Coronavirus and the Cardiovascular System: A Brief Synopsis
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Not only are those with cardiovascular disease at an increased risk for death from coronavirus infection, COVID-19 itself directly and indirectly causes damage to the heart and the entire cardiovascular system. "[Coronavirus 2] infects host cells through ACE2 receptors, leading to COVID-19-related pneumonia, while also causing acute myocardial injury and chronic damage to the cardiovascular system" (Zeng, YY, et al.)."

The diagram and caption below, from Akmerhov, et al., illustrate the mechanisms of cardiac injury in COVID-19.

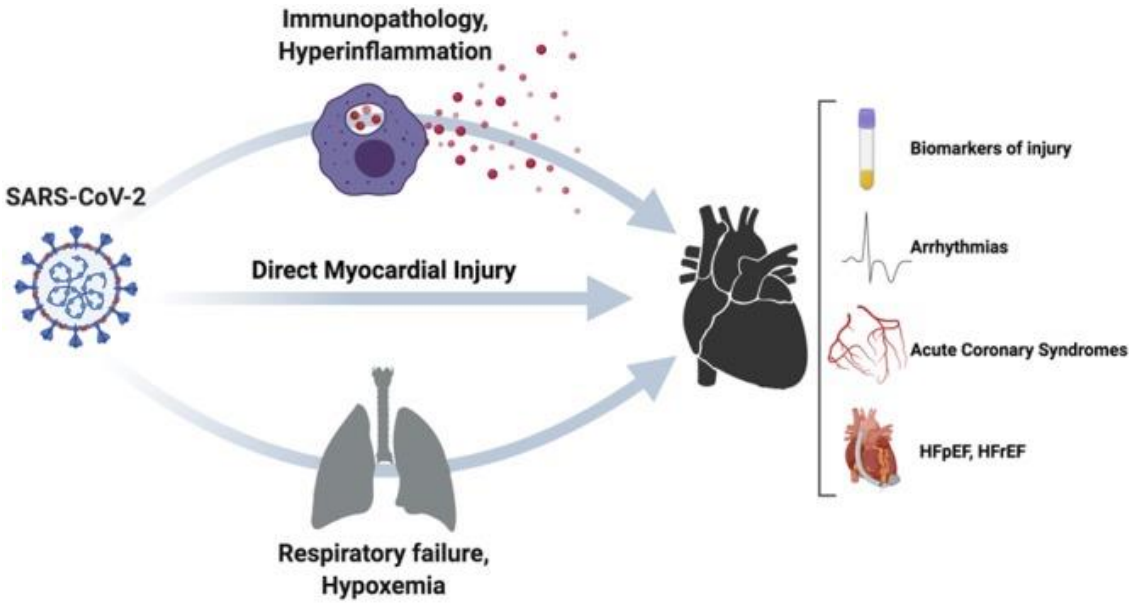

Figure 2. Proposed mechanisms of cardiac injury with clinical sequelae. *Cardiac injury can result via direct or indirect mechanisms. The direct mechanism involves viral infiltration into myocardial tissue, resulting in cardiomyocyte death and inflammation. Indirect mechanisms include cardiac stress due to respiratory failure and hypoxemia and cardiac inflammation secondary to severe systemic hyperinflammation. Biomarkers (cardiac troponin I and brain-type natriuretic peptide), arrhythmias, myocardial infarction, and heart failure are manifestations of myocardial injury. HFpEF indicates heart failure with preserved ejection fraction; HFrEF, heart failure with reduced ejection fraction; and SARS-CoV-2, severe acute respiratory syndrome novel coronavirus.* (Ahkmerov, et al.)

Driggin, et al, provide an excellent summary of the increased risks for patients with CVD. "First, those with COVID-19 and pre-existing cardiovascular disease have an increased risk of severe disease and death. Second, infection has been associated with multiple direct and indirect cardiovascular complications including acute myocardial injury, myocarditis, arrhythmias, and venous thromboembolism. Third, therapies under investigation for COVID-19 may have cardiovascular side effects. Fourth, the response to COVID-19 can compromise the rapid triage of non-COVID-19 patients with cardiovascular conditions." (Driggin, et al.)

In short, at this time it is even more essential to monitor and treat patients with existing or potential cardiovascular disease. Tools to detect subtle heart arrhythmias and real risk of adverse cardiovascular events, such as heart rate variability and pulse wave velocity, are even more essential during this time of pandemic. Heart rate variability detects subtle rhythm abnormalities that could be exacerbated, and even fatal, by COVID-19 if not adequately treated. Pulse wave velocity is the gold standard non-invasive test of arterial elasticity, an essential metric in a disease that is now known to cause severe clotting. Stiffened arteries increase the risk of clots even without COVID-19 infection, so a patient with such arteries would be at an even more elevated risk of deadly clots from COVID-19. Additionally, COVID-19 has been shown to cause chronic cardiovascular damage, so recovered patients should be carefully assessed as well.

Citations

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