Cardiology & Cardiovascular Research

Research Article

COVID-Related Constrictive Pericarditis Requiring Pericardiectomy: A Case Report

Rachel Boyles, Joseph Lu, Joseph Yoo and Louis Samuels*

Department of Surgery, Division of Cardiac Surgery, Jefferson-Einstein Medical Center, Philadelphia PA.

Abstract

The COVID-19 pandemic was primarily considered a respiratory malady in the early phases of the outbreak. However, as more patients suffered with the illness, a myriad of symptoms emerged in organ systems separate from the lungs. Among those patients with cardiac involvement, myocarditis, pericarditis, myocardial infarction, and arrhythmia were among the most common manifestations encountered. Pericarditis with pericardial effusion requiring medical or interventional treatments have been previously reported in the acute setting. However, chronic pericarditis with pericardial thickening resulting in constriction requiring sternotomy and pericardiectomy has not been published to date. A patient with COVID-19 associated constrictive pericarditis three years following the viral infection requiring pericardiectomy is reported. Descriptions of the clinical, diagnostic, and therapeutic features are illustrated. This case adds to the spectrum of COVID-19 related cardiac conditions and its treatment is believed to be the first reported of its kind.

Keywords

COVID-19, Pericardiectomy, Cardiovascular system.

Corresponding Author Information

Louis Samuels, MD
Jefferson-Einstein Medical Center, 5501 Old York Road, Klein Building, Suite 401, Philadelphia, PA 19141.

Received: December 12, 2023; **Accepted:** January 16, 2024; **Published:** January 23, 2024

Citation: Rachel Boyles, Joseph Lu, Joseph Yoo, Louis Samuels. COVID-Related Constrictive Pericarditis Requiring Pericardiectomy: A Case Report. Cardiol Cardiovasc Res. 2024;1(1):1-4.

Introduction

The COVID-19 pandemic primarily began as a respiratory illness, killing nearly 7 million people worldwide since its outbreak [1]. As the infection spread and more patients were afflicted, the extra-pulmonary manifestations grew exponentially. The cardiovascular system was not spared, a reaction related directly to the virus and indirectly to the body's immune response to it. Although the focus of attention was primarily respiratory in the early experience with the disease, cardiovascular effects were also encountered in some of the first reports from China. In a manuscript at the outset of the pandemic describing forty-one patients, Huang et al reported a 12% incidence of acute cardiac injury [2]. As the pandemic spread, cardiac manifestation became more apparent with a spectrum of pathologies including myocarditis, pericarditis, arrhythmia, and myocardial infarction—these conditions occasionally leading to heart failure and death. In 2021, for example, Halushka and colleagues reported on 277 postmortem examinations of COVID-19 patients and found myocarditis in 7.2% of the autopsies [3]. Although relatively uncommon, the nature of the myocarditis was sometimes associated with pericarditis, a condition appropriately termed myopericarditis or perimyocarditis. The clinical presentations of this combined state varied from subclinical to cardiogenic shock. Depending on the severity of the condition, therapies included medications (e.g., steroids, non-steroidal-anti-inflammatory drugs (NSAID), anti-viral agents, and immune-modulating chemotherapeutics). More serious cases required interventional/surgical treatments (e.g., pericardiocentesis, pericardial window) and mechanical cardiac support technologies (e.g., IABP, VAD, ECMO). For example, Walker and others treated a COVID-19 infected 30-year-old with pericardial tamponade utilizing a surgical subxiphoid pericardial window [4]. Samuels and colleagues managed a 58-year-old man

with COVID-19 who presented in cardiogenic shock with a percutaneous ventricular assist device (VAD) followed by extra-corporeal membrane oxygenation (ECMO) [5]. These case reports added to the spectrum of the cardiac disease processes associated with COVID-19 and the treatments necessary to manage them in their acute phase. The consequences of the infection beyond the initial weeks and months of the disease remained unknown at the time.

