












Multicenter Study: Impact of COVID-19 Pandemic on Surgical Procedures

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Submitted: 01.02.2022

Revised: 10.06.2022

Accepted: 20.06.2022

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Keywords: COVID-19
pandemic period; emergency
surgery; SARS-CoV-2.



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ABSTRACT

Objective: We aimed to evaluate the effect of the pandemic by comparing the number and distribution of patients who applied to the emergency services and were consulted to the emergency surgery service in the first peak period of the COVID-19 pandemic period with the same period of the previous year.

Methods: İstanbul is the province with the highest population in Turkey. Patients who applied to the emergency departments of five hospitals serving at tertiary level in İstanbul were evaluated retrospectively. It was divided into two groups as the February–June 2020 pandemic period and the February–June 2019 pre-pandemic period. In both periods, the number of patients admitted to the emergency department and the number of patients who were consulted to general surgery and their distribution according to the reasons for their visit were analyzed.

Results: The total number of patients admitted to the emergency department in the 5-month period during the pandemic period in 2020 was 548,509 and 742,064 for the pandemic period and the 5-month period in 2019, respectively. The total number of patients admitted or consulted to emergency general surgery was 21,399 and 30,868, respectively. In total, there was a 26.1% decrease in the number of patients who came to the emergency department during the pandemic period, and a 30.7% decrease in the number of patients consulted to the emergency general surgery ($p<0.001$). During the pandemic period, there was a decrease of 23.9% ($p=0.62$) in the total number of surgeries performed in the emergency surgery service, and 11.9% ($p=0.59$) in the surgeries performed due to trauma. The number of patients operated for non-traumatic reasons was 24% during the pandemic period. 0.4 ($p<0.004$) decreased, while the number of conservatively followed non-traumatic patients increased by 54.6% ($p<0.0001$).

Conclusion: In the first peak period of the COVID-19 epidemic in İstanbul, the number of patients coming to the emergency services in tertiary hospitals and the number of patients admitted to emergency surgery units and operated on decreased. There was a decrease in the number of surgeries in emergency surgery patients due to trauma and non-traumatic. An increase was observed in the number of non-traumatic conservative follow-up and emergency surgery patients treated.

INTRODUCTION

The COVID-19 pandemic has become the most important health problem of 2020 and has spread all over the world in a short time.^[1] An excessive density of patients with COVID-19 has been experienced in all hospitals, and there have been disruptions in the health-care services provided to these patients as well as to patients without COVID-19. Emergency general surgery units of tertiary hospitals are also centers where patients with high mor-

bidity and mortality risk are referred. In Turkey, as in many countries, during the first peak period of the pandemic, February–April 2020, all elective surgeries other than cancer and conditions requiring emergency surgery in tertiary hospitals were canceled. While it is expected that the density of patients with COVID-19 will be added to the normal patient density in the emergency units of the hospital, interestingly, there has been variation in the number of patients admitted to the emergency department and referred to general surgery in many countries.^[2,3]

In this study, the data of general surgery patients who applied to the emergency department in tertiary hospitals in Istanbul, the most populous city of Turkey (population of approximately 18 million) during the first peak period of the Covid-19 pandemic, were compared with the same period of 2019.

MATERIALS AND METHODS

A retrospective, multicentric clinical study was planned, and approval was obtained from the local ethics committee and the Ministry of Health of the Republic of Turkey. The study was conducted in five hospitals at the tertiary level in Istanbul, the most populous city of Turkey. Istanbul is a metropolis that consists of two main geographical parts, the continent of Europe and Asia. The two continents are connected by three bridges and a tunnel, and patients are not often transported between the two continents in the city's health system due to the size of the city and the difficulty of transportation. Due to this sociological structure, the centers in this project were chosen among the largest hospitals in two continents. Hospitals in Asia: Kartal Dr. Lütfi Kırdar City Hospital, Ümraniye Training and Research Hospital, Zeynep Kamil Gynecology and Pediatrics Training and Research Hospital. Hospitals in the European continent: Istanbul Training and Research Hospital and Prof. Dr. It is Cemil Taşcıoğlu City Hospital. The data of the patients (Group I) who applied to the emergency units of these hospitals between February 01 and June 30, 2020 and were consulted to the Emergency General Surgery units were compared with the same period of 2019 (Group 2).

