Abnormal Early Left Ventricular Filling as a Marker of Coronary Artery Disease During Dobutamine Stress Echocardiography: A Color M-Mode Doppler Analysis

C. Sotton, S. Suty, P. Houplon, A. Grontlingor, J.-P. Proiss, Y. Juillibe, N. Danchin, F. Cherrier. Cardiology, CHU Nancy-Bordeaux, France

Background: Myocardial ischemia induces a new impairment in LV relaxation.

Methods: To evaluate the evolution of LV filling during Dobutamine-Atropine stress echocardiography (DSE) in normal pigs without CAD and with normal left ventriculography (gr 1, n = 12, age: 59 ± 8 y; and in pigs with significant coronary artery stenosis (≥50%) CAD (gr 2, n = 26, age: 63 ± 11 y). All pigs underwent coronary angiography and maximal DAS (up to 40 μg/kg/min - Atropine infusion). Percent of changes between baseline and peak was calculated as follows: (peak - baseline) / baseline value.

Results: Among gr 2 pigs, 19 had previous myocardial infarction, and 8 pigs had massive CAD. Baseline values of LV VFV (gr 1: 68.3 ± 22.7 vs gr 2: 68.2 ± 23.1) were similar in the two groups. LV VFV values at peak were significantly different from baseline values in gr 1 (105.1 ± 25.0, p = 0.0001) but not in gr 2 (67.4 ± 19.3). Significant differences were noted between the two groups for VFV at peak (p = 0.0001) and for percent of change in FPV (gr 2: 93 ± 43 vs gr 2: 20 ± 39, p = 0.001). ROC curves showed that a percent of change of FPV less than 25% (gr 1: 31.2%, gr 2: 23.0%) allows detection of pigs with CAD with a sensitivity of 70% and a specificity of 75%.

Conclusion: During Dobutamine infusion, LV FPV does not increase as much in CAD patients as in normal patients. The assessment of this quantitative index of LV relaxation seems a worthwhile additional marker of CAD during stress echocardiography.

Myocardial Contrast Echocardiography: Insights From Experimental Models

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.

Heterogeneity of Segmental Myocardial Videointensity Increments During Intermittent Harmonic Imaging With Continuous Intravenous Infusion of Perfluorocarbon Microbubbles

L. Jiang, P. Lu, S. Li, S. Khankirawal, T. Porier. University of Nebraska Medical Center, Omaha, NE, USA

Digital subtraction contrast echocardiography has rarely been used for the highlighting of contract effect and quantification myocardial perfusion. However, heterogeneity of segmental myocardial videointensity increments with contrast has never been tested. We therefore developed a pixel videointensity mapping algorithm to automatically measure background myocardial videointensity (BMIV) and videointensity increments with contrast (VIWC), and applied it to 13 open chest dogs with normal myocardial perfusion. With constant instrumentation settings, end-systolic LV short-axis views at mid-papillary muscle level with conventional 6-segment assignment were obtained before and after triggering during intermittent harmonic imaging with continuous infusion of microbubbles. BMIV and VIWC were quantified with the exclusion of bright echoes from endocardium and epicardium. Segmental means and SDs were calculated for comparison.

Results:
1) Segments mean BMIV ranged from 53.8 to 57.9 with a mean of 55 ± 1.5, no significant difference among segments (p = 0.05); 2) VIWC within each segment was negatively exponentially correlated with corresponding BMIV (VIWC = BMIV - e^(-r), with an r of 0.92: sim. 0.95, P < 0.01); 3) Significant variations were observed in VIWC among segments, which was higher in septal (S) and lateral (L), and lower in inferior (I) and posterior (P) segments (Figure: *p = 0.05, **p = 0.01).

Conclusion: Significant heterogeneity is present in VIWC within segments.

