

Mitigating surgical emergency practice during COVID-19 pandemic?



Ann Ital Chir, 2021 92, 3: 312-316

pii: S0003469X21035259

Online ahead of print 2021 - June 21

free reading: www.annitalchir.com

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PURPOSE: To define the change in Emergency Surgical Unit (ESU) workload during the COVID-19 pandemic.

METHODS: Patient data for a three-week period was prospectively collected for ESU patients during lockdown period and compared to the ESU workload for the same time period prior to lockdown.

RESULTS: Surgical emergencies admissions reduced by 2.5 times during our study period (p value = 0.001). In this changed paradigm, the overall number of surgical emergencies were reduced. A high mortality ($n = 4$, 5.7%) was noted during lockdown period as compared to pre-lockdown period ($n = 1$, 0.58%, p value = 0.025). Almost half of surgical admissions were tested for COVID-19 based on their symptoms and more than third ($n=14$, 38.9%) of them were positive. Gastrointestinal symptoms were common in COVID-19 positive group (85.7%) and only a third (36%) of COVID-19 positive patients needed surgical attention. Chest x-ray findings were comparable to PCR testing in terms of sensitivity and specificity but CT chest was more sensitive.

CONCLUSIONS: It remains unclear how COVID-19 reduced surgical emergencies. A significant proportion of COVID-19 presented with gastrointestinal symptoms. In a new outbreak all General Surgical patients should be tested with CRP and WCC used as a triage adjunct.

KEY WORDS: Coronavirus, COVID-19, Emergency Surgery Pandemic, General Surgery

Introduction

A new strain of coronavirus was identified as a pathogen during December 2019 in Wuhan (China) ^{1,2} and given its rapid transmission rate it was at our doorstep before we could contrive any stringent preventive strategy. The team of scientists in China was able to identify the similarity with the coronavirus family ³ but due

to uniqueness of its antigen-binding site it was labelled a novel virus ⁴. Hence, we were facing a new enemy with a lack of any proven treatment options. This new strain causes a constellation of symptoms, which is labelled COVID-19 and can behave very aggressively with high morbidity and mortality rates ^{5,6} COVID-19 typically presents with fever, fatigue, cough, dyspnoea and anosmia ^{7,8}. Atypically patients may have symptoms that are more non-specific and these include gastrointestinal symptoms ⁹⁻¹¹.

The four Royal Colleges of Surgeons in the UK and Ireland responded to these unprecedented times, understanding the virulent and contagious nature of this viral pandemic, by jointly issuing a set of guidelines to support safe surgical practice and considering the safety of both staff and patients ¹². All elective surgical practice had to be postponed and emergencies were classified to

Pervenuto in Redazione Novembre 2020. Accettato per la pubblicazione Dicembre 2020

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Table I - Surgical diagnosis for in-patients during Pre-lockdown and Lockdown period of COVID-19 era in ESU (London North West University NHS Trust).

Surgical Diagnosis	Pre-Lockdown	Lockdown
Appendicitis	29 (17%)	12 (17.1%)
Gallstone disease	20 (11.7%)	8 (11.4%)
Hernia	8 (4.7%)	4 (5.7%)
Bowel Obstruction	12 (7%)	9 (12.9%)
Abscess	12 (7%)	7 (10%)
Head Injury	3 (1.8%)	8 (11.4%)
Gastrointestinal bleed	17 (10%)	2 (2.9%)
Diverticulitis	7 (4%)	2 (2.9%)
Others	18 (25.7%)	63 (36.9%)
Total inpatients	171	70

standardize the care and only cases which fell within the priority group 1a or 1b. This essentially involved NCE-POD (National Confidential Enquiry into Patient Outcome and Death) category 1 and 2^{12,13}.

London North West University NHS Trust has a dedicated Emergency Surgical Unit (ESU), which is also one of the busiest in London. Approximately 550 patients are treated per month based on hospital databases. About half of these patients have gallstone disease and prior to COVID-19 the majority (> 80%) have had definitive surgery at their index admission¹⁴ (Table I).

As there was a significant change in surgical emergency attendance patterns, we retrospectively reviewed our surgical workload and compared time periods before and during the lockdown period of COVID-19 pandemic. The primary aim of this study was to describe its impact on the surgical emergency workload. Secondly we aimed to understand the severity of the acute presentations and better understand the degree to which COVID-19 symptoms affect acute surgical presentations. We also looked at sensitivity and specificity for PCR, CT chest and chest x-ray.