The number of patients admitted to the emergency unit in both periods, the number of patients consulted to the emergency general surgery teams, the diagnoses at the time of admission, and the surgical interventions were evaluated retrospectively.

Non-emergency patients who were admitted to the hospital during these periods and patients who were not consulted to the emergency general surgery teams were not included in the study.

Statistical analysis

Patient data were analyzed using the SPSS 20.0 International Business Machines program. Measurable data between groups were compared using the Student's t-test and for categorical data using the Chi-square test. If the p-value was found to be <0.05 in the comparison, the difference was considered statistically significant.

RESULTS

In the 2020 pandemic period, the total number of patients who applied to the hospitals included in the study was 548,509, and this number was 742,064 in the 2019 pre-pandemic period. The total number of patients consulted to the emergency general surgery units during the 2020 pandemic period was 21,399, and this number was 30,868 in the pre-pandemic period of 2019. The decrease in the total number of patients admitted to the emergency department during the 2020 pandemic period is 26.1%, and the decrease in the number of patients applying to the emergency general surgery units is 30.7% ($p < 0.0001$). While the number of patients admitted to the emergency department is decreasing in all hospitals, it only increased in Dr. Lütfi Kırdar City Hospital. This situation occurred due to the conscious orientation of the central patient dispatch system in the Asian continent due to the renovation of the hospital building and increasing its capacity (Table 1).

During the pandemic period, a decrease of 24.4% was observed in the number of patients operated for non-traumatic reasons, whereas a decrease of 11.9% was observed in the number of patients operated due to trauma, and a 23.9% decrease was observed in the rate of emergency general surgery. The reduction rate in non-traumatic emergency surgeries is higher than in surgeries related to trauma, but the difference between the reductions in these two groups of surgeries is not statistically significant ($p = 0.62$) (Table 2).

While the rate of patients who were operated due to trauma during the pandemic period was 12.7%, 11.6% of the

Table 1. Distribution of patients admitted to emergency departments and consulted to emergency surgery units by hospitals

	Kartal Dr. Lütfi Kırdar CH	İstanbul TRH	Ümraniye TRH	Prof. Dr. Cemil Taşcıoğlu CH	Zeynep Kamil TRH
Group I total number of patients admitted to the emergency	142408	72297	154125	169935	9744
Group II total number of patients admitted to the emergency department	131605	107378	252920	240480	9681
Number of patients consulted to group I emergency general surgery units	6443	4820	1275	7011	1850
Number of patients consulted to group emergency general surgery teams	9098	6534	1984	10744	2508

CH: City Hospital; TRH: Training and Research Hospital.

Table 2. Change in number of emergency surgery operations

Reasons for surgery	2019	2020	Change	p
	n (%)	n (%)	%	
Non-traumatic	1338 (95.7)	1011 (95.1)	-24.4	0.62
Trauma-related	59 (4.3)	52 (4.9)	-11.9	
Grand total	1397	1063	-23.9	

Table 3. Change in trauma patients

Treatment	2019	2020	Change	p
	n (%)	n (%)	%	
Number of operations	59 (11.6)	52 (12.7)	-11.9	0.24
Non-surgical follow-up	511 (89.4)	408 (87.3)	-20.2	
Total	570	460	-19.3	

Table 4. Distribution of patients operated in the emergency surgery service due to trauma

Etiology	2019	2020	Change	p
	n (%)	n (%)	%	
Stabbing	29 (49.1)	21 (40.4)	-27.5	0.59
Bulletproofing	14 (23.7)	13 (25)	-7.1	
Blunt trauma	8 (13.6)	10 (19.2)	+25.0	
Traffic accidents	8 (13.6)	8 (15.4)	0.0	
Total	59	52	-11.9	

patients who applied for trauma in the pre-pandemic period were operated on. Despite the decrease in the number of patients who were evaluated in emergency surgery due to trauma, as well as those who were followed conservatively, there was a statistically significant decrease. There was no significant difference ($p=0.24$) (Table 3).

