



# IMPACT OF COVID-19 LOCKDOWNS ON EMERGENCY ABDOMINAL WALL HERNIA SURGERY: A RETROSPECTIVE COHORT

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## ABSTRACT

**Aim:** The aim of our study is to evaluate the impact of nationwide lockdowns imposed due to the COVID-19 pandemic on the incidence of incarcerated inguinal, femoral, and incisional hernias in Türkiye.

**Methods:** A retrospective analysis was conducted on patients who underwent emergency surgery for strangulated abdominal wall hernias between 01/04/2020 and 01/04/2023. Patients were divided into two groups based on the timing of surgery. Surgeries performed during the COVID-19 pandemic restrictions were categorized as the lockdown period, while those outside of this date range were considered the free period.

**Results:** The study included a total of 135 cases, and the results revealed significant differences between the free and lockdown periods in terms of hernia types and postoperative outcomes. During the lockdown period, the emergency admission rate for incisional hernias increased from 27.2% to 43.8%, while the rate for inguinal hernias decreased from 42.5% to 22.9%. Intestinal resections increased from 6.9% in the free period to 18.8% in the lockdown period ( $p<0.05$ ). The postoperative ICU admission rate increased from 12.6% to 27.1% ( $p<0.05$ ).

**Conclusion:** Our study found a proportional increase in incisional hernias during the closure period in hernia patients requiring emergency surgery, while a decrease in inguinal hernias was observed. An increase in the need for intensive care unit admissions was observed during this period and a significant increase in intestinal resections was observed. It emphasizes the need for ongoing research in this field to improve patient outcomes and inform clinical decision-making.

**Keywords:** COVID-19, Hernia, Incarceration, Strangulation

## COVID-19 KISITLAMALARININ ACİL KARIN DUVARI FITİĞİ AMELİYATLARINA ETKİSİ: RETROSPEKTİF KOHORT ÇALIŞMASI

### ÖZET

**Amaç:** Çalışmamızın amacı, COVID-19 pandemisi nedeniyle uygulanan ülke çapındaki kapanmaların Türkiye’de strangüle inguinal, femoral ve insizyonel fıtıkların insidansı üzerindeki etkisini değerlendirmektir.

**Yöntemler:** 01/04/2020 ile 01/04/2023 tarihleri arasında strangüle karın duvarı fıtığı nedeniyle acil cerrahi uygulanan hastalar üzerinde retrospektif bir analiz gerçekleştirildi. Hastalar ameliyat zamanlamasına göre iki gruba ayrıldı. COVID-19 pandemisi kısıtlamaları sırasında yapılan ameliyatlara “kapanma dönemi” olarak sınıflandırılırken, bu tarih aralığı dışında kalan ameliyatlara “serbest dönem” olarak kabul edildi.

**Bulgular:** Çalışmaya toplam 135 vaka dahil edildi ve serbest dönem ile kapanma dönemi arasında fıtık türleri ve postoperatif sonuçlar açısından anlamlı farklar olduğu ortaya kondu. Kapanma döneminde insizyonel fıtıklar için acil başvuru oranı %27,2’den %43,8’e yükselirken, inguinal fıtık oranı %42,5’ten %22,9’a düştü. Bağırsak rezeksiyonları serbest dönemde %6,9 iken kapanma döneminde %18,8’e yükseldi ( $p<0,05$ ). Postoperatif yoğun bakım ünitesi (YBÜ) yatış oranı %12,6’dan %27,1’e yükseldi ( $p<0,05$ ).

**Sonuç:** Çalışmamız, acil cerrahi gerektiren fıtık hastalarında kapanma döneminde insizyonel fıtıkların oransal olarak arttığını, inguinal fıtıkların ise azaldığını ortaya koymuştur. Bu dönemde yoğun bakım ihtiyacında bir artış ve bağırsak rezeksiyonlarında anlamlı bir artış gözlemlenmiştir. Bu bulgular, hasta sonuçlarını iyileştirmek ve klinik karar verme süreçlerine katkı sağlamak amacıyla bu alanda yapılacak araştırmaların devam etmesi gerektiğini vurgulamaktadır.

