11:15

CORONARY BLOOD FLOW MEASUREMENT BY CONTRAST ECHOCARDIOGRAPHY IS LIMITED BY CHANGES IN INTRAMYOCARDIAL BLOOD CONTENT

Daniele Rovai, Massimo Lombardi, Gianna Ghelardini, Maria Aurora Morales, Mario Marzilli, Alessandro Distante, Antonio L'Abbate. CNR Clinical Physiology Institute, Pisa, Italy

According to Henriques-Hamilton's principle, if a known amount of an indicator (dose) is injected as a bolus at the inlet of a system, and the concentration is measured downstream, the flow through the system can be calculated as dose/area under the concentration curve.
To verify the validity of this principle in contrast echocardiography, a constant dose of contrast agent was injected as a bolus into an in-vitro system of circulation, at variable flow rates (from 380 to 3600 ml/minute). Two-Dimensional (Two-D) echo images collected in short-axis view at a sampling point along the circuit were digitised, the videodensity was measured and time-intensity curves were built. As expected, flow was strighlty related to the area under the curves, r = .90.
With the aim of studying human coronary circulation, a constant dose (4.5 ml) of sonicated Iopamidol was bolus injected into the left coronary artery of 6 patients with less than 50% coronary stenosis. Injections were performed both at baseline and following coronary vasodilatation by Dipyridamole i.v. infusion (.84 mg/Kg in 10 minutes). Two-D echo images of the LV were digitised, and myocardial videodensity was measured to build time-intensity curves. Following Dipyridamole, the area under the curves did not decrease, as expected, but increased: + 44 ± 18 % compared to baseline values, P <.05.
The mismatch between data obtained in experimental model and in human circulation suggests that coronary hyperemia in man is paralleled by an increase in intramyocardial blood content, which masks the expected decrease in the area under contrast echo curves.

11:30

MYOCARDIAL CONTRAST ECHOCARDIOGRAPHY CAN BE USED TO DETERMINE VIABILITY AFTER ACUTE MYOCARDIAL INFARCTION IN HUMANS.

Peter Sabia, Eric Powers, Michael Ragosta, Sanjiv Kaul. University of Virginia, Charlottesville, VA

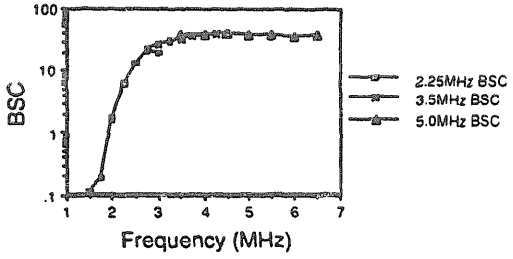
The two major determinants of infarct size following acute coronary occlusion are the duration of occlusion and the collateral flow to the myocardium at risk. While the importance of the duration of occlusion has been established, the significance of collateral flow in humans has been hindered by lack of appropriate clinical methods of assessing collateral perfusion. Because myocardial contrast echocardiography (MCE) has recently been shown to assess collateral blood flow in humans, we hypothesized that it can be used to determine viability following acute myocardial infarction (AMI). Accordingly, 26 patients with recent AMI (4 - 29 days, mean = 11 days) and total occlusion of the infarct-related artery, underwent MCE. Contrast (2 ml of sonicated Renografin) was injected into the vessels that were not occluded and contrast effect within the infarct zone was assessed as 0 to 3+. Coronary angioplasty (PTCA) of the occluded vessel was then attempted. In 5 patients, PTCA was not successful, while in 21 it was. Regional wall motion was scored in the pre-PTCA and 1 month post-PTCA echocardiograms as 0 to 3+. MCE assessed collateral flow was similar in patients with successful and unsuccessful PTCA (1.9 + 0.9 vs 1.7 + 1.1, p = NS). Change in wall motion, however was significantly greater in those with successful PTCA (improvement by 1.4 + 1.1 vs worsening by -0.2 + 0.4, p = 0.005). The 15 patients with greater collateral flow (≥2+) tended to improve their wall motion more than the 6 with less collateral flow (<1) after successful PTCA (1.6 + 1.1 vs 0.8 + 0.7, p= 0.10).
We conclude that residual collateral flow within the myocardium at risk is an important determinant of viability after AMI in humans. MCE can be used to assess viability following AMI and to determine which patients are most likely to benefit from revascularization.

