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A 48-Year-Old Man at Low Risk for SARS-CoV-2 Infection Who Underwent Planned Elective Triple-Vessel Coronary Artery Bypass Graft Surgery at a National Heart Center in Indonesia Followed by a Fatal Case of COVID-19

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Data Interpretation D
Manuscript Preparation E
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Patient: Male, 48-year-old
Final Diagnosis: Chronic kidney disease • coronary artery disease • COVID-19
Symptoms: Chest pain • fever • shorthness of breath
Medication: —
Clinical Procedure: Coronary artery bypass graft surgery
Specialty: Cardiac surgery

Objective: Rare co-existence of disease or pathology**Background:** This is of the first fatal case of coronavirus disease 2019 (COVID-19) pneumonia at a National Heart Center in Indonesia following planned elective triple-vessel coronary artery bypass graft (CABG) who was considered to be at low risk for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection when admitted for surgery.**Case Report:** A 48-year-old man was diagnosed with coronary artery disease (CAD) in 3 vessels (3VD) with an ejection fraction (EF) of 61% and chronic kidney disease (CKD) with routine hemodialysis. The patient was scheduled for a coronary artery bypass graft (CABG) surgery. He underwent surgery after COVID-19 screening using a checklist provided by the hospital. The patient's condition worsened on the 3rd postoperative day in the ward, and he was transferred back to the Intensive Care Unit (ICU), reintubated, and tested for COVID-19 with a real time-polymerase chain reaction (PCR) test. Because of the COVID-19 pandemic, we excluded the other possible pneumonia causes (e.g., influenza). An RT-PCR test performed after surgery revealed that the patient was positive for COVID-19. COVID-19 tracing was performed for all health care providers and relatives; all results were negative except for 1 family member. The patient was treated for 4 days in the isolation ICU but died due to complications of the infection.**Conclusions:** This report shows the importance of testing patients for SARS-CoV-2 infection before hospital admission for elective surgery and during the hospital stay, and the importance of developing rapid and accurate testing methods that can be used in countries and centers with limited health resources.**MeSH Keywords:** Coronary Artery Bypass • Coronary Artery Disease • COVID-19Full-text PDF: <https://www.amjcaserep.com/abstract/index/idArt/928900>

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Background

The World Health Organization (WHO) declared coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a global pandemic [1–3]. To date, the pandemic has killed more than 850 000 people around the globe, with >25 million confirmed cases [4].

In Indonesia, as of August 31 2020, there have been 172 053 COVID-19 confirmed cases, with 7343 deaths. Indonesia decided to implement large-scale social restriction (known as *Pembatasan Sosial Berskala Besar/PSBB*), in which all public spaces are temporarily closed and most workers have to work from home, to stop the spread of the virus. PSBB was chosen over lockdown based on the economic and political conditions in Indonesia.

Regarding surgeries in the COVID-19 pandemic era, several guidelines, such as ones issued by the United States (US) Centers for Disease Control and Prevention (CDC) and the American College of Surgeons, recommended reducing or stopping elective surgeries [5,6]. Nonetheless, Chikwe et al. performed a meta-analysis of reports from several countries, suggesting that postponement of a cardiac surgery increased mortality. The study also specifically highlighted the situation in Sweden, where there was an increase in the risk of death by up to 11% per month [7].

Lauer et al. estimated that the incubation period of COVID-19 is about 14 days, after which mild or severe symptoms develop. However, patients can remain asymptomatic after the suggested incubation period [8]. Asymptomatic patients should receive more attention owing to the incidence of nosocomial transmission from COVID-19 [9]. Hence, testing for SARS-CoV-2 using authorized real time-polymerase chain reaction (RT-PCR) methods in a validated laboratory is needed to assess the need for surgery postponement, as suggested by the guidelines for infection control program at the hospital [10].

Here, we report the first fatal case of COVID-19 pneumonia at a National Heart Center in Indonesia following planned elective triple-vessel coronary artery bypass graft (CABG) surgery in a 48-year-old man who had SARS-CoV-2 infection when admitted for surgery.

Case Report

A 48-year-old man diagnosed with coronary artery disease (CAD) and chronic kidney disease (CKD) was scheduled for an elective CABG. He was admitted to the Emergency Department (ED) of the National Heart Center, Harapan Kita Hospital, in Jakarta, Indonesia on March 4, 2020 with complaints of chest

pain and shortness of breath. After being stabilized in the ED, he was transferred to the intermediate general ward for drug optimization and hemodialysis.

Coronary angiography showed a 3-vessel CAD (3VD) with an 61% ejection fraction (EF). The patient's body mass index was 28.7 kg/m² (overweight), he had a history of CKD, hemodialysis, stroke, angina, diabetes, dyslipidemia, and smoking. The patient was scheduled for urgent CABG surgery.

