



Fear of contagion by COVID-19 and myocardial infarction: possible connection in times of pandemic

Guillermo A. Pérez Fernández¹✉ , MD, PhD; Leila Bayramova Rubail², MD; Aygun Rzayeva³, MD; Jorge F. Hernández Carballo⁴, MD, MSc; Carlos Fonseca Gómez⁵ , MD, MSc; and Rigoberto Betancourt Nápoles⁶, MD, MSc

¹ Department of Cardiology, *Hospital Universitario Celestino Hernández Robau*. Santa Clara, Villa Clara, Cuba. Cuba.

² Medical University and Semashko City Clinic Hospital N° 1. Baku, Azerbaijan.

³ Department of Cardiology, Semashko City Clinic Hospital N° 1. Baku, Azerbaijan.

⁴ Department of Pneumology, *Hospital General Provincial Dr. Ernesto Che Guevara*. Las Tunas, Cuba.

⁵ Department of Infectology, *Instituto de Medicina Tropical Pedro Kourí*. La Habana, Cuba.

⁶ Department of Neurology, *Hospital Provincial Docente Clínico Quirúrgico Manuel Ascunce Domenech*. Camagüey, Cuba.

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Abbreviations

ACS: acute coronary syndrome

AMI: acute myocardial infarction

COVID-19: acronym for coronavirus disease 2019

ABSTRACT

In March 2020, there were 118000 cases of COVID-19 in 114 countries, and more than 4000 deaths from this disease; at that time, the World Health Organization declared it a pandemic. Although respiratory symptoms are clinically prevalent in the clinical manifestations of COVID-19, SARS-CoV-2 infection may also be responsible for the presence of cardiovascular disorders. On a global scale, there has been a significant decrease in seeking for medical attention by patients, over COVID-19-nonrelated disorders, due to the concern of acquiring the SARS-CoV-2 virus in the hospital environment. In order to draw attention to the importance of the timely search for medical assistance in patients with cardiovascular symptoms in times of such a pandemic, the following case is presented, which is the first to address this issue in Cuba.

Keywords: COVID-19, Myocardial infarction, Medical care, Time-to-treatment

Temor al contagio por COVID-19 e infarto de miocardio: Conexión potencial en tiempos de pandemia

RESUMEN

En marzo de 2020 existían 118 000 casos de COVID-19 en 114 países y más de 4000 muertes por esta enfermedad; en ese momento la Organización Mundial de la Salud la declaró como una pandemia. Aunque los síntomas respiratorios dominan usualmente las manifestaciones clínicas de la COVID-19, la infección por el SARS-CoV-2 puede también ser responsable de la presencia de alteraciones cardiovasculares. A escala mundial ha ocurrido una disminución significativa de la búsqueda de atención médica por parte de los pacientes, con padecimientos no relacionados con la COVID-19, debido a la preocupación de adquirir la enfermedad viral (COVID-19) en el medio intrahospitalario. En aras de llamar la atención sobre la importancia de la búsqueda oportuna de asistencia médica en pacientes con síntomas cardiovasculares en tiempos de una pandemia como la COVID-19, se presenta el siguiente caso, el cual constituye el primero que trata este tema en el país.

✉ GA Pérez Fernández
Hospital Celestino Hernández Robau
Calle Cuba s/n,
e/ Barcelona y Hospital. Santa Clara,
CP 50200. Villa Clara, Cuba.
E-mail address: gpfholy@gmail.com

Palabras clave: COVID-19, Infarto de miocardio, Atención médica, Tiempo de tratamiento

INTRODUCTION

Several massive viral epidemics such as (SARS-CoV) severe acute respiratory syndrome coronavirus from 2002 to 2003, H1N1 influenza in 2009 and most recently MERS-CoV Middle East respiratory syndrome identified in Saudi Arabia in 2012 have been striking around the globe^{1,2}.

The World Health Organization (WHO) identified a new coronavirus as the causal agent of pneumonia in a group of patients in Wuhan Province, China, on December 2019 and tentatively called it novel coronavirus 2019¹ until the International Virus Taxonomy Committee named it SARS-CoV-2¹. On January 30, 2020, the World Health Organization (WHO) declared COVID-19 a public health emergency of international concern^{3,4}, on the following February 11, the name COVID-19 acronym for “coronavirus disease 2019” was officially announced for all manifestations caused by this causal agent¹, and on March 11 of the same year COVID-19 was declared a pandemic^{3,5}. By that time, 118.000 cases had already been diagnosed in 114 countries, with more than 4.000 human losses¹.

