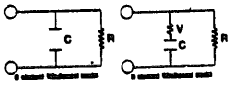
11:15

COMPARISON OF 2-ELEMENT AND 3-ELEMENT MODELS FOR ESTIMATION OF ARTERIAL VISCOELASTIC PARAMETERS

Gary McCray, Richard Marcus, Mark Lavenant, Claudia Korcarz, Pinhas Sareli, Roberto Lang, U. of Chicago, IL

Arterial stiffness results from the combined effects of compliance (C) and viscosity (V). Compliance estimates obtained using the currently favored 2-element Windkessel model, which ignores V, may be inaccurate. Accordingly, we used a 3-element model to estimate both these parameters from aortic root pressure and flow data. Instantaneous aortic pressure and flow measurements were obtained in 7 patients using Millar microtip catheters and intravascular electromagnetic flow probes, calibrated by thermodilution cardiac outputs. Values for (i) C alone (for the 2-element model) and (ii) C and V (for the 3-element model) were computed by an iterative procedure designed to identify parameter values which minimize the error function (D, the absolute average difference between measured and model pressure waveforms). 2-element model values for C and 3-element model values for C and V are shown below together with D values for both models. Values are mean±SD. *p=<.01, paired t test.

Model	2-element	3-element
C (cc/mmHg)	.73±14	.77±13*
V (mmHg*sec/cc)	0	.082±.023
D (mmHg)	7.1±1.6	2±1.1*



C values for the 2-element model are lower than values for the 3-element model. The error function is higher for the 2-element model than for the 3-element model. **Conclusion:** (i) The 3-element model, which incorporates both compliance and viscosity, describes the arterial pressure-flow relationship more accurately than the 2-element model. (ii) The 3-element model should be used for estimation of arterial viscoelastic parameters.

11:30

ROLE OF ASYNCHRONY ON REGIONAL LEFT VENTRICULAR DIASTOLIC FUNCTION IN EXERCISING DOGS WITH ISCHEMIA

Shunichi Miyazaki, Brian D. Guth, Toshiro Miura, Ciro Indolfi, and John Ross Jr.
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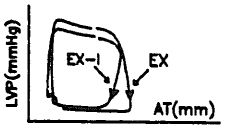
Effects of asynchronous wall motion (ASN) on regional diastolic function were examined in 7 conscious dogs instrumented with micromanometer for Left ventricular (LV) pressure (P) and sonomicrometers for anterior and posterior (AT and PT) wall thickness. After recording steady sate exercise (EX), ischemia (I) was created during EX (EX-I) by a pneumatic occluder on the left circumflex coronary artery. The AT and PT time difference (T-ASN) between peak thickening was measured as an index of ASN. From pressure-wall thickness loops of AT (LoopAT), loop areas were calculated as indices of regional myocardial work. From EX to EX-I, peak LVP decreased by 11% and T-ASN increased from 19.7±14.7 to 42.9±11.3 msec ($p<0.01$), accompanied by marked deformation of loopAT in AT during relaxation (Figure), which was related to impaired relaxation in PT. LoopAT area decreased ($p<0.05$), reflecting in part passive AT wall deformation during relaxation. LV relaxation was impaired (increased time constant of LVP decay from 14.0±2.7 to 17.0±3.9, $p<0.05$). Conclusion: During exercise induced ischemia, abnormal passive wall motion in normal regions produced marked asynchrony and contributed importantly to impaired global LV relaxation.

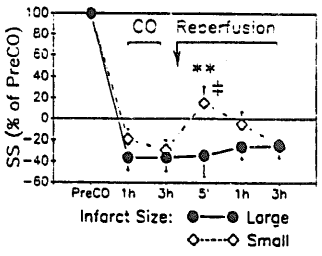


11:45

EARLY BUT TRANSIENT POSTISCHEMIC CONTRACTION: A RELIABLE INDICATOR OF VIABLE MYOCARDIUM?

Karin Przyklenk, Barbara Bauer and Robert A. Kloner, Heart Institute, Hospital of the Good Samaritan and USC, Los Angeles, CA.

Timely administration of thrombolytic agents is aimed at limiting infarct size, yet immediate and reliable clinical indicators of salvaged vs. necrotic myocardium are lacking. Using an anesthetized open-chest canine model, we sought to determine whether myocardial contractility measured postreperfusion could be used as a 'predictor' of viable vs. necrotic tissue. Ten dogs underwent 3 h of coronary occlusion (CO) followed by 3 h of reperfusion. Segment shortening (SS: an index of regional contractile function) was assessed in the ischemic/reperfused midmyocardium of all dogs and expressed as a % of baseline, preCO values. Five animals were severely ischemic during occlusion (mean endocardial blood flow of .02±.01 ml/min/g) and developed large infarcts (55±9% of the risk region), while 5 dogs had extensive collateral perfusion (endocardial blood flow of .31±.05 ml/min/g) and developed virtually no necrosis (4±2%). Large vs small infarcts could not be distinguished by the degree of dyskinesis during occlusion. However, all dogs with negligible necrosis exhibited an acute but transient increase in SS at 5 min post reflow (**p<0.05 vs large infarcts and ++p<0.05 vs 3 hours postCO). In contrast, there was no evidence of improved SS in dogs with large infarcts. This early but transient improvement in contractile function immediately after reperfusion may therefore provide a useful method to distinguish viable (but stunned) vs. necrotic myocardium.



Tuesday, March 5, 1991
10:30AM–12:00NOON, Room 257, West Concourse
Surgical Management of Coronary Occlusive Disease

10:30

20-YEAR RESULTS OF CORONARY BYPASS SURGERY FOR ANGINA

Shahbudin H. Rahimtoola, Cindy Fessler, Gary L. Grunkemeier, Albert Starr. The Heart Institute at St. Vincent Hospital and Medical Center, Portland, Oregon.

From 1969 to 1988, 238 of 8182 patients (Pts) who underwent coronary bypass surgery (CBS) for angina died within 1 month (2.9%). The 20-year survival for the entire series was 38±3.3 yrs. It was lower for those with 3-vessel disease and for those with abnormal left ventricular function.

Pts were grouped by year of operation: (A) 1969-73, mean age 54 yrs.; (B) 1974-78, 58 yrs.; (C) 1979-83, 61 yrs.; (D) 1984-88, 64 yrs. Group A had the best Pt characteristics but lowest operative and long-term survival, indicating 1969-73 was a period of major development towards optimization of CBS.

Groups D, C, and B had similar 5-year survival, and Groups C and B had similar 10-year survival. The annual mortality for Group B+C (4564 Pts) was relatively linear at 2.5%/year up to 10 years and increased to 3.6%/year after 10 years. The increase in mortality after 10 years occurred in most subsets of Pts. Reoperation rates were <1%, 2.4% and 3.4% per year for years 1-5, 6-10 and 11-15 after CBS. In the years 16-20 after CBS, 75% of Pts have no angina or mild angina.

We conclude that results of CBS for angina are most satisfactory for up to 20 years. After 10 years, mortality and reoperation rates are increased and are likely a result of the advancing age of Pts, progression of disease, development of new disease and long-term effects of abnormal left ventricular function.