



An Overview of Cardiac Arrhythmia in COVID-19 Patients

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Abstract :

Early research indicates that the 2019 coronavirus disease (COVID-19) is linked to a significant prevalence of cardiac arrhythmias. Coronavirus 2 infections associated with severe acute respiratory syndrome may harm cardiac myocytes and increase the risk of cardiac arrhythmia. The current severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) or coronavirus disease 2019 (COVID-19) epidemic has rapidly spread to become a worldwide pandemic. Patients with and without a history of cardiovascular illness have had COVID-19-related cardiac problems, which are well-documented. Myocarditis, heart failure, and acute coronary syndrome brought on by coronary artery thrombosis or plaque ruptures brought on by SARS-CoV-2 are among the cardiac consequences. Arrhythmias are one of the main problems, as rising data indicates. As a potential arrhythmia mechanism, viral infection-induced myocardial inflammation results in electrophysiological and structural changes. This could also be how SARS-CoV-2 causes various arrhythmias. We talk about arrhythmia manifestations in COVID-19 in this review.

Keywords: ARS, Acute Respiratory Syndrome, Covid-19, Coronavirus disease-2019, Disseminated Intravascular Coagulation (DIC)

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Introduction

Coronaviruses are positive single-stranded, enclosed, big RNA viruses that may infect a variety of animals in addition to humans. Coronaviruses were initially described in 1966 by Tyrell and Bynoe, who recovered the viruses from people with common colds (Tyrell, 1966). Because they were ball-shaped virions with a core shell and surface projections similar to a solar

corona, they were given the name coronaviruses (Latin: corona = crown). Coronaviruses fall into the alpha, beta, gamma, and delta subfamilies (Hughes et al., 2022). Gamma and delta viruses are believed to have originated in pigs and birds, but alpha and beta coronaviruses are most likely to have originated in mammals, mostly bats. The genome is between 26 and 32 kilobases in size.

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Only infections that are hardly symptomatic or without symptoms are caused by alpha coronaviruses, but beta coronaviruses among the seven different coronavirus subtypes that can infect people can lead to serious illness and even death. The B lineage of beta-coronaviruses and SARS-CoV viruses are closely related. The four basic structural genes are membrane glycoprotein (M), small membrane protein (SM), spike protein (S), and membrane glycoprotein (M), with an additional membrane glycoprotein (HE) found in the HCoV-OC43 and HKU1 beta-coronaviruses (Rehman et al.,2020).

Cardiac Arrhythmia (Also called: Irregular heartbeat):

this is a Disease when the heart's regular repeated pattern of movement is messed up. This review describes the typical sinus repeated pattern of the heart and the systems that may be used to examine the heart's activity (uh-RITH-me-uh)(Rappel,2022). When the electrical signals of the heart do not work, a defect occurs in the heart, and heart problems develop. The heart beats excessively due to incorrect signals. The heart works with its main function is to distribute blood to the body's organs, carrying with it nutrients, immune, and chemical regulating cells. The heart's rhythm is controlled through pockets called The sinus nodes The pacemaker regulates the work of the heart through these beats, controlling and controlling them without overworking (Smital et al.,2020). The impulses travel first to the atria and then to the ventricles through the sinus nodes. This pulse causes calcium processes that lead to contractions in the heart, especially its muscles that distribute blood to the body's organs. The bundles are known as Purkinje bundles and from there to the ventricles. This combined system allows delivery to all areas of the heart and is therefore responsible for effective ventricular contraction. Normally, the heart rate is 75 beats per minute (Albakri,2019). ECG is used as an electrocardiogram and shows the difference in voltage between sites in the heart to monitor the heart rhythm, where one wave in the schematic is associated with stimulating the atria and then connected to a special complex stimulating the ventricles, while the other wave has the function of relaxing the ventricles and then

reminds the period during the diagram (Fenton et al.,2008).

Arrhythmia Mechanism:

During COVID-19 infection, several possible processes might raise the risk of cardiac arrhythmias. The ways that involve damage to the heart muscle as well as extracardiac operations that lead to arrhythmia. It has been found that the function of the heart in terms of chronic blood vessels when infected with the virus and due to increased metabolism and decreased heart storage (Bababur Farrukhran et al. 2020) The imbalance leads to the risk of developing arterial syndrome Coronary heart failure, as well as injury to the heart muscle, and arrhythmia when infected with corona, may lead to stress of the heart muscle with high pressure and side effects caused by medicines, and the virus may have an effect on muscle and tissue damage in the body (Kochi et al.,2020).

Potential Arrhythmia Mechanisms and COVID-19:

When the SARS-CoV-2 virus reaches host cells, it causes viral infection, immune system activation, and damage to the heart, lungs, and other organ systems. may play a role in arrhythmia risk. Angiotensin-converting enzyme 2 (ACE2), acute respiratory distress syndrome (ARDS), cytochrome P450 (CYP450), disseminated intravascular coagulation (DIC), gastrointestinal (GI), interleukin (IL), and messenger RNA (mRNA) are all abbreviations for the same process. It has been proposed that COVID-19 progresses through three overlapping but separate stages. Refers to early infection with constitutional symptoms, whereas other Stage viral entrance and multiplication in type II pneumocytes results in direct viral cytotoxicity and the activation of an infection resulting in hypoxia and ARDS. Finally Stage—a hyperinflammatory state—occurs if the immune system is unable to effectively and protectively eliminate the virus. This stage is characterized by multiorgan dysfunction brought on by a cytokine storm (Atri et al.,2020).

