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Research Article

Cardiological Changes Resulting from SARS-VOC 2 Infection: A Review Study

Aguilar Antonio Marcos Moreira[1]*, Freitas BohdanBaranhuk de[2] and Lima Monia Maia de[3]

[1]Nurse, Municipal Health Department of Primavera do Leste - Mato Grosso, Master in Public Health, Specialist in Occupational Nursing, Specialist in Health Management, Specialist in Public Health, Brazil

[2]Physician, Municipal Health Department of Primavera do Leste - Mato Grosso, Specialist in Cardiology, Brazil

[3]Nurse, Master in Public Health, Specialist in Health Management, Specialist in Public Health, Brazil

***Corresponding Author:** Aguilar Antonio Marcos Moreira, Nurse, Municipal Health Department of Primavera do Leste - Mato Grosso, Master in Public Health, Specialist in Occupational Nursing, Specialist in Health Management, Specialist in Public Health, Brazil.

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Abstract

Introduction: The new coronavirus pandemic presents itself as one of the major global challenges of the past hundred years.

Objective: To analyze the main cardiac complications related to COVID-19 infection. Design: secondary study, bibliographic, qualitative and descriptive.

Results and Discussion: There was a consensus among the authors analyzed that different cardiovascular disorders may occur as a result of COVID-19 at different stages of the disease. Risk factors such as the presence of comorbidities, age factor and behavioral factors were associated with the possibility of negative outcomes.

Final Considerations: Potential complications such as myocarditis, acute myocardial infarction, reduced ejection fraction and inflammation of large vessels were reported in the course of the condition. Studies should continue to be carried out to better evidence this pathophysiological relationship between COVID-19 and the heart.

Keyword: *Coronavirus Infections; SARS Virus; Heart and Covid-19; COVID19 and Cardiac Sequelae*

Introduction

COVID-19, a disease caused by the coronavirus called SARS-CoV-2, was first identified in China in December 2019. On January 30, 2020, the World Health Organization (WHO) declared that the COVID epidemic -19 constituted a Public Health Emergency of International Importance (ESPII), and on March 11, 2020, a pandemic [1].

The COVID19 pandemic presents itself as one of the great global challenges of the past hundred years. In less than a year, the world was plagued by a new etiological agent hitherto unknown. The report of 20 November 2020 from the World Health Organization (WHO) shows that in the world there were 56,623,643 confirmed cases, with a total of 1,355,963 confirmed deaths. The African region in the period had 1,431,795 confirmed cases with 32,232 deaths. In the Americas region, there were 24,035,426 confirmed cases with 690,020 deaths. In the European region there were 16,353,141 confirmed cases with 365,480 deaths. In the Eastern Mediterranean region, there were 3,725,280 confirmed cases with 94,332 deaths. In the Western Pacific region, there were 822,723 confirmed cases with 16,689 deaths. In the Southeast Asia region, there were 10,254,537 confirmed cases with 157,197 deaths [2].

COVID-19 stands out for its speed of dissemination, difficulty in containment and seriousness. Epidemiological surveillance of human SARS-CoV-2 infection is being built as WHO consolidates information received from countries and new technical and scientific evidence is published. Thus, the best and most recent evidence was used in the preparation of this document, but due to the dynamics of the disease and the production of knowledge associated with it, updates may be necessary [3].

On March 20, 2020, community transmission of Coronavirus Disease 2019 (COVID-19) was declared nationwide. With this, the Health Surveillance Secretariat of the Ministry of Health (SVS / MS) carried out the adaptation of the Acute Respiratory Syndromes Surveillance System, aiming to guide the National Health Surveillance System for simultaneous circulation of the new coronavirus (SARS-CoV -2), influenza and other respiratory viruses within the scope of the Public Health Emergency of National Importance (ESPIN) (Ordinance GM 188/2020) [4].

The clinical evolution of COVID19 is complex and heterogeneous, and may evolve from milder to more severe conditions, which will require adequate medical and structural monitoring. In more severe cases, the patient may have involvement of several organs, including the heart and its vascular connections. It has been documented that patients with severe forms of COVID-19 had significant myocardial lesions, including infection-related myocarditis, with reduced systolic function and arrhythmias. These injuries can be secondary to severe lung damage [2].

The diagnosis can be made by clinical-epidemiological investigation and adequate physical examination of the patient if he presents symptoms characteristic of COVID-19. The laboratory diagnosis can be carried out either by molecular biology tests (RTPCR), immunological tests (serology by immunochromatography, rapid test for detection of IgM antibody and/or IgG antibody, enzyme immunoassay test - ELISA IgM or immunoassay by electrochemiluminescence - ECLIA IgG) and by imaging exams (high resolution computed tomography - HRCT), the following tomographic changes are compatible with the case of COVID-19:

- Peripheral, bilateral, frosted glass opacity, with or without consolidation or visible intralobular lines ("paving").
- Multifocal matte glass opacity with rounded morphology with or without consolidation or visible intralobular lines ("paving").
- Reverse halo sign or other findings of organizing pneumonia (seen later in the disease) [3].

