

RADIONUCLIDE ESTIMATION OF LEFT VENTRICLE MYOCARDIAL CONTRACTILITY IN PATIENTS WITH CHRONIC HEART FAILURE AND POST-INFARCTION CARDIOSCLEROSIS

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ABSTRACT

Acute myocardial infarction (MI) is an important risk factor for the chronic heart failure (CHF). Twenty-five ischemic heart disease (IHD) male patients with post-infarction cardiosclerosis (PICS) aged 40 to 60 (at a mean age of $52,8 \pm 1,3$ years) with MI duration from 6 months to 5 years were examined. Intensification of degree of CHF in IHD patients with PICS according to the findings of echocardiography and radioisotope ventriculography (RGV) was accompanied by a decreased myocardial contractility. RVG using sectoral analysis occurred to be an informative method in the evaluation of the myocardial contractility of the left ventricle, its reserve potentials in IHD patients with PICS complicated by CHF. It permits to optimize the diagnosis and treatment of CHF patients with PICS.

Key words: chronic heart failure, post-infarction cardiosclerosis, radioisotope ventriculography, echocardiography, nitroglycerine test

INTRODUCTION

Acute myocardial infarction (MI) is an important risk factor for chronic heart failure (CHF) (3,5). Despite of the recent achievements in treating the patients in an acute MI stage, the mortality rate reaches up to 25-40% during the first year after it. A high risk of CHF remains among the patients survived after an acute MI stage. CHF develops during the first 10 years in 25% of the patients after MI. After MI an intensification of neuroendocrine system results in undesirable structural alterations called 'myocardial remodeling' (6,7). During the MI and post-infarction left-ventricle remodeling the combination of failure, earlier and later mechanical and neurohumoral effects leads to structural reconstruction of the left ventricle characterized by cavity dilatation, thinning the walls, hypertrophy of undamaged myocardial areas, and myocardial fibrosis. Changes in the structure and geometrical form of the left ventricle entail in its functional damage, reducing myocardial contractility, and as a result there is a systolic dysfunction of the left ventricle accompanied by lowering stroke volume and cardiac output fraction (1,2,8).

The present study was aimed at estimating myocardial contractility of the left ventricle based on radioisotope ventriculography (RVG) and Echocardiography (Echo-CG) in the patients with I-III functional class (FC) of CHF with post-infarction cardiosclerosis (PICS).

MATERIAL AND METHODS

Twenty-five ischemic heart disease (IHD) male patients with PICS aged 40 to 60 (at a mean age of $52,8 \pm 1,3$) years with MI duration from 6 months to 5 years were examined. All the patients were divided into three groups according to their NYHA FC and six-minutes walking test (SMWT). The first group was formed by 9 patients with first FC, the second one – by 9 patients with second FC, and the third one – by 7 patients with third FC. The mean age of the patients in the first group was $46,6 \pm 2,6$ years, that in the second group - $43,0 \pm 5,1$ years, and that in the third group - $48,5 \pm 1,2$ years. The patients with diabetes mellitus, arterial hypertension, and cardiac arrhythmias were excluded. All the patients underwent electrocardiography, clinical and biochemical examinations, SMWT, two-chamber Echo-CG by using a Toshiba SSH-YOA apparatus and radioisotope ventriculography (RVG) on E-Cam gamma-camera (Siemens, Germany) with ^{99m}Tc TSK radiopharm preparation (blood serum albumin labeled with radioactive Technetium) aiming at determining the total cardiac output fraction (TCO) and sector cardiac output fraction (SCO). SCO was determined by a division of myocardium of the left ventricle into 4 areas (antebasal, retrolateral, apical and septal) and 9 sectors. To assess reserve myocardial potentials by RVG the pharmacological test with nitroglycerine (NTG-test) was used when RVG was performed initially and after 5 min following sublingual administration of nitroglycerine. The results obtained were processed by means of statistical softwares Microsoft Excel 7, Gpis, and Origin.

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RESULTS AND DISCUSSION

Our results showed that Echo-CG revealed an increase in both size and volume of the left ventricles and left atria with an enlargement of CHF degree that confirmed the more manifested process of remodeling accompanied by an increase in the size of the left heart sections, their dilatation and thinning the walls. An analysis of TCO indices by the findings of RVG and Echo-CG showed that TCO in the patients with FC I accounted for $60,6 \pm 1,57\%$, by the findings of RVG - $55,6 \pm 3,0\%$; TCO in the patients with FC II by the Echo-CG findings accounted for $51,8 \pm 0,98\%$, by RVG data - $43,0 \pm 4,1\%$, and in the patients with FC III - $43,0 \pm 2,1\%$, by RVG data - $34,0 \pm 3,5\%$. An analysis of the results obtained by Echo-CG and RVG revealed a decreased myocardial contractility in the patients with FC II and FC III characterized by a reliable reduction of TCO ($p < 0,05$) directly proportionally to an increase of CHF degree.

The findings of sectoral RVG analysis demonstrated that a decrease in contractility of the left ventricular myocardium was more pronounced in apical and septal ventricular areas with a compensatory increase in output fraction in alternate zones that confirmed the most frequent localization of MIs in the above-cited zones. There was a manifested decrease of SCO in the patients with FC I although TCO was not reduced due to the still expressed compensatory potentials of the left ventricular myocardium (4).

A reliable increase of TCO was fixed to be by 17,4% and 13,3% ($p < 0,05$), respectively, in the patients with FC I and FC II following NTG-test that showed an availability of reliable reserve possibilities of the left ventricular myocardium in the given cohort of the patients. An increase of TCO by 11% in the patients with FC III was shown by NTG-test, but it was not reliable that showed a reduction of reserve possibilities of the left ventricular myocardium by an increase of CHF degree caused by the more pronounced manifestations of left-ventricle post-infarction remodeling. The changes in the TCO indices in the zones accompanied by the reduced local contractility in NTG-test enable to estimate ischemic cicatricial areas and reserve myocardial potentials.

CONCLUSION

Thus an aggravation of CHF degree in the IHD patients with PICS established by using of Echo-CG and RVG was accompanied by a decrease of the myocardial contractility. RVG with sectoral analysis occurs to be an informative method for the evaluation of left-ventricle myocardial contractility, its reserve potentials in the IHD patients with PICS complicated by CHF. Besides it permits to optimize the diagnosis and treatment of these patients.

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