Material and Method

Data on the first cohorts of patients treated for Covid-19 in a major tertiary referral centre in the UK were prospectively collected using a specifically designed registry and retrospectively analysed. This study was registered with the local research and development department (London North West NHS Trust Research & Development Office) as Service Evaluation, Number SE20/039. We collected and compared the data over three-week period at the end of January 2020 (pre-lockdown period) and for a three-week period at the end of March 2020 (during lockdown period). We obtained the patient demographics, clinical details, laboratory profiles, radiology images, hospital stay and COVID results from the notes and the hospital electronic database. Sensitivity and specificity for CT chest and chest x-ray was observed

against the PCR. The number of admissions and variation in influx of common surgical pathologies for the two evaluation periods were compared by applying paired T-test and Chi-square test respectively. Inflammatory markers (WCC, CRP and platelets) for COVID-19 against non COVID-19 patients during lockdown period were compared using Mann Whitney U test and mortality rate for the two periods was tested with Fisher exact probability. P value was considered statistically significant when < 0.05. All the statistical analysis was performed on SPSS software (Vers. 26.0, IBM, Armonk, NY, US).

Results

At London North West University NHS Trust, the ESU received 171 patient admissions in the pre-lockdown period and 70 patients during the lockdown period. There was an approximately two-and-half fold reduction in the number of surgical in-patients which was statistically significant for the two periods (p value < 0.001). On comparing the two periods for different pathologies, statistically significant increase was noted for head injuries (p value < 0.001) otherwise altered proportion of common surgical emergencies was noted but it was not statistically significant (Fig. 1).

During the three-week lockdown period a total of 70 patients were admitted. Around half of them (n = 38, 54.2%) were suspected to have COVID-19. These were predominantly male (n = 25, 65.8%), with median age of 61.5 years (Range of 8 – 90). This group included two paediatric patients. Two-thirds of the suspected COVID-19 patients had a surgical diagnosis (n = 25, 65.8%), while others (n = 13, 34.2%) had non-specific symptoms and no surgical pathology was found (Table II).

Of the 38 COVID-19 suspected patients admitted to ESU, 36 patients (94.7%) had quantitative polymerase chain reaction (PCR) testing for COVID-19. The two patients who were not tested, had non-specific symptoms and they were discharged after a short period of

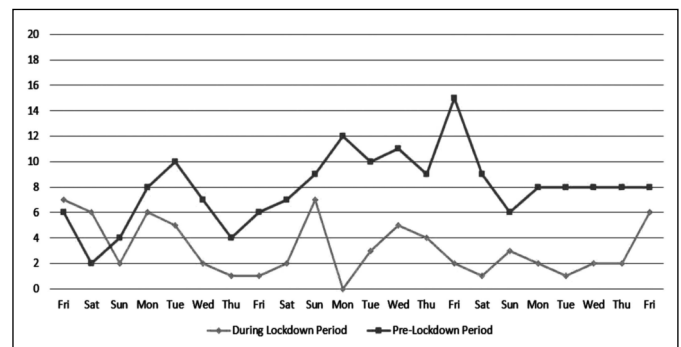


Fig. 1: Comparison of ESU admissions in 3 weeks during and pre-lockdown period. A p value < 0.0001 was observed when compared the two groups.

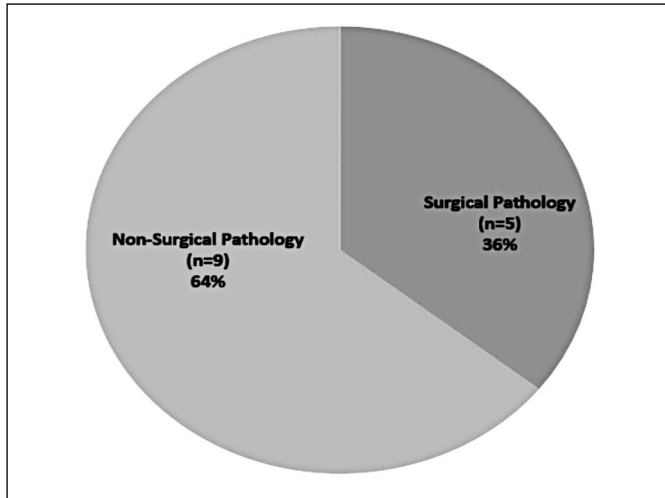


Fig. 2: Distribution of pathology among surgical in-patients with COVID-19.

observation. Of the tested cohort, 14 patients (38.8%) were positive for COVID-19. Of these, 5 patients (36%) needed surgical attention as they were found to have both COVID-19 and a surgical pathology. Nine patients (64%) were referred to the medical team as no surgical pathology was found (Fig. 2).

