1177-117 Volume-Mass Ratio by Freehand 3D Echo at Baseline in Dilated Cardiomyopathy Predicts Improvement/no Improvement Following Treatment With Carvedilol

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Carvedilol may be used in severe heart failure to reverse LV remodeling and improve EF. However, in dilated cardiomyopathy increasing LV volume relative to mass (failure of hypertrophy) may exceed myocardial capacity to improve EF with therapy.

Hypothesis: That baseline EDV/Mass will predict patients with EF improved by long-term treatment with carvedilol from those not improved.

Methods: 26 patients with dilated ventricles and heart failure (20/6 m/f, 63 ± 13 yrs, 14 idiopathic, 12 ischemic, baseline EF = 23.3 ± 8.0, range 11ndash;38%) treated with carvedilol had serial ventricular volume, mass and EF by freehand 3D echo using a surface reconstruction algorithm and the line of intersection display for guidance. Patients improved (ΔEF ≥+8% at 8 + weeks) vs. not improved were compared by the unpaired T test and Pearson's correlation.

Results:

	Improved (n = 14)	Not improved (n = 12)		
Baseline	Mean ± SD	Mean ± SD	T	p
EDV	216.8 ± 43.4	304.5 ± 112.7	-2.54	0.025*
ESV	70.4 ± 43.9	225.3 ± 101.7	-1.73	0.100
EF	22.2 ± 8.2	27.8 ± 8.4	-1.71	0.100
Mass	258.1 ± 60.6	302.3 ± 83.9	-1.52	0.150
EDV/Mass	0.8515 ± 0.097	0.9896 ± 0.2	-2.60	0.019*
ESV/Mass	0.6616 ± 0.099	0.7214 ± 0.2	-1.02	0.320

Thus, EDV/Mass and EDV at baseline among improved patients are significantly less than among those not improved. An EDV/MASS < 1.0 and EDV < 280 ml. best separated favorable treatment response (12/14) from 7 patients (4 idiopathic, 3 ischemic) with an EDV/Mass > 1.0 and EDV > 280 ml. who did not improve. EDV and EDV/Mass were negatively correlated with improving EF.

Conclusion: EDV/Mass and EDV by freehand 3D echo discriminate patients who will be improved vs. not improved by carvedilol. Improvement is not likely (0 of 7) if *baseline* EDV/Mass > 1.0, and is likely (14 of 19) with a ratio of < 1.0.

1177-118 Rapid Three-dimensional Echocardiography Using Rotational Geometry: Precision and Accuracy of Left Ventricular Volumes Using Various Levels of Slice Resolution

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Background: We have developed a rapid rotational image acquisition technique for three-dimensional (3D) reconstruction. The purpose of this study was to evaluate how many slices are required for precise and accurate left ventricular (LV) volume measurement.

Methods: Six dog heart specimens with known volumes and asymmetric LV shapes were studied. LV volumes were calculated from equally spaced axial slices acquired in apical projection. LV volumes composed of 36 to 48, 16 to 24, 8 to 12, 4 to 6, and 2 to 3 slices were analyzed and compared with known volumes.

Results: There were no significant differences between 3D volumes and known volumes. However, with a reduction of slice resolution to 2 to 3 slices, the error (3D volume minus known volume; mean ± SD) increased significantly (*p < 0.01) when compared with higher slice resolution scans.

Slices	Equation	r Value	Error (ml)
36 to 48	y = 1.03x - 0.55	0.99	1.73 ± 3.04
16 to 24	y = 1.03x - 0.56	0.99	1.53 ± 2.99
8 to 12	y = 1.03x - 0.66	0.99	1.28 ± 3.21
4 to 6	y = 1.02x - 1.23	0.99	0.52 ± 3.72
2 to 3	y = 0.95x + 1.28	0.98	-2.03 ± 5.68*

Conclusion: LV volume can be quantified precisely and accurately by rapid 3D echocardiography with as few as 4 to 6 axial slices.

1178 Dobutamine Stress Echocardiography: Improved Qualitative and Quantitative Techniques

Wednesday, April 1, 1998, 9:00 a.m.–11:00 a.m.
Georgia World Congress Center, West Exhibit Hall Level
Presentation Hour: 9:00 a.m.–10:00 a.m.

1178-122 Color Doppler Myocardial Imaging: A New Method to Quantify Dobutamine Stress Echocardiography?

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Dobutamine stress echocardiography (DSE) remains a qualitative rather than a quantative technique. Recent multi-center studies based on visual assessment of gray scale echo (GSE) images documented high inter-center variability. Thus a reproducible, quantitative technique is required for inter-center stress echo studies. Intramural velocity information can be quantitated from Color Doppler Myocardial Imaging (CDMI) which in a third generation iteration has both the temporal and spatial resolution to accurately reproduce regional myocardial systolic velocities (MSV). To determine whether this CDMI system (frame rate >60/s) can accurately quantify ischemia induced changes during DSE data obtained from normal DSE studies was compared with data from 10 pts with stress induced wall motion abnormalities (all with angiography). Real time GSE and CDMI images were acquired in parallel and real time CDMI images were subsequently post-processed off-line. Dobutamine induced changes in regional MSV measured by CDMI were compared with visual GSE scores for each myocardial segment of the standard 16 segment model. DSE in normals produced a measurable response in MSV for incremental doses of the drug. This varied for individual myocardial segments and was different for normal circumferential and longitudinal shortening. For the DSE studies visual GSE evaluation scored all 10 pts to be positive. In all, CDMI accurately quantified an abnormal MSV response to dobutamine for either longitudinal or circumferential shortening in the corresponding segments. These correlated well with the severity of the coronary artery lesions on angiography. This study strongly suggests that parallel GSE/CDMI data acquisition during DSE can for the first time provide a quantitative technique which may be used for inter-center stress echo studies.

1178-123 Second Harmonic Imaging Improves Endocardial Visualization During Dobutamine Stress Echocardiography Without Contrast

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Background: Second harmonic imaging (SHI) is a novel echocardiographic technique developed to enhance imaging of contrast agents. We have observed that routine 2D images have improved endocardial definition with SHI. Our purpose was to determine whether SHI may improve the ability to interpret dobutamine stress echocardiography (DSE) on a segmental basis.

Methods: Seventeen patients underwent DSE using a standard protocol. At baseline and peak stress, fundamental (FND) and SHI were sequentially performed and images stored digitally. Both FND and SHI images were judged by two blinded readers whether each segment was adequately visualized to interpret wall motion.

Results: 64% of segments were interpretable with FND which improved to 84% ($p < 0.001$) with SHI. There was improved visualization in 9 out of 16 segments, including all 7 most poorly visualized segments. Values represent % of time each segment was interpretable at peak stress. * $p < 0.05$. B = basal, M = mid, A = apical, Sep = septal, Lat = lateral, Inf = inferior, Pst = posterior, Ant = anterior.

A4C	FND	SHI	A2C	FND	SHI	LAX	FND	SHI
BSep	94	100	BInf	76	94	MPst	35	76*
MSep	100	97	MInf	94	100	BPst	59	85*
ASep	56	79	AInf	62	79	MAntSep	79	97*
ALat	29	59*	AAnt	35	65*	BAntSep	88	97
MLat	24	71*	MAnt	47	82*			
BLat	21	71*	BAnt	26	74*			

Conclusions: SHI improves endocardial visualization during dobutamine stress testing. Routine use of this technique may enhance the diagnostic capability and reduce the interreader variability of DSE especially in patients with poor acoustic windows.