POSTER SESSION

1037 New Technologies in Ultrasound

Sunday, March 07, 2004, Noon-2:00 p.m.
Morial Convention Center, Hall G
Presentation Hour: 1:00 p.m.-2:00 p.m.

1037-141 Simplified Three-Dimensional Measurement of Left Ventricular Volume and Ejection Fraction Using Automated Contour Tracking Method in Patients

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Background: Automated contour tracking (ACT) method allows automated detection of the left ventricular (LV) endocardial boundary of echocardiographic apical two-dimensional (2D) images. Application of ACT method to apical 4- and 2-chamber views and long-axis view provides simplified automated three-dimensional (3D) measurement of LV volumes and ejection fraction (EF). The purpose of this study was to evaluate the accuracy of this automated 3D measurement of LV volumes and EF with the ACT method in patients who underwent quantitative gated SPECT (QGS).
Methods: The study population was consisted of 37 consecutive patients who underwent QGS because of suspected ischemic heart disease (IHD). In every patient, apical 4- and 2-chamber views and long-axis view were obtained by 2D echocardiography. In each case, three sample points were placed on both sides of the mitral annulus and the LV apex, in the end-diastolic (ED) image of apical views. In the apical long-axis view, additional one point was placed on the basal septum in the ED image. The endocardial border was identified automatically, and extraction of the endocardial border of the LV cavity was completed in every frame throughout one cardiac cycle. ED and end-systolic (ES) 3D-LV volumes were calculated from these automated endocardial tracing. The automated 3D measurements of LV volumes and EF measurements were compared with those by QGS.
Results: In 30 patients of 37 patients (81%), adequate images were obtained for 3D-LV volumes and EF analyses. LV ED and ES volumes by the 3D-ACT method were correlated well with those by QGS (y=0.82x+10.4, r =0.97 and y=0.84x+3.3, r =0.98, respectively). The mean differences in LV ED and ES volumes between ACT and QGS were 6.4±12.4ml and 4.4±9.1ml, respectively (mean±SD). LVEF obtained by the ACT method was agreed well with that obtained by QGS (y=0.89x+6.1, r =0.92). The mean difference in EF was –0.1±6.0%.
Conclusion: The simplified automated 3D method with ACT provides accurate measurement of LV volumes and EF in patients with suspected IHD.

1037-142 Postsystolic Shortening Is Consistently Prevalent in Nonviable Myocardium in Patients With Acute Myocardial Infarction: Comparison With Contrast-Enhanced Magnetic Resonance Imaging

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Background: The assessment of myocardial viability in patients after acute myocardial infarction (MI) is a major diagnostic challenge. Revascularization is likely to be more successful in those with viable (although functionally impaired) myocardium. However this is not easy to do non-invasively and currently magnetic resonance imaging (MRI) is the investigation of choice. Post systolic shortening (PSS) of Tissue Doppler echocardiography has been suggested as a useful marker of viable myocardium due to its reversibility after relief of acute and chronic ischaemia in both animal and clinical studies. Therefore, we wish to ascertain whether the degree of PSS correlates closely with the degree of hyperenhancement of corresponding segment in the gadolinium-based MRI.
Methods: Standard echocardiography with Tissue Doppler echocardiography was performed in 43 first MI (24 anterior/19 inferior) patients (age 59.5±11.5yrs) within 6 days of acute onset using apical 4- and 2- chamber views. Basal, mid and apical segments of septal, lateral, anterior and inferior walls were analyzed offline and their peak systolic velocities (Sm) were measured. PSS was identified as positive velocity signal after aortic valve closure. The results were correlated to the infarct size on MRI. **Results:** PSS presented in 96.8% of hyperenhancement segments even with transmural infarct, and in 12.8% of remote segments without infarction. Infarct size validated by MRI was with mean value of 18.3 ± 11.2%. Mean Sm (3.8 ± 0.7 cm/s) and PSS (1.8 ± 0.6 cm/s) of infarcted segments correlated significantly with infarct size (r = -0.31, p = 0.048 and r = 0.41, p = 0.006, respectively). Whereas, ratio of PSS /Sm of infarcted segments correlated more closely with infarct size than PSS or Sm did (r = 0.62, p < 0.0001). **Conclusions:** PSS exhibits in almost all infarcted segments. Infarct size can be determined by PSS/Sm. Thus, PSS/Sm may be used to predict viable myocardium for selecting patients with reversible LV dysfunction who will benefit most from myocardial revascularization.

