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Increased mortality of emergency surgery during COVID-19 pandemic in comparison with normal condition.

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Abstract:
Background:
The pandemics of Coronavirus disease 2019 (COVID-19) has still several unknown aspects in the medical centers. Its exact route of spreading, best methods for diagnosis, its impact on the patients before and after the surgery, the involvement of the hospital staff, and the rate of its morbidity and mortality are among the unknown factors that make confronting this virus very complex.The present study was conducted toinvestigate the mortality rate of surgical produres during the pandemics of COVID-19 and to compare it with a similar time in the previous year.
Design: *Retrospective description*
Settings: *Academic tertiary general medical center*
Patients and Methods: *In this comparative cross-sectional study, all consecutive patients undergoing an emergency minor or major surgical procedure; between 17 February to 17th May 2020 and patients in the same period in 2019 were enrolled and reviewed.*
Main outcome measure: *Comparison of mortality between pandemic and no pandemic time*
Results: *One-hundred and forty-seven patients underwent emergency surgical procedures in 2020 (Group A) while the corresponding value was one-hundred and four patients in 2019 (Group B).*
The male consisted 102 (69.4%) in group A and 85 (81.7%) in-group B. (P= 0.027). the average age of the patients was (46.0 ± 21.4) years in group A and (40.9 ± 17.7) years in group B. In-group A, 19 patients were suspected to have COVID-19. Among these patients, 11 patients were confirmed COVID-19 cases by RT-PCR. group A had a significantly higher mortality rate compared with group B (6.1 % vs 3.8 % in groups A and B, respectively, P= 0.026). The mortality rate among COVID-19 patients was 45.45 % (5/11).
Conclusion: *We found that patients requiring emergency surgical procedures during the pandemic of COVID-19 had a significantly higher mortality rate compared with patients in the similar (no pandemic COVID-19)*
Limitation: *Single-center, retrospective and it was not a trail study*
Conflict of interest: *None*
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I. Introduction:

The pandemics of Coronavirus disease 2019 (COVID-19) has still several unknown aspects in the medical centers. (1) Its exact route of spreading, the best method for diagnosis, its impact on the patients before and after the surgery, the involvement of the hospital staff, and the rate of morbidity and mortality are among the unknown factors that make confronting this virus very complex. (2)

The human to human transmission of COVID-19, and the highly contagious nature of the disease, made the local health authorities to set the special protocols for surgical procedures. (3) The need to use all the facilities of medical centers led to the cessation of elective practices to empower the hospitals to better deal with the disease. (4) Based on the regulations all elective surgical procedures canceled and postponed. (5) Based on a regression model, 28,404,603 operations were canceled or postponed due to COVID-19. However, there are many emergency and urgent surgical procedures which cannot be postponed and need special considerations during the new emergent situation. (6)

In the COVID-19 era, various factors hypothetically can lead to higher mortality rates in the surgery departments. Older age, concomitant comorbidities, surgical period, and complexity of the procedure are associated with poorer prognosis in the operated patients. Furthermore, the delayed referral to the medical centers due to fear of getting sick, and the patients' refusal of the operations in the early stages of the disease are among the other major problems in the emergency settings. (7) These factors along with the disease spread from the environment and the medical staff could increase the mortality rate of the surgical procedures.

The main purpose of this study was to compare the mortality, age, sex, and causes of surgery at the time of the COVID-19 outbreak at the same time in the past year in a general hospital center. We hypothesized that the mortality rate is increasing compared to the same time last year.

II. Methods:

In this comparative cross-sectional study, all consecutive patients undergoing an emergency minor or major surgical procedure between 17 February to May 17th, 2020, and patients in the same period in 2019 were enrolled and reviewed. During the 2020 pandemic, approximately 3000 COVID-19 patients were admitted to special wards or ICUs.

The study protocol adhered to the tenets of the Declaration of Helsinki and approved by a local research ethics committee, an equivalent to the institutive review board in Shahid Beheshti University of Medical Sciences. The patients' information was kept confidential.

We retrospectively analyzed the clinical data and laboratory of all patients (group A) underwent emergency surgeries (all invasive procedure: minor or major surgery) during the outbreak of the COVID-19 in Iran at the Loghman Medical Center. COVID-19 diagnosis was defined based on the initiation date of the signs and symptoms reported by the patients. In this approach, patients with symptoms including fever cough, or respiratory symptoms were tested for RT-PCR of specimens caught from the throat. In patients with respiratory symptoms, a chest computed tomography (CT) scan was performed sooner. Either with the positive reverse transcription-polymerase chain reaction (RT-PCR) or typical involvement in the chest CT-scan showed typical involvements, the patient was confirmed with COVID-19. The number of COVID-19 hospitalized patients were extracted from the clinical governance unit of the hospital.

