Methods: A total of 117 patients with first ST elevation MI (STEMI), treated within 6 hours from symptom onset, were enrolled in the Acute Myocardial Infarction Contrast Imaging (AMI-CI) multicenter study. According to the guidelines and cath lab availability, 50 patients were treated with primary coronary stenting (PCI) (group A); 27 with PCI performed on the first day after fibrinolytic therapy (group B); and 20 with rescue PCI (group C) and 20 with thrombolysis alone (group D). Microvascular damage was evaluated by myocardial contrast echocardiography (MCE) using continuous infusion of Sonovue (Bracco SpA) in real-time imaging. The endocardial length of contrast enhancement (CEx%) on day 1 after reperfusion was calculated. The extent of wall motion abnormalities (WMA%), LV end-diastolic volumes (EDV), and ejection fraction (EF%) at day 1, and at 3 months follow-up were also calculated.

Results: Time to the first reperfusion treatment was similar in all groups. In group B, PCI was performed within 24 hours after successful thrombolysis while in rescue PCI, within 6 hours after unsuccessful lysis. On day 1 after reperfusion, CEx% was significantly smaller in both primary PCI and in PCI after lysis group as compared to rescue PCI and lysis groups (p < 0.001). At day 1, the extent of WMA% was similar in all groups while at follow-up it decreased significantly only in groups A and B (p < 0.01). Additionally, EF% was similar in all groups soon after reperfusion but it improved significantly only in group A and B at follow-up (p < 0.05). Finally, the EDV after revascularization was similar in all groups but at follow-up, a significant enlargement of EDV volume was observed in groups C and D (p < 0.05).

Conclusion: Our data suggest that, in STEMI patients, primary PCI and early PCI after thrombolysis, are more effective in reducing microvascular damage and improving LV function than rescue PCI rescue and lysis alone.

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In vitro delivery of plasmid DNA using ultrasound-targeted microbubble destruction. Comparison with standard lipidofection

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Background: It has been previously shown that ultrasound (US)-targeted microbubble destruction (UTMD) enhances gene transfer in cultured cells. The aim of this work was to compare the efficiency of the in vitro gene transfer mediated by UTMD with that obtained by standard lipidofection. Methods: Lipid microparticles were produced in the presence of increasing concentrations of the pCMV-rt-PCR (range 4.0 to 2.0 x 10^6 cells/2mL DMEM medium). HIEK-203 cell suspensions (2x10^5 cells/ml DMEM medium) were exposed to 100 ml of DNA-loaded liposomes and US at mechanical indexes of 1.2 or 1.8 for 60 or 120 seconds. Similar experiments were performed with microbubbles or US alone. 48 hours after transfection, cells were stained to reveal p-galactosidase expression. Standard lipidofection with lipofection and 48 of pCMV-galactosidase was used as control. Results: None of the cells exposed to either microbubbles or US alone showed p-galactosidase expression. By contrast, in cell suspensions exposed to both US and DNA-loaded microbubbles, the number of p-galactosidase positive cells increased with the DNA concentration, the duration of US exposure and the amount of US energy applied (figure). Yet, UTMD-assisted transfection was approximately 200 times less efficient than standard lipidofection.

Conclusion: The efficiency of UTMD-assisted DNA delivery is proportionate to the US energy applied, the duration of US exposure and the concentration of DNA in the microbubbles. Yet, the transfection efficiency reached by this method is considerably less than what can be achieved with conventional lipidofection.

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Comparison of myocardial contrast echo with single photon emission computed tomography for detection of coronary artery disease in hypertensive patients with chest pain

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Adenosine stress testing is currently used for the non-invasive detection of ischemia in patients with coronary artery disease. Purpose: The aim of this study was to compare the diagnostic accuracy of myocardial contrast echocardiography (MCE) during adenosine stress test with that of TL-201 SPECT in detecting coronary artery disease in hypertensive patients with chest pain and exercise-induced diagnostic ST depression.

Methods: We studied 40 hypertensive patients (mean age 55.4; 28 men) referred for coronary angiography underwent MCE and TL-201 SPECT scintigraphy for assessment of myocardial perfusion during adenosine protocol. Myocardial contrast echocardiographic protocol was performed as follows: At the baseline and over the last 3 min of adenosine protocol, SonoVue (Bracco) infusion was performed at a rate of 0.8 ml/min. Power modulation and a low mechanical index (0.1-0.2) was used. Transfer high mechanical index (1.7) imaging was used to destroy microbubbles, allowing the assessment of myocardial replenishment. Pre- and during adenosine infusion MCE perfusion data were compared and graded for each coronary territory.

