

Impact of the COVID-19 pandemic on operations in general surgery clinics in Turkey



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INTRODUCTION: *The Covid-19 pandemic spread rapidly throughout Turkey from March 2020 onward, and despite modified working conditions in the surgical clinics of our hospitals, some surgical patients became infected with the coronavirus during their perioperative period.*

AIM: *The present study investigates the impact of the novel coronavirus on patients undergoing general surgical operations in our clinics during the Covid-19 pandemic.*

METHODS: *A retrospective analysis was conducted of all surgeries performed in the general surgery clinics of two 'pandemic hospitals' between March 19 and April 30, 2020 - a period when all elective surgeries were suspended in hospitals within Turkey. Demographic data, comorbidities, choice of anesthesia method, blood parameters, duration of stay in hospital and the intensive care unit and mortality rates were compared statistically with the frequency of postoperative Covid-19 positivity in these patients.*

RESULTS: *A total of 275 surgical operations were performed during this period. Covid-19 was identified in seven patients during the postoperative period, and was more commonly diagnosed in those who were elderly and those with comorbidities. ($p=0.02$, $p=0.02$). Statistically significant correlations were found between a Covid-19 diagnosis and admission to the intensive care unit, the length of hospital stay and the length of stay in intensive care ($p<0.001$, $p<0.001$, $p=0.01$). Mortality was observed in two patients who developed Covid-19 postoperatively ($p=0.03$).*

CONCLUSIONS: *The Covid-19 pandemic has had a significant impact on patients undergoing operations in our general surgery clinics. Precautionary measures taken during postoperative care should be maximized for high-risk patients.*

KEY WORDS: Covid-19 pandemic, General surgery clinics, Novel coronavirus, Gastrointestinal system surgery

Introduction

The first cases of pneumonia caused by the new strain of coronavirus, SARS-CoV-2, were reported in Wuhan, China in December 2019, and the disease was subse-

quently named Covid-19. The most common symptoms are fever, cough, shortness of breath and fatigue, and more rarely, gastrointestinal system symptoms^{1,2}. Covid-19 was declared a pandemic by the World Health Organization (WHO) on March 11th, 2020³.

The first case of Covid-19 in Turkey was identified on March 10th, 2020, with the first death reported on March 15th, 2020. Subsequently, in order to cope with the pandemic, Turkish outpatient services were restricted from March 19th, and a moratorium was placed on all elective surgeries, with only emergency and cancer surgeries being carried out in general surgery clinics. During the past months, various international surgical societies have made recommendations to revise surgical practices to suit the new pandemic conditions^{4,5}. In our dedicated 'pandemic hospitals', a significant proportion

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of our general surgery beds have been reallocated for the treatment of Covid-19 patients; consequently, the number of surgical operations undertaken has decreased dramatically.

The present study investigates the impact of the novel coronavirus on surgeries performed in our pandemic hospitals during this period.

Methods

STUDY DESIGN

This study was designed as a retrospective cohort study and comprises 127 emergency surgeries and 135 elective oncological surgeries that could not be postponed. The operations were performed in the general surgery clinics of our two pandemic hospitals between March 19th and April 30th, 2020 - a period in which elective surgeries were suspended. The study protocol was approved by the Institutional Review Board of our hospital. (Approval No: 2011-KAEK-25 2020/05-20). Informed consent was obtained from all patients prior to surgery.

APPROACH TO SURGERY ADOPTED BY OUR CLINICS DURING THE COVID-19 PANDEMIC

The same surgical precautions were applied before and after all operations in both pandemic hospitals. All patients were thoroughly examined for Covid-19 prior to surgery, and then underwent a preoperative thoracic Computed Tomography (CT) scan. Each patient was given a routine nasopharyngeal Polymerase Chain Reaction (PCR) test preoperatively, although emergency operations were carried out without waiting for the PCR results. In contrast, no scheduled surgeries were performed until the test results were obtained. While operating on Covid-19 positive patients, or those highly suspected of being infected, the surgical team used protective equipment, N-95 respirators and eye protection. Between surgeries, the operating room was disinfected and ventilated for 30 minutes. For Covid-19-negative patients, the surgical team used N-95 respirators and eye protection during the operation. Postoperatively, each patient was allocated a private room; after discharge, patients were advised to remain in preventive quarantine for 15 days. Thoracic CT scans and PCR tests were repeated in any cases displaying postoperative pulmonary symptoms. Patients diagnosed with Covid-19 pneumonia were given appropriate treatment.