When the etiological distribution of the patients who were operated due to trauma was examined, 49.1% of the patients who were operated due to stabbing before the pandemic were operated, whereas 40.4% were operated

during the pandemic period, with a decrease of 27.5%. While 23.7% of those who were operated on due to bullet wounds were operated before the pandemic, 25% were operated during the pandemic period and a decrease of 7.1% occurred. While 13.6% of blunt traumas were operated in the pre-pandemic period, 19.2% were operated during the pandemic period, with an increase of 25%. While 13.6% of those operated due to traffic accidents were operated in the pre-pandemic period, 15.4% were operated during the pandemic period and no difference was found between them ($p=0.59$) (Table 4).

While 10.4% of the patients who applied to the emergency department due to ileus were operated during the pandemic period, 12.4% were operated in the pre-pandemic period, and a decrease of 10.7% occurred. While the rate of emergency surgery due to strangulated inguinal hernia was 6.2% in the pre-pandemic period, it was 9.3% during the pandemic period, with an increase of 13.3%. The rate of those operated for acute abdomen was 83.3% in the pre-pandemic period. During the pandemic period, it was 78.3% and a decrease of 29% occurred ($p=0.004$) (Table 5).

In the first peak period of the COVID-19 pandemic period and in the same period of the previous year, a statistically significant decrease was observed at the rate of 24.4% when the number of patients who underwent emergency surgery for non-traumatic reasons was compared ($p<0.004$).

A 54.6% increase was detected in the total number of patients followed up without surgery during the pandemic period. The number of patients followed up with ileus is an increase of 96.7%. While a decrease of 10% was observed in patients followed with strangulated inguinal hernia, and a decrease of 46.8% was observed in patients followed with acute pancreatitis by 7.6%, an increase of 135% was observed in patients followed up with acute appendicitis and acute cholecystitis ($p<0.0001$) (Table 6).

DISCUSSION

Emergency surgery has a very important place in the daily practice of general surgeons. After the first COVID-19 case was detected in Turkey on March 09, 2020, a dramatic decrease in emergency service applications started, and this decrease continued with fluctuations in April. [4] As soon as the COVID-19 pandemic emerged, some authors shared their surgical experience^[5-7] or reported

Table 5. Change in the distribution of patients operated for non-traumatic reasons

Etiology	2019	2020	Change	p
	n (%)	n (%)	%	
Ileus	140 (10.4)	125 (12.4)	-10.7	0.004
Strangulated Hernia	83 (6.2)	94 (9.3)	13.3	
Acute Abdominal (A. Appendicitis, A. Cholecystitis etc.)	1115 (83.3)	792 (78.3)	-29.0	
Total	1338	1011	-24.4	

Table 6. Change in the distribution of patients followed without surgery

Etiology	2019	2020	Change	p
	n (%)	n (%)	%	
Ileus (Conservative follow-up)	92 (12.9)	181 (16.4)	96.7	0.0001
Strangulated hernia (Reduced in emergency surgery)	30 (4.2)	27 (2.5)	-10.0	
Acute pancreatitis	238 (33.3)	220 (19.9)	-7.6	
Suspected acute abdomen	141 (19.7)	75 (6.8)	-46.8	
Other (A. Appendicitis, A. Cholecystitis etc.)	213 (29.8)	501 (45.4)	135.2	
Total	714	1104	54.6	

approach protocols in the treatment of patients infected with COVID-19^[8-12] to cope with the pandemic.

