Fusion by a Doppler guidewire enables prediction of later left ventricular (LV) remodeling from no-reflow pattern immediately after coronary intervention had a sensitivity, specificity, and accuracy of 100%, 63%, and 72%, respectively, 3) No-reflow pattern immediately after reperfusion by transthoracic Doppler echocardiography (TTDE) permits better prediction of LV remodeling in the chronic phase in patients with reperfused acute myocardial infarction (AMI). We investigated whether serial evaluation of coronary flow velocity pattern in the early phase after reperfusion by transthoracic Doppler echocardiography (TTDE) permits better prediction of LV remodeling in the chronic phase in patients with reperfused AMI. Methods: We assessed the coronary flow DCT in the left anterior descending artery (LAD) immediately, 48 hours, and 7 days after successful coronary intervention in 32 consecutive patients with AMI using TTDE. DCT in the LAD flow ≤ 350 ms was defined as no-reflow pattern. LV end-diastolic volume (LVEDV) was measured by two-dimensional echocardiography with biplane Simpson's method before and 1 month after intervention. An increase in LVEDV ≥ 20% was defined as abnormal LV remodeling. Results: 1) Abnormal LV remodeling was observed in 8 of 32 patients 1 month after coronary intervention. 2) Prediction of abnormal LV remodeling from no-reflow pattern immediately after coronary intervention had a sensitivity, specificity, and accuracy of 100%, 65%, and 72%, respectively, 3) No-reflow pattern immediately after reperfusion by TTDE was changed to good flow pattern after 48 hours in 4 patients with no abnormal LV remodeling 1month later. 4) Prediction of abnormal LV remodeling from no-reflow pattern 48 hours after coronary intervention significantly improved to 100%, 79%, and 94%, respectively. Conclusion: Serial evaluation of coronary flow velocity pattern by TTDE in the acute phase of reperfused AMI enables better prediction of LV remodeling in the chronic phase.

POSTER SESSION

1046 Cardiovascular Magnetic Resonance: Myocardial Viability and Pharmacologic Stress

Sunday, March 17, 2002, Noon-2:00 p.m.
Georgia World Congress Center, Hall G
Presentation Hour: 1:00 p.m.-2:00 p.m.

1046-49 In Vivo Quantification of Viability: Magnetic Resonance Detects Small Scar Regions in Metabolically Viable Segments

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Background: In experimental studies contrast-enhanced MR has been shown to detect scar with high spatial resolution and scar formation exceeding 37.5% transmurally reduced contractile function. Approximately 30% of metabolically viable tissue in PET do not recover function after revascularization. The aim of this study was 1), to identify impairment of glucose uptake in hyperenhancing tissue and 2), to determine adntrum of scar in PET-viable segments.

Methods: Nineteen patients with myocardial infarctions (>3 months) were studied with MR and PET. Following injection of 0.25mmol/kg of a gadolinium-based contrast medium ( OmniscanTM, Nycomed Imaging AS) the entire left ventricle was covered with short-axis slices (GE, GE Medical Systems). Inversion-recovery pulse sequence (TR/TE 6.3/ 1.6ms, spatial resolution: 1.3x1.3x8.6 mm3). In 8 segments/slice (64-86 segments/heart) subdivided into a subendocardial and subepicardial layer, scar mass was determined manually and automatically (threshold >3SD above a reference region). In corresponding segments 13N-ammonia and 18F-fluorodeoxy-glucose (FDG) PET was used to determine glucose uptake (percentage of reference region with highest testing flow).

Results: In 1056 segments the portion of scar/segment on MR inversely correlated with FDG uptake (r -0.73 p<0.0001). Agreement between MR and PET was obtained in 91% of segments (thresholds: 50% FDG uptake, 37.5% scar). Admittance of scar greater than 37.5%, which was shown to correlate contractile function, was detected by MR in 7.8% of PET-viable segments. Mean difference between manual and automatic determinations of scar was 0.7±0.3g (slope 0.96, r=0.98).

Conclusions: This MR technique differentiates metabolically viable tissue from scar with excellent spatial resolution. In metabolically viable segments admittance of scar tissue partly explains the general finding that up to 20% of such viable segments remain dysfunctional after revascularization.

