

Impact of SARS-Cov-2 pandemic on Emergency General Surgery.

A single-center observational study



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Alfonso Amendola*, Giuseppe Palomba*, Maria Gaudiello*, Vincenza Paola Dinuzzi*, Ester Marra*, Ferdinando Fusco**, Michele Lanza**, Massimo Antropoli**, Antonio Brillantino**, Federica Mastella*, Maurizio Castriconi**

*University of Naples "Federico II", Naples, Italy

**Azienda Ospedaliera di Rilievo Nazionale "Antonio Cardarelli", Naples, Italy

Impact of SARS-Cov-2 pandemic on Emergency General Surgery. A single-center observational study

INTRODUCTION: Several articles have been published on impact COVID-19 infection about reduction of surgical activity. We have focused on the differences between our surgical activity in an Emergency General Surgery department in "Cardarelli" Hospital in Naples.

METHODS: This retrospective study compared the patients treated from March 9, 2020 to April 27, 2020 (Italian lockdown time) and the patients treated in the same period of 2019. We recruited 75 patients in Group A (2020) and 165 patients in Group B (2019).

RESULTS: There was a reduction in hospitalizations for non-trauma disease (69 in group A and 122 in group B with $p: 0.001$), a reduction in transfers from other hospitals (2 patients in group A and 17 in group B with $p: 0.04$) and a reduction in hospitalizations for trauma disease (6 in group A and 43 in group B with $p: 0.001$). The severity of the disease in 2020 was greater than in the same period in 2019 and there was a higher rate of high-grade complications.

CONCLUSION: From data analysis, we conclude that there has been a reduction in hospitalizations and surgical interventions in our emergency surgery department. The patients, however, had a much more severe disease that resulted in a greater number of complications in the peri and post-operative time.

KEY WORDS: COVID-19, Lockdown, Emergency Surgery, Severity of disease

Introduction

Corona Virus Disease 2019 (COVID-19) is an infectious disease caused by the severe acute respiratory virus coronavirus 2 (SARS-CoV-2) ¹. The first cases of SARS-CoV-2 pneumonia occurred in Wuhan, the capital of Hubei (China) in December 2019 ². Since then the virus has spread all over the world; WHO reported this disease as a global pandemic on 11 March 2020 ³. This

infection has a more unfavorable course in elderly patients, with many pathologies, but younger people can also be affected. The most common symptoms are fever, cough, muscle aches, dyspnea and gastrointestinal symptoms ^{4,5}. Chest CT is the gold standard for diagnosis; appears with ground-glass opacities, septal thickening, and parenchymal consolidation.

Italy was one of the most affected European countries by SARS-Cov2 pandemic ⁶. In Codogno Hospital, little city of the Northern Italy (Lombardy region), on February 21, 2020 was reported the first case of secondary transmission. The Lombardy region became the epicenters of the epidemic in Italy ⁷. In few days, there was a rapid spread of COVID-19 epidemic with constitution of a "red zone". Until 27/06/2020, in the world there are 9,653,048 cases with 491,128 deaths, while in Italy there are 239,961 total cases and 34,708 deaths ^{8,9}.

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Correspondence to: Dr. Alfonso Amendola, University of Naples "Federico II", Naples, Italy (e-mail: amendolaalfonso2017@gmail.com)

The entire Italian population has been in lockdown from 10th March to 3rd May. On February 27th, in Campania region were registered the first three cases of COVID-19. Currently, there are 4,665 patients positive and 431 deaths for COVID-19⁹.

This scenario determined a rapid health national system (NHS) crisis with a reorganization of public health system and hospitals¹⁰.

Initially, with Intensive Care Units (ICU) near collapse, the elective operations have been cancelled^{10,11}. Even for the surgery have been several changes.

The aim of this study was to evaluate the impact of COVID pandemic in the Cardarelli Hospital Emergency Department Surgical activity, with particular focus on the pattern of treated pathologies and the amount of performed surgical procedures. Cardarelli Hospital is one of the bigger hospitals in the whole southern Italy and has a most important Emergency Department, where many patients are treated every day.

