

COVID-19 Outbreak and Surgical Practice

Unexpected Fatality in Perioperative Period

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Little is known about surgical practice in the initial phase of coronavirus disease 2019 (COVID-19) global crisis. This is a retrospective case series of 4 surgical patients (cholecystectomy, hernia repair, gastric bypass, and hysterectomy) who developed perioperative complications in the first few weeks of COVID-19 outbreak in Tehran, Iran in the month of February 2020. COVID-19 can complicate the perioperative course with diagnostic challenge and a high potential fatality rate. In locations with widespread infections and limited resources, the risk of elective surgical procedures for index patient and community may outweigh the benefit.

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The global incidence of novel coronavirus disease 2019 (COVID-19) that involves the lower respiratory tract (pneumonia) continues to rise since December 2019. The disease is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that simultaneously has high transmission and fatality rates. Little is known about surgical practice in the initial phase of the COVID-19 pandemic. The aim of this report is to describe the clinical presentation and outcomes of elective surgical patients during the COVID-19 outbreak.

This is a retrospective case series of 4 patients who developed perioperative complications in the first few weeks of the COVID-19 outbreak in Iran in the month of February 2020. The first case of COVID-19 in Iran, the epicenter of infection in the Middle East, was officially reported on February 19, 2020 from the city of Qom.

Three patients developed postoperative fever and pulmonary complications after uneventful elective operations. Two operations were performed before the official announcement of outbreak in Iran. Correct diagnosis and management in the postoperative setting were challenging. Two patients died (Table 1, Fig. 1).

The fourth case was a patient with severe obesity from Qom who had been scheduled for bariatric surgery on February 22. One day before the scheduled surgery he was taken to the emergency department with severe acute respiratory distress which rapidly progressed to cardiopulmonary arrest (Table 1).

This case series shows the challenges facing surgical practice in the initial phase of COVID-19 outbreak. The effects of surgical and anesthesia stress, perioperative medications, and postoperative changes (eg, development of lung atelectasis) on predisposition to new COVID-19 infection or exacerbation of current infection are not known. Based on current evidence, while it is believed that the fatality of COVID-19 is between 1 and 3%, most fatalities have occurred in elderly patients with underlying cardiopulmonary conditions, diabetes, and obesity.^{1–3} Although the current series may bias reporting toward more severe outcomes, postoperative patients may be another group of COVID-19 patients who would have poor outcomes. A complicated postoperative course may especially be seen more in elderly patients with underlying health conditions.

In the postoperative period, development of fever or pulmonary complications can lead to a diagnostic challenges and can complicate the recovery of patients from elective surgery. In patients with postoperative fever, several diagnostic tests are usually necessary to determine the source. Other forms of infectious pneumonia, aspiration pneumonia, pulmonary embolism, pulmonary edema, and other conditions are among the differential diagnoses in patients with postoperative pulmonary symptoms. During the current progressive outbreak, a high index of suspicion for COVID-19 may be increasingly important to make a correct diagnosis and to take correct actions to treat the index patient and to prevent the spread of virus.

The diagnostic accuracy of RT-PCR in the postoperative setting needs to be determined. Notably, in a recent series from China of over 1000 patients to assess the diagnostic accuracy of different tests, chest CT scan had sensitivity of 98% compared with RT-PCR sensitivity of only 71%.⁴ Furthermore, identification of biomarkers and development of clinical prediction models that predict severity and outcomes of COVID-19 in postoperative period would be extremely helpful. Some preliminary data suggest that severe lymphopenia and elevated levels of C-reactive protein (CRP), interleukin-6, cardiac troponin I, and D-dimer correlate with the severity of hypoxemia and may predict hospital mortality.^{5,6} Case 1 with elevated D-dimer, and Case 2 with lymphopenia, elevated CRP and ESR, and biomarkers of cardiac injury (elevated CKMB and troponin) died. However, Case 3 with a normal lymphocyte count and CRP survived.

These cases raise the possibility that performing elective operative interventions on patients with undetected hidden or mild forms of COVID-19 may lead to contamination of operative room and equipment, with risk of transmission of the infection to operative team and other healthcare providers in hospitals. Secondary transmission of COVID-19 in the hospital setting is not uncommon.³ Case 3, who developed fever on postoperative day 2, probably had hidden or mild form of disease at the time of surgery with a real risk of spreading to others during hospital admission. It is not clear if Case 1 and Case 2, who were readmitted about 2 weeks after surgery, got the infection at the time of surgery or after hospital discharge in the community, but we do not yet know whether undergoing major surgery might reduce the individual's ability to fight this infection. Obviously if Case 4 was not presenting with pulmonary manifestations (eg, if he was only in the

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Dr SS and Dr AR-J had full access to all of the data in the study and take responsibility for the integrity of the data.

