1036-161 Low Power Myocardial Contrast Echocardiography Accurately Discriminates Between Grades of Coronary Artery Stenosis

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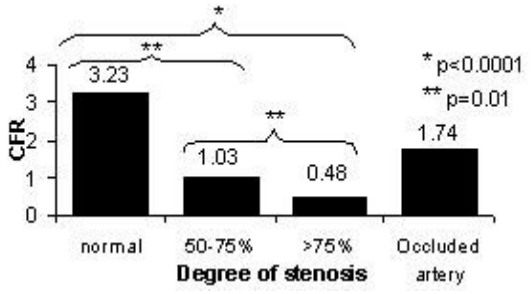
Background: Low power myocardial contrast echocardiography (MCE) is a new technique for the assessment of myocardial perfusion. We hypothesised that this technique can be used to accurately assess myocardial blood flow (MBF) and coronary flow reserve (CFR).
Methods: Accordingly, 36 patients scheduled for coronary angiography underwent low power MCE using infusions of intravenous Sonazoid® at rest and following vasodilator stress. MBF was assessed offline using QLab™ quantification software and CFR was calculated.
Results: There was no significant difference in resting MBF in the 8 patients with no significant LAD stenosis (9.4 ± 4.7), the 6 patients with moderate (50-75%) LAD stenosis (10.0 ± 5.8) and the 15 patients with severe (>75%) LAD stenosis (9.5 ± 3.7). A significantly lower MBF was seen in the 7 patients with previous myocardial infarction(MI) (2.7 ± 1.2; p=0.004). Following vasodilator stress, there was an increase in MBF in patients with no significant LAD stenosis (25.9 ± 14.8), no change in those with moderate stenosis (9.0 ± 3.5), and a decrease in those with severe disease (4.5 ± 4.1). In patients with previous MI, there was a slight increase in MBF (4.4 ± 4.1). These changes were reflected in the CFR in these groups (Fig). The persistence of CFR in patients with previous MI may indicate recruitment of collaterals.
Conclusion: Low power MCE accurately discriminates between grades of coronary artery stenosis and can assess myocardial viability.



1036-162 Does Real-Time Myocardial Contrast Echocardiography Cause Cardiac Arrhythmias in Humans? A Comparative Study at Rest and During Pharmacological Stress

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Background: Real time myocardial contrast echocardiography (RTMCE) is being used in many centers around the world. There have been isolated reports of RTMCE induced cardiac arrhythmias.
Aim: To study the occurrence and potential triggers to cardiac arrhythmias during RTMCE.
Methods: We prospectively evaluated 67 RTMCE studies in 42 patients (Mean age 58± 12 y, 21 men) performed only at rest (9) and at rest and during pharmacological stress (26 Dobutamine-atropine, and 32 Adenosine 140mcg/kg/min for 6 min). A 5-frame high mechanical index (MI) flash was used (MI>1.5). All studies were stored on videotape and digitally. Coronary angiography was performed in all pts.
Results: There were only 2 patients with premature ventricular contractions (PVC) at baseline and there were no severe side effect during any study. The incidence of cardiac arrhythmias is depicted in table 1 (between all stages/studies).All cardiac arrhythmias depicted in table 1 occurred at end systole (T wave) immediately after the use of Flash. There also were 21 PVC unrelated to Flash. Clinicaly each 4 Flash's triggered 1 cardiac arrhythmia (245/1067). There was no correlation between induced cardiac arrhythmias and presence or absence or coronary disease (p=0.154) or the use of a pharmachologic stress (p=0.26).
Conclusion: PVC are common during RTMCE imaging and are induced by high power Flash mode. It is therefore recommended that manufacturers set the flash mode to be triggered by the EKG R wave and a minimum number of flash frames should be set.

