

Theano Papavassiliu MD ^{1,2}, Raphael Sandberg¹, Rainer Schimpf MD ^{1,2}, Stefan O. Schoenberg MD ³, Martin Borggreffe MD ^{1,2}, Christina Doesch MD ^{1,2}

1st Department of Medicine Cardiology, University Medical Center Mannheim
DZHK (German Center for Cardiovascular Research), partner site Mannheim, Germany
Institute of Clinical Radiology and Nuclear Medicine, University Medical Center Mannheim

Background:

Hypertrophic cardiomyopathy (HCM) is a complex genetic heart disease. Thromboembolic complications and stroke are known complications in HCM.

Objectives:

We sought to assess the clinical and cardiovascular magnetic resonance (CMR) characteristics of patients with HCM suffering from thromboembolic events and analyzed the predictors of these unfavorable outcomes.

Methods:

A total of 121 consecutive patients with HCM were enrolled and underwent late gadolinium enhanced (LGE) CMR.

Results:

During the follow-up of 5.5 ± 3.3 years, the clinical endpoint of systemic embolism, ischemic stroke or transient ischemic attack occurred in 15 (12%). Of the 15 patients with thromboembolic events, 7 (47%) were women. The incidence of severe symptoms (NYHA III/IV) (13 [87%] vs 47 [44%], $p=0.002$) as well as atrial fibrillation (10 [67%] vs 37 [35%], $p=0.02$) was more prevalent and the CHA₂DS₂-VASc (3.1±1.6 vs 2.4±1.0, $p=0.03$) higher in patients with HCM suffering from thromboembolic complications. Among patients who suffered from a thromboembolic endpoint, septal MAPSE was significantly lower (0.7 ± 0.2 vs 1.0 ± 0.4 , $p=0.002$), the minimal left atrial (LA) volume was significantly elevated (100.1 ± 51.1 vs 65.3 ± 58.5 , $p=0.03$) and the LA ejection fraction was significantly reduced ($26.0 \pm 15.8\%$ vs $38.2 \pm 15.5\%$, $p=0.005$). The other CMR parameter (left and right ventricular ejection fraction, volumes and dimensions as well as the extent of fibrosis determined by LGE) were not significantly different between patients with thromboembolic events and event-free patients. Univariate analysis revealed only for septal MAPSE (RR 0.11 [0.01-0.91], $p=0.04$) a statistically significant relationship with the clinical endpoint.

Conclusions:

Thromboembolic complications showed a prevalence of 12%. These complications were more common in women, patients with atrial fibrillation and more severe symptoms as well as in those patients with HCM and a higher CHA₂DS₂-VASc score. Furthermore, the thromboembolic endpoint occurred significantly more often in patients with a lower LA ejection fraction, a higher LA minimal volume and a reduced septal MAPSE. Septal MAPSE was the only significant risk factor for thromboembolic complications in patients with HCM and might therefore be an important early risk marker.

Results: Study population

	With stroke N=15	Without stroke n=106	P-value
Age	61±10	56±15	0.18
Female gender	7 (47%)	37 (35%)	0.4
LVOT obstruction (gradient ≥30mmHg)	6 (40%)	29 (27%)	0.3
Atrial fibrillation	10 (67%)	37 (35%)	0.02
Severe Symptoms NYHA III/IV	13 (87%)	47 (44%)	0.002
CHA ₂ DS ₂ -VASC-Score	3.1±1.6	2.4±1.0	0.03

CMR characteristics

	With stroke N=15	Without stroke n=106	P-value
LVEF (%)	58±10	60±11	0.4
LV-EDVI (ml/m ²)	79±28	66±34	0.2
RVEF (%)	58±10	63±10	0.1
RV-EDVI (ml/m ²)	73±14	68±23	0.5
LA ejection fraction (%)	26±16	38±16	0.01
Septal MAPSE	0.7±0.2	1.0±0.4	0.002
Lateral MAPSE	0.9±0.2	1.1±0.4	0.1
Extent of fibrosis (% of LV mass)	12±14	13±15	0.8

Univariate analysis

	Odds Ratio (95% CI)	P-Value
Atrial fibrillation	1.054 (0.248-4.486)	0.9
Severe Symptoms NYHA III/IV	0.331 (0.061-1.804)	0.2
CHA ₂ DS ₂ -VASC-Score > median 2	0.911 (0.237-3.498)	0.9
LA ejection fraction (%) ≤ median 38.6	0.555 (0.123-2.500)	0.4
Septal MAPSE ≤ median 0.98	0.114 (0.014-0.909)	0.04

CMR determined MAPSE

