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Effects of COVID-19 Pandemic on General Surgical Emergencies Priorities

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ABSTRACT

Background: Since the occurrence of COVID-19 pandemic, global significant stress on healthcare programs to identify severity and mortality rate.

Aim of the work: The present article concentrates on emergency acute general surgical duties possessed to implement the spread of COVID-19.

Patients and Methods: In COVID-19 epidemic period from March 2018 to July 2021 files of all patients who underwent emergency surgery in the departments of General Surgery, Al-Azhar University Hospital-Assiut were followed and reviewed. All cases requiring surgical interference in “emergency surgery”. Cases subjected urgent procedures during (2020 and 2021) as “Pandemic Group” and during (2018 and 2019) as “Control Group”.

Result: Within the two eras, 770 cases (590+180), comprising 293 cases (102+116+50+25) who underwent emergency surgery and 477 patients (188+184+80+25) who were observed non-operatively, were included in the present study. There was 37% of the patients (102+116/590) underwent surgery in the control group and 42% of the pandemic group (50+25/180) underwent surgery. There was a 65.6% (143/218) reduction in the number of emergency surgeries and 61.4% (267/372) decline in the observational managed cases of the pandemic series.

Conclusion: This article aims to tool up proper directions to undergo urgent surgery in a protected and safe medium for both healthcare professionals and patients during COVID-19 attach displayed the most significant directions for COVID-19 victim’s requirements for urgent operative management. Thus advising checking of COVID-19 contagion in emergency expecting urgent interference. We advise keeping the suspected patient in isolation till PCR result is available, and to treat the patient as a case of overt COVID.

Keywords: COVID-19 pandemic; surgical emergencies; outcomes.

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Authorship: All authors have a substantial contribution to the article.

INTRODUCTION

All over the history and among societies, pandemics have been caused by infectious diseases. Infectious diseases arising and re-arising and occurring at unpredictable speed. Thanks to the World Health Organization (WHO), global emergence of disease epidemics and outbreaks caused by more than 20 agents over the past decade. Novel infectious agents cause some of these epidemics such as H1N1 and MERS-CoV (the novel coronavirus).¹

This new coronavirus (COVID-19) affecting humans became the 5th pandemic recorded after flu pandemic of 1915. Coronavirus initially isolated in China (Wuhan district), with subsequent invasion all over the globe. Official name of coronavirus is SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2). It is considered to be of an animal coronavirus origin. The ability of man-to-man infection was adapted. As it has high infectivity, this is why spread rapidly with continuous strain changes in the human race.²

The COVID-19 pandemic virus (SARS-CoV-2), which is endangers the entire planet, was activated prior to January 2020, when its pathogenicity exploded in China. It starts as a minor outbreak in Wuhan, (may be elsewhere) that did not succeeded to mature as an epidemic. Tracking of origin of its zoonosis proved that its reservoirs were bats. Transition between the limited outbreaks in 2019 and the pandemic of December–January was possible by the general negative status that caused the preceding minor outbreaks. Global spread was predictable. The unpredicted issue was its transition, simply from epidemic to pandemic. Increased transmissibility has been caused by a mutation in the spike protein of the SARS-CoV-2.³

SARS-CoV-2 appears as a new strain with no human immunity (rapid spread, higher morbidity and mortality, and exceeds medical services needed for serious illness). Corona strains similarities and world-wide pandemic indicate that infection control measures are well- reiterated and the present

technologies should be speeded to introduce new lines of treatment and even vaccinations.⁴

The outbreak of chest infection in Wuhan occurred in 12/2019. A new coronavirus was discovered in 1/2020 (2019-nCoV). WHO declared it as a source of pneumonia in man. Since this pandemic, the entire world obligated to react with severe pandemic. There was deficiency in critical care beds, ventilators, infusion fluids, and protective measures of medical staff and patients from intra-hospital exposure and viral transmission. COVID-19 resulted in high mortality rate of infected immune-compromised victims, as those with chronic debilitating diseases and polypharmacy. Also over-acceptable rate of morbidity and mortality among healthcare workers.⁵

