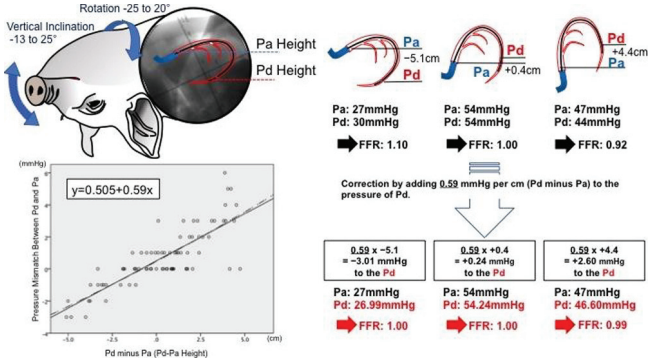
trast medium. Then, FFR was measured during stable adenosine triphosphate-induced hyperemia in each position, achieved by intravenous administration of 150 μg/kg/min.

Results: Due to various rotations with/without vertical inclination of the experimental bed, variations in Pd-Pa Height ranged from -5.1 cm to 4.5 cm. Mean FFR value was 0.95±0.03 in Pd>Pa positions (Pd was higher than Pa; 0 to 4.5 cm), and 1.01±0.03 in Pa>Pd positions (-5.1 to 0 cm) with a significant difference ($p<0.001$). Liner regression analyses revealed significant correlations between Pd-Pa Height and FFR values ($r=0.907$, $p<0.001$), and between Pd-Pa Height and the pressure mismatch (between Pd and Pa values) ($r=0.813$, $p<0.001$, Figure). A significant relationship between Pd-Pa Heights and FFR values did not differ in the analysis of LAD ($r=0.804$, $p<0.001$), LCx ($r=0.534$, $p=0.019$), or RCA ($r=0.893$, $p<0.001$) respectively. Theoretically, adding 0.59 mmHg per cm (Pd minus Pa) to the Pd, should correct the influence of physically expectable hydrostatic pressure. In the actual three example cases (in the Figure), corrected FFR were all around the value of 1.00 in these healthy coronary arteries.



Conclusion: Hydrostatic pressure variations resulting from Pd-Pa Height influence FFR values. It may affect their interpretation during FFR assessment. In the clinical setting, the Pd-Pa Height can be documented in a straight lateral 90° left anterior oblique (LAO) view for each lesion and patient position, it is appropriate to make corrections using present results for accurate evaluation of FFR.

HEART FAILURE WITH MID-RANGE EJECTION FRACTION: THE CONTROVERSY CONTINUES

2455
Predictive value of diastolic dysfunction severity on long-term survival in heart failure patients with mid-range or reduced left ventricular ejection fraction

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Background: Evaluation of diastolic function could provide additional prognostic information in heart failure (HF) patients with reduced left ventricular (HFrEF).

Purpose: Present study evaluated the prognostic performance of diastolic dysfunction (DD), defined as the presence of at least one of the 3 diastolic indices: ratio between mitral inflow early velocity and tissue-Doppler mitral annular early velocity (septal E/E'>14), left atrial volume index (LAVi>34 ml/m^2), and tricuspid regurgitation peak velocity (TRVmax>2.8m/s), on the long-term survival of heart failure patients with mid-range (HFmrEF) or HFrEF.

Methods: 471 HF patients with LVEF<50% (aged 65±13years, 78.3% male) admitted to our hospital between 2011 and 2017, were included. Patients were divided into HFmrEF (LVEF 41–49%, n=186), and HFrEF (LVEF ≤40%, n=285) groups. All patients were clinically followed up for a median of 46 (IQR 34–63) months. Primary endpoint was defined as all-cause death or heart transplantation (HTx).

Results: Patient clinical characteristics including age, sex, NYHA class, kidney dysfunction, and cardiovascular risk factors were similar between groups. The proportion of ischemic HF was significantly higher in HFmrEF group than in HFrEF group (68.3% vs. 55.4%, P=0.005). 125 (26.5%) patients died and 4 (0.8%) patients underwent HTx during follow-up. Overall survival was similar between groups (75.8% in HFmrEF vs. 70.5% in HFrEF, P=0.183).

Septal E/E' was an independent determinant of all-cause death in HFrEF group (septal E/E'>14 was associated with 2-fold increased risk of all-cause mortality as compared to septal E/E≤14; HR 2.13, P=0.009; all-cause mortality 36.7% vs. 15.5%, P=0.001), but not in HFmrEF group (all-cause mortality 28.7% vs. 19.6%, P=0.169).

LAVi was another independent determinant of all-cause death in HFmrEF group (LAVi >34ml/m^2 was associated with 2-fold increased risk of all-cause mortality; HR 2.13, P=0.016; all-cause mortality 33.0% vs. 16.3%, P=0.006), but not in HFrEF group (all-cause mortality 31.4% vs. 26.0%, P=0.355).

