

## A Case of Perimyocarditis during the Bergamo SARS-COV2-COVID-19 Peak without Evident Pulmonary Involvement

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### Abstract

SARS-CoV-2 infection is nowadays one of the most catastrophic diseases affecting Italy in the last years. This disease (commonly called COVID-19) could have very heterogenic manifestations starting from lungs disease with extensive parenchymal involvement, hepatic involvement with acute hepatitis, acute kidney insufficiency, coagulopathy (thrombotic or hemorrhagic), but also myocardial involvement usually detected by troponin release in the blood. We presented a case of a young man that showed mainly cardiac involvement detected by multimodality imaging, after a hospital admission for thoracic pain and revealed SARS-CoV-2 infection, with ECG signs of pericarditis. An echocardiography revealed left ventricle dysfunction. Cardiac MRI detected signs of predominant myocarditis with pericardial involvement. In conclusion, a diagnosis of perimyocarditis was possible due to a multimodality imaging assessment.

**Keywords:** SARS-COV2; Myocarditis; Pericarditis; Cardiac MRI; Multimodality imaging

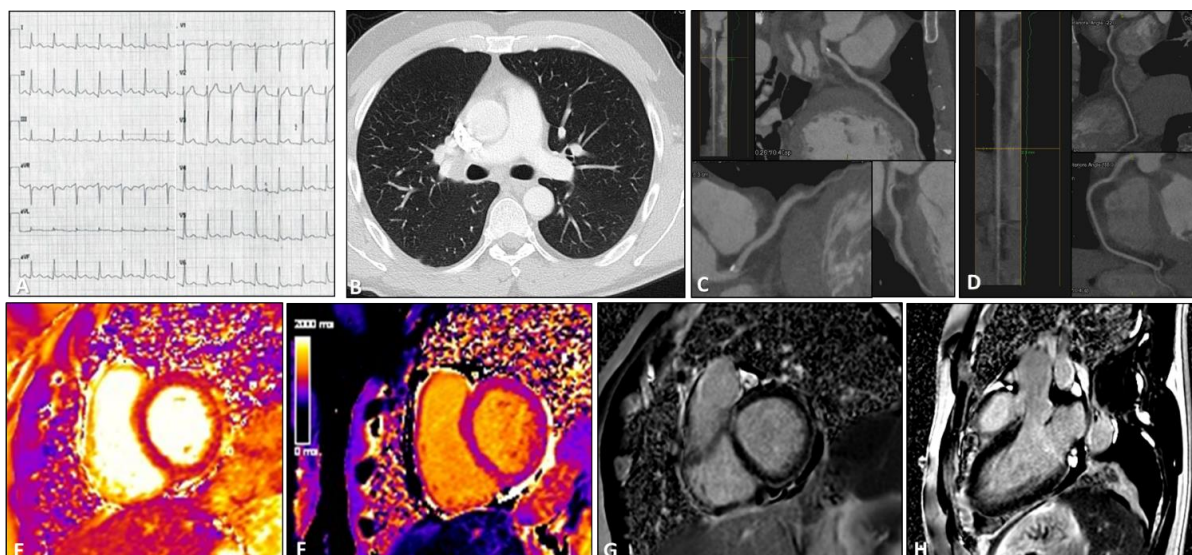
### Case Presentation

During the first catastrophic SARS-COV2 peak affecting Bergamo in 2020, a 40-year-old male patient was admitted to our Emergency Department for fever in the previous 3 days and chest pain [1-3]. At Chest X-Ray no signs of pneumonia were detected. Considering the period of Coronavirus outbreak in Bergamo-Italy, a nasopharyngeal swab was performed with negative result at first evaluation. At lab tests: Troponin I level was 444 ng/l (<19.8 ng/L) and Brain Natriuretic Peptide 1879 pg/mL (<101 pg/mL), peak of C-reactive protein was 46.6 mg/dl (<0.50 mg/dl) and Procalcitonin 2.94 ng/ml (<0.05 ng/ml). Blood culture and Urine culture were negative. Electrocardiography (ECG) showed a typical aspect of acute pericardial disease with diffuse ST supra-

elevation (**Panel A**). Echocardiography revealed normal Left Ventricular (LV) systolic with an estimated ejection fraction of 50%, no valvular disease, no pericardial effusion. A chest Computed Tomography (CT) excluded pulmonary thromboembolism and lung abnormalities including signs of viral pneumonia (**Panel B**). Following our hospital's rules, we repeated a second swab with positive result for SARS-CoV-2, and we admitted the patient. The patient developed soon a macular erythema on both arms and thorax: the suspicion of allergy to paracetamol was hypothesized (even if the patient had used in the past paracetamol without dermatological reaction), but similar cases had just been also reported in the small literature available at the first COVID-19 peak. During the night, the patient developed severe dyspnea and desaturation (SpO<sub>2</sub> 89%), with development of HR 120 in sinus tachycardia at ECG and severe reduction of Left Ventricle Ejection Fraction (LVEF 35%) with also right-side involvement at the echocardiography. The patient was treated with high dose furosemide and steroids, Continuous Positive Airway Pressure (CPAP) and, for hypotension, noradrenaline was used. After few hours, the situation was restored, and the patient reached a good control of the fluids balance. The day after a complete follow-up echocardiography showed diffuse left ventricle hypokinesia with mild reduction of ejection fraction (45%) and no valvular disease or pericardial effusion. At the ECG signs of acute pericarditis were still present.

