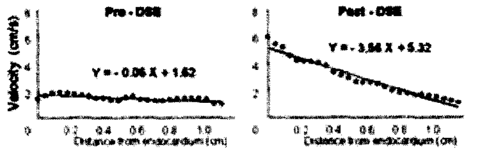
and MVP was analyzed off-line.
Results : 1) Wall motion score index (WMSI) assessed by 2DE decreased significantly in 9 of 12 patients (75%) reflecting improvement of regional wall motion abnormality. 2) In contrast, in 11 of 12 patients (92%) the peak systolic myocardial velocity (1.17 vs 4.97cm/s, $p < 0.001$) and transmyocardial velocity gradient (0.06 vs 3.26 s^{-1}, $p < 0.001$) obtained by MVP at the region suspected to be viable increased significanty.
Conclusions: Myocardial velocity profile (MVP) obtained from color TDI during low dose DSE quantitatively assessed myocardial viability in patients with myocardial infarction. MVP was better sensitive than evaluation using conventional WMSI.



slope of the regression line = myocardial velocity gradient

1189-37 Tissue Doppler Imaging Pattern of Left Bundle Branch Block Is a Strong Predictor for Mortality in Patients With Heart Failure

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Background Recent studies had established that left bundle branch block (LBBB) is a strong predictor for mortality in patients with heart failure (HF). Aim of the study was to assess if different electromechanical pattern due to LBBB, established by Tissue Doppler Imaging, had an influence on mortality in patients with HF. **Methods** We studied 21 patients with LBBB and dilated cardiomyopathy with 2D echocardiography and Tissue Doppler Imaging (TDI). We analyzed qualitatively color coded M-mode of interventricular septum (IVS) and the following electromechanical patterns were identified: mildly unsyncronized *(IIA)*, severely unsyncronized *(IIB)*, reversed early in systole *(IIIA)* reversed late in systole *(IIIB)*, reversed throughtout all the systole *(IV)*. All patients were divided in three groups, according to left ventricular function (LVEF): *Group I*: <30% LVEF; *Group II*: 30-40% ; *Group III*: >40%. We considered also age, NYHA functional class, QRS narrowing and mitral regurgitation for multivariate analysis. **Results** The highest mortality rate (100%) was observed in IIIB electrical-mechanical pattern and LVEF 30-40%, while the lowest mortality rate (25%) was related to IIA TDI pattern with LVEF <30% (100% vs 25%, p< 0.01). The multivariate analysis show that the electromechanical pattern is a strong predictor for mortality *indipendently* from age, NYHA functional class, QRS narrowing, mitral regurgitation (χ^2= 0; df=1). **Conclusions** TDI is an useful method to assess the severity of LV asincrony. The electromechanical pattern is a strong predictor on mortality, indipendently from LVEF, in HF patients.

1189-38 Longitudinal Myocardial Displacement and Strain Rate in the Hypertrophied Heart Evaluated by Tissue Strain Imaging With Doppler Angle Correction and Tissue Tracking Technique

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Background: The left ventricular (LV) systolic function in the long-axis direction has been evaluated by pulsed tissue Doppler mitral annular motion velocity. However, it could not avoid the effect of cardiac translation. A prototype software (ApliQ, Toshiba Corp.) was recently developed to obtain tissue strain imaging (TSI). In this program, the center of contraction was set in the LV cavity and velocity was automatically angle-corrected. The velocity values from the same region of moving myocardium were automatically defined and interrogated over time to yield displacement by 2D tissue Doppler tracking technique. TSI was finally obtained as a spatial derivative of the tissue displacement. **Purpose**: To evaluate longitudinal LV myocardial contractile characteristics in hypertrophied heart using TSI. **Methods**: Subjects consisted of 20 normal (N), 20 hypertensive hypertrophy (HHD) and 12 asymmetric septal hypertrophy (ASH). Color tissue Doppler image was recorded from apical four chamber view and the TSI at the base of ventricular septum was analyzed off-line. **Results**: Peak systolic displacement (Dp) and peak systolic strain rate (SRp) decreased and time to Dp prolonged in hypertrophied heart (table). **Conclusions**: Longitudinal myocardial fiber contraction was depressed in hypertrophied ventricular septum especially in asymmetric hypertrophy. TSI with Doppler angle correction and tissue tracking can quantitatively evaluate longitudinal LV contractility regardless of cardiac translation.