The clinical picture of COVID-19 is similar to that of other respiratory viruses, namely, fever, generally dry cough, tiredness and, in more severe cases (5%), dyspnea, pulmonary bleeding, severe lymphopenia and renal failure. In 80% of cases, symptoms are mild [5].

Concerning supportive therapy (antipyretics and hydration). Mild cases should be treated on an outpatient basis, requiring domestic isolation with guidance from contacts regarding hygiene (patient restricted to a room with a closed door and well ventilated, fomites must be cleaned with water and soap or alcohol 70° by the infected person). ideally, be monitored by the 48/48h Primary Care team via telephone or teleconsultation. It is recommended to guide the return if the clinical condition worsens and to offer work leave for domestic contacts for 14 days [6].

Faced with this problem and considering the countless challenges in understanding this new condition, the present article had the general objective of conducting a bibliographic review study about the main cardiological changes inherent to Sars Cov2 infection currently available in the literature. This topic is relevant to consider the potential damage that can be directly generated to cardiac tissue and its clinical and psychological repercussions on patients.

Methodology

This study is of the type bibliographic research, of an exploratory qualitative character, carried out from the secondary analysis of national and international databases available on the internet, such as LILACS, BIREME, BVS and official institutional bodies such as the Min-

istry of Health, Universities, World Health Organization, Brazilian Society of Cardiology and American College of Cardiology. Qualitative research is a non-statistical study that identifies and deeply analyzes non-measurable data - feelings, sensations, perceptions, thoughts, intentions, behaviors, values, understandings of reasons, meanings and motivations of a certain group of individuals in relation to something specific [7].

The articles were selected according to the purpose of the study, using the following health descriptors: Coronavirus infections, SARS virus, Heart and Covid-19, COVID19 and cardiac sequelae. The information was extracted in the month of November 2020, presented in the text in the discussion field. The methodological proposal was to demonstrate the findings of the current literature on the potential impacts on the cardiovascular system and cardiac tissue caused by infection with the new coronavirus Sars COV2. As it is a bibliographic study of public databases, it was not necessary to send the project to the Research Ethics Committee, since no ethical precepts were hurt in the research.

Results and Discussion

The new coronavirus pandemic completely changed social, economic, cultural and care structures at all levels of health care. Studies reinforce that the mortality rate of COVID-19 can be nine times higher among people with some chronic disease, when compared to that of patients without pre-existing pathology. This information corroborates the position when it says that COVID-19 is an extremely contagious disease caused by the new coronavirus SARS-CoV-2 and among susceptible individuals, it can lead to potentially fatal consequences [8,9].

Cardiac dysfunction is a common condition among patients hospitalized with COVID-19 and is associated with an increased risk of in-hospital mortality. Although the exact mechanism of cardiac injury needs to be further explored, it is a serious disease and clinical features of systemic inflammation, methaemoglobinaemia, hemodynamic instability and multiple system dysfunction. In recent studies, acute cardiac dysfunction occurred in 19.7% of those affected with hospitalized COVID-19, with 25% and 58% of patients having pre-existing heart disease and systemic arterial hypertension, respectively [10].

Research on cardiovascular implications in patients hospitalized with COVID19 has shown that although respiratory symptoms, especially the development of severe acute respiratory distress syndrome, dominate the discussion and initial concerns of the population and health professionals, the cardiovascular system is quite affected by these conditions and is often responsible for complications and mortality of these patients.8

American College of Cardiology in its clinical guidelines for cardiovascular care shows us that patients with underlying comorbidities are at risk.

Elevated risk of contracting COVID-19, with lethality rates that can vary depending on the underlying morbidity, with cancer around 5.6%, hypertension 6.0%, chronic respiratory disease 6.3%, diabetes 7.3% and disease cardiovascular 10.5% [11].

The Brazilian Society of Cardiology is in line with international organizations by emphasizing that infection with the new coronavirus affects the cardiovascular system in a considerable number of cases, and that patients with CVD are more likely to become infected, as well as to present the highest mortality rates associated with the disease. It reinforces that cardiac patients should be managed according to current guidelines in force by the Cardiologist, ensuring the best treatment available for these chronic diseases [12].

Considering the recent and unprecedented character of the pandemic, much progress has been made in recent months in relation to studies on the damage of the disease in the organic systems, especially the cardiovascular system. Regarding its pathophysiology, coronavirus is related to acute respiratory syndrome (SARS-CoV-2), which infects host cells through ECA2 receptors, leading to coronavirus

disease (COVID-19) related to pneumonia, causing at the same time, acute myocardial injury and chronic damage to the cardiovascular system [13].

Studies on the use of cardiac troponin to assess myocardial damage in COVID-19 that the acute increase of this marker are frequent in patients with COVID-19 and associated with adverse results, potentiating inflammatory and thrombotic processes, increasing the risk of acute non-ischemic myocardial injury and acute infarction [14].

A descriptive observational study based on a case report of a 39-year-old patient, previously healthy and without previous comorbidities, demonstrated that even a young patient, without risk factors, can also be the target of cardiac complications in the course of infection by the new coronavirus [15]. Nevertheless, research on the characteristics and clinical significance of myocardial lesion in patients with severe coronavirus 2019 has shown that myocardial injury among patients with severe COVID-19 is not uncommon, especially among those who die, in addition to advanced age. presence of pre-existing cardiovascular disease or related risk factors can aggravate myocardial injury [16].