Few data were shared regarding the number of patients admitted to the emergency department and emergency surgical activity. Two of them were presented as letters to the editor and one as a research article.^[2,3,13] In all of these reported studies, it was reported that there was a statistically significant decrease in emergency surgery activity compared to the same months of the year before the pandemic, as well as a decrease in the number of patients admitted to the emergency department.

In our study, we found that, with the onset of the COVID-19 epidemic, there was a significant decrease in the number of patients who applied to both the emergency room and emergency general surgery compared to April and May of the previous year. Factors causing this, it is the Ministry of Health and social communication networks, using the media to raise awareness of the society against the COVID-19 epidemic and encourage isolation at home. Another important situation that can explain the decrease in admissions to the Emergency Department and Emergency General Surgery is the postponement of all elective medical and interventional procedures to manage the current emergency situation of both the workforce of health workers and medical supplies and equipment. This precaution is also important in terms of using the potential resources of the health system more efficiently to prevent individuals applying to health-care institutions from being affected by the epidemic and to provide the opportunity to use anesthesia devices and mechanical ventilators in the intensive care unit.

In our study, there was a significant decrease in the total number of patients who applied to the emergency services and were consulted to general surgery during the 5-month pandemic between February 01 and June 30, 2020, when there was a pandemic, and compared to the same months of 2019. Fear of contracting COVID-19 may have contributed to patients' admission to emergency services. It was thought that patients might have delayed their admission to the emergency department, except in cases where the patient's complaints were unbearable. There has been a decrease in the number of patients operated on due to trauma. A decrease was observed in the number of bullets and stabbings. It can be thought that the most import-

ant reason for this is the decrease in social activities and the decrease in individual communication-interaction with people's curfews. These results of ours were compatible with studies in Italy that reported a decrease in cases requiring both emergency surgery and trauma surgery.

An increase in the number of strangulated inguinal hernias has been detected. This was attributed to the high tolerability of pain in the patient, even when the hernia could not be reduced. It was thought that the patient applied to the emergency services with his pain becoming severe until ileus and acute abdomen developed.

There has been a decrease in the number of surgeries due to ileus. During the pandemic, the management of the disease may have come to the fore with conservative treatments, which is one of the general surgical applications of ileus. There has been a decrease in acute appendicitis, which is the most frequently performed operation by emergency surgery, and in surgeries such as peptic ulcer perforation. This situation was thought to be due to the fact that the patient applied to small local hospitals due to the risk of covid 19 transmission from major pandemic hospitals. The increase in general surgery patients followed without surgery is interesting. This may be because surgical teams do not want to put themselves and patients at risk of contracting COVID-19. In addition, it can be explained by the tendency to treat diseases medically instead of surgically during the pandemic period and the patients' changing eating habits. Despite the lack of level I evidence, surgery is considered a high-risk procedure in potential COVID-19 patients. Therefore, general recommendations are supported if the non-operative treatment approach is appropriate and safe for the patient.^[14] Examples of non-operative conservative treatments are antibiotherapy for acute appendicitis, cholecystostomy drainage for acute cholecystitis, percutaneous transhepatic cholangiography drainage when necessary for cholangitis, interventional embolization for acute gastrointestinal bleeding, and even reduction under sedation for incarcerated hernia. If surgery is required in these patients, appropriate protective equipment should be used and precautions should be taken to protect the health-care team.

Another important situation that may explain the decrease in applications to the emergency department and emergency general surgery is the postponement of all

elective medical and interventional procedures to manage the current emergency situation of both the workforce of health workers and medical supplies and equipment. This practice is also important in terms of preventing the individuals applying to health-care institutions from being affected by the epidemic and using the potential resources of the health system more efficiently by providing the opportunity to use anesthesia devices as mechanical ventilators in the intensive care unit.

It is a fact that, in the process after the declaration of the COVID-19 pandemic, both the pressure on health-care professionals and the fear of patients being infected with COVID-19 are taken into account, leading to some restrictions and delays in the access to medical assistance of general surgery emergency patients with health problems. The potential consequences of the lack of access to health care for patients requiring emergency general surgery will be revealed by retrospective review of health data records and further studies of how it affects mortality and morbidity rates.

