

Arrhythmogenic Right Ventricular Cardiomyopathy vs. Cardiac Sarcoidosis - A Tissue Diagnosis Makes All The Difference

Benjamin M. Ramasubbu, Ross T. Murphy
Department of Cardiology, St James's Hospital Dublin, Ireland

Abstract

Arrhythmogenic Right Ventricular Cardiomyopathy (ARVC) is primarily an autosomal dominant structural abnormality where fibro fatty replacement of cardiac myocytes results in tachyarrhythmias and sudden death. Sarcoidosis, on the other hand, is a multisystem granulomatous disease of unknown aetiology characterized by non-caseating granulomas in involved organs. ARVC can be mimicked both clinically and radiologically by cardiac sarcoidosis. In some cases differentiating the diagnoses is only made at biopsy or autopsy. A 31 year old Irish male presented to a regional hospital with a one hour history of palpitations and mild chest discomfort. Emergency department (ED) electrocardiograph (ECG) revealed ventricular tachycardia (VT). Direct current cardioversion of 150 kilojoules was given due to haemodynamic instability and resulted in reversion to normal sinus rhythm. Following this, he was treated as a non ST-segment elevation myocardial infarction and referred to a tertiary referral centre for coronary artery angiography. Normal angiography and echocardiogram prompted cardiac magnetic resonance imaging (MRI) which demonstrated right ventricular outflow tract scarring consistent with either a primary diagnosis of ARVC or cardiac sarcoidosis. Initially, a diagnosis of sarcoidosis was deemed less likely on the basis of normal laboratory findings and absence of other clinical manifestations of extra cardiac sarcoidosis. However, an endovascular biopsy was taken from the right ventricle and tissue diagnosis was made of isolated cardiac sarcoidosis and corticosteroids were commenced. (*JAEM 2014; 13: 30-2*)

Key words: ARVC, sarcoid, sarcoidosis, cardiac

Introduction

Arrhythmogenic Right Ventricular Cardiomyopathy (ARVC) is primarily an autosomal dominant (rarely recessive) structural abnormality where fibro fatty replacement of cardiac myocytes results in tachyarrhythmias, heart failure and sudden death (1, 2). At the cellular level, ARVC can result from a number of gene mutations which control desmosome function important in cell-cell junctions (3). Abnormal function results in myocyte detachment and death, leaving scar tissue to form and fatty infiltration to occur (4). This causes a conduction deficit which predisposes to fatal arrhythmias (5). Thus, unfortunately a common presentation is that of sudden death. However, at least 25% can have early warning symptoms such as syncope and/or palpitations (6). ARVC, as the name would suggest, predominantly affects the right ventricle but later in the disease process it can involve the left ventricle as well (5).

Sarcoidosis on the other hand, is a multisystem granulomatous disease of unknown aetiology characterized by non-caseating granulomas in involved organs (7). When sarcoidosis affects the heart it can precipitate ventricular or supraventricular arrhythmia, complete heart block, congestive cardiomyopathy and sudden death (8).

ARVC can be mimicked both clinically and radiologically by cardiac sarcoidosis. In some cases differentiating the diagnoses is only made at biopsy or autopsy. However, a diagnostic distinction is important, as treatment with corticosteroids may benefit those with sarcoidosis (9).

Case Presentation

A 31 year old Irish male with no past medical history and no regular medication, presented to a regional hospital with a one hour history of palpitations and mild chest discomfort. The symptoms had woken him from sleep at 3 am, and following a 40 minute drive to the nearest open emergency department (ED), he was admitted. He described a six month history of intermittent, self-limiting (10-15 seconds) 'fluttering' of his heart occurring sporadically when he was excited or surprised. However, on this occasion it persisted. Also, in the preceding 4 days he described morning flu-like symptoms (including: headache, fatigue and lethargy) which waned in the afternoon and in the 48 hours prior to admission 'stinging' pain in his left arm.



