



# Effect of COVID-19 pandemic on surgical treatment of inguinal hernia: A retrospective study in a single center

COVID-19 pandemisinin inguinal herni cerrahi tedavisi üzerindeki etkisi: Tek bir merkezde retrospektif bir çalışma

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## Abstract

**Aim:** In this study, we aimed to examine the effect of the COVID 19 pandemic on the number, complication rates and epidemic characteristics of patients operated with the diagnosis of inguinal hernia in our institute.

**Methods:** We analyzed all patients who underwent inguinal hernia operation in Trakya University Faculty of Medicine, Dept of General Surgery, between March 11, 2019, and March 11, 2020, and compared them with the cases between March 11, 2020, and March 11, 2021, retrospectively. Percentages, mean, standard deviation, median and interquartile range were used as the descriptive statistics. Mann-Whitney U test was used for the variations which are contrary to the normal distribution range in the comparison of two groups. The relations between qualitative variations were studied by the Pearson Chi-Square test and Fisher's Exact test. Significant value was determined as 0.05 for all statistical analyses.

**Results:** Between March 11, 2019, and 2020, 65 patients were operated on (Group 1), and 26 patients between March 11, 2020, and 2021 (Group 2). The percentage of female patients was significantly higher in Group 2 (4.6% in Group 1, 23.1% in Group 2,  $p=0.008$ ) and there was a statistically significant increase in the rate of incarceration and strangulation in Group 2 (44.6% in Group 1, 84.6% in Group 2,  $p=0.001$ ).

**Conclusions:** During the COVID-19 pandemic the incarceration and strangulation rate was higher. The increase in complication rates can be attributed to the relative decrease in elective surgeries or the increase in the number of female patients admitted during the COVID period.

**Keywords:** Inguinal Hernia, COVID, strangulation, incarceration, surgery.

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## Öz

**Amaç:** Bu çalışmada, enstitümüzde kasık fıtığı tanısı ile ameliyat edilen hastaların sayısı, komplikasyon oranları ve epidemik özellikleri üzerine COVID 19 pandemisinin etkisini incelemeyi amaçladık.

**Yöntemler:** 11 Mart 2019-11 Mart 2020 tarihleri arasında Trakya Üniversitesi, Tıp Fakültesi Genel Cerrahi Anabilim Dalı'nda kasık fıtığı ameliyatı olan tüm hastaları geriye dönük olarak inceleyerek 11 Mart 2020-11 Mart 2021 tarihleri arasındaki olgularla karşılaştırdık. Tanımlayıcı istatistiksel değerlendirme olarak ortanca, çeyrek değerler; yüzde ve frekans oranları verildi. İki grubun karşılaştırılmasında normal dağılım aralığına aykırı varyasyonlar için Mann-Whitney U testi kullanıldı. Niteliksel varyasyonlar arasındaki ilişkiler Pearson Ki-Kare testi ve Fisher'in kesin testi ile incelendi. Tüm istatistiksel analizler için anlamlı değer  $p \leq 0,05$  olarak belirlendi.

**Bulgular:** 11 Mart 2019 – 2020 tarihleri arasında 65 hasta (Grup 1), 11 Mart 2020 – 2021 (Grup 2) arasında 26 hasta ameliyat edildi. Kadın hasta oranı Grup 2'de anlamlı olarak daha yüksekti (Grup 1'de %4,6, Grup 2'de %23,1,  $p=0,008$ ) ve Grup 2'de inkarasyon ve strangülasyon oranında istatistiksel olarak anlamlı bir artış vardı (Grup 1'de %44,6, Grup 2'de %84,6,  $p=0,001$ ).

**Sonuç:** COVID-19 salgını sırasında inkarasyon ve strangülasyon oranı daha yüksekti. Komplikasyon oranlarındaki artış, elektif ameliyatların göreceli olarak azalmasına veya covid döneminde başvuran kadın hasta sayısının artmasına bağlanabilir.

