nary artery stenosis. And plaque composition could be clearly differentiated and classified by MSCT, which holds promise for noninvasive risk assessment in patients with known or suspected coronary artery disease.

2:45 p.m.

### 845-4 Noninvasive Assessment of In-Stent Restenosis by 16-Slice Multislice Computed Tomography

Osamu Kuboyama, Tsunekazu Kakuta, Shigeki Kimura, Taishi Yonetsu, Kenji Suzuki, Yoshitoshi Nagata, Masahiko Goya, Yoshito Iesaka, Hideomi Fujiwara, Mitsuaki Isobe, Tsuchiura Kyodo Hospital, Tsuchiura, Japan, Tokyo Medical and Dental University, Tokyo, Japan

Background: Multislice computed tomography (MSCT) is a promising technique for noninvasive coronary artery assessment. We investigated the potential value of MSCT angiography to noninvasively identify in-stent restenosis and patency.
Methods: We studied 32 stent patients (26 male, 6 female; mean age 64 years), by both MSCT (16x0.75mm detector collimation, 0.42-s rotation time, retrospectively ECG-gated, with additional beta-blockade in 26 patients) and conventional coronary angiography. A total number of 62 stents (39xMultilink, 7xNIR, 6xVelocity, 1xWiktor, 4xGRII, 3xS6, 2xPS) were evaluated at a mean interval of 23 months after implantation. MSCT images of in-stent lumen and adjacent coronary arteries were analyzed by two investigators, unaware of the results of conventional angiography, for in-stent restenosis and patency. The results were compared with conventional angiography. Axial slices, maximum intensity projections, multiplanar, and 3-dimensional volume rendering reconstructions were assessed for image analysis.
Results: All stents were correctly located and 50 stents (80.6%) were evaluable for in-stent lumen and adjacent coronary arteries. Twelve stents were unevaluable (8xMultilink, 1xWiktor, 2xGRII, and 1xNIR) due to stent design, small stent size, severe calcification, and motion artifacts. Using conventional angiography as the gold standard in 50 evaluable stents, MSCT permitted the detection of 11 of 12 significant (>50%) stenoses (sensitivity, 91.7%) and correctly depicted the absence of restenosis in 27 of 38 stents (specificity, 71.1%). These values correspond to positive predictive value of 50% (11 of 22), and negative predictive value of 96.4% (27 of 28). In 11 of 12 angiographically restenotic stents, MSCT correctly identified the type of stenosis (focal in-stent, diffuse in-stent, and edge stenosis).
Conclusion: The latest generation of MSCT is useful in localizing intracoronary stents and may be helpful to noninvasively identify the patients without in-stent restenosis. MSCT may identify the type of in-stent restenosis if image quality is sufficient.

3:00 p.m.

### 845-5 Assessment of Microvascular Function After Acute Myocardial Infarction by 16-Slice Computed Tomography

Jonathan Lessick, Robert Dragu, Shmuel Rispler, Rafael Beyar, Haim Hammerman, Michael Kopilevitz, Yoram Agmon, Shimon Reisner, Diab Mutlak, Ahuva Engel, Rambam Medical Center, Haifa, Israel

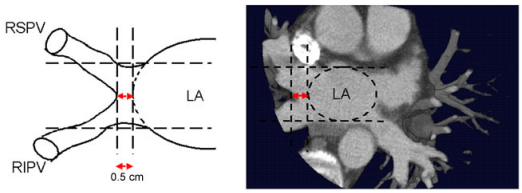
Multislice CT is capable of simultaneously assessing the coronary arteries, myocardial function and myocardial perfusion in a single scan. An additional scan, 5 minutes post-contrast can be added to assess late enhancement (LE), giving additional information concerning microvascular function.
Methods: We scanned 17 patients from day 3 to 7 following an acute myocardial infarction (MI) using a Philips IDT scanner, during injection of 120cc contrast. Of these, 13 underwent a late 5 minute post-contrast scan as well. All patients underwent catheterization with proven patent coronary arteries (Most underwent angioplasty). An echocardiogram was also performed in the 1st week post-MI. Using the 16-segment approach, segments were scored as normal, hypokinetic (hy) or akinetic (ak). Three short axis slices (apex, mid, base) were reformatted for each CT scan after being reconstructed in phases 0%, 40-50% and 70-80%, and were assessed for the presence and degree of early perfusion defects (ED) and LE.
Results: All patients with abnormal contraction on echocardiography demonstrated ED, however notall abnormal segments had ED. Nine of 13 patients had LE. Of 272 segments analysed, 12/35 hy and 28/46 ak segments demonstrated ED, while 7/24 hy and 19/33 ak segments showed LE. Ak segments had a larger area of LE, compared to hypokinetic segments (p=0.04), however ED size and transmurality and LE transmurality were not significantly different. The size of the ED correlated reasonably well with the number of abnormal segments on echocardiogram (r=0.55).
In summary, microvascular function commonly follows acute MI and correlates with the size of the dysfunctional zone and the severity of the dysfunction.

3:15 p.m.

