9:15 a.m.

1075A-MP-205 Assessment of Transmural Extent of Radiofrequency Ablation With Magnetic Resonance Imaging

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Background: The transmural extent of radiofrequency ablation (RFA) is highly predictive of the procedural success for either focal ablation or creation of isolation lines as for idiopathic ventricular tachycardia, atrial flutter and atrial fibrillation. However, current imaging technologies like fluoroscopy or echocardiography are unable to accurately assess the thickness of the created lesion. Therefore, we tried to determine the transmural extent of RFA using magnetic resonance imaging (MRI). **Methods:** RFA were created on the epicardial surface of the right ventricle in 18 mongrel dogs using a power-controlled, water-cooled 7-French catheter system (10 to 50W for 30s). The ablation lesions were imaged with non-contrast enhanced T1-weighted (SPGR: spoiled gradient recalled acquisition) and T2-weighted (FSE: fast spin echo) protocols, or after intravenous injection of 0.225mmol/kg gadolinium using a T1-weighted fast gradient echo (FGRE) sequence. Ablation lesions and intramural extent were analyzed in the MR images and compared to the gross anatomy and histopathology. **Results:** 59 RF lesions were created extending 2.2mm to 8.3mm into the ventricular wall and resulting in 17 transmural ablations. Lesions were accurately detected with all three imaging protocols. Non-contrast enhanced T2-weigthed images had a sensitivity of 100% and a specificity of 93.4% to detect transmural extent but slightly overestimated lesion thickness by 0.81mm. For T1-weighted imaging protocols the sensitivity and specificity were 71.4% and 100% without contrast and 85.7% and 94.4% after gadolinium injection. Transmural extent of the lesion as assessed with the T1-weighted protocols was underestimated by 0.15mm without and overestimated by 1.22mm with contrast. The correlation with the histopathological specimen was excellent with all three imaging protocols (r=0.89, r=0.89, and r=0.93, respectively). **Conclusion:**
Successful transmural RFA can be accurately assessed using MRI with and without contrast enhancement. Therefore, MRI might provide a useful tool to determine the procedural success for complex ablation procedures and guide further therapeutic strategies.

9:30 a.m.

1075A-MP-206 A Novel Liposomal Encapsulated Iohexol (Omnipaque) for Detection of Inflammation by Computed Tomography: A Potential Method for Identification of Vulnerable Plaques

Alireza Zarrabi, Daniel Chan, Zhongyun Dong, Alan Cohen, Silvio Litovsky, Mohammad Madjid, Samuel Ward Casscells, James T. Willerson, Morteza Naghavi, Texas Heart Institute, Houston, TX, University of Texas, Houston Health Science Center, Houston, TX

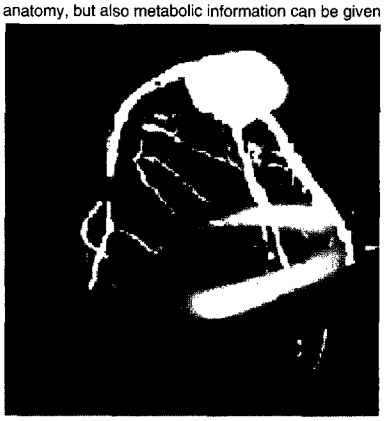
We have previously shown that inflammation in atherosclerotic plaques can be detected by MRI using lipid coated SPIO. We hypothesized that plaque inflammation can be detected by CT using a novel liposomal encapsulated iohexol.
Method: We have developed liposomal iohexol (about 50 nanometers) with clinically recommended dose of organically-bound iodine (300mg I/ml). Mouse peritoneal macrophages were cultured and incubated with rhodamine-labeled liposomal omnipaque for 1, 2, 4, 8, and 24 hours. Fluorometry and fluorescence microscopy were performed to assess uptake of omnipaque by macrophages. Finally, CT scan using GE LightSpeed Ultra was performed on each sample.
Results: Fluorescence microscopy showed intracellular rhodamine-labeled liposomal omnipaque confirming significant uptake by macrophages. Fluorometry showed the effect of different doses and incubation time on macrophage uptake. The peak uptake was found at 24 hr (69.94 arbitrary fluorescence units(AFU)) with approximately 40% of uptake in the first hour (30.34 AFU) and the rest distributed almost equally over time. CT scan could differentiate the contrast-enhanced cultured cells from control cells. Maximum effect was seen at 300 mgI/ml with a trend over different concentrations. However poor spatial resolution did not allow distinguishing different visible signal intensity across the samples (Figure).
Conclusion : We have developed a novel nano-liposome encapsulated iohexol. Macrophages avidly take up this liposomal iohexol. The intracellular liposomal iohexol maintains its CT contrast enhancement effect. Further studies are needed to elucidate the use of liposomal iohexol for in vivo detection of inflammation/ macrophage infiltration in atherosclerotic plaques by CT.

