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Para-cardiac Inflammatory Mass Compressing the Heart

A possible association with COVID-19

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Abstract

Infection with the SARS-CoV-2 virus causes coronavirus disease 2019 (COVID-19). COVID-19 usually affects the lungs but may also involve other organs such as the heart. We report a case of a para-cardiac mass in a previously healthy 45-year-old man who developed persistent dyspnea following SARS-CoV-2 infection. The patient underwent cardiac surgery since the mass was attached to the pericardium and was causing constrictive pericarditis. The pathology report indicated an inflammatory pattern for the mass. Based on our knowledge there has been no previous report of developing a para-cardiac inflammatory mass after SARS-CoV-2 infection. In conclusion, we would like to increase awareness regarding the possibility of developing a para-cardiac inflammatory mass following COVID-19.

Keywords: SARS-CoV-2; Pericarditis; Constrictive pericarditis; COVID-19; Cardiac tumor; Mediastinal tumor

Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is caused by the SARS-CoV-2 virus. The most common clinical manifestations of SARS-CoV-2 infection are respiratory symptoms; however, this infection may also involve other organs such as the heart and kidneys.[1] Some of the most common cardiac complications following coronavirus disease 2019 (COVID-19) include myocarditis, pericardial effusion and tamponade, myocardial infarction (MI), arrhythmias, acute heart failure (HF) with cardiogenic shock, and pericarditis. Most of these patients have shortness of breath and chest pain.[1] On the other hand, primary cardiac tumors are very rare and have an incidence of 0.001%–0.03% on autopsy findings and about 90% of them are benign.[2] In addition, 6 to 10% of primary cardiac tumors are primary pericardial masses which are also usually benign. The clinical signs and symptoms of pericardial masses include dyspnea, edema, pleural effusion, orthopnea, pericardial effusion, or murmur.[3] We report a case of a previously healthy 45-year-old male who developed persistent dyspnea and edema following his recovery from SARS-CoV-2 infection. Cardiac evaluation revealed a para-cardiac mass (attached to the pericardium) and constrictive pericarditis for which he underwent cardiac surgery. The mass was removed and pathological evaluation reported an inflammatory mass. This study follows the principles of the Declaration of Helsinki. Ethics approval from an International Review Board was not applicable. Informed consent was obtained from the patient for the publication of the information and images.

Case Report

A 45-year-old male came to our clinic complaining of persistent exertional dyspnea and edema in 2021. The patient had a history of hospital admission been due to COVID-19 two months earlier and his symptoms had developed following his SARS-CoV-2 infection. Based on the medical records of his previous admission, the patient was a healthy and active individual with no limiting conditions and there was no report of any thoracic lesions. Upon evaluation, a large hypoechoic mass with a size of 9×3.1cm was observed on echocardiography, (Figure 1). The report was suggestive of a possible extra pericardial inflammatory mass or a large hematoma with central liquefaction over the right atrium (RA) and right ventricle (RV) that had compressive effects. In addition, there was bilateral pleural effusion (PE) which was turbid with

