

Front Line Surgeons during the Covid-19 Pandemic

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Abstract

In December 2019, there has been an outbreak of pneumonia caused by novel coronavirus in Hubei province of China. On 11 February 2020, the World Health Organization (WHO) officially named the new coronavirus Disease 2019 (COVID-19).

Despite guidelines, surgeons feel almost as if they are in the middle of a war zone, with pressure on the one hand from the hospital to do at least emergency surgery to avoid merited charges of denial of needed care being countered by pressure from medical colleagues and intensive care units to avoid unnecessary exposure to COVID-19.

COVID-19 has disrupted surgical diagnosis and treatment work. The epidemic forces us to reflect on our usual diagnosis and treatment work, including the storage of protective materials, to closely examine the problems of aerosol and pneumoperitoneum during endoscopic surgery, and, perhaps, to think of ways of reducing unneeded surgical procedures.

This short communication, from the point of view of surgeons in the United States and China, will attempt to provide guidance for determining when surgical procedures should be performed and how to approach surgery with patients who are either likely to have COVID-19 infections or have actually been shown to be positive by laboratory testing.

Soon, we will likely return to the operating room armed with greater wisdom.

Keywords: Covid-19; Corona Virus; Pandemic; General Surgery; Indication for Surgery; Emergency Surgery; Elective Surgery; Protocols for Surgeries

Introduction

In December 2019, there has been an outbreak of pneumonia caused by novel coronavirus in Hubei province of China [1]. On 11 February 2020 the World Health Organization (WHO) officially named the new coronavirus 2019 infection Coronavirus Disease

2019 (COVID-19) [2]. Based on phylogenetic and taxonomic considerations, as well as established practice, the Coronavirus Study Group (CSG) of the International Committee on Taxonomy of Viruses formally recognizes this virus as a sister to Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV) and renamed it as

SARS-CoV-2 [3]. Because COVID-19 is the established name in the current marketplace of ideas, it is the one that will be used for this commentary.

Despite rigorous global containment and quarantine efforts, including travel restrictions, expanded triage, quarantine, and screening measures (e.g. temperature checkpoints), COVID-19 incidence continues rising. On March 11, 2020, WHO declared COVID-19 a global pandemic, which classified the outbreak as an international emergency [4]. On 26 April 2020, confirmed COVID-19 cases numbered 2,971,477 and deaths numbered 206,544 [5].

The COVID-19 pandemic has changed surgical practice. The U.S. Department of Health and Human Services, Centers for Medicare and Medicaid Services [6] promulgated postponement of elective, nonessential surgery. Similar bans followed in the United Kingdom [7] and Australia [8]. A plan supported by the American College of Surgeons (ACS), the American Society of Anesthesiologists (ASA), the Association of peri-Operative Registered Nurses (AORN), and the American Hospital Association (AHA) exists for reintroduction of elective surgical procedures [9]. This ban notwithstanding, surgeons still face risks associated with necessary surgical procedures, which must be mitigated as best as possible, which include exposure to patient airway management-related aerosols, bodily fluids, surgical smoke, contaminated insufflation, and specimen handling in emergency surgery [10].

ACS and ASA, as well as the Royal College of Surgeons, recommend surgical decisions be considered daily, beginning no later than the last pre-operative day, by a leadership team representing surgery, anesthesiology, and nursing [11].

Despite these guidelines, surgeons feel almost as if they are in the middle of a war zone, with pressure on the one hand from the hospital to do at least emergency surgery to avoid merited charges of denial of needed care being countered by pressure from medical colleagues and intensive care units to avoid unnecessary exposure to COVID-19. One result was a quantitative increase in anxiety and depression by surgical staffs during the outbreak period, often with clinically apparent mental health deterioration [12]. Means to ameliorate this stress have been suggested [13].

This short communication, from the point of view of surgeons in the United States and China, will attempt to provide guidance for determining when surgical procedures should be performed

and how to approach surgery with patients who are either likely to have COVID-19 infections or have actually been shown to be positive by laboratory testing.

Epidemiology and clinical features of COVID-19

Absent a vaccine and specific COVID-19 medication, prevention implies frustrating disease spread [14]. The Chinese Center for Disease Control and Prevention's (China CDC) case fatality estimate is 3.46% [3], but case fatality rates are quite varied for reasons known and unknown [15]. The mean incubation period is 5.2 (95% CI 4.1, 7.0) days, with the 95th percentile of the distribution at 12.5 days [16]. Reproductive values (R_0) lie between 2 and 3.35, implying each infected person transmits the disease to two to three others [16-18]; human-to-human contact is considered the major transmission mode. According to the sixth version of the guidance for diagnosis and treatments for COVID-19 issued by the National Health Commission of China, COVID-19 was transmitted through respiratory aspirates, droplets, contacts, feces, and possibly via aerosols [19].