TABLE II - Surgical diagnosis for COVID-19 positive patients in ESU (London North West University NHS Trust).

Surgical Diagnosis	Occurrences
Bowel Obstruction	4 (10.5%)
Head Injury	4 (10.5%)
Gallstone disease	3 (7.9%)
Appendicitis	3 (7.9%)
Diverticulitis	2 (5.2%)
Gastrointestinal bleed	2 (5.2%)
Incarcerated hernia, Fournier's Gangrene, Liver abscess, Colitis, Obstructed uropathy,	Individual cases (2.6%) of each pathology
Gastric cancer, Uterine fibroid degeneration	
Non-surgical diagnosis found	13 (34.2%)
Total	38 inpatients

TABLE III - Spectrum of symptoms found in PCR positive group (14 patients, 38.9%).

Symptoms	Occurrences in Patients
Localised abdominal pain	10 (71.4%)
Generalised abdominal pain	2 (14.2%)
Respiratory symptoms	8 (57.1%)
Fever	7 (50%)
Vomiting	3 (21.4%)
Diarrhoea, headache, myalgia and anosmia	1 (7.1% each)

TABLE IV - Sensitivity of CT chest against PCR. +ve = positive; -ve = negative.

	+ve PCR	-ve PCR	Total
+ve CT scan	6	3	9
-ve CT scan	0	6	6
Total	6	9	15
Sensitivity	100%	Specificity	66.7%
+ve CXR	4	3	7
-ve CXR	3	3	6
Total	7	6	13
Sensitivity	57.1%	Specificity	50%

Fourteen patients (38.9%) from the COVID-19 suspected cohort were positive, there was a high predominance of gastrointestinal symptoms (n = 12, 85.7%); localized abdominal pain (n = 10, 71.4%), vomiting (n = 3, 21.4%), generalized abdominal pain (n = 2, 14.2%), although only one-third of these patients (n = 5, 36%) was found to have a surgical pathology (Fig. 2). In the remaining patients (n = 9, 64%) respiratory symptoms (mainly cough and dyspnoea) along with fever were the chief complaints (Table III). Diarrhoea, headache, myalgia, and anosmia were uncommon within our group. Among our COVID-19 suspected patients, 15 (39.4%) needed a CT chest, nine of these had findings consistent with COVID-19. In addition, among COVID-19 suspected patients, 13 (34.2%) had a chest x-ray, and 7 of them were suggestive of COVID-19. In comparison with PCR which is our gold standard for COVID-19, CXR findings were equivocal but CT chest was more sensitive (100% for CT, 57.1% for CXR) and specific (66.7% for CT, 50% for CXR as shown in Table IV). At our Trust a white cell count (WCC) between 3 – 10 X10⁹/L, C reactive protein (CRP) < 5 mg/L and platelet count of 150 – 400 X10³/UL is considered within normal range. On comparison of COVID-19 (C) with non COVID-19 (NC) patients, we noted a median WCC of 6.3 (C): 14.1 (NC) X 10⁹/L (p value <0.001) and majority of patients (n = 10, 71.4%) had normal WCC within COVID-19 positive group which was statistically significant. Median platelet counts of 207 (C): 261 (NC) was observed (p value = 0.028), thus lower platelet count was statistically significant among COVID-19 group. About fifth (n = 3, 21.4%) of COVID-19 positive patients had thrombocytopenia and two of these patient required intensive care support. Median CRP was 80.95 (C): 42.25 (NC) mg/L (p value = 0.560), although most of the patients in both groups had raised levels but it was statistically insignificant.