Methods

In this retrospective study, we compared the patients treated since March 9, 2020 (start of the Italian lockdown) to April 27, 2020 with patients treated in the same period of 2019, in the General and Emergency Surgery Unit of "Antonio Cardarelli" Hospital in Naples. We analyzed the following features: patients related (age, sex, American Society of Anaesthesiology (ASA) score¹², and comorbidity), type of admission (transfer from other structure, admission for trauma and admission diagnosis) procedures related (laparoscopic procedures, exitus, operative time, intraoperative peritonitis with Mannheim Peritonitis Index (MPI)¹³, for the severity grading of acute cholecystitis, we used the classifications of Tokyo Guideline of 2018¹⁴, complications according to Dindo-Clavien classification¹⁵, length of stay, transfer during hospitalization).

STATISTICAL ANALYSIS

Statistical analysis was performed by means of InStat Graph-Pad Prism® 5 program (San Diego, California, USA). Values were expressed as numbers with percentages in parenthesis. Data were compared using the Fisher's exact test or Chi-square test to compare categorical variable and t-test to compare continuous parametric variable. A probability value of less than 0.05 was considered significant.

ETHICS

This study was approved by our institutional review board. All the patients gave informed-written consent for surgery and to participate in this study.

Results

Two hundred forty patients were recruited. Out of these, 75 were treated from 10 March to 27 April 2020 (group A) and 165 in the same period of 2019 (group B). Compared to 2019 there was a 120% reduction in our Emergency Surgery Unit.

Table I shows patients' stratification by age, sex, ASA score and comorbidity. All characteristics were not significantly different between the two groups except for the percentage of patients with ASA IV score that was significantly higher in group A (p. 0.04).

Table II shows the type of admissions in the two patients' groups. The percentages of transfers from another structures (2 in group A vs 17 in group B) and the percentages of total admissions for trauma-related diseases (6 in group A vs 43 group B) were significantly higher in group B compared to group A (p. 0.04 and p. 0.001, respectively).

The percentages of total admissions for not traumatic diseases (122 in group B versus 69 in group A) were significantly different between groups (p. 0.001).

Particularly, significative difference between groups was found in the percentages of admissions for intestinal occlusion (higher in group B (p. 0.006)), whereas percentages of admission for acute appendicitis, abscesses, acute cholecystitis, pneumothorax, gastrointestinal bleeding, gangrene, intestinal ischemia and gastrointestinal perforation were comparable.

Table III shows procedures related features in the two groups patients. Operative time was significantly higher in group A patients, both trauma and no trauma surgery (p. 0.02 and 0.0001, respectively). In group B there were 13 laparoscopic operations, while only one in group A

TABLE I - Patients related features

	Gruppo A (75)	Gruppo B (165)	P
Age	58.1.77	58.53	0.95
Sex ratio (M/F)		(94/71) 1.32	0.30
ASA			
ASA I	3 (4%)	4 (2,4%)	0.5
ASA II	14(18,6%)	50 (30,3%)	0.05
ASA III	38 (50.6%)	85 (51.5%)	0.9
ASA IV	20 (26.6%)	26 (15.7%)	0.04
Comorbidity			
Cardiovascular	25	51	0.7
Pulmonary	3	8	0.8
Kidney	4	4	0.2
Metabolic	16	29	0.48
Hepatic	4	5	0.38
Tumor	12	22	0.58
Others	6	11	0.7

