Right ventricular functions in pulmonary embolism

Pulmoner embolide sağ ventrikül fonksiyonları

Right ventricular myocardial performance has paramount importance in various disease states and right ventricular dysfunction has prognostic value in heart failure, pulmonary hypertension, pulmonary embolism, congenital heart disease and myocardial infarction (1). Right ventricular performance is a reflection contractility, preload and afterload.

Echocardiographic assessment of the right ventricle has been largely qualitative, because of the difficulty with assessing RV volumes because of its unusual shape (2). Right ventricular function can be assessed echocardiographically by using several parameters including right ventricular index of myocardial performance (RV MPI), tricuspid annular plane systolic excursion (TAPSE), myocardial acceleration during isovolumic contraction (RV IVA), right ventricular fractional area change (RV FAC), three-dimensional ejection fraction (3D RVEF), tissue Doppler-derived tricuspid lateral annular systolic velocity (Tri S), and longitudinal strain and strain rate (3).

Right ventricular myocardial performance index (RV MPI), also known as Tei index, is a global estimate of both systolic and diastolic function of the right ventricle. It can be calculated by two methods: the pulsed Doppler method and the tissue Doppler method. The MPI is defined as the ratio of isovolumic time (IVRT+IVCT) divided by ejection time (ET). In the tissue Doppler method, all time intervals are measured from a single beat by pulsing the tricuspid annulus. RV MPI has been studied in congenital heart disease, RV infarction, and hypertrophic cardiomyopathy (4-6). The RV MPI is reproducible and eliminates the limitations of complex RV geometry (7). Thus, it can be used in the evaluation of both systolic and diastolic function of the right ventricle in complement with other quantitative and nonquantitative measures.

Pulmonary embolism (PE) has significant mortality and morbidity, especially when associated with right ventricular dysfunction. Therefore, most critical points in patients with pulmonary embolism are judged on the basis of their ability to detect right ventricular dysfunction before it leads to refractory arterial hypotension and shock (8). Although RV dilatation and increased systolic pressure are shown in patients with PE (9) the role of newer quantitative measures of RV pressure and function, such as RV MPI, TAPSE and RV FAC has not been fully investigated.

In the article published in the current issue of the Anatolian Journal of Cardiology, Özsu et al. (10) carried out a study on the relationship between the RV Tei index and cTn-T in patients with acute normotensive PE. The results of this study showed that RV Tei index has been frequently impaired in patients with acute PE and a significant recovery has been seen after the treatment. Therefore, they suggested that RV Tei index can be used both the diagnosis of RV dysfunction and the assessment of treatment effectiveness.

There are a limited number of studies evaluating RV Tei Index in patients with PE (11, 12). These studies, as in the present study, showed that RV Tei index reduced in patients with PE and improved with optimal anticoagulant treatment. Myocardial hypoxia in acute pulmonary embolism may result in right ventricular damage, and this can be detected by elevated cardiac troponin levels. While these two studies did not investigate the relationship between the RV Tei index and cTn-T, the current study examined this relationship. Positive correlations were found between cTn-T levels and RV Tei index ($r=0.467$, $p<0.003$) (10).

The authors used only RV Tei index for assessing the right ventricular function in the patients with PE. However, a recently published guideline for the echocardiographic assessment of the right heart in adults recommended that RV MPI should not be used as the sole quantitative method for evaluation of RV function and it may be used for initial and serial measurements as an estimate of RV function in complement with other measures such as TAPSE (3). For this reason, further studies confirming the findings of the current study should be done, especially to examine other quantitative measures as well as RV Tei index.

In conclusion, right ventricular function can be assessed via several noninvasive methods including computed tomography, radionuclide methods and magnetic resonance imaging which are expensive, not routinely available, and not bedside procedures. Therefore, echocardiography may be considered as a diagnostic tool in the evaluation of RV function of the patients with clinical suspicion of nonmassive and massive PE. Newer quantitative measures of RV function such as RV Tei index can be used as a valuable noninvasive parameter for monitoring disease diagnosis and severity in patients with PE.

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