Types of heartbeats with an Irregular or Abnormal Rhythm: are grouped by

1- An abnormally rapid heart rate called Tachycardia.

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2- Abnormally slow heart action called Bradycardia.

An abnormally rapid heart: Types of methods include:

- **Atrial fibrillation:** a rapid heartbeat, the main cause of which is irregular signals and may lead to serious complications such as stroke (O'Day,2020).
- **Atria flutter:** makes the heart beat more regularly and may lead to stroke
- **Supraventricular tachycardia** is a tachycardia that begins above the ventricles and causes palpitations that start and end suddenly and may lead to multiple complications (Karhe et al.,2022).
- **Fibrillation in the ventricles:** Irregular heartbeat due to irregular electrical signals instead of pumping blood throughout the body and the condition may lead to death if the normal heart rate is not restored within minutes (Banerjee et al.,2020).
- **Arrhythmia of the ventricles** :where acceleration of the heartbeat occurs in the ventricles, which in turn does not allow the heart to fill with blood properly, so the heart does not pump blood around the body and the condition may lead to death or heart disease (Mahmud,2019).

Slow Heart Action :

The heart rate decreases in abnormal cases, which is an indication of a medical condition, knowing that the heart rate is 60 beats per minute, otherwise, it is considered a pathological condition.

Types of Slow Heart Action include:

- **The sinusitis syndrome.** The sinus node controls how quickly the heart beats. The heart rate may fluctuate between being too sluggish (bradycardia) and being too rapid if it isn't functioning properly (tachycardia). Scarring in the vicinity of the sinus node, which slows, obstructs, or blocks the passage of impulses, can result in sick sinus syndrome. The majority of people with sick sinus syndrome are elderly folks.

- **Block in conduction.** The electrical signals that start heartbeats can slow down or halt if the heart's electrical pathways are blocked. Some blockages might result in no symptoms at all, while others could result in missing beats or bradycardia (Chen et al.,2019).

COVID-19 Causes Myocarditis and can Result in Cardiac Failure and Arrhythmias:

A serious cardiac condition called myocarditis, which inhibits the heart from functioning properly, can also be brought on by a coronavirus. "A COVID-19 infection can directly harm the heart, resulting in arrhythmias and cardiac failure, however, we don't yet understand why or how this happens. Therefore, it's crucial to comprehend this risk factor and apply it to keep track of hospitalized patients.

Premature heartbeats

Premature heartbeats are additional heartbeats that happen one at a time, occasionally in patterns that change with the regular heartbeat. Premature atrial contractions or the bottom chamber of the heart may be the source of the additional heartbeats (premature ventricular contractions). Your heart may seem as though it skipped a beat if it beats prematurely. These additional heartbeats are often unimportant and seldom indicate a more serious disease. Even yet, a premature beat can result in persistent arrhythmia, particularly in those who have cardiac problems. A weak heart can occasionally result from highly frequent premature beats that endure for years. While at rest, premature heartbeats can happen. Stress, intense activity, or stimulants like caffeine or nicotine can occasionally trigger rapid heartbeats(Alfaras et al.,2019).

Corona Infection and Cardiac Arrhythmias:

During the spread of the Corona pandemic, data related to the heart and blood vessels was not available, and this necessitated the monitoring of cardiovascular patients when exposed to the virus, as research found that a number of patients recovered during the recovery period, so it was necessary to determine the treatment period with continuous monitoring of patients in case of infection with the virus with conducting tests Continuous and frequent for heart patients and monitoring the disease condition, taking into

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account those with heart muscle through electrocardiogram during a period (2-6) months from the diagnosis of corona infection and due to the risk of disease and arrhythmia during the injury period through a stress test or magnetic resonance to image the muscle. The heart is the most sensitive test for the heart, as studies have shown that a number of heart patients after recovering from corona were exposed to severe injuries to the heart, and a smaller group were exposed to heart defects and the end of acute lymphocytic inflammation. The study showed that infection with corona became a risk factor for heart failure, as the study showed. The importance of preventive treatment such as exercise and rest for the injured for at least two weeks. The study concluded that corona patients after recovery became more susceptible to cardiovascular injuries and varying glucose levels, and studies showed lipid instability as a result of taking steroids as a treatment for acute pneumonia. Therefore, patients should be monitored when they undergo steroid treatment to examine the heart and blood vessels (An et al., 2021).

Conclusions:

Cardiac arrhythmia is particularly significant in patients with corona because a significant number of patients experience arrhythmia following COVID-19 infection, and these patients are at a higher risk of mortality. Understanding some of the unique side effects of post-COVID-19 arrhythmia and associated risk factors is the main goal of this review.

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