

Supplementary Table S1. Baseline characteristics of patients with Ipc-PH and Cpc-PH.

Variables	Ipc-PH (n=37)	Cpc-PH (n=105)	<i>P</i> value*
Age (years)	51±15	50±14	0.622
Male, n (%)	31 (83.8)	85 (81.0)	0.702
Body mass index (kg/m ²)	23.01 (20.66, 25.95)	24.16 (20.13, 25.99)	0.279
Heart rate (beats/min)	78±16	81±14	0.288
Systolic blood pressure (mmHg)	112±19.86	108±16	0.319
Diastolic blood pressure (mmHg)	73±12	72±12	0.688
NYHA functional class, n (%)			0.010
II	11 (29.8)	10 (9.5)	
III	14 (37.8)	44 (41.9)	
IV	12 (32.4)	51 (48.6)	
Medical history			
Current smoker, n (%)	13 (35.1)	25 (23.8)	0.181
Coronary artery disease, n (%)	11 (29.7)	31 (29.5)	0.981
Arterial hypertension, n (%)	5 (13.5)	8 (7.6)	0.285
Cardiomyopathy, n (%)	24 (64.9)	72 (68.6)	0.679
Atrial fibrillation, n (%)	8 (21.6)	22 (21.0)	0.932
Diabetes, n (%)	7 (18.9)	20 (19.0)	0.986
Hyperlipidemia, n (%)	12 (32.4)	11 (10.5)	0.002
Cerebrovascular disease, n (%)	2 (5.4)	4 (3.8)	0.678
Renal insufficiency, n (%)	7 (18.9)	22 (21.0)	0.792
Liver insufficiency, n (%)	1 (2.7)	2 (1.9)	0.772

Hyperuricemia, n (%)	3 (8.1)	10 (9.5)	0.797
Laboratory tests			
Creatinine (μmol/L)	89.16 (71.18, 104.2)	90.49 (78.18, 105.7)	0.805
eGFR (ml/min/1.73 m ²)	79.94 (65.48, 96.36)	81.97 (64.87, 96.14)	0.847
Blood urea nitrogen (mmol/L)	7.15±2.33	7.97±2.64	0.097
Uric acid (mmol/L)	441.15±137.15	454.02±129.63	0.610
Triglyceride (mmol/L)	1.64±1.03	1.35±0.68	0.114
Cholesterol (mmol/L)	4.39±1.18	4.37±2.32	0.965
HDL-C (mmol/L)	1.29±1.47	0.97±0.32	0.189
LDL-C (mmol/L)	2.61±0.83	2.47±0.76	0.322
Glucose (mmol/L)	5.93±2.7	5.31±1.37	0.076
NT-proBNP (fmol/mL)	2279.2 (1080.0, 3743.1)	3539.6 (2171.9, 4673.6)	0.097
HbA1c (%)	6.0 (5.8, 7.5)	6.35 (5.93, 6.90)	0.778
Albumin (g/L)	38.7±4.89	39.4±5.83	0.517
Echocardiography			
Left atrial anteroposterior diameter (mm)	46.46±12.48	49.28±8.24	0.207
Left ventricular end diastolic diameter (mm)	62.57±13.58	68.16±12.1	0.021
Right ventricular anteroposterior diameter (mm)	25.31±8.1	27.11±7.5	0.237
Left ventricular ejection fraction (%)	37.11±17.02	33.24±14.4	0.222
Pericardial effusion, n (%)	5 (13.5)	13 (12.4)	0.845
Hemodynamics			
mRAP (mmHg)	11.35±5.82	10.06±6.47	0.325

