

## Review Article

### Surgical Practice During the COVID-19 Pandemic: An Update

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#### Abstract

The Covid-19 pandemic continues to wreak havoc as the world scrambles to find the yet elusive cure. With millions of infected cases and mortalities worldwide, it is mainly a droplet infection though other modalities have been documented. Diseases other than this pandemic infection continue unabated and must be managed alongside the menace of COVID-19 infection. Surgical practices need to adapt to cater for the threat of infection during human interactions in the community, during stay in the hospital and between the surgeon and his patients. Telemedicine is emerging to be an extremely important modality in patient management in the given circumstances. Patients need to be carefully selected for admission and screened for COVID-19 and operating room protocols upgraded. This status quo review of alterations in surgical practice during the pandemic explores the recommendations available on PUBMED, WHO and public funded sites with access to COVID-19 research.

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#### Introduction

COVID-19 caused by the Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)<sup>1</sup> continues to plague the world. It was declared a pandemic on March 12, 2020 by the WHO.<sup>2</sup> With no definitive cure in the offing despite diligent efforts, a Covid free world appears to be a pipedream. Our survival therefore lies in adapting to co-exist with the virus. Also, the advent of this pandemic does not obviate other calamities and disease. Current medical practices shall have to re-align themselves to limit the spread of infection while treating patients.

Surgical specialties have a high penchant for contributing to COVID-19 spread since interventions involve close interaction with both the patient and body fluids. Though notorious for causing fatalities from pneumonia and acute respiratory distress synd-

rome (ARDS), the prolonged presence of Corona Virus 2 in body fluids other than respiratory secretions have been reported in recent studies.<sup>3,4</sup> The virus displays a strong affinity for Angiotensin 2 converting enzyme receptors and hence its purported presence in the intestine, testicles and kidneys as well as their secretions.<sup>5</sup> Moreover, of all the coronaviruses, SARS-CoV-2 has been described to possess the toughest outer shell that enables its survival in extra-respiratory secretions extra and intracorporeally.<sup>6</sup> Its exceptionally hard shell also renders the virus impregnable to normal host defenses including antimicrobial enzymes. Consequently, Covid-19 patients shed a greater number of virus particles possessing prolonged activity making them more contagious compared to other SARS-CoV species.

Propounded to be a droplet infection, researchers

have revealed the presence of the virus in feces and tears for extended periods even in extracorporeal environments.<sup>7</sup> Transmission through food and blood has not been established yet. Moreover, asymptomatic cases exist that the authors reckon are the most dangerous and potent sources of infection. Considering these factors along with the multifaceted presentation of COVID-19,<sup>8,9</sup> it is imperative that every individual be regarded as a suspect unless proven otherwise. COVID 19 seems to be an unresolvable dilemma for now with consequences of considerable magnitude. This status-quo review based on current recommendations discusses changes in our current surgical practices to acclimatize to the present scenario. It is hoped that the recommendations made would curb transmission and mortality within surgical facilities and contain the socioeconomic repercussions that have shaken even the soundest economies of the world.

### Patient Selection

Out patient activity should be drastically curtailed to prevent transmission to the weak, elderly, and immunocompromised patients as well as those with comorbidities who are prone to the worst complications of a COVID-19 infection.<sup>10</sup> Telephonic consultations and tele-clinic systems can triage new referrals and follow up patients.<sup>11,12</sup> Routine referrals should be deferred. Suspected malignancies should be directly referred to diagnostic testing/imaging according to capacity. Patients with symptoms of fever, cough or known COVID-19 infection should be prohibited from attending clinics. All surgical staff should be cognizant of possible COVID-19 symptoms during face-to-face and telephonic conversations and trained to respond accordingly.

Inpatient staff should be reduced and consultations over the telephone/ electronic media be encouraged where possible.

### Hospital Admission

A quarantine area should be set up for all new admissions in the ward. All new patients should be isolated for a minimum of 3-5 days and preferably 14 days. During this period, they should be carefully monitored for any signs or symptoms of a COVID-19 infection. It is recommended that routine blood tests, nasopharyngeal swabs and CT chest be sent for all

patients being admitted as well as nucleic acid testing if available. If no signs or symptoms are evident and the patient is COVID-19 negative, he can be shifted to the relevant ward. Patients diagnosed with new coronavirus pneumonia should be isolated immediately. Patients with inflammatory exudates or decreased lymphocyte count should be referred to the fever clinic for further workup and all contacts should be screened immediately for the infection.