Although respiratory symptoms are the most typical clinical manifestation of COVID-19, SARS-CoV-2 infection may also be responsible for cardiovascular disorders, particularly in patients with pre-existing heart disease. Likewise, this pandemic directly affects every single cardiovascular health care provided by public health systems worldwide, as it modifies management guidelines and algorithms for patients with heart disease³. Moreover, the implementation of different quarantine measures creates a scenario where the operational efficiency of national cardiology networks is significantly reduced worldwide⁶.

In Cuba, action strategies to face COVID-19 in patients with heart disease have already been designed. The Cuban Society of Cardiology has made a statement on this issue, recognizing prevention as the cornerstone to address this global scourge and stressing the urgent need for cardiologists to be aware of flowcharts and health care protocols for the said patients, including those suffering from heart disease or others with cardiovascular complications (diagnosis, quarantine and therapeutic approach)⁷.

Tragically, the number of patients with non-COVID-19 related diseases seeking health care services has been consistently declining worldwide. The reason is an ever-growing fear of being infected precisely in the hospital setting, which has been evidenced by a significant reduction in hospital admissions for acute cardiovascular conditions —especially acute coronary syndrome (ACS)⁸—, and also neurological and renal diseases, among others.

We hereby present the following case with the aim of raising awareness among patients with cardiovascular symptoms on timely seeking medical assistance in times of such a pandemic as COVID-19. Our report is the first publication on the subject in Cuba; being also the result of a close scientific-medical collaboration between the Cuban International Disaster and Major Epidemic Medical Team “Henry Reeve” and the medical services of Azerbaijan in the fight against COVID-19.

CASE REPORT

We present the case of a 68-year-old white woman, retired, living alone, originally from a residential area of Baku, Azerbaijan, with a personal pathological history of type 2 diabetes mellitus, controlled with oral hypoglycemic agents for 19 years; who six days prior to admission began with intermittent fever, initially 38 degrees centigrade (°C), that came down with routine antipyretics and accompanied by poor general condition. The next morning, she persisted with a fever of up to 38.5°C responding well to antipyretics and referring momentary, non-radiating chest discomfort, lasting about 15 minutes and relieving spontaneously. Self-measurement of blood pressure at home was always normal. Chest pain grew in intensity overnight, radiating to the neck and accompanied by nausea, which was relieved by 250 mg of paracetamol (acetaminophen) after about 10 minutes.

She did not have a fever during the painful event and spent the next two days at home with feverish

peaks of up to 38 °C and chest pain episodes up to 5 minutes long, 3-4 times a day, for which she continued her paracetamol regimen; but on the fifth day after the onset of symptoms, the patient began with respiratory symptoms that manifested in a sensation of shortness of breath when lying down and cough with whitish expectoration, in addition to the persistence of fever and the previously described chest pain. She therefore decided to seek medical attention on the sixth day after the onset of symptoms and self-presented to the emergency department of Hospital Number 1 (Semashko) in Baku, Azerbaijan, complaining of general malaise and dyspnea on exertion as she had no chest pain at that time. The body temperature was 38.5°C and when asked why she had waited so long to seek medical care, the patient admitted that she was afraid of being infected with COVID-19 in the hospital.

Physical examination showed decreased vesicular breath sounds in both lung fields and bibasal crackling rales, with 92% peripheral oxygen saturation on admission, with no supplemental oxygen and no hemodynamic involvement.

Complementary routine tests (**Table**) and chest radiograph were performed, that showed frosted glass-like inflammatory lesions, especially towards the bases of both lungs, and slight right pleural effusion (**Figure 1**); confirmed by lung computed tomography (CT) scan (**Figure 2**). A nasopharyngeal swab was collected for PCR (polymerase chain reaction) testing for SARS-CoV-2.

The electrocardiogram showed sinus rhythm and presence of QS complexes in D_{II}, D_{III}, aVF and from V₂ to V₆, accompanied by ST-segment elevation up to 5 mm, more markedly from V₃ to V₅ (**Figure 3**).

Faced with the previous set of symptoms, her admission to the Coronary Intensive Care Unit (CICU) was agreed upon with potential diagnosis of evolved large anterior ST-segment elevation myocardial infarction and suspicion of uncomplicated COVID-19 pneumonia. She was commenced on standard anti-ischemic and anticoagulant drug treatment and considering the current epidemiological scenario of the pandemic in Azerbaijan, treatment was initiated according to the action protocol for patients with uncomplicated COVID-19 pneumonia.