During the COVID-19 pandemic, the National Heart Center hospital in Indonesia had its own preoperative screening to determine whether patient was suitable for surgery. The screening process uses a scoring system, included history-taking, physical examination, comorbid/COVID-19 high-risk criteria (especially in adult patients), and laboratory and radiology results. If the score is <4, the patient will not be tested by rapid or RT-PCR, but if the score is >4, a rapid test will be performed. If the rapid test is negative, then the operation will be carried out, but if the rapid test is positive, the urgency of the surgery will be further evaluated, with elective procedures postponed and emergency surgery to be performed using personal protective equipment (PPE) according to the National Heart Center hospital standards. In this case, patient's score was <4, thus, no further rapid testing was carried out.

Laboratory testing before surgery showed anemia (8.4 g/dL), leukocytosis (11,100/ μ L), increased cardiac enzymes with CK-MB (30 U/L), decreased pCO₂ (27.9 mmHg), increased pO₂ (170.5 mmHg), and decreased HCO₃ (19.6 mmol/L). A thorax X-ray showed cardiomegaly, with normal appearance of both lungs before surgery.

The surgery was carried out 8 days after admission, on March 11, 2020. CABG using 3 grafts, left internal mammary artery to left anterior descending (LIMA-LAD), saphenous vein graft to obtuse marginal 1 (SVG-OM1), and saphenous vein graft to posterior descending artery (SVG-PDA) was performed. After surgery, the patient was transferred to the Intensive Care Unit (ICU) and was extubated 20 h after surgery. The patient was treated in the ICU for 21 h before being transferred to the intermediate ward on March 12, 2020.

On March 16, 2020, he was transferred to the ward. On March 18, 2020, after 3 days in the ward, the patient complained of increased difficulty in breathing, proven by decreased saturation and low PO₂, accompanied by fever. The patient was then transferred to the isolation ICU room and was reintubated and tested for COVID-19 with an RT-PCR test. Because of the COVID-19 pandemic, we excluded the other possible pneumonia causes (e.g., influenza). The nasopharyngeal and oropharyngeal specimens were collected from the patient for RT-PCR examination using the one-step qPCR method (Sansure: 2020094)

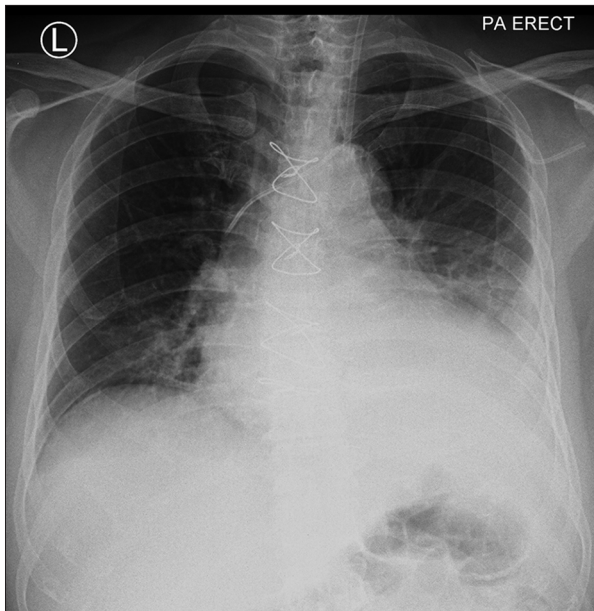


Figure 1. PA chest radiograph of a 48-year-old man at 5 days following triple-vessel coronary artery bypass graft (CABG) surgery. The chest X-ray shows cardiomegaly and an area of lung consolidation in the left lower lobe.

consisting of 19 μ L mix components and 1 μ L enzymes with the addition of a 5- μ L template. On March 18, 2020, RT-PCR was carried out using AB 7500 Fast RT-PCR (Applied Biosystems, Singapore) with a temperature setting of 50°C for 30 min, 95°C for 1 min, 95°C for 15 s, 60°C for 31 s, 45 cycles, and 25°C for 10 s, performed according to WHO standards [10]. RT-PCR testing showed he was positive for COVID-19, making him the first known heart surgery patient with COVID-19 in Indonesia.

Six days after surgery, on March 17, laboratory testing showed the neutrophil-to-lymphocyte ratio (NLR) was 14.03, which indicated moderate stress and the possibility of infection. From March 11 to March 20, posteroanterior and anteroposterior thorax X-rays performed after surgery showed consolidation of both lungs, suggesting pneumonia (Figure 1).

During the treatment in the ICU isolation room, the patient was hemodynamically unstable due to sepsis. He also experienced a deterioration of urea and creatinine levels, and was considered for continuous renal replacement therapy (CRRT). Two days before his death, the patient was suspected to have respiratory failure with pO₂ and relatively low saturation, despite high fiO₂. On March 23, 2020, after being treated for 12 days in the ICU isolation room, the patient died due to respiratory distress caused by COVID-19 infection.

Discussion

During this pandemic, each institution prepares an algorithm of surgery (before, during, and after surgery) based on its situation, resources, and preparedness. Cardiac surgeries are considered to have a higher risk than other surgeries, especially in difficult situations such as the COVID-19 pandemic [11]. The National Heart Center Indonesia is a referral center that accepts patients with more complex diagnoses and severe conditions, so it usually carries out more difficult and time-consuming surgeries, even without the availability of any special operating room facilities or experience in dealing with the current pandemic situation. Due to the lack of preparation by the health system, institutions must adapt whatever resources they have to prevent the spread of COVID-19 infection [12]. In Indonesia, every hospital has its own regulations to decide the criteria for performing surgery. The regulation change based on the information obtained from trial and error.

