

ORIGINAL RESEARCH

CORONA EXPERIENCE

Effects of the COVID-19 pandemic on the approach to emergency surgery: a comparative study

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Abstract

Background & objective: Corona pandemic has had profound effects on the practice of healthcare delivery across the globe. The institutional practices and protocols had to be rewritten to cope up with the surge of corona patients and to save the staff and the non-corona patients. We evaluated the emergency surgery cases during the first wave of COVID-19 after the decision to stop elective surgeries, in regard to differences in terms of case distribution, patient profile, anesthesia methods used and the management, and compared with an equivalent period before the pandemic.

Methodology: Patient files related to emergency surgery from October-November 2019 and April-May 2020, were retrospectively evaluated. Assessment parameters included age, gender, surgical discipline, ASA score, type of anesthesia, time to discharge, reoperation, laparoscopic or open surgery.

Results: The most common surgical cases in both periods belonged to general surgery. While the number of patients in ASA-I decreased during the COVID period, those in ASA-II increased. We found that while general anesthesia was preferred in majority of the surgeries during the non-COVID period, spinal anesthesia gained popularity in the COVID period ($p < 0.05$).

Conclusion: The decrease in the number of patients with ASA-I indicates a change in the surgeons' priorities in emergency surgery cases. Although there is a worldwide approach to the use of laparoscopic surgery, the use of open surgical techniques increased in our hospital.

Key words: Covid-19; Pandemic, Emergency surgery

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1. Introduction

In December 2019, the World Health Organization (WHO) reported cases of pneumonia of an unknown etiology in Wuhan, China. Later, they announced that the

underlying cause of this rapidly spreading disease was a novel coronavirus, SARS-CoV-2, and named the disease as COVID-19. ¹ Due to rapid person-to-person transmission, the disease spread quickly around the

world, and subsequently, the WHO declared the disease a pandemic and a "Public Health Emergency of International Concern".² The Ministry of Health of the Republic of Turkey confirmed the first case of COVID-19 in Turkey on March 10, 2020, after which the number of cases began to rise rapidly.³ As of November 2020, 53.7 million confirmed cases and 1.3 million COVID-19-related deaths had been reported to WHO worldwide.⁴

In the setting of the COVID-19 pandemic, hospitals are particularly high-risk institutions and require proper management. Other than emergency departments and intensive care units, one field that requires specific consideration is surgery. On March 17, 2020, the Ministry of Health of the Republic of Turkey announced its decision to postpone all elective surgical procedures in order to better control the spread of the disease, to alleviate the workload in hospitals, to prepare hospital beds and intensive care units for pandemic patients, to better utilize critical hospital resources and also personal protective equipment (PPE) such as gloves, masks, and gowns, and more effectively utilize healthcare workers.⁵ However, trauma surgery and other emergency surgical procedures that cannot be postponed were to resume in line with appropriate precautions, and cancer treatment protocols were to be maintained with a multi-disciplinary approach.^{6,7}

In the operating rooms, anesthetists, surgeons, nurses, and other assisting healthcare personnel work in coordination and quickly apply the pertinent treatment. During the pandemic, our hospital's patient management protocol included inquiring about disease contact and history of travel and to consider all surgical patients to be potentially infected with COVID-19. For this purpose, operating rooms were organized specifically for treating COVID-19 patients and equipped with adequate protective equipment for the emergency setting.

In this study, we compared emergency surgery cases admitted after 16:00 between April–May 2020, during the first wave of the COVID-19 pandemic after all elective surgeries were postponed in Turkey, and emergency surgery admissions after 16:00 between October–November 2019, before the pandemic started. We investigated any differences in terms of case distribution, patient profiles, anesthesia methods, and patient management.

