



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

Journal Pre-proof

Misdiagnosis in the COVID era: When Zebras are Everywhere, Don't Forget the Horses

Rayan Yousefzai, MD, Arvind Bhimaraj, MD



PII: S2666-0849(20)30380-6

DOI: <https://doi.org/10.1016/j.jaccas.2020.04.018>

Reference: JACCAS 469

To appear in: *JACC Case Reports*

Received Date: 6 April 2020

Revised Date: 15 April 2020

Accepted Date: 17 April 2020

Please cite this article as: Yousefzai R, Bhimaraj A, Misdiagnosis in the COVID era: When Zebras are Everywhere, Don't Forget the Horses, *JACC Case Reports* (2020), doi: <https://doi.org/10.1016/j.jaccas.2020.04.018>.

This is a PDF file of an article that has undergone enhancements after acceptance, such as the addition of a cover page and metadata, and formatting for readability, but it is not yet the definitive version of record. This version will undergo additional copyediting, typesetting and review before it is published in its final form, but we are providing this version to give early visibility of the article. Please note that, during the production process, errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

© 2020 The Author(s). Published by Elsevier on behalf of the American College of Cardiology Foundation.

Misdiagnosis in the COVID era: When Zebras are Everywhere, Don't Forget the Horses

Brief Title: A case of misdiagnosis in COVID era.

Rayan Yousefzai, MD^a Arvind Bhimaraj, MD^a

a: Department of Cardiology, Houston Methodist DeBakey Heart and Vascular Center.

Funding: None

Disclosures: No disclosures

Corresponding author:

Rayan Yousefzai, MD

Houston Methodist DeBakey Heart and Vascular Center

6550 Fannin St, Suite 1801

Houston, TX, 77030

Telephone: 713-441-1100

Fax: 713-790-2643

Email: ryousefzai@houstonmethodist.org

Keywords: Acute Coronary Syndrome, cardiomyopathy, Myocardial Infarction

Abbreviation:

ECG = Electrocardiogram

ECHO = Echocardiogram

STEMI = ST-elevation myocardial infarction

ARDS = Acute respiratory distress syndrome

LV = left ventricle

RV = right ventricle

LAD = left anterior descending artery

LCX = left circumflex artery

RCA = right coronary artery

ECMO = extracorporeal membrane oxygenation

Abstract: We report a patient who presented with respiratory failure, chest pain, and fever. In the COVID-19 pandemic era, the focus was diverted to the coronavirus infection, and STEMI was missed. Even though we need to be vigilant in the diagnosis of COVID-19, we should not forget about the common pathologies.

History of Presentation

A 56-year-old male patient presented with shortness of breath. His symptoms started ten days prior to the admission. He had a virtual visit with his primary care doctor. At that visit, he described his symptoms as shortness of breath and cough associated with dull chest pain. He also reported fatigue, myalgia, and a recorded temperature of 102 Fahrenheit. On further questioning, he also mentioned similar episodes of chest pain in the past, with exertion. He was started on bronchodilators and antibiotics. Three days after the virtual visit with his primary care doctor, his symptoms continued to worsen, and he decided to call 911. On presentation to the hospital, he was found to be in respiratory distress.

Past Medical History

The patient had a history of hypertension, on Lisinopril 20 mg daily and hydrochlorothiazide 12.5 mg daily. He had a 40-pack year smoking history. He worked in different restaurants and had exposure to a large number of people.

Differential Diagnosis

Acute coronary syndrome, infectious or inflammatory process, including COVID-19, ARDS, and pulmonary embolism.

Investigations

Chest x-ray showed diffuse patchy airspace opacities throughout the lungs (Figure 1). Arterial blood gas on presentation showed PH 7.11, PaCO₂ 66 mmHg, PaO₂ 50 mmHg, and bicarbonate 20.1 mmol/L. The patient was intubated. On 100% FiO₂, arterial blood gas showed PH 7.02, PaCO₂ 84 mmHg, PaO₂ 97 mmHg, and Bicarbonate 21 mmol/L, with a PaO₂/FiO₂ ratio of 97g. COVID-19 PCR test was ordered. ECG was done, which showed a new left bundle branch block (**Figure 2**), which was not present previously on an ECG, two months ago (Figure

3). Troponin was 56.82 ng/ml (normal range 0.00-0.04 ng/ml), and BNP was 2493 pg/ml (normal range 0-100 pg/ml). ECHO was performed, which showed severe LV dysfunction with wall motion abnormalities (Figure 4, Video 1).

