Case Report for the Sarcoid Patient

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Case report

Following on from the previous 2 editorials, which have looked at the diagnosis and risk stratification of patient with cardiac sarcoidosis and a case report, this is a second example of a case report in a patient with cardiac sarcoid whose initial presentation shows the difficulty in diagnosis of cardiac sarcoid, and also demonstrates various examples of cardiac involvement.

Sarcoidosis is a multisystem granulomatous disorder of unknown aetiology. The clinical manifestation depends on the location, extent and activity of the disease. Symptomatic cardiac sarcoidosis occurs in approximately 5% of the patients with pulmonary or systemic sarcoid. The three most common sequelae of cardiac sarcoidosis are conduction abnormalities, ventricular arrhythmias and heart failure (Birnie et al, 2014)

Case presentation

A 44 year old male presented in January 2010 with chest pain and palpitations. An electrocardiogram (ECG) showed ventricular tachycardia (VT), which was subsequently chemically cardioverted to sinus rhythm (SR) using Amiodarone. Serial ECGs showed sinus rhythm (SR) with ST-segment depression, routine bloods showed normal renal function with a positive Troponin T. The patient underwent a diagnostic coronary angiogram, which showed smooth unobstructed coronaries, with the left ventriculogram showing a normal left ventricular (LV) systolic function.

A Cardiac Magnetic Resonance (CMR) scan was performed and showed a non-dilated LV with preserved systolic function, with extensive myocardial oedema and delayed gadolinium enhancement seen in the basal anterior segments (see Figure 1).

The initial diagnosis was myocarditis due to the findings of the coronary angiogram and the CMR. There are myriad of potential clinical presentations of myocarditis include mild symptoms such as chest pain, palpitations and transient ECG changes, and may extend to include life-threatening symptoms such as cardiogenic shock or ventricular arrhythmias (Caforio et al, 2013).

Another CMR scan was performed due to increasing troponin prior to discharge (Figure 1b) which showed persistent oedema in the basal antero-septal wall, extending to the right ventricle (RV) similar to the admission cardiac MR. These changes persisted on a 6 week post-discharge CMR (Figure 1), and so an endomyocardial biopsy (EMB) was arranged. Two days prior to the EMB however, the patient re-presented to hospital with an episode of pre-syncpoe and SOBOE and was found to be in VT, this time requiring DC cardioversion, a further 48 hour Holter monitor showed a 51 minute episode of sustained VT. After initial fears of potential of conduction abnormalities due to the location and extent of extensive basal antero-septal oedema the patient was commenced on a beta-blocker and steroids. A right ventricular (RV) EMB during this admission showed intra and inter-cellular oedema with no signs of inflammation a further LV EMB showed a few cardiac myocytes but failed to further the diagnosis. As mentioned in the previous editorial, while the finding of non-caseating granulomas on EMB is virtually pathognomonic for a diagnosis of cardiac sarcoidosis, the patchy distribution of the granulomas gives EMB a low sensitivity, with non-caseating granulomas found in less than 25% of patients with CS (Birnie et al, 2014, Dubrey & Falk, 2010).

Fig 1: CMR images
Figure 1A – Shows the T2-STIR imaging for the basal cut of the short axis stack from baseline (left), 2 month (middle) and 6 months (right), myocardial oedema is seen as bright enhancement (*).

Figure 1B – Shows the T2-STIR imaging for the 2 chamber from baseline (left), 2 month (middle) and 6 months (right), myocardial oedema is seen as bright enhancement (*).

Figure 1C – Shows the delayed gadolinium enhancement for the basal cut of the short axis stack from baseline (left), 2 month (middle) and 6 months (right), myocardial scar is seen as bright enhancement (†).

Figure 1D – Shows the delayed gadolinium enhancement for the 2 chamber from baseline (left), 2 month (middle) and 6 months (right), myocardial scar is seen as bright enhancement (†).

The patient was followed up in a speciality heart muscle disease clinic, from which he was also referred to the respiratory clinic. His shortness of breath on moderate exertion continued (NYHA...
2) although he reported no further symptoms of pre syncope or palpitations. As part of ongoing investigations, a high resolution computed tomography (CT) scan of the chest was performed, which showed some mediastinal and hilar lymphadenopathy with some nodular fibrosis and scarring in both apices, suggestive of sarcoidosis, which were not obvious in the preceding CMR (Figure 2). Although not pathognomonic of sarcoid the patient’s recent blood tests showed mildly elevated erythrocyte sedimentation rate (ESR), and lymphopneumonia, (Dubrey & Falk, 2010). A bronchoscopy was organised with endobronchial and transbronchial lung biopsies, in order to pursue this possible diagnosis of sarcoidosis (with a plan to discuss a mediastinoscopy and lymph node biopsy with the cardiothoracic surgeons if non diagnostic). The bronchoscopy demonstrated inflammatory changes within the lungs, which were reported as being consistent with a diagnosis of sarcoidosis.

Figure 2: CT images with previous CMR images

Figure 2A: Cardiac MRI showing poor resolution of apical scaring (*) from admission CMR
Figure 2B: Cardiac MR showing hilar lymphadenopathy (†)
Figure 2C: High resolution CT scan showing apical scaring (*)
Figure 2D: High resolution CT scan showing hilar lymphadenopathy (†)

Due to the previous documented VT associated with pre-syncope, a dual chamber ICD was implanted, with an active atrial lead positioned in the right atrial (RA) appendage, and an active ventricular ICD lead positioned in the RV apex. ECG at implant showed SR (with right bundle branch block). The device was programmed to DDI 40bpm, with a VT monitor zone of 150bpm, VT therapy zone of 165bpm (antitachycardia pacing (ATP) followed by shocks) and a VF zone of 200bpm with shocks. The patient was signed up to remote monitoring to allow close monitoring of his VT burden from home.

