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Case Report / Olgu Sunumu

Pericardiectomy after constrictive pericarditis associated with second dose of BNT162b2 vaccine: A case report

İkinci doz BNT162B2 aşısı ile ilişkili konstriktif perikarditte perikardiyektomi: Olgu sunumu

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ABSTRACT

Constrictive pericarditis is quite rare complication of messenger ribonucleic acid-based severe acute respiratory syndrome-Coronavirus 2 (SARS-CoV-2) vaccine. It is a severe clinical picture with clinical symptoms of right ventricular failure. Initial physical examination, laboratory work-up, and chest X-ray may yield non-specific findings. Echocardiography, computed tomography, and cardiac catheterization are other diagnostic tools. Surgery with pericardiectomy is the definitive treatment option. Herein, we report a case of pericardiectomy after constrictive pericarditis associated with the second dose of BNT162b2 vaccine.

Keywords: Constrictive pericarditis, COVID-19 vaccines, mRNA vaccines, pericardiectomy, SARS-CoV-2.

ÖZ

Konstriktif perikardit, haberci ribonükleik asit bazlı şiddetli akut solunum sendromu-Coronavirus 2 (SARS-CoV-2) aşılarının oldukça nadir bir komplikasyonudur. Klinik olarak sağ ventrikül yetmezliği belirtileri gösteren ciddi bir klinik tablodur. İlk fizik muayene, laboratuvar çalışmaları ve göğüs röntgeninde nonspesifik bulgular izlenebilir. Ekokardiyografi, bilgisayarlı tomografi ve kardiyak kateterizasyon diğer tanı araçlarıdır. Perikardiyektomi ile cerrahi kesin tedavi seçeneğidir. Bu yazıda, BNT162b2 aşısının ikinci dozu ile ilişkili gelişen konstriktif perikardit sonrası perikardiyektomi olgusu sunuldu.

Anahtar sözcükler: Konstriktif perikardit, COVID-19, mRNA aşıları, perikardiyektomi, SARS-CoV-2.

Constrictive pericarditis (CP) is a rare clinical entity which progresses with pericardial thickening and calcification following an inflammatory process.[1] Rigid and inflexible pericardium causes non-functional diastolic relaxation; therefore, heart failure without pulmonary edema occurs.[2] The etiology of CP include idiopathic, viral, post cardiac surgery, radiation and tuberculosis, particularly in low socioeconomic populations.[1,3] Other rare causes of CP include fungal infections, uremia, neoplasms, connective tissue disorders, drugs, myocardial infarction and trauma.[1] Severe acute respiratory syndrome-Coronavirus 2 (SARS-CoV-2) and the messenger ribonucleic acid (mRNA)-based SARS-CoV-2 vaccines have emerged as potential, though rare, causes of cardiovascular complications.[4] In addition, vascular complications such as deep vein thrombosis and thromboembolism are seen more common than the other complications.[4] Cardiac complications of SARS-CoV-2 vaccines vary according to the type of vaccine.[4,5] The possibility of myocarditis and pericarditis was reported to be higher after mRNA-based SARS-CoV-2 vaccines compared to other vaccine types.[5]

Constrictive pericarditis poses a diagnostic challenge, as symptoms are non-specific and can mimic restrictive cardiomyopathy.[1] Initial physical examination, laboratory work-up, and chest X-ray may yield non-specific findings.[1] Echocardiography, computed tomography (CT), and cardiac catheterization are other diagnostic tools.[1] Surgery with pericardiectomy is the definitive treatment option.[1,2] In this article, we report a case of pericardiectomy after CP associated with the second dose of BNT162b2.

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CASE REPORT

A 28-year-old male patient presented with symptoms of fatigue and exertional dyspnea one week after receiving a second dose of BNT162b2 vaccine. He was admitted to our center four months later. There were bilateral pretibial edema and a pericardial rub on physical examination. Laboratory work-up was normal, except for slightly elevated C-reactive protein (CRP) values. There was P mitrale and low voltage on electrocardiogram. Chest X-ray findings were unremarkable. Transthoracic echocardiography revealed biatrial enlargement and septal bounce. There was no respiratory collapse or pericardial effusion with an E/A ratio of >1. Ejection fraction (EF) using the modified Simpson technique was calculated as 45%, and no valvular pathology was detected. Computed tomography revealed a 2-cm pericardial effusion and thickened pericardium with calcifications compatible with CP (Figure 1). There was also enlargement of the right ventricle, left atrium, and hepatosplenomegaly. Cardiac catheterization revealed equalized pressures in all cardiac chambers and coronary angiography findings were normal. The interferon-gamma release assay (IGRA) yielded negative results. The patient was also checked for human immunodeficiency virus (HIV) which was negative. A peripheral blood smear test was normal with normal platelet and hemoglobin levels. There was no malignancy or radiotherapy history. There was no unexpected mass in his abdominal and chest CT. The patient was investigated for tuberculosis infection and malignancies; however, the results were negative and these differential diagnoses were excluded. The Multidisciplinary Team consisting of chest physicians, cardiologists, and cardiac surgeons settled on surgical pericardiectomy and routine preoperative work-up was initiated. Pericardiectomy was planned.