2. Methodology

The study was granted approval by the Ministry of Health, Republic of Turkey, and the Ankara City Hospital Ethics Committee (No. E1-20-1275, dated November 11, 2020). The files of patients who were admitted to the General Surgery Department for emergency surgery during October–November 2019 and April–May 2020 after 16:00 hours were retrospectively

reviewed. The study included 224 patient files from October–November 2019 and 188 patient files from April–May 2020 periods. In the Ankara City Hospital, patients that require general surgery, plastic and reconstructive surgery, otolaryngologic surgery and eye surgery outside of normal hospital hours are admitted to the general surgery operating room. Therefore, our study included patients of these surgical specialties. We recorded each patient's age, sex, type of surgery, surgical specialty, American Society of Anesthesiologists (ASA) grade, type of anesthesia (general, local, sedation, peripheral block), COVID-19 positivity, intra- and postoperative complications, postoperative ICU admission status, length of hospital stay, postoperative mortality, repeat operations, and surgical method (laparoscopic, endoscopic, open, etc.) from patient files and the Ankara City Hospital Patient Information System.

Statistical Analysis

Descriptive statistics were used to evaluate the distribution of numerical data. Student's t-test was used for comparing numerical variables with normal distribution, and Mann-Whitney U test was used for comparing non-normally distributed numerical variables. Categorical variables (e.g. mortality) were analyzed with cross-tabulation and the chi-square test. A P-value < 0.05 was accepted as statistically significant in all analyses.

3. Results

The two groups (October–November 2019 and April–May 2020) were not significantly different in terms of demographic characteristics and sex distribution. The mean age was 43.4 y for the October–November 2019 group and 44.1 y for the April–May 2020 group, and therefore, similar for the two groups. The distribution of surgical specialties was similar for the two groups (Table 1).

General surgery was the most common surgical specialty in both groups. The percentage of patients with ASA-I and II was significantly different ($P < 0.05$). 45.50% and 27.70% of patients were ASA-I and ASA-II during October–November 2019, respectively, whereas 31.40%

Table 1: Surgical specialties

Surgical specialties	Oct–Nov 2019 N (%)	Apr–May 2020 N (%)
General surgery	188 (3.9)	158 (84)
Eye surgery	6 (2.7)	3 (1.6)
ENT	5 (2.2)	4 (2.1)
Plastic surgery	25 (11.2)	23 (12.2)
Total	224	188

and 48.40% of patients were ASA-I and ASA-II during April–May 2020, respectively. Patients with ASA-III and IV were not significantly different between the two groups. However, there were very few ASA V patients during October–November 2019 but none during April–May 2020 (Table 2).

During October–November 2019, the most commonly used type of anesthesia was general anesthesia (92%) followed by spinal anesthesia (4.5%), whereas during April–May 2020, general anesthesia was less commonly used (59.6%) and spinal anesthesia was comparatively more common (33.5%) ($P < 0.05$) (Table 3).

Postoperative ICU admission status was not significantly different between the two groups ($P > 0.05$).

Mean length of hospital stay increased by approximately 1 day during the pandemic. Mean length of hospital stay was 3.85 days during October–November 2019 versus 4.85 days during April–May 2020. This increase was statistically significant ($P < 0.05$).

The prevalence of repeat operation was not statistically different for the two groups.

When the two groups were compared in terms of surgical method, laparoscopy was less common during April–May 2020, and open surgeries significantly increased compared to October–November 2019 ($P < 0.05$) (Table 4).

Postoperative mortality was not significantly associated with pre- or peri-pandemic surgery, or the type of surgery during either period of time.

The postoperative complication rate was 6.7% and 11.2% for October–November 2019 and April–May 2020, respectively. This difference was statistically significant ($P < 0.05$).