COVID-19 symptoms and signs are stratified as being mild, moderate, severe, and critical [20]. Mild cases lack radiographic changes of COVID-19 infection; over half are afebrile, but still remain sources of disease spread. Symptoms include cough, sore throat, headache, nasal congestion, anosmia, tonsillar swelling, and conjunctivitis; such overlap with those of common diseases, such as allergy, influenza, and upper respiratory infections, frustrating clinical identification [20].

Moderate cases have fever, respiratory symptoms, and characteristic radiographic features. Severe cases have dyspnea (respiratory rate over 30 breaths per minute), oxygen saturation <93% in ambient air, and/or $PaO_2/FiO_2 < 300$ mm Hg. Using a variation of this classification, the China CDC stratified 44,672 confirmed cases, considering 80.9% mild/common pneumonia, 13.8% severe, and 4.7% critical [21].

Table 1 displays the means by which triage nurses in the clinic should investigate the temperature, epidemiological history and clinical symptoms.

General surgical disease treatment

Common conditions evaluated and treated by general surgeons include acute abdomen and cancer. Acute abdomen is often accompanied by severe systemic inflammatory responses and im-

munosuppression. Because COVID-19 patients and acute abdomen patients may lack fever and respiratory symptoms, surgeons must adopt protective strategies for all patients. Interventions that might aerosolize aerodigestive secretions should be avoided or used only when mandatory [22].

Epidemiological investigation
Whether there was any residential history and travel history in epidemic area and surrounding areas within 14 days
Whether there is a history of contact with travelers and residents in the epidemic areas within 14 days
Whether there is a history of contact with covid-19 suspected patients within 14 days
Clinical investigation
Whether there is fever (body Temperature > 37.3 °C)
Respiratory symptoms such as cough
Fatigue

Table 1: Triage nurse evaluations.

Cancer inflates risks of COVID-19 infection, morbidity and mortality [23-25]. A study of 1,524 cancer patients found, compared with the population at large, double the risk of COVID-19 infection [24]. COVID-19 patients undergoing tumor resections might have elevated peri-operative mortality [25].

Zhu., *et al.* [26], reported an interesting case of a patient who underwent endonasal endoscopic resection of a pituitary adenoma, followed three days later by fever, cerebrospinal fluid leak, and a positive COVID-19 laboratory test; several medical staff outside the operating room were diagnosed with COVID-19, while those participating in the surgery were not. COVID-19 infections among their departments medical staff were deemed to have been transmitted postoperatively, with insufficient application of personal airway protection being blamed [26].

Lei., *et al.* [27], retrospectively analyzed elective surgical patient experiences during the COVID-19 incubation period, 1 January 2020 – 5 February 2020. 34 patients, median age 55 (IQR 43, 63) years, 20 (58.8%) women, developed COVID-19 pneumonia shortly after surgery, with abnormal radiographic findings more apparent on chest radiographs than CT scans. Common symptoms included fever in 31 (91.2%), fatigue in 25 (73.5%) and dry cough in 18 (52.9%). 15 (44.1%) were admitted to the intensive care unit (ICU). 7 (20.5%) died, all admitted to the ICU. Compared with non-ICU patients, those admitted to the ICU were older, more often had comorbidities, had more severe laboratory abnormalities (e.g., leukocytosis and lymphopenia), underwent more difficult surgeries,

The most common decedent complications were ARDS, shock, arrhythmia, and myocardial infarction.

Aerosolization of COVID-19 laden material is considered the principle risk of COVID-19 infection of medical personnel [28].

Central south hospital of Wuhan university [29] found that, of 138 COVID cases, 57 (41.3%) were nosocomial. Health care workers accounted for 40 (70.1%) of the nosocomial cases, 31 (77.5 %) from the general ward, 7 (17.5 %) from the emergency department, and 2 (5%) from the ICU. Hospitalized patients, 17 (29.9%), accounted for the remainder, 5 (29.4%) each from the surgical ward, the medical ward, and oncology ward, 2 (11.8%) from other departments.

Ultimately, decisions must be made according to the nostrum “doing the right thing for the right reason” [30]; both case by case assessment and stratification are required [23]. Risk-stratification has created emergent (urgency < 1h), urgent (< 24h), urgent-elective (< 2 weeks), elective-essential (1 - 3 months) and elective-discretionary (> 3 months) procedures [31]. Ducournau., *et al.* [32], recommend: 1) all non-urgent surgeries should be deferred; 2) in the operating theatre, all members of the surgical team should comply with their hospitals infectious disease departmental guidelines; 3) in-person meetings should be replaced by video conferencing; 4) surgical wards and operating theater should have the same guidelines; 5) in-person office consultations should be deferred or cancelled. Online communication, in particular that suited to cell phones, such as WhatsApp, via text messages, voice messages, photographs, and videos, has, by being a substitute for in person office consultation, rapidly expanded the field of telemedicine [33].

