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The effect of covid-19 pandemic on emergency general surgery cases: A single-center observational study

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Ethics Committee Approval
This study received approval from Yozgat Bozok University Clinical Research Ethics Committee (Approval date: 14/10/2020. Number: 2017-KAEK-189_2020.10.14_15).
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Abstract

Background/Aim: Many people around the world have been affected by the COVID-19 pandemic. Some of them were directly affected as patients. However, even if some did not suffer from the disease, they may have been indirectly affected. The aim of this study was to investigate whether the COVID-19 pandemic has an impact on emergency general surgery admission volume and operations.

Methods: In this retrospective case-control study, all patients referred from the emergency department to our emergency general surgery unit between April 1 - May 31,2020 were evaluated. Patients over 18 years of age, who were hospitalized for longer than 24 hours and required evaluation and treatment by a general surgeon were included in the study. Patients with similar characteristics that were treated in our clinic in the same periods in 2018 and 2019 were evaluated as the control group.

Results: During the pandemic, a total of 208 patients were hospitalized in the emergency general surgery service. The number of admissions to the emergency general surgery service in 2020 was 25.9% less than that in 2018 and 30.8% less than that in 2019. During the pandemic, while there was a decrease in cases of non-specific abdominal pain and trauma (P=0.003, P=0.015, respectively), there was a significant increase in cases of gastrointestinal obstruction and perforation (P=0.001, P<0.001, respectively). The rate of surgery during the pandemic was 65.9%, which was significantly higher than the previous years (P<0.001). The rate of laparoscopic procedures decreased significantly during this period (P<0.001). The complication and mortality rates were significantly higher (P=0.004, P=0.025, respectively).

Conclusion: We observed that while emergency general surgery case applications, surgery rates, and hospital stay decreased during the COVID-19 pandemic, there was an increase in the rate of more serious diagnoses, complications, and mortality.

Keywords: Covid-19, Pandemic, Emergency, General surgery, Outbreak

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Introduction

Coronavirus Disease 2019 (COVID-19) caused by the new SARS-COV-2 virus first appeared in Wuhan, China, in December 2019 [1]. Due to its rapid spread throughout the world, the World Health Organization declared COVID-19 a pandemic on March 11, 2020 [2].

In our country, the first COVID-19 case was detected on March 11, 2020. Immediately after the detection of the first case, the government took a series of gradual measures to prevent the spread of the virus. First, schools at all levels, all restaurants, as well as all non-essential businesses and workplaces were temporarily closed [3]. People with chronic diseases and pregnant women who worked in public institutions were allowed to go on administrative leave. Following the increase in cases, the transition to remote working model in public institutions, intercity travel restriction, curfew for citizens over 65 and under 18 years were implemented. Moreover, in some cities where COVID-19 cases were more widespread, more stringent curfews, where all citizens were asked to stay at home unless needing medical attention, were enacted during the weekends [4-6]. In addition, it was emphasized on many platforms that citizens should stay home and apply to the emergency rooms only when necessary in order to keep the capacity of the emergency services at the maximum. The Ministry of Health took some measures by designating pandemic hospitals in each province and recommending postponing all elective surgical operations to a later date [7, 8].

Our hospital is one of two medium-sized hospitals located in the area with approximate population of 400,000. During the pandemic, our hospital served non-COVID-19 patients, while the other hospital was designated as a pandemic hospital. This was done in order not to alleviate the pressure on the healthcare system and to minimize hospital transmission. Some studies have reported that hospital admissions were gradually decreasing during the pandemic and these late admissions have caused negative outcomes [9, 10]. We have not come across a study evaluating emergency general surgery cases during the pandemic in our country. The aim of this study was to investigate whether the COVID-19 pandemic had an impact on emergency general surgery admission volume and operations. The findings presented here are intended to shed light on the management of emergency general surgery cases in future similar pandemic situations.

