CONTRAST ECHOCARDIOGRAPHY

170 Quantification of regional perfusion during dipyridamole stress before and after revascularization of left anterior descending coronary artery by real-time myocardial contrast echocardiography.

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Aim of the study: To evaluate the ability of real-time myocardial contrast echo (MCE) to detect changes in regional perfusion before and after revascularization of left anterior descending coronary artery (LAD) and to correlate perfusion parameters with regional myocardial wall motion abnormalities (RWMA) and quantitative coronary angiography (QCA).

Method: 18 pts, 11 men, aged 59±8 yrs, with >50% stenosis of LAD underwent real-time MCE with Sonovue® (Bracco) using Power Doppler Harmonic Imaging (Vivid 7 GE) at baseline and during dipyridamole stress (0.84 mg/kg in 4’) and QCA before and 1-4 weeks after successful coronary revascularization of LAD by angioplasty or bypass surgery. MCE time-intensity data in 2 regions of interest (proximal (PSE) and distal septum (DSE)) were fitted to the exponential function y= A(1-e-t/b), where A is the peak plateau signal intensity, b the rate of signal increase and the product Ab is proportional to regional myocardial blood flow.

Results: see table.

Baseline Peak Baseline Peak
A distal septum 28.1±13.3 33.0±32.7 28.1±8.7 27.4±10.8
b distal septum 0.31±0.18 0.37±0.28 0.39±0.26 0.82±0.47 
A distal septum 1.5±0.9 2.3±1.9 2.2±0.33 4.7±0.21 *
b distal septum 2.01±1.8 2.47±1.8 3.02±2.0 6.0±3.6 
Transient RWMA 14/18 pts 0/18
MLD LAD (mm) 0.58±0.04 0.58±0.05 2.48±0.22 **
% LAD stenosis 79±15 104±26 **

1) In pts with LAD disease real-time MCE detects an abnormal response of regional perfusion parameters to vasodilation associated with transient RWMA in most of them; 2) after revascularization of LAD a significant improvement of these parameters associated with normal wall motion response is demonstrated. Thus, real-time MCE can be a useful tool to quantify regional perfusion in pts with LAD disease undergoing revascularization.

171 Myocardial contrast echocardiography adds diagnostic value to stress echocardiography in ischemia detection. A comparison study with coronary angiography.

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Myocardial contrast echocardiography (MCE) is a new technique for perfusion evaluation. The aim of this study was to assess of the value of MCE by real time perfusion imaging in comparison with stress echocardiography, using coronary angiography as gold standard.

Methods: We studied 38 patients (pts), 26 males, 56±8 years old, with suspected coronary disease and referred to coronary angiography. Pts with rest dysfunctional segments were excluded. All were submitted to stress echocardiography (DSE) with harmonic imaging and MCE, followed by coronary angiography. MCE was obtained in three apical views, at rest and after 0.56 mg/Kg of dipyridamole, using Sonovue® (IV infusion) as contrast agent. Real time perfusion modality was flash power pulse inversion imaging with triggering replenishment. DSE protocol was completed until a dipyridamole dose of 0.84 mg/Kg and atropine administration when the study was negative by the low dose. Perfusion by MCE was analysed visuually, using a 16 segments model of the left ventricle; ischemia was defined when heterogeneous or absent perfusion occurred in 2 or more contiguous segments. Quantitative analysis was performed (Qlab software) and the ratio of maximal intensity (Int-C) to left ventricle cavity was obtained to all segments. Ischemia was considered according to contractility, when a new abnormality (hypokinesis, akinesis, dyskinesis) occurred in 2 or more contiguous segments.

Results: Coronary angiography yielded 29 patients with significant disease (70% stenosis), involving 36 territories (LAD in 20, the RCA in 8 and the CX in 8). Perfusion was adequately visualized in 98% segments. Rest studies by MCE showed normal perfusion in all visualized segments; after stress, 31 from 36 ischemic territories were identified by visual assessment and two false negatives occurred. In comparison with angiography, MCE yielded positive and negative predictive values for ischemic territories detection of 88% and 97%, while DSE had 84% and 97% respectively. MCE and DSE together had positive and negative predictive values of 90% and 97%. Visually detected ischemic segments had lower Int than normally perfused ones (0.11±0.08 vs 0.65±0.21, p<0.005).