	Dp (cm)	Time to Dp (msec)	SRp (1/s)
N	10.4 +/- 3.2	267 +/- 60	16.1 +/- 3.0
HHD	8.7 +/- 2.8	303 +/- 54*	11.2 +/- 3.7*
ASH	5.7 +/- 1.0*#	338 +/- 46*	8.6 +/- 2.0*#

1189-39 Accurate and Quick Assessment of Left Ventricular Function in Patients With Ischemic Heart Disease Using Biplane Advanced Automated Contour Tracking Method

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Background: Newly developed, advanced automated contour tracking (AACT) method allows accurate automated detection of the left ventricular (LV) endocardial boundary of echocardiographic apical images by just placing 3 sample points at both sides of the mitral annulus and the LV apex. Accurate LV ejection fraction (EF) may be estimated by applying the AACT method to two orthogonal planes in patients with ischemic heart disease (IHD) even with regional wall motion abnormalities. The purpose of this study was to examine the reliability of the biplane AACT method in the measurement of LVEF in patients with IHD by using quantitative gated SPECT (QGS) as a reference standard.
Method: The study population was consisted of 46 consecutive patients who underwent QGS. In every patient, both apical 4- and 2-chamber views were obtained by 2-dimensional echocardiography. Biplane LVEF was measured off-line by both AACT method and manual tracing method using modified Simpson's method. The accuracy of the AACT method for LVEF measurement was determined in comparison to QGS. The reproducibility of the AACT method for LVEF measurement was assessed by two blinded observers and compared to that of manual tracing methods.
Results: In 40 patients (24 with and 16 without regional wall motion abnormalities) of 46 patients (87.0%), adequate images were obtained for LVEF analysis. LVEF measured by the AACT method was correlated well with that by QGS (y=0.94x+3.7, r =0.91). The mean difference between AACT and QGS was 0.4±5.5% (mean±SD). The mean time required for analyzing one set of image by the AACT method was much shorter than that by manual tracing method (7±1 vs. 37±4 sec, p<0.0001). The observer variabilities for LVEF assessment were also significantly smaller in the AACT method compared to manual tracing method (intraobserver variability; 4.5±3.3 vs. 8.8±6.0 %, p<0.005, interobserver variability 8.5±6.8 vs. 13.7±8.4 %, p<0.05).
Conclusion: The biplane AACT method provides accurate and quick measurement of LVEF in patients with IHD.

1189-40 Quantitative Assessment of Regional Peak Myocardial Acceleration During Isovolumic Contraction and Relaxation Time by Tissue Doppler Imaging

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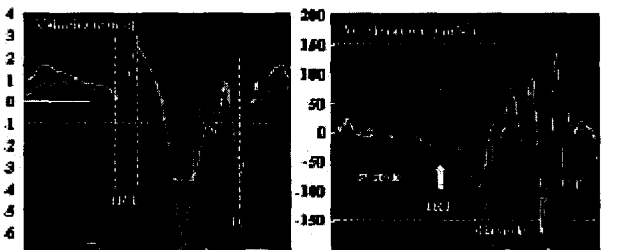
Background: Myocardial acceleration during isovolumic contraction (ICT) has been reported as an index of contractility. **Methods:** We studied 8 sheep using tissue Doppler imaging (VingMed Vivid FiVe) in apical 4-chamber views to evaluate 6 left ventricular wall segments and 2 mitral annulus sites. We analyzed peak myocardial acceleration during isovolumic periods (pIVA) derived from tissue Doppler imaging during ICT and isovolumic relaxation (IRT) for each segment. After scanning for the baseline, we changed hemodynamic status by blood, dobutamine and metoprolol infusion and compared the pIVA during IRT and ICT under 4 different hemodynamic conditions and peak positive and negative dP/dt conditions. **Results:** pIVA of basal lateral segment during ICT showed the strongest correlation with peak positive dP/dt (r = 0.96, p<0.0001) and there was good correlation between pIVA of septal mitral valve annulus during IRT with peak negative dP/dt (r = 0.80, P < 0.0001). There was a significant difference in pIVA between dobutamine and metoprolol conditions during ICT in all segments (p < 0.05), but pIVA was less sensitive to blood loading. pIVA during IRT showed little difference between the 4 different hemodynamic conditions. **Conclusions:** pIVA during ICT is a sensitive, preload independent marker for evaluation of dP/dt; the pIVA of basal lateral wall during ICT showing the strongest correlation with peak positive dP/dt; pIVA of septal mitral valve annulus during IRT showed a good correlation with peak negative dP/dt.



