1167-39 The Transmural Extent of Necrosis Modulates the Contractile Response of Metabolically Viable Myocardium to Dobutamine

Bernhard L. Gerber, Agnès Pasquet, Véronique Roelants, David Vancraeynest, Anne-Marie D'Hondt, Jean-Louis J. Vanoverschelde, Université Catholique de Louvain, Brussels, Belgium

Background: Both positron emission tomography (PET) and low-dose dobutamine echocardiography (LDE) have been proposed to assess the presence of viable myocardium. Although both of these modalities share the same final purpose, i.e. to predict which segment is likely to resume contractile function following revascularization, they frequently disagree on the presence of segmental viability. In particular, many segments with preserved metabolic viability lack evidence of contractile reserve during LDE. The aim of this study was to determine whether small subendocardial infarcts might contribute to the lack of inotropic reserve in metabolically viable myocardium. **Methods:** Thirteen patients (10 M, 60±11 years) with CAD and altered cardiac function (EF 34±15%) underwent FDG-PET, LDE and Gd-enhanced MRI for the assessment of myocardial viability. Baseline contractile function, inotropic reserve (LDE) and the transmural extent of necrosis (quantitative late-enhancement MRI) were compared among PET viable (>60% remote FDG uptake) segments and non-viable as well as in LDE responding and non-responding segments. **Results:** At baseline, 127/208 segments were dysfunctional. Sixty-four of these segments were considered PET viable, whereas 63 were PET non-viable. Among the 63 PET non-viable segments, 53 (84%) did not improve during LDE. Conversely, among the 64 PET viable segments only 24 (38%) improved contraction with dobutamine. Gd-enhanced MRI demonstrated that PET viable segments had less transmural necrosis than PET non-viable segments (20±21 vs. 61±26% p<.001). The extent of necrosis was also lower in dobutamine responsive PET viable segments than in dobutamine non responsive PET viable segments (13±12 vs. 31±22%, p<.001). **Conclusions:** The transmural extent of necrosis is larger in metabolically viable segments that fail to respond to dobutamine than in those exhibiting contractile reserve. The presence of more extensive subendocardial infarction probably contributes to the lower sensitivity of LDE vs. PET for the detection of myocardial viability.

1167-40 Myocardial Hyperenhancement by Magnetic Resonance Imaging in Genotyped Hypertrophic Cardiomyopathy Patients Identifies Early Disease and Correlates With Clinical Risk

James C. Moon Jens Mogensen, Gillian C. Smith, Andrew G. Elkington, Sanjay Prasad, Perry M. Elliott, Dudley J. Pennell, William J. McKenna, Royal Brompton Hospital, London, United Kingdom, St. George's Hospital, London, United Kingdom

Introduction: Some patients with Hypertrophic Cardiomyopathy (HCM) have abnormal areas of myocardial hyperenhancement after gadolinium-DTPA by Cardiovascular Magnetic Resonance (CMR). This is believed to represent myocardial fibrosis or disarray, but the precise histology and relationship to genotype and disease stage is unknown. We examined a cohort of genotyped subjects all carrying the same sarcomeric protein mutation (Troponin I) to assess the relationship between hyperenhancement and disease stage and to assess whether CMR could detect early disease.
Methods: Thirty patients from 13 families underwent cine and contrast enhanced CMR. 15 patients fulfilled WHO criteria for HCM with abnormal wall thickness on echo (G+/LVH+) and 15 were gene positive with a normal echo (G+/LVH-).
Results: All (100%) G+/LVH+ patients and 4 (27%) G+/LVH- patients had abnormal cine CMR imaging with abnormal regional hypertrophy. Abnormal hyperenhancement was present in 12 (86%) G+/LVH+ patients and 3 (20%) G+/LVH-. Where present, the mean extent of hyperenhancement in the G+/LVH+ patients was 15% (range 3-48%) and less in G+/LVH-patients (3.6%). Overall, the extent of hyperenhancement was related to high clinical risk of sudden death (≥2 standard risk factors for sudden death), (mean 15% high risk vs 4%, p=0.03), total LV mass (r=0.56, p<0.001) and inversely to ejection fraction (r=0.56,p<0.001). Increased hyperenhancement was not associated with age over the whole group, but was when comparisons were made within families. Segmental analysis showed that as segmental wall thickness increased, hyperenhancement was more prevalent (p<0.0001 for trend) and more extensive (r=0.99).
Conclusion: Hyperenhancement occurs in almost all G+/LVH+ patients, and a significant number of G+/LVH- patients. The intra-pedigree relationship of hyperenhancement with subject age is evidence that hyperenhancement increases over time as the phenotype evolves. Hyperenhancement may have a role both in the diagnosis of early disease and as a new marker for clinical risk.

1167-41 Determination of Infarct Size by Contrast-Enhanced MRI: Comparison Between Quantitative Planimetry and a Semiquantitative Visual Score Method

Clerio F. Azevedo Marcelo Hadlich, João L. Petriz, Luis A. Mendonça, Jorge Moll, Carlos E. Rochitte, Rede D'Or & Labs, Rio de Janeiro, Brazil, Heart Institute (Incor), University of São Paulo Medical School, São Paulo, Brazil

