Cardiac and pulmonary sarcoidosis presenting as syncopal episode: Report of two cases

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Sarcoidosis is a systemic disorder of unknown etiology with a wide variety of clinical and radiologic manifestations, most commonly pulmonary. We describe two patients with biopsy-proven sarcoidosis and an initial presentation of syncope. We present the results of multimodality imaging evaluation of these patients, with an emphasis on the spectrum of findings provided by cardiovascular magnetic resonance.

Case #1

A 32-year-old Caucasian man, without significant past medical history, presented to the Emergency Department with syncope while shoveling snow. No signs of congestive heart failure were noted on physical exam. An initial electrocardiogram (ECG) showed sinus rhythm, first-degree AV block, right-bundle branch block (RBBB), and left posterior hemiblock. Chest radiography revealed perihilar fullness and diffuse pulmonary nodular opacities (Fig. 1). Coronary arteries were normal on angiography. Cardiovascular magnetic resonance (CMR) was performed to further evaluate the myocardium for possible infiltrative process. Steady-state free-precession (SSFP) images were remarkable for thickened myocardium and severely depressed biventricular systolic function, with a calculated right ventricular ejection fraction (RV EF) of 27% and left ventricular ejection fraction (LV EF) of 30%. Postgadolinium, phase-sensitive inversion recovery (PSIR) images demonstrated diffuse areas of abnormal delayed hyper-enhancement (DHE) within the left ventricular myocardium in an epicardial/midwall distribution consistent with nonischemic cardiomyopathy (Fig. 2). Turbo-spin-echo (TSE) imaging with T2 weighting revealed scattered areas of increased signal intensity, most prominent in the interventricular septum, suggesting edema. In addition, axial images of the chest revealed enlarged mediastinal lymph nodes and bilateral pulmonary abnormalities with perihilar predominance. Overall findings were highly suggestive of sarcoidosis, with areas of active inflammation.
A transbronchial biopsy confirmed the diagnosis of sarcoidosis. Subsequently, positron-emission tomography (PET-FDG) imaging confirmed active disease in the mediastinal lymph nodes and myocardium (Fig. 3). The patient was started on systemic steroids and methotrexate. Since the trifascicular block was presumed to be the cause of the syncope, in the context of severe biventricular dysfunction and cardiac sarcoidosis, an implantable cardioverter-defibrillator (ICD) was implanted to prevent sudden death.

Following ICD placement, the patient had three episodes of ventricular tachycardia during the first month, two of them requiring a shock.

**Case #2**

A 57-year-old, previously healthy African-American man presented to the Emergency Department with recurrent palpitations and syncope. No signs of congestive heart failure were noted on physical exam. Holter monitoring demonstrated episodes of sustained and nonsustained monomorphic ventricular tachycardia, which was the presumed cause of syncope. Echocardiography was notable for thickening and increased echogenicity involving the distal half of the left and right ventricles, and mild hypokinesis of the interventricular septum (Fig. 4). CMR revealed diffuse biventricular wall thickening, with associated extensive...
DHE involving the apex, mid, and distal segments of the LV and right ventricular (RV) walls (Fig. 5A). T2-weighted TSE images showed increased signal in the same segments consistent with active inflammation (Fig. 5B). Unlike the previous case, this patient demonstrated normal left ventricular function (LV EF 60%) but mildly depressed right ventricular systolic function (RV EF 44%). Hilar and mediastinal lymphadenopathy was also detected on SSFP images of the chest (Figs. 5D, E). MRI findings were again highly suggestive of sarcoidosis with active areas of inflammation. Endomyocardial biopsy of the RV confirmed the suspected MRI diagnosis of sarcoidosis (Fig. 6). The patient was started on systemic steroids. Because of the history of recurrent episodes of sustained and nonsustained ventricular tachycardia and biopsy-proven diagnosis of cardiac sarcoidosis, sotalol was started and an ICD was placed. Holter monitoring repeated one month after discharge showed good response to treatment with suppression of arrhythmias.