4. Discussion

With the rapid spread of COVID-19 in Turkey, the Ministry of Health implemented special measures in line with WHO recommendations. One of the most prominent measures was the postponement of non-emergency and non-cancer-related elective surgical procedures.⁵ Accordingly, our hospital started to admit surgical patients only if they required emergency treatment. With this study, we aimed to assess the change in the number of emergency surgery patients during the pandemic. Our review of patient files revealed that 224 versus 188 surgical patients were admitted during October–

Table 2: ASA Physical Status

ASA	Oct–Nov 2019 N (%)	Apr–May 2020 N (%)	P
I	102 (45.0)	59 (31.4)	< 0.05
II	62 (27.7)	91 (48.4)	
III	26 (11.6)	26 (13.8)	
IV	9 (4)	12 (6.4)	
V	3 (1.3)	0 (0)	
Total	224	188	

Table 3: Type of anesthesia

Type of anesthesia	Oct–Nov 2019 N (%)	Apr–May 2020 N (%)	P
General	206 (92)	112 (59.6)	< 0.05
Spinal	10 (4.5)	63 (33.5)	
Axillary Block	5 (2.2)	4 (2.1)	
Mask	1 (0.4)	0 (0)	
Sedation	2 (0.9)	7 (3.7)	
Combined	0 (0)	2 (1.1)	
Total	224	188	

Table 4: Type of surgery

Type of surgery	Oct–Nov 2019 N (%)	Apr–May 2020 N (%)
Laparoscopic/ Endoscopic	24 (10.7)	3 (1.6)
Others	200 (89.3)	185 (98.4)
Total	224	188

November 2019 and April–May 2020, respectively. This represents a decrease of 16% in emergency surgical admissions compared to before the pandemic. Studies from different countries show that before the pandemic, a total of 778 thousand surgical cases were treated daily and a total of 284 million patients annually. However, during the pandemic, 28 million elective operations were either postponed or cancelled.⁸ Even though the number of surgical patients decreased by 16%, the percentage of general surgery patients was similar before and during the pandemic. The decrease in the number of general surgery patients was correlated with the decrease in the number of patients with ASA-I and the number of laparoscopies performed.

In a survey of general surgeons in Italy, Patrì et al. reported a marked decrease in the number of individuals

requiring emergency surgery during the COVID-19 pandemic.⁹ Cano-Valderrama et al. analyzed emergency admissions to 3 different hospitals in Spain during the pandemic and similarly reported a decrease of 65.40%.¹⁰ They proposed several possible reasons for this decrease. Patients with surgical complaints may have been reluctant to visit emergency departments where COVID-19 patients are concentrated. This, in turn, may have resulted in delayed treatment and thus a more complicated clinical picture, thus increasing the length of hospital stay. In our study, we found that the number of cases decreased and the length of hospital stay increased during the pandemic. Although Cano-Valderrama reported a decrease in acute cholecystitis and appendicitis cases in Spain during the pandemic, in our study, acute appendicitis was the most common cause of admission both before and during the pandemic.

The decreased number of admissions may also be attributed to the national COVID-19 control measures, which required only emergency surgical patients to be treated and which may have resulted in fewer incidences requiring surgery due to curfew and other related measures.

On the other hand, the World Society of Emergency Surgery (WSES) guidelines recommended that physicians should seriously consider intravenous antibiotics and analgesics for the management of patients with infections in order to delay surgical intervention during the COVID-19 pandemic, and to use intravenous antibiotic therapy as an alternative to surgery in critically ill patients.¹¹ As per this recommendation, it can be speculated that surgeons were more meticulous when evaluating patients who will undergo surgical procedures. Another study found that there was no clear consensus among surgeons regarding the indications for emergency surgery during the pandemic. However, it was argued that in potentially complicated cases, such as appendicitis, surgical intervention should not be delayed until test results are finalized.¹²

In our study, ASA 1 patients decreased, and ASA 2 patients increased during the pandemic. We believe this may be due to surgeons' postponing operations for one day until COVID-19 test results were available if feasible and applying non-surgical treatment and conservative treatment, when possible, as recommended in the literature.