INCLUSION AND EXCLUSION CRITERIA

The study included patients aged 18 and above who tested positive for SARS-CoV-2 in the postoperative peri-

od. Those who tested positive for SARS-CoV-2 preoperatively were excluded from the study, as were patients under 18 years of age, those who did not undergo a preoperative swab test or could not complete postop follow-up at our clinic.

STUDY GROUPS

The study patients were divided primarily into two groups: Covid-19 (+) and Covid-19 (-). The Covid-19 (+) group included patients who had tested negative upon initial admission to the hospital, but later tested positive during hospitalization, as well as those who tested positive after discharge. The Covid-19 (-) group, in turn, included patients who tested negative upon admission to the hospital and in the perioperative period. Two methods were used to ascertain Covid-19 status after discharge from hospital: while a routine follow-up of patients for fever and COVID-19 symptoms continued during outpatient clinic visits, in addition, the national health monitoring system (e-nabız) was used to check whether any patients had been diagnosed with COVID-19 outside of our hospital within the first two weeks of discharge. Any patients with a positive COVID-19 swab sample or those who showed infiltration on a thoracic CT scan within the first two weeks of discharge were considered positive for hospital-acquired infection.

The afore-mentioned emergency surgeries included appendicitis, incarcerated hernia, acute cholecystitis, abscess drainage, cutting or piercing injuries, gunshot wounds and gastrointestinal system perforations. Likewise, our major gastrointestinal system (GIS) surgeries included gastrointestinal system malignancies and non-malignant elective bowel resections (e.g. inflammatory bowel disease).

DATA

In this study, demographic data, comorbidities, methods of anesthesia, blood parameters, durations of stay in the intensive care unit or hospital, instances of cancer or emergency surgery and mortality rates were compared statistically with the frequency of postoperative Covid-19 positivity.

STATISTICAL ANALYSIS

The statistical analysis was performed using IBM SPSS version 24.0 (IBM Co., Armonk, NY, USA) software package. Descriptive statistical methods (median, frequency, percentage, minimum and maximum) were used to evaluate the study data. Pearson's Chi-square test was used to compare qualitative data, and Fisher's exact test was used in the case of a low number of sub-groups.

The normality of distribution of quantitative data was assessed using Kolmogorov-Smirnov and Shapiro-Wilk tests, while non-parametric distribution was evaluated with a Mann Whitney-U test. For the results of these analyses, a p value of <0.05 was considered statistically significant.

Results

Between the specified dates and in the general surgery clinics of our two pandemic hospitals, operations were carried out on a total of 275 patients, 13 of whom were diagnosed with SARS-CoV-2 infection preoperatively, and therefore excluded from the study. Among the remaining 262 study patients, 75 underwent major GIS surgery and 127 required emergency surgical interventions, while 60 patients had non-GIS malignancies (27 breast cancer surgeries, 23 thyroid cancer surgeries, 10 malignant lymph node excisions). Seven patients who had tested SARS-CoV-2 negative preoperatively were found to be infected during hospitalization (Fig. 1). The mean age of the study patients was 49.5 (16-92) years and postoperative SARS-CoV-2 infections were more common in the elderly patients (p=0.02). The study sample comprised 148 male and 114 female patients; there was no significant relationship between gender and postoperative Covid-19 infection rates. Of the total sample, 58% had comorbidities, and postoperative Covid-19 was more common in this group