**Anahtar Kelimeler:** COVID-19, Fıtık, İnkarserasyon, Strangülasyon

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## INTRODUCTION

In December 2019, the SARS-CoV-2 virus originating from Wuhan, China, later its leading disease recognized globally as COVID-19, suddenly took center stage in our lives, becoming a pandemic that affected the entire world. During this period, many hospitals temporarily suspended elective surgical procedures to focus on the intensity of the pandemic. With the exception of prioritized cases such as cancer treatment and emergency surgeries, limitations were imposed on elective surgical procedures. A study conducted by the COVIDSurg collaboration developed a model to predict the consequences of the global postponement of elective surgical procedures and another study, also conducted in collaboration with COVIDSurg, supported the reduction of elective surgeries. (1).

Inguinal, umbilical, and incisional hernias, generally referred to as abdominal wall hernias, have surgery as their only treatment method, and there is no medical treatment available. Surgery is recommended even for asymptomatic cases to prevent mortality or morbidity in the event of potential strangulation. (2,3).

It is hypothesized that the lockdown measures implemented nationwide during the pandemic period, along with the postponement of elective surgeries for infection control, and quarantine practices influenced by the overall number of cases and related contacts, have led to an increase in the incidence of strangulated hernias. Furthermore, it is believed that these measures have contributed to an increase in ischemic complications (intestinal resections) due to strangulation in hernias, affecting mortality and morbidity. Indeed, studies have shown an increase in mortality rates in emergency surgeries during the pandemic period. (4).

The aim of our study is to demonstrate the impact of the lockdown measures implemented nationwide during the COVID-19 pandemic on incarcerated inguinal, femoral, and incisional hernias in patients presenting with emergency conditions across the country

## MATERIALS AND METHODS

This study was planned as a retrospective cohort observational study. When establishing the study protocol, the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines were followed. (5).

Retrospectively, incarcerated abdominal wall hernias operated on under emergency conditions between 01/04/2020 and 01/04/2023 were screened at the General Surgery Clinic of Ümraniye Training and Research Hospital. Patients were divided into two groups. Surgeries performed between 01/04/2020 and 01/07/2021, during the period of COVID-19 pandemic restrictions, were defined as lockdown period surgeries, while surgeries performed between 02/07/2021 and 01/04/2023 were considered as free period surgeries. All hernia surgeries were defined according to the ICD-10 (International Classification of Disease) coding system determined by the World Health Organization (WHO). Laparoscopic surgeries could not be performed in our clinic during the lockdown period, therefore they were excluded from the study.

In Türkiye, COVID-PCR test results are processed independently by contact tracing team authorized by the Ministry of Health, and these data are collected in the Ministry of Health's database. For this reason, the COVID-PCR test results for the majority of patients could not be accessed. Therefore, this study was designed to retrospectively assess the temporal effects of the pandemic process, rather than the impact of COVID-19 on patients.

Demographic data (age, gender), date and type of surgery, anesthesia risk according to the American Society of Anesthesiologists (ASA score), type of hernia, mesh usage, and concurrent procedures were analyzed. Descriptive statistics (frequency [f], percentage [%], arithmetic mean [x], standard deviation [SD]) were used to evaluate the data. The normal distribution of variables was determined using visual (histograms and probability plots) and analytical methods (Kolmogorov-Smirnov/Shapiro-Wilk). Non-parametric or parametric tests were chosen based on the suitability. Categorical variables were compared using the X2 test or Fisher's exact test when any of the values were less than 5. Continuous variables were presented as mean and standard deviation, and compared using independent t-tests (or Mann-Whitney U tests when appropriate). A p-value less than 0.05 was considered statistically significant.

