

# Asymptomatic patients with coronavirus disease and cardiac surgery: When should you operate?

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## Abstract

The coronavirus disease (COVID) pandemic and the decision-making process of whether to perform urgent procedures during a surge are issues that will likely not disappear in the near future as reflected by the current rise in COVID cases in the southern and western United States and the resurgent numbers of confirmed cases around that world leading to are leading to new lock-downs. Multi-disciplinary discussions will continue to be important to decide individual risk and benefit profiles for patients with asymptomatic COVID patients moving forward. While imperfect, this most recent study provides more insight to some of the risks that should be weighed in these discussions. Further prospective, longitudinal research and better understanding of the heterogeneity of the COVID positive patient will further enhance understanding the decision-making process in the cardiac surgical patient through these difficult times.

## KEYWORDS

cardiac surgery, corona virus, COVID-19, urgent surgery

The novel coronavirus (coronavirus disease 2019 [COVID-19]) was declared to be a worldwide pandemic by the World Health Organization on 11 March 2020. During the peak of COVID-19, elective surgeries were canceled and postponed both nationally and abroad for conservation of hospital resources and personal protective equipment. Statements from the American College of Surgeons indicated that during the peak, non-emergent surgeries should be triaged according to an elective surgery acuity scale. Most elective cardiac surgeries in question qualify as Tier 2 where there is “intermediate acuity” and delay may increase patient morbidity.<sup>1</sup> The decision-making process for surgery at that time balanced the real risk of proceeding and the real risk of delay. Now that the initial surge has subsided in many places around the world, and elective surgeries are resuming, a new question of when to operate with patients with COVID-19 has emerged. In this new calculus, the risk of adverse outcomes due to having COVID should be weighed against the risk of morbidity for delaying the surgery.

The retrospective cohort study by published recently in the *Journal of Cardiac Surgery* by Barkhordari et al<sup>2</sup> gives important evidence to help inform the risk-benefit balance in proceeding or

triaging cardiac surgical patients with COVID-19. The authors describe the outcomes in 25 patients with asymptomatic COVID-19 infections undergoing emergent or urgent cardiac surgery in Tehran, Iran. Most of the operations were performed on bypass (84%), with the majority of patients receiving coronary artery bypass grafting. The authors found that the patients postoperatively had a median PaO<sub>2</sub>/FiO<sub>2</sub> ratio of 231 (with one case of failed extubation) and a median duration of intubation and intensive care unit (ICU) stay were 13 hours and 3 days, respectively. The overall mortality rate and ICU readmission rate were both 16% each. Of note, those requiring readmission to the ICU fared poorly—the PaO<sub>2</sub>/FiO<sub>2</sub> ratio of this subgroup was 84.5, with a mortality rate of 75%. Barkhordari et al conclude that while most of the asymptomatic COVID positive patients had early postoperative respiratory outcomes comparable to their pre-COVID propensity-match cohort, a significant number that required ICU readmission fared extremely poorly.<sup>2</sup> Due to this risk, the authors recommended cardiac surgeries in the asymptomatic COVID-19 positive population to be postponed unless deemed emergent.

Despite the small sample size of the study, the data is both timely and relevant during the current global pandemic. To our knowledge,

this is the only study correlating cardiac surgical patients who tested COVID-19 positive to clinical outcomes. Other studies have previously demonstrated potential adverse outcomes in COVID-19 positive noncardiac surgical patients. Lei et al<sup>3</sup> performed a retrospective study of 34 patients who had elective noncardiac surgery while COVID-19 positive. They found that 44.1% required ICU level care postoperatively, with a mortality rate of 20.5%. Furthermore, Aminian et al<sup>4</sup> describe cases of severe peri-operative complications in elective noncardiac surgical patient during initial COVID-19 outbreak in Iran. Three patients developed fever and pulmonary complications after uneventful operations, and 2 out of 3 (67%) of these patients died. Another patient with morbid obesity who had been scheduled to undergo bariatric surgery was brought to the emergency room 1 day before his operation for severe respiratory distress which rapidly escalated to cardiopulmonary arrest. Both authors note that the physiologic stressors induced during surgery and anesthesia, such as atelectasis and proinflammatory changes, may exacerbate the pre-existing COVID-19 infection. However, this study is needed as the cardiac surgical patient population is unique in that it is both high-risk for adverse outcomes with COVID and cardiac morbidity if they do not have immediate surgical intervention for symptomatic heart disease. Therefore, the level of urgency is higher than in elective noncardiac surgery and the patients are usually sicker. In addition, in this patient population described by Barkhordari et al, cardiopulmonary bypass and the need for continued mechanical ventilation post-surgery further increases risk of pulmonary injury.<sup>5</sup>

Anesthetic management of these patients in the study included a lung-protective strategy as recommended for COVID-19 patients. Tidal volumes of 6 to 8 mL/kg IBW were employed, with ventilatory parameters being adjusted on the basis of hemodynamics and ABG data. However, pH was not reported in this study. Pulmonary considerations for the anesthetic management of COVID-19 positive cardiac surgical patients aim for a pH greater than or equal to 7.25.<sup>6</sup> Specific details of peri-operative acid-base management and permissive hypercapnia are warranted in the future analyses of postoperative respiratory outcomes in cardiac surgical patients with COVID.