As the world community experienced years of the disease, the lingering effects of COVID-19 the so called 'Long COVID' began to appear. Persistent symptoms remained in subsets of patients some minimally debilitating, others crippling. Some of the acute cardiovascular consequences of the infection became chronic problems, such as COVID-cardiomyopathy. The purpose of this report is to illustrate another chronic cardiac pathology associated with COVID-19: constrictive pericarditis. This additional entity, constrictive pericarditis, can now be added to the growing list of cardiac COVID. The clinical presentation and diagnosis of this condition along with the findings and treatment with pericardiectomy are described in this case report. We believe this condition— COVID-19 associated constrictive pericarditis requiring pericardiectomy—is the first report of its kind.

Case

A 37-year-old man contracted COVID-19 in October 2020 with symptoms of anosmia and ageusia. Over the next two years, he began to complain of fatigue, dyspnea, and right sided chest pressure. Chest radiography demonstrated a moderate right pleural effusion. He was referred to the pulmonary clinic in November 2022 where a thoracentesis was recommended. The next week, a right thoracentesis yielded 2250 mls of serosanguinous fluid. A month later, in December 2022, a Chest CT Scan demonstrated recurrence of a moderate to large right pleural effusion and a small pericardial effusion with high density suggestive of hemopericardium or exudative effusion from prior pericarditis (IMAGE 1a). He was referred to Thoracic Surgery. Prior to the performance of a surgical drainage procedure, transthoracic echocardiography demonstrated a normal LVEF at 55%, normal RV size and function, and no valvulopathy. However, there was mitral annular velocity consistent with annulus reversal suggestive of constrictive physiology. In addition, there was a small pericardial effusion localized posteriorly and the IVC failed to collapse with forced inspiration. In January 2023, a Video-Assisted-Thoracoscopic-Surgery (VATS) was performed yielding 2700 mls of serous pleural fluid from the right chest. Operative findings included mild thickening and inflammation of the parietal pleura. Pleural biopsies were found to be composed of adipose with lymphoid aggregates. The pleural fluid showed rare lymphocytes and rare mesothelial cells; there was no growth from the cultures and cytology was negative. Although initially improved from a respiratory standpoint, the patient began to experience dyspnea again along with abdominal bloating and leg swelling several months later. A chest radiograph in August 2023 demonstrated recurrence of the right pleural effusion. Additional studies were undertaken.

An abdominal MRI was ordered to evaluate the patient's gastrointestinal symptoms as well as the blood chemistries showing elevated liver function tests (IMAGE 1b). Images of the lower chest showed bilateral pleural effusions and the pericardium demonstrated progressive thin enhancement suggestive of underlying pericarditis. There was no change to the proteinaceous or hemorrhagic pericardial effusion seen on the prior CT scan. Lastly, there was evidence of mild to moderate ascites. The patient was referred to interventional radiology where a liver biopsy was performed revealing central venous sinusoidal dilatation along with nodular regenerative hyperplasia. Focal portal and periportal fibrosis with periportal metaplastic hepatocytes were also seen. These hepatic findings were consistent with cardiac origin. As such, the patient was referred to cardiology. In October 2023, right