Multidisciplinary patient management of COVID-19 patients should be implemented.

### Wound Examination

Though studies recommend double surgical gloving and disposable surgical gowns over white lab coats while examining wounds with pre and post washing of hands, the authors recommend full PPE with at least FFP2 to safeguard from accidental splashes especially while examining exudative wounds. Direct contact with the wound should be avoided unless necessary. Hand washing before and after wound examination is mandatory. Direct contact requires prompt washing the area with running water and disinfection with 75% ethanol or chlorine (500 mg/L).

### Dressing Change

Full PPE should be worn as given in Table 1. Hand washing before and after is mandatory. Suspected exposure should be managed with 75% ethanol or chlorine (500mg/ml) disinfection. Whenever possible, dressings that can be kept on for 3-5 days should be used. Interactive dressings that promote healing or absorb exudate over a period of days should be the choice. If applicable, dressing facilities at nearby hospitals should be availed, otherwise patients and their immediate caregivers should be educated in wound care and dressing changes. Monitoring of the wound can be done by video/ Whatsapp follow ups.

### Elective Surgery

All elective procedures should be postponed till situation improves.<sup>13,14</sup> Higher thresholds for surgery are recommended especially for procedures requiring post-operative critical care. A three-pronged beneficial effect has been expounded.<sup>10</sup> Firstly, beds shall be released in the ward, the ICU as well recovery rooms (that can be used as additional ICUs) to accommodate

the increasing number of COVID-19 patients. Secondly, with lesser procedures to do, anesthetists and acute care surgeons shall be more available to impart critical care to the COVID-19 patients. Lastly, installing patient filters shall decrease hospital traffic and prevent cross-infection.

Competition among different surgical specialties for operating opportunities is inevitable in such circumstances. Protocols for prioritization must be established wherein clinical urgency should be balanced with resources on-hand. Dual consultant operating and stalling training procedures to curtail operating times are effective measures when resources are limited. Patient involvement and counselling is a must.

Pre-emptive planning to accommodate the back log of patients once the pandemic is over is strongly advised.

### Cancer surgery

Neo-adjuvant therapy can be employed to postpone operative intervention for as long as possible considering the immunosuppressed, frail condition of cancer patients placing them at an increased risk of contracting COVID-19 infection. However, a repeated review of decisions should be made at regular intervals. The benefits of postponing surgery should be weighed against its negative effects on tumor load and spread. Each case should be examined individually. Delaying high-risk cancer surgeries for more than 6 weeks can affect the outcome and prognosis.<sup>15,16</sup> MDTs and tumor boards should be involved in all decision making preferably via electronic media.

Patients were classified into 4 tiers according to urgency of treatment during the pandemic. Aggressive, locally invasive, metastatic head and neck squamous cell and thyroid carcinomas, some skin and skull base cancers, colorectal cancers were to proceed with surgery; low grade papillary thyroid cancers and some skin cancers could be deferred for 30 days while benign thyroid nodules, revision papillary thyroid cancers and basal cell carcinomas could be deferred from 30-90 days.<sup>17</sup> Lastly decisions should be based on prognosis of the patient, rate of progression and tumors with rare histology or uncertain progression rates. Selection criteria should prioritize tumors whose excision defects could be covered with local or

pedicled flaps. COVID-19 testing 48 hours prior to surgery is advised.<sup>18</sup> Aerosol generating procedures should be avoided.

### Emergency Surgery

Surgical interventions in COVID-19 patients and suspects should be postponed until infection clearance is obtained. Where deferral outweighs other risks, strategies to minimize the number of staff be employed. Ineffective human and other resource management can expose and infect key players in the management system, especially senior surgeons and staff.<sup>19</sup>

COVID-19 can present with severe gastrointestinal symptoms that emulate acute surgical pathologies. Staff should be trained to recognize the symptoms of a concurrent COVID-19 infection and respond accordingly.

Patients admitted for COVID-19 management may develop complications requiring emergency surgery. It is important to be mindful of the high peri and postoperative mortality in these patients. A study reported postoperative pulmonary complications in half the patients with perioperative SARS-CoV-2 infection.<sup>20</sup>

In postoperative patients who develop respiratory symptoms or pyrexia of unknown origin, it is vital to consider a nosocomial COVID-19 infection. These patients should be isolated and both the patients and their contacts tested for COVID-19. A CT chest of the symptomatic patient should be sent for. A high index of suspicion for a COVID-19 infection should be maintained.