Discussion

Sarcoidosis is a multisystem granulomatous disease of unknown etiology with variable presentation, prognosis, and progression. It commonly affects young and middle-aged patients, with a slightly higher prevalence in women (1). The disease has distinct geographic and racial predilections, with African-Americans and northern Europeans commonly affected (1). Approximately 50% of patients with sarcoidosis are asymptomatic, and detection is often secondary to prominent mediastinal lymph nodes noted on routine chest radiography. Alternately, patients may complain of dyspnea and persistent cough (25%), and a similar percentage has extrathoracic symptoms, usually related to the skin or eyes (2). Cardiac involvement produces symptoms in only 5% of patients with sarcoidosis, although autopsy and CMR findings suggest myocardial involvement in approximately 20% to 50% of patients (3, 4). Cardiac involvement is the initial presentation in 10% to 15% of cases. It is an important cause of death in patients with sarcoidosis, causing 30% to 65% of sarcoidosis-related deaths (5).

In addition to sudden death, cardiac sarcoidosis can present with congestive heart failure as well as atrial or ventricular arrhythmias. Cardiac sarcoidosis can affect virtually any location of the conduction system, leading to left- or right-bundle branch block (complete or incomplete), atrioventricular block of any degree, and even sinus node arrest. Complete heart block is the most common presenting conduction abnormality (23% to 30%) and most frequently presents as syncope (6). Complete heart block can often manifest without any significant evidence of cardiomyopathy. Both supraventricular and ventricular arrhythmias can occur in patients with cardiac sarcoidosis. These arrhythmias are often related to atrial dilatation secondary to left ventricular dysfunction or cor pulmonale. Less commonly, they may be caused by direct granulomatous involvement of the atria. Ventricular arrhythmias are more common.
and are usually caused by direct granulomatous involvement of the myocardium (6). Sudden death, due to either ventricular arrhythmia or complete heart block, is the most feared cardiac manifestation of cardiac sarcoidosis. It is responsible for 24% to 65% of all deaths related to cardiac sarcoidosis in the United States (6). Importantly, sudden death may be the initial presenting manifestation. Corticosteroid therapy may help prevent malignant arrhythmias and improve left ventricular function (7).

The advent and evolution of noninvasive imaging technology has aided in the early detection of sarcoidosis, thus permitting earlier initiation of treatment. Chest radiography and computed tomography (CT) can depict hilar and mediastinal lymphadenopathy as well as pulmonary abnormalities. ECG is used to detect arrhythmias, and transthoracic and transesophageal echocardiography are useful to assess left ventricular infiltration and/or ventricular dysfunction. Gallium-67 and PET can detect uptake from sarcoidosis; however, the pattern can be nonspecific and may mimic other disease processes, including lymphoma and diffuse metastatic disease (8). CMR is a particularly versatile tool that can evaluate not only myocardial abnormalities (both by tissue characterization and functional assessment) but can also extracardiac manifestations of sarcoid including mediastinal lymphadenopathy and (to a limited extent) pulmonary abnormalities. Cardiac sarcoidosis may manifest with areas of increased signal intensity on T2-weighted images, suggesting edema related to active disease, and increased signal intensity on postgadolinium inversion recovery images, typically in an epicardial or midwall distribution (1). On cine imaging, cardiac sarcoidosis may exhibit segmental contraction abnormalities and areas of myocardial thinning or thickening, without respect for epicardial coronary territories. Confluent sarcoid granulomas may be visible on MRI as nodules with increased intra-myocardial signal intensities on both T2-weighted and DHE images.

These two cases included biopsy-proven sarcoidosis and an initial presentation of syncope. Multiple noninvasive tests contributed to the eventual diagnosis; however, we note in particular the significant advantages of CMR in the characterization of myocardial involvement, and detection of multi-organ findings of sarcoidosis.

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