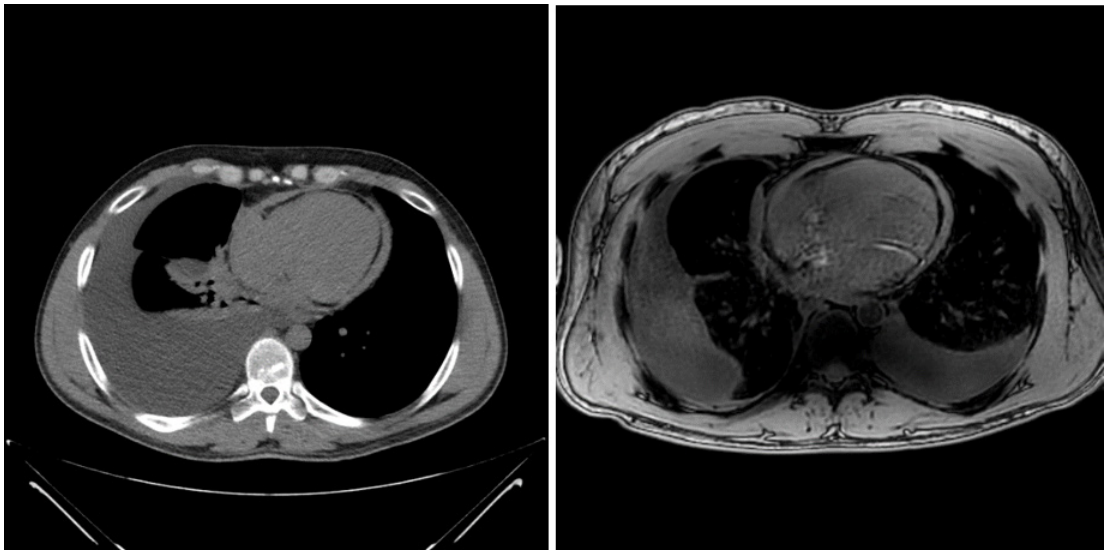

Image 1a and 1b: CT scan and MRI demonstrating pericardial thickening.

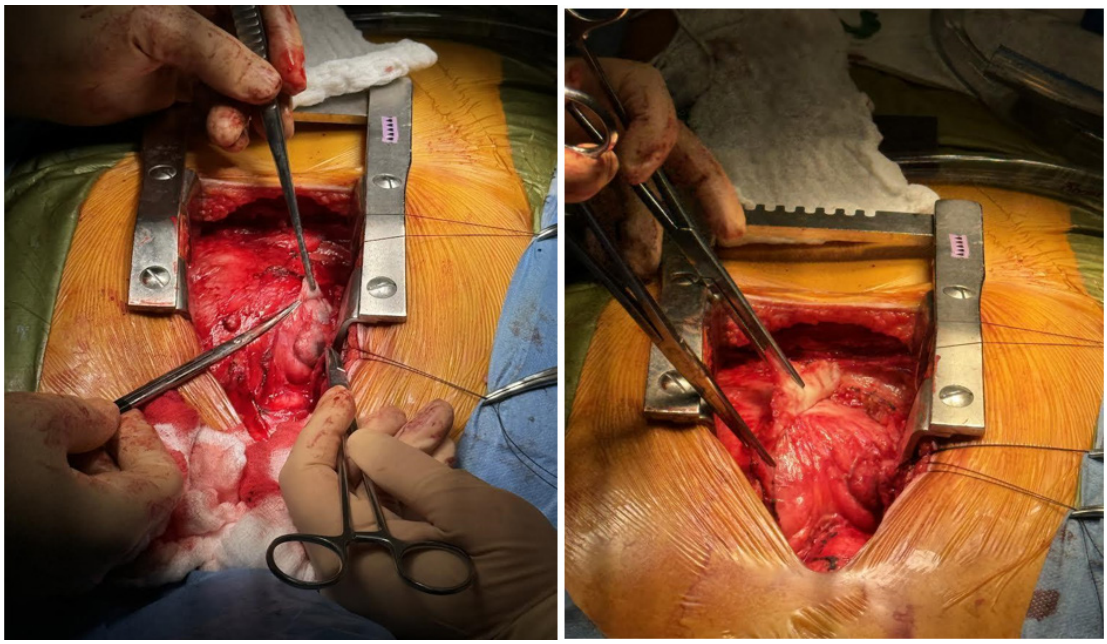

Image 2a and 2b: Dissection of Pericardium from right atrium and right ventricle.