RVSP (mmHg)	42.11±11.06	56.24±16.91	0.002
RVEDP (mmHg)	11.89±7.23	10.89±7.98	0.648
sPAP (mmHg)	43.03±8.73	59.05±15.66	<0.001
dPAP (mmHg)	22.78±4.8	30.16±8.48	<0.001
mPAP (mmHg)	30±5.79	40.51±10.25	<0.001
PAWP (mmHg)	24±5.86	23.65±6.26	0.765
PVR (WU)	1.31±0.52	5.12±2.58	<0.001
TPR (WU)	5.61±4.14	4.01±3.49	0.054
SVR (WU)	17.47±4.10	23.48±7.13	<0.001
Cardiac index (L/min/m ²)	2.53±0.71	1.97±0.55	<0.001
SvO ₂ (%)	68.78±5.61	65.94±7.95	0.287
Treatments			
ACEI/ARB/ARNI, n (%)	23 (62.2)	57 (54.3)	0.406
Beta blocker, n (%)	30 (81.1)	92 (87.6)	0.326
Diuretics, n (%)	29 (78.4)	99 (94.3)	0.005
MRA, n (%)	27 (73.0)	96 (91.4)	0.005
Lipid-lowering agents, n (%)	12 (32.4)	27 (25.7)	0.431
Antidiabetic drugs, n (%)	5 (13.5)	19 (18.1)	0.523
Insulin resistance indices			
METS-IR	39.62±9.64	38.52±8.94	0.529
TG/HDL	3.7±2.55	3.55±2.07	0.730
TyG	8.74±0.69	8.53±0.55	0.086
TyG-BMI	216.34±41.63	203.88±44.86	0.141

*Comparison between Ipc-PH and Cpc-PH.

Ipc-PH: Isolated post-capillary pulmonary hypertension; Cpc-PH: Combined post- and pre-capillary pulmonary hypertension; PVR: pulmonary vascular resistance; TPR: total pulmonary resistance; SVR: systemic vascular resistance.

Other abbreviations as in Table 1.

Supplementary Table S2. Comparison of hemodynamics and insulin resistance surrogates between patients with HFrEF-PH and HFpEF-PH.

Variables	HFrEF-PH (n=117)	HFpEF-PH (n=25)	<i>P</i> value*
Hemodynamics			
mRAP (mmHg)	9.55±6.11	14.09±6.05	0.002
RVSP (mmHg)	53.3±17.66	49.6±15.23	0.414
RVEDP (mmHg)	9.74±9.02	13.08±5.21	0.089
sPAP (mmHg)	55.85±15.81	50.32±15.37	0.113
dPAP (mmHg)	28.83±8.33	25.48±7.97	0.068
mPAP (mmHg)	38.4±10.4	34.84±9.94	0.119
PAWP (mmHg)	23.94±6	22.8±6.81	0.401
PVR (WU)	4.41±2.8	2.76±2.38	0.007
TPR (WU)	4.54±3.85	7.84±3.69	<0.001
SVR (WU)	22.89±7.14	18.02±4.70	0.002
Cardiac index (L/min/m ²)	2.01±0.61	2.61±0.56	<0.001
SvO ₂ (%)	66.32±5.41	67.27±7.88	0.744
Insulin resistance indices			
METS-IR	39.08±9.02	37.52±9.6	0.441
TG/HDL	3.62±2	3.45±3	0.725
TyG	8.56±0.58	8.68±0.67	0.365
TyG-BMI	206.61±45.18	209.57±40.28	0.762

* Comparison between HFrEF-PH and HFpEF-PH.

HFrEF: Heart failure with reduced ejection fraction; HFpEF: Heart failure with preserved ejection fraction; Other abbreviations as in Table 1 and Supplementary Table S1.

Supplementary Table S3. Comparison of insulin resistance surrogates in different HF etiology groups.

HF due to coronary artery disease			
	Non-PH (n=81)	PH-HF (n=42)	<i>P</i> value[*]
METS-IR	34.75±6.52	37.99±8.59	0.021
TG/HDL	4.17±4.07	3.61±2.75	0.426
TyG	8.74±0.67	8.61±0.58	0.285
TyG-BMI	194.76±28.38	206.25±37.56	0.086
HF due to other etiologies			
	Non-PH (n=6)	PH-HF (n=100)	<i>P</i> value[*]
METS-IR	31.36±8.99	39.14±9.34	0.050
TG/HDL	3.07±2.01	3.58±1.94	0.527
TyG	8.58±0.60	8.57±0.60	0.973
TyG-BMI	177.84±45.39	207.50±46.93	0.135

* Comparison between Non-PH and PH-HF.