The two-dimensional echocardiogram on admission showed akinesia of the postero-inferior segments of the left ventricle and aneurysmatic dilatation of the interventricular septum in all its extension, with ejection fraction of 40%. No chamber dila-

Table. Blood test results on admission.

Complementary	Result	Normal levels
Complete blood count (g/dL)	12.60	13.7-17.5
Leukocytes (K/ μ L)	14.20	4.23-9.07
Neutrophils (K/ μ L)	12.60	1.78-5.38
Neutrophils (%)	88.70	34-67.9
Lymphocytes (K/ μ L)	0.90	1.32-3.57
Lymphocytes (%)	6.50	21.8-53.1
C-reactive protein (mg/l)	81.68	< 6
Creatinine (μ mol/l)	156	53-97
Direct bilirubin (mmol/l)	9.58	1-19
Indirect bilirubin (mmol/l)	6.5	0-4.3
Ferritin (ng/ml)	5105	<300

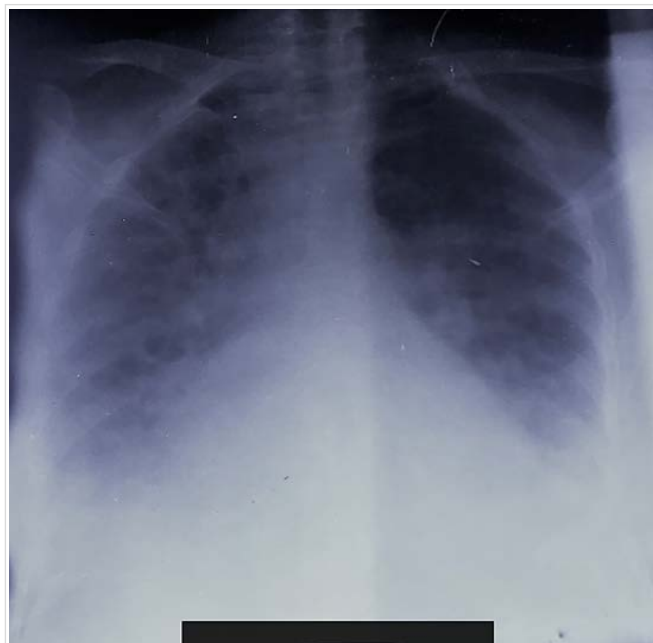


Figure 1. Anteroposterior chest radiograph (portable). Inflammatory lesions are observed towards the bases of both lung fields with slight right pleural effusion. Enlarged cardiac silhouette is visible (non-telecardiogram distance assessment).

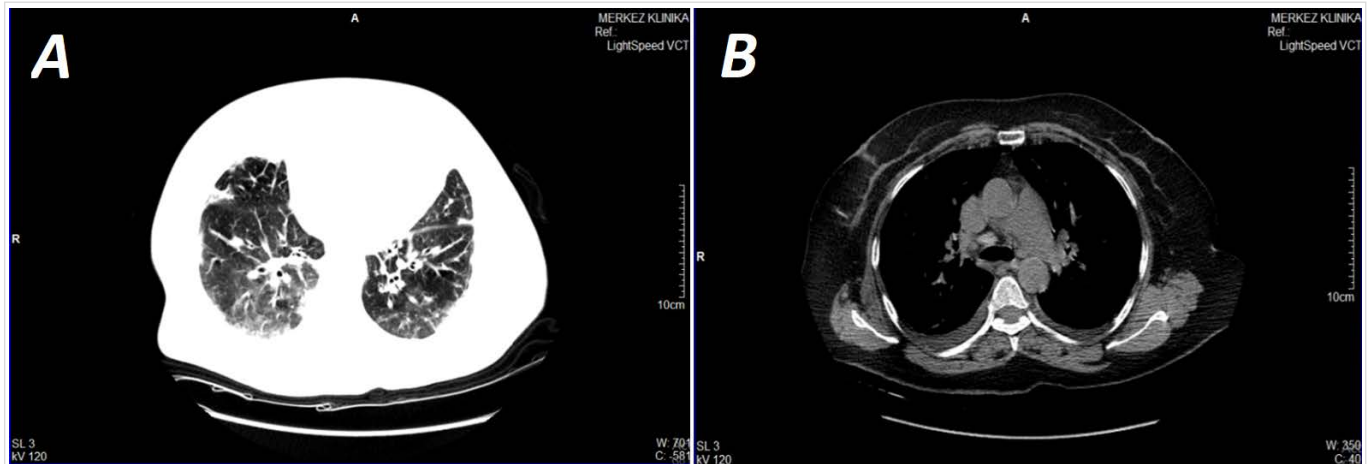


Figure 2. Lung CT Scan. **A.** Bilateral frosted glass-like inflammatory lesions predominantly towards the bases of both lungs are clearly seen. **B.** slight right pleural effusion is visible.

