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Comparison of real-time contrast echocardiography and low-dose dobutamine stress echocardiography in predicting the left ventricular functional recovery in patients after acute myocardial infarction under different therapeutic intervention☆

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Abstract

Background: Early prediction of left ventricular (LV) functional recovery after acute myocardial infarction (AMI) remains challenging. This prospective study aims to compare real-time myocardial contrast echocardiography (MCE) with low-dose dobutamine stress echocardiography (LDDSE) in predicting the LV functional recovery in patients after AMI who underwent different therapeutic interventions.

Methods: Ninety-two patients with AMI were divided into 3 groups: primary coronary intervention group (n=34), thrombolysis group (n=30) and conservative therapy group (n=28). MCE was performed 2.3±0.7 days after chest pain onset. LDDSE was done within 2 days of MCE study. Follow-up echocardiography was performed 4 months later.

Results: Patients treated by primary coronary intervention or thrombolysis had significantly lower regional perfusion score (0.65±0.53 vs. 1.01±0.49, p=0.008; 0.78±0.55 vs. 1.01±0.49, p=0.03), better contractile reserve (regional dobutamine Δwall motion score -1.12±0.39 vs. −0.80±0.43, p=0.01; −0.99±0.50 vs. −0.80±0.43, p=0.08) and LV function recovery (regional Δwall motion score −1.67±0.53 vs. −1.02±0.46, p=0.003; −1.42±0.58 vs. −1.02±0.46, p=0.03) than those of conservative therapy group. MCE and LDDSE showed good concordance for predicting LV functional recovery (kappa=0.63, p<0.001). Perfusion score index had a good correlation with LV functional recovery (r=−0.75, p<0.001).

Conclusions: This study demonstrates that perfusion score index obtained from real-time MCE is comparable to LDDSE in predicting the LV functional recovery even under different therapeutic interventions. Revascularization results in better preservation of myocardial microvascular integrity, regional contractile reserve and LV functional recovery.

Keywords: Acute myocardial infarction; Low-dose dobutamine stress echocardiography; Myocardial contrast echocardiography; Primary coronary intervention; Thrombolysis

1. Introduction

In the process of left ventricular (LV) functional recovery after acute myocardial infarction (AMI), infarct size, location, transmurality, patency of infarct related artery, microvascular integrity and different therapeutic interven-

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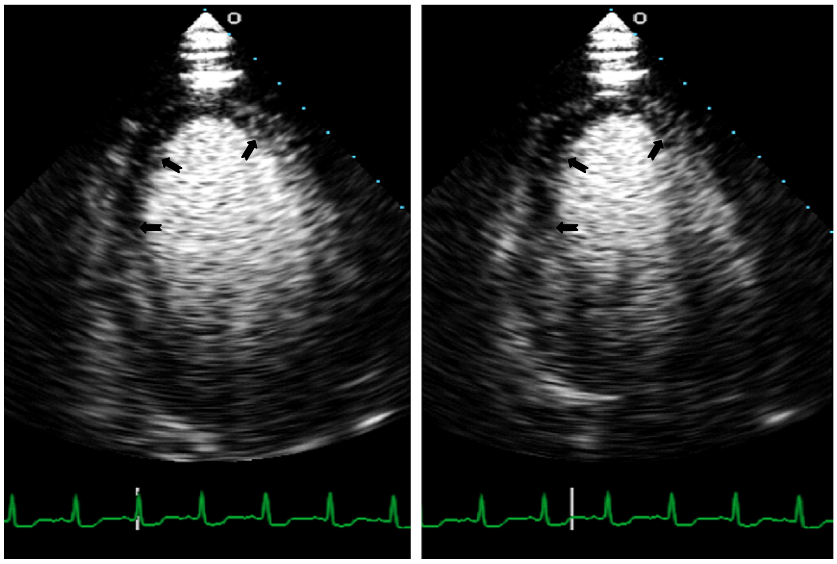

Fig. 1. Real-time myocardial contrast echocardiographic images of a patient with first acute anterior myocardial infarction at end-diastole (left panel) and end-systole (right panel). This patient received conservative therapy due to late arrival to our hospital and follow-up coronary angiography showed 95% stenosis of left anterior descending coronary artery. Arrows showed mid-septal, apical–septal and apex segments without contrast opacification i.e. non-viable myocardium, which correlated well with non-viable area at follow up two-dimensional echocardiograms 4-month later.

tions are involved [1]. Early prediction of LV functional recovery after AMI remains challenging [2]. Low-dose dobutamine stress echocardiography (LDDSE) is a good choice of imaging modality to assess LV functional recovery and myocardial viability [3].

Myocardial contrast echocardiography (MCE) is a new technique to evaluate coronary artery disease in a simple, noninvasive, easily accessible, and cost-effective manner [4,5] (Fig. 1). It has been demonstrated that intracoronary [6,7] and intravenous [8,9] MCE allows prediction of LV functional recovery after primary percutaneous coronary intervention in patients with AMI. Application of MCE may have incremental value to the LDDSE for the prediction of functional recovery in patients after AMI [10]. The non-invasive evaluation of the impact of different therapy strategies including primary coronary intervention, thrombolysis or conservative therapy may have clinical significance. However, there exists no published data on the comparison of real-time MCE and LDDSE in early predicting LV functional recovery in patients after AMI with special emphasis on different therapeutic approaches. The prospective study was undertaken to compare MCE with LDDSE in early prediction of LV functional recovery under different therapeutic interventions.

2. Materials and methods

2.1. Patients

Between May 2002 and February 2004, one-hundred and fifteen consecutive patients with first Q-wave AMI were admitted in our hospital. Diagnosis of AMI was made on the basis of typical anginal pain lasting more than 30 min, ST-segment elevation $\geq$0.2 mV in $\geq$2 contiguous electrocardiogram leads, biochemical evidence of peak creatine kinase more than 2 times of upper limit of normal, and wall motion abnormalities by echocardiography. Criteria for exclusion included the following: postinfarct angina, in hospital reinfarction, persistent LV failure, significant ventricular arrhythmias, significant valvular disease or primary myocardial disease, left bundle branch block, paced rhythm, patients who died within the first 72 h, allergy to blood products and previous myocardial infarction and total occlusion of infarct-related artery by follow-up angiography. Twenty-three of 115 patients were excluded, including: three underwent rescue coronary intervention due to post-infarct angina, four died during follow-up periods, three lost follow-up and others (13 cases) due to total occlusion of infarct-related artery by follow-up angiography. Therefore, a total of 92 patients were included in the study. All but 9 patients were men (mean age 63.5$\pm$14.5 years). We divided all patients into 3 groups: primary coronary intervention group (34 patients), thrombolysis group (30 patients) and conservative therapy group (28 patients).

2.2. Study protocol

During hospitalization, peak creatine kinase level was acquired from serial measurements every 6 h. All patients received baseline two-dimensional echocardiography at the same time as MCE, underwent both MCE and LDDSE during hospitalization and two-dimensional echocardiography 4 months after AMI attack. Physical examinations were performed on hospital admission. Drug history and the