1189-41 True 2-D Velocity Display by Multiscale Motion Mapping (Triple-M Imaging) Allows New Insights Into Complex Cardiac Motion Patterns

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Background: Quantitative motion assessment in echo usually relies on tissue Doppler & border detection algorithms despite known limitations. **Methods:**
Multiscale motion Mapping is a novel image processing technique combining optical flow & spline imaging in space & time. Using all available grayscale info, it yields quantitative

motion maps which are neither angle dependent nor limited to visible borders. Motion measurement is possible in any image sector. The technique was validated in an echo phantom and applied to a variety of clinical echos. **Results:** Measured velocities (range, 0 - 24 cm/s) corresponded to known motion of the phantom. In contrast to simultaneous tissue Doppler imaging (only displaying motion vectors parallel to the beam), Multiscale Motion Mapping yielded true 2D motion vectors. In clinical echos, comprehensive motion information became visible: pericardial, myocardial, valvular and anular trajectories coincided with known motion. Phenomena not accessible to quantitation hitherto became evident, like circular mitral anulus motion and myocardial motion with components both inward & towards the apex. Radial & torsional apex motion in the short axis view also became visible.**Conclusion:** Multiscale Motion Mapping is an exciting new echo imaging modality that yields true 2-dimensional, Doppler independent and border independent motion maps. This broadly applicable technique thus allows new physiologic and pathophysiologic insights into complex cardiac motion.

1189-42 Interatrial Septal Strain Echocardiography Predicts Success or Failure of Cardioversion for Atrial Fibrillation

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The purpose of this study was to assess the feasibility of measuring left atrial (LA) dysfunction with tissue Doppler imaging derived strain rate (SR) and to explore its role in predicting maintenance of sinus rhythm after cardioversion for atrial fibrillation.
Methods: Strain rate (SR) and tissue velocity imaging was performed with offline analysis of the basal left atrial free wall and inter-atrial septum in the apical 4-chamber view, and basal of anterior and inferior wall of left atrial at the apical 2-chamber view. Mean peak systolic (Sm-SR) and peak early diastolic (Em-SR) SR were measured with LA end-systolic anteroposterior, longitudinal and transverse dimensions (LADs, LADlo and LADtr). 27 healthy age-matched controls (C) and 42 patients with AF before cardioversion were studied. Follow-up was for 3.5 years. Cardioversion to SR was successful in 26 pts but 14 patients reverted to AF within 4 weeks. We grouped patients into two subgroups: those who cardioverted and remained in SR (group S, n=12) and those who either failed to cardiovert or reverted to AF within 4 weeks (group F, n=30).
Results: Sm-SR (2.05±0.96 s -1) was significantly reduced in the AF group comparing to normal (2.83±0.73 s -1 p <0.01). Em-SR (2.57±1.01 s -1) was also non-significantly lower compared to normals (3.00±0.78 s -1). LADs, LADlo and LADtr were significantly increased and Em-SR significantly lower in group F than group S (all p<0.01). Multivariate regression analysis showed that Em-SR was the most strongly independent predictive parameter for maintenance of sinus rhythm post cardioversion (p= 0.0051).
Conclusions: In AF atrial Sm-SR and Em-SR are due to regular and circular deformation induced by ventricular motion. The lower values in AF patients suggests decreased passive lengthening (stretching) and shortening of atrial walls possibly because of atrial remodeling with fibrosis and reduced compliance. Thus, AF patients with low SR values are less likely to cardiovert or remain in sinus rhythm.

1189-43 Peripheral Vascular Adaptations to Transverse Aortic Banding in Mice

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Background: Transverse aortic banding (TAB) in mice is an important model of cardiac hypertrophy. However, its effects on peripheral hemodynamics are unknown, and the amount of hypertrophy generated is variable. The purposes were to characterize the peripheral blood flow in banded mice using noninvasive Doppler methods, and investigate if changes in flow could predict the amount of cardiac hypertrophy induced. **Methods:** We used a custom-made probe with a 1 mm diameter 20 MHz ultrasound crystal mounted at the tip of a 2 mm diameter, 10 cm long stainless steel tube for Doppler studies. Normal C57BL6 mice underwent TAB (n=15) or sham operation (n=6). Doppler studies were performed on the right and left carotid arteries (RCA and LCA) 1 day later, and the heart weight/body weight (HW/BW) ratio was measured at 7 days. In another 12 banded mice, serial Doppler velocity signals were obtained from the TAB site, the RCA, and LCA before, 1 day, and 7 days after TAB. **Results:** The HW/BW ratio was higher (6.70±0.97 vs 5.77±0.61 mg/g, p<0.05) in banded mice than in sham mice. The RCA/LCA peak velocity ratio was significantly correlated with the HW/BW ratio after TAB (r=0.62, p<0.005). In serial study, peak RCA velocity increased from 34±7 cm/s at baseline to 55±16 cm/s at 1 day (p<0.01 vs baseline) and 50±11 cm/s at 7 days (p<0.01 vs baseline). Peak LCA velocity decreased from 31±7 cm/s at baseline to 15±6 cm/s at 1 day (p<0.01 vs baseline) and 15±7 cm/s at 7 days (p<0.01 vs baseline). There were no changes in mean velocities of RCA (10±3 vs 9±2 vs 11±2 cm/s, p=ns) and LCA (10±3 vs 8±2 vs 8±3 cm/s, p=ns) at baseline, 1 day and 7 days after TAB. The peak velocity across the TAB site increased from 0.61±0.15 m/s to 2.61±0.68 m/s at 1 day (p<0.01 vs baseline) and remained at 2.89±0.66 m/s at 7 days (p<0.01 vs baseline). There was a significant positive correlation (r=0.83, p<0.001) between the RCA/LCA peak velocity ratio and peak velocity across the aortic band. **Conclusions:** Changes in carotid velocity after TAB can be used to estimate the pressure drop across the aortic band and to predict the amount of cardiac hypertrophy in mice. After TAB, mice utilize peripheral arterial adaptations to keep normal mean carotid flow, and maintain cerebral perfusion.