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TABLE 1. Clinical Characteristics of 4 Patients Who Developed Perioperative Complications in the First Few Weeks of COVID-19 Outbreak in Iran

N	Age (Sex)	Planned Surgery	Date of Surgery	Date of Symptoms	Presentation	Chest CT	RT-PCR*	Other Work-ups	Hospital Course	Outcome
1	75 (F)	Incisional hernia repair	February 9, 2020	February 27, 2020	Fever, cough, dyspnea	Figure 1A	Positive [†]	On February 28, 2020: elevated D-dimer [‡]	Progressed to ARDS and MOF	Died (March 1, 2020)
2	81 (M)	Laparoscopic cholecystectomy	February 8, 2020	February 22, 2020	Initial: abdominal pain, anorexia, N/V After 2 days: fever, dyspnea, diarrhea	Figure 1B	Negative [§]	On February 27, 2020: bilateral diffuse patchy infiltrations on CXR, lymphopenia, elevated CRP, ESR, CKMB, and Troponin I [¶]	ARDS, sepsis, acute cardiac injury	Died (March 4, 2020)
3	54 (F)	Cholecystectomy and hysterectomy	February 24, 2020	February 26, 2020	In-hospital fever on POD 2 and dyspnea on POD 3	Figure 1C	Positive	CBC, ESR, CRP, CXR, U/A, and abdominal ultrasound were normal.	Symptoms resolved on POD 5	Alive in good condition (March 2, 2020)
4	44 (M)	Gastric bypass**	February 22, 2020	Unknown ^{††}	Admitted in a local ED in Qom with severe acute respiratory distress ^{‡‡}	Not done	Not done ^{§§}	Not done	Rapidly progressed to cardiopulmonary arrest in few hours	Died (February 21, 2020)

*Reverse transcriptase–polymerase chain reaction (RT-PCR) test for COVID-19 nucleic acid of nasopharyngeal swab specimen.

†Resulted postmortem.

‡2992 µg/L (normal range <500 µg/L).

§Due to progressive course of disease which led to death before resulting the first RT-PCR, repeat assay was not performed. Although not laboratory confirmed with the single RT-PCR test, clinical picture, chest imaging findings consistent with coronavirus pneumonia, and occurrence at the time of progressive outbreak in Iran made the clinical diagnosis of critical COVID-19 infection.

¶During the ICU admission, he developed lymphopenia (984 per µL, normal range: 1000–4000), CRP (+3), elevated ESR (58 mm/h, normal range: 2–20) and biomarkers of cardiac injury including CKMB (63 IU/L, normal range 6–25) and Troponin I (>50 ng/mL, normal range <0.06).

||Resulted postdischarge.

**For severe obesity (weight = 198 kg, body mass index = 69 kg/m²).

††On the last preoperative phone conversation on February 19, the patient did not mention any problems.

‡‡Occurred on February 21, 2 d after official announcement of first case in Iran which started from the city of Qom and 1 d before the scheduled bariatric surgery.

§§RT-PCR was not performed due to rapid progressive course of disease, and insufficient testing capacity in initial phase of epidemic.

ARDS indicates acute respiratory distress syndrome; CKMB, creatine kinase-MB; CRP, c-reactive protein; CXR, chest x-ray; ED, emergency department; ESR, erythrocyte sedimentation rate; F, female; M, male; MOF, multiple organ failure; N/V, nausea and vomiting; POD, postoperative day; U/A, urinalysis.