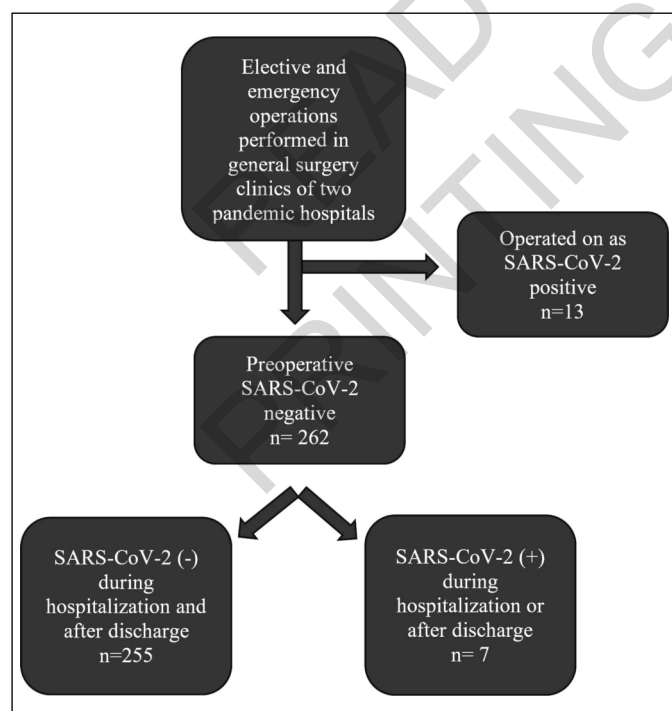


Fig. 1: The quantitative distribution of SARS-CoV-2 (+) and (-) patients from this study.

(p=0.02). The subgroup analyses revealed a higher frequency of Covid-19 in patients with hypertension (HT) and chronic obstructive pulmonary disease (COPD) (p=0.03, p=0.004, respectively). Regarding blood parameters, the frequency of postoperative Covid-19 was higher in patients with low preoperative hemoglobin levels (p=0.03). There was no statistically significant difference between the methods of anesthesia used.

Covid-19 pneumonia was more likely to occur in patients who required postoperative treatment in the intensive care unit (p<0.001). The duration of hospitalization and the length of stay in the intensive care unit were also significantly associated with Sars-CoV-2 infection (p<0.001, p=0.01, respectively). In addition, postoperative Covid-19 pneumonia was observed more frequently among patients who underwent major gastrointestinal system surgeries (p=0.003). The mortality rate was higher among patients with Covid-19 pneumonia (p=0.03).

Discussion

The Covid-19 pandemic has changed the approach to surgical procedures in healthcare systems all around the world, with more than 80% of surgical departments having adapted their working conditions as a result ^{6,7}. Several guidelines on the management of surgical patients have been published since the outbreak, most of which are based on expert opinion rather than quantitative data ⁸⁻¹⁰. However, it is necessary to establish the effect of SARS-CoV-2 on postoperative complications and mortality so that surgeons and patients can make evidence-based decisions. Accordingly, the present study provides insight for determining an optimal treatment strategy for the management of surgical patients during pandemics such as Covid-19.

The effects of SARS-CoV-2 infection are greater among patients of advanced age, the immunosuppressed and those with comorbidities, and the disease is more often fatal among such patients when compared to a younger population ¹¹. Concurring with previous research, the present study recorded a higher prevalence of postoperative SARS-CoV-2 infections in the elderly (p=0.02) (Table I).

The Coronavirus Global Surgical Collaborative (CVGSC) recommends routine Covid-19 testing for all patients prior to any surgical or interventional endoscopic procedure in institutions with a high volume of Covid-19 patients ¹². Indeed, patients undergoing surgery are at high risk of exposure to SARS-CoV-2 infection in hospital. Such patients may experience, in particular, pulmonary complications due to surgery-related proinflammatory cytokines and immunosuppressive responses to mechanical ventilation ^{13,14}. Prior to the pandemic, the rate of postoperative pulmonary complications was 8%, but this proportion has increased to 50% during the