possible exudative effusion. There was also a mild to moderate RV dysfunction as well as a moderate left ventricular (LV) systolic dysfunction with normal LV size. LV ejection fraction (LVEF) by Simpson's mode was 45%. Based on the echocardiography result, although there was no thickening or calcification of the pericardium, physiological constrictive pericarditis was assumed to have occurred due to a mass. Therefore, the patient was referred to a cardiac surgeon with the impression of a localized exudative para-cardiac mass or hematomata to remove the mass, evaluate the pericardium, and drain the pleural effusion. A multi-slice high-resolution computed tomography (HRCT) scan of the chest revealed bilateral mild pleural effusion. In addition, there was patchy and ground-glass opacity in the right lower lobe (RLL) which was suggestive of a sequel of his previously SARS-CoV-2 infection. Linear atelectasis was detected in both the right and left upper lobes as well as the left lower lobe (LLL). The report also noted minimal atelectasis with pericardial effusion (Figure 2). Evaluation with cardiac magnetic resonance (CMR) confirmed the findings detected on echocardiography and CT scan. CT scan and MRI images are shown in Figure 2. Consequently, based on the results of echocardiography, CT scan, and CMR, a diagnosis of para-cardiac mass with compressive effects on the heart and physiological constrictive pericarditis was established and the patient was scheduled for surgery. Treatment with anti-inflammatory drugs (such as corticosteroids or interleukin-receptor antagonist) to reduce the para-cardiac mass was not initiated before cardiac surgery. On admission, his condition was good with unremarkable signs and normal physical examination. The patient had no significant medical or family histories and did not use any medication. Laboratory results and electrocardiography (ECG) were also normal. A summary of the patient's laboratory workup is shown in Table 1. A day after admission, the patient underwent open-heart surgery with general anesthesia for two hours. Upon surgery, a median sternotomy was performed and a large mass with the size of 10x4x3cm with severe adhesion to the RA and RV was detected (Figure 3). Cardiopulmonary bypass (CPB) with an arterial cannula in the ascending aorta was established and the venous return was achieved through the femoral vein. With beating heart bypass surgery, the mass was completely excised by sharp and blunt dissections. Subsequently, the patient was weaned from CPB without any difficulty. Chest closure was performed with the placement of two drains (mediastinal and right pleural). There were no signs of any complications during surgery. The patient was discharged from the hospital four days later with stable vital signs and no evidence of post-surgical complications. The

macroscopic pathological evaluation of the mass revealed a 10×6×3.5cm mass with elastic brown tissue and a soft cystic change at the center of the tissue. On microscopic evaluation, some lesions had necrosis, neutrophilic infiltration, and foamy macrophages. In addition, some of the fibrotic areas contained lymphocytic infiltration and lympho-plasma cells. However, there was no evidence of malignancy or granuloma. The patient did not have any medical complaints on his cardiology and cardiosurgery follow-up visits.

Informed consent was obtained from the patient for publication of this case report and any accompanying images.

Discussion

There have been reports of cardiovascular complications and death or deterioration of pre-existing cardiac disorders following influenza infection.[1] SARS-CoV-2 infection may also lead to cardiovascular complications. Post-COVID-19 cardiac complications include myocarditis (42.1%), pericardial effusion (15.8%), acute MI (15.8%), cardiac arrhythmias (10.5%), RV mural thrombus with pulmonary embolism (5.3%), acute HF with cardiogenic shock (5.3%), cardiac tamponade, Takotsubo cardiomyopathy, pericarditis, and myopericarditis.[1] In addition, the majority of symptoms of post-COVID-19 cardiac complications include shortness of breath (52.6%), chest pain (36.8%), fever (26.3%), cough (26.3%), fatigue (10.5%), abnormal troponin levels (68.4%), abnormal B-type natriuretic peptide (BNP) levels (42.1%), and ST-segment elevation (52.6%).[1] Different factors are involved in myocardial injury and the development of cardiovascular complications of COVID-19 and include an increased hypercoagulable status, systemic inflammatory response to a viral infection which may lead to increased metabolic activity, angiotensin-converting enzyme 2 (ACE2) expression on cardiac cells (which act as a receptor for the SARS-CoV2 virus leading to the invasion of the cardiac cells by the virus), and direct viral injury of cardiac cells.[1]

On the other hand, around 90% of primary cardiac tumors are benign including myxoma (50%), fibroelastoma (26%), fibroma (6%), lipoma (4%), inflammatory myofibroblastic tumors (IMTs) (< than 5%), and other benign tumors.[2] Primary pericardial masses are also usually benign and constitute about 6% to 10% of primary cardiac tumors. These benign primary pericardial masses