1037-143 Positive Isovolumic Relaxation Velocity Is a Strong Marker of Critical Stenosis in the Coronary Artery of the Normally Contracting Heart: Detection by a Simplified Tissue Doppler Mapping Technique

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Background: Positive isovolumic relaxation velocity (V_{IR}) detected by tissue Doppler echocardiography has been shown to indicate severely ischemic myocardium. We tested whether critical coronary artery stenosis in patients with apparently normal LV contraction may be detected using this methodology by a simplified tissue Doppler velocity mapping technique without provocation.
Methods: 61 subjects (male: female=42:19, age 64.6±9.9 years) with suspected angina pectoris who underwent diagnostic coronary arteriography (CAG) were enrolled. Pulsed tissue Doppler measurements were done at the annular and mid-LV levels (4 points) in each standard apical plane (long axis, 4 chamber and 2 chamber views) prior to CAG. Positive V_{IR} was defined as an upward spike during the isovolumic relaxation period. % diameter stenosis of more than 90% was defined as the critical stenosis by CAG.
Results: 51 patients (84%) had critical stenosis. Overall, the presence of positive V_{IR} predicted the critical stenosis with the sensitivity of 81% and the specificity of 58%. Positive predicted value was 89% and negative predicted value was 44%. Sensitivities for the left anterior descending coronary artery (LAD) stenosis, the circumflex coronary artery (LCX) stenosis, and the right coronary artery stenosis were 86%, 93% and 65%, respectively. None of the subjects who did not have critical stenosis demonstrated positive V_{IR}.
Conclusion: Positive V_{IR} appeared to be a marker of the critical stenosis in LAD and LCX with high sensitivity. This simple methodology may be used as an adjunct to predict the presence of high grade coronary artery stenosis among patients with normal LV contraction complaining chest pain prior to coronary arteriography.

1037-144 Left Atrial Volume and the Risk of Paroxysmal Atrial Fibrillation in Patients With Hypertrophic Cardiomyopathy

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Background: Paroxysmal atrial fibrillation (PAF) is a common complication of patients with hypertrophic cardiomyopathy, often leading to heart failure and cerebral infarction. Therefore, the early detection of patients with hypertrophic cardiomyopathy at risk for developing PAF may be useful in treatment strategies. Enlarged left atrium (LA) determined by M-mode left atrial dimension (LAD) is a risk factor for subsequent AF. Whether LA volume (LAV) can predict PAF development has not been established. The purpose of this study was to evaluate the relation between LAV and the occurrence of PAF in hypertrophic cardiomyopathy. **Methods:** We studied 141 patients with hypertrophic cardiomyopathy and sinus rhythm at the time of examination. Chronic AF, other arrhythmia and permanent pacemaker implantation were excluded. 31 pts had evidence of PAF (PAF group). Comprehensive transthoracic echocardiographic study was performed and all patients had normal left ventricular function. LAV was measured off-line using biplane area-length method. The maximum LAV indexed to body surface area (BSA){LAV/BSA}was also assessed.
Results: Age and ejection fraction were not significantly different between PAF group and no PAF group. LAD, maximum LAV and LAV/BSA were significantly increased in PAF group compared to those in no PAF group (LAD; 4.09±0.57 vs. 3.67±0.60 cm, p=0.0006, maximum LAV; 73.0±19.7 vs. 47.4±14.8 ml, p<0.0001, LAV/BSA; 43.4±12.0 vs. 29.4±8.8 ml/m2, p<0.0001). Among the echocardiographic variables, only maximum LAV and LAV/BSA were significantly associated with the occurrence of PAF. Cutoff value of 56.0ml for LAV and 34.0 ml/m^2 for LAV/BSA gave the best balance between sensitivity and specificity in differentiating the no PAF group and PAF group.
Conclusion: LA volume can be used as a useful marker for identifying patients with hypertrophic cardiomyopathy likely to develop PAF.

1037-145 Ultrasound Myocardial Tissue Characterization Allows Early Detection of Cardiac Involvement in Patients With Sarcoidosis

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Backgrounds: Although cardiac involvement is an important prognostic factor in patients with sarcoidosis, early detection of cardiac sarcoidosis is difficult. Cyclic variation of myocardial integrated backscatter (CV-IB), which provides noninvasive measurement of acoustic properties of the myocardium, may detect early myocardial involvement even in patients without apparent abnormality by 2-dimensional echocardiography (2DE). The purpose of this study was to clarify the value of CV-IB analysis for early detection of myocardial involvement in patients with sarcoidosis. **Methods:** The study patients consisted of 22 consecutive biopsy-proven patients with systemic sarcoidosis who did not have any abnormal findings on conventional 2DE. Cardiac sarcoidosis was diagnosed by radionuclide testing including thallium-201 scintigraphy, gallium-67 scintigraphy and cardiac fluorine-18-deoxyglucose positron emission tomography. The magnitude and delay of the CV-IB (Sonos 5500 ultrasound system, Phillips Medical Systems) were analyzed in the basal septum, mid septum, basal posterior, and mid posterior wall of the left ventricle in all subjects. When cyclic variation showed asynchrony, we expressed its magnitude as negative values. **Results:** The patients were divided into 2 groups: 8 patients with cardiac involvement and 14 patients without cardiac involvement. In the basal septum of the left ventricle, marked reduction in the magnitude (1.8 ± 4.4 vs. 6.6 ± 1.3, P = 0.012) and

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