This patient was scheduled for elective surgery during COVID-19 pandemic, but in a condition that was not optimal in terms of readiness, experience, and management by our hospital, and thus had unfavorable outcomes. At that time, the initial screening was done using a protocol to determine whether a patient should have a rapid test before surgery. This patient did not have an RT-PCR or rapid test preoperatively, although RT-PCR is the current WHO criterion standard to detect the corona virus [13].

Preoperative screening without using RT-PCR as the criterion standard for SARS-CoV-2 examination can result in substantial risk because some patients might not show clear symptoms. Furthermore, performing heart surgery on a COVID-19-positive patient might be very risky for the patient, as it can lead to unstable hemodynamic conditions, which might reduce the overall clinical condition, including the immune system, causing severe signs and symptoms.

There have been several clinical guidelines developed for the evaluation of patients undergoing elective cardiac surgery during the SARS-CoV-2 pandemic. According to Chikwe et al., delaying an elective cardiac surgery is risky. For example, a study from Sweden reported the risk of death increased by 11% per month for elective patients who had surgery postponed. Additionally, a study from New Zealand also showed higher operative mortality in nearly 20% of patients readmitted with acute coronary syndromes while waiting for bypass surgery. Therefore, Chikwe et al. created a guidance on restarting cardiac surgery activity, in which one of the recommendations is “the cardiovascular service line, including cardiac surgery, should be among the first clinical services supported to resume elective inpatient and outpatient care as soon as critical care capacity becomes available” [7].

In the case of elective surgery, there is a relevant statement by Haft et al: "The purpose of postponing cardiac operations is based on 3 principles: protecting the cardiac patient, protecting the institution and society at large, and protecting the health care team" [1].

The patient came to the National Heart Center on March 4, but the surgery was performed on March 11; therefore, the patient was in the hospital for 8 days before he underwent surgery. During these 8 days, while all medical personnel in charge of handling the patient had already been declared "safe" due to negative RT-PCR results carried out by the hospital, the patient himself did not undergo an RT-PCR test due to limited hospital resources; therefore, the adult cardiac surgery division devised a screening tool as described above. During these 8 days in hospital for stabilization of the patient's condition before surgery, there are possibilities of nosocomial infection because exposing cardiac patients to the hospital environment results in higher infection risk, especially COVID-19 infection [1,9].

The suspicion of the source of infection leads to the visiting family, because in Indonesia, visiting people in the hospital is an inherent tradition, and those who visit are usually extended family members, followed by friends or colleagues of the patient.

After tracing, it was proven that one of the patient's extended family was positive for COVID-19 through a RT-PCR examination, which was how the patient managed to contact COVID-19 infection during the family visitation during his hospital stay. This is clearly an unfavorable practice in terms of managing the COVID-19 pandemic.

The patient was admitted to the ED on March 4 with complaints of chest pain and shortness of breath, and after stabilization with cardiovascular medication, the patient was asymptomatic (for cardiovascular symptoms). A few days after surgery, on March 18, 2020, the symptoms of COVID-19 were observed when the patient complained of increased difficulty in breathing, proven by decreased saturation and low PO₂, accompanied with a fever. Since being admitted to the hospital until the first occurrence of COVID-19 symptoms, the time period was approximately 14 days. This finding agrees with the incubation period of SARS-CoV-2 proposed by Lauer et al. [8].

This patient, who was later proven to have been infected with SARS-CoV-2 through RT-PCR examination, and who also had a history of cardiovascular disease, CKD on HD, stroke, DM, dyslipidemia, and active smoking, experienced a sharp decline in overall clinical condition. This is supported by study of Driggin et al., which states that a previous history of cardiovascular disease has an effect on SARS-CoV-2 infection [14]. Based on that experience, this is a warning sign for optimal preoperative management, starting from the screening process that requires better evaluation and management.

A study by Yang et al., which examined the diagnostic and predictive role of NLR in COVID-19, concluded that "elevated NLR is an independent prognostic biomarker for COVID-19 patients" [15]. This is consistent with the finding in our patient that showed an increase in NLR. In PA thorax X-ray, particularly after surgery, lung consolidation was found, suggestive of pneumonia, which corresponded with a study in Wuhan, China of 41 patients with COVID-19, who all had pneumonia [16]. Future evaluation should include more examination tools, especially to detect COVID-19 by using PCR, so all patients should undergo nasopharyngeal and oropharyngeal swabbing for PCR testing before surgeries, regardless of symptoms. Another consideration, as mentioned by Tan et al., is that there need to be separate safety protocols against COVID-19, including preoperative, intraoperative, and postoperative periods, in accordance with the resources and capabilities of the institution [3].

Conclusions

This report has shown the importance of testing patients for SARS-CoV-2 infection before hospital admission for elective surgery and during the hospital stay, and the importance of developing rapid and accurate testing methods that can be used in countries and centers with limited health resources.

Conflict of interest

None.

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