include lipomas, pericardial cysts, and paragangliomas, and hemangiomas. In addition, pericardial tumors are associated with some disorders such as Erdheim-Chester disease and IgG4-related disease. The clinical signs and symptoms of pericardial masses include dyspnea, edema, pleural effusion, orthopnea, pericardial effusion, or murmur.[3] Inflammatory pseudotumors of the pericardium are among the primary pericardial tumors that are benign. Although the exact cause of inflammatory pseudotumors is unknown, these masses have been reported to occur following surgery, trauma, IgG4-related sclerosing disease, or infection (with bacteria such as *Mycoplasma* and *Nocardia*). In addition, some have argued that inflammatory pseudotumors develop through a low-grade neoplastic process.[4] Cardiac and pericardial tumors are rare and to our knowledge, there have been no reports of SARS-CoV-2 infection inducing the development of a cardiac or para-cardiac mass (that may present as a cardiac mass such as in our case). We report a previously healthy 45-year-old male that developed persistent dyspnea and edema following SARS-CoV-2 infection. He underwent cardiac surgery due to the presence of a compressive mass with physiological constrictive pericarditis. The pericardium was intact and the mass was removed. The pathology report indicated an inflammatory nature for the mass. Confirmation of an association between the development of a para-cardiac inflammatory mass and SARS-CoV-2 infection requires further investigation.

Conclusion

We report the first reported case of a para-cardiac mass development following SARS-CoV-2 infection in a previously healthy 45-year-old man.

Author Contributions

AM, AMS, and MMMR, MR clinically managed the patient. The primary draft was conducted by SH. AM, AMS, MMMR, and MR conducted the first edit. All authors have read and approved the final manuscript.

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Table 1. A summary of the patient's laboratory workup before surgery.

Laboratory test	**Result**	**Normal range**
WBC 10^9/L	8.77	Adult: 5-10
RBC 10^6/uL	4.27 (Low)	Male: 4.7-6.1
Hb g/dl	11.5 (Low)	Male: 13.2-16.2
HCT %	34.8 (Low)	Male: 39-52
Neutrophil %	63.5 (High)	40-60
Lymphocyte %	28.8	20-40
Platelets 10^3/ml	469 (High)	150-450
PTT seconds	64	30-45
PT seconds	18.1 (High)	12-16.5
INR (ratio)	1.36	Ratio: 1.34
Blood group	O positive	-
ESR (1hr) mm/hr	67 (High)	<10
CRP mg/l	32.5 (High)	Up to 6
Magnesium mg/dl	2.2	1.8-2.6
Hbs Ag (Index)	Negative	<1: Negative
HCV Ab (Index)	Non-reactive	Non-reactive: <0.9
HIV (IFA) (Index)	Non-reactive	Negative: <0.25

Abbreviations: White blood cells (WBC), Red blood cells (RBC), Hemoglobin (Hb), Hematocrit (HCT), PTT (Partial thromboplastin time), PT (Prothrombin time), INR (international normalized ratio), ESR (erythrocyte sedimentation rate), CRP (C-reactive protein),

Hbs Ag (Hepatitis B virus surface antigen), HCV Ab (Hepatitis C virus antibody), HIV (human immunodeficiency virus), and Indirect fluorescent antibody (IFA).