Since the early phase of the pandemic, Operative theatres and other wards were converted to critically ill wards for advanced patients. Non-urgent, and non-cancer Surgical lists of non-acute, non-malignant cases were postponed. All medical staff and trainee were reallocated in COVID wards. These ultimate doomed situations, augment the critical role of surgeons in the differentiation between infected and non-infected cases in bad need for emergency surgery. Surgeons needs safe environment to react for limitation of virus distribution in healthcare personals and to downgrade complications and death rates. The World Society of Emergency Surgery educational board (WSES) recommended in its paper entailing priorities of management of urgent surgical cases under COVID-19 pandemic environment for the safety of both the cases and medical personnel's.⁵

Mutation of the viruses occurs all the time. Most variations are inconsequential. Sometimes it may be harmful to the virus, and sometimes it makes the organism more aggressive. These types of mutations tend to dominate. Viruses with the most important changes called "variants of concern". They are observed with the closest concern by virologists, the different strains included: Delta which currently accounts for 99% of new Covid cases in the UK, Alpha which first identified in the UK and spread to about 50 countries and continue mutation, Beta which discovered in South Africa and spread to more than 20 countries, including UK, and finally Gamma which first recognized in Brazil and spread to 10 other countries, including UK.⁶

As regard to vaccination, about 28.3% of the global population underwent vaccination (one dose at least), and 14.6% is fully vaccinated (two doses). Globally, 4.14 billion doses have been administered. Each day, 37.72 million doses are given. In low-income countries down to 1.1% of people were vaccinated (Fig. 1).⁷

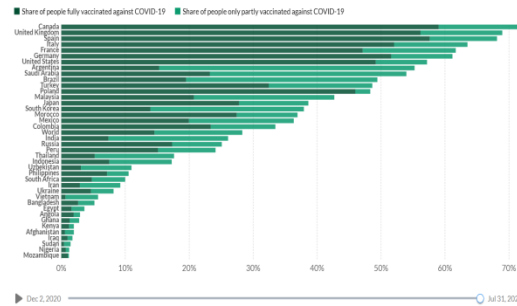


Fig. 1: Vaccination against COVID-19, Jul 31, 2021.⁷

PATIENTS AND METHODS

In the epidemic period from March 2018 to July 2021 folders of cases who performed urgent interference and go ahead were surveyed. Surgical operations implemented on cases required immediate interference after admission and those who needed immediate surgery during conservative follow-up in the emergency ward are classified as "emergency surgery". Cases who followed conservatively by surgeons in emergency ward were involved in the research for the test of four different periods. In response to complications, re-opened cases after elective interference were excluded from the study. Different data items were reviewed (demographic, number and type of operation, operative details, re-exploration, complications and death rates were registered. "Pandemic Group" entails cases that performed urgent surgery in the pandemic era (2020 and 2021) and cases that performed urgent surgery in 2018 and 2019 were called "Control Group". Comparison of data was performed between pandemic and control groups (Fig. 2).

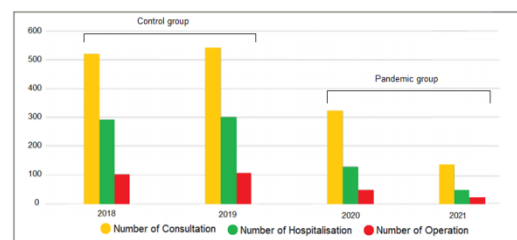


Fig. 2: Ratio of emergency consultation, hospitalization, and operation from March 2018 to July 2021.

Patients were investigated for COVID-19 infection as a secondary outcome. Pre-operative COVID-19 positive patients and postoperative hospital-induced COVID-19 infection were examined. Pre-operative CT chest was implemented in all cases who performed emergency operation (pandemic group). PCR test performed to cases with positive CT findings and those with clinical manifestations suggesting COVID-19. They were quarantined in the surgical ward. Patients suspected to have post-surgery COVID-19 manifestations underwent both PCR and CT chest. Healthcare professionals (operators, nurses, and workers) who were in direct contact with these patients were tested for COVID-19.

In the present study we followed recommendations (WSES position paper) for surgical patients in

the emergency situation of COVID-19 pandemic. Patients with epidemiologic and clinical manifestations suspecting COVID-19 were screened at emergency wards. Strongest recommendations were PCR naso-pharyngeal swab and a chest CT. Inconclusive chest X-ray or CT scan in patients' needs urgent surgery should be managed as COVID-19 +ve patient to prevent spreading of the virus in the surgical theatres. Postoperatively, the questionable cases should be isolated till PCR result is obtained with further admission in COVID (+ve) or (-ve) wards.