Hospitalization days were defined as the number of days that patients were admitted. COVID-19 duration was calculated from the point that symptoms were started and was reported subjectively by the patients.

All emergency patients in the same period last year (group B) were analyzed in terms of age, sex, causes of emergency surgery, and mortality in the hospital, and these two groups were compared.

Minor surgeries performed under local anesthesia include Central vein catheter placement, tracheostomy, wound infection, diabetic foot debridement, and abscesses drainage. Local anesthesia used for minor surgery, local anesthesia was performed using local, spinal, or epidural anesthesia, depending on the patient's condition. Major surgeries were performed under general anesthesia. Clinical outcomes of two groups were examined until the patients discharged or the outcome was death.

Statistical Analysis

To present the data, we used to mean, standard deviation, and frequency. To compare the data non-parametric tests were used. To compare continuous variables between two groups Mann-Whitney test was used. To compare the categorical variables chi-square test was used. All analyses were performed using SPSS (Version 25, IBM, Chicago). A P-value of less than 0.05 was considered statistically significant.

III. Results

Within the three-month study period, the number of admitted patients in the Loghman Medical Center has approximately3000 patients. One-hundred and forty-seven patients underwent emergency surgical

procedures in 2020 (Group A) while the corresponding value was one-hundred and four patients in 2019 (Group B) that was significantly lower. The male consisted 102 (69.4%) in group A and 85 (81.7%) in group B. (p= 0.027). the average age of the patients was (46.0 ± 21.4) years in group A and (40.9 ± 17.7) years in group B. (p= 049) (Table 1)

In-group A, 19 patients were suspected to have COVID-19. Among these patients, 11 patients were confirmed COVID-19 cases by RT-PCR. Five out of 9 deceased patients had positive COVID-19 tests. The mortality rate among COVID-19 patients was 45.45 % (5/11). The COVID-19 survived patients were followed for at least 1 month by phone cells or examination and did not show any morbidity.

Local anesthesia was the route of anesthesia in 28 (19%) patients in group A and in 35 (33.7%) patients in group B. General anesthesia was used in 119 (81%) in group A and 69 (66.3%) in group B. (p= 0.017)

The average duration of hospitalization was 6.0 ± 6.1 and 5.9 ± 6.9 days in-group A and B, consecutively. The difference between the two groups was not statistically significant. (p= 0.9)

Two groups were comparable regarding the indications of surgical procedures. Table 2 summarizes the details of the patients. In summary, perianal abscess drainage was the most common emergency procedure performed under LA both in group A and group B followed by central catheter placement. Accordingly, appendectomy was the most common major surgical procedure in both groups followed by laparotomy for perforated peptic ulcer. There was no significant difference between the two groups in terms of surgical procedures.

Regarding mortality rates in two groups, group A had a significantly higher mortality rate compared with group B (6.1 % vs 3.8 % in groups A and B, respectively, p= 0.026).

IV. DISCUSSION:

The result of the present study demonstrated an increase in the emergency surgical procedures, a higher mortality rate, and a longer duration of hospitalization during the same period compared with the previous year. On the other hand, the surgical indications remained the same as the previous year.

The mortality rate showed a significant increase from 3.8 % to 6.1 % in two periods. Several reasons could explain the higher mortality rate. The first cause would be the higher mortality rate in COVID-19 patients who undergo surgical procedures. The COVID surgery collaborative reported a 30-day mortality of 23.8 % (268 of 1128) among COVID-19 patients who underwent surgical procedures. Most of these procedures were major emergency surgeries. Pulmonary complications affect half of the patients with perioperative COVID-19 who undergo surgeries. (8) The mortality rate and patents condition of confirmed COVID-19 patients were higher than similar reports in patients in China. (9)The mortality rate also was high among patients who were diagnosed with COVID-19 after surgery.

The mortality rate also was high among patients who were diagnosed with SARS-CoV-2 after surgery. Furthermore, the mortality rates for coronavirus patients after surgery approached those of the most seriously ill patients admitted to intensive care after contracting the virus in the community. Since the PCR and CT-scan were not performed in the other group, the result of mortality rate among COVID-19 patients should be interpreted with caution.