## STATISTICAL ANALYSIS

In the study, SPSS (Statistical Package for the Social Sciences) Windows 29.0 (IBM Corp. Armonk, NY, USA) was used for data transformation and analysis of raw data obtained for both groups.

## RESULTS

A total of 135 cases were included in the study. The mean age of all patients was  $60.28 \pm 16.69$ , with a mean age of  $61.98 \pm 16.82$  in the lockdown period group,  $59.34 \pm 16.64$  in the free period group. In terms of gender distribution, 68 (50.4%) patients were male, and 67 (49.6.1%) were female (Table 1).

In the lockdown period group, 10.4% of the patients were operated on for recurrent hernias, while this rate was 2.3% in the free period group. and it was statistically significant ( $p=0.042$ ) (Table 1).

Patients were categorized based on ASA scores into ASA 1-2 and ASA 3-4. During the lockdown period, the distribution was 50% for ASA 1-2 patients and 50% for ASA 3-4 patients. In the free period, these ratios were 64.4% for ASA 1-2 patients and 35.6% for ASA 3-4 patients. Despite the proportional increase in ASA 3-4 patients during the free period, there was no significant difference in the both period ( $p=0,104$ ) (Table 1).

When comparing hernia operations based on their general characteristics, there was no significant difference in the prosthetic mesh usage, bowel strangulation and length of hospital stay between the two periods (Table 2).

In the lockdown period, among patients operated on under emergency conditions, 18.8% underwent bowel resection, while in the free period, this rate was 6.9%. There was a statistically significant difference between the groups ( $p=0.038$ ) (Table 2).

Post-operative intensive care unit (ICU) admission was 27.1% during the lockdown period and 12.6% during the free period. This difference was statistically significant ( $p=0.036$ ) (Table 2).

**Table 1. Demographic Data and Preoperative Characteristics of Patients**

	Total (n = 135)	Lockdown Period (n =48)	Free Period (n = 87)	p
<b>Age (years)</b>				0.272
Mean (SD)	$60.28 \pm 16.69$	$61.98 \pm 16.82$	$59.34 \pm 16.64$	
<b>Gender</b>				0.063
Male (%)	68 (%50.4)	19 (%39.5)	49 (%56.3)	
Female (%)	67 (%49.6)	29 (%60.5)	38 (%43.7)	
<b>Hernia Type (%)</b>				0.006
Incisional Hernia	36 (%26.7)	21 (%43.8)	15 (%27.2)	
Umbilical Hernia	30 (%22.2)	8 (%16.7)	22 (%25.3)	
Femoral Hernia	21 (%15.6)	8 (%16.7)	13 (%14.9)	
Inguinal Hernia	48 (%35.6)	11 (%22.9)	37 (%42.5)	
<b>Recurrence (%)</b>				0.042
Recurrence	7 (%5.2)	5 (%10.4)	2 (%2.3)	
<b>ASA scores</b>				0,104
ASA 1-2	80 (%59.3)	24 (% 50)	56 (%64.4)	
ASA 3-4	55 (%40.7)	24 (% 50)	31 (%35.6)	
SD = standard deviation Data presented as mean $\pm$ SD or n (%)				

	<b>Total (n = 135)</b>	<b>Lockdown Period (n = 48)</b>	<b>Free Period (n = 87)</b>	<b>p</b>
Mesh Usage (%)	127 (94.1%)	43 (89.6%)	84 (96.6%)	0.101
Bowel Strangulation (%)	83 (61.5%)	32 (66.7%)	51 (58.6%)	0.358
Bowel Resection	15 (11.1%)	9 (18.8%)	6 (6.9%)	0.038
Postoperative ICU Admission	24 (17.7%)	13 (27.1%)	11 (12.6%)	0.036
Length of Hospital Stay	2.75 ± 4.09	2.44 ± 2.25	2.92 ± 4.81	0.915
<i>ICU: Intensive Care Unit</i> <i>Data is presented as mean ± SD or n (%)</i>				

When we look at the rates of different hernia types in all hernia repairs, incisional hernia repair was 17.2% during the free period, and this rate increased to 43.8% during the lockdown period. Inguinal hernia repair, on the other hand, decreased from 42.5% to 22.9%. There was a significant difference in hernia types between the two periods ( $p=0.006$ ). Subgroup analysis revealed that this difference was attributed to incisional and inguinal hernias.

