

Article

Influence of Heart Rate on Left and Right Ventricular Longitudinal Strain in Patients with Chronic Heart Failure

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Supplementary Material

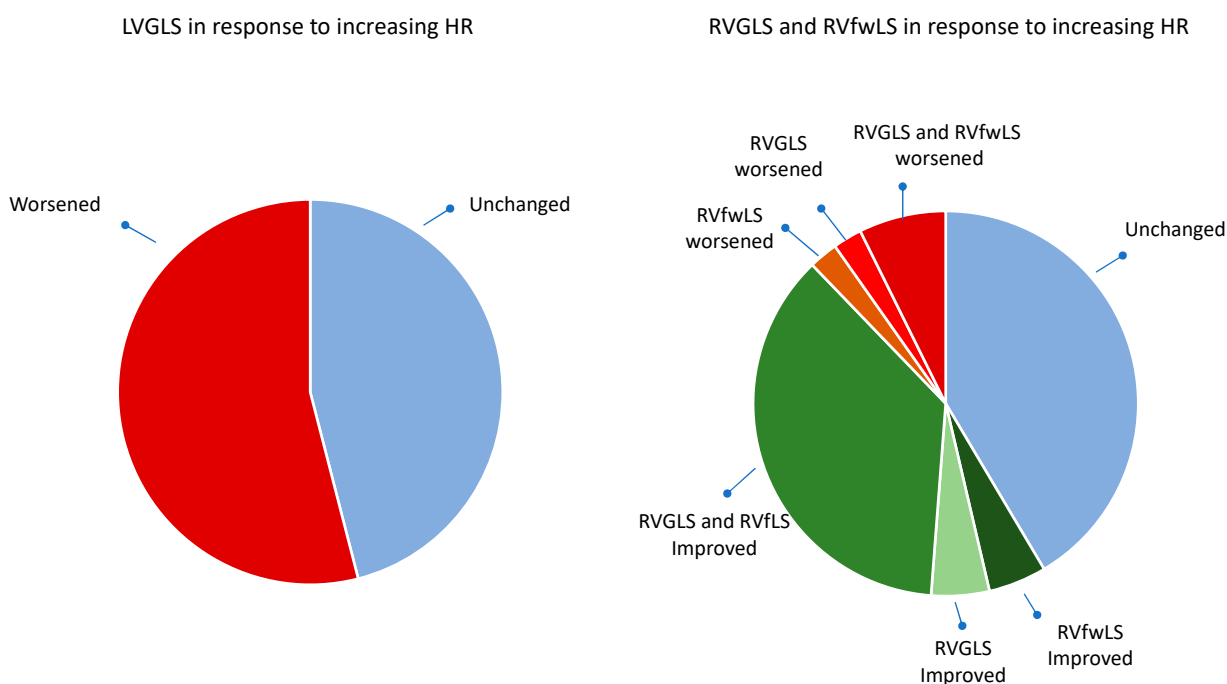


Figure S1. Overall changes in LVGLS (panel A) and RVGLS and RVfWLS (panel B) in response to increasing HR.

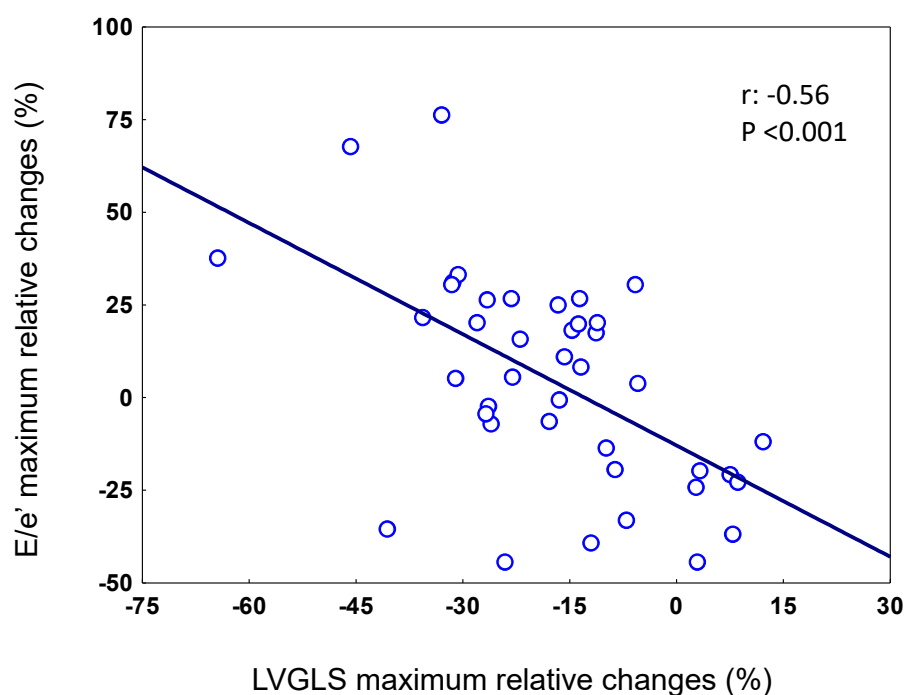


Figure S2. Linear correlation between the maximum E/e' ratios and maximum LVGLS in response to changes in HR.

Table S1. Clinical characteristics of participants in the groups carrying implantable cardioverter defibrillator, implantable cardioverter defibrillator and cardiac resynchronization therapy and a pacemaker.