tion, pericardial effusion or intracardiac thrombus were found. The diagnosis of COVID-19 was confirmed on hospital day two.

After 48 hours in the CICU with favorable clinical, hemodynamic and radiological outcome she was

referred to the conventional ward where her health continued to improve progressively. The patient was discharged with outpatient cardiology follow-up, awaiting coronary angiography as soon as the service is restored.

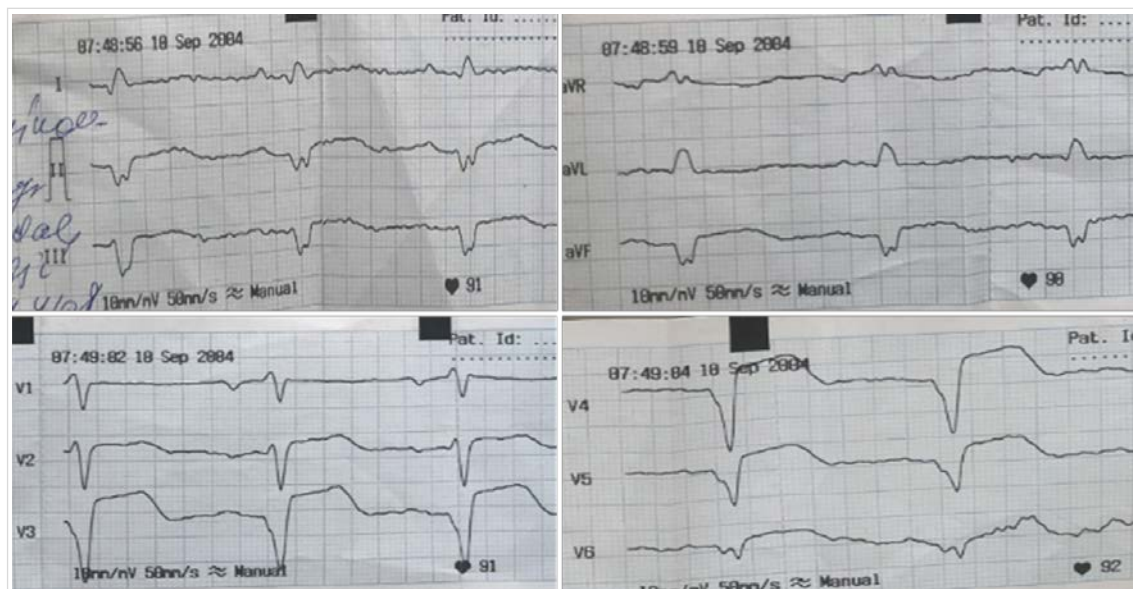


Figure 3. Standard 12-lead electrocardiogram (ECG paper speed of 50 mm per second): sinus rhythm and presence of QS complexes in leads I, II, aVF and from V₂ to V₆, accompanied by ST-segment elevation up to 5 mm, more markedly from V₃ to V₅.

COMMENTS

Although the mechanism of myocardial injury is not fully understood, SARS-CoV-2 is thought to cause cardiac involvement through a number of mechanisms: 1) indirect heart damage due to excessive inflammatory immune response and cytokine storm, 2) direct damage by invasion of cardiomyocytes, and 3) severe hypoxia due to acute respiratory distress, which can cause oxidative stress and myocardial injury due to increased myocardial oxygen demand in the presence of severe acute respiratory distress syndrome³.

Patients with a history of ischemic heart disease, or those likely to have atherosclerotic disease, have an increased risk of developing ACS. The infection results in increased myocardial oxygen demand, usually linked to respiratory failure, and can trigger type 2 AMI, secondary to imbalance between oxygen supply and demand. On the other hand, the systemic inflammatory response with elevated C-reactive protein, interleukin 6, interferon, tumor necrosis factor, procalcitonin and ferritin, among others, may destabilize atherosclerotic coronary plaques and lead to type 1 AMI⁹.