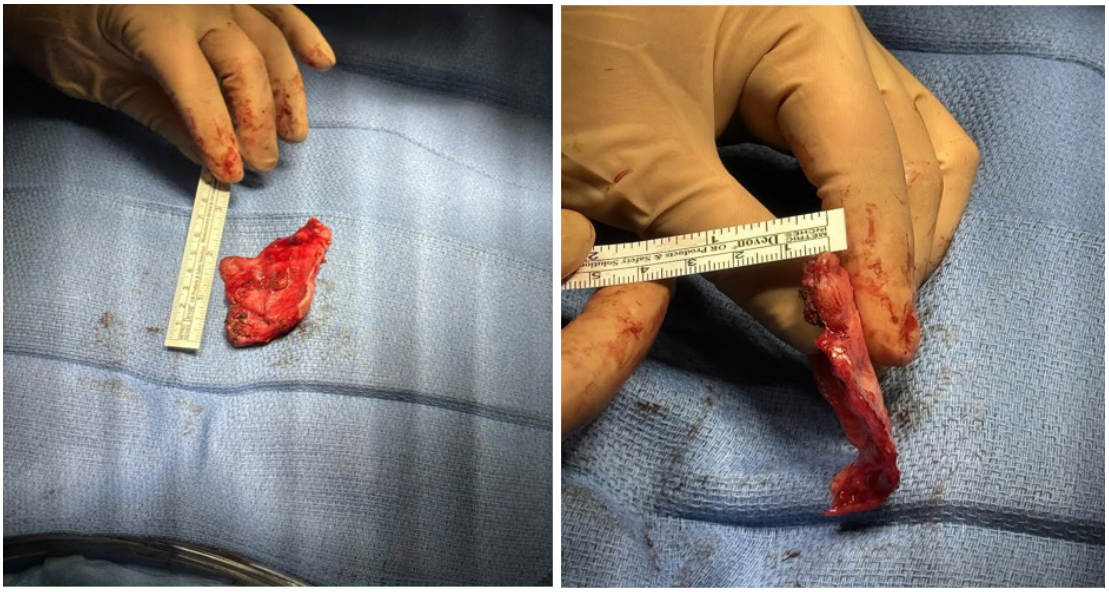

Image 3a and 3b: Portion of Pericardium.

and left heart catheterization was performed with the following findings:

1. Diastolic equalization of pressures, with elevated LVEDP and RVEDP, pulmonary capillary wedge pressure.
2. Steep X and Y descents, square root sign, and LVEDP greater than 1/3 of RV systolic pressure all consistent with impaired diastolic filling often seen with pericardial constriction.
3. Vagal event during procedure requiring IV fluids, atropine and Neo-Synephrine.
4. Normal epicardial coronary arteries, with very slow TIMI II flow, suggestive of myocardial/microvascular dysfunction

In view of these hemodynamic findings along with the radiographic imaging and clinical features, the diagnosis of constrictive pericarditis was made and the patient referred to cardiac surgery for pericardiectomy.

The patient was taken to the operating room on October 13, 2023—three years following his initial COVID-19 infection- whereupon he underwent median sternotomy and pericardiectomy. Cardiopulmonary standby was available, but not utilized. Operative findings included a thickened pericardium (8 mm) that was densely adherent to the epicardium (IMAGES 2a and 2b). Several hours of dissection were necessary to safely resect the pericardial tissue with

particular care to release the SVC and IVC as well as the heart with avoidance of injury to the phrenic nerves. The right atrial pressure prior to the pericardial resection was 21 mmHg and 9 mmHg at the end of the case. In addition, the right pleural space was opened and 500 mls of serous fluid evacuated. A mediastinal lymph node was also sampled. The pathology report from the pericardium showed fibrous tissue consistent with chronic inflammation; the mediastinal lymph node demonstrated sinus histocytes and interfollicular polyclonal plasmacytosis. The patient's postoperative course was uncomplicated and he was discharged on a regimen of colchicine. His shortness of breath resolved within the first week and outpatient follow-up a month later was notable for resolution of all symptoms including the abdominal bloating and leg edema.