Management

Based on his symptoms on the presentation and his history, there was a suspicion for COVID-19 infection. The patient was intubated, but soon a veno-venous (VV) ECMO was considered emergently. The troponin elevation was considered a presentation of myocarditis. Norepinephrine and vasopressin were started for hypotension. VV ECMO Placement was complicated with RV rupture with worsening hypotension because of which there was an emergent placement of a peripheral veno-arterial (VA) ECMO followed by repair of the RV and placement of a central LV-vent to decompress the LV. The patient was then transferred to our institution for higher level of care. The COVID-19 PCR result was negative twice by this time. After arrival at our institution, he was taken to the cardiac catheterization lab. Coronary angiogram showed severe 99% stenosis of the mid-LAD artery with TIMI 2 flow, 60% long segment stenosis in the proximal LCX and the moderately diffusely diseased RCA (Figures 5-7, Videos 2-4).

Discussion

In December 2019, an outbreak of pneumonia caused by a novel coronavirus occurred in Wuhan, China (1). The virus was identified as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which leads to coronavirus disease (COVID-19) (2). Even though the primary manifestation of COVID-19 is respiratory symptoms, some patients have severe cardiovascular damage (3). Patients with cardiovascular disease have an increased risk of death. Cardiovascular manifestations of the patients with COVID-19 include heart failure, myocarditis, arrhythmia, and

elevated troponin, which can mimic STEMI or NSTEMI. In Wuhan out of 72,312 patients, 81% had mild symptoms, 13.9% had severe symptoms requiring oxygen, and 4.7% were critically ill needing ICU care (4). In a case series from Zhongnan Hospital of Wuhan University, the manifestation of myocardial injury included 8.7% shock, 16.7% arrhythmia, and 7.2% acute cardiac injury (5). In another series (7), 6% of the COVID-19 positive patients presented with VT/VF, and 27.8% had myocardial injury by elevated troponin.

The COVID-19 pandemic has undoubtedly alerted the cardiology community to the cardiovascular manifestation of COVID (5). The vigilance and precautions needed for COVID suspected patients in no way should be relaxed, but the fear should not preclude us from delivering appropriate care. For example, in the case of the patient that we presented, before the COVID era, most likely, he would have been referred for a further evaluation immediately. The patient has significant risk factors for coronary artery disease, with a history suggestive of chronic angina; therefore, further investigations were warranted. In the COVID era, the hesitation of the patients to go to the hospital to avoid exposure, the reservation of the providers to send their patients to the health care facilities, and the limitation of the resources, have created a significant barrier for evaluation. Even in the case of the patients who are already admitted to the hospital, when the suspicious for COVID is raised, it can affect the care either by distracting from other diagnoses or delaying the procedures to avoid the exposure. For example, in this case, while the patient was being considered for ECMO, with proper protection, an angiogram should have been performed.

Recently, the neurology community released a plea to the public not to ignore symptoms of a stroke. We also plea to the cardiology community to do the same and be vigilant about the common cardiac-related diagnosis that we might mislabel in the COVID-19 era.

Follow up

Since he had completed the LAD infarct (Figure 8), the decision was made against LAD revascularization. The patient was taken to the operating room, and Impella 5.5 was placed through the axillary artery, and ECMO was weaned off successfully. Currently, he remains in the ICU recuperating from an arduous journey to be able to be considered for options of potential revascularization (after proven viability), LVAD placement (if cannot wean off the Impella) vs. cardiac recovery (if able to successfully wean off the Impella).

Conclusion

We have presented a 56-year-old male with risk factors for coronary artery disease who presented with STEMI. In the COVID-19 era, the diagnosis was diverted towards COVID-19, and STEMI was missed. COVID-19 patients can present with cardiovascular manifestations. We have to be vigilant in diagnosing COVID-19 patients; however, we should not forget about the common diagnosis. The appropriate diagnostic tests and care should be delivered to the patients suspicious for COVID-19 with taking the proper precautions.

Learning Objective

In the COVID era, the vigilance for timely diagnosis, isolation, and treatment of the COVID-19 patients is imperative; however, the fear should not deter us from recognizing common pathologies.