Materials and methods

Study design and participants

All patients referred from the emergency department to our emergency general surgery unit between April 1, 2020 and May 31, 2020, which was the time of the strictest measures taken to prevent the spread of the epidemic in our country, were analyzed retrospectively. Before the COVID-19 outbreak, emergency room doctors first evaluated all patients admitted to the emergency room, and patients thought to have general surgery pathologies were referred to the emergency general surgery unit. During the COVID-19 pandemic, this practice was revised and patients who were thought to have emergency general surgery pathology and did not have COVID-19 symptoms were directed to our emergency general surgery unit. Patients who had emergency general surgery pathology and were positive for COVID-19 were referred to the pandemic hospital in our city.

The main inclusion criteria in our study were requiring the evaluation and treatment of a general surgeon and hospitalization that lasted >24 hours. The exclusion criteria were referral to the pandemic hospital, being under the age of 18 years, and a hospital stay of <24 hours.

All patients who had similar inclusion and exclusion criteria with the pandemic group and were treated in the emergency general surgery unit during the same time period (April 1 - May 31) in the last two years (2018 and 2019) were included as the control group.

Data collection

Electronic medical records of patients treated in our institution were examined. Demographic characteristics, diagnoses, operation status, open or laparoscopic operation status, complications, intensive care unit stay, and hospital stay were evaluated. Complications were defined according to Clavien-Dindo Classification [11].

Statistical analysis

For the purpose of statistical analysis, patients were grouped by year of admission. SPSS 22.0 (Statistical Package for Social Sciences, IBM Inc., Chicago, IL, USA) was used for statistical analysis of the data. Chi-square or Fisher's exact tests were used to compare groups of categorical variables. One-way analysis of variance (ANOVA) and Student's t-test were used to determine statistical difference in parametric data. p values <0.05 were considered significant.

Results

A total of 208 patients were hospitalized to the emergency general surgery service between April 1, 2020 and May 31, 2020. The number of admissions to the emergency general surgery service in 2020 was 25.9% less than that in 2018 and 30.8% less than that in 2019. The mean age of the patients in 2020 was higher than those of the patients in 2018 and 2019 (P<0.001). On the other hand, no difference was found between the groups in terms of gender (P=0.236). The demographic data of the patients are given in Table 1.

The distribution of diagnoses of appendicitis, biliary pathology, pancreatitis, diverticulitis, and hernia were similar between the groups. However, the number of patients hospitalized due to non-specific abdominal pain was significantly less in 2020 (P=0.003). On the other hand, in 2020, 31 patients were treated due to gastrointestinal (GI) obstruction, which was more than in 2018 and 2019 (P=0.001). Similarly, the number of patients treated for GI perforation was significantly higher in 2020 (P<0.001). On the contrary, 41 (14.6%) patients in 2018, 36 (12.7%) patients in 2019, and 13 (6.2%) patients in 2020 were treated for trauma, and this decrease in 2020 was significant (P=0.015). Data on patient diagnoses are shown in Table 1.

While 45.9% of the patients hospitalized in the emergency general surgery service were operated in 2018, this rate was 47.2% in 2019. In 2020, the operation rate was higher (65.9%) compared to other years (P<0.001). Laparoscopic

procedure was performed in 55.8% of the patients operated in 2018 and 57.7% in 2019. In 2020, this rate was relatively low with 32.1% (P<0.001). The data on the treatment approach are given in Table 2.