TABLE II - Type of admission

		Group A (n)	Group B (n)	P
Transfer from another structure		2 (2,6%)	17 (10,3%)	0,04
Admission Diagnosis no trauma		Group A (69)	Group B (122)	0,001
Acute appendicitis	total	10 (14,5%)	11 (9%)	0,24
	laparoscopic	1	3	0,58
	complicated	6	6	1
Abscesses	total	4 (5,7%)	5 (4%)	0,59
	gluteal	2	1	0,52
	perineal	1	3	0,52
	other regions	1	1	1
Acute cholecystitis	total	5 (7,2%)	11 (9%)	0,67
	Mild (Grade I)	0	6	0,09
	Moderate (Grade II)	1	3	1
	Severe (Grade III)	4	2	0,03
Pneumothorax	spontaneous	0	3 (2,4%)	0,55
Gastrointestinal bleeding	total	4 (5,7%)	6 (4,9%)	0,79
	gastric cancer	1	0	0,4
	duodenal ulcer	1	0	0,4
	colorectal cancer	1	1	1
	previous abdominal surgery	1	5	0,19
Gangrene	total	4 (5,7%)	3 (2,45%)	0,23
	Fournier	1	1	1
	other region	3	2	1
Intestinal Ischemia	total	5 (7,2%)	3 (2,45%)	0,11
Intestinal occlusion	total	18 (26%)	56 (46%)	0,006
	complicated hernia	4	20	0,28
	intestinal adhesions	3	10	0,9
	intestinal malrotation	2	7	0,87
	peritoneal carcinomatosis	2	2	0,21
	colon cancer	5	13	0,69
	rectum cancer	1	1	0,39
	advanced pancreatic cancer	1	0	0,24
	ileum cancer	0	1	1
	acute diverticulitis	0	1	1
	advanced gastric cancer	0	1	1
Gastrointestinal perforation	total	17 (24,6%)	21 (17,2%)	0,21
	previous intestinal anastomosis	5	4	0,45
	gastric ulcer	3	4	0,91
	gastric-duodenal cancer	1	1	0,87
	gist	1	0	0,44
	diverticulitis	1	3	0,4
	peritoneal carcinomatosis	1	2	0,67
	unknown causes	4	1	0,08
	colon cancer	1	4	0,23
	pancreas cancer	0	1	1
	abdominal abscess	0	1	1
Others		2 (2,8%)	3 (2,4%)	0,85
Admission diagnosis for trauma		6 (8%)	43(26%)	0,001

TABLE III - Procedures relative features

	Group A	Group B	p
Laparoscopic	1	13	0,004
Exitus post-surgery	16 (21.3%)	15(9%)	0.008
Post trauma (49)	2 (33.3%)	6(14%)	0.22
No post trauma (191)	14 (20.2%)	9(21%)	0.008
Peritonitis intraoperative MPI	19 (25.3%)	24 (14.5%)	0.04
<21	2	4	0,56
21-27	2	9	0,04
>27	15	11	0,02
Operative time (min)	144.66	93.41	0.0001
Trauma (49)	124.16	71.51	0.02
No trauma (191)	146.44	101.94	0.0001
Complications	38 (50.6%)	58 (35%)	0.05
Grade I	6 (15.7%)	18 (31%)	0.48
Grade II	1 (2.6%)	4 (6.8%)	0.62
Grade III (A and B)	13 (34%)	14 (24%)	0.04
Grade IV (A and B)	2 (5,2%)	7 (12%)	0,55
Grade V	16 (44.4%)	15 (25.8%)	0.0008
Length of stay (days)	11,92	11.8	0,98
Trauma	7,4	8,33	0,82
No trauma	12,3	12,58	0.82
Transfer during hospitalization	4	11	0,69

