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Apparently normal epicardial coronaries in a patient with inferior wall myocardial infarction on the background of mild coronavirus disease-2019: take a second look!

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Abstract

The coronary angiographic (CAG) findings of ST elevation myocardial infarction (STEMI) in patients of coronavirus disease 2019 (COVID-19) range from increased coronary artery thrombus burden to normal coronaries due to STEMI mimics. Here we report the case of a 45-year-old gentleman who presented with evolved inferior wall myocardial infarction with ongoing angina along with mild COVID-19. CAG showed normal epicardial coronaries except for distal right posterior descending coronary artery (RPDA) 100% occlusion on careful examination. He was treated for the myocardial infarction with medical management along with treatment of COVID-19. The importance of our case is to highlight the possibility of distal total occlusion of small coronary branches which maybe missed if not carefully looked for as a normal CAG in COVID-19 patient will require only supportive therapy, while the finding of distal 100% occlusion of RPDA deemed us to prescribe optimal medical therapy as per acute myocardial infarction protocol along with treatment for COVID-19.

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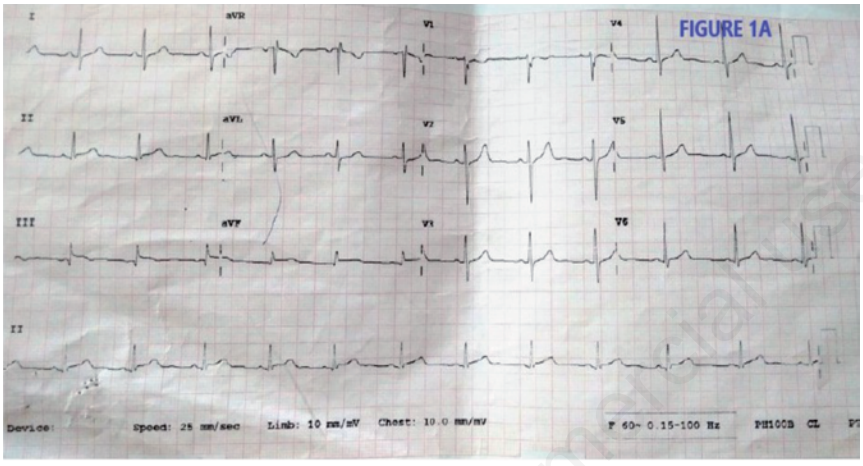
Introduction

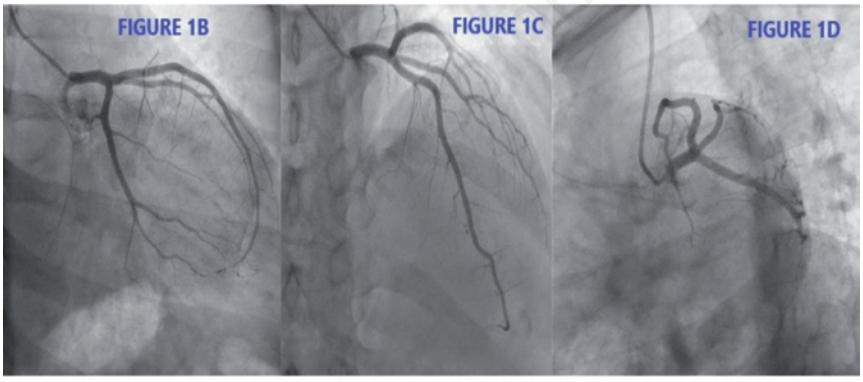
Patients of coronavirus disease 2019 (COVID-19) are found to have a hypercoagulable state known as COVID-19 associated hemostatic abnormalities (CAHA). The prothrombotic state can include venous thromboembolism (VTE), stroke, acute limb ischemia, aortic thrombosis, splenic infarcts and acute coronary syndrome (ACS) [1]. Patients of COVID-19 who present with ST elevation myocardial infarction (STEMI) have variable coronary anatomy on coronary angiography (CAG), with few reports of increased coronary artery thrombus burden [2], and few reports of STEMI with normal epicardial coronaries [3,4].

Case report

Here, we report the case of a 45-yea-old gentleman, type 2 diabetic, non-smoker who presented to us with a 3-day history of retrosternal chest pain radiating to left arm associated with sweating. He reported history of fever, dry cough and sore throat for 4 days but no history of loose stools, breathlessness or loss of smell or taste. Twelve lead surface electrocardiogram (ECG) showed q with ST elevation in leads III and aVF with no reciprocal changes (Figure 1A) with a peak troponin I of 20.5mcg/L (normal <0.05mcg/L), suggestive of evolved inferior wall myocardial infarction (IWMI). Transthoracic echocardiography showed