During lockdown period, the mortality was 5.7% (n = 4) as compared to 0.58% (n = 1) during pre-lockdown period, which was statistically significant (p value = 0.025). During lockdown period among the four mortality cases, two of them had head injuries associated with advanced age and several co-morbidities. Of these

two patients, one was COVID-19 positive. The other two cases were under the age of 60 and with few comorbidities, both of them were initially admitted with non-specific symptoms and later manifested respiratory symptoms, which progressed significantly. No surgical cause was found in either of these cases and their COVID-19 PCR was also negative. Whereas, during pre-lockdown period the only mortality observed was one post-operative complication.

Discussion

This study has shown a significant reduction in the number of patients presenting with emergency surgical conditions. Although the reasons are not fully understood our observation is consistent with the one-third reduction in emergency attendance noted by the Public Health England "Emergency department: weekly bulletins for 2020"¹⁵. A similar trend was also noted in New York (USA) for patients with cardiac conditions¹⁶.

We did not notice any statistically significant change in various common surgical pathologies presenting when comparing the two periods, an increase in the proportion of other surgical conditions like head injuries which was statistically significant could be a misrepresentation due to reduction in overall number of common pathologies.

During the lockdown period patients were swabbed based on their symptoms, only over a half of them were tested, of whom a third were positive for COVID-19 and two-thirds of the positive group did not have any surgical pathology. More than a third of patients with Covid-19 during this period required admission with non-specific symptoms and two-fifths had gastrointestinal symptoms.

It is clear that symptoms alone should not be the only criteria for COVID-19 testing. Our results also show statistical significant for majority of our patients with positive COVID-19 PCR had normal WCC and lower platelet counts although CRP was raised in both groups. Thus WCC and platelet counts should be considered along with classical symptoms as a risk for COVID-19. High mortality with emergency surgical patients could be attributed to COVID-19, as the relatively younger patients that died in our group did not have any specific surgical diagnosis and their COVID-19 PCR test was negative. In these cases, the low sensitivity of PCR testing should be taken in consideration¹⁷⁻²³ with a low threshold for CT chest.

Conclusions

In conclusion, during these unprecedented times a significant proportion of emergency surgical patients have COVID-19, so a high index of suspicion and better

triage criteria are essential. The reasons behind the reduction of surgical workload and its implication on patient safety remain unknown and further reassessment on in a post COVID-19 era should be considered.

Acknowledgments

We would like to thank Dr Madiha Mohyuddin and Dr Anastasia Ilisuan at Northwick ark Hospital for helping in the collection of our database. A warm thank you to the all staff of the emergency surgical unit who helped in these unprecedented times.

Riassunto

SCOPO DELLO STUDIO: È di definire la variazione del carico di lavoro dell'unità chirurgica di emergenza (ESU) durante la pandemia COVID-19 sono stati raccolti prospetticamente i dati dei pazienti per un periodo di tre settimane per i pazienti dell'unità di emergenza chirurgica durante il periodo di blocco e confrontati con il carico di lavoro della stessa Unità per lo stesso periodo di tempo prima del blocco.

RISULTATI: I ricoveri per emergenze chirurgiche si sono ridotti di 2,5 volte durante il nostro periodo di studio (valore $p = 0,001$). In questo scenario cambiato, il numero complessivo di emergenze chirurgiche si è ridotto. Durante il periodo di blocco è stata osservata un'elevata mortalità ($n = 4$, 5,7%) rispetto al periodo di pre-blocco ($n = 1$, 0,58%, valore $p = 0,025$). Quasi la metà dei ricoveri chirurgici sono stati controllati per COVID-19 in base ai loro sintomi e più di un terzo ($n = 14$, 38,9%) è risultato positivo. I sintomi gastrointestinali erano comuni nel gruppo positivo per COVID-19 (85,7%) e solo un terzo (36%) dei pazienti positivi per COVID-19 necessitava di cure chirurgiche. I risultati della radiografia del torace erano paragonabili al test PCR in termini di sensibilità e specificità, ma la TC del torace era più sensibile.

CONCLUSIONI: Non è chiaro come COVID-19 abbia ridotto le emergenze chirurgiche. Una percentuale significativa di COVID-19 presentava sintomi gastrointestinali. In una nuova epidemia tutti i pazienti di chirurgia generale dovrebbero essere testati con CRP e WCC usati come coadiuvanti del triage.

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