Leucopenia with relative lymphocytopenia, elevated inflammatory biomarkers such as C-reactive protein, ESR, lactate dehydrogenase, creatinine, troponin I, fibrinogen, and D-dimer are the pathognomonic laboratory findings in COVID-19.

Artificial pneumo-peritoneum and viruses rich smoke from the equipment's of laparoscopy and laparotomy surgery make them as a highly risk procedures. It can be participate in intra-hospital viral spread duo to exposure to infected fluids, and generated smoke from electro-cautery.

TACS classification system (Timing of Acute Care Surgery) should be a valid guide for the detection of proper timing of interference and how severe the surgical disease is (Table 1).⁸

Timing- iTTS from diagnosis	Possible Clinical Scenarios(TACS)	Color code	Note
Immediate surgery	Bleeding emergencies	Red	Immediate life saving surgical intervention, resuscitative laparotomy
Within an hour	Incarcerated hernia, perforated viscus, diffuse peritonitis, soft tissue infection accompanied with sepsis	Orange	Surgical Intervention as soon as possible but only after resuscitation (within 1 to 2 hours), administration of antibiotics upon diagnosis- no delay
Within 6 hours	Soft tissue infection (abscess) not accompanied with sepsis	Yellow	Administration of antibiotics upon diagnosis- no delay
Within 12 hours	Appendicitis (local peritonitis), cholecystitis (optional)	Green	Administration of antibiotics upon diagnosis- no delay
Within 24 or 48 hours	Second-look laparotomy	Blue	Schedule in advance. Intervention should occur during day time

Table 1: TACS classification.⁸

Intuitive paradigms and common knowledge caught by urgent care operators were challenged by the collected experience on the effect of delaying urgent operations on patient outcomes. Results of multi-institutional prospective studies become clear about the need to detect the appropriate time of surgery for surgical emergencies.

RESULTS

Through the two eras of the present work, 770 patients were included in the study (590+180), 293 cases (102+116+50+25) underwent emergency surgery and 477 patients (188+184+80+25) were observed non-operatively. There was 37% of the

patients (102+116/590) underwent surgery in the control group and 42% of the pandemic group (50+25/180) underwent surgery. There was a 65.6% (143/218) reduction in the number of emergency surgeries and 61.4% (267/372) decrease in observational managed cases in the pandemic group. The and Number of the cases who performed surgery for acute cholecystitis, complicated hernia, GI bleeding, and perforations in the two groups were statistically insignificant plus demographic data were summarized in **Table 2**.

The rate of surgery in the pandemic group was statistically higher in cases admitted for AMIO (acute mechanical intestinal obstruction) (**Table 2**). There was a severe decline in the number of cases admitted with AMIO. When the etiological factors were investigated, adhesive bowel obstruction admissions was low in the pandemic group (70 - 12). There were fewer surgeries for incarcerated hernia (70 to 19) in the pandemic group; also there was no significant difference among cases that performed small bowel resection between the two groups (**Table 2**).

The number of patients admitted for acute cholecystitis during the pandemic period, decreased by 9.7% (4/46). In the control group the rate of operations was higher, although it was statistically insignificant (Table 2). There was 64.5% reduction in the number of cases who performed appendectomy (80/124) in the pandemic group. Uncomplicated appendicitis admissions were declined by 80.8% (126/156). The number of cases who performed appendectomy for complicated appendicitis was statistically higher in the pandemic group (Table 2). Postoperative morbidity and reoperations were equal in the two groups. Mortality was statistically higher in the pandemic group (Table 3).

Findings diagnostic for COVID-19 in the preoperative evaluation were observed in chest CT of 16 (8.9%) cases (secondary outcome). Five cases were documented as positive by PCR test (2.8%) of these cases. Consultation with infectious diseases specialists started immediately and these patients received COVID-19 medication protocol. There was no mortality among these patients. One case with no initial COVID-19 manifestations, found to have COVID-19 infection observed in CT chest during postoperative intensive care period. This patient was PCR negative. He categorized as ASA 4 (American Society of Anesthesiologists). The patient died on the 7th postoperative day. None of the healthcare professional including surgeons (12 worker and 6 surgeons) participating in urgent surgeries were COVID-19 infected. COVID-19 virus was found in two (16.7%) healthcare professional belonging to the ward.

