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EDITORIAL

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Coronary artery bypass grafting surgery versus percutaneous coronary intervention: What is the clinical decision framework amid COVID-19 era?

1 | INTRODUCTION

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) leads to coronavirus disease (COVID-19), predominantly pneumonia. It reached pandemic levels in March 2020 and has resulted in a devastating effect globally with over 200 countries being affected. Its virulence, vector of transmission, and its inclination to create a multitude of uncertainties have been unprecedented. It has disrupted and stretched healthcare provision worldwide and with the lockdown measures imposed by governments and the need to free intensive care unit (ICU) beds to provide respiratory support and mechanical ventilation, redistribution and reorganization of resources within hospitals have become necessary with important consequences.

In response to pressures on global health services, the elective component of our work has been reduced. Emergency and urgent patients, however, will continue to need care and thus, we need to provide the best local solutions to maintain the appropriate management of these patients without increasing the risk of disease propagation, while still protecting resources for the response to Coronavirus.

2 | COVID-19 IN HOSPITALS

In an investigation of the prevalence of SARS-CoV-2 within hospitals, the virus was widely distributed in the air and on object surfaces in both the ICU and general wards, implying a potentially high infection risk for medical staff and patients alike.[1] The contamination was greater in the ICU than in the general wards and the transmission distance of SARS-CoV-2 might be 4 m. As patients undergoing cardiac surgery will spend longer periods in hospital and ICU than patients undergoing percutaneous coronary intervention (PCI), this will ultimately influence the choice of intervention recommended by clinicians and chosen by patients.

Real-time reverse transcription-polymerase chain reaction (RT-PCR) assays have played an important role in the clinical diagnosis of suspected cases of SARS-CoV-2 infection by oro- or naso-pharyngeal swab.[2] Such methods, however, are laborious and time-consuming; because of this, they cannot satisfy the current demands of testing the large number of suspected patients admitted for coronary revascularisation. Early swab samples had limited sensitivity of approximately 66%,[3] and a rapid, simple, and sensitive assay has only recently become available.

Asymptomatic patients with COVID-19 infection are a particular risk group. Asymptomatic infection at the time of laboratory confirmation is widely reported, with a large proportion of these cases experiencing some symptoms at a later stage of infection.[4] There are also reports of cases remaining asymptomatic throughout the whole duration of laboratory and clinical monitoring. These patients are not only at increased risk from intervention, but also a risk to other patients and hospital staff.

The median incubation period is considered to be 5 to 6 days for COVID-19, with a range from 1 to 14 days.[5] Moreover, prolonged viral RNA shedding has been reported from nasopharyngeal swabs (up to 37 days after onset of symptoms). Immunocompromised patients may shed SARS-CoV-2 virus for prolonged periods and as cardiac surgery with cardiopulmonary bypass induces postoperative immunosuppression and impaired pulmonary function, there is an argument for PCI or a delay to surgery for at least 6 weeks.

Cardiovascular patients who develop COVID-19 infection have worse in-hospital outcomes and should be protected from infected subjects and those whose COVID-19-related status is still unknown.[6] Wang et al[7] reported a significant percentage of hospital-associated transmission of the virus (12.3% of all patients) in a cohort of hospitalized patients with novel coronavirus-infected pneumonia in Wuhan, China at the start of the pandemic. Thus, patients accessing hospitals with acute cardiac conditions and no signs or symptoms of viral infection should complete their investigations in a clean area and finally access a COVID-19-free ward.

3 | COVID-19, CARDIOVASCULAR DISEASE AND INTERVENTION

One of the complexities we are faced with relates to the multifaceted presentations of patients with coronary artery disease (CAD). Chest pain or tightness could be a symptom of the increased anxiety associated with the COVID-19 pandemic but it can also be a manifestation of COVID-19, cardiac, and noncardiac disease, making the diagnosis somewhat elusive. The problem is further aggravated by increasing concerns about the delayed presentation of cardiac

emergencies as patients are afraid to seek medical attention during the pandemic.

Patients with CAD appear to share the same co-morbidities as those with COVID-19. A large Chinese study analyzing data of 44 672 confirmed COVID-19 cases revealed 12.8% had hypertension, 5.3% diabetes, and 4.2% cardiovascular disease (CVD).[8] A further study of 5700 patients from the USA reported a similar message that hypertension (56.6%), obesity (41.7%), diabetes (33.8%), CAD (11.1%) and congestive heart failure (6.9%) were common co-morbidities in patients with COVID-19.[9]

Although the clinical manifestations of COVID-19 are dominated by respiratory symptoms, some patients develop severe cardiovascular damage.[10] Cardiac involvement is common in COVID-19 and adversely affects prognosis. Myocarditis appears in COVID-19 patients several days after initiation of fever, indicating myocardial damage caused by the SARS-CoV-2. Furthermore, myocardial injury secondary to COVID-19 infections is associated with increased cardiac biomarker levels, which may be a consequence of both myocarditis and ischemia, complicating decision making, and management.