9:45 a.m.

1075A-MP-207 Fusion Imaging in Chronic Coronary Artery Stenosis of the Rat by Phosphorus Spectroscopy and Magnetic Resonance Coronary Angiography

Matthias Nahrendorf, Karl-Heinz Hiller, Thomas Neuberger, Andreas Greiser, Sascha Köhler, Kai Hu, Axel Haase, Georg Ertl, Wolfgang R. Bauer, Medizinische Klinik, Würzburg, Germany

Aim of the study was to evaluate the concept of fusion imaging by magnetic resonance spectroscopy (MRS) and imaging in the model of chronic coronary stenosis (CS) in the rat. 3D coronary angiograms (MRA) were fused with ATP metabolite maps, which were acquired by 31P localized MRS in the isolated rat heart.
Methods. CS was induced by a ligation including a 300µm wire placed next to the left coronary artery. The wire was taken away imediately after the suture was closed. 2 weeks later localized 3D 31P Chemical Shift imaging was performed in 8 isolated perfused hearts on a Bruker 12 T AMX. (voxel size 4 x 4 x 6 mm). PCr/ATP was determined in a control and the ischemic region. MR angiography was performed with a flow weighted 3D gradient echo (TE 1.0ms, matrix 128x128). Metabolite maps of ATP were fused with the angiogram using the Amira software. After MR, fraction of scarring within ischemic region was determined in histology.
3D MRA enabled detection of CS. In the ischemic region, PCr/ATP was decreased when compared to control region (1.24+/-0.38 vs 1.45+/-0.49, p<0.05). Fraction of fibrosis in histology was 12.8+/-1.4%, and was correlated to ATP signal reduction in the ischemic region (r=0.71, p<0.05).
Conclusion. In future this kind of image fusion might be of help in fast characterisation of the severity of a stenosis and might aid decision making concerning revascularisation, because not only anatomy, but also metabolic information can be given at a glance.



POSTER SESSION

1091 Coronary Flow and Flow Reserve: New Echocardiographic Observations

Monday, March 31, 2003, 9:00 a.m.-11:00 a.m.
McCormick Place, Hall A
Presentation Hour: 10:00 a.m.-11:00 a.m.

1091-31 Coronary Flow Velocity Pattern by Transthoracic Color Doppler Echocardiography in Patients With Acute Myocardial Infarction Can Predict Myocardial Viability Assessed by Thallium Scintigraphy at Six Months

Minako Katayama, Atsushi Yamamuro, Yoshiaki Ueda, Koichi Tamita, Kenji Yamabe, Motoaki Ibuki, Tsutomu Takagi, Kazuaki Tanabe, Tomoko Tani, Toshikazu Yagi, Shigefumi Morioka, Kobe General Hospital, Kobe, Japan

Background: Our recent studies have shown that coronary flow velocity pattern (CFVP) with a rapid diastolic deceleration (DDT) and early systolic retrograde flow implies the advanced microvascular damage and poor left ventricular recovery at 1 month. However, the relationship between CFVP and myocardial viability assessed by single-photon emission computed tomographic (SPECT) thallium-201 imaging at 6 months has not been discussed. The aim of this study was to determine whether CFVP using transthoracic color Doppler echocardiography (TTCDE) can predict myocardial viability in the late stage.
Methods: The study population consisted of 50 consecutive patients with first anterior acute myocardial infarction successfully treated with percutaneous coronary intervention. Using TTCDE (Logic500, GE Yokogawa Medical, 3.5-8MHz), we measured coronary flow velocity in the left anterior descending coronary artery at 24 to 72 hours after the infarction. Patients were divided into two groups based on myocardial viability assessed by thallium-201 SPECT 6 months after the infarction. Redistribution patterns or residual maximal myocardial activity>50% are indices of tissue viability.
Results: Using TTCDE, coronary flow velocity measurement was possible in 47 of 50 patients (94%); 27 patients with viable myocardium and 20 patients with nonviable myocardium 6 months after the infarction. Coronary flow velocity variables showed significantly higher systolic peak velocity (SPV) (12±11 vs −30±33 cm/s; p<0.0001) and longer DDT (906±291 vs 353±291 ms; p<0.0001) in viable myocardium group compared with nonviable myocardial group. On the basis of receiver operating characteristic curve analysis, optimal cut off values of 0 cm/s for SPV and 600ms for DDT were chosen to predict viable myocardium (sensitivity=0.84,specificity=0.92 and sensitivity=0.86,specificity=0.89, respectively).
Conclusion: In patients with anterior acute myocardial infarction, noninvasive assessment of CFVP using TTCDE is clinically useful to predict myocardial viability in the late stage.