TABLE I - Association between preoperative data and Covid-19

	All patients n= 262	COVID-19 (-) n= 255	COVID-19 (+)	p value
Age, *	49.5 (16-92)	48 (16-92)	69 (42-81)	0.02 ^a
Gender, n (%)				0.14 ^b
Male	148 (56.5)	142 (55.7)	6 (85.7)	
Female	114 (43.5)	113 (44.3)	1 (14.3)	
Comorbidity, n (%)				0.02 ^b
No	110 (42)	110 (43.1)	0	
DM	27 (10.3)	25 (9.8)	2 (28.6)	0.16 ^b
HT	53 (20.2)	49 (19.2)	4 (57.1)	0.03 ^b
COPD-Asthma	14 (5.3)	11 (4.3)	3 (42.9)	0.004 ^b
Cardiac	25 (9.5)	25 (9.8)	0	
Malignancy	110 (42)	106 (41.6)	4 (57.1)	0.46 ^b
GIT malignancy	70 (26.7)	66 (25.9)	4 (57.1)	0.09 ^b
Anesthesia, n (%)				0.6 ^b
General	229 (87.4)	222 (87)	7 (100)	
Regional	33 (12.6)	33 (13)	0	
Hgb, (g/dl) *	13.1 (6.6-18.8)	13.2 (6.6-18.8)	10.5 (7.8-14.7)	0.03 ^a
Wbc, (103/uL)*	1.7 (0.24-18)	1.7 (0.24-18)	1.4 (0.9-4)	0.4 ^a
Plt, (103/uL) *	255 (89-951)	255 (89-951)	263 (145-289)	0.6 ^a

a: Mann-Whitney U; b: Fisher's Exact Test; *median (range); HT: hypertension; DM: diabetes mellitus; COPD: chronic obstructive pulmonary disease; GIS: gastrointestinal system; Hgb: hemoglobin; Wbc: white blood cell; Plt: platelet; ICU: intensive care unit.

TABLE II - Association between postoperative data and Covid-19

	All patients n= 262	COVID-19 (-) n= 255	COVID-19 (+) n= 7	p value
Admission to ICU n(%)	54 (20.6)	48 (18.8)	6 (85.7)	<0.001 ^b
Length of Stay in ICU, days*	3.5 (1-60)	2 (1-60)	12 (3-21)	0.01 ^a
Length of Hospital Stay, days*	3 (0-60)	3 (0-60)	18 (7-25)	<0.001 ^a
Major GIS surgery, n(%)	75 (28.6)	69 (27)	6 (85.7)	0.003 ^b
Emergency surgeries, n(%)	127 (48.5)	126 (49.4)	1 (14.3)	0.12 ^b
Mortality, n(%)	11 (4.2)	9 (3.5)	2 (28.6)	0.03 ^b

a: Mann-Whitney U; b: Fisher's Exact Test; *median (range); GIS: gastrointestinal system; ICU: intensive care unit.

Covid-19 pandemic¹⁵. Furthermore, the present study established a high risk for postoperative Covid-19 in patients with comorbidities such as COPD and hypertension ($p=0.004$, $p=0.03$) (Table 1). Clearly, the high prevalence of patients contracting Covid-19 postoperatively and those with pulmonary complications underline the importance of obtaining a preoperative PCR test result for Covid-19. Accordingly, in the present study, all patients scheduled for surgery were subjected to a preoperative PCR test, including those taken for emergency surgery. In the future, routine preoperative screening for SARS-CoV-2 may be possible through rapid tests with a low rate of false negatives; however, hospital-acquired infections will still remain a challenge¹⁶. Diagnostic delay in emergency cases has emerged as a common problem during the pandemic, with many patients refraining from presenting to emergency departments, despite having symptoms, due to the risk associated with the novel coronavirus¹⁷. Actual diagnosis of

patients presenting to emergency departments may be further delayed due to the necessity of tests such as swabs and tomography to exclude Covid-19¹⁷. Patients with more complex cases may have prolonged hospitalization, which, in turn, increases the possibility of Covid-19 exposure and postoperative infection, creating an unwelcome vicious circle. The present study identified an increased risk of contracting postoperative Covid-19 in patients with prolonged hospital and intensive care unit stays ($p<0.001$, $p=0.01$) (Table II). Additionally, mortality was more common among patients with postoperative Covid-19 ($p=0.03$).