Emergency general surgery

Evidence based guidance concerning the performance of emergent procedures are lacking [34]. For patients suspected of having COVID-19, a respiratory panel, procalcitonin test, chest radiographs (conventional or CT), EKG and pulse oximetry are wise; wearing an N95 mask is vital. Table 2 provides relevant queries.

Patients excluded from COVID-19 infection by a negative laboratory test can undergo emergency operations using normal surgical procedures and guidelines. For clinically suspected or laboratory test confirmed COVID-19 patients, after reporting matter to the hospital management department, communication among operating room, anesthesiology department and other relevant departments is initiated, and the operation is conducted under strict protection. Figure 1 outlines matters.

Suspected patients
Contact/droplet precaution N95 mask
Respiratory Panel
COVID-19 TEST
Procalcitonin
CxR, CT scan Chest, EKG
Pulse OX

Table 2: Management of suspected patients.

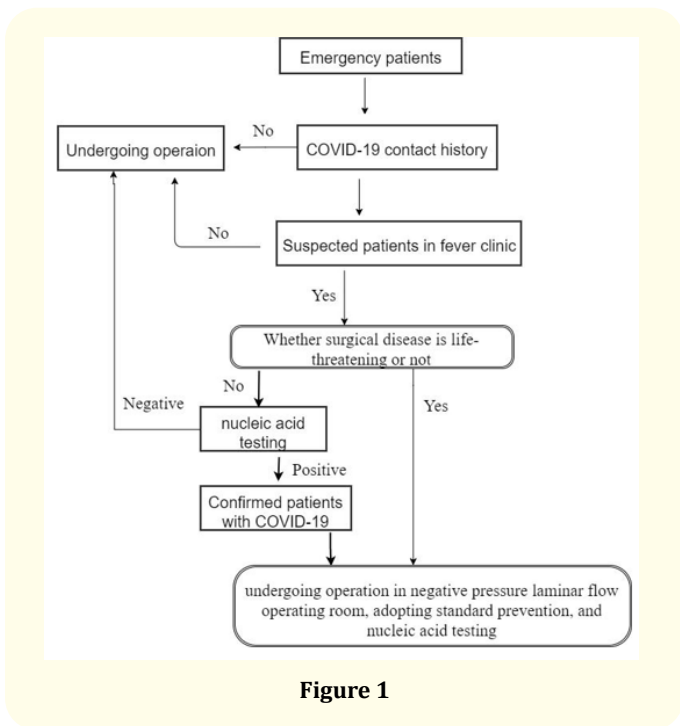


Figure 1

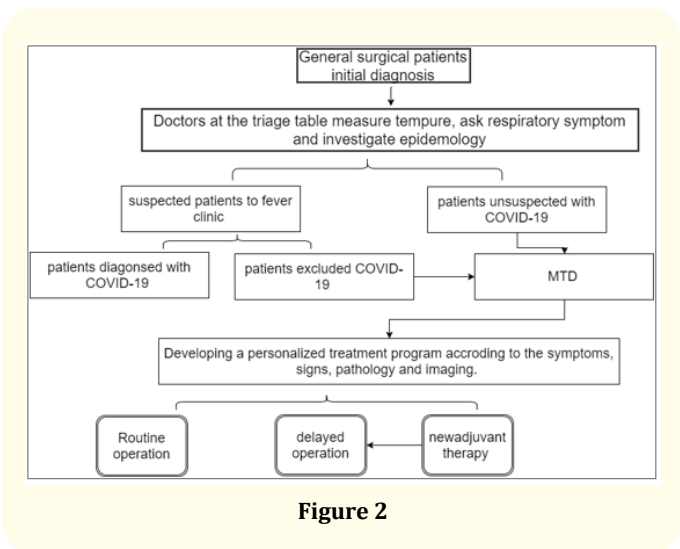


Figure 2

Questions
Will this patient experience a high likelihood of death without surgery?
What comorbidities are present?
How significant are respiratory problems?
Can stabilization and medical therapy defer the procedure?
Answers
A significant risk of death outweighs all other considerations and mandates the operation.
Comorbidities, always a consideration when determining if surgery is warranted, are more important with COVID-19 patients.
Respiratory problems in COVID-19 patients can eventuate into ICU admission with a high attendant risk of death
Stabilization and medical therapy should always be chosen if they are viable choices.

Table 3: Issues when considering emergent surgery for patients suspected of having COVID-19.