During the lockdown period, the strangulation rate in incisional hernias was 37.5%, while it was 14.9% during the free period ( $p=0.003$ ). Intestinal resections during the lockdown period were 10.4%, compared to 1.1% during the free period ( $p=0.021$ ) (Table 3).

In the umbilical, inguinal and femoral hernia subgroups, there were no statistically significant differences in terms of strangulation and intestinal resection (Table 3).

While the total postoperative morbidity, recurrence, COVID-19 infection and mortality were similar between the two groups (Table 4).

	<b>Total (n = 135)</b>	<b>Lockdown Period (n = 48)</b>	<b>Free Period (n = 87)</b>	<b>p</b>
<b>Incisional Hernia</b>	<b>36 (26.7%)</b>	<b>21 (43.8%)</b>	<b>15 (17.2%)</b>	<b>0.001</b>
Strangulation	31 (23%)	18 (37.5%)	13 (14.9%)	0.003
Bowel Resection	6 (4.4%)	5 (10.4%)	1 (1.1%)	0.021
<b>Umbilical Hernia</b>	<b>30 (22.2%)</b>	<b>8 (16.7%)</b>	<b>22 (25.3%)</b>	<b>0.286</b>
Strangulation	13 (9.6%)	3 (6.3%)	10 (11.5%)	0.379
Bowel Resection	2 (1.5%)	1 (2.1%)	1 (1.1%)	1.000
<b>Femoral Hernia</b>	<b>21 (15.6%)</b>	<b>8 (16.7%)</b>	<b>13 (14.9%)</b>	<b>0.808</b>
Strangulation	13 (9.6%)	5 (10.4%)	8 (9.2%)	1.000
Bowel Resection	5 (3.4%)	0 (0%)	3 (3.4%)	0.160
<b>Inguinal Hernia</b>	<b>48 (35.6%)</b>	<b>11 (22.9%)</b>	<b>37 (42.5%)</b>	<b>0.025</b>
Strangulation	26 (19.3%)	6 (12.5%)	20 (23%)	0.139
Bowel Resection	5 (3.7%)	3 (6.3%)	1 (1.1%)	0.126

**Table 4. Mortality-Morbidity-Recurrence Rates**

	<b>Lockdown Period (n =48)</b>	<b>Free Period (n = 87)</b>	<b>p</b>
Morbidity	12 (25%)	28 (32.2%)	0.382
Morbidity related to pulmonary sources	1 (2.1%)	7 (8%)	0.259
Morbidity related to cardiac sources	0	3 (3.4%)	0.552
Wound site infections	11 (22.9%)	21 (24.1%)	1
Intra-abdominal abscess	1 (2.1%)	1 (1.1%)	1
Recurrence	5 (10.4%)	2 (2.3%)	0.097
COVID-19 infection	24 (50%)	39 (44.8%)	0.564
Mortality	4 (6.2%)	5 (5.8%)	1
<b>Data presented as n (%)</b>			

## DISCUSSION

When examining demographic data, the mean age of all patients was found to be  $58.92 \pm 15.97$ . During the lockdown period, the mean age was  $60.33 \pm 17.76$ , while it was  $58.43 \pm 15.55$  in the free period. Comparing with the study conducted by Topçu et al. in 2013, it was observed that emergency abdominal wall hernias were in line with the demographic data in Türkiye (6). Although the difference was not statistically significant, an increase in the proportion of female patients during the lockdown period was observed. The “watchful waiting” (WW) procedure was described by Fitzgibbons et al. in a randomized controlled trial conducted exclusively in male patients. In that study, which included 720 male participants, only one patient in the WW group developed incarceration within two years, and one patient required intestinal resection during a four-year follow-up. In the present study, the lower proportion of male patients during the lockdown period could be interpreted in this context. However, it should be emphasized that the WW procedure is applied to elective cases. The delay in elective surgeries during the lockdown period was not due to the intentional implementation of this procedure, but was a consequence of the suspension of elective hernia surgeries due to pandemic-related restrictions (7).