Table 1: Patients' diagnosis and demographic characteristics

	2018	2019	2020	*P*-value
Total admission	281	301	208	
Age †	47.60 (16.54)	50.09 (17.07)	54.06 (17.31)	<0.001*
Gender				
Female‡	126 (44.8)	156 (51.8)	99 (47.6)	0.236**
Male‡	155 (55.2)	145 (48.2)	109 (52.4)	
Diagnosis				
Non-specific abdominal pain‡	41 (14.6)	49 (16.3)	13 (6.2)	0.003**
Appendicitis‡	68 (24.2)	64 (21.3)	68 (24.2)	0.087**
Biliary pathology‡	55 (19.6)	67 (22.3)	37 (17.8)	0.447**
Pancreatitis‡	21 (7.5)	25 (8.3)	14 (6.7)	0.801**
GI obstruction‡	16 (5.7)	21 (7.0)	31 (14.9)	0.001**
GI perforation‡	9 (3.2)	13 (4.3)	27 (13.0)	<0.001**
Diverticulitis‡	14 (5.0)	11 (3.7)	5 (2.4)	0.332**
Hernia‡	16 (5.7)	15 (5.0)	6 (2.9)	0.331**
Trauma‡	41 (14.6)	36 (12.7)	13 (6.2)	0.015**

†mean (SD). ‡n (%). *One-way analysis of variance (ANOVA) was used to determine statistical difference. **Chi-square or Fisher's exact tests were used to determine statistical difference. GI: Gastrointestinal

Table 2: Patients' perioperative data

	2018	2019	2020	*P*-value
Treatment approach				
Non-interventional†	152 (54.1)	159 (52.8)	71 (34.1)	<0.001*
Operative†	129 (45.9)	142 (47.2)	137 (65.9)	
Operation type				
Open†	57 (44.2)	60 (42.3)	93 (67.9)	<0.001*
Laparoscopic†	72 (55.8)	82 (57.7)	44 (32.1)	
Clavien-Dindo Complication: ≥Grade III†	-	-	2 (11.8)	0.530*
ICU admission (day) †	8 (2.8)	12 (4.0)	11 (5.3)	0.389**
Hospital LOS (day) ‡	4.46 (3.03)	4.78 (2.99)	3.70 (2.82)	<0.001**
Mortality†	1 (0.4)	1 (0.3)	5 (2.4)	0.025*

*n (%),‡mean (SD), *Chi-square or Fisher's exact tests were used to determine statistical difference. **One-way analysis of variance (ANOVA) was used to determine statistical difference. ICU: intensive care unit, LOS: length of stay

In general, the rate of complications among the operated patients was 3.9% in 2018, 3.5% in 2019, and 12.4% in 2020. This increase in 2020 was significant (P=0.004). However, the ratio of grade III and above complications according to Clavien-Dindo classification system was similar between the groups (P=0.530). While mortality rates were 0.4% and 0.3% in 2018 and 2019, respectively, this rate was 2.4% in 2020 (P=0.025). Complication status and data on mortality are given in Table 2.

Finally, while the intensive care admission rates were similar between the groups (P=0.388), the mean length of stay in the hospital was significantly lower in 2020 (P<0.001).

Discussion

During the pandemic, the number of patients admitted to the emergency general surgery unit was 25.9% and 30.8% less compared to the same periods in 2018 and 2019, respectively. Similar results were reported in studies conducted in different countries during the pandemic [12, 13]. However, while 2 hospitals were serving the emergency general surgery patients in our city before the pandemic, only our hospital served non-COVID-19 patients during the pandemic (the other hospital was designated as a pandemic hospital). With this in mind, it can be concluded that the decrease in number of patients treated during the pandemic may actually be even greater. However, to be able to make a definite decision on this issue, it is necessary to reach other hospital's date from previous years.

Many factors might have caused the decrease in patient acceptance during the pandemic. The most important factor might be the fear of hospital-related COVID-19 transmission. Indeed, a study has shown that during the first phase of the pandemic, a significant proportion of patients were reluctant to seek access to healthcare services for non-COVID-19 diseases [14].