The patient was prepared and draped in the standard way for cardiac surgery. Groins were kept ready for femoral artery and vein access for emergency cardiopulmonary bypass. Standard median sternotomy was performed which provided a wider surgical exposure into the right ventricle, right atrium, cava-atrial junction, great vessels, and the phrenic nerves. Using blunt and sharp dissections through the midline tissues, the right ventricular wall was freed and the phrenic nerves identified (Figure 2). The pericardium was noted to be thick and calcific and, subsequently, total pericardiectomy was performed in stages from right to the left ventricular side with great attention to avoid injury to the phrenic nerves, the right atrium, caval veins, and the left anterior descending (LAD) artery (Figure 3). Total pericardiectomy was done and adequate hemostasis was achieved. The sternum was closed with sternal wires. The skin and the subcutaneous tissues were closed in a standard fashion.

Following pericardiectomy, the patient had an uneventful postoperative period with symptomatic relief and was discharged on Day 5.

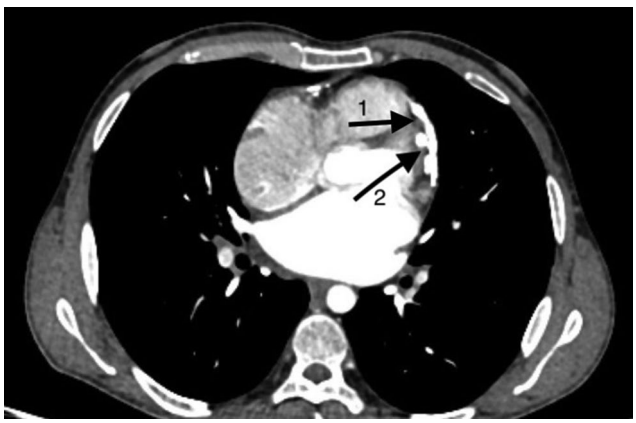

Figure 1. The first and second arrows are showing pericardial calcification in the computed tomography image.

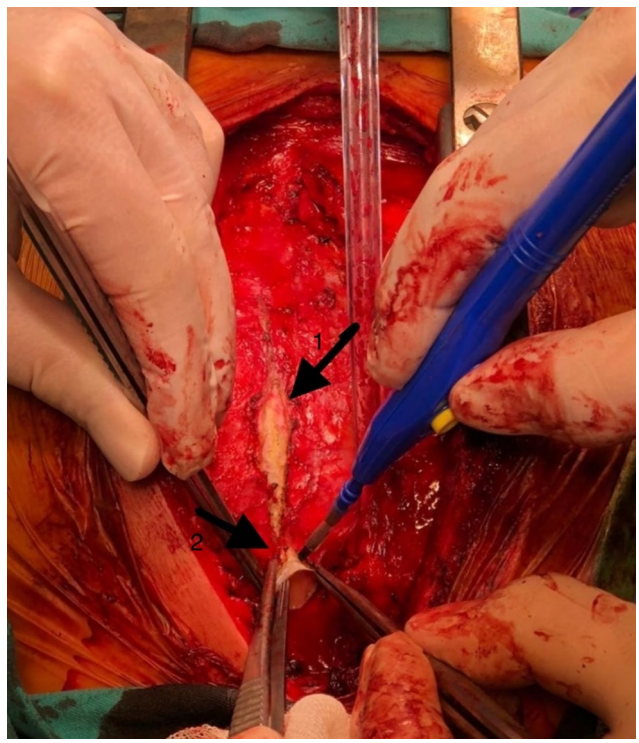

Figure 2. An intraoperative view showing the right ventricle (first arrow) and freeing aorta (second arrow).

