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Characterisation of dynamic left ventricular systolic and diastolic function in patients with obstructive sleep apnea syndrome and preserved left ventricular ejection fraction

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Background: in patients with obstructive sleep apnea syndrome (OSAS), repetitive hypoxia due to sleep-induced apnea adversely affects the interaction between myocardial oxygen demand and supply, resulting in the development of subclinical cardiac dysfunction. We hypothesized that patients with OSAS with preserved left ventricular (LV) ejection fraction (EF) would have abnormalities in LV diastolic function and/or deformation, with increased dynamic diastolic stiffness compared with healthy controls.

Methods: conventional echocardiography, Doppler myocardial imaging (DMI) and two-dimensional speckle tracking echocardiography (2DSTE) of LV longitudinal deformation, at rest and during supine bicycle exercise stress echocardiography, were performed in 40 patients (51.1±15.2 y; 27 males) affected by moderate to severe OSAS with preserved (>50%) EF, and in 25 age and sex-matched healthy controls. The following LV myocardial parameters were measured, at baseline and during effort: peak early (E) and late (A) diastolic velocity of the mitral inflow, E/A ratio, peak early myocardial diastolic velocity (E'), E/E' ratio, and global longitudinal strain (GLS). Cardiac function indexes were compared to functional respiratory parameters arising from spirometry and arterial blood gas.

Results: despite comparable EF, there were significant differences in terms of LV GLS both at rest (-15.8±2.2 in OSAS vs. -21.4±3.3 in controls; p<0.0001) and at peak exercise between the two groups. In addition, both pulmonary artery systolic pressure and E/E' ratios (14.8±3.3 in OSAS vs 8.5±2.7 in controls) increase during effort were higher in OSAS vs healthy subjects (p<0.0001). The best correlation with exercise capacity (peak of watts reached) was E/E' at peak stress (r = -0.68, P < 0.0001). On multivariate analysis, independent associations of LV E/E' at peak effort with blood lactate concentration, apnea–hypopnea index, and LV GLS were evidenced (global R² model: 55.3; p<0.001).

Conclusions: the evaluation of hemodynamic response of diastolic function and of myocardial deformation during exercise is feasible during stress echocardiography and provides valuable information in predicting exercise capacity in patients with OSAS, independent of LV EF. A therapy aimed at increasing LV diastolic function reserve could improve the quality of life and the effort tolerability of this subgroup of patients.