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## Feasibility of the exercise stress echocardiography for the evaluation of the right heart and pulmonary circulation unit in different clinical conditions: the right heart international network

Ferrara F.<sup>1</sup>; Gargani L.<sup>2</sup>; Guazzi M.<sup>3</sup>; D'alto M.<sup>4</sup>; Wierzbowska Drabik K.<sup>5</sup>; Argiento P.<sup>4</sup>; Cocchia R.<sup>6</sup>; Bandera F.<sup>3</sup>; Contaldi C.<sup>1</sup>; Lanero S.<sup>7</sup>; Russo V.<sup>8</sup>; Vriz O.<sup>9</sup>; D'andrea A.<sup>10</sup>; Kasprzak JD.<sup>5</sup>; Bossone E.<sup>6</sup>

<sup>1</sup>Cardiology Division Cava deTirreni-Amalfi Coast, University Hospital of Salerno, Salerno, Italy

<sup>2</sup>Institute of Clinical Physiology (IFC), Pisa, Italy

<sup>3</sup>IRCCS Policlinico San Donato, San Donato Milanese, Italy

<sup>4</sup>Second University of Naples, Department of Cardiology, Napoli, Italy

<sup>5</sup>Medical University of Lodz, Lodz, Poland

<sup>6</sup>Cardarelli Hospital, Naples, Italy

<sup>7</sup>SDN Foundation IRCCS, Naples, Italy

<sup>8</sup>Federico II University of Naples, Naples, Italy

<sup>9</sup>King Faisal Specialist Hospital & Research Centre, Riyadh, Saudi Arabia

<sup>10</sup>Hospital Umberto I, Nocera Inferiore, Italy

**Funding Acknowledgements:** no funding sources exists

**OnBehalf:** RIGHT Heart International NETwork (RIGHT-NET)

**Purpose:** Exercise stress echocardiography (ESE) is a well-validated tool in ischemic and valvular heart diseases. The aim of this study is to assess the ESE feasibility for the evaluation of the right heart pulmonary circulation unit (RH-PCU) in a large cohort of subjects, from healthy individuals and elite athletes to patients with overt or at risk of developing pulmonary hypertension. Methods: 954 subjects [mean age 54.2 ± 16.4 years, 430 women] [254 healthy volunteers, 40 elite athletes, 363 patients with cardiovascular risk factors, 25 with pulmonary arterial hypertension, 149 with connective tissue diseases, 81 with left heart and valvular diseases, 42 with lung diseases], underwent standardized semi-recumbent cycle ergometer ESE with an incremental workload of 25 watts every 2 minutes up to symptom-limited maximal tolerated workload. ESE parameters of right heart structure, function and pressures were obtained according current recommendations. Results: The success rate for the evaluation of the RV function at peak exercise was 903/940 (96%) for tricuspid annular plane systolic excursion (TAPSE), 667/751 (89%) for tissue Doppler-derived tricuspid lateral annular systolic velocity (S') and 425/772 (63%) for right ventricular fractional area change (RVFAC). Right ventricular-right atrial pressure gradient [RV-RA gradient = 4 x tricuspid regurgitation velocity<sup>2</sup>] was obtained in 894/954 patients (93.7 %) at rest and in 816/954 (85.5%) at peak exercise. At peak exercise, pulmonary acceleration time (AcT) was feasible among 435/545 (82.5%) patients (Table 1). Conclusions: In daily ESE monitoring of TAPSE and S' resulted to be less challenging than of RV FAC. ESE was a feasible tool for the evaluation of RV-RA gradient and pulmonary AcT.

Table 1

Parameters	Rest mean ± SD	Peak mean ± SD	P value	Assessed n (%)	Feasibility at rest n (%)	Feasibility at peak n (%)
RVED area (cm <sup>2</sup> )	17.4 ± 5.7	17.4 ± 5.8	0.9	672	632 (94.0)	425 (63.2)
RVES area (cm <sup>2</sup> )	9.7 ± 4.3	9.6 ± 4.9	0.7	672	632 (94.0)	425 (63.2)
TAPSE (mm)	22.9 ± 3.9	27.4 ± 5.5	<0.001	940	922 (98.1)	903 (96.0)
S' (cm/s)	13.1 ± 2.9	18.5 ± 5.0	<0.001	751	746 (99.4)	667 (88.8)
RVFAC (%)	45.7 ± 10	46.7 ± 11	0.121	672	632 (94.0)	425 (63.2)
RV-RA gradient (mmHg)	24.3 ± 15	42.5 ± 20	<0.001	954	894 (93.7)	816 (85.5)
Pulmonary AcT (m/s)	129 ± 31	116 ± 35	<0.001	545	527 (96.7)	435 (82.5)

RVED, right ventricle end diastolic area; RVES, right ventricle end systolic area; p values indicate differences at rest and peak exercise. The term "assessed" indicates that an attempt was done in order to measure the parameter. The term "feasibility" indicates that it was possible to measure the parameter that was assessed.