches minimize surgeons' exposure to body fluids, reducing blood contamination. In addition, it is associated with a shorter postoperative recovery period. Preoperative COVID-19 RTPCR testing was performed in all cases within 72 hours of the proposed surgery. A rapid antigen test was also conducted, and surgery was performed in a separate suspect operating room with all precautions. Only patients who tested negative were taken up for semi-emergency surgery. Kiykaç Altinbaş et al. [11] stated that if urgent surgery is required, preoperative COVID-19 screening should be performed, and surgery should be performed after. In case of insufficient time for preoperative COVID-19 screening, surgery can be performed by laparoscopy with the appropriate protective measures in place. In case of emergencies, we performed the rapid antigen test, and all patients subsequently tested negative in the RTPCR. A mortality rate as high as 20% has been observed in patients with subclinical COVID-19 infection who underwent surgery, which is much higher than the adverse outcomes attributed to other perioperative complications, such as surgical site infections or venous thromboembolism [12]. Admitting untested patients for surgery creates an unnecessary risk both for patients and all healthcare professionals looking after that patient. Therefore, all over the world, COVID testing prior to any surgical procedure has become a new norm and is well accepted. Nine out of the 60 patients tested positive for COVID infection on preoperative evaluation, and surgery was postponed for 3 weeks until the infection has completely resolved. These additional COVID testing protocols and the division of the workforce between routine services and dedicated COVID managing pools, although vital in current times, have increased the preoperative preparation time. In our study, we detected an average decision to incision interval of 1 hour in cases of ectopic pregnancy, torsion, and adnexal cysts, which are classified as emergency cases, with preparation time being even more prolonged in malignancy surgeries and other semi-emergency cases in ascending order. Although no mortality or increased morbidity was encountered in the management of emergency surgeries in our study, the ease of preoperative preparation has been strained with the additional requirements, as reflected by the 'neutral' average on the Likert score. Furthermore, another challenge in surgeries during COVID times is operating in a PPE, as most surgeons in the operating team reported a moderate degree of difficulty while operating in a PPE. Our operating team used level 1 PPE in all the semi-emergency surgeries and level 3 PPE in emergency cases, with a minimal number of personnel scrubbed in to avoid crowding in operating rooms. Yánez Benítez et al. [13] found that more than half of their study participants stated that a PPE significantly affected surgical performance, decreased comfort, impeded communication, and impaired vision significantly during surgery. In a study by Agarwal et al. [14], additional issues such as contact dermatitis, nasal bridge pain, pain over the pinna, and risk of self-contamination due to self-readjustment of masks were noted. In our center, a teaching hospital, the average number of surgeons scrubbed in for the emergency and semi-emergency cases during COVID times was 4, less than the pre-COVID number of 5-6 surgeons per case. This may have contributed to the slight prolongation of the surgical duration. Apart from this, only one laparoscopy technical staff member was available in all cases during the pandemic. Setting up the paraphernalia for laparoscopic surgeries resulted in a decrease in the availability of technical staff and prolonged surgical time. Difficulty in dealing with technical issues associated with the laparoscopic instruments and exhaustion due to reduced staff also led to frequent interruptions in the surgeries, prolonging the surgical duration. All patients transitioned smoothly into the postoperative period with no major adverse events. Postoperative complications

were confined to fever (n=5), blood product transfusion (n=6), and inadvertent exposure (n=1) of patients with COVID. No cases of respiratory distress requiring intensive care or mortality were observed. This reinforces that with adequate precautions in place, properly screened patients could undergo surgical interventions with routine risks even during this pandemic.

Another obstacle encountered during this study was the exposure of tested COVID-negative patients to untested patient attendants. Stringent measures, such as allowing a single attendant with each patient after appropriate screening and limited meeting times, were put in place. Though inconvenient, these were later appreciated by the patients.

Worldwide, healthcare professionals dealing with the pandemic are being infected by this virus. In our study, despite maintaining all precautions, 5 healthcare workers tested positive for coronavirus during the study, though the source of infection is unknown. There is a high probability that they may have acquired the infection from the community.

Overall, most of our patients were very satisfied with the surgical team and staff members, their behavior and communication, and management skills during their entire hospital stay. This may because the extent of care provided in these difficult times exceeded their expectations, and many refused surgery in other healthcare setups in the country due to the lack of facilities for semi-emergent gynecological procedures. In addition, stringent policies were implemented in the hospital, both in the wards and in the operating room, for infection control, a major factor for improved patient satisfaction. These findings also corroborate Bin Traiki et al.'s, [15] who conducted a patient satisfaction survey that demonstrated a high level of patient satisfaction after surgery in the COVID era.

The present study found that surgical operations could continue during the COVID-19 pandemic in a tertiary care center, and elective surgeries with curative intent need not be deferred. With all appropriate precautions for both healthcare workers and patients' safety, a tertiary care center can cater to both the COVID and non-COVID needs of the population.

In conclusion, with appropriate screening measures in place, gynecological emergency and semi-emergency surgeries can be performed in a tertiary care center, despite the constraints caused by the ongoing pandemic. Although the surgical time was slightly prolonged due to the minimal number of staff, surgeries can be performed with equal efficacy. Given the advantages of laparoscopy, including safety, it can be the preferred mode of surgery compared to laparotomy in COVID areas.

Conflict of interest

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

Ethical approval

Ethical approval for the study was obtained from the Institute Ethics Committee before the commencement of the study (IEC-890/04.09.2020). The study was performed in accordance with the principles of the Declaration of Helsinki.

Patient consent

Written informed consent and the use of images from patients are not required for the publication.

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