Based on different international studies, 3 levels of priority triages surgical patients as shown in Table 1.<sup>21</sup>

### Burns

Acute burn is a surgical emergency. However it is recommended that patients do not come to the hospital unless absolutely necessary.<sup>22</sup> Protocols for treatment of minor burns at home should be publicized in the community. Video consultations should guide management and follow up. In cases requiring hospital management, admission should be prudently selective with only one patient admitted at a time.

Attendants should be limited to one person per patient and should not be replaced. Video visits should be encouraged to update family members and friends.

Distancing of 1 meter from the doctor and wearing of masks should be mandatory for the patients and attendants. Regular temperature taking of all burn unit inmates is necessary with referral to the fever/medicine clinic in case of temperatures above 37.3 Fahrenheit or any symptom of virus infection.

Hand sanitizers should be freely available throughout the burn center.

Ideally all burn patients and their attendants must be screened for COVID-19. Apart from the standard history and examination for burns, history of contacts and presence of symptoms of the infection in both the patients and their consorts must be noted. It is vital to record the demographics of the patient and movement within the last 14 days<sup>23</sup> so to exclude travel to COVID-19 prevalent areas.

Fever is a common feature of both burns and COVID-19 infection. All patients developing new fever should be screened for coronavirus infection. It is important to re-check all contacts for the infection. CT chest and routine blood tests<sup>22</sup> should be ordered. Also, investigate other sources of infection such as the wound, urinary tract and all catheters.

Burn fever does not accompany cough. Burn fever may follow wound infection or major surgery and blood samples reveal elevated pro-calcitonin levels as well as white cell counts. However, in severe sepsis white cells may be depressed. Nucleic acid testing and nasopharyngeal swabs will be negative for COVID-19 in a burn fever. Chest CT findings will be those of bacterial or atypical microbial infections.<sup>22</sup>

### **Burn Inhalational Injury**

Irrespective of COVID-19 status, patients with inhalational burns should be managed in a negative pressure isolation room. Patients should be educated on self-changes in position and how to expectorate safely in special containers that can be sealed after every use. Tracheostomy, bronchial and endotracheal tube lavage as well as other aerosol generating procedures should be avoided or performed with full PPE.<sup>24,25</sup>

### **Burn Surgery**

It is necessary to shorten intraoperative times of indispensable procedures like tracheostomies, escharectomies, fasciotomies, debridement and skin grafting of large burns by judicious planning. Infection control measures need to be fortified at every step. Debridement should be as conservative as possible with care to avoid vital tissue exposure that might need complex coverage.<sup>22</sup> Minimize tissue handling and arrange for only relevant instruments.

### **Organizing the Medical Team**

The administration must plan doubling or cross-covering or back-up protocols for doctors falling sick from the pandemic, mental or physical exhaustion<sup>(26, 27)</sup>. Vulnerable staff members such as pregnant doctors, older surgeons and those with co-morbid factors should be assigned duties that place them at lower risk such as caring for patients proven to be COVID-19 negative. Shortage of the workforce can be overcome by utilizing the services of retired surgeons with no co-morbidities, clinical academicians or final year medical students.

COVID-19 specific surgical teams not treating non-infected patients should be constituted to prevent cross infection.

### **Planning for Surgery:**

Patients should be tested with the gold standard PCR 24 hours prior to surgery and isolated or social distancing implemented thereafter.<sup>28</sup> Once patients have been screened for COVID-19 infection, it is judicious to plan multiple surgeries on one or two designated days to decrease the chances of cluster infection and exposure of the surgical staff. Plans to stage and simplify the operation must be considered to shorten operative times. Informed consent is taken by the surgeon and the anesthetist regarding changes in the standard operating procedures due to the special circumstances. All antibiotics administered should cover coronavirus instigated pneumonia. Planning and equipment to reduce splashes and contamination during surgery should be in place.

For infected cases, Covid dedicated operated rooms (Covid Operating Areas or COA) should be assigned and marked. These along with any attached induc-

tion/ accessory rooms or sterilization spaces should remain closed. Unnecessary equipment should be moved out of the pre-allocated COVID patient transit route (Table 3). Staff must adhere to the standard protection protocols for Class A infectious diseases<sup>30</sup> during all stages of the procedure including disinfection of instruments, surgical waste and other medical equipment.

