1154-145 Abnormal Left Ventricular Wall Rotation In Patients With Complete Left Bundle Branch Block: Analysis Using Magnetic Resonance Imaging Tagging Images

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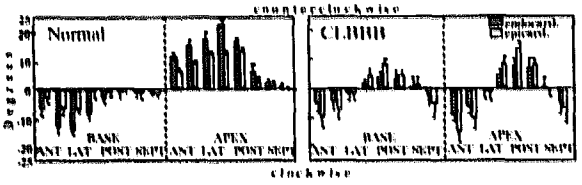
Segmental cardiac wall motion can be assessed by means of magnetic resonance imaging (MRI) tagging images. Using this method, we examined 7 patients with complete left bundle branch block (CLBBB) without any cardiac disease and 5 normal volunteers and assessed the rotation of the left ventricular (LV) wall around the center of gravity in the transverse plane of the heart. The angle of rotation was positive, when it was counterclockwise viewed from the apex. In normal hearts, the rotation gradually changed in the midventricle from clockwise in the basal portion to counterclockwise in the apical portion. The rotation angle was greater at the endocardium than at the epicardium. In all the CLBBB hearts, both the basal and apical portions displayed a clockwise rotation in the anterior wall but a counterclockwise one in the inferoposterior wall. The rotation angle was greater at the epicardium than at the endocardium unlike the normal hearts.



The abnormal LV rotation in the CLBBB hearts may be related to the disorder of myocardial depolarization which spread from the ventricular septum to the lateral epicardial segments through the anterior and inferoposterior walls. We first clarified the abnormal rotation of the LV in CLBBB using tagging MRI. This abnormality may affect the function of LV in CLBBB.

1154-146 Assessment of Coronary Artery Blood Flow Velocity Using Breath-hold Phase Contrast MR Angiography in Patients With Acute Myocardial Infarction

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Background: The purpose of this study was to assess the infarct-related coronary artery blood flow velocity in patients with reperfused acute myocardial infarction and to correlate these results with flow measurements obtained by intracoronary doppler US

Methods: We measured coronary blood flow velocity after direct or rescue coronary angioplasty in 15 patients with acute myocardial infarction using a 0.014 doppler guidewire. MR exam was also performed in all patients within one week after the coronary angioplasty. Following doppler parameters were measured: average peak velocity (APV), maximum peak velocity (MPV) and average diastolic peak velocity (ADPV). MR imaging was performed on a 1.5T clinical imager with Torso phased array coil. The phase contrast pulse sequence (FASTCARD PC) was employed in breath-hold with 10 to 21 temporal phases with 4 view per segment, flip angle 20 deg., acquisition matrix 256 × 128, and one excitation. Field of view, TE, TR were 44 × 33 cm, 7 ms, 16 ms.

Results: MR and doppler measurements after angioplasty were obtained at the same anatomic levels: 10 proximal and distal LAD segments and 5 proximal and distal RCA segments. Mean APV was 17.8 ± 6.3 cm/sec, mean ADPV was 21.5 ± 7.8 cm/sec and mean MPV was 33.9 ± 10.9 cm/sec. Mean MRI APV was 15.5 ± 10.3 cm/sec, mean MRI ADPV was 24.0 ± 11.3 cm/sec, and mean MRI MPV was 31.1 ± 15.0 cm/sec. Mean MRI APV correlated well to ADPV ($r = 0.50$; $p < 0.05$).

Conclusion: Comparing MR with invasive intracoronary doppler flow measurements, the measured MR values showed good agreement with APV, ADPV and MPV. Thus, phase contrast MR imaging allows to assess the coronary blood flow velocity pattern and the presence of microvascular dysfunction in patient with reperfused acute myocardial infarction.

