Cardiomyopathies as cause of ischemic stroke: a cardiac magnetic resonance imaging study

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Introduction

Cardiomyopathies may be a cause of ischemic stroke in adults currently classified as having strokes of undetermined etiology. Cardiac Magnetic Resonance Imaging (CMR) has diagnostic utility in the assessment of cardiomyopathies that may not be detected by echocardiography.

Aim

We aimed to determine if CMR could be useful to identify previous undiagnosed cardiomyopathies in a cohort of patients with ischemic stroke and to determine the type and frequency of these cardiomyopathies

Methods

We prospectively included a consecutive sample of ischemic stroke patients from 2 university hospitals from October 2016 to February 2018 with standard etiological evaluation. We determine etiology according to the TOAST classification. Patients were further divided in the groups according: cardioembolic etiology (AF), undetermined cause and other determined stroke cause (large or small vessel disease or other stroke mechanism).
Patients with structural changes on echocardiography considered as causal for stroke in TOAST classification were excluded.
A 3-Tesla CMR was performed within 3 months of the index stroke
We compared the frequency of the found cardiomyopathies with reference values for the general population.

Results

One hundred and thirty two patients were included with a mean age of 68.4 years. In 7 patients, CMR identified a cardiomyopathy– frequency of 5.3% 95%CI (2.59-10.54%). Four patients had a hypertrophic cardiomyopathy, 2 restrictive cardiomyopathy and 1 non-compaction cardiomyopathy. Six of these patients had had a diagnosis of undetermined stroke and one of cardioembolic stroke (AF) at hospital discharge (non-compaction). We found a higher frequency of hypertrophic cardiomyopathy in the entire cohort and in the undetermined cause group than in the general population (3.03% and 5.81% versus 0.2% respectively,p=0.001 and p<0.001). The frequency of non-compaction cardiomyopathy was also higher in our cohort (0.76% vs 0.05% respectively, p<0.001).

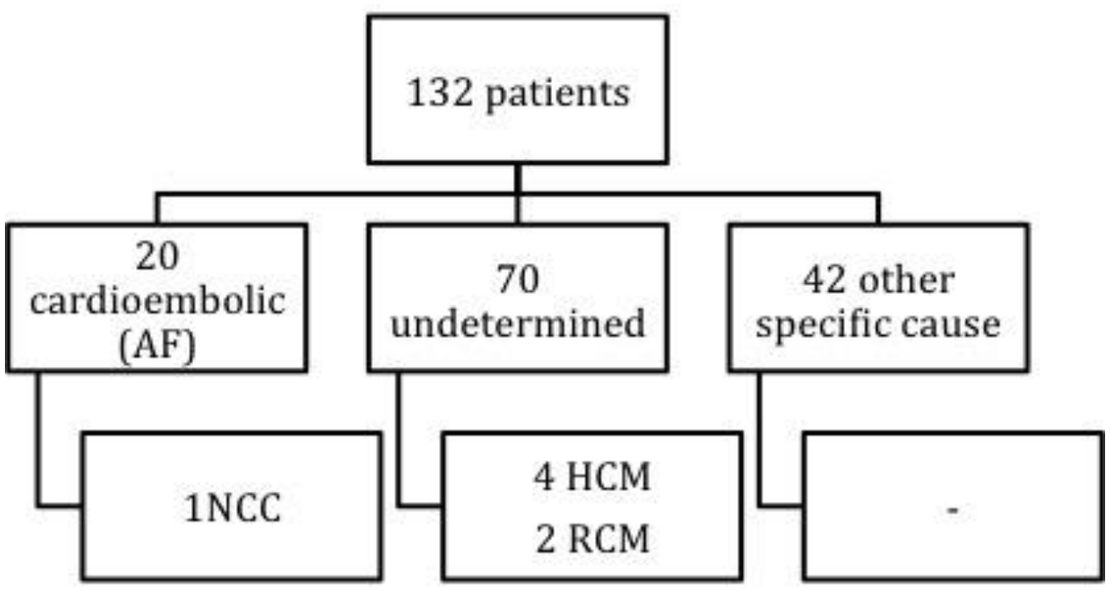

Figure 1 – Distribution of the type of cardiomyopathies among included patients, HCM – Hypertrophic cardiomyopathy, NCC – Noncompaction cardiomyopathy, RCC – restrictive cardiomyopathy