11:45

FREQUENCY DEPENDENCE OF THE BACKSCATTER COEFFICIENT OF ALBUNEX®

James M. Glass, Lin X. Yao, Peter S. Rahko, James A. Zagzebski, Cardiology Section, University of Wisconsin Medical School, Madison, Wisconsin

Albunex® is a proprietary echo contrast agent consisting of air-filled albumin microspheres. It has been reported to be safe, stable, uniform in size and is highly echogenic. The Backscatter Coefficient (BSC), an absolute measure of ultrasound scattering intensity, has been previously reported to be proportional to microsphere concentration.
The purpose of this study was to characterize the frequency dependence of scattering in this material. Mixtures of Albunex® in 5% human serum albumin were kept in solution with a magnetic stir rod and imaged with a series of standard transducers. Individual frequency ranges were isolated electronically from the frequency spectra of the transducers and BSC for each frequency spectrum determined.
A representative graph of BSC versus Frequency is seen below. Absolute scattering intensity is shown to be dependent upon frequency as well as microbubble concentration. Additionally, there is a pronounced roll-off of BSC at frequencies less that 2 MHz.
This observed frequency dependence might be useful to obtain enhanced contrast echo images using Albunex® and has implications for quantitation of echo contrast studies.



Thursday, March 7, 1991
10:30AM–12:00NOON, Room 364, West Concourse
Modulation of Coronary Vasoconstriction and Vasodilation

10:30

COCAINE USE REDUCES PROSTACYCLIN PRODUCTION IN RABBIT AORTA.

Eric J Eichhorn, Saba E Demian, John E Willard, Susan Molina, Lori L Bartula, Luis G Alvarez, Paul A Grayburn, Stuart I Myers. University of Texas Southwestern and VA Medical Centers, Dallas, Tx

We have previously demonstrated abnormalities of coronary artery endothelial function and histology in patients who abuse cocaine. The present study examines the hypothesis that chronic cocaine abuse may alter endothelial prostaglandin production, especially prostacyclin (PGI_2). 12 New Zealand White rabbits were given a low cholesterol diet and 6 were treated with 2mg/kg cocaine IV 5 days per week for 8 weeks. The rabbits were then sacrificed and the abdominal aorta was removed and examined for histologic changes. Additional slices were incubated in oxygenated Krebs buffer (pH 7.4, 37°C) and PGI_2 (6-keto $PGF_{1\alpha}$), Thromboxane B_2 (TxB_2), and PGE_2 release were assayed by radioimmunoassay at 5, 15, and 30 minutes. Data expressed as ng prostanoid released/mg protein at each time period (Mean±S.D.).

Group	Assay	5 min	15 min	30 min
Control	6-keto $PGF_{1\alpha}$	317±195	734±499	456±290
(n=6)	TxB_2	51±87	32±43	12±21
	PGE_2	139±171	110±145	35±35
Cocaine	6-keto $PGF_{1\alpha}$	129±130	149±75*	111±56†
(n=6)	TxB_2	6±4	5±4	3±3
	PGE_2	20±14	17±18	21±25

*p<0.05, †p<0.02 vs. controls. The groups did not differ in cholesterol levels at the time of sacrifice. Additionally, 3 of the 6 cocaine fed rabbit aortas showed minimal histological evidence of non-atherosclerotic intimal changes while none of the control aortas had evidence of any endothelial abnormalities.
Conclusions- Cocaine decreases prostacyclin production in rabbit endothelium. Such alterations in prostacyclin production at the endothelial surface may predispose cocaine abusers to vasoconstriction and thrombosis. This may be one important factor in cocaine induced myocardial infarction in chronic cocaine abusers.