	ICD	CRT	PM	<i>p</i>
n	21	17	7	
Age (years)	60 ± 12	69 ± 14*	75 ± 7*	0.016
Male, n (%)	17 (81%)	15 (88%)	4 (57%)	0.221
BMI (kg/m²)	24 ± 5	24 ± 4	23 ± 4	0.812
Ischemic cardiomyopathy, n (%)	10 (48%)	6 (35%)	3 (43%)	0.746
Arterial hypertension, n (%)	9 (43%)	15 (88%)	5 (71%)*	0.013
Diabetes mellitus, n (%)	4 (19%)	5 (29%)	4 (57%)	0.156
Dyslipidemia, n (%)	14 (67%)	11 (65%)	7 (100%)	0.071
CHF, n (%)	16 (100%)	17 (100%)	1 (14%)*†	<0.001
SAP (mmHg)	110 ± 15	121 ± 25	123 ± 23	0.179
Heart rate (bpm)	67 ± 7	66 ± 7	64 ± 5	0.421
LVEF≤40%, n (%)	19 (90%)	12 (71%)	0 (0%)	<0.001
NYHA class, n (%)				
I	0 (0%)	0 (0%)	7 (100%)	<0.001
II	11 (52%)	10 (59%)	0 (0%)	
III	10 (48%)	7 (41%)	0 (0%)	
GFR-EPI (ml/min/1.73 m²)	88 ± 15	76 ± 8	71 ± 28	0.054
Therapy				
ACEi/ARBs, n (%)	11 (52%)	7 (41%)	4 (50%)	0.847
ARNI, n (%)	6 (29%)	6 (35%)	0 (0%)	0.705
Beta-blockers, n (%)	21 (100%)	15 (88%)	6 (86%)	0.239
MRA, n (%)	15 (71%)	11 (65%)	1 (14%)*†	0.024
Loop diuretics, n (%)	17 (81%)	14 (82%)	1 (14%)*†	0.001

* $p < 0.05$ at post-hoc analysis vs. ICD. † $p < 0.05$ at post-hoc analysis vs. CRT. ACEi, inhibitors of angiotensinogen converting enzyme; ARB, angiotensin II receptor blockers; ARNI, angiotensin receptor neprilysin blockers; BMI, body mass index; MRA, mineralocorticoid receptor antagonists. CRT: patients carrying implantable cardioverter defibrillator and cardiac resynchronization therapy; ICD: patients carrying implantable cardioverter defibrillator; PM: patients carrying pacemaker.

Table S2. Echocardiographic characteristics of the in the groups carrying implantable cardioverter defibrillator, implantable cardioverter defibrillator and cardiac resynchronization therapy and a pacemaker.

	ICD	CRT	PM	p
n	21	17	7	
LVEDV (mL)	205 ± 98	177 ± 64	89 ± 23*†	0.007
LVESV (mL)	151 ± 83	120 ± 56	36 ± 13*†	0.002
LVEF (%)	29 ± 7	35 ± 9	60 ± 7*†	<0.001
LVGLS (%)	-8.9 ± 2.8	-9.4 ± 3.7	-15.6 ± 3.7*†	<0.001
LV Tei index	0.74 ± 0.18	0.58 ± 0.23	0.51 ± 0.25*	0.024
CI (L/min/m²)	1.9 ± 0.5	2.3 ± 0.5	2.8 ± 0.5*†	0.010
LVMI (g/m²)	158 ± 45	168 ± 31	119 ± 26*†	0.021
LAVi (mL)	42 ± 19	45 ± 19	23 ± 9*†	0.031
Septal e' (cm/sec)	4.8 ± 1.5	4.9 ± 1.2	5.9 ± 1.43	0.157
Lateral e' (cm/sec)	6.4 ± 2.8	7.3 ± 3.1	7.5 ± 2.2	0.511
E/e' ratio	13.7 ± 7.3	13.0 ± 5.2	11.8 ± 2.8	0.375
MR (a.u.)	2.0 ± 0.9	2.1 ± 0.9	1.7 ± 0.9	0.606
TAPSE (mm)	18.6 ± 2.9	17.7 ± 3.3	22.3 ± 3.2*†	0.002
RVGLS (%)	-14.8 ± 2.8	-14.1 ± 3.7	-20.7 ± 2.2*†	<0.001
RVfwLS (%)	-19.9 ± 4.4	-19.9 ± 5.8	-26.3 ± 2.7*†	0.009
CVP (mmHg)	6.7 ± 3.4	6.2 ± 2.8	5 ± 0	0.505
PASP (mmHg)	35 ± 13	34 ± 11	42 ± 15	0.487
TR (a.u.)	1.8 ± 1.1	1.8 ± 1.0	1.9 ± 1.1	0.994

* $p < 0.05$ at post-hoc analysis vs. ICD. † $p < 0.05$ at post-hoc analysis vs. CRT. CI, cardiac index; CRT: patients carrying implantable cardioverter defibrillator and cardiac resynchronization therapy; CVP, central venous pressure; e' s, early septal mitral diastolic velocity at tissue Doppler imaging; e' s, early lateral mitral diastolic velocity at tissue Doppler imaging; E/e', ratio between early pulsed Doppler diastolic mitral velocity and the mean value of e's and e' l; ICD: patients carrying implantable cardioverter defibrillator; LAVi, indexed left atrial volume; LVEDV, left ventricular end-diastolic volume; LVESV, left ventricular end-systolic volume; LVEF, left ventricular ejection fraction; LVGLS, left ventricular global longitudinal strain; LV Tei index, left ventricular Tei index; MR, mitral regurgitation; MRA, mineralocorticoid receptor antagonists; PM: patients carrying pacemaker; SV, stroke volume; LVMI, indexed left ventricular mass; PASP, pulmonary pressure systolic peak; RVfwLS, right ventricular free wall longitudinal strain; RVGLS, right ventricular global longitudinal strain; TAPSE, peak of systolic excursion of the tricuspid annulus; TR, tricuspid regurgitation.