	Cohort (n=132)
Age, y	68.4 (10.8)
Female sex	63 (47.7)
Hypertension	107 (81.1)
Diabetes mellitus	24 (18.2)
Dyslipidemia	64 (48.5)
Previous stroke	22 (16.7)
Admission NIHSS	6 (7)
Stroke etiology after standard evaluation Cardioembolic (AF) Undetermined Other specific cause (large and small vessels disease)	 20 (15.2) 70 (53.0) 42 (31.8)

Table 1- Clinical characteristics of the cohort, age is displayed in mean and standard deviation, admission NIHSS with median and interquartile range, categorical variables are displayed with absolute number and percentage

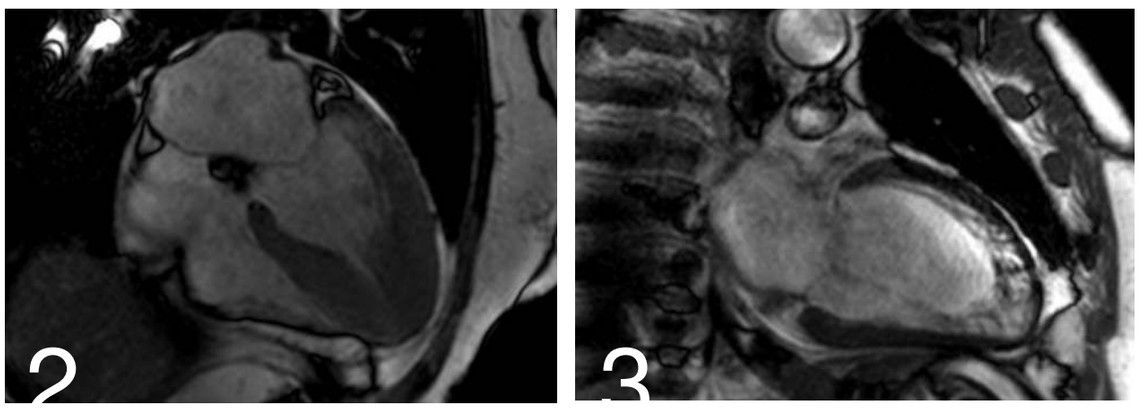

Figure 2 – Systolic image from a cardiac magnetic resonance imaging cine in a 4-chamber plane, depicting an apical hypertrophic cardiomyopathy with hypertrophy of the apical segments and an ace-of-spades morphology,

Figure 3 - Still image from a cardiac magnetic resonance imaging cine in a 2-chamber plane, showing a typical image of noncompaction cardiomyopathy with an outer thin layer of compacted myocardium and an inner thick layer of noncompacted one.

	General population	Our cohort (n=132)	p-value	Undetermined cause group (n=70)	p-value
Hypertrophic	0.2 %	3.03 (1.18-7.53)%	0.001	5.71 (2.24-13.8) %	<0.001
Restritive	UNK	1.52 (0.42-5.36)%		2.86 (0.79 – 9.83) %	
Non-compaction	0.05 %	0.76 (0.13-4.17)%	<0.001	0 (0-5.2)%	0.9

Table 2- Frequency of hypertrophic, amyloid and non-compaction cardiomyopathies and 95% confidence intervals, in the general population, in our cohort and in the undetermined cause group, UNK - unknown

Discussion

Both hypertrophic and amyloid cardiomyopathy could have been the cause of the ischemic stroke in the group of patients with undetermined stroke etiology. These cardiomyopathies can cause ischemic stroke due to atrial fibrillation or by inducing ventricular stasis that favours the formation of a intraventricular thrombus.
Although rare, cardiomyopathies should be considered as a possible cause of ischemic stroke classified as of undetermined etiology after standard evaluation