### **Imaging evaluation**

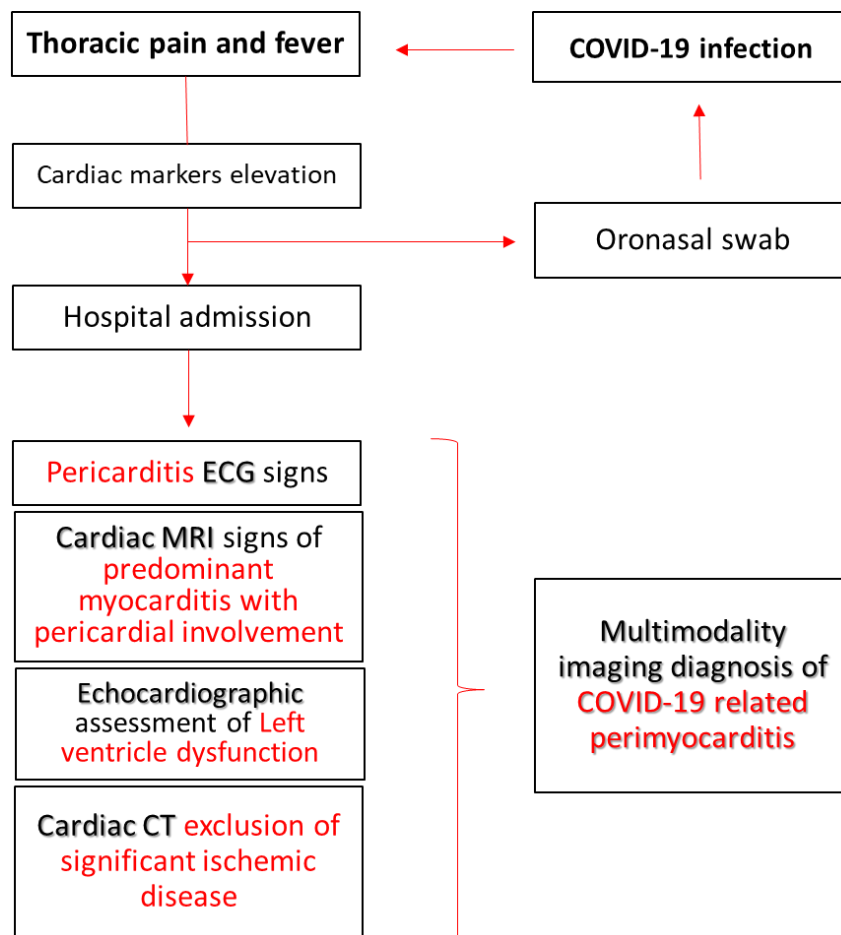
When the patient's conditions were stable, we performed a cardiac CT excluding significant coronary arteries abnormalities (**Panels C and D**), with mild pericardial effusion recognition and still no signs of pneumonia. Cardiac magnetic resonance imaging confirmed the presence of mild pericardial effusion (on diaphragmatic wall and closed to the right ventricle), reporting mild-to-moderate reduction of Left Ventricle Ejection Fraction (LVEF 44%) and mild reduction of Right Ventricle Ejection Fraction (RVEF 46%). A diffuse high signal intensity in the LV myocardium on T2 mapping images (**Panels E**) was found, with average T2 58 msec (normal value < 55msec), more evident at inferior wall. Native T1 mapping (**Panel F**) showed an increased value of T1 in an inferior wall but also the medium value of the myocardium was increased if compared to our reference value (average native T1 1130 ms, laboratory normal range 950-1050 ms). The Extracellular Volume, calculated using the real hematocrit value, was found above the normal limit (ECV 31%). Late gadolinium enhancement images showed a thin subepicardial late enhancement on left ventricle basal segments of inferior and infero-lateral wall, and a diffuse enhancement of pericardial layer on diaphragmatic wall and next to right ventricle wall (**Panels G and H**). These findings were in line with international guidelines for the diagnosis of acute myocarditis with pericardial involvement [4-5] (**Figure 1**).



**Figure 1:** The multimodality imaging study to assess a SARS-COV2 perimyocarditis without pulmonary involvement. Panel A: Electrocardiogram showing PR down sloping and diffuse ST elevation, signs in keeping with pericarditis. Panel B: Chest CT showing normal lungs without typical aspect of viral pneumonia (ground glasses or crazy paving lesions). Panel C: Left coronary artery with a calcified plaque on left descending artery without significant stenosis. Panel D: Normal right coronary artery. Panel E: Increased T2 mapping values as for myocardial edema. Panel F: Elevated T1 mapping values, mainly on inferior wall next to pericardial effusion. Panel G and H: Phase sensitive inversion recovery images post contrast (10 minutes after injection) showing a subepicardial late enhancement on left ventricle basal segments of inferior and posterior-lateral wall and a diffuse enhancement of pericardial layer on diaphragmatic wall and next to right ventricle wall, in keeping with perimyocarditis.

### Therapy

Accordingly, to the diagnosis of perimyocarditis, we treated the patient with Colchicine and Indomethacin for the acute pericarditis; Ramipril, Bisoprolol, Furosemide and Spironolactone were used for the myocarditis and steroids were weaned during the hospital stay (3,6). The pre-discharge echocardiography showed still mild pericardial effusion, without hemodynamic relevance. The patient was discharged after some days with the suggestion to continue the therapy for at least 30 days and then to perform a new cardiological evaluation (Figure 2).



**Figure 2:** Timeline of clinical case with a multimodality imaging.

### Conclusions

This is a case in keeping with COVID-19 perimyocarditis without pulmonary involvement, confirmed by multimodality imaging during the first acute peak in Bergamo. A multimodality imaging approach was powerful to increase diagnostic accuracy, as mentioned and known in cardiomyopathies and other causes of Heart Failure. In particular, Cardiac CMR can detect myocyte infiltrations with tolls as late gadolinium enhancement and T1-T2 mapping, linked with tissue characterization.

### Acknowledgments

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