Coronary sinus dilatation as a sign of right ventricular dysfunction in patients with heart failure

Since Polak et al. (1) reported that low right ventricular ejection fraction (RV EF <35%) was associated with poor survival in patients with heart failure, several studies have shown RV dysfunction as a strong and independent predictor of survival in patients with congestive heart failure (2-5), in which RV EF was measured by cardiac catheterization or radionuclide scan with radiation hazard. Therefore, it is much more desirable to have a diagnostic tool that is non-invasive, safe, portable, and repeatable. Although echocardiography could not provide reliable RV EF, it could provide other parameters for evaluating RV function such as fractional area change (FAC), myocardial performance index (MPI), and tricuspid annular peak systolic excursion instead of EF (6, 7). The RV MPI defined as the ratio of isovolumic time of RV divided by ejection time of RV can be measured by either conventional pulsed wave Doppler or tissue Doppler imaging with reference lower value respectively. The RV MPI has been shown to be increased in patients with pulmonary hypertension, RV infarction, and hypertrophic cardiomyopathy (8, 9); however, the prognostic value in patients with HF has not been shown yet.

According to a study of 133 individuals with normal ventricular systolic function in sinus rhythm, the coronary sinus (CS) diameter was 8.3±2.5 mm just before the onset of the P wave (10). CS dilatation can result from increased blood flow due to abnormal venous drainage in the persistent left superior vena cava, total anomalous intra-cardiac pulmonary venous drainage, severe tricuspid regurgitation, hemodialysis or a coronary artery to CS fistula (11-14), or high RA pressure due to functional tricuspid regurgitation (15). When it comes to the relation of CS diameter with heart failure, an autopsy study of 284 hearts showed that the diameter of the CS was larger in patients with poor ventricular function (16). Other studies have found a strong association between CS diameter and pulmonary artery pressure (PAP) and the size of the right atrium in patients with pulmonary hypertension (17, 18).

In this study entitled "Coronary sinus dilatation is a sign of impaired right ventricular function in patients with heart failure" published in Anatol J Cardiol 2015; 15: 542-7. by Çakıcı et al. (19), the authors found a strong correlation between increased coronary sinus diameter and the global dysfunction of the right ventricle in patients with heart failure and concluded that the CS diameter can be used as a novel echocardiographic marker for impaired RV function in patients with HF. Given this interesting result, several limitations of this study makes me wonder as to whether we can identify patients with a high risk of RV failure by simply measuring the CS diameter with such high sensitivity and specificity. First, it is ambiguous to discriminate CS dilatation due to impaired RV function from CS dilatation due to LV dysfunction. The authors did not provide the correlation of CS dilatation with LV MPI. Second, considering the author's speculation that CS dilatation might be caused by elevated RA pressure, RV MPI may be an inappropriate parameter for RV function. According to the 2010 ASE guideline (7), it is not recommended to use RV MPI in the presence of elevated RA pressure. Third, taking account of the curved course of CS along the LV posterior wall, which is off-axis for apical 4 chamber view, the diameter in the mid or distal CS portion could be underestimated to get maximal proximal CS diameter. This might be the cause of the relatively low cut-off value of the CS diameter for RV dysfunction. It might be worth considering the apical 2 chamber view as an alternative or a supplemental view in future studies. Fourth, although severe TR was excluded in this study, it might be important to know whether moderate TR can affect the size of CS in patients with HF.

Notwithstanding, the authors provided a novel parameter for the evaluation of RV function in patients with HF. An easy, reproducible echocardiographic parameter has a potential to be a clinically robust tool for the evaluation of RV function. Taken the results of this study for granted, we might think of next steps in the application of this novel parameter. It might be a possibility that the change in the CS diameter can be used to evaluate the response of RV function to the specific therapy for pulmonary hypertension or to choose patients who need urgent cardiac transplantation due to poor prognosis of RV failure. Comparison of CS diameter with IVC diameter may also be an interesting topic in patients with RV dysfunction.

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