Journal Pre-proof

References

1. Wang D, Hu B, Hu C, et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. [E-pub ahead of print]; <https://doi:10.1001/jama.2020.1585>.
2. Zhou P, Yang XL, Wang XG, et al. A pneumonia outbreak associated with a new coronavirus of probable bat origin. Nature 2020 Feb 3 [E-pub ahead of print]; <https://doi.org/10.1038/s41586-020-2012-7>.
3. Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet 2020 Jan 24 [E-pub ahead of print]; [https://doi.org/10.1016/S0140-6736\(20\)30183-5](https://doi.org/10.1016/S0140-6736(20)30183-5).
4. Driggin E, Madhavan MV, Bikdeli B, et al. Cardiovascular considerations for patients, health care workers, and health systems during the coronavirus disease 2019 (COVID-19) pandemic. JACC 2020 Mar [E-pub ahead of print]; <https://doi:10.1016/j.jacc.2020.03.031>.
5. CCA ACC COVID 19 Conference 18 March 2020 Part 2
6. Guo T, Fan Y, Chen M, et al. Cardiovascular implications of fatal outcome of patients with coronavirus disease 2019 (COVID-19). JAMA 2020 March 27 [E-pub ahead of print]; <https://doi:10.1001/jamacardio.2020.1017>

Figure Legends

Figure 1: Chest x-ray shows diffuse patchy airspace opacities throughout the lungs, suggested as an infectious/inflammatory process such as multifocal pneumonia versus pulmonary edema or ARDS.

Figure 2: ECG at presentation shows sinus tachycardia and left bundle branch block.

Figure 3: The previous ECG shows normal sinus rhythm and an incomplete right bundle branch block.

Figure 4: ECHO still image of an apical two-chamber view with contrast.

Figure 5: Coronary angiogram RAO 0, Cranial 17 view, shows 99% stenosis of the mid-LAD, 60% long segment stenosis in the proximal LCX with the severe diffuse disease in the distal artery.

Figure 6: Coronary angiogram LAO 36, Cranial 20 view, shows 99% stenosis of the mid-LAD, 60% long segment stenosis in the proximal LCX with the severe diffuse disease in the distal artery.

Figure 7: Coronary angiogram LAO 48 Caudal 2 view shows moderately diffusely diseased RCA.

Figure 8: Follow up ECG shows normal sinus rhythm and anterior infarct.

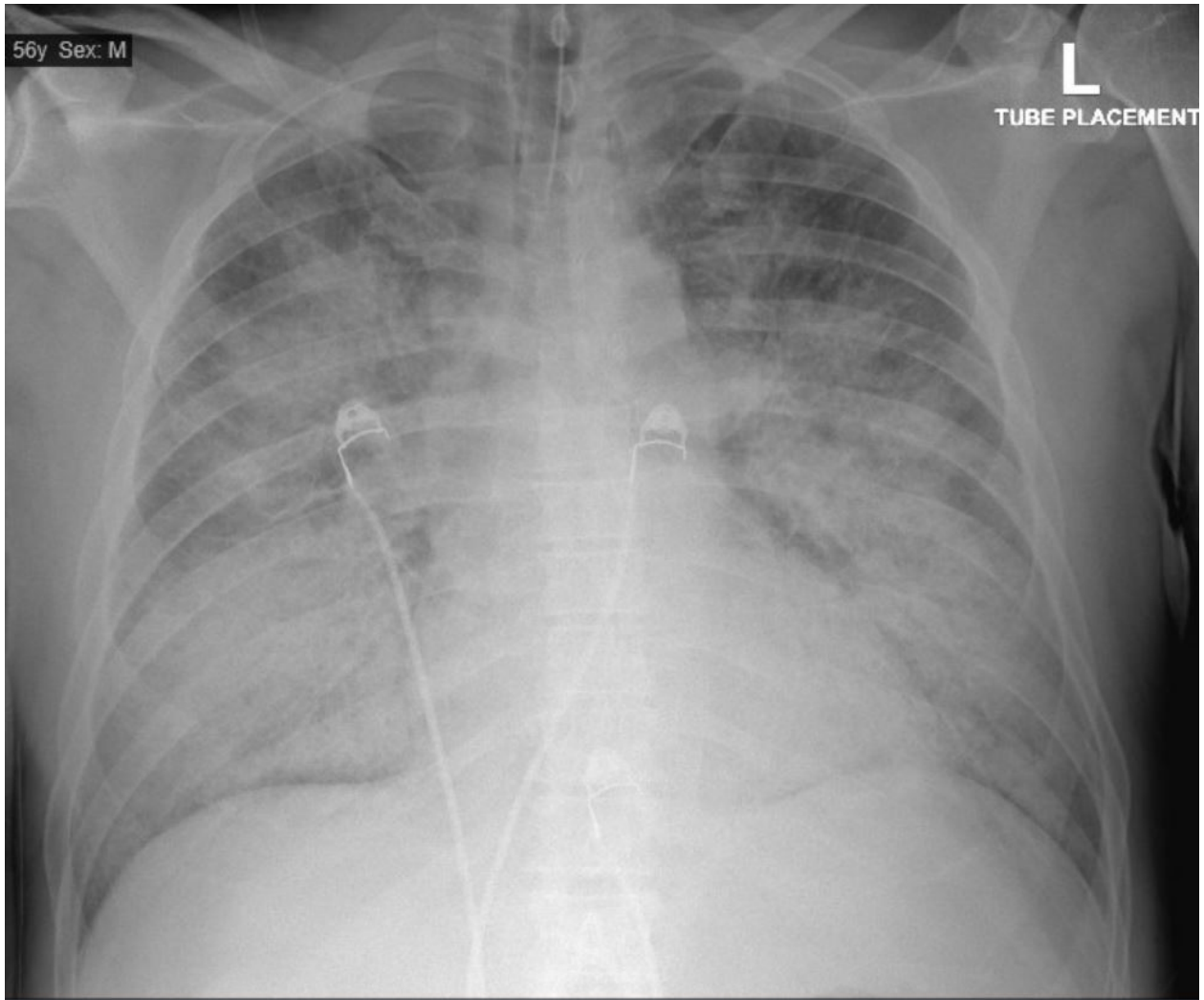
Video Legends:

Video 1: ECHO apical three chamber view shows severely depressed LV function with wall motion abnormalities.

Video 2: Coronary angiogram RAO 0, Cranial 17 view, shows 99% stenosis of the mid-LAD with TIMI2 flow, 60% long segment stenosis in the proximal LCX with the severe diffuse disease in the distal artery, totally occluded third obtuse marginal artery.

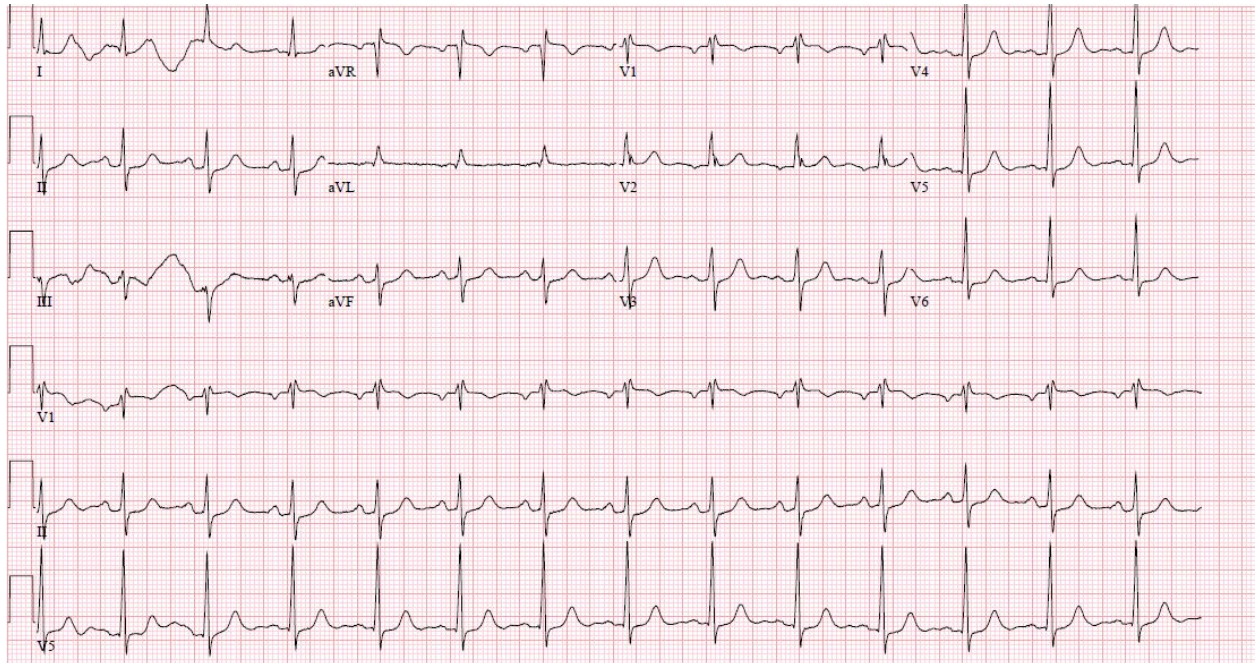
Video 3: Coronary angiogram LAO 36, Cranial 20 view, shows 99% stenosis of the mid-LAD with TIMI2 flow, 60% long segment stenosis in the proximal LCX with the severe diffuse disease in the distal artery, totally occluded third obtuse marginal artery.

