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Were appendicitis' more complicated in the Covid-19 pandemic?

Covid-19 Pandemisinde Apandisitler Daha Komplike Miydi?

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Öz

COVID-19 pandemi sürecinde kliniğimizde akut apandisit nedeniyle opere edilen hastaların sıklığını, komplikasyon oranlarını ve hastane maliyetlerini nasıl etkilediğini araştırdık. Retrospektif olarak planlarak yapılan bu çalışmada Covid-19 pandemi dönemi (15 Mart – 31 Mayıs 2020) sırasında akut apandisit tanısı ile opere edilen hastalara ait veriler pandemi olmayan dönemde (15 Mart – 31 Mayıs 2019) opere edilen hastalara ait veriler ile karşılaştırıldı. COVID-19 pandemi döneminde opere edilen hastalar Grup A ve pandemi olmayan dönemde opere edilenler ise Grup B olarak kategorize edildi. Hastaların klinikopatolojik özellikleri, hastalık insidansı, hastalığın komplike olup olmadığı ve hastane maliyetleri incelendi.Çalışma kriterlerini sağlayan toplamda 108 hastanın 46'sı grup A'da ve 62'si grup B'de olacak şekilde gruplandırıldı. Apendiks çapları karşılaştırıldığında Grup A'daki hastaların apendiks çapı Grup B'deki hastaların apendiks çaplarına göre daha yüksekti (8±SD mm vs 7±SD mm, p<0.001). Grup A'daki hastaların operasyon süresi Grup B' deki hastalara göre daha uzundu (47.5±15.41 dakika vs 40±9.61 dakika, sırasıyla, p<0.001). Grup A'da 10 hastada (%21.7) ve Grup B'de 4 hastada (%6.5) intraabdominal dren yerleştirilmek zorunda kalındı (p=0.039). Yara yeri enfeksiyonlarının tamamı Grup A'da açık yapılan operasyonlarda görüldü. Gruplar arasında maliyet analizi karşılaştırıldığında Grup A'da hasta başı maliyet ortalaması 1284.10 ±804.11TL iken Grup B'deki hastalarda 1066.43 ±671.28 TL idi ve gruplar arasındaki fark istatistiksel olarak anlamlı bulundu (p=0.040). Covid-19 pandemi döneminde akut apandisit tanısı ile opere edilen hastalar daha komplike hale gelmiş, hastalarda morbidite ve hastane maliyetleri artmıştır.

Anahtar Kelimeler: Akut Apandisit, Covid-19, Komplike Apandisit, Morbidite

Abstract

To investigate the frequency of patients operated for acute appendicitis during the COVID-19 pandemic period, their complication rates and how it affected hospital costs. In this retrospective study, the data of patients who were operated with the diagnosis of acute appendicitis during the Covid-19 pandemic period (15 March - 31 May 2020) were compared with the data of those operated in the non-pandemic period (15 March - 31 May 2019). Patients who were operated during the COVID-19 pandemic period were categorized as Group A and those operated in the non-pandemic period as Group B. The clinicopathological characteristics of patients, the incidence of the disease, whether the disease was complicated, and the hospital costs were analyzed. Of a total of 108 patients meeting the study criteria, 46 were assigned to Group A and 62 to Group B. When the appendix diameters were compared, the mean appendix diameter of the patients in Group A was higher than that of the patients in Group B (8±SD mm vs. 7±SD mm, p< 0.001). The mean operative time of the patients in Group A was longer than that of the patients in Group B (47.5±15.41 minutes vs. 40±9.61 minutes, respectively, p < 0.001). Intraabdominal drain was required in 10 patients (21.7%) in Group A and 4 patients (6.5%) in Group B (p=0.039). All the wound infections developed in Group A in open operations. When the cost analysis between the groups was compared, the mean cost per patient in Group A was 1284.10±804.11 TL, while it was 1066.43±671.28 TL in Group B, and the difference between the groups was statistically significant (p=0.040). During the Covid-19 pandemic, patients who were operated with the diagnosis of acute appendicitis became more complicated, and the morbidity and hospital costs of patients increased.

