Efficacy of Sonovue, a New Second Generation Echocontrast Agent, for the Evaluation of Microvascular Perfusion After Acute Myocardial Infarction by Real-Time Microvascular Imaging: Comparison With SPECT

Luciano Agati, Stefania Funaro, Maria Pina Madonnina, Daniela Bokor, Massimino Bona, Gabriele Vanacore, Francesca De Maio, La Sapienza University of Rome, Rome, Italy, Bracco Imaging, Milan, Italy.

The objective of this study was to evaluate the efficacy of Sonovue in the assessment of microvascular perfusion after acute myocardial infarction. At this aim, 12 consecutive patients underwent myocardial contrast echocardiography and idesir MIBI SPECT on day 8 after their first acute myocardial infarction. Sonovue was administered as an IV bolus of 1.1-1.6 ml, using Agilent 8600 or ATL 8000 and real-time imaging (n=MC2). Two blinded reviewers evaluated at SPECT and n=MCE images. Microvascular perfusion was assessed using a 12-segment model (4-2-chambers apical views for r-MCE and horizontal and vertical long views for SPECT). For each segment a contrast score was calculated by both methods using the following scale: 1: Artifact, 2: Segment not visible, 3: Normal myocardial perfusion, 4: Patchy perfusion, 5: Microvascular perfusion defect. The number of uninterpretable segments by n-MCE (to contrast activity, not visualized, artifact, attenuation) was very low with a feasibility of 92%. Microvascular perfusion was assessed in 110 segments by both methods. A satisfactory concordance (75%) between SPEC defect detection and Sonovue n-MCE was achieved. In particular, a score 6 was assigned by n-MCE to 31 segments. The same score was assigned by SPECT to 30 of these (96%). Similarly, a score 3 was assigned by n-MCE to 24 segments. The same score was assigned by SPECT to 32 of these (94%). The concordance between the 2 methods in normally contracting areas was 57%, whereas in the infarct areas was 75%. In particular, 49/53 (92%) normokinetic segments were graded as normally perfused by n-MCE, and only 38/58 (64%) by SPECT. Conversely, 15/50 (30%) akinetic segments were graded as normally perfused by n-MCE, and only 4/50 (8%) by SPECT. Finally, the highest concordance in perfusion grading was achieved in the apical and lateral walls (69% and 75%, respectively). In conclusion, preliminary data from this pilot study showed that Sonovue is an excellent contrast agent for real-time perfusion imaging giving reliable information on the severity of microvascular damage in acute myocardial infarction.

Quantitative and Qualitative Analysis of Real-Time Myocardial Contrast Echocardiography in the Detection of Coronary Artery Stenoses


Background: It has been known that coronary blood flow reserve (CBFR) can be measured noninvasively using contrast myocardial echocardiography (MCE).

Methods: We studied 21 patients with normal coronary artery and 12 pts with single-vascular disease (left anterior descending artery). Real-time MCE was performed with low mechanical-index Power Modulation Imaging during continuous injection of microbubbles. CBFR was measured from MCE-derived myocardial blood flow velocity at rest and during intravenous infusion of adenosine (140 μg/kg/min). Myocardial perfusion was also qualitatively interpreted by off-line visual analysis for comparison.

Results: Myocardial CBFR in LAD territory was significantly different between pts with near-normal coronary artery and pts with significant coronary stenosis (50%/<2.66.47, 1.2 and 1.35, respectively; p<0.006). Using abnormal CBFR (>2.0) as the cut-off value, sensitivity and specificity for coronary stenosis detection were 73% and 80%, respectively. By visual estimation, sensitivity and specificity were 60% and 72%, respectively. Concordance for the two methods was 85% (k=0.59).

Conclusion: Coronary artery stenoses can be diagnosed using quantitative real-time MCE, and qualitative analysis was comparable to quantitative method.

Poster Session

1213 Technical Advances in Assessing Perfusion, Function, and Metabolism With Radionuclide Imaging

Tuesday, March 19, 2002, 3:00 p.m.-5:00 p.m.
Georgia World Congress Center, Hall G
Presentation Hour: 4:00 p.m.-5:00 p.m.

Does Gated 18-F-Fluorodeoxyglucose Position Emission Tomography Accurately Define Cardiac Function and Better Characterize Myocardial Tissue?

George Szabo, Robert A. de Kemp, Helkild Ulauskis, Terrence D. Rudy, Robert S. Biederman, University of Ottawa Heart Institute, Ottawa, Ontario, Canada.

Background: Incorporating ECG gating into F-18 fluorodeoxyglucose position emission tomography (FDG-PET) may provide global and regional LV function data that could complement viability imaging to aid clinical decision-making.

Methods: Forty-eight patients with CAD and LV dysfunction (41m, age=65.10) undergoing resting gated imaging with a breath-hold cine-MRI to assess left ventricular function. The left ventricular myocardium was divided into 9 segments, and motion (WM) was scored in 5 segments (3 segments for CATH) on a 5 point subjective scale by experienced readers separately for each modality, blinded to the other results. Comparisons were assessed by mean % exact score agreement (ExAg), close agreement within 1 score (CaAg), and Kappa analysis.

Results: Mean inter-reader agreement for RbPET was 67% ExAg and 98% CaAg, similar to that of FDG-PET. Concordance between RbPET and MRI was 51% (k=0.45) with comparable inter-reader agreement.

Conclusion: Agreement of Gated RbPET With Other Modalities

<table>
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<th>WMI</th>
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<th>ExAg</th>
<th>CaAg</th>
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<tr>
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<td>279</td>
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ECOG-Gated F-18 FDG and To-99m MIBI Dual-isotope Simultaneous Acquisition SPECT to Assess Myocardial Glucose Metabolism, Perfusion, and Function in a Single Study

Ichiyo Matsurani, Sugako Kanayama, Susumu Fujino, Tatsuya Yoneyama, Junichi Takii, Kenichi Nakajima, Noboru Takahashi, Stephan G. Nekolla, Norihisa Tonami, Kinichi Hisada, the Medical and Pharmaceutical Research Center Foundation, Hamai, Japan, Kanazawa Medical University, Ishikawa, Japan.

Background: Dual-isotope simultaneous acquisition (DISA) SPECT with F-18 FDG and To-99m MIBI is an attractive approach for the detection of viable myocardium, because it enables simultaneous assessment of glucose metabolism and perfusion. Another potential benefit of this approach is that the measurement of left ventricular function may be possible by ECG gating. The aim of this study was to assess the feasibility of ECO-gated DISA SPECT to assess myocardial glucose metabolism, perfusion, and function in patients with prior myocardial infarction.

Methods: Nineteen patients underwent ECO-gated F-18 FDG/MIBI DISA SPECT and FDG/ MIBI SPECT. Of these, 12 patients also underwent a breath-hold cine-MRI to assess left ventricular function. The left ventricular myocardium was divided into 6 segments; and each segment was classified as viable or scar using a semiquantitative visual scoring system based on defect severity and the presence or absence of perfusion-FDG mismatch, assessing the left ventricular ejection fraction (LVEF) measured by gated SPECT was compared with the results of MRI.

Results: Of 144 PET viable segments, 141 (98%) were identified as viable by DISA SPECT. Conversely, 22 (81%) of 27 PET scar segments were scar by DISA SPECT.