Video 4: Coronary angiogram LAO 48 Caudal 2 view shows moderately diffusely diseased RCA.

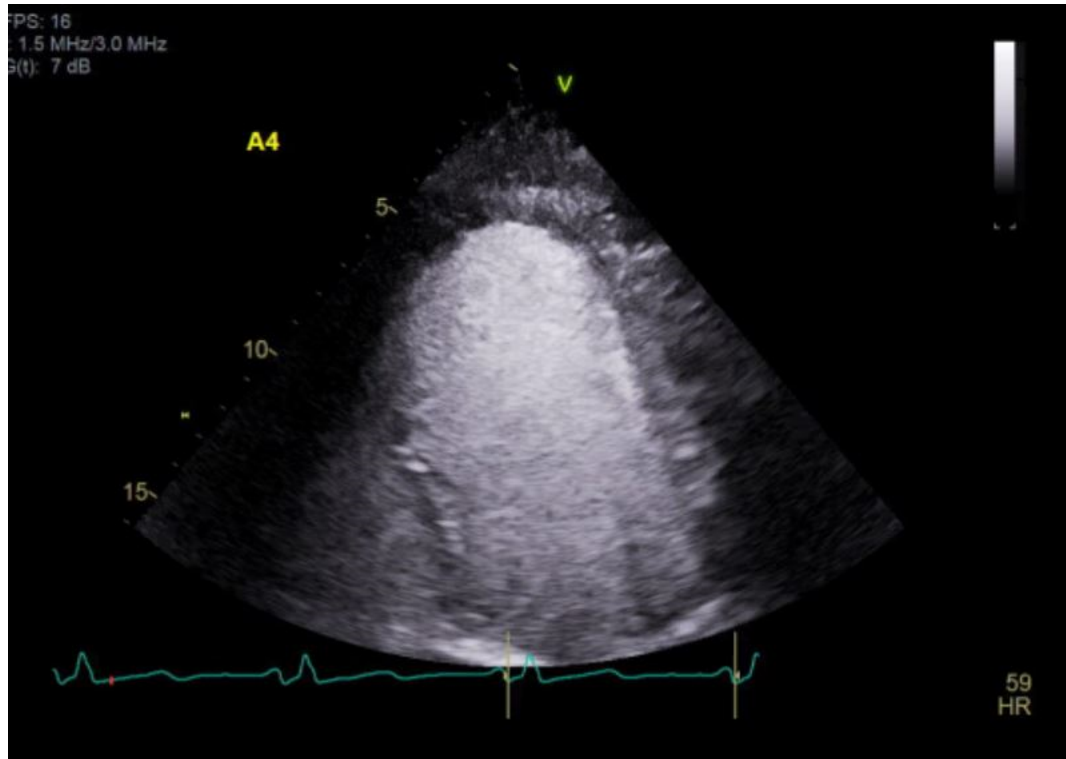


