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Case Report

Dilated right ventricular outflow tract in a young woman due to localized constrictive pericarditis: cardiac CT and MRI findings

Serap Baş, MD*

Department of Radiology, İstanbul Yeni Yüzyıl University Gaziosmanpaşa Hospital, Çukurçeşme Cad. No:51
Gaziosmanpaşa-İstanbul, Turkey

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ABSTRACT

We present a case of a dilated right ventricular outflow tract (RVOT) in a 30-year-old woman because of localized constrictive pericarditis where the diagnosis was reached with the help of cardiac CT, and MRI. The patient was suffering from congestive heart failure for two years and had partial pericardiectomy 10 years ago. The diagnostic evaluation of the localized pericarditis requires a multimodality approach and suspected patients would benefit from simple tests, such as X-ray and echocardiography, but also furthermore complex imaging, including cardiac CT and MRI. To our knowledge, our case is the second case in the literature that show localized constrictive pericarditis presenting with giant RVOT and this is the first case that cardiac CT and MRI have been performed.

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Introduction

Constrictive pericarditis is a rare disease characterized by fibrosis and adhesions of the pericardium followed by scarring and loss of elasticity resulting in external restriction of cardiac filling and reduced compliance [1]. In the developed world, the etiology is the most commonly repeated pericarditis, previous cardiac surgery, or radiation injury. Tuberculosis is still a common cause in developing countries. Generalized constriction is the usual presentation, but the localized form may occur [2]. The cases of localized constrictive pericarditis are rare and can be misdiagnosed as apical pseudo-ballooning and aneurysm [3].

In this case study, we report of a dilated right ventricular outflow tract (RVOT) in a young woman because of localized constrictive pericarditis where the diagnosis was reached with the help of cardiac CT, and MRI.

Case presentation

A 30-year-old female patient was admitted to our hospital for heart failure for more than 2 years. She had had partial pericardiectomy due to tuberculosis pericarditis 10 years ago. On the basis of physical examination, the findings revealed that she had marked jugular venous distension. The abdominal ultrasound showed that the liver and spleen become en-

* Corresponding author.

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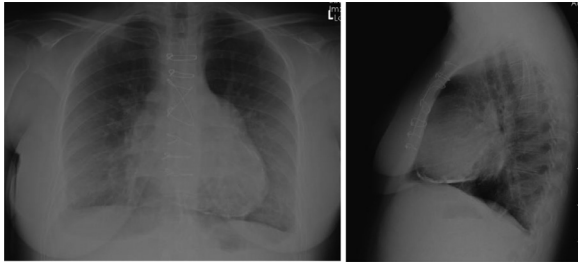


Fig. 1-2 – Linear hyperdensity surrounding the heart suggesting calcification on the posteroanterior and lateral view (Chest X-ray).

larged due to heart failure and the contour of the liver was lobular.

Echocardiography revealed biatrial enlargement and left and right ventricular diastolic dysfunction. The ejection fraction was noted to be normal (EF 60%). Chest X-ray showed linear hyper density surrounding the heart suggesting calcification on the posteroanterior and lateral view (Figs. 1 and 2). The left hilar enlargement was also recognized.

Using a 64-detector row CT scanner (Somatom sensation 64, Siemens Medical Solutions; Forchheim; Germany) cardiac CT with the synchronous electrocardiographic tracing of the patient was performed. Approximately 70 mL of nonionic contrast medium was injected at a rate of 5 mL/s, followed by 50 mL of saline solution. ECG gated cardiac CT confirmed the echocardiographic findings but also showed focally calcific pericardium surrounding the left ventricle completely and right ventricle partly which provided us with the clue to the suspicion of localized constrictive pericarditis. Dilated RVOT, which was measured as 48×32 mm, was seen during the examination (Figs. 3 and 4).

Cardiac MRI was performed with a 1.5 Tesla MR scanner (Brivo MR355, GE HealthCare, Milwaukee, WI, USA) with ECG triggering. The MRI sequences were as follows; T1-weighted spin echo, T2-weighted spin echo, FIESTA (Fast Imaging Employing Steady-state Acquisition) pulse sequences and post-contrast T1-weighted images. Cardiac MRI showed diastolic dysfunction of ventricles, dilatation of RVOT, pericardial thickening, and biatrial enlargement (Figs. 5-7).

On the basis of diagnosis, the patient underwent pericardiectomy. In the operation, the thickened fibrous and calcified pericardium was found to mainly encircle the left ventricle and partly the basis of the right ventricle.

Pathology of resected pericardium showed significant fibrosis and calcification. Granulomatous inflammation was not seen. The patient was uneventfully discharged after surgery. In the third month after operation, echocardiographic findings were normal. On the X-ray calcifications around the heart silhouette were not seen (Fig. 8). The patient's consent was obtained for this study.

Discussion

Constrictive pericarditis is the result of scarring and consequent loss of normal elasticity of the pericardial sac. Common causes include repeated pericarditis, previous cardiac surgery, and radiation therapy. However, less commonly, it may arise from tuberculosis, particularly in sub-Saharan Africa and parts of Asia, neoplasms, autoimmune disorders, or uremia. Localized pericardial constriction is rare, but should be considered in patients who present with recurrent pericardial constriction following previous partial pericardiectomy [4]. A total pericardiectomy is the treatment of choice for constrictive pericarditis, as partial pericardiectomy although technically easier, is known to be associated with a higher incidence of reconstruction, which could be generalized or localized. Constrictive pericarditis is characterized by the impaired diastolic filling of ventricles due to chronic fibrosis thickening or calcification of the pericardium, or both [2].