1046-50 Assessment of Myocardial Viability Using Contrast-Enhanced Magnetic Resonance Imaging: Comparison With FDG-PET and Septambli-SPECT

Harald P. Kuhl, Arno P. van der Weert, Aartm C. Baas, Aass A. Visser, Frans C. Visser, Albert C. van Rossum, VU University Medical Center, Amsterdam, The Netherlands.

Contrast-enhanced (CE MRI) has been shown to predict recovery of function after revascularization in patients with chronic coronary artery disease. The value of the technique in comparison to the in-vivo standard for viability assessment, FDG-PET, is unknown. We compared CE-MRI to FDG-PET and Septambli-SPECT (SPECT) in 23 patients with chronic coronary artery disease and left ventricular dysfunction for myocardial viability assessment.

Methods: For CE-MRI an inversion-recovery gradient-echo sequence (TE/TR 4.4/9.6 ms, FA 25°, typical TI 250-300 ms) was used on a 1.5T MR scanner (Sonata, Siemens, Erlangen, Germany). 20 minutes after 0.2 mmol/kg Gdodhium-DTPA. Data acquisition was performed in short-axis views covering the whole left ventricle and in selected long-axis views. FDG-PET was performed under hyperinsulinaemic-euglycemic clamp (ECAT EXACT HR+, Siemens, CTI). Resting perfusion was assessed using SPECT. For data analysis we used a 17-segment model including 8 basal, 6 midventricular, 4 distal segments and the apex. Analysis of PET and SPECT data was done by visual interpretation. According to PET/SPECT findings segments were categorized as either viable or non-viable. In corresponding segments the percentage regional (REG) and transmural extent of hyperenhancement (TRA) at CE-MRI were calculated.

Results: Mean ejection fraction was 31.1±10.6%. A total of 361 segments were analyzed with both techniques. Viable segments by PET/SPECT showed significantly less REG and TRA compared to non-viable segments (2.2±0.9% vs. 6.6±4.5% and 71.1±28.6% vs. 102.0±63.0%, P<0.001). By ROC analysis the area under the curve was 0.94 for the assessment of viability using CE-MRI. Using a cutoff value of 33%, the accuracy for identification of myocardial viability was 95.0% with excellent agreement (kappa value >0.8). 90% of segments (25/28) with a flow-perfusion mismatch were also identified as viable by CE-MRI-only. In the 3 "false negative" segments by CE-MRI REG was close to the cutoff value of 33% (35 to 41%).

Conclusion: CE-MRI allows accurate assessment of myocardial viability compared to PET/SPECT as reference standard.

1046-51 Comprehensive Assessment of Coronary Artery Disease With Magnetic Resonance Imaging


We present a Magnetic Resonance Imaging (MRI) protocol for assessment of myocardial function, perfusion, and coronary arteries in a single integrated study. 28 patients with coronary artery disease (CAD) were studied on a 1.5T Philips MRI scanner. The protocol includes: resting and stress perfusion (4 short axis slices, first pass of Gadolinium, Adenosine stress), short-axis and long-axis cine, coronary artery scans (respiratory navigator gated, resolution 0.78 x 0.78 x 1.5mm), viability imaging (delayed Gadolinium enhancement, 5-6 short axis slices). On a segmental basis, wall motion (WMS) was graded from 1 (normal) to 5 (akinetie), perfusion was scored as normal, fixed, or inducible defect and delayed enhancement as transmural or subendocardial. On coronary MRI the presence of stenoses ≥75% was reported. The sensitivity and specificity of each MRI component alone and of all components combined to detect significant CAD (>70% stenosis on x-ray angiography) was assessed.

Mean scan time was 1:1 (±-6) minutes. Sensitives and specificities were: coronary MRI 85% and 71%, viability 85% and 81%, WMS 90% and 85%, perfusion 58% and 87%. The sensitivity of combined analysis was 100%, with a specificity of 56%. Figure 1 shows images (wall motion, delayed enhancement, perfusion, viability) from one patient.

In conclusion, a comprehensive assessment of CAD in one hour with MRI is feasible and yields high sensitivities for detection of CAD. It may serve as a screening tool for patients with suspected CAD.