Role of combined exercise stress echocardiography and cardiopulmonary exercise test in chronic thromboembolic disease

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Background: Chronic thromboembolic pulmonary disease (CTEPD) without pulmonary hypertension could cause significant exercise limitations. However, interventional or surgical treatments for CTEPD with mild pulmonary hypertension or normal pressure are on controversy.

Purpose: We aimed to evaluate cardiopulmonary function through cardiopulmonary exercise test (CPET) with stress echocardiography and to determine whether exercise pulmonary hypertension can explain exercise limitations in CTEPD patients with mPAP < 30mmHg.

Methods: Patients diagnosed as CTEPD with mPAP less than 30mmHg was derived from our pulmonary hypertension center registry from April 2014 to October 2021. Transthoracic echocardiography (TTE) was performed at baseline (resting state) and immediately after CPET. TTE derived parameters and CPET parameters were compared with hemodynamic parameters measured by right catheterization.

Results: Total 37 patients were enrolled. Of these, Thirty-five patients had previously been diagnosed with CTEPH and had undergone PEA, BPA, or both. Most of the patients complained dyspnea of WHO functional class II or III. Pulmonary vascular resistance (PVR) was slightly higher than normal (185.0±102.2 dyne sec cm⁻⁵). Also VO₂max was decreased in CPET (23.1±6.5 mL/kg/min). In correlation analysis, the higher the mPAP and PVR at rest, the lower VO₂max during exercise. Meanwhile basal right ventricular (RV) function was normal, an increase in RVSP was notably observed during exercise (RVSP: pre-exercise 36.2±11.9, post-exercise 60.7±19.3, p value < 0.001). Furthermore RV function deteriorated during exercise (TAPSE: pre-exercise 16.1±4.8, post-exercise 12.9±5.0, p value < 0.001).

Conclusions: CTEPD patients with mild or normal PAP showed limited exercise capacity with exercise induced hypertension. Even in the mPAP less than 30mmHg, PVR and mPAP was significantly associated with exercise capacity. CPET with stress echocardiography could help to identify the main cause of exercise limitation in CTEPD patients and possibly provide the guideline for treatment plan.