Background: Delayed-enhanced MRI can measure infarct size precisely, which has important clinical and prognostic significance. We examined whether a faster semiquantitative visual score method is valid to determine infarct size when compared to the quantitative and time-consuming planimetric method.
Methods: Sixty-two patients with previous myocardial infarction underwent contrast-enhanced MRI on a 1.5T whole-body magnet (Intera NT, Philips). Eight short-axis slices covering the whole left ventricle (LV) were acquired and analyzed in two ways: manual drawing of the hyperenhanced regions and LV endocardial and epicardial borders to determine infarct size as a percent of LV mass (planimetry, PL); visual evaluation by score (VS) of all 8 slices, divided in 48 segments (2 basal slices with 8 segments, 4 middle slices with 6 segments and 2 apical slices with 4 segments, therefore weighting for the segment mass), by two independent observers that were blind to the planimetry results. They graded the transmural extent of hyperenhancement on a four-point scale in which a score of 0 indicated no hyperenhancement, a score of 1 hyperenhancement of 1 to 25% of tissue within a segment, a score of 2 hyperenhancement of 26 to 75%, and a score of 3 more than 75%. The final score of each patient was then divided by the total possible score, providing the infarct size as percent of LV mass.
Results: Mean infarct size was similar by PL versus VS (19.8±1.4% vs. 18.6±1.3%, P NS). Correlation coefficient for PL vs. VS was good for both observers (r=0.90 and 0.82, P<0.01). Bland -Altman analyses revealed a mean difference of -1.2%, with a 95% confidence interval for the differences between PL and VS ranging from -11.0 to 8.6% . Moreover, good correlation was observed between VS and LV ejection fraction (r=0.75, P<0.01).
Conclusion: The visual semiquantitative evaluation of the delayed-enhanced images by the score method showed good accuracy and reproducibility to determine the percent of infarcted LV mass when compared to the quantitative planimetric method. Therefore, infarct sizing by the score method can be used in routine cardiac MRI exams, adding objective data to the report and significantly decreasing post-processing time.

1167-42 Assessment of Myocardial Viability in Patients With Left Ventricular Dysfunction Using Contrast-Enhanced Magnetic Resonance Imaging : Comparison to 201-Thallium Single Photon Emission Computed Tomography

Matthias Regenfus, Christian Schlundt, Johannes von Erffa, Robert Krähner, Dieter Ropers, Stephan Achenbach, Michaela Schmidt, Niels Oesingmann, Kristin Schmiedehausen, Günther Platsch, Torsten Kuwert, Werner G. Daniel, FAU Erlangen-Nürnberg, Erlangen, Germany, Siemens Medical Solutions, Erlangen, Germany

Objective: We compared contrast-enhanced (ce) magnetic resonance imaging (MRI) and 201-Tl SPECT concerning detection of myocardial viability in patients with left ventricular dysfunction.
Methods: 53 patients (pts) with left ventricular dysfunction (EF 39±15%) who had suffered myocardial infarction (MI) (26 chronic MI, 27 within 7 days of acute MI) were examined. Ce images were acquired 10 min after intravenous injection of 0.1 mmol/kg Gd-DTPA. SPECT was performed according to standard protocols. A 14-segment model of corresponding basal, midventricular and apical slices was analysed independently for MRI and SPECT. Segmental hyperenhancement (HE) for MRI and defect size for SPECT was visually graded. Segments were categorized as viable or nonviable according to SPECT. Moreover, segmental extent of infarction (SEI) was quantified for MRI.
Results: Viable (78%, 579/742) segments by SPECT showed significantly less SEI compared to nonviable (22%, 163/742) segments (12.3±19.7% vs. 61.1±27.5%, p<0.0001). Summed SPECT score and summed MRI score showed close agreement for pts with chronic MI (r=0.8, p<0.0001) and acute MI (r=0.9, p<0.0001). However, SPECT failed to detect 70 of 352 (20%) segments showing HE by MRI, and, on a patient basis, missed 7 of 53 (11%) of pts with small MI, which had all been detected by MRI. Moreover, of 163 segments assessed nonviable by SPECT only 83 (51%) showed transmural HE.
Conclusion: Ce MRI and SPECT show a close overall correlation for determination of myocardial viability. Potential advantage of MRI is the superior spatial resolution which allows for determination of both the transmural extent and delineation of small myocardial necrosis.

1167-43 Simultaneous Evaluation of Myocardial Function, Viability, and Microvascular Dysfunction by a New Magnetic Resonance Technique

Gilbert L. Raff, Beth A. Bartholomew, Ralph Gentry, Anil N. Shetty, Kostakis G. Bis, James A. Goldstein, William W. O'Neill, William Beaumont Hospital, Royal Oak, MI

Background In patients with acute coronary syndromes, the ability to rapidly delineate hibernating myocardium and assess microvascular dysfunction (MD) has therapeutic implications. At present such analyses are performed by standard cardiac magnetic resonance techniques (ST) combining delayed enhancement and cine function study. We developed a new method, contrast-enhanced cine magnetic resonance (CEC), that simultaneously does both. This study compared CEC to ST for diagnosis and total exam time.
Methods 18 patients were studied to date: 7 with acute infarction within 24 hours and at 1 week, and 11 over 3 months post-infarction. After a 0.20 mmol/kg gadolinium first-pass study, patients were imaged by an ECG-gated, segmented k-space, inversion recovery, multi-slice true-FISP sequence. 9 short axis and horizontal and vertical long-axis slices were obtained. This completed the CEC exam. ST exam followed, using a standard inversion-recovery turbo-FLASH sequence. Areas of delayed hyperenhancement (DH) and hypoenhancement (MD) were planimetered for size and transmurality score.
Results DH area by the two techniques was highly correlated (0.92, P<0.0001), as was MD (0.60, P<0.0001) and transmurality score (0.60, <0.0001). CEC reduced exam time by 38% (15 +/- 6 minutes vs 24 +/- 5 minutes).
Conclusions These findings demonstrate that this novel method, contrast-enhanced cine magnetic resonance, can rapidly assess myocardial viability and microvascular dysfunction. This more rapid technique may be advantageous in the evaluation of patients with acute coronary syndromes.