Initial opinion deemed laparoscopy’s COVID-19 infectious risk, given pneumoperitoneum and use of electrical and/or ultrasonic devices, greater than that of open surgery, aerosolization of blood borne viruses [35]. Scant evidence comparing laparoscopic and open approaches notwithstanding, some have recommended filtration devices, smoke evacuation devices connected to trocars, self-sealing trocars connected to negative pressure suction, and minimizing energy device use during laparoscopy [36]. In order to reduce the influence of artificial pneumoperitoneum on the circulatory respiratory function, open rather than laparoscopic procedures are advisable for patients with advanced age, poor general condition and poor cardiopulmonary function.

With better understanding of COVID-19’s transmission pathway and enhanced protective measures, infections of medical personnel will likely be less frequent. Medical personnel lacking appropriate protection who make contact with COVID-19 patients should be quarantined for two weeks; with wide availability of three-level personal protective equipment and adherence to established protocols, such quarantines should become rare.

With respect to operations on COVID-19 patients, some [37] have recommended medical personnel involved in operations conduct “medical observation” for two weeks. Surgical personnel who wear three-level protective equipment, follow disconnection and

elimination procedures, and lack accidental exposure they can be exemption from observation; the remainder should be under medical observation for 14 days, seeking prompt medical assessment of any abnormality during observation.

Elective general surgery

The 14 March 2020 recommendation to defer elective surgery by the Surgeon General led to anxiety and confusion as to the near, intermediate, and long-term future of our healthcare system [38]. By the same token, operating room time and personal protective equipment (PPE) are both scarce resources in much of the country today. PPE now includes masks (denoted as 2 or 3 filtering face pieces, depending on the aerosol-generating risk level), eye protection, double non-sterile gloves, gowns, suits, caps, and socks. A distress for many surgeons is the mandate to stay home unless specifically called upon to render direct patient care; sitting at home doing nothing amid a crisis does not fit with the personality of most surgeons. This notwithstanding, given that many physicians and other medical workers will be infected with COVID-19, staying home allows preserves the medical work force in anticipation of future shortages [39]. In order to minimize resource exhaustion, the use of surgical appliances and staff must be well pondered and balanced [40]. It is important to ensure the ability of surgeons and specialized professionals to function through the pandemic [41]. When physicians themselves are at risk of being a scarce resource, for a physician to risk caring for a patient without appropriate PPE is irresponsible, not heroic [39].

The decision to suspend or cancel elective surgical operations should not only be made on the risk of COVID-19 spread, but must also consider risks of cancer, vascular disease, and organ failure without the provisioning of elective surgery [42]. On balance, in the current pandemic, elective surgical operations should be suspended unless not operating poses a high risk of significant morbidity, organ failure or mortality.

When possible, all surgical procedures on all suspected COVID-19 patient should be postponed until confirmed infection clearance. For patients who need elective surgery, operations can be postponed as appropriate on the premise of COVID-19's potential deleterious effect upon outcomes. In the presence of COVID-19 epidemic, Measures taken in China suspend all elective surgery while extensive efforts were made to track the disease and control its spread. After the outbreak was under control, body temperature

measurement and epidemiological screening have been applied before performing elective surgery. Absent fever, but with an epidemiological history, a stay at home quarantine for two weeks is imposed, after which admission to the hospital occurs. If there is no epidemiological history or fever, routine admission examinations such as pulmonary CT scans are completed; barring the uncovering of abnormality, admission proceeds according to ordinary guidelines. In China, except for Hubei province, hospital surgical departments resumed normal activities within a month.

For patients with advanced malignant tumors, if neoadjuvant therapy is expected to have a good effect after network MDT discussion, it can be given first after full communication with the patient's family, and surgical treatment can be performed after the epidemic is controlled.

Most cancer patients in general surgery can wait up to a month. Studies from Korea have shown that 1-month delay in surgical treatment for colon cancer has no effect on survival [43]. The Danish study suggested that colon cancer had no increased risk during the short observation period (< 60 d), but was not suitable for rectal cancer [44]. Whether patients who have confirmed COVID-19 infection should stop their anti-cancer therapy or not remains debated; one reported patient with lung cancer diagnosed with COVID-19 continued targeted therapy during the course of virus infection [45]. If the effect of neoadjuvant therapy is expected to be poor or the patients and their families have a strong desire for surgery, it can be treated surgically after full communication.

Conclusion

COVID-19 has disrupted surgical diagnosis and treatment work. Most senior surgeons can only stay at home awkwardly, instead of fighting on the front line against the epidemic. In contrast to these negative aspects, we should remember the epidemic forces us to reflect on our usual diagnosis and treatment work, including the storage of protective materials, to closely examine the problems of aerosol and pneumoperitoneum during endoscopic surgery, and, perhaps, to think of ways of reducing unneeded surgical procedures. In the near future, we will likely return to the operating room armed with greater wisdom.

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