COVID-19 and spontaneous coronary artery dissection: causality?

La COVID-19 y la disección coronaria espontánea: ¿causalidad?

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To the Editor,

The severe acute respiratory syndrome coronavirus 2 [SARS-CoV-2] is the causative agent of the coronavirus disease 2019 (COVID-19) and is responsible for the current global outbreak. Although COVID-19 causes viral pneumonia mainly, alarms have gone off about its potential to damage the cardiovascular system with myocardial injury as a risk factor for mortality. Several are the potential causes of COVID-19 related myocardial injury including type I and type II myocardial infarction. 1

This is the case report of an apparent spontaneous coronary artery dissection (SCAD) in a patient with COVID-19 followed by a systematic review of the medical literature available.

This is the case of a 40-year-old male without any known past medical history or cardiovascular risk factors who was admitted to our tertiary hospital with fever and cough. The patient tested positive in the reverse transcriptase-polymerase chain reaction test for SARS-CoV-2 infection, and the chest x-ray performed showed bilateral opacities (figure 1A). The patient was admitted to the intensive care unit due to a rapidly deteriorating clinical course within the first 72 hours despite initial supportive therapy that required early intubation. The laboratory work showed severe lymphopenia (<0.5 × 10^9/L), troponin-T levels of 42 ng/dL, D-dimer levels > 10 000 ng/mL, CRP levels > 300 mg/dL, and ferritin levels > 3000 ng/mL. Although corticosteroids and remdesivir were administered, the patient’s hemodynamic status deteriorated with signs of acute respiratory distress syndrome and cardiogenic shock (CS). Concomitant inotropic and vasopressor support was initiated, and a transthoracic echocardiography performed revealed the presence of severe biventricular dysfunction with intraventricular thrombus without segmental wall motion abnormalities. After heart team discussion, a veno-arteriovenous extracorporeal membrane oxygenation (VAV-ECMO) was implanted. Within the first week after VAV-ECMO implantation a new electrocardiogram performed showed diffuse T-wave inversion in precordial leads (figure 1B). The patient’s successful progression allowed the withdrawal of VAV-ECMO, adrenergic drugs, and mechanical ventilation.

Two months after the index event a cardiac magnetic resonance imaging performed discarded any signs of inflammation or fibrosis, a left ventricular ejection fraction of 35%, and resolution of the intraventricular thrombus. The endomyocardial biopsy performed tested negative for myocarditis (figure 1C). The coronary angiography performed (figure 1D,E; video 1 of the supplementary data) to discard concomitant coronary artery disease showed an isolated lesion of the distal segment in a tortuous left anterior descending....
prior to admission.

computed tomography; PVT, polymorphic ventricular tachycardia; RCA, right coronary artery.

CA, coronary angiogram; COVID-19, coronavirus disease 2019; HF, heart failure; LAD, left anterior descending coronary artery; LEVF, left ventricular ejection fraction; OCT, optical coherence tomography.

1 However, SCAD may be due to other contributing factors typically seen in critically ill patients. For instance, an overactive sympathetic system can cause intimal dissection. Also, SCAD could be the result of high-dose corticosteroid therapy, broadly used in COVID-19, due to the spontaneous rupture of a weakened arterial wall.6 Finally, a direct SARS-CoV-2 related endothelial damage cannot be discarded either.

Although SCAD is more common in females, 3 out of 4 cases reported were males, which could be explained by the higher incidence of COVID-19 reported in males. Chest pain is the most common symptom of SCAD and is present in 2 of the cases reported; however, the case reported by Courand PY et al. and our own case did not show specific symptoms of acute coronary syndrome.3 Whether SCAD is the cause of CS and severe ventricular dysfunction, in our case, is still under discussion. A previous unknown cardiomyopathy or transient ventricular dysfunction is possible causes since the SCAD was found in a distal small portion of the LAD. In any case, regardless of the severity of COVID-19, conservative management is a safe strategy. Morbidity is high as Kumar K et al. reported polymorphic ventricular tachycardia,3 and our patient presented with CS. We chose single antiplatelet therapy with aspirin, and guideline-directed medical therapy for heart failure like Courand PY et al. did,3 but different from the other 2 cases reported that chose dual antiplatelet therapy.4,5 It may raise concerns whether anticoagulation is a safe strategy as COVID-19 is associated with a prothrombotic state.