1154-147 Phase Contrast Magnetic Resonance Imaging of Effective Orifice Area for Restrictive Valve Orifices

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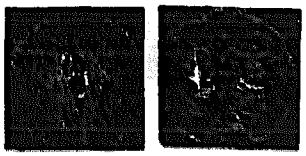
We investigated the applicability of phase contrast magnetic resonance imaging (PC MRI) for direct measurement of effective orifice are (EOA) and explored the effect of flow rates, orifice sizes, and geometry on EAO and contraction coefficient (Cc) (which is the relationship of EOA to actual OA). On PC images, a 1.5T GE SIGNA system was used for imaging steady flows, ranging from 3.6–9.0 l/min., through 4 orifices (2 circular, 1 rectangular and 1 eccentric prolapsing mitral valve orifice) with OA 0.12–0.24 cm^2 set in a custom designed in vitro model. EOA was determined by computer-assisted processing of the velocity-weighted MR images using 3 mm slices of the narrowest cross-sectional area of the jet derived from multiple referenced imaging planes and views. EOAs correlated and agreed well with EOAs calculated from actual flow rate/CW Doppler velocity ($r = 0.94$, SEE = 0.03 cm^2). Cc by MRI was significantly larger ($P < 0.05$) for high flow rates than for low flow rates; it was also larger for the circular orifice than for rectangular orifices.



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The shape of the MRI resolved EO images highly resembled those of the true orifices. PC MRI with high resolution multiple plane referenced image plane selection is capable of imaging flow events and determining EOA to aid the quantitative evaluation of valvular regurgitation and stenosis.

1154-148 Magnetic Resonance Techniques for the non Invasive Determination of Coronary Blood Flow Velocity

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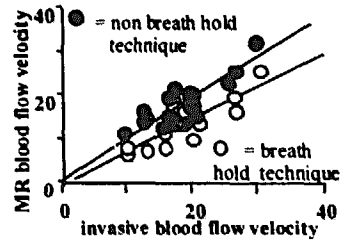
The functional assessment of coronary artery stenoses by invasive intracoronary Doppler flow velocity measurements is well established. Magnetic resonance (MR) tomography allows a non invasive estimation of coronary artery blood flow velocities. The aim of this study was to evaluate two different MR techniques for the assessment of coronary blood flow.

Methods: Coronary blood flow velocities (average peak velocities) were measured invasively in 24 angiographically normal segments (12 patients) with a 0.014" FloWire (FloMap system, Cardiometrics). Non invasive blood flow measurements were performed in identical segments with the 2 MR techniques using a 1.5 Tesla system (Philips Gyroscan NT). A single breath hold technique (duration 16–20 s, spatial resolution 1 × 0.9 × 4 mm, temporal resolution = 140 ms) and a non breath hold technique with prospective navigator correction (duration 150 s, spatial resolution 1 × 1 × 4 mm, temporal resolution = 31 ms) were used. Maximal diastolic flow velocity was measured and corrected for cardiac motion.

Results: Three patients had to be excluded due to insufficient MR image quality. Coronary blood flow velocities determined by both MR techniques correlated closely with the invasive measurements (figure). However, the breath hold technique tended to under-estimate maximal flow velocity.



Conclusions: Both MR techniques allow an estimation of coronary blood flow velocities. The higher temporal resolution of navigator corrected non breath hold techniques may lead to an increased accuracy.

1154-166 Gadolinium-enhanced 3 Dimensional Magnetic Resonance (MR) Angiography for Identifying Coronary Graft Patency

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Background: We investigated prospectively graft patency in patients with inter-

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nal mammary artery (IMA) and venous coronary artery bypass graft (CABG) using contrast-enhanced MR angiography with a new 3 dimensional gradient echo (GE) technique with ultra-short echo time in comparison to conventional coronary angiography.