In 2022, Howard et al. examined umbilical and incisional hernias operated on for 12 years. They reported a recurrence rate of 14.3% (8). In a study based in Denmark in 2015, the recurrence rate of umbilical and epigastric

hernias in the population was reported as 16.5% (9). In a study by Neumayer and et al. comparing laparoscopic and open prosthetic mesh use, the recurrence rate for inguinal hernias was reported as 15%. (10). In our study, there was no significant difference in the recurrence rates, which are consistent with the literature from non-pandemic periods. However, the weaknesses of our study include not having reached an adequate follow-up period and the lack of homogeneity in follow-up durations among the groups.

Even though the watchful-waiting procedure is available for inguinal hernias, delays in the treatment of femoral and incisional hernias increase incarcerations and strangulations. Although Kokotovic et al. (11) suggested that the WW procedure could be applied to umbilical and incisional hernias, long-term waiting is not recommended for incisional hernias. Like in our study, a study examining abdominal wall hernias in Southeast Scotland during the COVID-19 pandemic was conducted. Ewing et al. mentioned the decreased elective surgeries during the pandemic. This study showed a proportional increase in emergency surgeries in umbilical, incisional, inguinal, and femoral hernia types. However, there was also a significant increase in femoral and incisional hernia types in emergency surgery rates (12). In the study conducted by Turan et. al. during the pandemic period in Türkiye, it is observed that the demographic data are consistent with the data from our own study's pandemic period (13).



The significant increase in intestinal resections has been a critical point in our study. This is because a study conducted by Kurt et al. at Kartal Training and Research Hospital in our country has addressed the relationship between the duration of symptoms, intestinal resection, and mortality (14). On the other hand, Turan et al. did not find a statistically significant difference in terms of organ resections.

In the study by Surek et al., which examined 355 emergency surgical operations in Türkiye, no significant difference in postoperative morbidities was found between the lockdown and free periods, supporting the findings of our study (15). However, the absence of data regarding body mass index, smoking and alcohol consumption, and comorbidities in our study constitutes an important limitation in the interpretation of this result.

During the early stages of the pandemic, concerns about the potential spread of pneumoperitoneum gases, combined with warnings, led to the non-use of laparoscopy in emergency operations at our clinic (16).

## CONCLUSION

In our study, incisional hernias were found to significantly increase in emergency admissions during the lockdown period, while inguinal hernias decreased. Despite similar hospitalization durations, post-operative ICU admissions and bowel resection rates were significantly higher during the lockdown. Subgroup analysis revealed increased bowel resections in incisional hernias, with strangulation rates notably higher in these cases. Recurrence rates and overall morbidity and mortality was the similar between groups. Our study is retrospective, based on data within our hospital. The lack of information regarding BMI, smoking habits, alcohol use, and comorbidities in our study represents a limitation. Additionally, the size of the population is a limiting factor and likely contributes to the nonsignificant results observed. In future pandemics, prospective studies with larger samples should validate these data.

## DECLARATIONS

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### Conflicts of Interest

The authors declare that they have no competing interests.

### Ethical Standards

Our study was conducted with the ethical approval numbered B.10.1.TKH.4.34.H.GP.0.01/179, obtained from the Clinical Research Ethics Committee of Ümraniye Training and Research Hospital, University of Health Sciences, on May 15, 2023.

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