COVID-19 patients appear to be at higher risk for thrombotic disease states including acute coronary syndrome (ACS), venous thromboembolism (VTE) and stroke. COVID-19 may predispose to VTE in several ways including through endothelial dysfunction, systemic inflammation, and release of high plasma levels of proinflammatory cytokines and platelet activation.[11] ACS and acute myocardial infarction can occur in patients with COVID-19 due to heightened thrombotic activity. Given the elevated risks in affected patients, consideration is now being given to thrombolytic therapy.[11] In addition, there are increasing concerns about a possible increase in platelet aggregability associated with COVID-19 leading to stent thrombosis. Thus, patients undergoing coronary stenting may be at increased risk and the ideal antiplatelet therapy in these patients needs further investigation.

A study examining the clinical characteristics and outcomes of patients with SARS-CoV-2 infection undergoing surgery, suggests that surgery accelerates and exaggerates disease progression of COVID-19.[12] Patients developed COVID-19 symptoms within a few days of the surgery suggesting that these patients were in their incubation period before undergoing surgery. In addition, the mortality rate appears higher than the reported overall mortality rate of 2% to 3% in COVID-19 patients without surgery. In a multicentre analysis of 1128 patients with perioperative SARS-CoV-2 infection undergoing all surgery, 51.2% developed pulmonary complications in the postoperative period and the overall 30-day mortality was 23.8%. In the 50 patients who underwent cardiac surgery, the 30-day mortality was 34% and 94.1% developed pulmonary complications.[13]

Although the long-term effects of a COVID-19 infection are not yet known, it is well established that hypercoagulability and systemic inflammatory activity can persist for a long period, and thus, COVID-19 infection may be linked with elevated long-term CV risk.

4 | TIMING OF CARDIAC SURGERY

Cardiac surgery has its own unique challenges when it comes to postponing surgical therapy. Turning elective operations into emergent ones may result in greater risk or an inferior result. Guidelines have been developed to determine who should undergo early surgery and who can wait until normal surgical schedules have been developed. It is important to strike a balance between the risks of delaying surgery and the risks to both patients and hospital staff of performing the operation in the current environment. In making these decisions, surgeons will have considered the current condition of each patient, the potential for the natural progression of each patient's disease while waiting, and the current capabilities of their surgical facility. In general, worsening symptoms should not be ignored and communication with, and careful follow-up of patients will be essential as we cope with the challenges of COVID-19.

The donning of personal protection equipment during cardiac surgery including special face masks is uncomfortable with reports of diminished vision/vocal/auditory sense, headaches, facial pressure, excessive fatigue, and anxiety. These effects may increase the risks of surgery and sway clinicians to offer patients less invasive treatments.

In patients with COVID-19, unless requiring emergency surgery, we advocate a delay of surgery until recovered or PCI, if surgery cannot be delayed. In those with unknown COVID-19 status, preoperative testing is mandatory and patients should only be offered surgery if the results are negative. If results are not available and the patient needs urgent surgery, the patient should be nursed in a side room until shown to be negative. When considering these recommendations, it is important to also consider the test sensitivity/specificity.

Multiple protocols have been mandated to provide a safety net for cardiac patients attending hospitals for interventions. It appears that these stringent protocols have minimized the number of COVID patients entering tertiary centers, but it remains undetermined whether they are effective in optimizing outcomes in patients with cardiac disease in general and amongst infected patients.

5 | CONCLUSIONS

With increasing fatalities worldwide and governments poised between lockdown and easing measures, the future is uncertain. Patients with CAD will continue to die with and without treatment, waiting lists will get longer and patients will present at a more advanced stage of their disease. Given the fluidity of the situation, there is a need for new clinical decisionmaking processes and frameworks that help guide patients to the appropriate revascularisation strategy of coronary artery bypass grafting or PCI amid COVID is needed. And it may be appropriate that these recommendations appear to contradict legacy guidelines derived from studies undertaken in a pre-COVID era.

AUTHOR CONTRIBUTIONS

WIA: Concept/design, drafting, critical revision and approval of article. MI, SK, and MB: Drafting and approval of article.

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