Patients	Control group		Pandemic group		P value
Total	590 (100%)		180 (100%)		0.342
Year	2018	2019	2020	2021	
Hospitalized, n (%)	290 (100%)	300 (100%)	130 (100%)	50 (100%)	
Operated upon, n (%)	102 (35%)	116 (39%)	50 (38.5%)	25 (50%)	
Age (mean \pm SD)	42.3 \pm 12		38.6 \pm 18.4		0.740
Gender: Male, n (%)	340 (58%)		112 (62%)		0.852
Female, n (%)	250 (42%)		68 (38%)		
Acute appendicitis:	280 (47.6%)		74 (41.1%)		0.002*
Surgery performed, n (%)	124 (44%)		44 (59.5%)		
Conservative follow-up, n (%)	156 (56%)		30 (40.5%)		
Acute cholecystitis:	46 (7.9%)		42 (23.2%)		0.083
Surgery performed, n (%)	6 (13%)		6 (14.3%)		
Conservative follow-up, n (%)	40 (87%)		36 (85.7%)		
Complicated hernia:	162 (27.6%)		38 (21%)		0.185
Repair, no resection, n (%)	66 (40.7%)		18 (47.4%)		
Repair with resection, n (%)	4 (2.5%)		1 (2.6%)		
Conservative follow-up, n (%)	92 (56.8%)		19 (50%)		
Acute mechanical intestinal obstruction:	70 (11.9%)		12 (6.8%)		0.034*
Surgery performed, n (%)	12 (17.1%)		3 (25%)		
Conservative follow-up, n (%)	58 (82.9%)		9 (75%)		
GI bleeding:	18 (3.2%)		12 (6.8%)		0.732
Surgery performed, n (%)	2 (11%)		1 (8%)		
Conservative follow-up, n (%)	16 (89%)		11 (92%)		
Perforations:	4 (0.8%)		2 (1.1%)		0.854
Duodenal ulcers, n (%)	2 (50%)		2 (100%)		
Small intestine, n (%)	1 (25%)		0 (00%)		
Colon, n (%)	1 (25%)		0 (00%)		

Table 2: Distribution of the patients who performed urgent operation and cases that conserved medically.

Morbidity and mortality	Control group 590 (100%) n, (%)	Pandemic group 180 (100%) n, (%)	P value
Wound infection	20 (3.4%)	7 (3.9%)	
Wound dehiscence	7 (1.2%)	5 (2.8%)	
Intra-abdominal abscess	13 (2.2%)	7 (3.9%)	
Anastomotic leakage	7 (1.2%)	5 (2.8%)	
Ileus	11 (1.8%)	9 (5%)	
Postoperative bleeding	7 (1.2%)	3 (1.7%)	
Urinary complications	5 (0.8%)	3 (1.7%)	
Pulmonary complications	13 (2.2%)	9 (5%)	
Cardiovascular complications	10 (1.7%)	5 (2.8%)	
Re-operation	14 (2.4%)	10 (5.4%)	
Total postoperative complications	107 (18.1%)	63 (35%)	0.218
Mortality	7 (1.19%)	9 (5%)	0.038*

Table 3: Outcome of emergency surgery.

DISCUSSION

Healthcare practices showed dramatic changes all over the world after COVID-19 spread. New guidelines have been published by medical professional societies as regard management of non-COVID-19 disorders.⁹ Elective procedures have been postponed by surgeons in many healthcare facilities except for cancer cases and surgical emergency. Different surgical operations have also been a subject of various modifications during this period.¹⁰⁻¹² whereas very emergency and emergency cases have been operated on immediately, semi-emergency cases have been operated on only after evaluation and approve of triage committees.

Most of the published literature on emergency surgery during the pandemic consists of reviews, expert recommendations, and guidelines; very few studies have yet reported the outcomes of altered clinical practices. In the present report, the outcomes of emergency cases managed at single hospital during the pandemic. After the first documented

case, emergency surgical procedures were evaluated. In this context, preoperative and postoperative COVID-19 symptoms, COVID-19 test results, hospitalizations, and postoperative complications were documented.^{13,14}

After acceptability of patients and for the convenience of operation oro-pharyngeal swabs became the commonest specimens taken at discharge. Nasal swabs were collected also at the same time. The amount of Corona virus remaining in the cells of the pharyngeal wall in the later stages of the disease is scanty or very low in most patients, so false negative results are encountered. The true positive results taken through the anus are more than that of naso-pharyngeal swabs where viral nucleic acid cannot be encountered. Although alveolar lavage is inconvenient procedure with high risk of exposure, the harvested viruses are easier to detect. It may be used on intubated cases.¹⁵ In observational study underwent on 150 infected patients, they found that transition from PCR +ve to -ve was one day after onset of clinical syndrome (as an average). About

