Right bundle branch block and male sex may help predict appropriate ICD therapies in patients with non-ischemic dilated cardiomyopathy and a prophylactic implantable cardioverter defibrillator

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Background: Previous studies have shown that prophylactic implantable cardioverter-defibrillators (ICD) in patients with symptomatic severe systolic dysfunction reduce all-cause mortality. However, their benefit in patients with severe systolic dysfunction of non-ischemic origin is not so clear, and is currently under debate.

Methods/Aim: We retrospectively reviewed all consecutive patients with nonischemic dilated cardiomyopathy (NICM) who underwent prophylactic ICD implantation between 2008 and 2020 in two tertiary centers. Our main goal was to identify predictors of appropriate ICD therapies (ATP and/or shocks) in this cohort of patients.

Results: A total of 224 patients were included, median age 62.7 years, 73.7% men. During a median follow-up of 51 months, 61 patients (27.2%) required appropriate ICD intervention, 7 patients (3.1%) presented inappropriate shocks and 11 (4.9%) had device infection.

Patients that received appropriate ICD therapies, as compared to those who did not, were more frequently men (86.9% vs 68.7%, p=0.006) and were signifi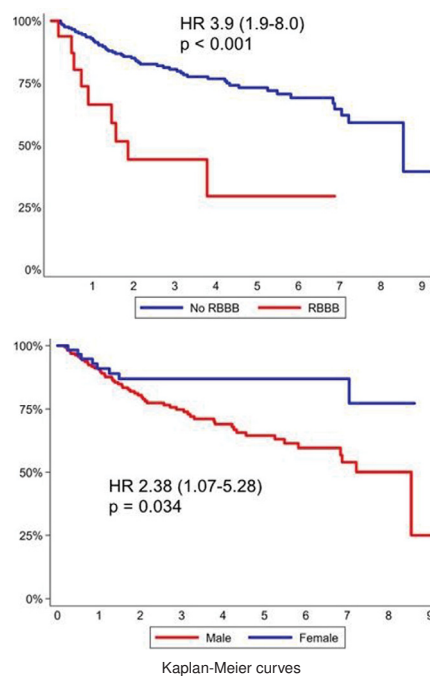cantly younger (median age 58.7 years, IQR 53.0–64.8 vs 63.7, IQR 57.0–69.8; p=0.02). Left ventricular end diastolic volume (LV-EDV) and left ventricular end systolic volume (LV-ESV) were both significantly higher in this subgroup of patients (median LVEDV 100 ml/m^2 vs 86, p=0.0106; median LVESV 72.2 ml/m^2 vs 60.9, p=0.0467). A trend towards lower LVEF was also noted, but it did not reach statistical significance (26% vs 29%, p=0.077). Regarding ECG previous to implant, patients that required ICD intervention presented more frequently complete right bundle branch block (RBBB) (14.8% vs 4.3%, p=0.007). On the other hand, left bundle branch block (LBBB) was more frequent in those patients who did not receive ICD intervention during follow-up (47.2% vs 26.2%, p=0.005). Table 1 summarizes baseline characteristics and results.

In a multivariate Cox regression analysis, RBBB (HR 3.9, CI 95% 1.9–8.0, p<0.001) and male sex (HR 2.38, CI 95% 1.07–5.28, p=0.034) were identified as independent predictors of appropriate ICD therapies (Figure 2).

Conclusion: RBBB and male sex may help identify patients with NICM at high-risk of ventricular arrhythmias requiring ICD intervention.

	Total (n=224)	No therapies (n=163)	Appropriate therapies (n=61)	p
Age, years (median, IQR)	62.7 (55.1-69.0)	63.7 (57.0-69.8)	58.7 (53.0-64.8)	**0.0204**
Male sex, n (%)	165 (73.7%)	112 (68.7%)	53 (86.9%)	**0.006**
NYHA class, n (%)				0.7961
I	20 (9.1%)	17 (10.7%)	3 (4.9%)	
II-III-IV	195 (88.7%)	138 (86.8%)	57 (93.4%)	
IV	5 (2.3%)	4 (2.5%)	1 (1.6%)	
NT-proBNP, pg/ml, median (IQR)	1421.5 (503-4586)	1396 (501-4755)	1465 (515-4586)	0.9526
ECG - Rhythm				0.9131
Sinus rhythm, n (%)	143 (64.7%)	108 (66.7%)	35 (59,3%)	
Atrial fibrillation, n (%)	64 (29.0%)	41 (25.3%)	23 (39.0%)	
Ventricular pacing, n (%)	14 (6.3%)	13 (8.0%)	1 (1.7%)	
QRS width (mseg), median (IQR)	133.5 (100-160)	137 (100-160)	130 (97-160)	0.6750
ECG - Conduction disturbance				
LBBB, n (%)	93 (47.7%)	77 (47.2%)	16 (26.2%)	**0.005**
RBBB, n (%)	16 (8.2%)	7 (4.3%)	9 (14.8%)	**0.007**
IVCD, n (%)	23 (11.8%)	17 (10.4%)	6 (9.8%)	0.896
None, n (%)	62 (31.8%)	40 (24.5%)	22 (36.1%)	0.086
Echocardiogram at baseline				
LVEF (%) (median, IQR)	28 (22-31.9)	29 (24.2-32.0)	26 (20-30)	0.0770
LV-EDV, ml/m2 (median, IQR)	90.9 (72.6-113.5)	86.0 (71.3-110)	100 (90-116.8)	**0.0106**
LV-ESV, ml/m2 (median, IQR)	65.2 (49.5-84.7)	60.9 (47.4-80.5)	72.2 (58.9-87.4)	**0.0467**
Moderate/severe mitral regurgitation, n (%)	81 (36.2%)	61 (37.4%)	20 (32.8%)	0.520
Type of cardiomyopathy				0.9199
Familial, n (%)	14 (6.4%)	10 (6.3%)	4 (6.7%)	
Alcoholic, n (%)	32 (14.6%)	21 (13.1%)	11 (18.3%)	
Valvular, n (%)	9 (4.1%)	6 (3.8%)	3 (5.0%)	
Hypertensive, n (%)	3 (1.4%)	3 (1.9%)	0 (0%)	
Idiopathic, n (%)	133 (60.5%)	98 (61.3%)	35 (58.3%)	
Others	29 (13.0%)	22 (13.6%)	7 (11.6%)	
Heart failure medications				
ACE inhibitors, n (%)	196 (88.3%)	143 (88.8%)	53 (86.9%)	0.689
Betablockers, n (%)	207 (92.8%)	153 (94.4%)	54 (88.5%)	0.127
Mineralocorticoid-receptor antagonist, n (%)	160 (71.8%)	119 (73.5%)	41 (67.2%)	0.356
Sacubitril/Valsartan, n (%)	17 (7.7%)	15 (9.3%)	2 (3.3%)	0.131
Antiarrythmic drug, n (%)	24 (10.8%)	18 (11.1%)	6 (9.8%)	0.784
Type of device implanted				
Single-chamber ICD, n (%)	98 (43.8%)	70 (42.9%)	28 (45.9%)	0.655
Dual-chamber ICD, n (%)	10 (4.5%)	7 (4.3%)	3 (4.9%)	0.924
ICD-TRC, n (%)	116 (51.8%)	86 (52.8%)	30 (49.2%)	0.657

Baseline characteristics and results

HR 3.9 (1.9-8.0)
p < 0.001

No RBBB   RBBB

HR 2.38 (1.07-5.28)
p = 0.034

Male   Female

Kaplan-Meier curves