Keywords: Acute Appendicitis, Complicated Appendicitis, Covid-19, Morbidity

Introduction

In Wuhan, Hubei province of China, 2019 novel coronavirus (2019-nCoV) was temporarily identified in December 2019 and then severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) on 12 January 2020. On February 11, 2020, the World Health Organization officially named the disease caused by the virus as COVID-19 (1). According to the July 30, 2020 data of the World Health Organization, the virus was detected in more than 16 million people, and more than 660 thousand died, and it still continues to spread rapidly (2).

Acute appendicitis (AA) is the most common emergency condition faced by general surgeons, accounting for 4.5% of all abdominal pain cases (3). While appendectomy is considered the gold standard for AA treatment, there are also those who argue a conservative approach using antibiotics as the first-line therapy in selected cases (4).

After the first case was announced in our country on March 11, 2020, elective surgeries except for emergency and malign diseases were limited within the scope of the measures taken, and this restriction continued until June 1, 2020. Many countries are struggling to prevent the spread of the COVID-19 pandemic using different strategies. Authorities instructed the public to use more telemedicine-based practices, to stay home and to avoid visiting local clinics and hospitals (5). However, medical emergencies continue to be seen alongside the current epidemic, and these life-threatening emergencies must be treated urgently. Early diagnosis and treatment is of great importance to reduce the complication rate. Delayed diagnosis and

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treatment of these emergencies can lead to significant morbidity that can aggravate the damage caused by COVID-19 infection (6).

Preoperative intraabdominal or pelvic abscess is seen in 3.8% of patients presented with appendicitis (7). A delay before admission to the hospital is conventionally considered as the most important risk factor for perforation and abscess formation. Low perforation rates are possible in patients who have faster access to surgical intervention and who are treated rapidly after the diagnosis. While the number of COVID-19 cases has increased worldwide, there has been a decrease in other emergencies such as appendicitis, organ perforations, myocardial infarction and cerebrovascular pathologies presented to the emergency department (8). We noticed that there was a significant decrease in the number of AA cases presented to our emergency department, and that the cases we encountered were more complicated, the length of hospital stay of patients increased, and the costs were higher.

This study aims to investigate the frequency of patients operated for acute appendicitis during the COVID-19 pandemic period, their complication rates, and how it affected hospital costs.

Material and Method

This study was conducted on patients who were operated with the clinical and/or radiological diagnosis of acute appendicitis in Gazi University, Faculty of Medicine, General Surgery Clinic after obtaining approval from the Clinical Research Ethics Committee of Gazi University (25901600-604.01-18). The data of the patients who were operated with the diagnosis of acute appendicitis during the Covid-19 pandemic period (15 March - 31 May 2020) were compared with the data of those operated in the non-pandemic period (15 March - 31 May 2019).

Patients who were operated during the COVID-19 pandemic period were categorized as Group A and those operated in the non-pandemic period as Group B.

The study included patients older than 18 years of age, who were operated with the clinical and/or radiological diagnosis of acute appendicitisand whose electronic medical records can be accessed. A patient with a postoperative pathological diagnosis of malignancy and a patient who was operated with the diagnosis of AA during the treatment in the hematology clinic were not included in the study.
The patients' demographic characteristics such as age and gender, type of operation (open-laparoscopic), operative time, laboratory tests such as neutrophil and white blood cell count for preoperative diagnosis, preoperative ultrasonography or abdominal computed tomography findings, time from admission to emergency service to operation, use of intraabdominal drains postoperatively, postoperative length of hospital stay, postoperative complications (wound infection, intraabdominal abscess), and hospital costs were analyzed retrospectively from hospital records . Histopathologically acute appendicitis with local peritonitis, lymphoid hyperplasia, obliterated appendicitis or appendicitis without specific pathology were classified as uncomplicated, and those defined as phlegmanous appendicitis and perforated appendicitis were classified as complicated.

