Original Research Article

Role of Magnetic Resonance Imaging in Non Ischaemic Dilated Cardiomyopathies

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Abstract

Cardiomyopathy refers to abnormal conditions of the cardiac muscles. Cardiomyopathies are a significant cause of mortality and morbidity caused due to cardiovascular pathologies. Dilated cardiomyopathy is the most common type of cardiomyopathy. Cardiac magnetic resonance imaging is an excellent modality for diagnosis and evaluation of cardiomyopathies. Non ischaemic cardiomyopathy is a type of cardiomyopathy which has varied etiologies, including and not limited to genetic, inflammatory conditions, auto-immune diseases, stress, infiltrative disorders, drug toxicity, granulomatous diseases and storage disorders. Hence role of cardiac magnetic resonance imaging is important in the diagnostic and research indications in cardiology. Cardiac MRI is a powerful tool in this regard owing to its multifaceted assessment of ventricular structure and myocardial physiology, in matching arbitrary scan planes. Cardiac MRI is routinely performed in experienced centers to complement echocardiography in assessing new cardiomyopathies. It is not only accurate but also highly reproducible. We present a case series depicting cardiac magnetic resonance imaging appearance of non ischaemic dilated cardiomyopathies which presented to our hospital.

Keywords: Non ischaemic cardiomyopathy, Cardiac MRI, Cardiomyopathy, Dilated Cardiomyopathy, Left Ventricular Non Compaction, Hypertrophic cardiomyopathy.

Introduction

Cardiovascular diseases are considered as one of the most common disorders in developed nations and an increasingly growing problem in developing nations.[1-3]Cardiomyopathies are important, both in terms of prevalence and the negative effect they have on patient's health. They contribute significantly to various morbidity indices.

Cardiomyopathies are described as "a heterogeneous group of diseases of the heart muscles associated with mechanical and/or electrical dysfunction that usually (but not invariably) show inappropriate ventricular hypertrophy or dilatation and are because of a variety of causes that commonly are genetic." [4]

Cardiomyopathy refers abnormal conditions of the muscles of the heart. These conditions have many causes, symptoms, signs, management and treatments. The cardiac muscles become enlarged, thick or rigid in the various types of cardiomyopathies. There may even be a replacement of the muscle tissue with scar tissue in rare cases.[5].The main feature of dilated cardiomyopathy (DCM) is an enlargement of either the left or both ventricles with deterioration of systolic function. The dilatation of the left ventricle is often associated with an increase in ventricular mass, however the amountof hypertrophy is less than what might be expected by the extension of LV dilatation [6].

Even though the cause may not always be clear, more than 75 specific heart diseases may initiate the spectrum of DCM [7]. Hence, a meticulous clinical examination and right diagnostic approach are needed before designating DCM as idiopathic.

CMR is one of the best apparatus for assessment of mass and volumes of the ventricles, abnormalities of wall motion, and systolic and diastolic ventricular function [8].

In a hospital setting, the question often comes up as to if the enlarged and abnormally functioning left ventricle is due to ischaemia or is it nonischemic. Abnormalities of motion of the walls themselves aren't reliable, because they are present in both conditions [9].

Bello et al. [10] noted that LGE was seen in cent percent of patients with LV systolic dysfunction and occlusive coronary artery disease, while this imaging finding was seen in only 12% of patients with idiopathic DCM.

In his research Assomull et al. [11] noted that, in patients of DCM, the extent of LV LGE is a useful prognosticator of all types of mortality and morbidity related to cardiovascular hospital admission. LV LGE can also foresee the happening of sudden cardiac death or serious cardiac arrhythmias. In conclusion, it is conceivable that CMR study should be recommended in the work-up and assessment of LV dysfunction to attain a greater understanding of the underlying causes and a better risk factor stratification.

Materials and Methods

Ours is a descriptive observational study, conducted inDr. D. Y. Patil Medical College and Hospital and Research Centre, Pimpri, Pune. Patients were assessed on 3 tesla Siemens MAGNETOM Vida Magnetic Resonance Imaging machine. Institutional ethical committee clearance was obtained for the study. Only adult patients with clinical suspicion or diagnosis of non ischaemic dilated cardiomyopathy were considered for the study.

Technique

For cardiac MRI first localizer sequences are done in various planes to localize the heart for anatomy and position.Precontrast scanning is done for morphology and function. Sequences used for morphology are T2 TRUFI, T2 HASTE Dark Blood, T1 TSE Dark Blood, T2 TSE Dark Blood, T2 STIR Dark Blood while 4 Chamber CINE TRUFI in Long Axis, 2 Chamber CINE TRUFI in Long Axis, CINE TRUFI Retro in Short Axis , CINE RVOT and CINE LVOT are used to assess cardiac function. Contrast studies are done for Perfusion and viability studies with Omniscan (Gadodiamide) or Magnevist (dimegluminegadopentetate) used as contrast agents in dose of 0.1mmol /kg body weight. All images acquisitions were ECG-gated cardiac synchronization (retrospective gating) except CINE imaging where we do not take the Rotation noted to the right left. Interval based capturing.

Single breath holds were required (end-expiratory of about 10–15 s).