Methods and Results: Twenty-nine consecutive patients (28 men, age 58 ± 9 years) who had undergone CABG were examined by MR and conventional angiography 26 ± 5 months after cardiac surgery. In total, 75 grafts (28 IMA, 47 venous grafts) were analyzed. For MR angiography, a frequency spoiled 3 dimensional GE technique with ultra-short echo time was used (repetition time 4.4 ms, echo time 1.8 ms). Data acquisition was performed in sagittal and coronal planes during application of a gadolinium chelate using a breath holding technique. Twenty-two IMA and 34 venous grafts were diagnosed correctly as patent by MR angiography. The sensitivity was 96% (IMA) and 94% (venous grafts) (p = NS). One of the truly occluded IMA and 2 of the truly occluded venous grafts were falsely diagnosed as patent by MR angiography (specificities 67% and 83%, respectively; p = NS). The accuracy for a patent graft was 93% (IMA) and 91% (venous CABG, p = NS), overall 92%.

Conclusions: MR angiography using a 3 dimensional gradient echo-technique with ultra-short echo time is a highly accurate and relatively non-invasive approach of assessing saphenous vein graft and IMA graft patency. To date, this advanced technique is limited by the inability to visualize graft stenosis as well as the patency of the distal anastomosis site.

1155 Evaluating Extent of Peripheral Vascular Disease and Associated Operative Risk

Tuesday, March 31, 1998, 3:00 p.m.–5:00 p.m.
Georgia World Congress Center, West Exhibit Hall Level
Presentation Hour: 4:00 p.m.–5:00 p.m.

1155-47 How Safe Is Vascular Surgery Soon After Myocardial Infarction?

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Elective vascular surgery (VS) is contraindicated within the first 6 months of MI. However, this principle is based on high complication rates from old case series. To determine whether modern medical management and revascularization might lead to better outcomes, we compared patients who had VS within 6 months after MI to patients who had VS 6 to 12 months after MI. Forty-six consecutive patients underwent 63 vascular procedures from January 1989 to December 1995. Group I (n = 30) had MI < 6 months and group II (n = 16) had MI 6 to 12 months before VS. Thirty major arterial reconstructions, 9 thromboembolectomies and 22 amputations or revisions were performed. Both groups had similar preoperative characteristics, risk factors, Goldman and Cooperman scores. The high overall prevalence of revascularizations (37%) and treatment with aspirin (87%), beta-blockers (65%) and ACE-inhibitors (76%), did not differ significantly between both groups. The perioperative outcomes are summarized in the table.

Group (mths)	n	Perioperative MI	Cardiac Mortality	Any Cardiac Event	Total Mortality
I (<6)	30	1 (3.3%)	0 (0%)	7 (23.3%)	2 (6.7%)
II (>6-12)	16	1 (6.2%)	1 (6.2%)	3 (18.7%)	1 (6.2%)
p value†		0.99	0.35	0.99	0.99

† Fisher exact test

Conclusions: Newer medical and surgical interventions have resulted in reduced perioperative complication rates, even in patients operated upon within 6 months of MI. In patients requiring VS, surgical treatment should not be delayed on the basis of recent MI.

1155-48 Active Pedal Plantarflexion in Patients With Intermittent Claudication: Comparison With Treadmill Exercise

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Background: The ankle: brachial systolic pressure index (ABI) measured after a treadmill walking test (TWT), is accurate in the diagnosis of intermittent claudication. Active pedal plantarflexion (APP) is often used as an alternative to TWT, but formal comparisons are limited. This study was designed to compare the ABI response to TWT and APP.

Methods: Fifty patients (28 men, 22 women), mean age 70.6 years, undergoing TWT for evaluation of intermittent claudication were also tested using APP (≤50 repetitions of ankle plantarflexion while standing). The order of testing was random and a 30 minute recovery period was allowed between the tests. For both APP and TWT, the post-test ABI was defined as the ABI within the first minute following exercise. A paired t-test and Pearson correlation coefficient were used to compare the two studies' post-test ABIs.

Results: Mean post-test ABIs were not significantly different between TWT and APP (p = 0.58, 95% confidence interval [CI] = [−0.029, 0.016]). The correlation between TWT and APP post-test ABIs was strong (r = 0.95, 95% CI = [0.93, 0.97]).

Conclusion: The correlation between APP and TWT is excellent. APP may be an alternative to TWT in patients with intermittent claudication.

1155-49 White Coat Hypertension and Carotid Atherosclerosis: Is there a Relationship?