Subsequent device checks revealed several episodes of a supraventricular tachycardia (SVT) falling into the VT zone (Fig 3). He was listed for an electrophysiology study (EPS) and catheter ablation for atrial tachycardia (AT) in early 2012. Due to the cardiac sarcoid it was suggested that it might be left atrial, therefore the CARTO 3 mapping system was used. Tachycardia was easily induced with programmed electrical stimulation from the RA, with an AH jump seen at the onset of tachycardia, and the earliest signals mapped to the region of the coronary sinus. There was no atrial
advancement with his synchronous ventricular premature beats, thus ruling out atrioventricular re-entry tachycardia (AVRT) and leading to a diagnosis of atrioventricular nodal re-entry tachycardia (AVNRT). Ablation of the slow pathway was performed, with a good junctional response during ablation, and no further inducible tachycardia or echo beats seen. The patient was in sinus rhythm post-procedure.

Figure 3: Electrogram showing SVT, with 1:1 AV conduction, and seen to initiate in the atria and terminate in the ventricles. SVT discriminators appropriately identify the rhythm based on morphology.

An admission occurred in Dec 2012 due to symptoms of shortness of breath on minimal exertion and sweating revealed his ECG (Figure 4) to now show complete heart block (CHB). An ICD check just one month prior had shown sinus rhythm with only 1% RV pacing.
It was unclear whether this CHB was due to the Bisoprolol, or due to progression of sarcoid, however after the CHB persisted despite a trial of reduced beta blockade, and the ICD was reprogrammed to DDD at 60bpm.

A Fluorodeoxyglucose positron emission tomography (FDG-PET) scan was performed in 2013 (the ICD is not a CMR conditional system). Significant myocardial uptake of FDG (a glucose analogue) is thought to indicate active myocardial inflammation, as activated inflammatory cells have a higher glycolytic rate (Birnie et al, 2014; Khan et al, 2013). In sarcoidosis, macrophages are activated while involved in granuloma formation, therefore granulomatous lesions show strong FDG activity, and the degree of FDG uptake has been related to the activity of the disease (Khan et al, 2013). The scan showed FDG-avid lymph nodes within the hilar and mediastinal regions of the chest, liver, spleen and in the RV wall, therefore suggesting of ongoing active sarcoidosis. In response, immunosuppressive agents were increased, and a further FDG PET scan performed 6 months later. This time, no significant focal FDG uptake in the myocardium was seen, and in comparison to the previous scan, FDG uptake in the myocardium and enlarged mediastinal and abdominal nodes had resolved. A significant improvement in the bronchovascular nodularity was reported, with only a few small ground-glass nodules remaining at the apices.

Abnormal FDG uptake has been associated with sustained VT, and device interrogations since implant have shown frequent episodes of both non sustained VTs, as well as several episodes of VT requiring 1 x burst of ATP to terminate (see Fig 5-8), with several morphologies seen.
Over the last year the patient's ventricular arrhythmia burden has stabilised, with between 5-10 non sustained ventricular tachycardia (NSVT) episodes each month, predominantly less than 10 beats in duration with no further atrial arrhythmias. The patient continues to be monitored closely in device clinic, with monthly remote monitor downloads to check for atrial and ventricular arrhythmia burden, and the results relayed to the Electrophysiology, Heart Muscle Disease and Respiratory teams.

Discussion:

VT is one of the most frequent arrhythmias noted in CS. The sarcoid granulomas can act as foci for abnormal automaticity as well as allowing macroreentrant pathways around areas of granulomatous scar (Sekhri et al., 2011; Birnie et al., 2014). Triggered activity and abnormal automaticity have also been described secondary to the myocardial inflammation in myocarditis, again making initial diagnosis of sarcoidosis following presentation of VT difficult. In addition to VT, CHB has been reported in 23-30% (and bundle branch block in 12-32%) of patients with cardiac sarcoidosis, and is due to either scar tissue at the basal septum, granulomas, or ischaemia of the conduction system caused by involvement of the nodal artery (Sekhri et al., 2011).

As this case has shown, although the patient may not initially present with conduction block, it may develop later as the disease progresses, and thus should be considered when programming the brady parameters of a device.

Atrial involvement is common in CS although involved to a lesser extent than the ventricles, and atrial arrhythmias are typically due to inflammation or scarring (Birnie et al., 2014). This case was interesting, in that the SVT actually turned out to be AVNRT and therefore a re-entrant arrhythmia not related to the scarring caused by sarcoid.
Conclusion

This case highlights the importance for frequently reassessing the sarcoid patient, as new cardiac symptoms may present as the disease progresses, and there may also be cardiac symptoms unrelated to the disease, e.g. AVNRT. In patients with CS careful consideration should be taken due to the sequelae of the disease when programming bradycardia and tachycardia parameters in an ICD:

1) Potential for AV block to occur; choice of a mode which is appropriate to minimise unnecessary RV pacing but to ensure pacing will occur if AV block develops
2) Ventricular arrhythmias; are detection times appropriate to ensure unnecessary therapies don’t occur, but to ensure symptomatic VT is treated. There may be various VTs of different morphologies and rates, requiring several different VT zones.
3) Atrial arrhythmias; ensure appropriate SVT discriminators are in place to prevent inappropriate therapies due to SVTs falling in a VT zone.

The diagnosis and the management of patients with sarcoid requires good communication within the multidisciplinary team, in this case the close communication between respiratory, heart muscle disease, electrophysiology and device clinics working closely together to provide an up to date management plan for this patient.

References