hypokinesia in the right coronary artery (RCA) territory with left ventricular ejection fraction (LVEF) of 45% with normal right ventricular function. He was loaded with tablet aspirin 325 mg, tablet clopidogrel 600mg and tablet atorvastatin 80mg. Reverse transcriptase polymerase chain reaction (RT-PCR) nasopharyngeal (NP) and oropharyngeal (OP) swab tested positive for SARS-CoV-2. His oxygen saturation on room air was 99%. The investigation panel including complete blood count, renal function tests, liver function tests, serum ferritin, interleukin-6, lactate dehydrogenase and d-dimer levels were within the normal range. High-resolution computed tomography thorax was within normal limits. In view of the ongoing angina, he was taken up for coronary angiography (CAG) from the right radial route. The left coronary system was normal (Figure 1 B-D). Right coronary system also appeared normal at the first look (Figure 1 E,F). Careful review of the RCA CAG showed abrupt cut-off of the distal right posterior descending coronary artery (RPDA), suggestive of distal RPDA 100% occlusion (Figure 2 A,B; Videos 1 and 2). The patient was kept on medical management for the IWMI with injection enoxaparin 60 mg subcutaneous twice daily for 5 days, dual antiplatelets, tablet aspirin 150 mg once daily and tablet clopidogrel 75 mg once daily, tablet atorvastatin 40 mg once daily, tablet metoprolol succinate 50 mg once daily, tablet nitroglycerine 2.6 mg twice daily along with oral hypoglycemic agents for diabetes. Treatment for COVID-19 included tablet vitamin C 500 mg thrice daily, tablet zinc 50 mg once daily, tablet paracetamol 500 mg thrice daily and tablet favipiravir 1800 mg twice on day 1 followed by 800 mg twice daily for 7 days. He improved with RT-PCR NP abd OP swab for SARS-CoV-2 turning out negative on day 8. He was advised a follow-up CAG to look for the RPDA distal total occlusion, however the patient refused.





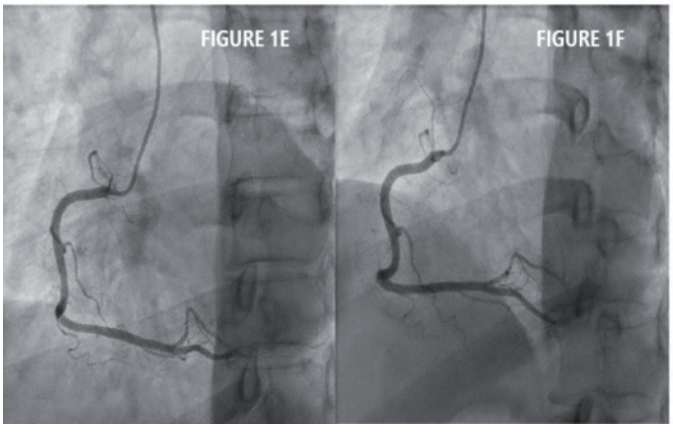


Figure 1. A) Twelve lead surface electrocardiogram showing sinus rhythm with q with ST elevation in leads III and aVF. B) Left coronary angiogram done through right radial route in right anterior oblique caudal view showing normal left main coronary artery, normal type III left anterior descending coronary artery, normal non-dominant left circumflex coronary artery and a normal ramus intermedius branch. C) Left coronary angiogram done through right radial route in antero-posterior cranial view showing normal left main coronary artery, normal type III left anterior descending coronary artery, normal left circumflex coronary artery and a normal ramus intermedius branch. D) Left coronary angiogram done through right radial route in left anterior oblique caudal view showing normal left main coronary artery, normal left anterior descending coronary artery, normal non-dominant left circumflex coronary artery and a normal ramus intermedius branch. E) Right coronary angiogram done through right radial route in left anterior oblique 30° caudal 5° view showing dominant right coronary artery with normal proximal, mid and distal segments, with normal conus, right ventricular and acute marginal branches, terminating into posterior descending and postero-lateral branches. F) Right coronary angiogram done through right radial route in left anterior oblique 34° cranial 12° view showing dominant right coronary artery with normal proximal, mid and distal segments, with normal conus, right ventricular and acute marginal branches, terminating into posterior descending and postero-lateral branches.

Discussion

Angiotensin-converting enzyme 2 (ACE2) has been identified as a functional receptor for coronaviruses, which is highly expressed in type II pneumocytes in the respiratory and cardiovascular systems resulting in cardiovascular manifestations of COVID-19. Patients with COVID-19 develop a hypercoagulable state known as CAHA [1]. Increased number of extramedullary megakaryocytes in vascular beds of lungs and hearts plays an important role in the increased thrombotic risk of COVID-19 patients [5,6]. In patients who require hospitalization, the rate of any thrombotic event is approximately 16%, varying between 11.5% in non–intensive care unit (ICU) to 29.4% in ICU settings [7]. The CAHA is divided into three stages. Stage one includes patients with mild symptoms who show pulmonary microthrombi of peripheral microvasculature which may not be detected by computed tomography. Stage two includes patients who may develop severe symptoms requiring ICU support who show lung ventilation/perfusion impairment caused by thrombi or emboli on computed tomography scan and may have asymptomatic or symptomatic deep vein thrombosis (DVT). Stage three includes critically ill patients who need invasive mechanical ventilation or extracorporeal membrane oxygenation who exhibit VTE and extrapulmonary thrombosis involving several organs, such as intestine, limbs, and coronary or cerebral circulation [1]. Thus, coronary thrombosis occurs in CAHA stage 3. Patients may present with a clinical diagnosis of STEMI but have no evidence of obstructive epicardial coronaries [1,3,4]. ST elevation on the ECG in COVID-19 patients can occur due to myocarditis, microvascular thrombosis, cytokine-mediated injury, stress-induced cardiomyopathy, hypoxic injury, coronary spasm, and endothelial or vascular injury [8-10]. The prevalence of acute myocardial infarction (MI) in patients with COVID-19 ranges from 7-17% of hospitalized patients and over 20% of ICU patients [11].