According to the results of our study, there have been significant changes in diagnoses at the time of patient admission during the pandemic compared to previous years. For example, a significant decrease in hospitalizations due to non-specific abdominal pain during the pandemic is noteworthy. The most important reason for this might have been the desire to avoid COVID-19 transmission. Although there were studies that reported similar results to ours, there was also a study showing that hospitalizations due to non-specific abdominal pain did not change [13, 15]. Moreover, in our study, hospitalizations due to GI obstruction and perforation during the pandemic were higher than in previous years. In fact, this result might indicate patients' late arrival to the hospital. In other words, patients did not come to the hospital when they had non-specific abdominal pain but presented only after the GI perforation had developed. We also found a significant decrease in trauma cases during the pandemic compared to previous years. The decrease in trauma cases is not surprising in this period when human mobility was minimized due to curfews, restrictions on intercity travel, and stay-at-home orders that were enacted to control the spread of the virus.

Although the American and UK Surgical Colleges recommended reducing operational interventions during the pandemic, in our study, the surgery rates were higher during the pandemic, while non-interventional methods were predominant in the past years [16, 17]. It might have been because there were many patients hospitalized with the diagnosis of non-specific abdominal pain in the past and most of them were treated with non-interventional methods. Another reason may have been that the patients waited for their illness to become more severe (if they had received medical treatment earlier, perhaps they would have been treated without surgery) and only then applied to the hospital. The studies on this subject have not reached a consensus. While McLean et al. reported similar surgery rates before and during the pandemic, McGuinness et al. reported that the surgery rates decreased during the pandemic [12, 15]. In addition, in our study, the rate of laparoscopic cases was lower during the pandemic. The underlying reason for the low rates of laparoscopic cases is the recommendation from guidelines to perform open surgery instead of laparoscopic surgery in order to minimize the risk of transmission [16, 17].

The examination of complication status showed that the general complication rate, which was below 4% in the past years, increased to 12.4% during the pandemic. Fortunately, serious complication rates during this period were similar to previous years. The fact that more patients with severe diagnoses such as GI obstruction and GI perforation were operated during the pandemic may explain the higher rate of general complications during the pandemic.

Interestingly, although our rate of surgery and complications was higher during the pandemic, the duration of hospital stay was shorter. Despite the general complication rate being high, the rate of serious complications was similar to previous years, and thus we believe that the effect of complications on the duration of stay was minimal. In addition, the shorter hospital stay can be explained by the effort to keep the hospital bed capacity at maximum and to minimize the

spread of infection. Based on this, it can be concluded that patients' length of stay in the general surgery service and the reasons behind it should be analyzed even further.

In our study, the rate of hospitalization of emergency general surgery patients during the pandemic was similar to the rate from previous years. We think that the effort to keep the ICU occupancy rate as low as possible had an impact on this outcome. Another result of our study indicated that the mortality rate during the pandemic was higher than in previous periods. Facing a more severe disease group during the pandemic may have resulted in a higher mortality rate. In addition, our patient group during the pandemic had higher mean age, which might have led to more comorbidities and thus might have caused higher mortality.

We believe that the main reason for high rates of GI obstruction and perforation diagnoses, as well as high complication and mortality rates seen during the pandemic in our study was the late admission to the hospital. Use of telemedicine during public health emergencies such as COVID-19 pandemic can prevent this trend. Telemedicine can help determine patients that need early admission to the hospital due to severe diagnosis and can help with follow-up of patients treated at home with oral antibiotics, or patients that are followed with "watch and wait" strategy due to non-specific abdominal pain [18]. We believe that with necessary regulations telemedicine is an ideal tool that can be actively used in future public health emergencies.

The fact that our study was conducted in a single center can be considered as a limitation as it prevents generalization throughout the country. Another limitation of our study was that the data of the patients after discharge were not evaluated.

Conclusion

To the best of our knowledge, this is the first study evaluating emergency general surgery cases in our country during the COVID-19 pandemic. We observed a decrease in emergency general surgery case applications, surgery rates, and hospital stay, and an increase in the rate of more serious diagnoses, complications, and mortality during the COVID-19 pandemic. The reason behind these results is probably multifactorial. However, we think that the most important of these are late hospital admissions due to the concern of transmission and the effort of physicians to discharge the patients as soon as possible. Therefore, we emphasize that telemedicine should be developed and used widely as soon as possible.

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