In our clinic, in patients that required immediate treatment and it was not feasible to wait for the COVID-19 test results, we investigated the history of travel abroad or contact with a person who has recently traveled abroad. After routine preoperative temperature measurement, posteroanterior chest X-ray assessment and a detailed anamnesis, each patient was approached as if they were COVID-19 positive. Personal protective

equipment (PPEs) were used with diligence during the treatment of every patient. Each operation was conducted with minimal staff, all required equipment and materials were prepared in the room before the operation in order to reduce entrance to and exit from the operating room during surgery, and thus to reduce the risk of disease transmission. The operations were delayed until COVID-19 test results arrived, when possible.

As is well known, SARS-CoV-2 is transmitted from person to person via airborne droplets. In the setting of general anesthesia, intubation and extubation are major risk factors for droplet transmission. One study measured aerosol generation during intubation and extubation between the anesthetist and patient during the treatment of three patients using an optical particle counter and measured 0.40 particles during mask ventilation, 1.40 particles during tracheal intubation, 21 particles during tracheal extubation, and 739 particles during coughing.¹³ Therefore, intubation and particularly extubation are associated with an increased risk of disease transmission.

Procedures with high aerosol potential include mask ventilation, laparoscopic procedures, bronchoscopy, electrocautery (especially after 10 min), and endoscopic interventions. In terms of disease transmission, if general anesthesia is absolutely necessary, one must assume the highest level of precaution. That said, local anesthesia should be primarily preferred provided it is adequate for the procedure. In our group of patients, local anesthesia was significantly more common during the pandemic compared to before it. This finding is in line with anesthesia guidelines for COVID-19 patients.

There are few publications comparing laparoscopy and conventional open surgery in the setting of COVID-19, and as of yet, there is no clear consensus on which method is more preferable.¹⁴ Open methods pose an increased risk of contact with patient fluids and tissues for the surgical team. On the other hand, laparoscopic surgery is associated with an increased risk of viral contamination due to aerosolization. Although previous research has shown that laparoscopic surgery can cause the aerosolization of blood-borne viruses, there is not much evidence to suggest that this effect is relevant in the context of COVID-19.^{15,16} It is strongly recommended to use special equipment to filter the carbon dioxide gas containing aerosol particles during laparoscopic procedures.¹⁷

It is up to the surgeon to choose the appropriate surgical approach to minimize the operative time and provide maximum safety for both patients and healthcare workers. In the United Kingdom and Ireland, surgeons recommended using laparoscopy in cases where it will specifically provide clinical benefit to the patient.¹⁸ On the other hand, some researchers argue that laparoscopic procedures create a functional barrier between the

surgeon and the patient and reduce exposure to disease (including aerosol transmission) compared to open surgery. If laparoscopy is to be performed, negative pressure rooms should be preferred. Balloon trocars may be considered to limit gas leakage. If the operating area is suitable, gasless laparoscopy, an older practice, may be considered depending on the surgeon's skills.¹⁴

Our review of patient data revealed that open interventions were significantly more common during the COVID-19 pandemic. In contrast, Patrick et al. did not report any change in surgical approaches. Moreover, they reported that 2 out of 3 patients were operated with a minimally invasive technique. However, they did not present postoperative results.¹⁰

In our study, pre-pandemic and pandemic periods were similar in terms of ICU admission and mortality rates.

5. Conclusion

In conclusion, the number of patients treated in the general surgery operating room of our hospital decreased during the COVID-19 pandemic (April-May 2020) compared to before the pandemic (October-November 2019). The decrease in the number of patients with ASA-I suggested the changed priorities of the surgeons regarding emergency patients. Although studies from different countries report various approaches regarding laparoscopy in the setting of COVID-19, open surgery was more commonly applied in our hospital during the pandemic.

6. Conflict of interest

The authors did not declare any conflicting interests.

7. Funding

No internal or industry funding was involved in this study.

8. Data availability

Numerical data is available with corresponding author

9. Authors' contribution

YA, EE, Ok: Manuscript editing

HG: Concept, literature search

TG, LO: Concept

GK: Data collection

NC: Statistical analysis

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