Due to her age and associated cardiovascular risk factors, the patient may or may not have had ACS resulting or not from COVID-19; but no doubt this disease increased the likelihood of AMI, for if she had sought earlier medical attention, her chest pain would not have gone beyond a probably reversible ischemia, had she been treated in time.

It should be noted that COVID-19 has revealed certain behaviors in different ACS-related scenarios that would be quite unusual in non-pandemic periods. Avoiding or delaying seeking medical help for acute cardiac symptoms due to concern about being infected with the COVID-19 virus is one of them. This phenomenon was also reported on during the SARS-CoV and H1N1 outbreaks in 2003 and 2009, respectively¹⁰.

A study conducted in China by Tam *et al*⁶ within the context of the current pandemic found that patients with cardiovascular disease often delayed seeking medical care because of worries about becoming ill with COVID-19. Meanwhile, Garcia *et al*¹¹, in the United States, found a reduction of up to 38% in the activation of hemodynamic laboratories for emergency coronary catheterization in nine leading cardiology centers in the country. According to De Filippo *et al*¹², another study carried out in California proved that weekly AMI hospitalization rates de-

clined by 48% from the previous year, three months after the pandemic broke out. All of these studies illustrate how patients really do feel an exaggerated fear of seeking medical assistance in the presence of chest discomfort, a sign that was "minimized" at the onset of symptoms^{6,8,11,12}, in the case previously presented.

In view of all this, an increase in the number of patients with AMI is to be expected not only because of the effects of COVID-19 on the body but also because of the increase in social and psychological (stress) factors that are worsened by the pandemic and lead to procrastination. Although there is still little research in the medical literature thoroughly addressing the issue of avoidance or delay in seeking emergency medical care for non-COVID-19 related illnesses, we can safely state that fear of contagion when presenting to any medical facility is the major decisive factor for this avoidance behavior. It may then be inferred that in the case of patients with or without heart disease, this kind of behavior in clinical situations –suggestive of evolving ACS– could lead to serious cardiovascular complications such as acute ventricular dysfunction, cardiogenic shock or even death.

In the specific case of this patient, it is obvious that delay in seeking medical attention after five days suffering from chest pain stopped her from receiving the therapeutic (pharmacological and non-pharmacological) procedures for coronary reperfusion indicated for this type of AMI. This brought about further negative consequences for left ventricular geometry and function; which also favors the appearance of subsequent cardiovascular complications. It is pertinent to highlight the worrying fact that our patient took time to seek medical attention fully aware of her symptoms and simply ignored them in the hope that they would disappear later. Luckily she had a satisfactory outcome but this will not always be the case, neither from a cardiological standpoint nor from the perspective of COVID-19. In both diseases, every minute lost may be fatal.

Although there is not enough evidence since studies on this topic are scarce, this "delay-avoidance" pattern in seeking medical attention when facing cardiovascular symptoms is considered to be a noticeable trend also among the Cuban population, which would bring about another equally important problem in the future: increased morbidity and mortality owing to this and other conditions, since by the time that persistence and intensity of symptoms compel the patient to seek medical care,

it may actually be too late. This pandemic has actually changed the way medicine is being practiced. The medical community has been compelled to re-adjust care protocols and some patients are reluctant to attend hospitals in clinical scenarios not related to COVID-19 as they are fearful of the risks of infection. Another aspect to be considered is the urgent reorganization of care processes for patients with chronic diseases, since the decrease in medical consultations worldwide may cause some chronic non-communicable diseases to worsen due to lack of adequate follow-up; so we would not be wrong if we thought that months or years from now, health care services globally will be faced with the consequences of the chronic psychological stress, on a population basis, that this terrible pandemic has unleashed.

Cuba, with a robust health system focused on prevention, is one of the countries where the pandemic has been most effectively controlled. Nevertheless, we hope that our report will raise awareness on the issue of patients' avoidance or delay in seeking timely medical attention for diseases other than COVID-19, due to fear of contagion. In the case of active screening of cases with symptoms suggestive of COVID-19 it would be advisable to also investigate symptoms, even if mild, pointing out to cardiovascular disease. In the case of patients with heart disease, rather than just inquiring, the practitioner is supposed to play a guiding role aimed at addressing the fears –often justified– of patients in times of epidemics, especially for those who live alone.

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