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Background: Ambulatory blood pressure monitoring (ABPM) devices are increasingly used in the assessment of hypertension, but the association of abnormal ABPM recordings with atherosclerosis is unclear.

Methods: Carotid atherosclerosis was defined as the presence of an atherosclerotic plaque, stenosis or occlusion in ≥1 of 6 carotid artery segments examined (right and left internal, external and common carotid arteries). Blood Pressure (BP) was measured manually with a standard mercury sphygmomanometer. ABPM measurements were made with an oscillometric device (Spacelabs 90207). The 1st reading with the ABPM device was compared with simultaneous manual measurements. Mean 24 hour, mean daytime and mean nighttime ABPM results were analysed. Nocturnal BP fall ('dipping') was defined as a 10% fall in mean BP at night.

Results: We studied 79 patients (51 men; mean ± SD age, 62.4 ± 11.56 years); 30 (38%) had a previous history of hypertension. 44 (56%) patients had evidence of carotid atherosclerosis. There was no significant difference between manual clinic systolic BP and first ABPM systolic BP. First diastolic BP by ABPM was significantly higher than the clinic recording (mean ± SD difference, 9.6 ± 11.2, t = 6.12, p < 0.0005).

mean (SD) mmHg

Carotid Doppler Examination	Manual Clinic Systolic BP	Manual Clinic Diastolic BP	Mean 24 hr Systolic BP	Mean 24 hr Diastolic BP
Normal	131.1 (17.6)	79.7 (14.6)	128.1 (13.7)	78.2 (9.03)
Atherosclerosis	146.7 (25.2)	78.1 (13.4)	133.1 (21.7)	77.1 (10.4)
P (two-tailed t-test)	= 0.003	N.S	N.S	N.S

There were 12 'dippers' in the normal group and 18 in the carotid atherosclerosis group (X^2 = 0.04, NS).

Conclusions: This study demonstrates that clinic, but not 24 hour mean systolic BP assessed by ABPM, is associated with carotid atherosclerosis. This data supports recent evidence that White Coat Hypertension should not be considered as simply a benign condition.

1155-50 Is Noninvasive Testing Necessary for all Patients Undergoing Preoperative Risk Assessment: The Predictive Value of Clinical Variables in Patients With Peripheral Vascular Disease

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Previous reports and recent ACC/AHA guidelines have suggested that noninvasive diagnostic tests for preop risk assessment are most useful only in pts with intermediate- to high-risk probability of significant CAD based on clinical predictors; however, this strategy has not been prospectively evaluated. Accordingly, we prospectively evaluated the utility of exercise treadmill testing (ETT), ambulatory ECG monitoring (AEM), and dipyridamole thallium scintigraphy (DTS) in 223 consecutive pts referred for risk assessment for major vascular surgery. Each pt underwent detailed clinical assessment and ETT, 48-hr AEM, and DTS. Mean age was 68 ± 8. Stepwise discriminant analyses identified 5 clinical variables (diabetes, hypercholesterolemia, smoking, chest pain, and hypertension) as the best discriminators between intermediate- to high-risk vs low-risk groups. The presence of ≥3 clinical predictors vs ≤1 clinical predictor had 79% sensitivity and 92% specificity with 98% ppv (p < 0.0001). Seventy-nine percent of the intermediate-to high-probability group based on ≥3 clinical predictors had ≥2 noninvasive tests that were positive. Within the intermediate to high-risk group, prior hx of CAD further stratified pts into high-risk subset with ≥2 vessel CAD (84% sensitivity, 57% specificity, 84% ppv, p = 0.002). Evaluation of additional predictive value of noninvasive tests using Bayesian approach indicated that only ischemia on AEM was able to further discriminate for seventy of CAD (79% ppv). Although DTS had 89% sensitivity, it did not help further stratify pts identified by clinical predictors. In summary, these results show that clinical evaluation is extremely useful in preop risk assessment. Whereas noninvasive tests can be helpful in further stratification, they might not be essential for initial risk assessment.