### Personal Protection Equipment (PPE) for the Surgical Staff:

The main load of virus is through air-borne droplets<sup>29,30</sup> that are larger than 5 micrometers. These can travel distances of one meter before they are affected by gravitational forces. A two meter social distance is recommended. Viruses can live on surfaces for days and cause contact transmission.<sup>31</sup>

All surgical and burn unit staff must be trained to don and doff Personal Protective Equipment (PPE). A “buddy system” where a colleague with a checklist ensures the correct procedure for donning and doffing of the PPE should be instituted. Training and practicing PPE use before patient management is essential for staff and patient safety. Surgeons with beards must take special care to ensure mask fit. A strong correlation exists between proper fit and protection. The recommended PPE gear for burn and other surgeries is given in Table 2.<sup>32</sup> Incorrect or misuse of the PPE can lead to infection spread.<sup>33</sup> Moreover, using higher levels of PPE than indicated can lead to resource shortage for the future

Gloves must be exchanged immediately if damaged or contact with infected material occurs. FFP3 masks should be worn for procedures that potentially generate aerosol particles. Table 3 summarizes the aerosol generating procedures.<sup>34,35</sup> Visors or goggles should be worn to protect the conjunctiva as it is a veritable source of virus transmission.<sup>25</sup>

### Transport and Logistics Management

Figure 1 summarizes the procedure for transporting a COVID-19 patient to the operating room (OR).

### Operating Room Directives

OR staff should be meticulously organized when ready to receive the patient in full PPE. Surgical staff be reduced to the minimal necessary.<sup>36</sup> Equipment

needed should be kept to a bare minimum and must be pre-checked carefully by a designated “Scout Nurse” to avoid unnecessary traffic through the theatre fetching things during the procedure. The OR suite should have an adjoining negative pressure anteroom fitted with a HEPA filter for donning and doffing the PPE without contamination of clean hubs. A “jumper” or “runner” should be present in the anteroom to pass in any missing materials in exceptional circumstances.

Transit of personnel through the OR should be strictly prohibited once the patient is shifted and all doors closed. A high rate of air exchange ( $\geq 25$  cycles/ hour) to minimize viral load (37) can be attained with negative pressure ORs (38, 39) of at least  $-4.7 \text{ PA}^{40}$  instead of standard positive pressure suites.

Surgical instruments and sutures are kept in sterilizable steel baskets instead of on the trolley. Used anesthesia instruments should be placed in a zip-lock bag attached to the IV pole on the left. As far as possible, use disposable linen and other materials. All surfaces should be wiped with alcohol after induction. Decolonization within an hour of making the incision should be performed with chlorhexidine wipes, mouth rinse and 2 doses of nasal povidone iodine.<sup>41</sup> The use of electrocautery should be limited.<sup>31</sup>

Awake and fiberoptic intubation techniques should be avoided to prevent aerosol generation.<sup>24</sup> Rapid sequence intubation is preferred, and manual ventilation avoided or kept to very small volumes. Nevertheless, intubation of any type is considered high risk for COVID-19 transmission. Closed suction systems and HEPA filters<sup>42,43</sup> should be used with the filter and soda lime changed after each use.<sup>44</sup> Dedicated ventilators are used. Endotracheal tubes should be clamped while switching from the portable to the OR ventilator to prevent aerosol dispersal.

The patient should be moved directly to the COVID-19 ward or ICU instead of the recovery room without pause. The route should again be pre-allocated away from public areas.

### Discharge of Surgical Patients

Discharge criteria for new coronavirus patients must be set in conjunction with the infection control specialists. The necessary protocol for isolation and

observation must be followed. Patients in worst hit areas should not return to non-epidemic areas until proven negative.

### Rehabilitation

Bespoke rehabilitation programs for each individual should be designed to reduce the frequency of visits. Patients should be well educated and trained about self-care and rehabilitation regimens and availing facilities near area of residence. Follow-ups and consultation through video conferencing/ telemedicine should be incorporated in the program.

### Conclusion

In the wake of the highly contagious epidemic, surgical patients should be triaged according to evidence-based guidelines. Demographics, history and screening of the patient are mandatory before admission. Inpatient quarantine and curtailing hospital traffic are part of COVID infection control. Special operating room preparation, organization of teams and transport planning are essential in patients requiring operations. Telemedicine is emerging as an effective modality in patient management and infection control.<sup>45-47</sup> The current situation could be a testing ground of its feasibility as a reliable practice for the future as well. It is hoped that positive changes in infection control improvised to curtail COVID19 spread would become habitual so as to convert a parasitic relationship into a symbiotic one.

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