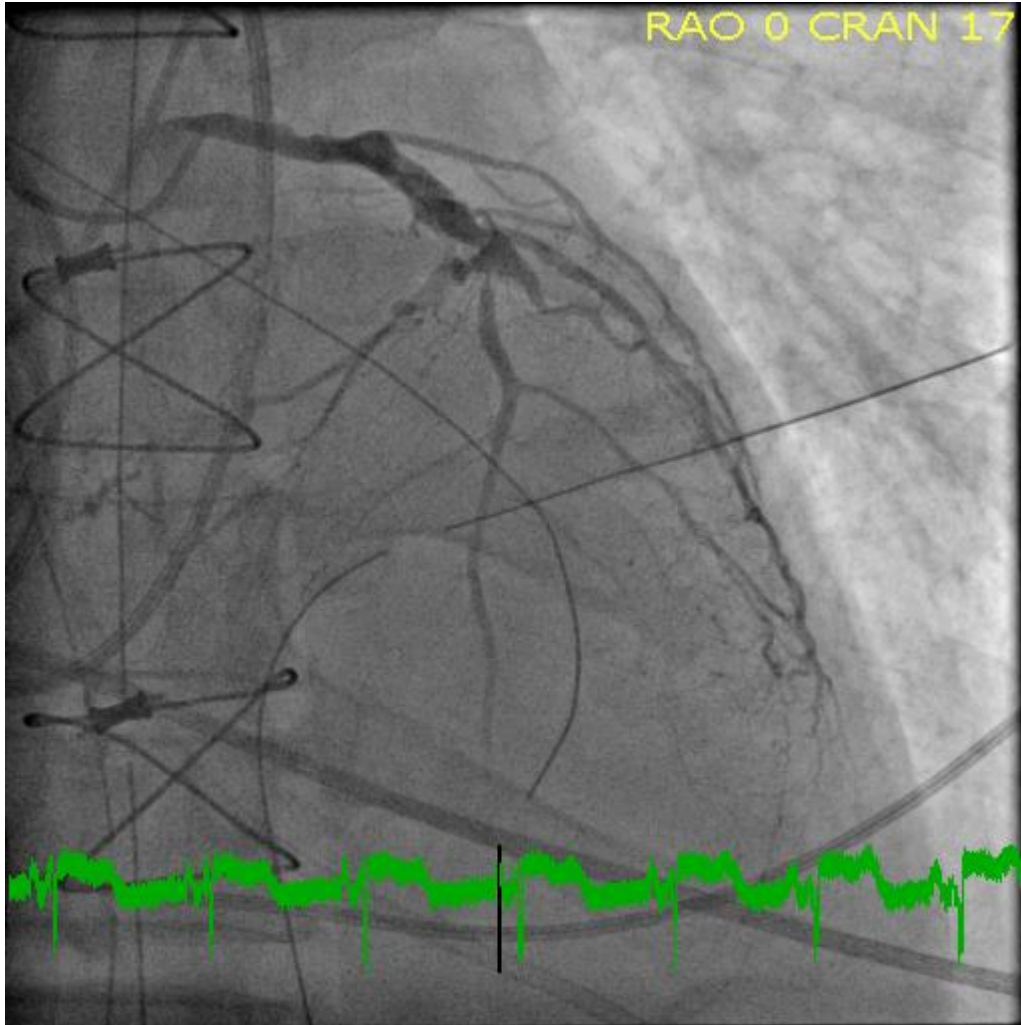


Journal Pre-proof

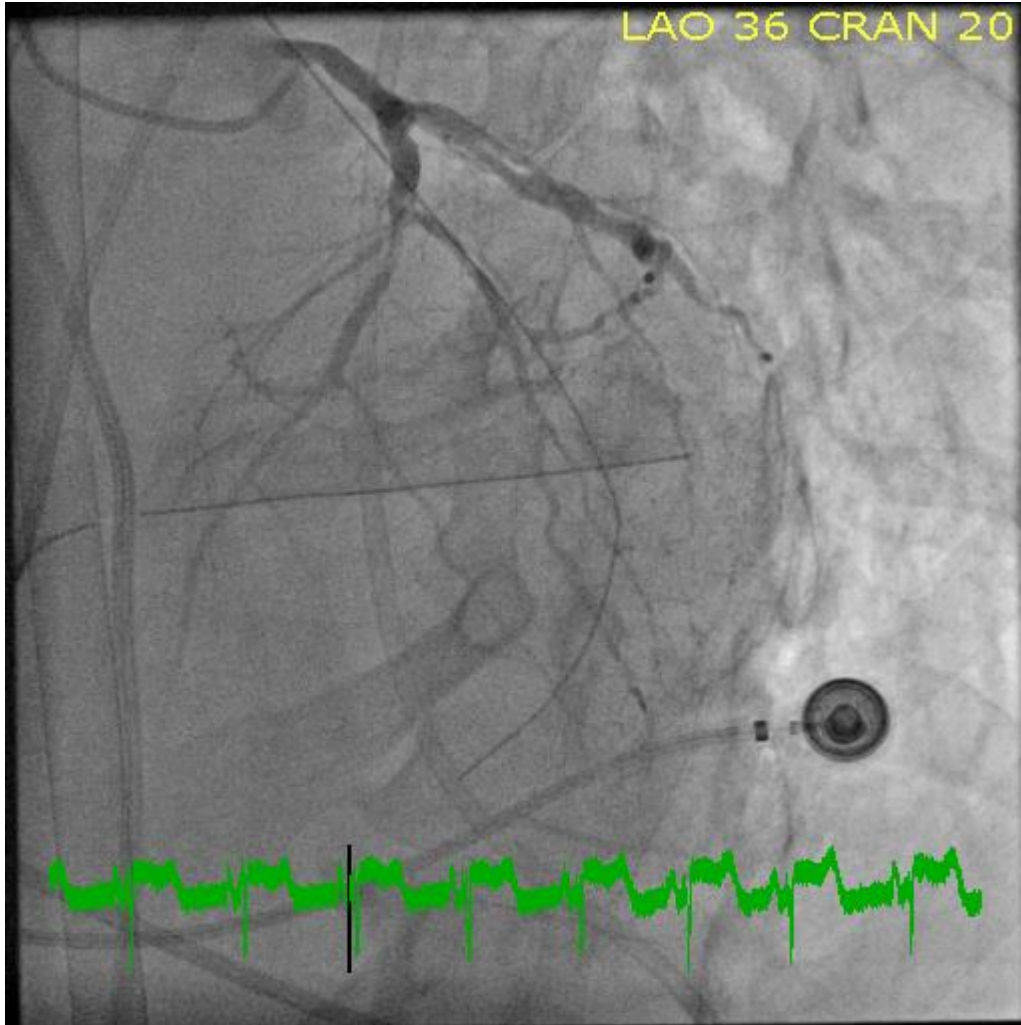


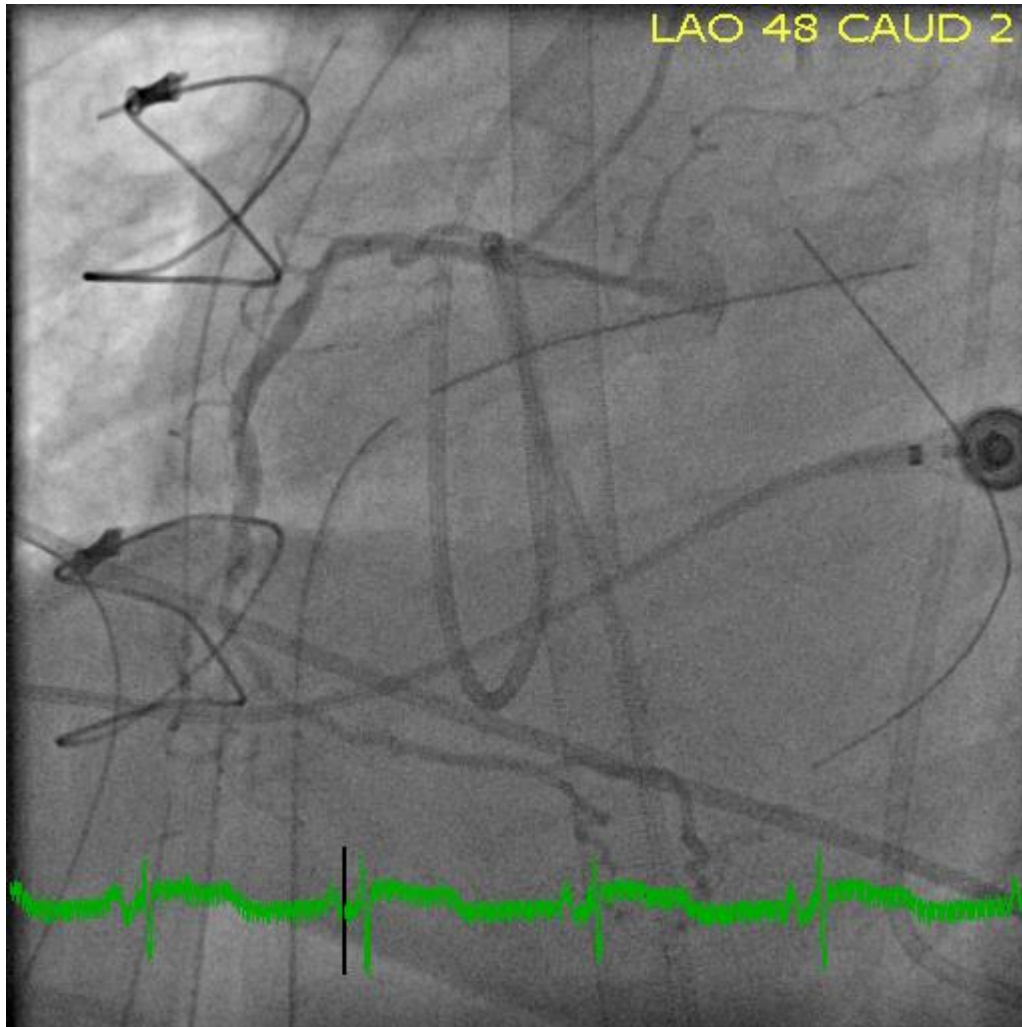
Journal Pre-proof