After adjusted for age and sex, TRVmax>2.8m/s remained an independent predictor of all-cause death in HFmrEF group (HR 2.42, P=0.004; all-cause mortality 41.6% vs. 15.9%, P<0.001), but not in HFrEF group.

Patients were further defined as mild DD (none or 1 predictor positive), moderate DD (2 positive), and severe DD (3 positive). Moderate and severe DD were associated with significantly higher all-cause mortality both in HFmrEF (mild 13.8%, moderate 39.1%, severe 38.7%, P<0.001) and HFrEF (mild 18.2%, moderate 38.0%, severe 37.5%, P=0.002) groups as compared to mild DD.

Conclusions: Moderate to severe DD is associated with worse outcome in both HFrEF and HFmrEF patients. Septal E/E' ratio is an independent determinant of all-cause mortality in patients with HFrEF. Increased LAVi and TRVmax are associated with increased all-cause mortality in patients with HFmrEF.

2456
Functional behavior of heart failure with mid-range ejection fraction assessed by stress echocardiography and cardiopulmonary exercise test: truly distinctive phenotype o simply mid-way entity?

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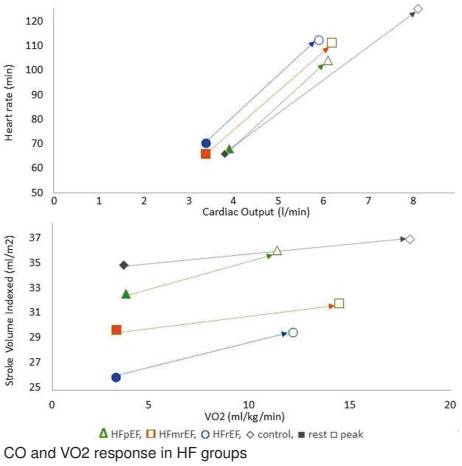
Background: Latest ESC heart failure (HF) guidelines, reinforced the paradigm of an ejection fraction (EF)-based classification for HF, introducing in between HF with preserved (EF >50%) and reduced (EF <40%), the mid-range EF class (HFmrEF; EF 40–49%).

Purpose: We aimed to characterize HFmrEF patients, evaluating left ventricle (LV) remodeling and hemodynamic response to exercise, in comparison to HFrEF and HFpEF groups.

Methods: We performed combined exercise stress echo and cardiopulmonary test in 179 HF patients, divided in 3 cohorts: 31 HFpEF (76 yy, M 23%), 34 HFmrEF (68 yy, M 73%), 114 HFrEF (age 66 yy, M 75%).

Results: LV progressed from the concentric phenotype of HFpEF group toward the eccentric hypertrophy in HFmrEF and HFrEF patients. All patients showed some degree of functional impairment, with cardiac output (CO) overlap, regardless EF. In HFpEF, chronotropic incompetence accounted primarily for the inade-



CO and VO2 response in HF groups

Abstract 2456 – Table 1

Variable	HFrEF		HFmrEF		HFpEF		p value	
	rest	peak	rest	peak	rest	peak	rest	peak
Left ventricle mass indexed (gr/m^2)	130.5 (107.7–147.4)§		116.4 (104.1–143.5)		106.1 (79.4–132.4)		0.003	
Relative wall thickness	0.30 (0.26–0.33)$^{\#\S}$		0.34 (0.30–0.37)*		0.44 (0.42–0.54)		<0.001	
Ejection Fraction (%)	30 (25–35)$^{\#\S}$	31 (27–38)$^{\#\S}$	43 (42–44)*	45 (39–49)*	63 (56–70)	69 (59–75)	<0.001	<0.001
Stroke volume indexed (ml/m^2)	25.9 (20.6–32.4)§	29.6 (22.1–35.5)§	29.8 (21.5–34.1)	31.9 (25.6–38.5)	32.7 (26.7–35.5)	36.2 (28.8–44.3)	0.009	0.01
Cardiac output (ml/min)	3.4 (2.6–4.0)	5.9 (4.1–7.4)	3.4 (2.4–4.0)	6.2 (5.0–7.1)	3.9 (3.1–4.6)	6.1 (4.4–7.4)	0.11	0.64
Peak oxygen consumption (ml/kg/min)		12.2 (9.4–15.3)$^{\#}$		14.5 (11.0–16.7)*		11.4 (9.5–13.1)		0.02
Peripheral O2 extraction	93.84 (76.7–113.1)§	160.5 (120.8–200.2)	83.7 (61.5–96.5)	159.89 (120.2–202.0)	63.68 (58.5–88.7)	143.61 (101.6–183.8)	0.02	0.35
Stroke volume indexeded, Δ rest-to-peak (ml)		2.94 (0.02–5.79)		4.20 (1.70–6.53)		3.03 (1.18–4.15)		0.42
Heart rate, Δ rest-to-peak (min)		37 (28–53)§		47 (30–55)*		28 (20–41)		0.02

p≤0.05: $^{\#}$HFrEF vs HFmrEF, §HFrEF vs HFpEF, *HFmrEF vs HFpEF.