**Anahtar Kelimeler:** İnguinal herni, COVID, strangülasyon, inkarasyon, cerrahi.

## Introduction

Coronavirus 2019 (COVID-19) is a highly contagious respiratory infection caused by a new virus, acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2). On March 11, 2020, the outbreak of COVID-19 was declared a pandemic by the World Health Organization (WHO) [1, 2]. Symptoms of this viral pneumonia include fever, cough, and chest discomfort, as well as dyspnea and bilateral lung infiltration in severe instances.[3]. Because of the virus's high infectious potential, hospitals around the globe quickly became overburdened with the number of infected patients and their need for respiratory assistance. As a result, numerous countries declared states of emergency and recommended their citizens to stay at home, while hospitals were recommended to cancel elective surgeries [4-6]. These factors combined with the fear of COVID-19 led to a fewer number of ER visits but an increased complication rate of emergency surgeries such as acute appendicitis [7, 8].

Inguinal hernia is one of the most performed abdominal surgeries with more than 10 million performed all around the globe every year. Incarceration of the hernia happens when the contents of the hernia get trapped within it and cannot return to their original position. The symptoms of the incarceration, which is mostly pain and discomfort, depends on the hernia's pathological effects on the physiological function of the trapped part. If the trapped part's blood flow is cut off the part becomes strangulated.[9]. A noteworthy factor for developing complicated inguinal hernia is the time between the beginning of the symptoms and admission to the hospital [10, 11].

With the beginning of the COVID-19 pandemic, admission to hospitals with abdominal emergencies such as incarcerated hernias decreased significantly [12, 13]. While some articles reported a serious decrease in emergency surgeries and the number of incarcerated hernias, some reported an increase in the number of incarcerated hernias during the pandemic [14,15].

In this study, we compared the inguinal hernia surgeries and the rate of incarceration within those cases in 1 year period after the declaration of COVID-19 as a pandemic to compare it with the same duration of time before March 11, 2020, to see if the COVID-19 pandemic had any effect on emergency inguinal hernia surgeries.

## Material and methods

### Study

This single-center retrospective study included the period between 11 March 2019 and 11 March 2020 as the pandemic period (Group 1) and between 11 March 2020 and 11 March 2021 (Group 2) in Trakya University Faculty of Medicine, Department of General Surgery, Edirne, Turkey. The study included all patients who were operated for inguinal hernia in the General Surgery Clinic of the Trakya University Hospital. This study was approved by the Scientific Research Ethics Committee of Trakya University School of Medicine (Protocol Code: Protocol code: TÜTF-GOBAEK 2022/175).

The data of only emergency operated patients were analyzed by reviewing the hospital system. We exclude the patients who were under 18 years old or had hernias other than an inguinal hernia. Patients presenting with symptoms of mechanical intestinal obstruction, incarceration and/or strangulation were urgently operated, while patients with a history of incarceration in the pandemic period or severe pain who did not have an indication for emergency surgery were operated electively. The single-center study and the small number of patients studied can be cited as the limitations of this study.

Patients' age, gender, length of stay, surgical procedure, and presence of incarceration were recorded. The data were compared between Group 1 and 2.

### Statistical Analysis

Percentages, mean, standard deviation, median and interquartile range were used as the descriptive statistics. Categorical data were analyzed with Pearson's Chi-Square and Fisher's Exact test to compare between categories expressed as numbers while Student's T-Test and Mann-Whitney U Test were used for continuous variables. Statistical significance was shown as P value <0.05 and all results were expressed with a confidence interval of 95%. G-Power program to perform our Post-Hoc power analysis. The calculated effect size of the study group was 0.523. With 0.523 effect size, Df=1 and a significance value of p<0,05, the power of the study was calculated as 0.998. All statistical analyses were performed with the TURCOSA (Turcosa Analytics Ltd Co, Turkey, www.turcosa.com.tr) statistical software program.

## Results

### Number of Inguinal Hernia Cases

Between March 11, 2019, and 2021, a total of 110 patients were administered to our hospital for inguinal hernias. Of those, 19 patients were excluded from our research because of misdiagnosis. Of the remaining 91, 65 patients were operated on before March 11, 2020, and 26 patients were operated on during the first year of COVID-19 Pandemic.

### Pre-operative Characteristics

Between the groups, there was no significant difference of median ages (59 for Group 1, 62 for Group 2). Although there was a statistically significant increase in female patients in Group 2, (23%) when compared with the Pre-Pandemic Group 1 (5%) with a p-value of P=0,008. Indirect inguinal hernia rates in Group 1 and Group 2 were 52%- 46%, direct inguinal hernia rates were 35%- 30%, respectively, while femoral hernia rates were 12% and 23% (p<0.005). Most importantly when the incarceration rate was compared between groups there was a statistically significant increase in Group 2(85%) compared to Group 1(56%). The demographic and clinical data of Group 1 and Group 2 are summarized in Table 1.