with $p = 0.004$. Exitus post-surgery was significantly lower for group B ($p = 0.008$). As a percentage, intraoperative peritonitis was highest in group A then group B (25,3% versus 14,5%, $p = 0.04$). Moreover, in group A, 15 patient has MPI with score $> 27\%$ while 11 in group B with statistically difference ($p = 0.02$). For severity of acute cholecystitis, in group A there were 4 cases of Grade III while 2 in group B with a statistically significant difference ($p = 0.03$). In group A there have been more complications than group B (38 vs 58 with $p = 0.02$). In patients treated in group A we observed 6 grade I complications (two fever, two nausea, one headache and one vomiting), 1 grade II (transfusion), 2 grade IIIa (wound abscesses), 11 grade IIIb (9 perforations, 1 bleeding and 1 abscess), 2 grade IV and 14 grade V (2 death during operation, 12 within 30 days); while in group B we observed 18 grade I (8 fever, 3 nausea, 2 headache and 5 vomiting), 4 grade II (2 wound infection and 2 transfusion), 3 grade IIIa (wound abscesses), 11 grade IIIb (2 occlusion, 7 perforations and 2 bleeding), 7 grade IV (1 IVb) and 15 Grade V (2 death during operation and 13 within 30 days). There was a difference statistically significant only for grade III and grade V (more in group A, $p = 0.04$ and 0.03 , respectively).

Discussion

The World health Organization (WHO) declared COVID-19 a Public Health Emergency as of February

1st, 2020 and as pandemic on March 11th, 2020³. In the last years, other coronavirus did several outbreaks, as the 2002/2003 SARS (Severe Respiratory Syndrome) and 2012 MERS (Middle East Respiratory Syndrome)¹⁶.

The disease is highly contagious, even it is too early to identify the accurate reproductive number (R_0) (i.e. patient's capability to spread the disease to people in contact), some studies have estimated the mean R_0 in a range of 2.20 - 3.58. This means that each patient has been spreading the infection to 2 or 3 other people^{17,18}.

The impact of COVID-19 on the medical activity, especially in surgery, was very heavy. From March 9th, 2020 the elective surgical activity was strongly reduced, and many operating rooms were converted into ICUs using post anesthesia care unit beds first, leaving space for emergency/urgent surgery. Even the oncologic and emergency surgery experienced a decrease: the numbers of emergency admissions decreased in the lockdown time in all Italian hospitals¹⁹.

From the beginning of pandemic to nowadays, several recommendations have followed and our Surgery Unit quickly adapted to ensure high-quality surgical care. Management with internal protocol during the COVID-19 pandemic was developed with anesthesiology, virology, intensive care management and hygienists.

All patients who are eligible for operative intervention in our department need to be categorized into three groups (non-infected people, asymptomatic carriers and symptomatic patients). In ER's triage center the nurse identifies and isolate patients with COVID-19 symptoms at the first point of contact with the hospital. We evaluated the body temperature, presence of respiratory or gastrointestinal symptoms such as diarrhea and nausea and recent travel to an endemic country. All patients are undergone to a Rapid IgM - IgG Combined Antibody test for SARS-CoV-2 and after to blood exam and chest X ray. If the Rapid test is negative, the patient is recovered in our department, instead the test is positive, or the chest-X-Ray/CT is suggestive the patient is recovered in a dedicate area.

All cases of known or suspected COVID-19 positive patient should be performed with airborne precaution (FFP2 or FFP3), eye protection, suite, gown, gloves, hair cover and shoe covers^{20,21}. There isn't clear evidence regarding the risks of laparoscopy versus the open approach, but we use the laparoscopy only in highly selected individual case, where clinical benefit to the patient substantially exceeds the risk of potential viral transmission, in According the Royal colleges in the UK and Ireland²². We decided to treat patients in laparoscopy who, for comorbidity, weight and type of disease, could benefit most from this technique, excluding patients who could not benefit from it (infact we treated only one patients in 2020 despite 13 patients in 2019). In the literature, the use of devices to filter released CO_2 is recommended and in our department

it is used but the utility is controversial^{22,23}. Furthermore, the electrocautery of blood, gastrointestinal tissue, and any of the body fluids may generate an aerosol²⁵.

Another important aspect for containment of contagion was limit visitors to patients to "end of life". As proposed in others Italian structures, the patients were contact by phone and if necessary, the communications were assigning at the senior surgeons^{26,27}.

Finally, all medical staff are periodically subjected to serological examination and pharyngeal swab for COVID-19.

We observed a reduction in surgery compared to those performed in the same period of 2019. This decrease has also been observed in other Italian emergency surgery departments²⁸.