The higher mortality rate could also be ascribed to the delay in patients' arrival to the emergency wards (7) or their refusal to receive timely treatment in the early stages of the disease. (10) Wong et al reported the concern of "fear from pandemics" would result in avoiding emergency care-seeking. (11)

The other plausible cause that would lead to higher surgical mortality is the delay in the diagnosis of COVID-19 in patients undergoing surgical procedures. The concomitant existence of COVID-19 in patients require a careful weighing between waiting or performing the procedures. (12) The essential need to keep balance between performing urgent procedures and rational postpone of these procedures led to the formation of many guidelines. (3,4,12) the primary focus of this guideline is rationally to triage the patients who need urgent action. (13, 14)

The need for COVID-19 testing is a controversial issue before surgical procedures. While routine RT-PCR combined with CRP, ESR, and CBC is routinely recommended by many guidelines (15), various reports questioned its need in all patients. (16) The inability of the testing to rule out the disease and the economic aspects of testing led to the uncertainty in the best practice.

Another result of the present study is the significantly lower GA compared with the previous year. The most performed surgery that was appendectomy was performed under GA, but LA was the preferred method of surgery whenever it was possible.

Regardless of the testing protocol, there are many essential tips recommended for surgical staff. The scrub team performing emergency surgery in such patients should be equipped with full personal protective equipment (PPE). (17, 18) The number of surgical, nursing and anesthetist team members working in the operation rooms should be limited to the minimum required numbers. (19) The staffs who feel ill have to send to the isolation and the honesty to express the symptoms is highly required.

Before scheduling emergency surgery for patients with suspected or confirmed COVID-19, hospitals should designate negative-pressure operating rooms out of heavy-traffic zones, preferably isolated from the main surgical theaters (20). Using Ultra-Violet Radiation for a quarter minute to use this room for the next operation. (21) These equipment are essential in a separate recovery room and a single hospital room or especial ICU. (22) In this case, the patients recovered from the surgery will be either discharge or the symptoms of COVID-19 disease will be identified in them and they will become similar to COVID-19 patients.

V. CONCLUSION:

The result of the present study demonstrated the increased emergency surgical procedures, a higher mortality rate, and longer duration of hospitalization during the same period compared with the previous year. On the other hand, the surgical indications remained the same as the previous year.

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Footnotes

Author contributions: All residents of surgery contributed to this work.

The authors report no conflicts of interest

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Tables

Table 1. Baseline characteristics of two study groups.

	Group A	Group B	P-value
Age	46.0 (± 21.4)	40.9 (± 17.7)	0.042*
Sex Male (N, %)	102 (69.4%)	85 (81.7%)	0.027[γ]

Group A consists of patients who underwent emergency surgical procedures during COVID-19 pandemics. Group B consists of the same period in the last year.

Table 2. Emergency Surgical procedures during a three-month period in two study groups.

	Group A		Group B	
Type of surgery	**Number of patients (%)**	**Surgical mortality**	**Number of patients (%)**	**Surgical mortality**
Appendectomy	35 (23.8%)	0	25 (24%)	0
Incision Drainage	13 (8.8%)	0	30 (28.8)	0
CV catheter placement	9 (7.7 %)	0	8 (7.7 %)	0
Tracheostomy	9 (6.1%)	3	0	0
Wound infection	4 (2.7 %)	2	4 (3.9 %)	0
Laparotomy due to peritonitis	11 (7.4%)	2	9 (8.6%)	2
Laparotomy due to Caustic injury	8 (7.4%)	1	5 (4.8%)	1
Bowel obstruction (small bowel or colon)	8 (2.7%)	0	9 (3.8%)	1
Herniorrhaphy	3 (2%)	0	3 (2.9%)	0
Thoracotomy	2 (2.4%)	0	0	0
GI Bleeding	3 (3.7%)	0	0	0
Cholecystectomy	4 (2.7%)	1	2 (1.9 %)	0
Diabetic foot amputation or debridement	6 (4.1%)	1	2 (1.9%)	0
Chest tube insertion	4 (2.7%)	0	2 (1.9%)	0
Vagotomy and Pyloroplasty	1		1	0
Gastrojejunostomy	1		0	0
Gastrectomy	1		0	0
GastrotomyandRepair	6 (4.1%)	1	0	0
Exploration of the chest wall or	3 (2.7%)	0	0	0

neck stab wound				
Diagnostic Laparoscopy	1 (1.2 %)	0	0	0
Whipple procedure	1 (1.2 %)	0	0	0
Fasciotomy	1 (1.2 %)	0	0	0
Hemorrhoidectomy	1 (1.2 %)	0	0	0
pericardialtamponade pericardial window	1 (0.7 %)	0	0	0
Open splenectomy	1 (0.7 %)	0	1 (1%)	0
Sigmoidoscopy	3 (1%)	0	0	0
Ovarian Cyctectomy	1	0	0	0
Neck Dissection	2	0	2 (1.9 %)	0
Video-assisted thoracoscopy	2	0	0	0
Tendon Repair	2	0	1	0

Group A consists of patients who underwent emergency surgical procedures during COVID-19 pandemics. Group B is consisted of

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