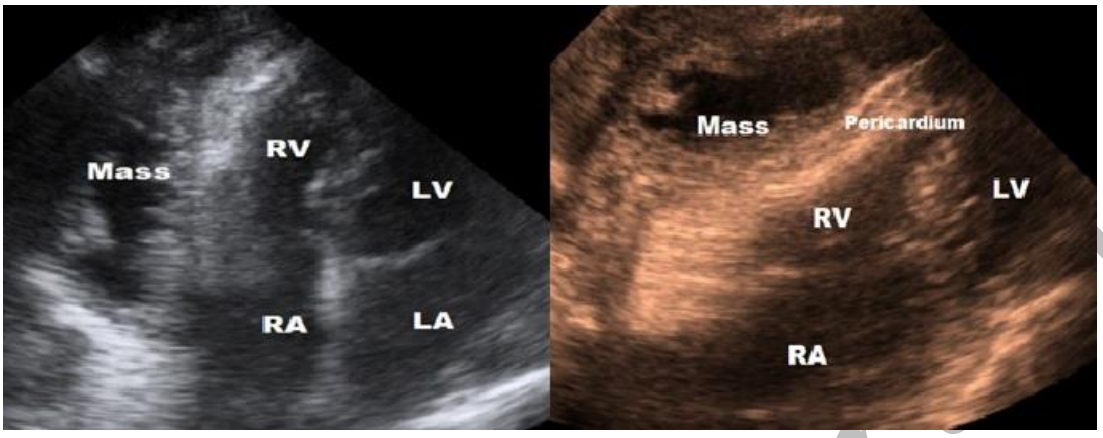

Figure 1. Echocardiography: A large hypoechoic mass (size: 9x3.1cm in size) suggestive of an extra pericardial inflammatory mass or a large hematoma with central liquefaction over the right atrium (RA) and right ventricle (RV) causing compressive effects.

Figure 2. A. Multi-slice high-resolution computed tomography (HRCT) scan of the chest revealing bilateral mild pleural effusion; Patchy and ground-glass opacity in the right lower lobe (RLL) [suggestive of a sequel of the patient's previously COVID-19 infection]; Linear atelectasis in both the right and left upper lobes as well as the left lower lobe (LLL); Minimal atelectasis with pericardial effusion; Arrow showing the mass. **B and C.** MRI of the chest; Arrows showing the mass (RV: Right Ventricle; LV: Left ventricle; PE; pleural effusion).

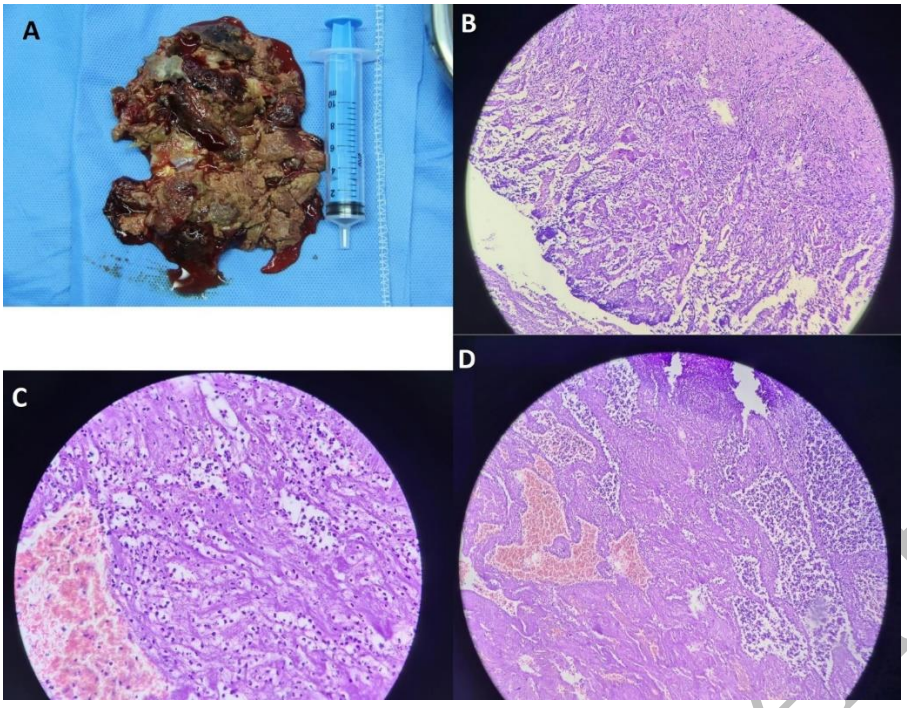

Figure 3. A. Image of the large mass (size of 10x4x3cm) that was excised upon surgery. **B, C, and D.** Microscopic evaluation of the mass (some lesions had necrosis, neutrophilic infiltration, and foamy macrophages; some of the fibrotic areas contained lymphocytic infiltration and lympho-plasma cells. No evidence of malignancy or granuloma).