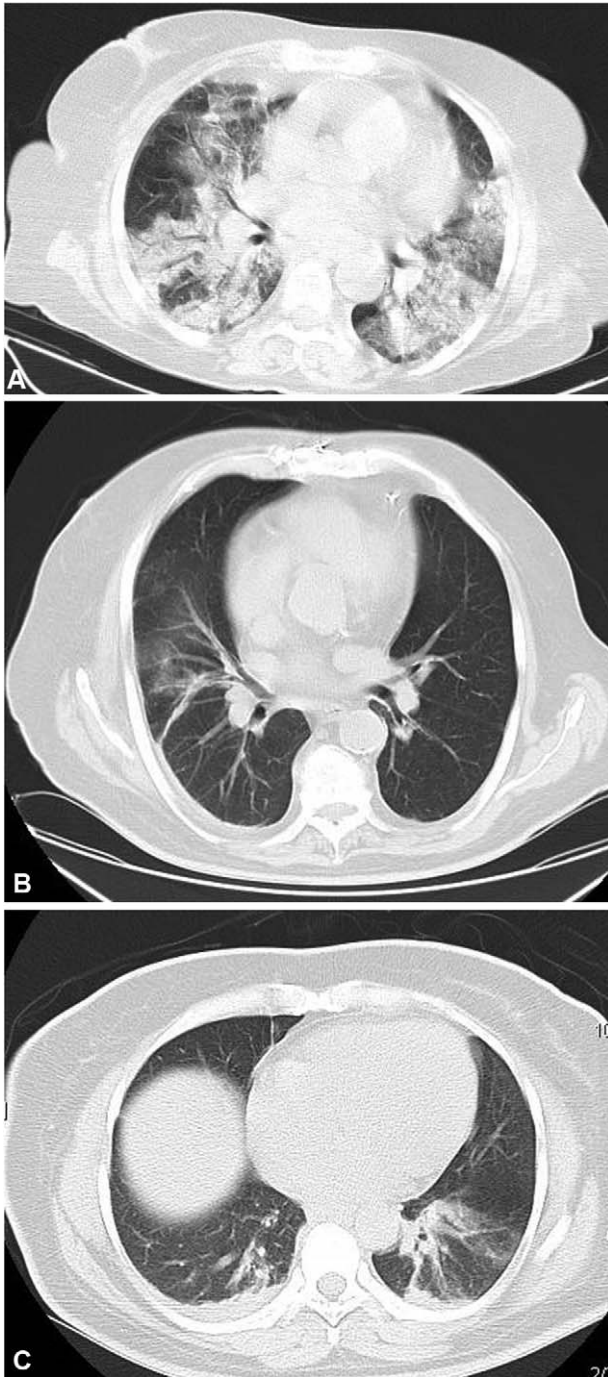


FIGURE 1. Chest CT scan of COVID-19 pneumonia. A, Case 1: Bilateral large areas of ground-glass opacities and consolidations, giving a white lung appearance, 19 d after an elective incisional hernia repair. B, Case 2: Unilateral peripheral ground-glass opacities 16 d after laparoscopic cholecystectomy. C, Case 3: Bilateral dependent consolidations in lung bases with minimal pleural effusion 3 d after hysterectomy and cholecystectomy.

incubation period of infection with minimal symptoms), he would have had the bariatric procedure the next day.

At the very least, COVID-19 can complicate the perioperative course with diagnostic challenges and potentially increase the fatality rate. As we learn more about this disease, likely depending on the severity of an epidemic and availability of resources, the risk and benefits of performing elective surgical procedures should be carefully re-assessed. In locations with widespread infections and limited resources, the risk of elective surgical procedures for index patient and community may outweigh the benefit, especially when one considers the potential for unnecessary utilization of personal protective equipment (PPE). In some situations, postponing elective surgical procedures might be the right decision, although it depends on how the word “elective” is defined, and many of our patients will still need treatment as an emergency, for cancer, or for symptomatic conditions that may deteriorate over time.

Our response to and management of this situation will evolve over time. Many institutions are currently dealing with critical, hopefully short-term, limitations of PPE availability. In this period, conservation will be all important. As time goes on and we become more used to working in a COVID-19 environment, we will adjust our workflows and decision making to optimize care for our patients, while also caring for the caregivers. Many expert groups are currently sending out recommendations for dealing with coronavirus, although little evidence exists at the present time other than anecdotal reports. What is clear is that we must protect our surgeons and caregiver and address their fears, while balancing risk to others, to patients, and managing the availability of resources. Concerns about aerosolization in otolaryngology or skull base surgery, endoscopic, or laparoscopic procedures are being discussed, and this may become more of a concern as the prevalence of asymptomatic or undetected cases increases, and as hospitals get back to doing “elective” surgery. While point of care testing or preoperative chest CT scan may also help us address this, the accuracy of testing asymptomatic patients is not clear. For peri-operative care, using telemedicine and virtual visits using a smartphone or other devices can also be an option to decrease the risk of spreading infection during the outbreaks.

In conclusion, although many questions remain unanswered about COVID-19 and surgical practice, the surgical and perioperative communities should be aware that this virus may impact perioperative outcomes, as well as caregiver practice. Careful deliberation and rapid studies to determine the correct response will be critical as we proceed into the future.

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