Conclusion: MCE by real time perfusion imaging yielded high predictive value in chronic ischemia diagnosis, which was enhanced when combined to DSE. This modality is a simple and promising method for bedside diagnosis of ischemia.

172 Prediction of functional improvement of left ventricle after myocardial infarction treated with primary coronary angioplasty: myocardial contrast echocardiography and low-dose dobutamine study.

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Objective: The relation between myocardial perfusion and contractile reserve of left ventricle of patients (pts) suffered from acute myocardial infarction (AMI) treated by means of primary coronary angioplasty (PCI) is still uncertain. The aim of the study was to establish to what extent myocardial contrast echocardiography (MCE) and low-dose dobutamine echocardiography (LDDE) might predict recovery of left ventricular function in these pts.

Methods: 32 consecutive pts (24 male, 8 female, mean age 56.8±10.1 yrs) with LAD occlusion (single vessel disease) and subsequent AMI treated successfully with PCI (TIMI 3 flow) were enrolled. They underwent harmonic MCE (H-MCE) with Levotherm 1–2 days after MI (exam I). After MI, 2D echo (exam II), 1 month later 2D echo was repeated (exam III). In each examination wall motion score index (WMSI) and ejection fraction (EF) were measured. Calculation of the LV function was defined as decrease of WMSI and increase of EF between exam I and III.

Results: Functional improvement was observed in 22 pts (68%) at follow-up (recovery group) in whom WMSI and EF changed significantly (1.50±0.25 vs 1.26±0.20, p<0.001 respectively; 51.2±7.9 vs 57.3±7.1%, p<0.001, respectively). In non-recovery group corresponding values were 1.72±0.13 vs 1.74±0.15, and 46.3±4.6 vs 45.0±4.6, respectively. The sensitivity of H-MCE for score 2 and 1 and LDDE for predicting functional improvement was 96% and 57% respectively with specificity 54% and 95% respectively. If homogenous perfusion (score 2) was assessed solely sensitivity of H-MCE decreased to 85% whereas its specificity increased up to 92%. Complementary evaluation of H-MCE and LDDE discovered improvement of LV function in 11 pts with sensitivity 79% and specificity 100%.

Conclusions: After successful PCI for AMI significant improvement for LV function was observed in 68%. Evident perfusion in H-MCE seems to be a good predictor of functional recovery of the LV after AMI. For optimal evaluation combination of H-MCE and LDDE has to be applied.

173 Usefulness of a quantitative analysis of intramycocardial contrast echocardiography to analyze coronary perfusion after myocardial infarction in patients with an open artery.

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Objectives: We aimed to analyse the usefulness of myocardial contrast echocardiography with intravenous injection of contrast (MCE-iv) to study coronary perfusion after myocardial infarction (MI) in cases with an open intact related artery (IRA). MCE with intravenous injection of contrast (MCE-ic) was the „gold standard“ of perfusion.

Method: Twelve patients with a first ST-elevation MI were analysed. At the end of cardiac catheterization (median 5 days post-MI, stent in 9 cases) all patients showed an open (TIMI 3) IRA. MCE-ic in the 3 territories (anterior, circumflex and right coronary arteries) was evaluated by means of intracoronary boluses of sonicated galactose. Mean score perfusion of each territory (0=no reflow, 5=patchy and 1=normal). „Gold standard“ of normal perfusion: MCE-ic=1 was determined. MCE-iv (real time” and “trigger 1.4”, bolus and intravenous infusion of “Sonoview”) was performed at least 24 hours after cardiac catheterization (median 8 days post-MI); coronary perfusion was quantified using the software “P-Echum” (no reflow”-lack of perfusion in ≤25% of a territory).

Results: In the 36 territories analysed (3 per patient) MCE-iv correlated with MCE-ic (r=0.67 < 0.0001). A normal perfusion with MCE-iv (”no reflow” ≥25% of the territory) showed a positive predictive value of 94% and a negative predictive value of 75% in detecting a MCE-ic=1 (p<0.004 Kappa=0.62). In the 12 infarcted territories, MCE-iv correctly identified 8 of 9 territories with normal perfusion (MCE-ic=1) and 2 of 3 with decreased perfusion (MCE-ic=1).

Conclusions: Our results indicate that a quantitative analysis of MCE-iv could be useful for the non-invasive assessment of coronary microcirculation in post-MI patients with an open IRA artery. A normal result with MCE-iv is highly suggestive of a preserved perfusion.