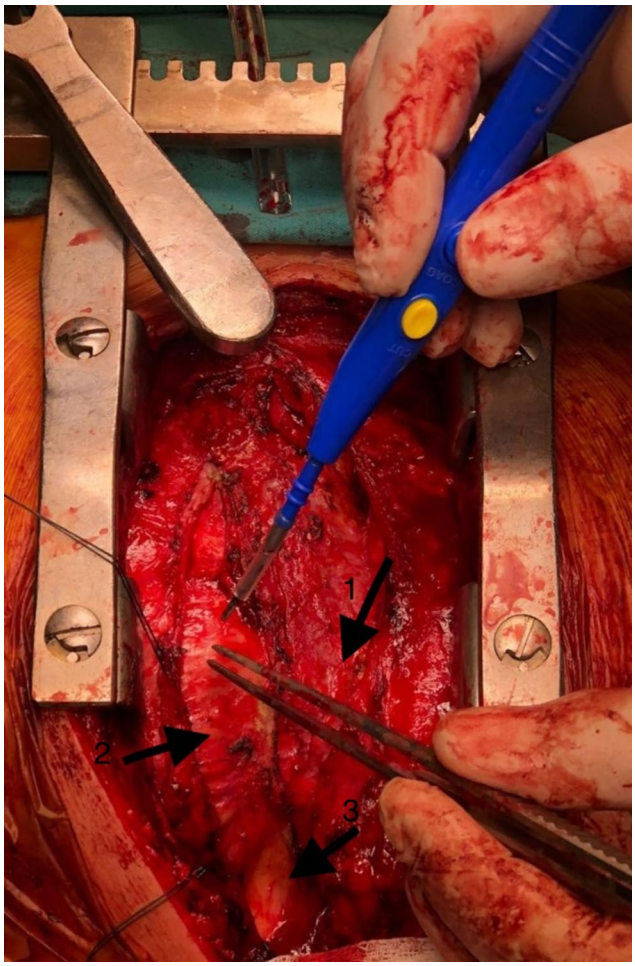

Figure 3. An intraoperative view showing the right atrium (first arrow), freed right ventricle (second arrow), and freed aorta (third arrow).

DISCUSSION

The SARS-CoV-2 infection may cause cardiovascular complications.[4] Similar cardiovascular complications may also be seen as a complication of SARS-CoV-2 vaccines.[4] Although the exact pathophysiology is still unknown,[4] there is a hypothesis that can be useful in understanding the mechanism. Vaccination-related wide-ranging inflammatory response and molecular similarity of antibodies associated cross-reactivity are blamed in this hypothesis.[4] Researchers have observed in some retrospective studies that male adolescents and young adults have an increased risk of myocarditis and pericarditis following the second dose of mRNA vaccines.[4] Diaz et al.[5] found in their study that young adults had an inclination toward myocarditis, while older patients favored toward pericarditis. There is few and limited information in the literature about the SARS-CoV-2 vaccine-related CP, due to the rarity of the cases. To the best of our knowledge, idiopathic CP is the most important cause of CP.[1] If remarkable differential diagnoses are excluded, idiopathic CP remains as the diagnosis. In our case, we considered SARS-CoV-2 vaccine-related CP as a part of idiopathic, as there is no certain test used in the clinical practice. However, there was a certain relation between the onset of symptoms and receiving the second dose of vaccine according to the patient's medical history. Considering other centers' detection phases of the SARS-CoV-2 vaccine-related CP, we can understand that they employed the same method as us: exclusion of possible causes and detection of existing relationship between vaccine and symptom onset.[4,6] Nakanishi et al.[6] published another study about SARS-CoV-2 vaccine-related CP. They preferred to delay pericardiectomy after the patient benefited from diuretics with existing mild symptoms. According to our surgical opinion, the patient was already a candidate of the high-risk population for cardiac surgery.

Surgical treatment has a fundamental role in CP.[1,2] Bertog et al.[2] demonstrated that idiopathic CP could be treated safely with pericardiectomy. In most cases, without a surgical intervention, CP causes progression of symptoms and often early mortality.[2] An improvement in functional class or quality of life has been reported in the majority of patients undergoing successful pericardiectomy.[2] Chowdhury et al.[7] worked on partial versus total pericardiectomy and they found that total pericardiectomy was associated with decreased mortality rates, less postoperative low cardiac output syndromes, shorter hospital stays, and better long term survival rates compared to the partial pericardiectomy. Arsan et al.[3] also shared the results of a 10-year follow-up study including 82 patients who underwent pericardiectomy for chronic CP in Ankara. According to their study, cardiopulmonary bypass was utilized for only nine patients; these patients had a higher risk due to additional cardiac problems or having severe calcifications. The authors observed no side effects related to cardiopulmonary bypass in these nine patients. In our case, we preferred median sternotomy as previously mentioned. The reason for our preference was safety of the procedure. We already kept the groins ready for cardiopulmonary bypass, if necessary. In addition, the median sternotomy provides absolute additional space for cardiopulmonary bypass. Moreover, it provides a wide aspect to intervene immediately. Guided by the extensive information in the literature,

we accomplished that case via median sternotomy. Off-pump total pericardiectomy is the most optimal choice for the patients for their future life comfort according to our clinical aspect. Thus, we performed this procedure successfully.

In conclusion, in unexplained cardiovascular events, particularly in rare cases such as myocarditis and pericarditis, SARS-CoV-2 infection and SARS-CoV-2 vaccine should be taken into account in the medical history. Surgical treatment should be considered for constrictive pericarditis due to SARS-CoV-2 vaccine. Total pericardiectomy, following SARS-CoV-2 vaccine-related symptomatic constrictive pericarditis, is feasible and safe with favorable postoperative outcomes. Taken together, total pericardiectomy may be considered in selected cases with SARS-CoV-2 vaccine-related constrictive pericarditis as the first-line treatment method.

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Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: All authors contributed equally to the article.

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