The latest guidelines on management of acute MI during the COVID-19 pandemic, state that percutaneous coronary intervention (PCI) is the preferred therapy within 90 min from first medical contact, though fibrinolysis may be considered in patients who are "relatively stable" [11-13]. Patients with equivocal symptoms, atypical ECG, or delayed presentation and possible STEMI should undergo further evaluation including echocardiogram and serial ECGs [11].

As our patient had mild symptoms of COVID-19, he belonged to CAHA stage 1 and hence the acute IWMI and the COVID-19 were probably coincidental. The aim of our case report is not to draw conclusions on the relationship between the CAG findings and COVID-19. Small vessel occlusions can occur in otherwise any myocardial infarction patient with or without COVID-19. The background knowledge of the long list of differentials for STEMI mimics with normal epicardial coronaries among COVID-19 patients may lead clinicians to hastily arrive at a wrong diagnosis of normal coronaries and miss the important finding of distal total occlusion of side branches like RPDA as in our patient.

Hence our case report aims to highlight the possibility of acute distal total occlusion of branches like PDA or other side branches like septal, diagonal or marginal which can be missed if not specifically looked for, as a normal CAG in COVID-19 patient will require only supportive therapy, while the finding of 100% occlusion of distal RPDA deemed us to prescribe optimal medical therapy as per acute myocardial infarction protocol along with treatment for COVID-19.

Conclusions

Patients of COVID-19 have increased rates of thrombotic complications including acute STEMI. Patients of STEMI and COVID-19 can have normal epicardial coronaries due to various reasons. A careful review of the CAG images is mandated before labelling a COVID-19 patient with STEMI as having normal epicardial coronaries as distal total occlusion of small branches maybe missed on casual inspection of CAG images. A normal CAG would dictate supportive management for such patients, while acute total occlusions of small branches are the consequences of acute MI per se and require medical/interventional treatment for the same.

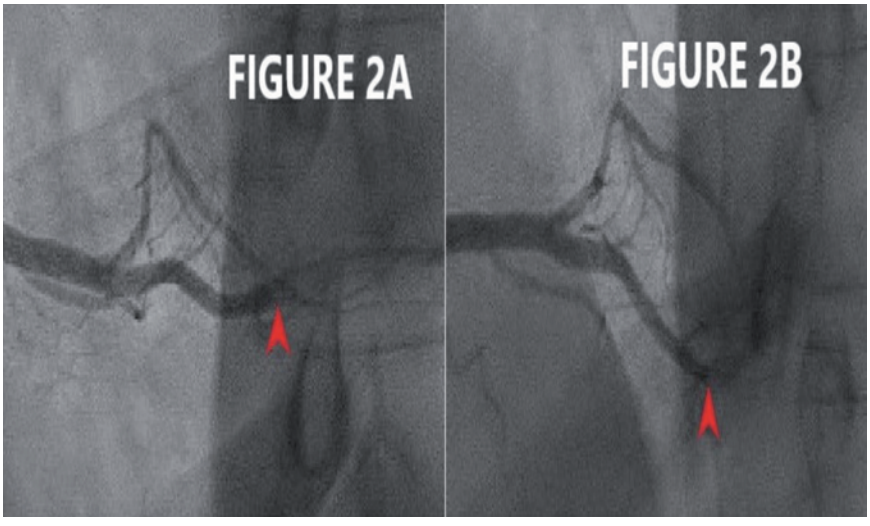


Figure 2. A) Right coronary angiogram done through right radial route in left anterior oblique 30° caudal 5° view, zoomed-in image showing abrupt cut-off of distal posterior descending coronary artery suggestive of total occlusion with normal postero-lateral branches. B) Right coronary angiogram done through right radial route in left anterior oblique 34° cranial 12° view, zoomed-in image showing abrupt cut-off of distal posterior descending coronary artery suggestive of total occlusion with normal postero-lateral branches.

VIDEO LEGENDS

Video 1. Fluoroscopic movie of right coronary angiogram done through right radial route in left anterior oblique 30° caudal 5° view showing abrupt cut-off of distal posterior descending coronary artery suggestive of total occlusion with normal postero-lateral branches.

Video 2. Fluoroscopic movie of right coronary angiogram done through right radial route in left anterior oblique 34° cranial 12° view showing abrupt cut-off of distal posterior descending coronary artery suggestive of total occlusion with normal postero-lateral branches.

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