Results: Of the 46 pts studied, 28 had significant coronary artery disease. All pts had left ventricular (LV) hypertrophy (LVmass index: men >116gm2, women >104gm2), mean value of LVmass index = 118gm2. Both MCE and SPECT were analyzable in 22 coronary arteries. MCE adenosine stress test had higher specificity and accuracy compared with SPECT (92 vs 41%, p<0.001, and 67 vs 71%, p<0.01, respectively), and lower sensitivity (80 vs 95%, p<0.01, respectively).

Conclusion: Combination of adenosine stress echocardiography and MCE appears to be the most valuable method in detecting coronary artery disease in hypertensive pts with chest pain and positive stress test, whereas false positive perfusion abnormalities are common in the lateral wall. Larger studies on this subset of pts would merit major consideration.

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Simultaneous triplane contrast echocardiography for accurate assessment of left ventricular volumes and ejection fraction. A comparison with magnetic resonance imaging

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Background: Currently, cardiac magnetic resonance (CMR) imaging is accepted as the gold standard for the assessment of left ventricular (LV) volumes and function. However, CMR is an expensive, time-consuming technique that requires patient cooperation and is not feasible for every clinical setting. Echocardiography offers a more accessible alternative, but its accuracy has not been extensively validated. The Triplane imaging system (VIVID 7 Dimension, GE Healthcare) allows acquisition of the LV in three orthogonal planes, which can be used for accurate LV volume and function assessment.

Objective: To evaluate the feasibility and accuracy of simultaneous triplane contrast echocardiography for assessment of LV volumes and EF, using magnetic resonance imaging (MRI) as reference method.

Methods: Fifty consecutive patient were studied with no selection from baseline days. Echocardiography was performed using Vivid 7 Dimension with a 3V transducer for conventional 2D-imaging in the apical 4-chamber and long-axis views, and with a 3V transducer for simultaneously acquiring three apical views, using tissue harmonic imaging and a multipurpose contrast (Optison) application (Codified phase inversion) for both methods. Within one hour, MRI of LV short axis sections was performed. LV endocardial borders were traced manually. Conventional disc summation was used to calculate end-diastolic and end-systolic volumes from MRI and 2D biplane echo. In triplane data, a triangular mesh was constructed by 3D interpolation between outlined contours and volumes calculated by the Fourier Transform.

Results: Of the study patients (aged 57±9), 48% had regional LV dyssynergy due to previous myocardial infarction. MRI EF was 58±15%. Triplane image acquisition and volume analysis was simple and rapid. The feasibility of precontrast endocardial tracing of triplane was 74% vs. 62% for 2D imaging, with contrast 94% and 100%, respectively. 95% limits of agreement for EF between echo and MRI were −17.2 to 9.9% (baseline) and −9.3 to 6.5% (contrast) with 2D biplane, and −16.4 to 7.0 (baseline) and −8.5 to 4.2% (contrast) with triplane imaging (figure).

Conclusion: Simultaneous LV triplane imaging is feasible with rapid image acquisition and volume analysis. There is excellent LV EF measurements than conventional 2D biplane methods, compared to MRI.

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Adverse reactions to ultrasound contrast agents: is the risk worth the benefit?

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Background: Last year, three fatal (0.002%) and nineteen severe, non-fatal adverse reactions (0.012%) were reported in a post marketing analysis of more than 100 million injection of ultrasound contrast agents. Adverse reactions to ultrasound contrast agents are rare events and could be minimized by additional intra-operative consultation with anesthesiologists.

Methods: We evaluated the patient characteristics, diagnostic procedure, type of contrast agent and the use of anti-platelet agents.

Results: Of the 60 reactions, 11 events (0.002%) were caused by anaphylactic shock (5 events) and myocardial infarction (6 events). All events occurred during Gd-EOB-DTPA (Optison) injection. In 11 of 60 events, a history of allergy or asthma were present. All patients were treated with primary PCI and 26% reported pre-existing asthma. An anaphylactic reaction was more likely to occur during primary PCI (11 vs 0% during rescue PCI).

Conclusion: Ultrasound contrast agents are not associated with serious adverse reactions. However, an anaphylactic reaction is more likely to occur during primary PCI. Therefore, we recommend that primary PCI should be used with extreme caution.

Eur J Echocardiography Abstracts Supplement, December 2005