10% of the cases still +ve even after 33 days of onset.¹⁶

From the clinical point of view hospital discharge of uncertain, clinically suspected, or confirmed cases of COVID-19 (asymptomatic or mild symptomatic) may be considered as an appropriate decision following surgical recovery. In response to WHO justifications, in confirmed COVID-19 infection clinical standards for hospital discharge are :3 days of normal temperature (no use of fever-reducing drugs).¹⁵ Considerably relieved respiratory manifestations. Fundamental CT chest ameliorated acute exudative lesions. Two repeated negative PCR test with 1-day interval. CDC recommended that¹⁶, in the case of elderly patient's isolation if appropriate care providers are ready at home, the patient could be discharged.

For limiting exposure risk for other members of the family, infected member can be isolated in private room with adequate ventilation, wearing of face mask, prevention of close contact with other family members, feeding separate meals, proper sanitation, with absolute prohibition of outdoor efficacy. Of ultimate importance there should be no home members who may catch infection with increased possibility of COVID-19 complications such as old age > 65 years, pregnant women, children, immune-compromised persons, or patients with chronic heart, lung, liver or kidney diseases. Family members should be adherent to advised precautions to avoid catching the virus until transmission risk is minimal.

Meticulous planning and major consultation are needed in the present circumstances for decision making to undergo elective and emergency surgical procedures. All patients should be suspected as COVID-19 +ve and should undergo pulmonary imaging before their urgent surgical interference unless proven otherwise –ve.¹⁷ Nowadays, guidelines for the treatment of acute cholecystitis and appendicitis (as both treated traditionally surgically), have drastically modified. Viral spread facilitated through aerosols disseminated with CO₂ circulation within the abdominal cavity during laparoscopic surgery. So, laparoscopic GIT surgery in a patient with COVID-19 is considered highly risky.¹⁸

Patel et al.¹⁹ encysted that most of the patients diagnosed as appendicitis should receive parenteral broad spectrum antibiotics (65%). Non responders who had manifestations of appendicular complications (35%) were treated through open surgery (as regard to national guidelines).¹⁷ Recurrent uncomplicated appendicitis reached 27% with conservative management. The safest option to treat appendicitis is antibiotics during these matchless periods.^{20,21} Also, all cases of acute cholecystitis presented in the outbreak time managed with parenteral broad spectrum antibiotics diverging from well-known practical guidelines of laparoscopic Cholecystectomy within the first few days of the attack.²²

Peoples' situations and behaviors adjusted during this short time period represent the early phase of the lockdown time. The long standing effects of medical services reduction and delays in essential surgical

interference are well seen. So, the manner and gravity of clinical presentations are also changed.

Urgent surgery declined by 65.6% in the pandemic time. Highest decline occurred in acute cholecystitis, uncomplicated appendicitis and incarcerated hernia. Patients underwent surgical interference for acute mechanical intestinal obstruction, GIT perforation and GIT system bleeding, were identical in both groups. An increase in the number of surgeries during pandemic was observed in complicated appendicitis and acute mechanical intestinal obstruction. Mortality rate was higher in cases underwent urgent surgery in the pandemic time.

ESTES (European Society of Trauma and Emergency Surgery) recommended that the treatment of trauma and urgent surgical procedures must be the same as in the non-pandemic time.²³ This recommendation was followed in the present study, the number of urgent interference showed significant decrease in the era of pandemic. Gallego et al.²⁴ stated that the number of surgical emergencies during the era of pandemic declined from 3.6 to 1.6 per day. The current study showed that incarcerated hernia, acute cholecystitis, and uncomplicated appendicitis surgeries were mostly influenced by the pandemic insult. Decline in surgeries for acute cholecystitis and uncomplicated appendicitis may be explained by more antibiotics used during pandemic or many patients have improved with symptomatic management during quarantine. Laparoscopic appendectomy still the gold standard management for uncomplicated acute cholecystitis and appendicitis, therapy with antibiotics is a respectable option.^{25,26} A multi-center study by Tankel et al.²⁷ stated that acute appendicitis admissions reduced by 40% during the pandemic, and concluded that cases with non-complicated appendicitis recovered with medical therapy at home. Though there was a 72.9% (51/70) decline in the surgeries for incarcerated hernias. The sector of the cases' needs small intestinal resection and anastomoses still the same. The performed urgent operations due to mesenteric ischemia, perforation, and GIT bleeding were not changed by the pandemic. Feature of these urgent surgical diseases is that they are in the ambulatory type that needs immediate interference within hours. High mortality shown if early interference is postponed.²⁸ Madelona et al.²⁹ stated that in spite of the decline in general urological urgent intervention, total number of admissions requiring immediate surgery such as acute obstructive pyelonephritis, acute obstructive renal injury testicular torsion did not declined. This study revealed that patients who are in bad need for urgent surgery are admitted to the hospital during pandemic.