When treating cancer patients during the pandemic, the choice between surgery and using neoadjuvant therapy becomes extremely important. The administration of neoadjuvant therapy may be preferred in advanced disease with nodal involvement if emergency surgery is not indicated (bleeding, perforation, obstruction, etc.) due to the risk of postoperative SARS-CoV-2 infection¹⁸. This

may be a wise choice, since most of the beds in intensive care units will be reserved for Covid-19 patients during the pandemic. For this reason, we referred any non-emergency patients for neoadjuvant therapy rather than for surgical treatment. Among the 126 patients who underwent emergency surgery, postoperative SARS-CoV-2 infection was observed in only one patient, who had perforated cholecystitis. In contrast, postoperative SARS-CoV-2 infection was observed in six of the 75 patients who underwent major GIS surgeries (three colorectal cancer patients, one esophageal cancer patient, one inflammatory bowel patient and one colovesical fistula patient). The frequency of postoperative Covid-19 was therefore higher in patients undergoing major gastrointestinal surgeries, who were not referred for neoadjuvant therapy ($p=0.003$) (Table II). Naturally, the decision to postpone curative cancer resections should be taken very carefully, as delays may have a considerable adverse effect on long-term survival, patient morbidity and the efficient use of surgical resources¹⁹. Delays may also result in such complications as ileus, perforation or hemorrhage, and may cause elective cases to become urgent. If cancer surgeries are postponed without considering the outcome, it may cost many more lives than those that are saved by the allocation of all surgical resources to the treatment of Covid-19.

The limitations of the present study are its retrospective design and the low number of Covid-19 (+) patients, which may cause a type-2 statistical error.

Conclusion

The present study highlights the hazards of perioperative Covid-19 exposure and the need for careful management of surgical patients during the pandemic. In eligible cases, strategies including referral for non-surgical treatment such as neoadjuvant therapy, a delay in surgical procedures and the postponement of non-emergency procedures should all be considered. However, the increased risks associated with SARS-CoV-2 infections must be balanced against the risk of delayed surgery. Most importantly, new strategies are urgently required to minimize the hospital-associated transmission of SARS-CoV-2, and to reduce the risk of postoperative complications in SARS-CoV-2-infected patients for whom surgery cannot be delayed.

Considering the inevitability of ongoing oncological and emergency cases during pandemics, the current study has established the need for the development of clear, consistent national or international guidelines.

Riassunto

La pandemia di Covid-19 si è diffusa rapidamente in tutta la Turchia da marzo 2020 in poi e, nonostante le

condizioni di lavoro modificate nelle cliniche chirurgiche dei nostri ospedali, alcuni pazienti chirurgici sono stati infettati dal coronavirus durante il periodo perioperatorio. Il presente studio indaga l'impatto del nuovo coronavirus sui pazienti sottoposti a operazioni di chirurgia generale nelle nostre cliniche durante la pandemia Covid-19. È stata condotta un'analisi retrospettiva di tutti gli interventi chirurgici eseguiti nelle cliniche di chirurgia generale di due "ospedali pandemici" tra il 19 marzo e il 30 aprile 2020, un periodo in cui tutti gli interventi chirurgici elettivi sono stati sospesi negli ospedali in Turchia. Dati demografici, comorbidità, scelta del metodo di anestesia, parametri del sangue, durata della degenza in ospedale e unità di terapia intensiva e tassi di mortalità sono stati confrontati statisticamente con la frequenza della positività postoperatoria al Covid-19 in questi pazienti.

Un totale di 275 interventi chirurgici sono stati eseguiti durante questo periodo. Covid-19 è stato identificato in sette pazienti durante il periodo postoperatorio ed è stato diagnosticato più comunemente in quelli anziani e in quelli con comorbidità. ($p = 0,02$, $p = 0,02$). Sono state trovate correlazioni statisticamente significative tra una diagnosi di Covid-19 e l'ammissione all'unità di terapia intensiva, la durata della degenza ospedaliera e la durata della degenza in terapia intensiva ($p < 0,001$, $p < 0,001$, $p=0,01$). La mortalità è stata osservata in due pazienti che hanno sviluppato Covid-19 dopo l'intervento ($p=0,03$).

In conclusione la pandemia Covid-19 ha avuto un impatto significativo sui pazienti sottoposti a operazioni nelle nostre cliniche di chirurgia generale. Le misure precauzionali prese durante l'assistenza postoperatoria dovrebbero essere massimizzate per i pazienti ad alto rischio.

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