This decrease derives from the lower number of access to the hospital for fear of contracting COVID-19. We believe that patients fearing an infection have underestimated their symptoms, often treating them improperly with home medical therapy and then going to the hospital when these symptoms became unmanageable, more acute and severe. So, the clinical conditions worsened a lot and sometimes some patients died without resorting to any medical treatment.

The intraoperative findings were more serious and complicated than those of the previous year. In fact, peritonitis has an MPI with a higher score than the previous year¹³ and cholecystitis have higher degrees of severity¹⁴. Therefore, the average operating time was longer compared to that of the same period last year (144,66 minutes in 2020 and 93,41 minutes in 2019), considering that the surgical techniques and approaches and the teams have not changed.

Reduction of admission for urgent and emergent conditions in the lockdown time could be followed by a rebound surge. So a large amount of patient with complicated acute disease may arrive in Emergency Department (ER), Surgical Department and in ICU.

To avoid a new overcrowding of these departments, territorial medicine must be implemented. General practitioners should, equipped with appropriate PPE, visit patients who require medical treatment and evaluate not only by phone if they need urgent hospitalizations and surgery²⁹.

Analyzing peri and post-operative morbidity and mortality, it is possible to observe an increase in all post-operative complications according to the classification of Clavien Dindo. In particular we find a statistically significant difference for type III and V complications which in 2020 were respectively 13 and 16 (34% and 44.4% of cases) while in 2019 14 and 15 (24% and 25.8% of cases) (p. 0.04 and p. 0.0008). We suppose that the greater number of peri and post-operative morbidity and mortality is caused by the greater severity of the disease; often patients arrive in critical conditions, with hemodynamic instability. Surgery is therefore more difficult and the post-operative course longer.

Conclusion

In accordance with recent literature, we have found a reduction in the number of hospitalized patients and surgery performed but an increase in the severity of the diseases treated. We therefore fear that in the next weeks with a gradual return to normal and with a constant drop in infections, a "rebound" effect may occur, which could saturate our system again and which may not ensure optimal medical care for all patients. To prevent this problem in the future, it is necessary from the outset to follow the guidelines and equip general practitioners with all PPE so that they can visit and screen patients who require specialist hospital care. It is important to diversify the care pathways, reserving specific departments or entire hospitals for COVID, to avoid that the "hospital" is considered a "place of infection".

Riassunto

Sono stati pubblicati numerosi articoli sull'impatto dell'infezione da COVID-19 sulla riduzione dell'attività chirurgica. Ci siamo pertanto interessati a confrontare la differenza tra l'attività chirurgica in un dipartimento di Chirurgia generale d'urgenza dell'Ospedale Cardarelli di Napoli in questa evenienza.

Si tratta di uno studio retrospettivo comparativo dei pazienti trattati dal 9 Marzo 2020 al 27 Aprile dello stesso anno – nel periodo di lock down in Italia – ed i pazienti trattati nello stesso periodo del 2019. Abbiamo reclutato 75 pazienti nel Gruppo A (2020) e 165 pazienti nel Gruppo B (2019).

Abbiamo riscontrato una riduzione dei ricoveri ospedalieri per patologia non traumatica (69 nel Gruppo A e 122 nel Gruppo B, con p. 0.001), una riduzione dei trasferimenti da altri ospedali (2 pazienti nel Gruppo A e 17 nel Gruppo B, con p. 0.04) e una riduzione dei ricoveri ospedalieri per patologia traumatica (6 nel Gruppo A e 43 nel Gruppo B, con p. 0.001). La gravità delle patologie nel 2020 è risultata superiore nel 2020 rispetto allo stesso periodo nel 2019, così come la gravità delle complicanze.

Dall'analisi di nostri dati possiamo concludere che c'è stata una riduzione dell'ospedalizzazione e degli interventi chirurgici nel nostro dipartimento. Infine, i pazienti presentavano patologie di maggiore gravità, con un aumento del numero di complicanze sia peri- che post-operatorie.

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