Table 1. Incidence of cardiac arrhythmias

	Rest	Pre Peak Dobutamine	Peak Dobutamine	Recovery Dobutamine	Peak Adenosine	p
Total Number of Flash's	446	105	166	149	201	*p=ns
PVC	102	26	28	30	47	*p=ns
Pared PVC	7	1	3	0	1	*p=ns
NSVT	0	0	0	0	0	*p=ns
Total Number studies/stages	67	26	26	26	32	*p=ns

1036-163 Impact of Myocardial Contrast Echocardiography on Vascular Permeability: Comparison of Three Different Contrast Agents

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Background: Microvascular permeabilization, petechial hemorrhage and premature ventricular contractions (PVCs) have been demonstrated in an in vivo rat model of myocardial contrast echocardiography (MCE). The purpose of this study was to compare these effects for three approved ultrasound contrast agents (USCA): Optison, Definity and Imagent.
Methods: Evans blue dye, an indicator of microvascular permeability, and a contrast agent were injected intravenously via a tail vein in anesthetized rats suspended in a water bath to mimic scanning depths seen in clinical cardiology. B mode scans with 1:4 end-systolic triggering were performed at 1.7MHz using a cardiac phased array scanhead to provide a short axis view of the left ventricle. Protocols varied the dose of USCA, and the ultrasound pulse peak rarefactional pressure amplitude (PRPA). Microvascular leakage was characterized by the area of Evans blue dye coloration determined from photographs of the hearts and detected by extraction of the dye from tissue samples. PVCs were counted from ECG traces recorded with the MCE images. The number of petechia were noted on the epicardial surface of excised hearts.
Results: Neither evidence of capillary leakage nor PVCs were seen in shams. The magnitude of all tested endpoints increased with increasing USCA doses. There was no apparent difference between the three agents' microvascular damage potential at low doses, when expressed in terms of the number of stabilized microbubbles (rather than as a simple volume dose per kg). However, the tendency for PVC induction appeared to be somewhat less for Definity. The effects increased strongly with PRPA, with apparent thresholds for petechiae at 0.4 MPa and for PVCs at about 1.0 MPa.
Conclusion: All three agents appeared to have approximately the same potential for causing microvascular leakage with the same gas body microbubble-dose (rather than the recommended volume doses). The potential for the induction of PVCs was less for Definity than for the other two agents. These results should be of value for maximizing benefits of USCA in diagnosis and optimizing efficacy in therapeutic applications.

1036-164 Impact of Contrast Echocardiography on the Myocardium: Histological Observations

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Background: In an in vivo rat model of myocardial contrast echocardiography (MCE), petechiae have been noted on the epicardial surface for high MI scans. The purpose of this study was to examine the hypothesis that micro-scale lesions occur in the myocardium.
Methods: Anesthetized hairless rats were suspended in a water bath. A short axis view of the left ventricle with 1:4 end-systolic triggering was obtained using a cardiac scanhead at 1.5 MHz and 1.8 Mechanical Index (measured in the bath without the rat). Optison® was injected via a tail vein as a 0.5 ml/kg bolus twice during 10 min. This high dose of about 10 times the maximum clinical dose was used to elicit clearly definable responses. Five rats received sham MCE, and five received MCE with the agent given during the scanning. The rats were sacrificed 24 hr after MCE. The hearts were excised and prepared for histology with hematoxylin and eosin staining. Slides were scored blind by a pathologist for the area of the sections affected by inflammatory response, necrosis and hemorrhage. In addition, the anterior half of sections were photographed at 20x magnification at seven positions and analyzed to determine the area occupied by micro-lesions.
Results: Micro-lesions were identified by inflammatory cells, presumably macrophages, which occupied regions approximately the size of cardiomyocytes (about 20 µm diameter and 100 µm long). The sham MCE sections showed no or extremely minimal indications of damage. The MCE heart samples showed micro-lesions scattered primarily over the anterior half of the sections. The pathologist scoring indicated inflammatory responses areas of 0.6 ± 0.5 % for shams and 3.6 ± 3.6 % for MCE (P<0.01, Mann-Whitney rank sum test), necrotic response areas of 0.6 ± 0.5 % for shams and 1.4 ± 0.5 % for MCE (not significant) , and no clear evidence of hemorrhage. The image analysis measured micro-lesion areas of 0.5 ± 0.8 % for shams and 7.4 ± 5.0 % for MCE (P<0.02, Student's t-test).
Conclusion: MCE using high MI has a potential for causing micro-scale lesions in the myocardium. The lowest efficacious MI and contrast dosages should be used to maximize the safety profile of MCE.