The primary aim of the study was to understand whether there are changes in the preoperative, intraoperative and postoperative characteristics of patients who were operated with the pre-diagnosis of acute appendicitis during the COVID-19 pandemic period and in the non-pandemic period. The secondary aim was to determine the costs of this condition to our hospital by evaluating the reasons for the decrease in the incidence of AA.

All statistical analyses were carried out with IBM SPSS version 20.0 (IBM Co., Armonk, NY, USA) and p-values of <0.05 were considered statistically significant. Qualitative parameters were presented by persentages and frequencies. Continuous data were analyzed using mean, median, standard deviation, and min-max values. The chi-square test was used to compare two groups with nominal results. The Kolmogrov-Smirnov test was used to determine whether the data follow a normal distribution. The independent t-test was used to compare variables conforming to normal distribution, and the Mann-Whitney U test was used to compare variables that were non-normally distributed.

Results

Between the study dates, 110 patients were operated with the diagnosis of AA. One patient, whose histopathological diagnosis was carcinoid tumor and who was operated in the hematology clinic, was not included in the study. Of a total of 108 patients meeting the study criteria, 46 were assigned to Group A and 62 to Group B. Neither preoperative nor postoperative Covid-19 infection was detected in any of the patients.

When the patient groups were compared, there was no statistically significant difference between the groups in terms of demographic characteristics such as age, gender, laboratory results such as neutrophil count, white blood cell count, time from hospital admission to operation, length of hospital stay, and the incidence of postoperative intrabdominal abscess development (Table 1). When the appendix diameters obtained by ultrasound and abdominal computed tomography performed for the preoperative diagnosis were compared, appendix diameters of the patients in Group A were higher than the appendix diameters of the patients in Group

B (8±4.34 mm vs 7±4.12 mm, <0.001). In Group A, 31 (67.4%) of the patients underwent open surgery due to the precautions taken, while all patients in Group B were operated using the laparoscopic technique. The mean operative time of the patients in Group A was longer than that of the patients in Group B (47.5±15.41 minutes vs. 40 ±9.61 minutes, respectively, p<0.001). Drains were used in the patients who we thought might develop postoperative intra-abdominal infection, collection, or bleeding. Intraabdominal drain was required in 10 patients (21.7%) in Group A and 4 patients (6.5%) in Group B (p<0.039). All the wound infections developed in Group A in open operations. One of the wound infections was deep and the others were superficial. Postoperative intra-abdominal abscess developed in 2 patients in Group A and 1 patient in Group B, and patients in Group A received percutaneous drainage. When the cost analysis between the groups was compared, the mean cost per patient in Group A was 1284.10±804.11Turkish Liras (TL), while it was 1066.43±671.28 TL in Group B, and the difference between the groups was statistically significant (p<0.040).

Table 1. A comparison between Groups A and B of the demographic and clinical data of the patients presented with AA

	Total (n=108)	**Group A (n=46)**	**Group B (n=62)**	**p**
Age, year	28.5±10.02	27 ±8.63	29 ±10.95	0.514
Gender, n (%)				
Male	64 (59.3)	32 (69.6)	32 (51.6)	0.093
Female	44 (40.7)	14 (30.4)	30 (48.4)	
Neutrophil count	10.253 ±4.1	10.98 ±4.09	9.71 ±4.07	0.089
WBC	12.73±4.08	13.17 ±4.13	12.40±4.05	0.204
Diameter of appendix, mm	7.004 ±4.12	8 ±4.34	7 ±3.73	**0.001**
Operation type, n (%)				
Open	31 (28.7%)	31 (67.4%)	0	**0.001**
Laparoscopic	77 (71.3%)	15 (32.6%)	62 (100%)	
Length of surgery, min.	40(20-90)	47.5(25-90)	40 (20-70)	**0.001**
Postop. peritoneal drain	14 (13%)	10 (21.7%)	4 (6.5%)	**0.039**
Length of admission, day	2 (0-11)	2 (0-11)	2 (1-11)	0.183
Wound infection, n (%)	7 (6.5%)	7 (15.2%)	0	**0.002**
Intraabdominal abscess	3 (2.8%)	2 (4.3%)	1(1.6%)	0.574
Pathology				
Complicated	14(%13)	8(17.4%)	6(9.7%)	0.373
Uncomplicated	94(%87)	38(82.6%)	56(90.3%)	
Cost effectiveness, TL	1185.8	1284.10 (596.15-3658.32)	1066.43 (553.69-3218.04)	**0.040**
Time period between admission and operation, hr.	7(±4.52)	7(±6.1)	7(±2.78)	0.756

