Coronary thrombosis after COVID-19 infection in a young patient with no comorbidities

Trombose coronariana em paciente jovem sem comorbidades após infecção pela COVID-19

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ABSTRACT – COVID-19 emerged as a viral infection causing severe acute respiratory syndrome, taking global proportions in 2020, with significant impact on public health. The scenario has become alarming since the infection is more severe in patients with cardiovascular diseases, mortality being up to four-fold greater in these patients, as compared to the general population. As a probable contributor, the prothrombotic inflammatory state has been subject of discussion among scientists, with no consolidated treatments in the short and long term. We describe the case of a young patient, with no cardiovascular risk factors, with ST-segment elevation myocardial infarction caused by coronary thrombosis, in the late period after COVID-19 infection, and reviewed the most recent recommendations for its treatment.

Keywords: Acute coronary syndrome; ST elevation myocardial infarction; COVID-19; Coronary thrombosis; Angioplasty

INTRODUCTION

Coronavirus disease 2019 (COVID-19) has been weakening global public health since 2020, when it was declared pandemic. The scenario has become alarming for the infection is more severe in patients with cardiovascular diseases, and mortality being up to four-fold greater in this group of patients as compared to the general population. We describe the case of a young patient, with no cardiovascular risk factors, with ST-segment elevation myocardial infarction (STEMI) caused by coronary thrombosis in the late period after COVID-19 infection, and reviewed the most recent recommendations for its treatment.

The Internal Review Board of the Instituto de Cardiologia do RS/Fundação Universitária de cardiologia evaluated and approved this study (opinion number 4.682.382, CAAE: 45636121.5.0000.5333) on April 30th, 2021.

CASE REPORT

A 27-year-old male patient presented to the emergency department for pressure-type retrosternal pain that had initiated 8 hours before, irradiating to both
shoulders and associated with nausea. He was unaware of comorbidities or family history of cardiovascular diseases, and reported only oligosymptomatic COVID-19 infection 25 days before the visit, confirmed by reverse transcriptase polymerase chain reaction (RT-PCR). He denied the use of illicit substances or hormone or nutritional protein supplements, as well as smoking or alcohol drinking habits. Physical examination with no significant abnormalities, stable vital signs, symmetrical pulses, and absence of heart murmur.

Electrocardiogram (ECG) upon arrival showed sinus rhythm and ST-segment elevation in DII, DIII and aVF leads, as well as V3R and V4R (Figure 1), and an inferior wall and right ventricle STEMI was diagnosed. A loading dose of dual antiplatelet therapy (DAP; acetylsalicylic acid – ASA – 300mg and clopidogrel 600mg) and anticoagulation with unfractionated heparin were given. The patient was referred for primary percutaneous coronary intervention (PCI) in due time (less than 120 minutes).

He was admitted to a reference tertiary care hospital, with persistence of chest pain and ECG abnormalities, and was referred for coronary angiography, which demonstrated absence of obstructions in the left coronary system, and right coronary artery (RCA) occluded in the proximal third by acute thrombosis (Figure 2). Percutaneous coronary intervention was carried out implanting two drug-eluting stents, with complete recovery of the vessel lumen, Thrombolysis in Myocardial Infarction (TIMI) flow II, with no signs of dissection (Figure 3). The patient was subsequently referred to the coronary unit for monitoring and post-acute coronary syndrome care.

**Figure 1.** 12-lead electrocardiogram showing ST-segment elevation in the inferior wall and right leads.

**Figure 2.** Coronary angiogram showing left coronary system in right anterior oblique caudal view (A), no obstructions. The right coronary system is viewed in oblique anterior left view (B), with acute thrombotic obstruction in the proximal third of the right coronary artery.

ADA: anterior descending artery; LCx: left circumflex artery; RCA: right coronary artery.
The patient progressed with no complications. Laboratory tests demonstrated elevation of ultrasensitive troponin T with a peak of 1,794.00pg/mL (reference value <14.00pg/mL), non-reactive viral serologies, negative inflammatory and autoimmune tests, and normal glycemic and lipid tests. Considering the need for early anticoagulation and the state of acute thrombosis, clinical conditions that may interfere in the investigation of thrombophilia, the decision was for additional investigation on an outpatient basis. Transthoracic echocardiogram showed preserved ejection fraction, with no associated mechanical complications. The treatment was optimized with angiotensin-converting enzyme inhibitor, statin, beta-blocker, DAP with ASA and clopidogrel, and anticoagulation with unfractionated heparin.