### Operative and Post-operative Characteristics

Regarding surgical interventions, there was no significant difference between conventional and laparoscopic approaches when groups are compared (10 laparoscopic, 55 conventional operations in Group 1, and 4 Laparoscopic, 22 conventional operations in Group 2, p=1.000). There were no post-operative deaths in both groups. When compared, there was no significant difference between mean Length of stay between groups (2.86 ± 2.03 days for Group 1 and 2.15 ± 0.78 days for Group 2, p=0.208).

## Discussion

In our study, designed to see if the COVID-19 pandemic had any effect on inguinal hernia surgeries, we found that there was a significant increase in the rate of incarceration seriously. We found that during the first year of the COVID-19 pandemic, the rate of incarceration was surprisingly increased from 56% to 85% when compared with the previous year.

Table 1. Demographic and clinical characteristics of the groups.

		Group I (Pre-Pandemic) (n=65)	Group II (Pandemic) (n=26)	p
Age (year) †		59 (22-85)	62 (28-89)	0.662
Sex ‡	Male	62 (95.4)	20 (76.9)	0.008
	Female	3 (5.6)	6 (23.1)	
Length of stay (day) §		2.86 ± 2.03	2.15 ± 0.79	0.208
Reductable ‡		36 (55.4)	4 (15.4)	
Incarceration ‡		29 (45.6)	22 (85.6)	0.001
Approach ‡	Conventional	55 (84.6)	22 (84.6)	1.000
	Laparoscopic	10 (15.4)	4 (15.4)	

†: median (range), ‡: n (%), §: mean standard deviation

There is a relative decrease in the number of operations in our center which was consistent with the studies conducted by Surek et al.[13], Lima et al. [14], and Kurihara et al. [16]. The decrease in the number of operations may be due to the authorities' encouragement to stay at home, the cancellation of elective surgeries, and patients' fear of contracting the virus and getting infected. Additionally, the increase of incarceration rate is most likely due to delayed admission to the hospital probably caused by same factors that led to the decrease in the surgeries.

The high number of female patients and femoral hernias during the COVID period can also be shown as the reason for the increase in the rate of incarceration. It is known that femoral hernias are high risk group among inguinal hernias and are frequently associated with complications [17]. Femoral hernia rate of 3% among inguinal hernias constitutes a small part of elective operations. However, with incarceration and strangulation, the rate of femoral hernia can reach up to 20-40% in emergency applications. In the study of Glassow et al. [18], covering a period of 17 years and 2105 patients with femoral hernia, it is shown that the rate of femoral hernia in women increased up to 38%. As a result, femoral hernia and indirectly female gender are thought to constitute a risk group for emergency incarcerated hernia operations when compared with elective operations [17].

Surprisingly, the data we studied showed that significantly more women were operated on for inguinal hernia during the pandemic than the previous year. This might be caused because being a female is a risk factor on its own for complicated hernia and it might increase the chances of complications in an event where the hospital admission is already delayed [10, 11]. But our patient groups are too small to make such assumptions. With a larger study group, this parameter could be researched better.

In our post-operative data, we found that the length of stay in our hospital was longer in the Pre-Pandemic group. This data contradicts with research done for abdominal surgeries such as colorectal surgeries conducted by Changzheng et al. [8] and the study studying complicated appendicitis conducted by Marie Burgard et al. [19] where length of stay at hospitals were longer during the pandemic. It can be assumed that, because there is an additional risk of contracting COVID-19 infection, patients were more likely sent home sooner than the pre-pandemic group to eliminate any further risk recommended by guidelines [4-6].

We can list the existing limitations in our study as follows; being single-centered, retrospective, and small sample size. We used the data of a single hospital limited to between March 11, 2019, and March 11, 2021. Choosing a longer period of time as the control group might have led to different results. The curfew during the pandemic and the underestimations of

symptoms by the patient or general practitioners could have led to a fewer number of patients but most of our patients were already in conservative follow-up period by our surgeons so we believe who did not admit to our hospitals were relatively low.