Discussion

With the onset of the Covid-19 pandemic period, the public was advised not to leave their homes, the working system of hospitals was changed and the number of beds was reduced to meet Covid-19 patients, some of the doctors and nurses working in our clinic were assigned to wards where Covid-19 patients were followed up, and elective surgeries were postponed.

As Tankel et al. found, we found in this study that the number of patients operated for AA significantly decreased during the Covid-19 pandemic period (4). There are studies reporting a decrease not only in the incidence of AA but also in the incidence of emergencies such as intestinal obstructions, gall bladder diseases, myocardial infarction and cerebrovascular diseases, which are frequently encountered in admissions to the emergency department (9). Likewise, there are studies reporting a 40% decrease in the number of patients with myocardial infarction in emergency department admissions (10, 11). Garcia et al. thought the possible reasons for this as follows: avoiding medical care caused by social distance, fear of being infected with Covid-19 in the hospital, misdiagnosis, relieving the pain with painkiller or antibiotic treatment, and the reservation of some hospitals close to the patients only for Covid-19 patients (11).

While there was no difference between the two groups in terms of the laboratory tests we performed preoperatively for the diagnosis of acute appendicitis, there was a significant increase in the appendix diameters of Group A obtained by US and abdominal CT examinations. In the study by Romero et al. investigating the abdominal CT of patients with AA in the pandemic period, it was also stated that the appendix diameters were higher and complicated in the Covid-19 pandemic period (12).

The majority of operations in Group A performed openly considering the warnings suggesting that the laparoscopic surgery will increase exposure to the virus (13). Laparoscopic surgery was performed on the patients who had PCR or thoracic CT before the operation and found to be negative for COVID-19. We thought that the longer operative time in Group A was due to the use of postoperative drains and high rate of wound

infection, more complicated appendicitis, higher incidence of wound infection in open surgery, and performing a higher number of laparoscopic appendectomy in our routine surgical practice.

Similar lengths of hospital stay of patients may be due to the patients' fear of Covid-19 contamination and their wish to be discharged as soon as possible, and early discharge in order to be able to use the hospital beds actively. Patients' visits to healthcare facilities increase due to complications such as postoperative intraabdominal abscess and wound infection, leading to an increase in the risk of exposure to the virus and harming the effective use of the health system (4, 6).

While many studies evaluate the time from patients' onset of symptoms to the operation, we questioned the time from emergency service admission to the operation in our study and did not find it significant. Although some members of the team in our clinic were assigned to the Covid ward, this result suggests that there is no malfunction in the time of diagnosis and treatment after the emergency service admission, and that the main problem is due to the prolongation of the time between the onset of the patients' symptoms and their admission to the emergency room. Although the number of perforated appendicitis was higher in Group A, there was no statistically significant increase. The reason for this can be explained by the low number of patients in our study.

The measures taken during the pandemic and the fear of contamination with the corona virus have complicated many emergency cases, resulting in an increase in hospital costs. We think that the increase in costs is due to percutaneous drainage or IV antibiotic treatments due to postoperative complications.

Considering that we had the first wave of the Covid-19 pandemic and the authorities warned that the second wave may occur, we think that it is necessary to take lessons from the events experienced during the first wave. While advising people not to leave their homes, they should be informed better about diseases that require urgent intervention, except for the Covid-19 infection, and they should be able to access health facilities as soon as possible.

In conclusion, our study found that the delayed admissions of individuals to the hospital made appendicitis more complicated, increased its morbidity and hospital costs.

Ethics Committee Approval: Ethical approval for the study was received from Gazi University Clinical Research Ethics Committee (25901600-604.01-18) on 21/07/2020.

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