In conclusion, SCAD is a potential cause of type II myocardial infarction in patients with COVID-19, but more studies are needed to establish causality. Infection-related SCAD may occur at any time during index events and could be difficult to diagnose. Conservative management seems like a safe strategy, although CS and ventricular arrhythmias can occur.

### Table 1: Systematic review of the medical literature on spontaneous coronary artery dissections in patients with COVID-19

<table>
<thead>
<tr>
<th>Authors</th>
<th>Journal/year</th>
<th>Age/sex</th>
<th>LVEF at admission</th>
<th>Previous predisposing factors*</th>
<th>Symptoms/ signs at admission</th>
<th>COVID-19 severity</th>
<th>In-hospital treatment</th>
<th>Coronary angiography</th>
<th>Management of SCAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Courand PY et al.2</td>
<td><em>JACC Cardiovasc Interv</em> 2020</td>
<td>55/male</td>
<td>Preserved</td>
<td>Peripheral artery disease</td>
<td>Fever, dyspnea, and cough</td>
<td>Mild</td>
<td>Unreported</td>
<td>Mid-RCA dissection (confirmed on the OCT)</td>
<td>Conservative Aspirin, statins, and beta-blockers</td>
</tr>
<tr>
<td>Gasso LF et al.3</td>
<td><em>Eur Heart J</em> 2020</td>
<td>39/male</td>
<td>50% to 55%</td>
<td>None</td>
<td>Fever, dyspnea, cough, chest pain, and myalgia</td>
<td>Severe</td>
<td>Hydroxychloroquine, azitromycin, lopinavir/ritonavir, tocilizumab</td>
<td>Multivessel dissection (no intracoronary imaging)</td>
<td>Conservative Dual antiplatelet therapy</td>
</tr>
<tr>
<td>Kumar K et al.4</td>
<td><em>Catheter Cardio Int</em> 2020</td>
<td>48/female</td>
<td>45% to 55%</td>
<td>Migraine Dyslipidemia</td>
<td>Chest pain</td>
<td>Mild</td>
<td>Unreported</td>
<td>Mid-to-distal LAD dissection (confirmed on the computed tomography scan)</td>
<td>Conservative Dual antiplatelet therapy LifeVest, beta-blockers, and amiodarone after sustained PVT</td>
</tr>
<tr>
<td>Reported patient</td>
<td>2020</td>
<td>40/male</td>
<td>Severe (&lt; 30%)</td>
<td>None</td>
<td>Fever, and dyspnea</td>
<td>Severe (mixed shock)</td>
<td>Hydroxychloroquine, azitromycin, lopinavir/ritonavir, corticosteroids, remdisivir, inotropic and vasopressor agents, VAV-ECMO</td>
<td>Distal LAD dissection (no intracoronary imaging)</td>
<td>Conservative Aspirin, and guideline-directed medical therapy for HF The follow-up CA confirmed the complete resolution</td>
</tr>
</tbody>
</table>

CA, coronary angiogram; COVID-19, coronavirus disease 2019; HF, heart failure; LAD, left anterior descending coronary artery; LEVF, left ventricular ejection fraction; OCT, optical coherence tomography; PVT, polymorphic ventricular tachycardia; RCA, right coronary artery.

* Prior to admission.
SUPPLEMENTARY DATA

Supplementary data associated with this article can be found in the online version available at https://doi.org/10.24875/RECICE.M20000185.

REFERENCES