In conclusion, in our study, COVID-19 pandemic caused a decrease in both elective and emergency hernia surgery but a significant increase in the incarceration rate. The small sample size and retrospective design are the limitations of our study. It will be useful to reveal a clearer surgical planning calendar in order to reduce our rate of encountering complicated cases in pandemic situations such as covid, thanks to prospective and larger series studies to be carried out in the future.

## References

1. RETAINER Collaborative Group; Irish Surgical Research Collaborative. International snapshot study exploring the impact of COVID-19 on elective inguinal hernia repair. *Br J Surg.* 2021;108:e301-e1173.
2. Wu F, Zhao S, Yu B, Chen YM, Wang W, Song ZG, et al. A new corona virus associated with human respiratory disease in China. *Nature.* 2020;579:265-9.
3. Hu B, Guo H, Zhou P, Shi ZL. Characteristics of SARS-CoV-2 and COVID-19. *Nat Rev Microbiol.* 2021;19:141-54.
4. COVIDSurg Collaborative, Global guidance for surgical care during the COVID-19 pandemic, *Br J Surg.* 2020;107:1097-103.
5. Brindle ME, Gawande A. Managing COVID-19 in Surgical Systems. *Ann Surg.* 2020;272:e1-e2.
6. Stabilini C, East B, Fortelny R, Gillion JF, Lorenz R, Montgomery A, et al. European Hernia Society (EHS) guidance for the management of adult patients with a hernia during the COVID-19 pandemic. *Hernia.* 2020;24:977-83.
7. Boserup B, McKenney M, Elkbuli A. The impact of the COVID-19 pandemic on emergency department visits and patient safety in the United States. *Am J Emerg Med.* 2020;38:1732-6.
8. Burgard M, Cherbanyk F, Nassiopoulou K, Malekzadeh S, Pugin F, Egger B. An effect of the COVID-19 pandemic: Significantly more complicated appendicitis due to delayed presentation of patients! *PLoS One.* 2021;16:e0249171.
9. HerniaSurge Group. International guidelines for groin hernia management. *Hernia.* 2018;22:1-165.
10. Kurt N, Oncel M, Ozkan Z, Bingul S. Risk and outcome of bowel resection in patients with incarcerated groin hernias: retrospective study. *World J Surg.* 2003;27:741-3.
11. Ge BJ, Huang Q, Liu LM, Bian HP, Fan YZ. Risk factors for bowel resection and outcome in patients with incarcerated groin hernias. *Hernia.* 2010 Jun;14(3):259-64.
12. Dong CT, Liveris A, Lewis ER, Mascharak S, Chao E, Reddy SH, Teperman SH, McNelis J, Stone ME Jr. Do surgical emergencies stay at home? Observations from the first United States Coronavirus epicenter. *J Trauma Acute Care Surg.* 2021;91:241-6.
13. Lima DL, Pereira X, Dos Santos DC, Camacho D, Malcher F. Where are the hernias? A paradoxical decrease in emergency hernia surgery during COVID-19 pandemic. *Hernia.* 2020;24:1141-2.
14. Surek A, Ferahman S, Gemici E, Dural AC, Donmez T, Karabulut M. Effects of COVID-19 pandemic on general surgical emergencies: are some emergencies really urgent? Level 1 trauma center experience. *Eur J Trauma Emerg Surg.* 2021;47:647-52.

15. Mulita F, Sotiropoulou M, Vailas M. A multifaceted virus. Non-reducible and strangulated effects of COVID-19. *J Trauma Acute Care Surg.* 2021;91:e34.
16. Kurihara H, Marrano E, Ceolin M, Chiara O, Faccincani R, Bisagni P, et al. Impact of lockdown on emergency general surgery during first 2020 COVID-19 outbreak. *Eur J Trauma Emerg Surg.* 2021;47:677-82.
17. Uludag M, Yetkin G, Kebudi A, Isgor A, Akgun I, Dönmez AG. A rare cause of intestinal obstruction: incarcerated femoral hernia, strangulated obturator hernia. *Hernia.* 2006;10:288-91.
18. Glassow F. Femoral hernia. Review of 2,105 repairs in a 17 year period. *Am J Surg.* 1985;150:353-6.
19. He C, Li Y, Huang X, Hu S, Yan Y, Liu Y, Zhao P, Lin H, Xu X, Wang Y, Teng D, Du X. How should colorectal surgeons practice during the COVID-19 epidemic? A retrospective single-centre analysis based on real-world data from China. *ANZ J Surg.* 2020;90:1310-5.