Although the study included both urgent and emergent procedures, the authors refrained from providing specific guidance regarding when to proceed with urgent procedures in the asymptomatic COVID-19 positive population. While it is generally accepted that emergent cardiac procedures should be performed during the COVID-19 pandemic, and the authors argue that elective surgeries should be postponed, the issue of performing urgent cases is more nuanced and depends on a multitude of patient and procedural factors, as well as the clinical environment. The definition of an urgent cardiac surgical procedure may differ among various and institutions, medical specialties, and individual physicians based on institutional guidelines and clinician judgment. The acceptable amount of time that a physician feels is appropriate to wait before a COVID positive patient tests negative before an urgent issue becomes an emergent one may differ as well and the negative consequences on the patient need to be weighed carefully against the

risks associated with pulmonary-related COVID infection in the postoperative period.

Hospital resources and capacity, a major issue during the surge in COVID-19, is another factor in determining whether to perform urgent cases.<sup>7</sup> If a hospital is over its capacity due to excess volume of patients with COVID-19, providing the necessary postoperative care cardiac surgical patients required becomes more difficult. Another consideration is whether it may be possible to perform a cardiac intervention in a minimally invasive approach. It is currently unclear if COVID-19 has played a role in the decision to perform cardiac interventions minimally invasive or open. For instance, if there is significant debate among the Heart Valve Team whether a patient would benefit most from an open surgical versus percutaneous aortic valve replacement, deciding on the latter approach might be advantageous in a clinical environment overburdened by COVID due to its quicker postoperative recovery time, avoidance of cardiopulmonary bypass, and with the majority of patients undergoing sedation versus general anesthesia, avoiding intubation. The potential short-term benefit of decreased pulmonary complications, quicker recovery, and immediate relief from symptomatic structural heart disease should be weighed against long-term considerations of the appropriateness of valve intervention in the cases where the patient does not fully meet criteria for TAVR (eg mixed aortic stenosis, aortic regurgitation, etc).

The current unreliability and variability of COVID-19 testing combined with the potential for reinfection further complicate the decision to perform urgent cardiac surgical procedures. COVID diagnosis in this study was based both on positive reverse transcription-polymerase chain reaction (PCR), commonly known as the nasal swab test, and/or chest imaging. In the United States however, due to increased testing capacity, the majority of the patients receive PCR tests. Positive computed tomography chest imaging findings in an asymptomatic patient may indicate a more severe case of COVID than those with positive PCR tests. It is also unclear what the significance of a persistently positive PCR test is in a patient that has recovered symptomatically from COVID, and whether these patients would be considered to be asymptomatic COVID positive.<sup>8</sup> Anecdotally we have seen cases where patients have had positive COVID a month ago, have tested negative elsewhere, and then have re-tested positive before their procedures, making it unclear if this reflects re-infection or a previous false negative test with the patient continuing to shed virus. If the latter is true, the asymptomatic COVID positive patient who has completed the third phase of the disease and recovered may have a different perioperative risk profile than the asymptomatic COVID patient in the first phase of the disease who may go to develop symptoms. In a study of 94 patients, He et al<sup>9</sup> collected a total of 414 throat swabs from the onset of symptoms up to 32 days. They found that viral loads can be detected in COVID patients for about 21 days from the onset of symptoms, thus making the distinction between re-infection or previous false negative more difficult.

The decision to proceed with cardiac surgery of an asymptomatic patient with positive COVID test therefore might be supplemented

by an understanding of the transmissibility and viral shedding. As mentioned, one possible scenario includes a patient with a falsely negative PCR test that might still be an asymptomatic carrier. In the same study of 94 patients with confirmed COVID-19, He et al<sup>9</sup> discovered the highest viral loads were present in pharyngeal swabs of patients that correlated with the onset of symptoms. The authors inferred that infectivity of COVID-19 peaks during or before the start of symptoms, and estimate that about 44% of secondary cases occurred via presymptomatic carriers. This finding may support the decision to avoid performing urgent procedures, particularly for the reason of preventing nosocomial spread of the virus. Another potential clinical scenario involves a patient who has recovered from COVID-19, is asymptomatic but now with a repeat positive PCR. In “Symptom-Based Strategy to Discontinue Isolation for COVID-19,<sup>10</sup>” the Center for Disease Control note that “replication-competent virus has not been successfully cultured more than 9 days after onset of illness,” and “Among those who continue to have detectable RNA, concentrations of detectable RNA 3 days following recovery are generally in the range at which replication-competent virus has not been reliably isolated by CDC.” This might serve as a timeline as to when to safely operate on a patient who has recovered from COVID-19 with a persistently positive PCR test. However, there are further concerns that a persistent positive test may reflect a re-infection.

In addition, different institutions have evolving recommendations for the timing of COVID PCR before the scheduled procedure: while testing 24 to 48 hours before a procedure was previously preferred early in the pandemic, negative tests up to 5 days can be acceptable as numbers have dwindled in the Northwest. This increased time from testing to procedure may increase the likelihood of an asymptomatic carrier with a negative COVID test being brought in for elective surgery.

The COVID pandemic and the decision-making process of whether to perform urgent procedures during a surge are issues that will likely not disappear in the near future as reflected by the current rise in COVID cases in the southern and western United States and the resurgent numbers of confirmed cases around that world leading to are leading to new lock-downs. Multi-disciplinary discussions will continue to be important to decide individual risk and benefit profiles for patients with asymptomatic patients with COVID moving forward. While imperfect, this most recent study provides more insight to some of the risks that should be weighed in these discussions. Further prospective, longitudinal research and better understanding of the heterogeneity of the COVID positive patient will further

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