Correspondence to: Benjamin Mohan Ramasubbu, Department of Cardiology, St James's Hospital Dublin, Ireland
Phone: 00353 857880972 e.mail: ramasubb@tcd.ie

Received: 04.10.2013 **Accepted:** 18.01.2014

©Copyright 2014 by Emergency Physicians Association of Turkey - Available online at www.akademikaciltip.com
DOI:10.5152/jaem.2014.44712

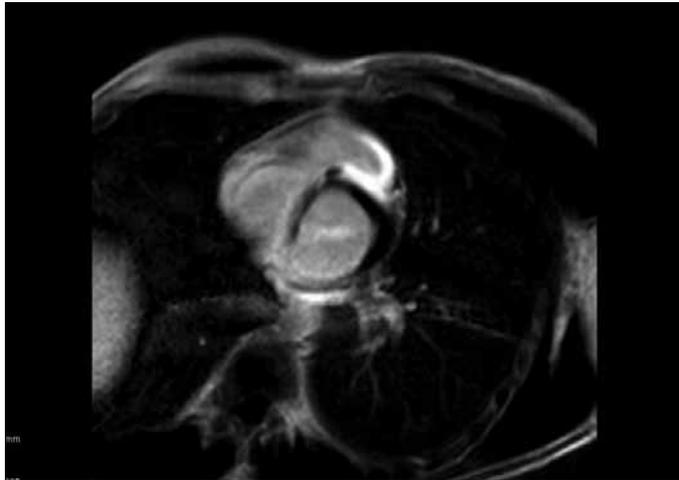


Figure 1. Axial section Cardiac MRI showing right ventricular infiltration consistent with a diagnosis of ARVC

The initial emergency department electrocardiograph (ECG) revealed ventricular tachycardia (VT). Within 20 minutes of admission, the patient became haemodynamically unstable with a blood pressure (BP) of 90/60. Direct current cardioversion with a single shock of 150 kilojoules was given, resulting in reversion to normal sinus rhythm. Symptoms settled following cardioversion. Admission troponin was 70 (rising to 150 the following morning), and chest x-ray was non-contributory. He was treated as a non-ST segment elevation myocardial infarction (NSTEMI), loaded with aspirin 300 mg, clopidogrel 600mg and therapeutic enoxaparin 1 mg/kg and referred to a tertiary referral centre for coronary artery angiography.

Angiography demonstrated no coronary artery disease and an echocardiogram showed normal left and right ventricular function, normal tissue Doppler velocities and no valvular pathology. An exercise stress test was carried out showing short runs of VT in recovery. Further tests included the short acting sodium channel blocker 'Ajmaline Challenge' (75mg intra-venous over 7 min 30sec) to outrule Brugada syndrome. An adrenaline challenge did not suggest Long QT syndrome.

Figures 1 and 2 show images from the Cardiac magnetic resonance imaging (MRI) which demonstrate right ventricular outflow tract scarring consistent with either a primary diagnosis of ARVC or a secondary diagnosis of myocarditis.

The other main differential diagnosis was sarcoidosis. Initially, normal laboratory investigations and pulmonary function tests along with consultation from respiratory medicine excluded this diagnosis.

Unsustained runs of VT on telemetry were noted and, as seen in Figure 3, a dual chamber Implantable Cardiac Defibrillator (ICD) was inserted. A second exercise test was carried out, demonstrated by Figure 4, showing runs of 'Slow VT' during stage 4. The patient was referred for genetic screening.

Subsequently, an endovascular biopsy was taken from the right ventricle showing multiple non-caseating granulomas. A diagnosis of cardiac sarcoidosis was made and steroid therapy was commenced.

Discussion

An endovascular biopsy can have grave consequences; however, corticosteroid therapy may benefit those with cardiac sarcoidosis and so a definitive diagnosis is imperative.

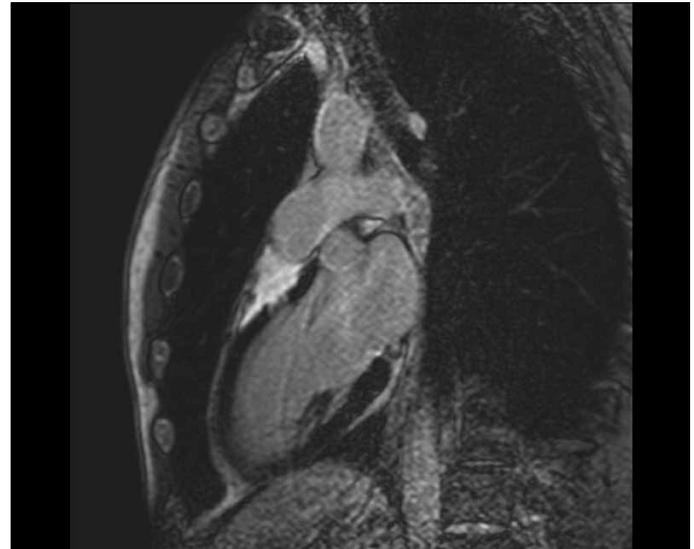


Figure 2. Sagittal section of Cardiac MRI showing right ventricular infiltration and involvement of the pulmonary valve