Complicated appendicitis and acute mechanical intestinal obstruction surgeries rose significantly during the pandemic era. Report by Gallego et al.²⁴ underwent four appendectomies in twenty days in the pandemic (all patients proved to have complicated appendicitis). A multicenter study stated that surgical interference for acute mechanical intestinal obstruction increased in the pandemic.³⁰ In the current study, one of the causes for increased performance of acute mechanical intestinal

obstruction was the 82.9% (58/70) decrease in hospitalization for adhesive bowel obstruction (non-operative treatment was effective). World Society of Emergency Surgery stated that in the absence of peritonitis or bowel ischemia this group should be managed conservatively. Success rates ranged from 60 to 90%.³¹ The most important result of this work is that although the reoperation and morbidity rates were equal in cases that underwent urgent surgery between both eras. Mortality rate increased during pandemic episode. Cano-Valderrama et al.³⁰ stated that morbidity rate was increased in cases that performed urgent interference during the pandemic. Reoperation and mortality percentages were equal. This is explained by delayed admission during the pandemic. Delayed treatment in a multicenter paper recorded > 40% of abdominal emergencies (non-traumatic) during pandemic.³²

De Simone et al.³³ stated that conservative measures can be stratified to acute cholecystitis, acute appendicitis, and adhesive bowel obstruction and obstructed hernias in pandemic era. Another report by East et al.³⁴ recommended taxis approach for irreducible groin hernias as a safe primary technique in case where operative therapy is not immediate, as COVID-19 pandemic. There were marked decline in the number of cases who needed non-operative observation in up to date publications during pandemic. Surgeons wonder if outpatient observation is conceivable in these groups, where non-operative follow is feasible to meet the increasing bed demands on hospitalization.

The success of the protective measures taken against COVID-19 pandemic was investigated as a secondary outcome. Pre-admission chest CT was performed in all patients who were candidates for urgent surgery. PCR was not used as a routine test due to delayed outcome. ESTES advocated that delay in PCR results might affect the critical timing of surgical management.³⁵ Some papers accounted that chest CT is more sensible than PCR.^{36,37} Patients with clinical suspicion and positive CT insult should be isolated and tested with PCR. Specific theater and elevator are only permitted for cases with COVID-19 suspicion. Surgical team absolutely wears masks, and face shields during operations of these patients. Measures taken in line with the recommendations of ESTES prohibit members of the surgical team from contact with infected patients.³⁵ Abu Shakra et al., study detected 12 (24%) of the surgical team gained infection with COVID-19.³⁸

Important restriction of the present work is that it is single-center purpose. Final outcomes may not be generally applied to all medical centers. Admission of cases should be directed to less risky hospitals. For the reliability of these results comprehensive national and international studies are needed. Treatment of the cases comprising proper inquiries as CT and control schedules must be individualized according to the reviewing operator.

CONCLUSION

Screening for COVID-19 is highly recommended in all surgical patients who need immediate care. They

are candidates for approval and emergency surgery. PCR nasopharyngeal swab test and chest CT are recommended, depending on availability and experience. Multidisciplinary task is needed for the management of COVID-19 surgical patients. It is highly recommended to protect theater staff, for the safety of the patient if an immediate intervention is mandatory, whether laparoscopic or open. Patients with acute cholecystitis and uncomplicated appendicitis should be treated with antibiotics and followed-up on outpatient bases. Taxis procedure may be successful in irreducible hernias. The long-term outcomes of patients are required to identify and matching those managed preservative during COVID-19 pandemic with those treated operatively. Discharged cases with medical treatments should be matched for morbidity and needs for readmissions. Global study may help in risk correspondence and detection of the cohort of cases appropriate for remote follow-up.

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