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Detecting right ventricular systolic dysfunction in patients with acute ST-elevation myocardial infarction: echocardiography is good enough

Pickure Z.[1]; Kalinin A.[1]; Pickurs K.[2]; Zakharova E.[3]; Alekhin M.[4]; Lejnieks A.[1]

[1]Eastern Clinical University Hospital, Riga, Latvia
[2]Riga Stradins University, Riga, Latvia
[3]"Tradintek" SIA, Riga, Latvia
[4]Central Clinical Hospital of the Presidential Administration of the Russian Federation, Moscow, Russian Federation

Background: Many recent years" studies confirm the impact of the right ventricle (RV) dysfunction on morbidity and mortality in patients with an acute ST segment elevation myocardial infarction (STEMI). Earlier echocardiography (Echo) was not accurate enough in detecting RV dysfunction. The newest Echo methods allow to directly and accurately assess the RV systolic function.

Purpose: The aim of this study was to estimate the frequency of both RV segmental and global dysfunction in patients with STEMI using three-dimensional (3D) Echo and myocardial longitudinal strain (LS).

Methods: A group of 73 patients with first-time acute STEMI of different localization was selected. A control group of 32 people was formed of healthy individuals. As a standard for determining RV systolic dysfunction, changes in the traditional Echo parameters of the RV were accepted. In our study RV 3D ejection fraction (EF) less than 49% (AUC = 0.88, $p < 0.001$, sens 73%, spec 78%, PPV 50%, NPV 91%) and RV free wall LS less than 24.5% (AUC = 0.95, $p < 0.001$, sens 88%, spec 89%, PPV 74%, NPV 96%) best predicted RV involvement in STEMI. RV involvement frequency in STEMI was analyzed in 4 levels: 1 - visual estimation only (RV segmental or global dysfunction); 2 – visually + pathologically changed conventional Echo parameters; 3 – visually + pathological conventional Echo parameters + pathological RV EF and RV LS defined by current guidelines; 4 - visually + pathological conventional Echo parameters + new pathological 3D RV EF and RV LS cut-off levels, defined in our study.

Results: RV involvement in patients with STEMI was found in 26%, if estimation was only visual (presence of segmental and/or global dysfunction). By adding in algorithm pathologically changed conventional Echo parameters, RV dysfunction was detected already in 36% of cases. New Echo parameters (3D RV EF and RV LS) added 6% more to RV involvement cases, resulting in 42% in total, if current guideline-recommended pathological cut-off levels were used. But the highest number of RV involvement cases - 62%, was reached, if visual evaluation and conventional Echo parameters were combined with 3D RV EF and RV LS, using higher pathology cut-off levels, defined in our study. This number is much closer to the data, provided by cardiac magnetic resonance and autopsy.

Conclusion: Modern echocardiography can provide greatly improved RV dysfunction diagnostics. In the case of STEMI current echocardiography methods show much closer results to the gold standard – cardiac magnetic resonance imaging and autopsy data, detecting RV involvement in more than 60% cases of acute STEMI.