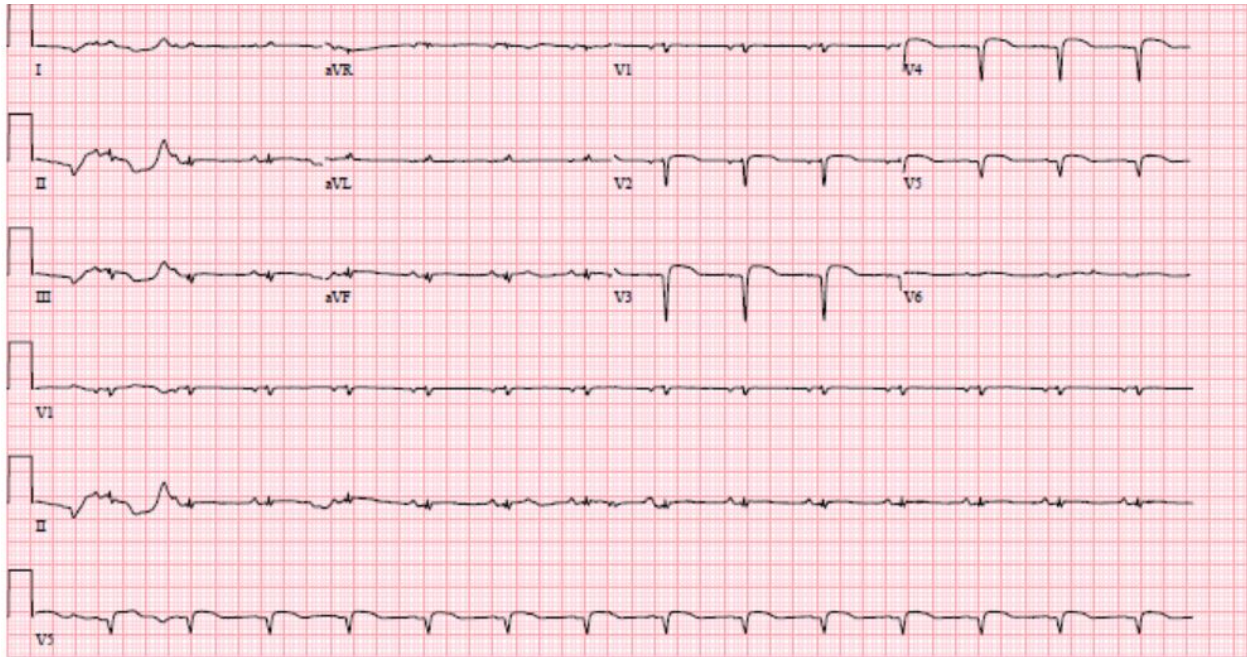


Journal

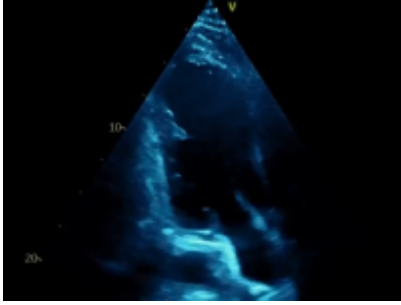




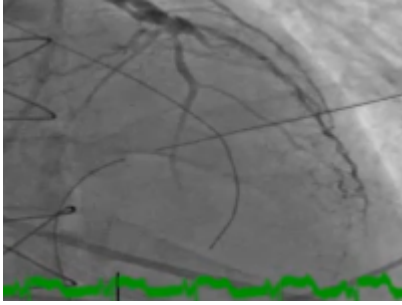
Journal



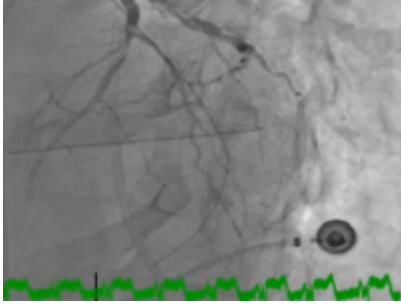
Journal Pre-proof



Journal Pre-proof



Journal Pre-proof



Journal Pre-proof



Journal Pre-proof