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Results

A total of 5 patients were studied. Diagnosis on MRI was made with background of clinical context. In our study, the age range was from 26 years to 43 years. The mean age was 33 years. All but one of the patients was female. 60% of the patients showed gross cardiomegaly. All of the patients showed both atria as dilated. Both the ventricular cavities were also dilated. 60% of the patients also showed associated mitral or tricuspid regurgitations. Only one case showed pericardial effusion, which too was mild. The ejection fraction was greatly reduced in all the cases, ranging from 12-34%. All cases showed hypokinesia of cardiac muscles but there was no abnormal enhancement on contrast study, confirming non ischaemic nature of the cardiomyopathy.

Table 1: Age Distribution

Age categories (years)	Number	Percentage	Male	Female
20-29	2	40	1	1
30-39	2	40	2	0
40-49	1	10	1	0
More than 50	0	0	0	0
Total	**5**	**100.0**	**4**	**1**

Table 2: Ejection Fraction

Left Ventricular Ejection Fraction (%)	Number	Percentage
50 and above	0	0
41-49	0	0
40 and below	5	100
Total	5	100.0

Table 3: Atrial and Ventricular Cavity Size

	RA Size (mm)	LA Size(mm)	RV Size (mm)	LV Size (mm)
Case 1	32	32	30	55
Case 2	38	36	26	54
Case 3	32	33	27	45
Case 4	38	28	38	47
Case 5	40	43	38	60
Average size	**36**	**34.4**	**31.8**	**52.2**

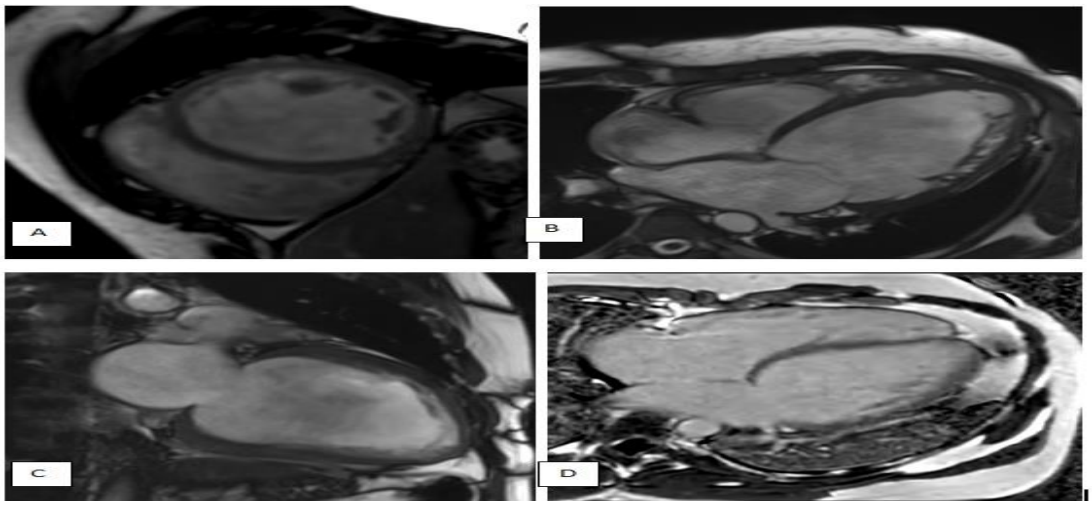

Fig 1:A 26 year old male with Primary Dilated cardiomyopathy. A)2 Chamber CINE TRUFI RETRO Short Axis, B) 4 Chamber CINE TRUFI RETRO Long Axis, C) 2 Chamber CINE TRUFI RETRO Long Axis and D) DE TRUFI High Res PSIR sequences showing moderate cardiomegaly with dilatation of the both atria and ventricles. There was also gross impairment of systolic function(LVEF=12%) with no evidence of delayed myocardial enhancement to represent infarct/ scar in myocardium.

Discussion

In our study, out of 5 patients, 4 were males and 1 was female.

The ages ranged from 26 years to 43 years with 4 out of 5 patients i.e almost 80 percent patients being less than or equal to 40 years.DCM patients show enlargement and reduced systolic function of the LV or both ventricles which is represented by reduced LVEF. They generally have a normal wall thickness. In our study almost all patients showed moderate to grossly dilated ventricles and atria with normal sized LV wall, RV wall and IV septum.Patients of DCM also show Mitral regurgitation (MR) and tricuspid regurgitation (TR) commonly as a result of ventricular enlargement as was noticed in our study where all patients showed regurgitation to some extent. Approx, 60% of the cases in our study also showed moderate to gross level of cardiomegaly.In our study, all 100% of the cases showed LVEF less than 34%, and 3 out of the 5 showed a significantly reduced LVEF of less than 25% signifying that fact that DCM

represents a very important group of heart failure patients as was noted by Jessup et al.[12]In our study, Lack of sub endocardial LGE in a coronary artery territory with no regional wall thinning also pointed out to the Non-ischemic nature of cardiomyopathies as was pointed in a study conducted by Bello et al[10].

Conclusion

In this case series, we have demonstrated MRI appearance of non ischaemic dilated cardiomyopathies which show that cardiac MRI is an indispensable part in the analysis, diagnosis and management of patients of nonischemic dilated cardiomyopathy. Moreover, cardiac MRI is advantageous over the conventional cardiac investigations. It is a non-invasive modality that provides high-resolution imaging that help in comprehensive and meticulous assessment of the myocardial structure, function, tissue characterization in real time via the CINE sequences.

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