CONCLUSION

In COVID-19 pandemic emergency trauma, there has been a decrease in the total number of surgeries in general surgery cases, resulting in an increase in the number of patients treated and followed conservatively. It is clear that COVID-19 disease causes changes in treatment protocols by general surgeons. Comprehensive studies are needed to reveal the reasons for the reduction in the number of these surgeries.

Ethics Committee Approval

This study approved by the Kartal Dr. Lütfi Kırdar City Hospital Clinical Research Ethics Committee (Date: 26.08.2020, Decision No: 2020/514/184/9).

Informed Consent

Retrospective study.

Peer-review

Externally peer-reviewed.

Authorship Contributions

Concept: M.A.; Design: E.A.; Supervision: M.K.; Fundings: S.A., A.Ö.; Materials: M.Y.; Data: O.O.; Analysis: M.K.; Literature search: U.O.i.; Writing: M.A.; Critical revision: S.K., H.F.K., A.B.

Conflict of Interest

None declared.

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Çok Merkezli Çalışma: COVID-19 Pandemisinin Cerrahi Prosedürler Üzerine Etkisi

Amaç: COVID-19 pandemi periyodunun birinci pik dönemi ile bir önceki yılın aynı döneminde acil servislere başvuran ve acil cerrahi servisine konsulte edilen hasta sayılarını ve dağılımını karşılaştırılarak pandeminin etkisini değerlendirmeyi amaçladık.

Gereç ve Yöntem: Türkiye'nin nüfusu en fazla ili olan İstanbul'dur. İstanbul'da üçüncü basamak düzeyinde hizmet veren beş hastanenin acil servisine başvuran hastalar retrospektif olarak değerlendirildi. Şubat-Haziran 2020 pandemi dönemi ve Şubat-Haziran 2019 pandemi öncesi dönemi olarak 2 gruba ayrıldı. Her iki dönemde de acil servisine başvuran hastalar ile genel cerrahiye konsulte edile hasta sayıları ve geliş nedenlerine göre dağılımları analiz edildi.

Bulgular: 2020 yılındaki pandemi dönemindeki beş aylık dönem içinde acil servise başvuran toplam hasta sayısı pandemi dönemi ve 2019 yılındaki 5 aylık dönem de pandemi öncesi için sırasıyla 548509 ve 742064 idi. Acil genel cerrahiye başvuran veya konsulte edilen toplam hasta sayısı sırasıyla 21399 ve 30868 idi. Toplamda acil servise gelen hasta sayısında pandemi döneminde %26.1, acil genel cerrahiye konsulte edilen hasta sayısında %30.7 azalma ($p<0.001$) görüldü. Pandemi döneminde de Acil cerrahi servisinde yapılan toplam ameliyat sayılarında %23.9 ($p=0.62$), travmaya bağlı yapılan ameliyatlarda %11.9 ($p=0.59$) azalma görülmüştür. Travma dışı nedenlerle ameliyat edilen hasta sayıları pandemi döneminde %24.4 ($p<0.004$) azalırken, konservatif takip edilen travma dışı hasta sayısı ise %54.6 ($p<0.0001$) artmıştır.

Sonuç: İstanbul'da COVID-19 salgınının birinci pik döneminde üçüncü basamak hastanelerde acil servislere gelen hasta sayıları, acil cerrahi birimlerine başvuran ve ameliyat edilen hasta sayıları azalmıştır. Travma ve travma dışı nedeniyle acil cerrahi hasta ameliyat sayılarında azalma saptanmıştır. Travma dışı konservatif takip ve tedavi edilen acil cerrahi hasta sayılarında artış izlenmiştir.

Anahtar Sözcükler: Acil cerrahi; COVID-19; pandemi; SARS-CoV-2.