

**CORRELATIONS BETWEEN CHANGES IN VENTRICULAR KINETICS
EVALUATED BY 3D ECHOCARDIOGRAPHY AND VENTRICULAR
FUNCTION IN CORONARY AND MYOPERICARDIAL DISEASES**

Abstract

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Introduction: Loss of tissue following a myocardial infarction is one of the triggers for ventricular remodeling and development of heart failure, the degree of ventricular remodeling being an important post-infarction prognostic marker. In this respect, it became necessary to identify some effective diagnostic methods that capture the ventricular remodeling in the early evolutionary stages, thus decreasing the frequency of complications and the socioeconomic impact of coronary vascular occlusion caused by acute and / or chronic diseases. On the other hand, pericardial diseases are uncommon among cardiovascular diseases. However, there are many publications that focus on clinical aspects of the pericardial disease while surprisingly little have focused on expanding the inflammatory process from the myocardium into the pericardium.

Objectives: We aimed to study, by means of computerized three-dimensional echocardiography, changes of global and regional myocardial contractility and remodelling in coronary and myopericardial heart diseases, on three different patient subsets: Study 1 – Correlation between changes in segmental ventricular kinetics and remodeling in postinfarction patients; Study 2 - Correlation between changes in segmental ventricular kinetics and reverse remodeling in revascularized total chronic occlusions and Study 3 - Correlation between changes in segmental ventricular kinetics and ventricular function in pericarditis.

Material and method: This was an observational and prospective clinical study, including patients hospitalized in the Cardiology Clinic of the Emergency Clinical Hospital of Târgu-Mureș in a period of 4 years. The patients included were:

- patients with acute myocardial infarction that presented in the Interventional Cardiology Department in the optimal treatment window (under 12 hours) and who underwent per primam revascularization (48 patients), divided into 2 subgroups: Group 1 – 26 patients with positive remodeling at follow-up (PR, defined as an increase in global end-diastolic volume > 15% compared to the baseline.) and Group 2 – 22 patients without ventricular remodeling (non-PR)
- 38 patients hospitalized with successful reopening of an LAD chronic total occlusion
- 28 patients diagnosed with chronic pericarditis, compared with a control group of 28 clinical healthy persons.

All patients underwent computerized 3D echocardiography with complex assessment of global and regional function and remodelling, based on specific classification parameters (EF,

ventricular volumes) and 3D indexes – RICA – regional index of contraction amplitude and ICA – index of global contraction amplitude.

Results:

Study 1

Patients with positive remodeling (PR) following myocardial infarction presented lower ejection fraction at baseline (44.75% versus 49.95%, $p = 0.009$), higher end-systolic volume (80.34 ml vs 70.63 ml, $p = 0.02$), lower values for index of contraction amplitude – ICA (3.05 vs 3.53, $p = 0.01$) and for regional index of contraction amplitude – RICA (1.38 versus 2.78, $p < 0.0001$) than those who did not develop ventricular remodeling.

The best statistical significance in predicting development of LV remodelling was achieved for RICA, for which the logistic analysis based on ROC curve showed an area under the curve (AUC) of 0.88, being highly statistically significant ($p = 0.0001$). The cut-off limit of 1.8 for RICA presented a high sensitivity (92%) and a positive predictive value of 90% in predicting the occurrence of LV remodeling in the post-infarction period.

Study 2

Regression of ventricular remodeling has been evaluated 3 months after revascularization of a chronically occluded LAD.

Linear regression showed a statistically significant correlation between the index of regressive remodeling and the regional index of contraction amplitude ($p = 0.02$) at 3 months post-revascularization.

The logistical analysis based on ROC curve characteristics for RICA showed that this parameter is a good predictive indicator of regressive remodeling in the left ventricle, after revascularization of the occluded artery, with a good area under the curve (AUC) of 0.72, being statistically significant ($p = 0.003$). Also, AUC for ICA showed superior values of 0.82, being statistically significant ($p = 0.006$). The cut-off point of 3.5 for the index of contraction amplitude had a sensitivity of 68%, with a good specificity of 94% in predicting regression of ventricular remodeling after revascularization.

Study 3

The difference between the groups for EF, EDV and ESV at baseline was not statistically significant. Thus, the presence of pericardial fluid and / or thickened pericardium did not affect left ventricle's performance – defined by ejection fraction, EDV and ESV.

The values for index of contraction amplitude showed no statistically significant differences between the two groups. The only parameter that significantly correlated with the presence of pericardial fluid was the RICA value for the regions adjacent to pericardial fluid ($p < 0.0001$).

Conclusions: This study demonstrates the correlation between changes in global and regional ventricular contractility and the development of left ventricular remodeling following an acute myocardial infarction, and also with the regression of ventricular remodeling after revascularization of a chronic total occlusions. However, the present study demonstrates that a changes of contractility at a regional level correlates better with the ventricle's remodeling process than the global impairment of ventricular contractility.

To our knowledge, this is the first study which uses computerized 3D echocardiography parameters to predict remodeling/regressive remodeling postrevascularization. Thus, the index of contraction amplitude and the regional index of contraction amplitude show high predictive values for the development of ventricular remodeling and also for its regression.

On the other hand, the use of a new index that defines segmental contractility – the regional index of contraction amplitude – for the assessment of ventricular kinetics in pericardial diseases, served to demonstrate the existence of subsequent segmental wall motion disorders in pericardial inflammation, without affecting the overall hemodynamic status of heart.

Keywords: acute myocardial infarction, chronic total occlusion, pericarditis, three-dimensional echocardiography, remodeling, regressive remodeling, index of global contraction amplitude, regional index of contraction amplitude.