### 845-6 Anatomical Observations of the Left Atrium and Pulmonary Veins by Multislice Computed Tomography in Patients With Atrial Fibrillation

Monique R.m Jongbloed, Jeroen J. Bax, Martijn S. Dirksen, Ernst E. van der Wall, Albert de Roos, Martin J. Schalij, Leiden University Medical Center, Leiden, The Netherlands

**Background:** Electrical isolation of pulmonary veins (PV) by radiofrequency catheter ablation (RFCA) at PV ostia may cure atrial fibrillation (AF). Information on ostial shape and insertion is mandatory to determine ablation strategy. No proper definition of the pulmonary venous junction is present at this time.
**Methods:** MSCT was performed in 33 patients (pts) referred for RFCA at PV ostia. The insertion of PV in the left atrium (LA) was evaluated in 3 orthogonal planes and 3-D reconstructions. The border of the LA was extrapolated on coronal or transversal sections and a virtual line was drawn. If the ostium of the PV was 0.5 cm outside this line, the insertion was defined as "common ostium" (Figure). The sagital plane was used to confirm a common truncal part of superior and inferior PV. PV ostial diameters were measured in 2 directions.
**Results:** Common ostia of left PV were observed in 26 (79%) pts and of right PV in 11 (33%) pts. Additional left and right PV were observed in 1 and 10 pts respectively. An early branching pattern of PV was observed frequently (67% for left and 85% for right PV). Indices of measurements in 2 directions were 1.39±0.29 vs 1.21±0.17 mm for left and right PV respectively, suggesting an oval shape of especially left PV ostia.
**Conclusion:** Variation in anatomy occurs in a large number of pts. Common ostia are observed more often in left PV. Additional veins and early branching were seen more often in right PV. Recognition of variations in PV anatomy using a standardized method may facilitate RFCA of PV ostia.




POSTER SESSION

## 1168 Ultrasound at the Bench

Tuesday, March 09, 2004, 3:00 p.m.-5:00 p.m.
Morial Convention Center, Hall G
Presentation Hour: 4:00 p.m.-5:00 p.m.

### 1168-161 Effect of High Intensity Focused Ultrasound on Cardiac Valves

Ryo Otsuka, Kumiko Hirata, Kana Fujikura, Yuki Oe, David Engel, Charles Marboe, Marco Di Tullio R. Di Tullio, Robert Muratore, Fred Lizzi, Shunichi Homma, Columbia University, New York, NY, River Side Institute, New York, NY

Backgrounds: High intensity focused ultrasound (HIFU) produces immediate focal lesions with intense focused exposures within short periods. HIFU beams can be non-invasively focused within small volumes. Exposures at high intensity levels in a few seconds produced superficial thermal lesions and creating valvular lesions may prove to be useful for such procedures as valvuloplasty or valvuloplasty. The purpose of this study was to evaluate the possibility to create lesions in valve tissues in-vitro.
Methods: We studied 10 calf mitral valves. Each specimen was mounted on rubber sheet and immersed in a water bath at 37 C. The focal point was set at 2.5 cm from the transducer. The operating frequency of the transducer was 4.67 MHz, and the focal zone was10mm depth × 1.1 mm wide. Ultrasound energy was applied with an acoustic intensity of 26.9kW/cm$^2$ for 10 seconds, 20 sec, 30 sec, 40 sec, 50 sec and 60 sec on each valve.
Results: Visible changes of the valves required more than 20 second exposure at this intensity. The surfaces of lesion on mitral valve were slightly discolored, and pathologically coaglation of tissue in the affected areas were observed. HIFU exposure for more than 40 sec resulted in perforation on all leaflets with mean diameter of 1.0±0.2 mm.
Conclusion: We concluded that HIFU could create superficial thermal lesions and perforation in mitral valve tissues. With further refinement, HIFU may prove useful for valvulotomy or valvuloplasty.

### 1168-162 Targeted Ablation of Myocardium Using High Intensity Focused Ultrasound in Beating Dog Hearts

Ryo Otsuka, Kana Fujikura, Todd Pulerwitz, Kumiko Hirata, Jie Wang, Daniel Burkhoff, Robert Muratore, Fred Lizzi, Shunichi Homma, Columbia University, New York, NY, River Side Institute, New York, NY

Backgrounds: High intensity focused ultrasound (HIFU) produces immediate focal lesions. Previously we have reported on the feasibility of creating thermal lesions by HIFU in in-vitro cardiac tissues. The purpose of this study was to evaluate the possibility of creating targeted and focused myocardial lesions in beating dog hearts.
Methods: The operating frequency of the transducer was 4.67 MHz, and the focal zone was 10mm depth × 1.1 mm wide at a distance of 25 mm from the transducer tip. Two dogs were anesthetized and underwent a left sided thoracotomy. The left ventricular surface was coupled with the transducer surface using echotransmission gel and water bath. The timing of the HIFU discharge was set during diastole (0.2 sec before the R wave) using an ECG triggering system newly created for this purpose. The focal point was set at the middle of the left ventricular (LV) anterior wall using conventional 2D echocardiography. Ultrasound energy was delivered at an acoustic intensity of 26.9kW/cm$^2$ for 0.2 seconds. For each dog and in-vitro cardiac tissue, we created 5 lesions twice (ablations were performed 10, 15, 20, 25, and 30 times for each lesion, respectively). Lesion size was assessed by measuring it's length and width.