Temporal and Spatial Heterogeneity of Myocardial Contrast Enhancement, Despite Lack of Posterior Wall Attenuation, With a New Contrast Agent, NC100100

N. Masani, P. Nikutta, M. Arraut, C. Kimmistio, N. Pandian. Tufts, New England Medical Center, Boston, Mass, USA

Variability of myocardial contrast enhancement may be due to both technical and physiological factors. Advances in imaging and contrast agents have reduced technical limitations. Posterior wall attenuation limitation of the contrast effect is now possible. However, it is important to determine the temporal and spatial patterns of myocardial opacification using new imaging techniques and transpulmonary agents. To do this, we performed contrast echos with NC100100 (0.3 kq IV) (Nymco) e 1 open chest dogs with normal myocardial blood flow. A HP Sonos 5500 scanner was used for harmonic imaging and short axis views obtained. Background subtracted, process corrected acoustic enhancement was measured in 6 LV regions to derive peak intensity (P, dB) and time-to-peak (TP, secs). Excellent myocardial opacification was achieved. PI in all regions (mean ± SD) = 9.02 ± 4.72. Marked heterogeneity between regions was seen with minimal PI seen in the anterior wall (PI = 7.83 ± 3.39) and max PI seen in the posterior (PI = 15.72 ± 3.94, P < 0.05) with no posterior wall attenuation (PI = 14.12 ± 3.71). A characteristic temporal pattern was observed, with a short TP anteriorly (TP = 3.10 ± 1.18) and longest in the posterior wall (TP = 8.34 ± 8.0, P < 0.05). Also, respiratory variations in acoustic enhancement - 5 dB were seen. In conclusion, intravenous NC100100 produces excellent contrast enhancement. Under conditions of normal myocardial blood flow considerable temporal and spatial heterogeneity exists between regions of the LV. Normal variations in contrast enhancement will need to be considered in attempts to quantify myocardial perfusion by contrast echo.

Identification of Myocardial Infarction by Contrast Echocardiography Using a New Transpulmonary Agent – NC100100: Comparison of Anterior vs. Posterior, and Patchy vs. Solid Necrosis

N. Masani, J. Yao, Q.-L. Cao, E. Avolar, M. Vannan, N. Pandian. Tufts, New England Medical Center, Boston, Mass, USA

Background: In most studies, videodensitometry of perfusion defects has been limited to the anterior LV wall because of posterior attenuation. How well transpulmonary contrast echo (MCE) can identify posterior infarcts (MI) or differentiate patchy and solid necrosis are not known.

Methods: We studied the efficacy of a new transpulmonary agent (NC100100) at a fluorocarbon contrast agent - in identifying regions of MI and compared the videointensity in anterior vs posterior, and patchy vs solid MI. In 8 dogs MCE was performed 4 hours after LAD or LCx occlusion. During IV injection of NC100100, short-axis views were obtained using harmonic, triggered imaging. Macroscopic examination of the corresponding TTC-stained LV was used to identify regions of patchy and solid MI. Background subtracted patchy acoustic enhancement (PI, dB) was measured in patchy/solid infarcted and control regions.

Results: Excellent MCE opacification was seen in all 8 logs, with contrast defects corresponding to the TTC defined infarct zone. PI (mean ± sd) was 12.5 ± 4.9 in control regions compared with 4.4 ± 2.2 in MI regions (p = 0.01). Posterior defects were as apparent as anterior defects: the difference in PI between MI and control regions was 7.8 ± 5.5 (posterior) vs 8.7 ± 4.4 (anterior) (p = ns). PI was similar in patchy (4.3 ± 2.6) and solid (4.8 ± 2.8) MI.

Conclusion: IV injections of NC100100 produced excellent acoustic enhancement of perfused myocardium without posterior wall attenuation. While PI could not be used to differentiate patchy from solid necrosis, MI regions can be identified regardless of their location and macroscopic appearance.

Noninvasive Assessment of Myocardial Perfusion in Mice: A Contrast Echocardiography Study

M. Scherrer-Crosbie, W. Stoudel, P.R. Hunziker, N. Liel-Cohen, W.M. Zapol, M.H. Picard. Massachusetts General Hospital, Boston, MA, USA

Background: Noninvasive methods to assess myocardial perfusion in transgenic mice may enhance current models of endothelial function and microvascular integrity. We applied contrast transchonatic echocardiography (TTE) for myocardial perfusion in healthy mice.