Discussion

With the COVID-19 pandemic spreading in two waves across diverse populations throughout the world, the long-term impact of this viral infection on the heart is yet to be fully understood. Although the relationship with myopericarditis has been studied, there are few cases highlighting the severity of the disease and the potential long-term effects. By examining the features of previous cases as well as those newly reported, the clinician may better understand the various manifestations of the COVID-19 infection as it pertains to myopericarditis. This case report adds to the short list of similar experiences by others. Two publications, for example, reported on a review of COVID-19 cardiac disease in general and commented on some with myopericarditis in men under 50 years of age [6,7]. Another publication highlighted the case of an 80-year-old man with constrictive pericarditis who presented with shortness of breath, peripheral edema, weight loss, and skin rash. COVID-19 related constrictive pericarditis was diagnosed requiring a VATS procedure in which the pleural effusion was drained and a partial anterior pericardiectomy performed. The pathology report from the specimen concluded an autoimmune or immunoglobulin etiology [8]. These manuscripts postulate an immunologic process as the mechanism by which the inflammatory pathways of the host result in the clinical and histologic findings within the pericardium and elsewhere. Treatments, therefore, were a combination of medical and surgical interventions.

The existing literature suggests that the pathophysiology of COVID-19 on the pericardium lies within its ability to stimulate innate pathways of the immune system such as complement, TLR4, and inflammasome. In this milieu, there are increases in IL-1β and IL-18-- which have been shown to be enhanced in men. This pathway may be responsible for some of the dilated cardiomyopathies due to viruses and provide an explanation for the population of men under 50 years of age developing myopericarditis in the setting of COVID-19 [7]. There have also been studies examining the relationship between the mRNA vaccine developed for the COVID-19 virus and the incidence of myocarditis and pericarditis. One such study reviewed 29 published cases of mRNA vaccine-induced myopericarditis. The cases reviewed in this manuscript described chest pain occurring within 1-5 days of the second dose [9]. Similarly, the cases in this review observed a common trend in younger males. This study speculates a pathogenesis attributed to the increased antibody reactivity found in a portion of younger individuals which may enhance a response parallel to the multisystem inflammatory syndrome seen in children (MIS-C)—a reaction leading to a more severe response to the virus.

In summary, the case of COVID-19 constrictive pericarditis requiring pericardiectomy three years after the initial infection represents another pathology to be added to the growing list of COVID-related cardiac disease. Clinicians need to be vigilant in suspecting and treating patients presenting with acute signs and/or symptoms of pericarditis in order to avoid the long-term chronic consequences such as constrictive pericarditis requiring pericardiectomy.

References

1. https://covid19.who.int
2. Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet. 2020; 395: 497-506.
3. Halushka MK, Vander Heide RS. Myocarditis is rare in COVID-19 autopsies cardiovascular findings across 277 postmortem examinations. Cardiovasc Pathol. 2021; 50: 107300.
4. Walker C, Peyko V, Farrell C, et al. Pericardial effusion and cardiac tamponade requiring pericardial window in an otherwise healthy 30-year-old patient with COVID-19 a case report. Scholarly Journal. 2020; 14: 1-6.
5. Samuels L, Samuels M, Kalra S, et al. COVID-19 associated fulminant myocarditis a multidisciplinary approach to treatment utilizing advanced mechanical circulatory support and anti-viral medical therapies. J Cardiol Res Rev Rep. 2021; 2: 1-3.
6. Diaz-Arocutipa, Carlos, Massimo Imazio. Pericarditis in patients with COVID-19 A systematic review. Journal of Cardiovascular Medicine. 2021; 22: 693-700.
7. Fairweather DeLisa, Danielle J. Beetler, Damian N Di Florio, et al. Covid-19, Myocarditis and Pericarditis. Circ Res. 2023; 132: 1302-1319.
8. Alkutobi Ziad, Ansari G, Nandagudi A. A rare case of constrictive pericarditis with co-existing positive COVID-19 Probable autoimmune or immunoglobulin related disease. Rheumatology. 2021; 60: 247.
9. Das Bibhuti B, William B Moskowitz, Mary B Taylor, et al. Myocarditis and Pericarditis Following mRNA COVID-19 Vaccination What do we know so far. Children. 2021; 18: 607.