1189-44 Quantitative Estimation of Subendocardial Ischemia With Dobutamine Stress Echocardiography Assessed by a Newly Developed Strain: M-Mode Echocardiography

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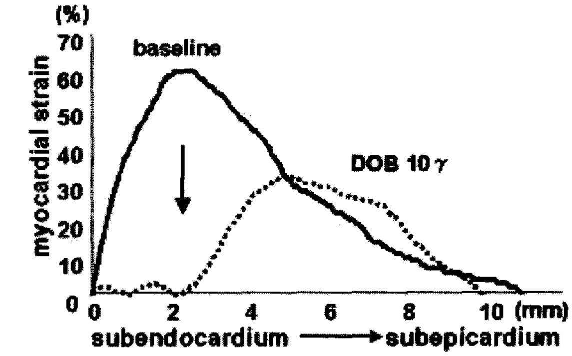
Background: Myocardial ischemia has been well demonstrated by inducible asynergy with dobutamine stress echocardiography (DSE), but subendocardial ischemia has not been quantified and fully elucidated. To address this issue, we evaluated the transmural myocardial strain distribution by using the recently developed myocardial strain M-mode imaging system (ApliQ, Toshiba, Japan). **Methods:** Wall motion abnormalities were assessed in 8 patients with a standard DSE protocol. Placing M-mode cursor on the parasternal left ventricular short-axis view, we obtained end-systolic myocardial strain profile in each segment (anterior and posterior walls at levels of base and mid). **Results:** Regional wall motion changes were assessed in 24 segments; 13 showed normal responses and 11 showed new wall motion abnormalities. Strain in the subendocardial-half layer (EndSt) in normal segments increased during DSE (62.8±31.2 vs.91.0±44.3%, p=0.001), but that in abnormal segments decreased (50.9±20.8 vs.2.7±29.5%, p=0.001) (Figure). Strain in the subepicardial-half layer (EpiSt) was much the same by DSE in both normal (32.5±16.4 vs.37.4±16.4%, p=0.307) and abnormal segments (24.9±9.7 vs.31.0±17.3%, p=0.152). Thus, EndSt / EpiSt was attenuated in abnormal segments (2.15±0.66 vs.-0.24±1.38, p=0.001). **Conclusions:** Subendocardial ischemia could be quantified by the transmural myocardial strain profile obtained by the newly developed strain imaging system combined with DSE.



POSTER SESSION

1190MP Moderated Poster Session...Atherosclerotic Burden by Computed Tomography and Magnetic Resonance Imaging

Tuesday, April 01, 2003, Noon-2:00 p.m.
McCormick Place, Hall A

Noon

1190MP-163 Progression of Coronary Calcification Poses a High Risk of Myocardial Infarction

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Background. Progression of coronary artery calcification (CAC) can be accurately assessed by means of sequential electron beam tomography (EBT) imaging. However, the prognostic significance of a measured change in CAC is still unknown.
Methods. We conducted an observational study for the occurrence of myocardial infarction (MI) in asymptomatic individuals submitted to sequential EBT screening at a minimum interval of one-year between scans. Plaque quantification was performed with a volumetric method (calcium volume score: CVS) and annual progression of CVS was assessed as absolute and percentage change when the initial CVS≥30.
Results. 833 subjects met the inclusion criteria (average time between EBT scans: 2.1±1.4 years). 45 subjects suffered an MI (2.2% per year). Only 3 MI patients (7%) showed stabilization of CVS (yearly change≤15%) compared to 42% of the remaining 788 subjects (p<0.0001). The yearly average CVS change in MI patients was 47.5±7.5% while it averaged 26±1.2% in patients without events (p=0.001). The relative risk of suffering an MI in the presence of CVS progression was 11.7 (CI: 3.5-34) compared to no progression. In a stepwise Cox model initial CVS, diabetes mellitus, hypercholesterolemia, and % CVS change were independent predictors of MI.
Conclusions: The risk of suffering an MI increases significantly in asymptomatic individ-