After 5 days at the hospital, he was discharged in good general conditions, with no clinical signs of heart failure or chest pain. It was decided to maintain full anticoagulation with rivaroxaban for 3 months, associated with DAP, due to the high thrombotic load and the probable correlation between the clinical event and the prothrombotic state induced by COVID-19.

DISCUSSION

COVID-19 emerged as a viral infection causing severe acute respiratory syndrome, taking global proportions in 2020, with significant impact on public health. High morbidity and mortality have been observed in patients with preexisting cardiovascular diseases, being up to four times more lethal in this population as compared to the general population. Cardiovascular involvement in the clinical presentation of COVID-19 is commonly reported, with increased markers of myocardial injury (troponin) in up to 12% of cases, which is related to higher mortality. As for the mechanism of myocardial injury, the possible causes are direct toxicity of the virus in cardiomyocytes, microvascular dysfunction secondary to endothelial injury, imbalance between oxygen supply and demand, rupture of a preexisting atherosclerotic plaque, and formation of thrombi in the microvasculature secondary to disseminated intravascular coagulation.

The prothrombotic state is being proven as the reports of these arterial or venous thrombotic events increase in the infected people, and may manifest in patients with no respiratory symptoms, or even weeks after the acute condition. A multifactorial model is proposed as an explanation for this phenomenon, related to macrophage activation of the complement system, cytokine storm, hyperactivation of the renin-angiotensin system, among others.

In this report, the early clinical presentation of the coronary event, along with the absence of cardiovascular risk factors, strengthens the hypothesis of COVID-19 infection as the etiology of thrombogenesis, even in a late phase. In a retrospective study recently published with 28 patients with COVID-19 undergoing angiography for STEMI, Stefanini et al. demonstrated in 85.7% of them, infarction was the first manifestation of the viral disease. In 60.7% of those, there was obstructive lesion requiring revascularization. However, other scenarios that predispose to vascular thrombosis in this age group must be investigated, such as smoking, alcohol consumption, thrombophilia, and the use of illicit drugs or ergogenic hormones, nutritional protein supplements, and stimulants.

The intensity of anticoagulation in COVID-19 has been widely discussed. Recent guidelines recommend maintaining prophylactic anticoagulation in hospitalized patients with no evidence of thromboembolic event. However, in cases of high risk for thrombosis with low risk of bleeding, full anticoagulation may be considered. After discharge, for high-risk patients, rivaroxaban 10mg, for 31 to 39 days, has been approved as antithrombotic prophylaxis in non-COVID-19 patients and can be considered individually in infected patients. Due to the large number of thrombi on angiography, it was decided to maintain anticoagulation for a prolonged period (3 months), associated with DAP. There is no evidence so far in the literature regarding the duration of prothrombotic state after coronavirus infection, and the duration of the treatment should be individualized according to the risk of new events, thrombotic load, and risk of bleeding.

Myocardial infarction due to coronary thrombosis may present as a single manifestation of coronavirus infection, even weeks after the acute phase. There is no consensus in the scientific literature on prevention and treatment of these events. The period of prothrombotic state after infection is uncertain, and oral anticoagulation may be con-
sidered for a longer period after the thromboembolic event, especially in affected patients who do not have higher risk factors for bleeding related to anticoagulant therapy.

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None.

DECLARATION OF CONFLICTS OF INTEREST

The authors declare having no conflicts of interest.

CONTRIBUTION OF AUTHORS

Conception and design of the study: MSB, SFFF, BSF and RBG; data collection: MSB, SFFF, BSF and RBG; data interpretation: MSB, SFFF, BSF and RBG; text writing: MSB, SFFF, BSF and RBG; approval of the final version to be published: MSB, SFFF, BSF and RBG.

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