Abbreviations as in Table 1.

Supplementary Table S4. Univariate Logistic analysis of insulin resistance surrogates in patients with HF due to coronary artery disease

HF due to coronary artery disease		
	OR (95% CI)	<i>P</i> value
METS-IR	1.061 (1.007-1.119)	0.027
TG/HDL	0.955 (0.853-1.070)	0.427
TyG	0.719 (0.394-1.313)	0.283
TyG-BMI	1.011 (0.999-1.023)	0.063

Abbreviations as in Table 1.

Supplementary Table S5. Correlation analysis between insulin resistance surrogates and established clinical markers in patients with PH-HF.

	METS-IR	TG/HDL	TyG	TyG-BMI
WHO-FC	0.100 (p=0.238)	0.017 (p=0.844)	-0.140 (p=0.096)	-0.023 (p=0.784)
ln(NT-proBNP)	-0.110 (p=0.225)	-0.172 (p=0.056)	-0.325 (p<0.001)	-0.267 (p=0.003)
RAP (mmHg)	0.152 (p=0.089)	0.012 (p=0.893)	0.087 (p=0.334)	0.189 (p=0.034)
mPAP (mmHg)	0.037 (p=0.664)	-0.022 (p=0.792)	-0.044 (p=0.603)	0.026 (p=0.756)
PAWP (mmHg)	0.076 (p=0.367)	0.102 (p=0.229)	0.077 (p=0.362)	0.055 (p=0.515)
CI (L/min/m ²)	-0.078 (p=0.359)	-0.127 (p=0.132)	0.053 (p=0.532)	0.046 (p=0.585)
PVR (WU)	-0.106 (p=0.211)	-0.026 (p=0.763)	-0.126 (p=0.136)	-0.160 (p=0.058)
TPR (WU)	-0.049 (p=0.600)	-0.002 (p=0.979)	0.088 (p=0.343)	0.021 (p=0.819)
SVR (WU)	-0.195 (p=0.028)	0.138 (p=0.123)	0.020 (p=0.827)	-0.248 (0.005)

Data are presented as correlation coefficient r (p-value).

Analysis was restricted to the PH-HF subgroup.

Abbreviations as in Supplementary Table S1.

Supplementary Table S6. Nested logistic regression models for METS-IR and TyG-BMI.

Model Comparison	Log-Lik	Chi-Sq Statistic	P value[*]
METS-IR			
Model 1 (Covariates [#] + BMI)	-70.36		
Model 2 (Covariates [#] + BMI + METS-IR)	-70.35	0.016	0.900
TyG-BMI			
Model 1 (Covariates [#] + BMI)	-70.36		
Model 2 (Covariates [#] + BMI + TyG-BMI)	-70.11	0.492	0.483

[#]Covariates: age, gender, etiology, diabetes, nutritional status, lipid-lowering agents, atrial fibrillation, eGFR, and left ventricular ejection fraction.

^{*} P for Likelihood Ratio Test;

Log- Lik: Log- Likelihood; Chisq: Chi- square;

Other abbreviations as in Supplementary Table S1.

Supplementary Table S7. The association between residuals of METS-IR/TyG-BMI and PH-HF.

Variable	OR (95% CI)	<i>P</i>
METS-IR Residuals*	1.01 (0.89, 1.13)	0.900
TyG-BMI Residuals*	0.99 (0.96, 1.02)	0.487

*Covariates: age, gender, etiology, diabetes, nutritional status, lipid-lowering agents, atrial fibrillation, eGFR, and left ventricular ejection fraction and BMI.

Supplementary Figure S1. Distribution of body mass index.