A survey of 187 patients with COVID-19 to assess the cardiovascular implications of fatal outcomes found that 52 (27.8%) exhibited myocardial injury, as demonstrated by the fact that the highest mortality was in individuals with elevated troponin levels, associated with underlying cardiovascular diseases [17]. Hellenic Journal of Cardiology in its editorial on current data on the cardiovascular effects of COVID-19 demonstrates the countless studies that link the infection of the new coronavirus to various damage to cardiac tissue and say that this association is of causes direct and indirect, which can lead to acute myocardial infarction, myocarditis, as well as arrhythmias [18].

Based on the aforementioned premise, these events set the stage for serious thrombotic complications, including acute coronary syndromes, ischemic strokes, pulmonary embolism and damage to other organs. These peculiarities can complicate the course of any patient with COVID-19, being potentially devastating for individuals with pre-existing cardiovascular disease [19].

The sedimentation of the domains, skills and mainly continuous and current knowledge of the pathophysiology of the new coronavirus in the cardiovascular and pulmonary system is vital. Research on the relationship between the presence of Covid-19 and changes in ventricular ejection fraction has shown that patients with pre-existing cardiovascular disease (CVD) have a worse prognosis to the detriment of individuals without comorbidities. The authors reinforce that although recent data are still limited, there is the possibility of a direct fulminant injury to the myocardial muscle [20].

Research on cardiac injury and mortality by Covid-19 concluded that acute cardiac injury is common in patients hospitalized for Sars-Cov2. There was also a high prevalence of non-communicable diseases in the analyzed sample, such as obesity, diabetes and hypertension, with a worse clinical evolution in these patients [21].

Given the physiopathological complexity, researchers say that the Brazilian Society of Cardiology, the European Society of Cardiology and the American College of Cardiology recommend patient assessment and that when treating patients with COVID-19 cardiologists should be aware of new clinical manifestations, such as arrhythmias, left ventricular dysfunction and systemic embolism [22].

Along these lines, other authors reflect on the result of their case study that cardiac involvement, which leads to acute heart failure, has been pointed out as one of the major sources of secondary complications. Although it is not possible to make any inference because it is a case study, it is descriptive [23].

In patients with COVID-19, the incidence of cardiovascular symptoms is high, due to the systemic inflammatory response and disorders of the immune system during the progression of the disease. For this reason, patients with underlying cardiovascular diseases who are infected with COVID-19 may have a worse prognosis. Special attention should therefore be given to cardiovascular protection during the treatment of COVID-19 [24].

In this context, some notes are relevant for discussion. First, acute lung injury is a common problem with patients with COVID-19 and results in significant morbidity and mortality. However, growing clinical and epidemiological evidence suggests that SARS-CoV-2 infection is associated with myocardial injury and arrhythmic complications [25].

Furthermore, the authors above say that patients with cardiovascular and metabolic diseases may face a greater risk of progressing to a serious condition of COVID-19 and have a greater worsening of cardiac performance in those with previous heart disease. Based almost exclusively on data from China, where the pandemic originated, cardiac injury appears to be a prominent feature of the disease, occurring in 20 to 30% of hospitalized patients and contributing to 40% of deaths.

Other authors corroborate the position above and say that in view of the pandemic of the disease caused by the new coronavirus (COVID-19), the management of patients with risk factor and/or cardiovascular disease is challenging today and that the cardiovascular complications evidenced in the patients with COVID-19 result from several mechanisms, ranging from direct injury by the virus to complications secondary to the inflammatory and thrombotic response triggered by the infection [26].

A review study on the diagnosis, management and pathophysiology of arterial and venous thrombosis in COVID-19 reflects that these circulatory disorders are common in Sars-CoV-2, especially in critically ill patients. The authors reinforce that prophylactic therapeutic measures in hospitals and in intensive care units should be instituted in preventive regimens, as well as in outpatients with a high risk of thrombosis [27].

With caution, work on biomarkers of myocardial injury and cardiac complications associated with mortality in patients with COVID-19 confirm that the underlying cardiovascular conditions, the elevation of myocardial injury biomarkers during COVID-19 infection and acute cardiovascular decompensation are predictors of mortality from SARS-CoV-2 [28] infection.

Final Considerations

Although this article was carried out after a brief analysis of the literature about the main cardiac complications resulting from infection with the new coronavirus, it was possible to observe that in several regions of the world, potential changes to the cardiovascular system have been reported. However, it is necessary to emphasize that this study has some methodological limitations such as selection bias and insufficient quantity of articles to better support the proposed discussion.

Regardless of the limitations presented, the theme is extremely relevant and current, which succumbs to a greater deepening of this theme at national and international level. As a specialist, I reinforce that it is vital not only to follow evidence-based research, but also to keep up to date on the complexities and possible cardiovascular implications of the population most vulnerable to illness due to COVID-19. It is then expected that further research will continue to be carried out and its results disseminated to health professionals, managers and to all organized civil society.

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