Echocardiography is a helpful and essential diagnostic tool in patients with constrictive pericarditis. The 2-dimensional echocardiographic findings of increased pericardial thickness, abnormal septal motion, atrial enlargement, and dilatation with the diminished collapse of the inferior vena cava and hepatic veins are supportive of the diagnosis [5]. Besides, cardiac CT and MRI, as valuable complementary methods, can allow more excellent visualization of the pericardium and thus facilitate detecting an abnormal pericardium missed on transthoracic echocardiography. Cardiac CT can show thickened and calcified pericardium as well as dilated suprahepatic inferior vena cava both supporting constriction. Also, cardiac

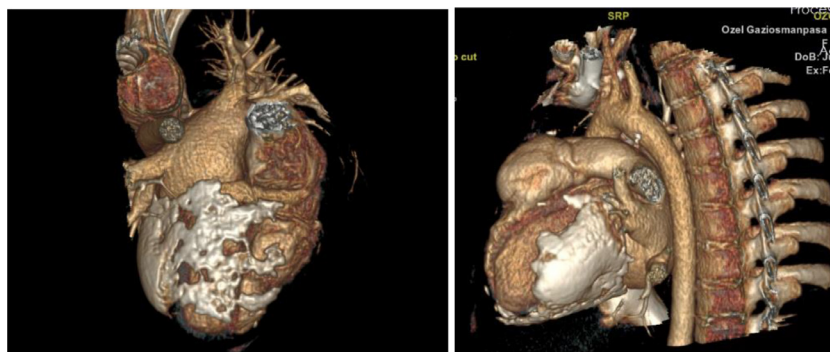


Fig. 3-4 – Focally calcific pericardium surrounding the left ventricle completely and right ventricle and dilated RVOT (48×32 mm in diameter) (3D CT VRT).

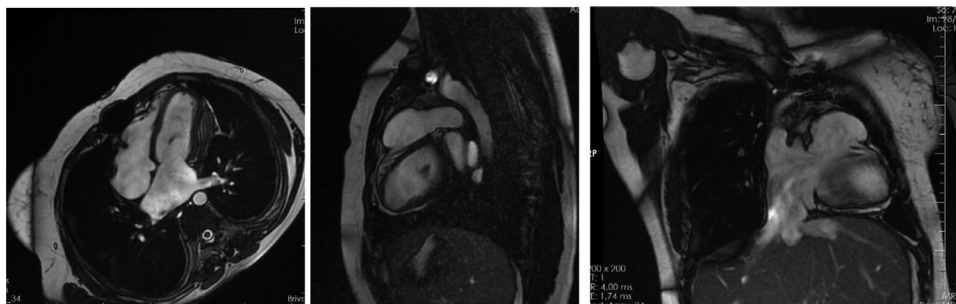


Figure 5-6-7 – Dilatation of RVOT, pericardial thickening, and biatrial enlargement (MRI FIESTA axial, sagittal, coronal).



Figure 8 – After the operation calcifications around the heart silhouette were not seen (chest X-ray).

CT gives excellent 3-dimensional morphologic assessment as in our case. Cardiac CT showed an RVOT dilatation, which was not seen by echocardiography. Cardiac MRI is useful for addressing the challenges of confirming a diagnosis of constrictive pericarditis by both visualizing the thickened pericardium and also allowing using free breathing sequences to look for ventricular septal flattening on inspiration suggesting constrictive physiology. Cardiac MRI can also detect rare complications of tuberculosis pericarditis, such as left ventricle pseudoaneurysms [3,4].

Compared to diffuse constrictive pericarditis, localized pericarditis tends to have special cardiac deformation because of long-standing and higher intraventricular filling pressure in the regions without pericardial constriction. Owing to the anatomical distribution of constrictive effects, localized constrictive pericarditis is readily regarded as an aneurysm or cardiac apex diverticulum in the literature. In this case, the obvious dilated right ventricle outlet tract is partly related to the early onset of the localized pericardium restriction [3]. According to literature, dilatation of RV related to pericardial disease has been reported after pericardiectomy, congenital absence of the pericardium, and following therapeutic pericardiocentesis for cardiac tamponade [5]. Anatomic studies have shown the presence of myocardial atrophy in cases of con-

strictive pericarditis. These findings were attributed to partial ventricular immobilization resulting from long-standing pericardial constriction and also could be the result of an inflammatory process extended into the myocardium [6]. There have been several reports regarding RVOT changes after Tetralogy of Fallot repairs [7,8]. To our knowledge, our case is the second case in the literature that show localized constrictive pericarditis presenting with giant RVOT [3]. To our knowledge, this is the first case that cardiac CT and MRI have been performed.

In summary, in our case, the usual clinical and investigatory findings of constrictive pericarditis were evident in addition to the features of localized constriction as manifested by RVOT dilatation. The diagnostic evaluation requires a multimodality approach and suspected patients would benefit from simple tests, such as X-ray and echocardiography, but also furthermore complex imaging, including cardiac CT and MRI. Cardiac CT can show calcific pericardium, 3D morphology of the heart. Cardiac MRI can demonstrate morphologic and functional assessment in high resolution.

Patient consent

I have been told that your hospital is a Medical Faculty hospital. I know that interns, interns and assistants can participate in the procedures in order to train and reinforce healthcare personnel during my treatment and I approve their participation. I know and confirm that photographs and videos can also be recorded during the operation and intervention process if necessary. I agree to be used for scientific purposes, provided that my name is not disclosed in the recorded records.

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