Figure 3. Chest X-Ray following ICD implantation

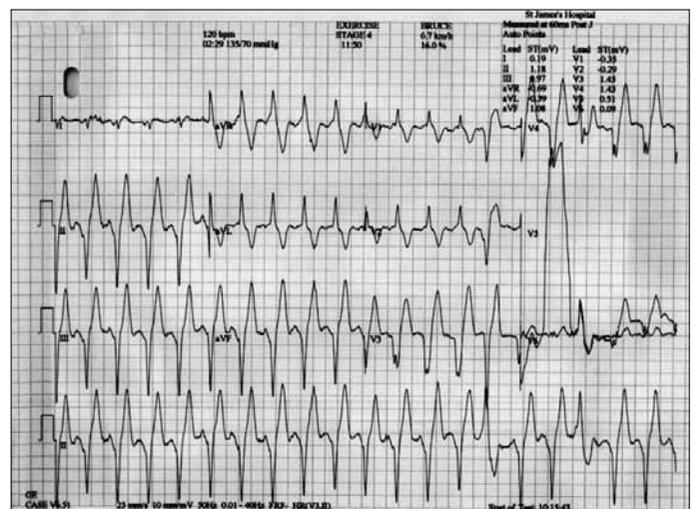


Figure 4. Repeat Exercise Stress test demonstrating 'slow VT' in Stage 4

Conclusion

History, presentation and radiology (Cardiac MRI) were consistent with a diagnosis of ARVC. Initially, a diagnosis of sarcoidosis was deemed less likely on the basis of normal laboratory findings, and absence of other clinical manifestations of extra cardiac sarcoidosis. However, a tissue diagnosis was made of isolated cardiac sarcoidosis and corticosteroids were commenced. Subsequent repeated 24 Holter monitoring showed a dramatic drop in total ectopic count, and the patient remains asymptomatic with no ICD utilisation.

Informed Consent: Informed consent was obtained from the patient who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept B.R, R.M; Design - B.R, R.M; Supervision - R.M; Materials - B.R; Data Collection and/or Processing - B.R; Analysis and/or Interpretation B.R, R.M; Literature Review - B.R; Writer - B.R; Critical Review - R.M.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

References

1. Gerull B, Heuser A, Wichter T, Paul M, Basson CT, McDermott DA, et al. Mutations in the desmosomal protein plakophilin-2 are common in arrhythmogenic right ventricular cardiomyopathy. *Nat Genet* 2004; 36: 1162-4. [\[CrossRef\]](#)
2. McKoy G, Protonotarios N, Crosby A, Tsatsopoulou A, Anastasakis A, Coonar A, et al. Identification of a deletion in plakoglobin in arrhythmogenic right ventricular cardiomyopathy with palmoplantar keratoderma and woolly hair (Naxos disease). *Lancet* 2000; 355: 2119-24. [\[CrossRef\]](#)
3. Sen-Chowdhry S, Syrris P, McKenna WJ. Role of Genetic Analysis in the Management of Patients with Arrhythmogenic Right Ventricular Dysplasia/Cardiomyopathy. *J Am Coll Cardiol* 2007; 50: 1813-21. [\[CrossRef\]](#)
4. U.S Library of Medicine, Genetic Home Reference. Reviewed: May 2010. Published: January 30, 2012.
5. Corrado D, Thiene G. Arrhythmogenic Right Ventricular Cardiomyopathy/Dysplasia: Clinical Impact of Molecular Genetic Studies. *Circulation* 2006; 113: 1634-7. [\[CrossRef\]](#)
6. Arrhythmogenic Right Ventricular Cardiomyopathy. NYU Langone Medical Centre, Cardiovascular genetics programme. <http://www.med.nyu.edu/>
7. Sekhri V, Sanal S, Delorenzo LJ, Aronow WS, Maguire GP. Cardiac sarcoidosis: a comprehensive review. *Arch Med Sci* 2011; 7: 546-54. [\[CrossRef\]](#)
8. Mitchell DN, Du Bois RM, Oldershaw PJ. Cardiac sarcoidosis - A potentially fatal condition that needs expert assessment. *BMJ* 1997; 314: 320-1. [\[CrossRef\]](#)
9. Ott P, Marcus FI, Sobonya RE, Morady F, Knight BP, Fuenzalida CE. Cardiac Sarcoidosis Masquerading as Right Ventricular Dysplasia. *Pacing Clin Electrophysiol* 2003; 26: 1498-503. [\[CrossRef\]](#)